

# CD with the Analogue Touch

AUDIO NOTE'S TOP CD PLAYING COMBO COSTS A FORTUNE, MEASURES APPALLINGLY, AND SOUNDS WONDERFUL. MARTIN COLLOMS AND CHRIS BRYANT ATTEMPT TO PICK THE BONES OUT OF THIS CONUNDRUM

This exceptionally costly transport and DAC combination, could be said to employ some rather arcane methods to try and recreate the sound of fine analogue replay. Audio Note pioneered the use of non-oversampling for CD replay, and at the same time it also controversially chucked out the previously ubiquitous digital 'brick wall' filter. Several other brands subsequently followed, notably 47 Laboratory and Zanden. Some consider that Audio Note also employs other mysterious and improbable technologies to achieve its aims, and a selection of these will be discussed in the technology section.

Audio Note's musical heart is undoubtedly in vinyl and it has long struggled to match with CD what it already achieves with the older analogue format. And leaving out considerations of cost, it would seem that the struggle has been relatively successful.

These products are evolutionary and have been under continuous development for many years. I first assessed an £18,000 *DAC5* for a *Hi-Fi News* review in Feb 2000. At the time it set a reference standard for sound quality. In particular aspects generally associated with solid state design and digital sound replay seemed held at bay, while more naturally musical characteristics were brought forward, giving a sweet and spacious effect with great transparency, an upbeat character and delicately resolved detail.



Lab measurement presented some problems, since the design was largely developed by ear, and the need for good measurement results was not high on the agenda. In particular the simple signal path meant that the filtering of digital artefacts above the recorded limit of 20kHz was poor, creating some unpredictability amongst the following pre- and power amplifiers.

This latest two-box combination incorporates virtually all of Audio Note's best techniques, and these are all directed towards maximising the quality of the listening experience.

Our samples were finished with high gloss black fascias with black enamel metal cases. The £4,950 *CDT Three II* transport (disc drive) is a sliding lid, manually operated top-loader with a minimum of controls; in its simplicity it seems more like a turntable. The *Three* designation refers to improvements in power supply technology, especially in the use of high grade Black Gate capacitors. The disc drive itself is a Philips *CDM Pro*, a modest remote control handset is supplied, and both RCA SPDIF and balanced AES EBU digital outputs are provided.

Specifications for the £39,500 *DAC5 Signature* are very sparse, the (balanced) output is rated at 3.2 V and 600 ohms; channel balance is 0.2dB or better; recommended load is 100 kohm (a modification for more low bass with lower pre-amp loads is available). The unit weighs a substantial 22kg, thanks to power amp sized transformers, and measures 14.5 x 45 x 42.5 cms (hwxwd).

## TECHNOLOGY

The basic design closely matches the standard *DAC5* model. The very costly *Signature* improvements relate to the extensive use of top-spec Black Gate capacitors for reservoir and decoupling duty, and silver wire made specially for Audio Note. There is not much copper left inside, since the critical current-to-voltage transformers, the internal wiring, and the windings of the output transformers are all silver. To guarantee the transformer performance Audio Note has now made its own 50% nickel permalloy laminations, at considerable cost: these are 0.1mm AN-Perma 50 in a double C-core configuration.

Unusually the output of the selected *AD1865* DAC is coupled to the first valve via a special high ratio transformer with a very generous permalloy core, effectively converting current at low impedance to voltage at the high input impedance valve grid. The unit has an

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all-valve gain path, with *ECL82* valve regulation and an *OB2* gas stabiliser voltage reference. Early gain is from an *ECC82* double triode leading to a *6463* for the zero feedback anode follower balanced output drive. The valves are vintage NOS types.

## SOUND QUALITY.

Unmistakably high end, there was more than a hint of magic from the very beginning. While still recognisably *DAC5*, the sound was considered to be some 50% better and at first it was hard to pin down quite why. You could argue there was no point in speculating, and one should simply enjoy the result, but my inquisitiveness drove me to try and understand why this CD replay sounded so much more like vinyl, in the very best sense.

