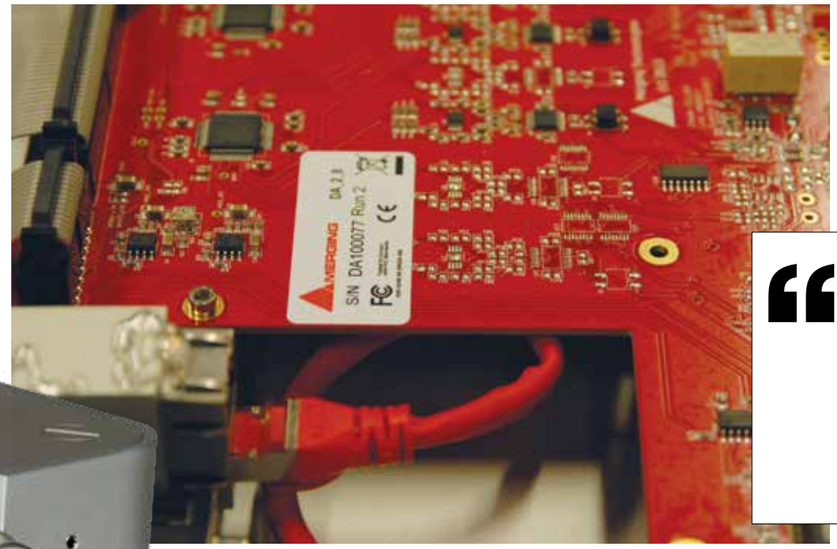
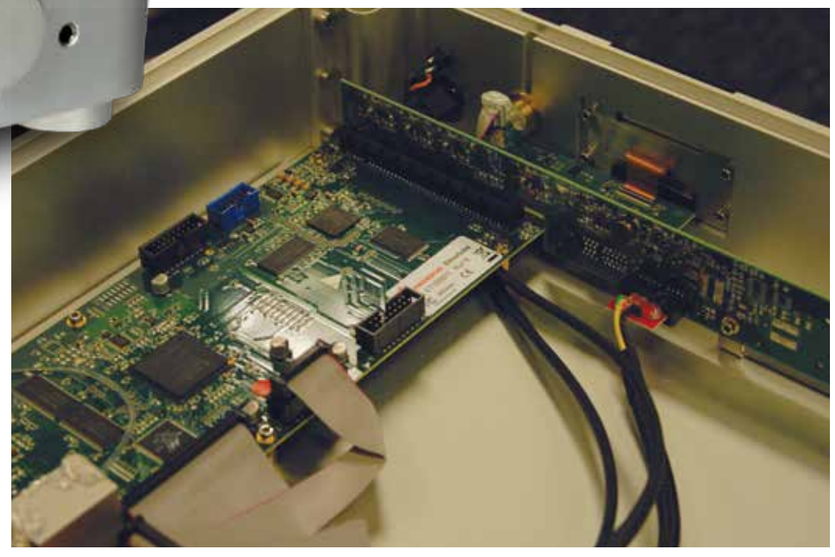
MERGING TECHNOLOGIES
NADAC DAC

In yet another inroad from the Pro studio arena into the audiophile/enthusiast space, Switzerland's Merging Technologies' NADAC (network-adaptable digital-to-analogue converter) has plans to disrupt the status quo of the established consumer high-end digital specialists. And, as if to rub further salt into the wounds of the competition at consumer level, the NADAC's in-built Merging Technologies-developed Pro-credentialled Ravenna Ethernet network protocol allows connectivity (via standard RJ45-terminated Cat5e/6 cable) to a LAN and music server environment without the cable length limitations and other potential issues related to ye ole' USB. Ethernet connectivity allows digital information to be sent across from the server (or dedicated computer source) to the NADAC in data packets transferred at gigabit speeds allowing extremely precise error correction while reducing jitter to claimed unprecedentedly-low levels (can you hear the competition shouting: '*Why didn't we do that?*') and the unit's ability to soar to multiple escalations of both the PCM and DSD formats further elevates it to state-of-the-art heights.

Merging Technologies' gear is said to be used in some of the world's best recording studios—Bob Ludwig's renowned Gateway Mastering Studios for one—and being a respected entity in such an exalted arena equates to formidable potential in the high-end consumer electronics space… these guys know a thing or three about digital technologies. Basically, they're saying that if it's a DSD recording you're about to play, it's most likely the digits came from Merging Technologies' own number-crunching furnace. From the studio to your listening room, just as it should be (oven mitts optional).





> *Any omissions? Yes… there's no USB connectivity … which could turn out to be a potentially costly omission*

WANTING FOR NADA?

The NADAC is attractively styled and finished in a silvery aluminium—and rather solid—chassis featuring neatly-rounded corners. Simplicity itself, the fascia's left hand side sports a large multi-coloured multi-function LED-backlit push button (LED colour changes to indicate the resolution being played) styled in the Merging Technologies logo, flanked by etched company and model names. On the right-hand side you'll find a blackened panel sporting, a rather small and low-res OLED display (160×128 pixels, 16-bit colours) while to the right a large multi-function knob facilitates access to the NADAC's menus and sub-menus (press and hold, turn and quick press) and also provides volume control when the unit is in preamp mode. A built-in headphone amplifier outputs via a duo of mini and standard jack sockets alongside the display. The NADAC comes remote-less but Merging Technologies has developed a remote app which provides some level of control via tablet or smartphone, although a small remote control (the classy Apple Remote perhaps?) would have been a nice value-add, if for nothing else other than for volume control and input switching.