One hint was smooth sounding but ever present background noise, a near subliminal level of hiss more like vinyl than tape in character. Inaudible on highly modulated rock, it was mildly evident on classical material and wide dynamic range jazz. Historic work I did on FM tuners showed that the addition of near-subliminal smooth uncorrelated noise caused some threshold unmasking or sensitisation of the ear to low level sounds, making the result a little more detailed and transparent. This acts a little like aural dither (in a digital sampling system, 'noise' is commonly added to improve the resolution at lower levels).

Certainly this Audio Note system possessed remarkable transparency and low level resolution, bringing a rich deep texture to the timbre of familiar midrange sounds. While it was very capable on rock and involving with jazz, classical program let the musical performances rule, with grand perspectives and fine recovery of the hall acoustic. Not only were dynamics lively and ear-catching, but I sometimes heard information revealed which I had not heard before from the silver disc, yet knew was present in the vinyl equivalent.

Much digital replay sounds disappointingly anaemic and grey. Often dynamics are dulled, and while resolution may be quite good, the results are not very entertaining, seemingly just going through the motions. Not so this *CDT Three II/DAC5 Signature*, which presents the grand musical design with full detail, good focus and very fine depth and perspectives – just slightly sweet, like LP. Is this result accidental or intentional? The sound is upbeat, nicely dynamic and essentially natural, with a classic 'low feedback' quality, meriting a high, reference grade score of 78.

However, there is a caveat. The above result is possible with care, and most probably in all-Audio Note system context, but cannot be guaranteed in any given system



due to the significant ultrasonic noise on the output. A few simple checks with some lower grade transistor amplification showed some variable loss in treble quality and clarity could occur due to this interaction.

## LAB REPORT (Chris Bryant)

Not having had the opportunity of measuring an Audio Note DAC previously, and given the company's philosophy, I anticipated that the measured results would be rather different from the near perfection shown by most regular CD players, as indeed it turned out.

On frequency response the *DAC5* bucks the dead flat trend completely, registering -0.5dB at 20Hz and around -1.4dB down at 12.5kHz (measured with a spectrum analyzer); also -2.4dB at 16kHz and -4.0dB at 20kHz. The technology compromises adopted in this player let through unusual amounts of high frequency and in-band spurious.

A constant 0.5 dB channel balance error is small enough not to complain. The DAC phase-inverts both single-ended and balanced outputs, which is audible on some systems. The impulse responses clearly show a localised pre- and post-echo ringing. The Audio Precision measured response of the same signal from the transport shows the more usual result.

## The system.

Conrad Johnson 350SA power amplifier supplemented by an EVA Proteus; XTC, Audio Research Reference 3 and Conrad Johnson ACT2 MkII control units; Audio Physic Scorpio and Avalon Diamond loudspeakers. Cables were by Cardas and Transparent, with Audio Note silver cable for the DAC transport connection.



Intermodulation distortion is one of the worst ever measured on a CD player. The 1kHz artefact created by the full level, dual 19/20kHz IM signal is only 40dB down on the fundamental, and a spread of signals also appears as a result of the signals mixing with the relatively unfiltered sampling frequency. Dropping the test signal by 10dB shows an improvement, to -53dB and reduced level of IM/sampling frequency products. I'm sure the player would sound better if these interactions could be reduced. A single 20kHz full level tone is shown in wideband analysis and this clearly demonstrates the weakly filtered spurious products. Even the -70dB dithered tone produces some non-harmonic artefacts such as a grouping around 2kHz. Imagine the effect on a modern highly compressed recording especially if it had a wide bandwidth. The likely artefacts produced above 20kHz are capable of adversely affecting the following electronics and some wideband amplifiers will even put this high frequency

energy out into your loudspeakers. Some thought is required when matching this product to a system.

Good signal-to-noise ratio figures of greater than 100dB are normally expected, but here the measured ratios were heading in the direction of vinyl – the 1kHz CCIR weighted figure of -66dB was surprisingly bad, with the A-weighted at -75dB and unweighted (22Hz to 22kHz filtered) a 'satisfactory' -72dB.

Linearity was good down to -70dB but then started to go slightly awry, giving a 2dB negative error by -80dB; this doesn't increase much by -90dB. (The -100dB dithered signal is lost in noise.) Output level was on the low side at 1.4V single-ended, 3dB below the industry standard of 2V; likewise the balanced output is 2.9 volts. For meaningful listening comparisons volume adjustments must be made. Distortion was very similar on both channels, reaching almost 1% at 20 Hz, improving to better than 0.1% in the midrange before breaking the 1% barrier at 20kHz – most unlike CD. The channel separation was asymmetric with breakthrough from right into left rather poorer.

The transport successfully concealed errors of up to 1.5 mm, which is fairly average by today's standards, and it was not quite as slick as some when it comes to TOC and track search. It proved impossible to get useful jitter data from the pairing as the high noise floor of the DAC5 masked the telltale low level signals jitter may produce.

I couldn't resist the temptation to audition this unusual CD playing combo, and despite the above technical issues, there's no escaping the conclusion that its sound quality is very fine indeed.

Uncomplicated music was quite beguiling, voices hanging in space, plucked strings resonating with great realism, but when an orchestra gets going and there is more treble energy in the mix, the presentation becomes rather more confusing. Nevertheless it remains one of the best players I've yet heard, with flashes of midrange lucidity I've never previously encountered from the medium.

## CONCLUSIONS

The lab testing delivers a controversial counterpoint to the subjective findings, suggesting potential problems with some matching electronics: very likely solid state Class D amplification should be avoided on these grounds. The mild background noise does not seem to injure the listening experience, and might even enhance it, but it is a factor that needs weighing in the balance. The alias tones and distortions look worse on test than they really are when you consider the moderate power spectrum and mean modulation level of most music. If you compare

### CD PLAYER TEST RESULTS TEST RESULTS

Make <b>Audio Note</b>	Date: 25/09/07	Ser. No. 0792	
Model <b>CDT Three II / DAC5 Signature</b>			
Distortion THD inc noise	20Hz	1kHz	20kHz
0dB	-44 dB	-65 dB	-36 dB
Channel separation 0dB	-34 dB	-66/-85 dB	-41/-61 dB
Frequency response IHF 0.5 V Aux	-0.5 dB	0 dB	-4.0/3.8 dB
Intermodulation Distortion	1 kHz difference tone		
19kHz/20kHz 1:1	0 dB	-40 dB	
	-10 dB op	-53 dB	
Signal to noise ratio	"A weighted"	CCIR 1kHz weighted	22Hz-22kHz unweighted
Ref:	0 dB	-75 dB	-67 dB
			-72 dB
Channel reference	-90 dB		
L ch is reference at 0 dB	+0.52 dB		
Linearity ref 0 dB	-70 dB	-70.6/-70.3 dB	
	-80 dB	-82.0/-81.5 dB	
	-90 dB	-93.0/-92.0 dB	
	-100 dB	into noise dB	
Maximum output level (1% clip) 100 k ohm load	1.406 V SE	2.97/2.80 V Bal	
Output impedance SE	15 ohms		
Balanced	7.5 ohms		
DC offset	Left 0 mV	Right 0 mV	
Size CDT WxHxD	306 mm	150 mm	430 mm
Size DAC 5 WxHxD	450 mm	150 mm	440 mm
Price	£4,950 + £39,500		
Contact	AudioNote UK Tel: 01273 220511 www.audionote.co.uk		

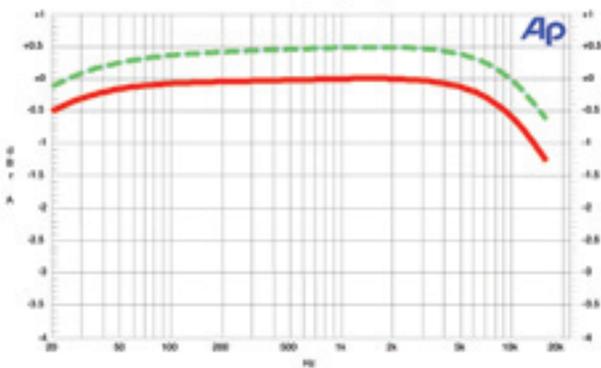
this combo to other players, do note its lower than usual output level, and increase the replay volume accordingly.

This combo can't be considered good value for money. It is not competitive, nor is it intended to be. Rather it's an expression of commitment to CD music replay, to show what can be done when a truly ambitious objective is set.

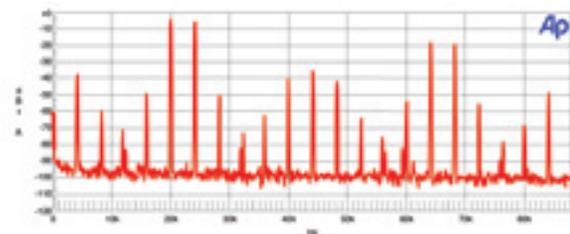
Once again the usual simplistic view of test data correlates poorly with aural perception. Just what technical attributes we should be getting right remains speculative.

And once again Audio Note confounds the audio establishment with a thoroughly musical pure Red Book CD playing transport/DAC combination, which is a delight to audition in well matched systems. It tells so much about performances, about the recording venue and the quality of musicianship that CD really is made to sound more like very good vinyl replay. Recommended, but with caution.

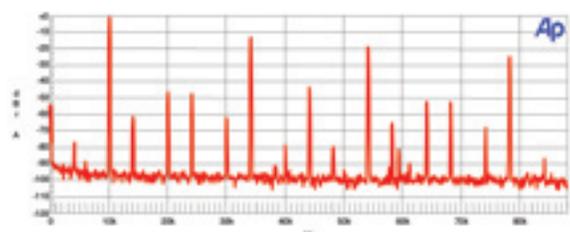
AudioNote DAC 5 Frequency Response, L, R



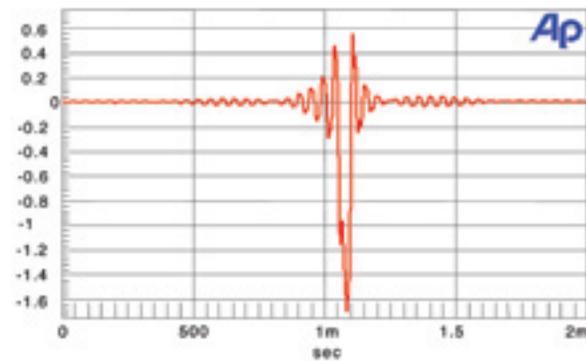
AudioNote DAC 5 20kHz 0dB, note spuriae



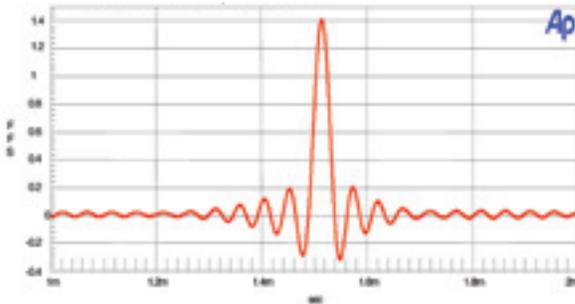
AudioNote DAC 5 10kHz 0dB, note spuriae/noise in bandwidth



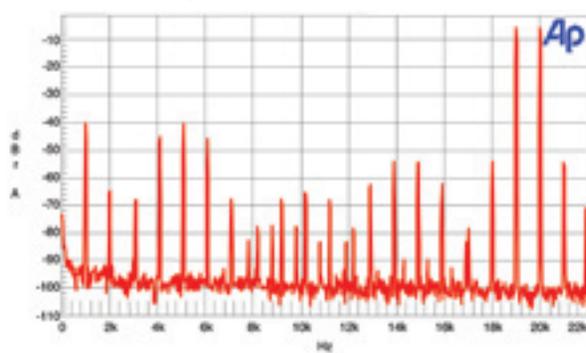
AudioNote DAC 5 impulse response



AudioNote Transport digital impulse response (APSPDIF input) compare this reference with the DAC response above



AudioNote DAC 5: 0 dB 1/M 19/20kHz, note raft of in-band signals for this peak level signal



AudioNote DAC 5: 1k at -70dB with dither, this is a tidy result