More fun awaits on the rear panel where, from left, we find a high-quality Neutrik XLR-style Ethernet RJ45 socket (Audio Engineering Society AES-67 standard) followed by the digital input cluster. Here you'll find AES/EBU and RCA SPDIF, Optical and a word clock input via a true 75Ω BNC connector. Both XLR and RCA analogue outputs are provided and a fused IEC socket with adjacent mains power switch rounds out the back panel items. Any omissions? Yes… there's no USB connectivity. When several competitors' DACs offer DSD resolution via USB this could, indeed, be seen as a perplexing, even a potentially costly omission for the plug-and-play user. However, the point of the NADAC is that, at its core, it's an Ethernet-centric device, which in theory is a superior method of data transfer given the USB interface's in-

herent deficiencies. A further benefit of network connectivity is internet access via the server's own connection to a modem/router (preferably a managed switch to prioritise port traffic), providing opportunities of sourcing high-resolution download/streaming sites such as Tidal, HDtracks or even Spotify. The legacy CD format is catered for via the digital inputs, should you choose to feed the NADAC from a CD transport.

In terms of setting-up, I understand the Ravenna Ethernet protocol is not quite plug-n-play and requires a modest amount of computer and network expertise to establish. In order to facilitate this process the local distributor ATT Controls is set-up to provide assistance. For the purposes of an expedient review and in order to observe real-world publishing time constraints, I was supplied with a just about-ready-to-go stand-alone server well-stocked with music encompassing all manner of genres with files at all levels of resolution up to DSD256. DSD files are available for download from an ever-increasing number of sites (HDtracks and Acoustic Sounds seeming to be the most popular among audiophiles) some even offering Master Tape DSD transfers—Google is your friend. The custom-built server was assembled by Sydney company Life FX, an outfit that specialises in building HTPCs and audio-based PCs of the highest quality.

The Windows 10 server allows ASIO driver native DSD playback and can be controlled via a Remote Desktop app on an iPad/tablet. Files were managed via the increasingly popular Roon software (JRiver can also be used, for example) while the listening tests also included my reference AMR CD-77.1 wonder-child CD player feeding PCM via SPDIF. Interestingly, by way of a strong retrospective contrast, the AMR CD-77.1 uses NOS Philips TDA1541 multi-bit DACs that, as superb as they are sound quality-wise, could be considered ancient in comparison to NADAC's own state-of-the-art implementation of the ES9008S Reference ESS Sabre DAC chips.

The NADAC's balanced output impedance is 40Ω and the stereo dynamic range is 130dB (A-weighted) while THD+N at 1kHz is quoted to be 0.00016%. These figures are somewhat different for the unbalanced analogue output with the impedance now being 20Ω while the dynamic range is 123dB (A-weighted) and the THD+N at 1kHz being 0.0002%. Via the Ethernet input the NADAC's sample rate will cater for 44.1 to 384kHz, DSD64, DSD128 and DSD256 resolutions. Resolutions are reduced to between 44.1kHz and 96kHz via the SPDIF inputs with an escalation to 192kHz via AES/EBU.

LISTENING

The many pleasures of DSD256—and DSD128, for that matter, which I found to be of equivalent excellence—were fully revealed via the NADAC. If I had to attribute a single descriptor to the inherent sonic signature of this DAC when handling DSD files, it would be… *ease*.

All things being equal, in terms of the playback system's quality, listening fatigue and the phenomenon audiophiles describe as '*digititis*', could be a thing of the past. The NADAC's timbral presentation is extremely well-sorted, making for harmonically-rich instruments captured with their inherent tonal signature intact; true representations of what you hear in 'live' instruments.

Talking bass, treble and midrange performance is almost a moot point here. The NADAC handles all of those elements with thorough adroitness, just as any high-quality competently-engineered DAC would. But it absolutely shines in presenting spatial information. More pertinently than ever here, there's the impression of a 'soundfield', such is the breadth of the soundstage in all directions. This results in a separation of image density that places instruments and voices within discrete, layered volumes of space contrasting presentations where this phenomenon is flatter and, taking it to its extreme, almost 2D-cardboard-cut-out-ish in terms of image body.

Also responsible for the tremendous soundfield and intense sense of musical ease was an extraordinary ability to retrieve ambient information on applicable recordings. The perception of the recording's environment was uncanny via DSD (of either 128 or 256 variety), as was transient attack, frequency-wide dynamic expression and microdynamic detail—all signs of outstanding overall resolution.

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Also of note was the NADAC's handling of delicate high-frequency content. Cymbals, bells and the like sounded extended, finely nuanced, detailed and, again, tonally spot-on. Acoustic guitar and the piano's high notes (and the rest of the instrument's spectrum too) stood out as being particularly pleasurable. And this followed-on down to the midrange where voices were realistically palpable.

These extraordinary qualities were manifested at their pinnacle via DSD128 or DSD256 and this is where NADAC sounded its very best. And this is as it should be too, seeing that it processes these files natively. Importantly, by the way, NADAC was faultless in its operation, never losing sync or dropping out while switching between and playing all DSD resolutions. Also of note; I preferred a signal path that included my reference Supratek valve preamplifier over direct-to-power amp connectivity using the NADAC in preamplifier mode. The inclusion of a valve stage in the signal path—a personal bias of this writer—or indeed just having a preamplifier in the component hierarchy, provided added presence, dynamic expression and a fuller sound overall.

Given a PCM signal via SPDIF the NADAC was competent enough, with nothing standing out as being deficient other than a noticeably reduced 'soundfield' scope. It's a flatter sound that is only evident once accustomed to the NADAC's blissful treasure-trove when handling DSD material.

Interestingly, my reference CD player (for context, a $20K monster) provided a contrasting sound that was more forthright and spatially more along the lines of the NADAC's DSD abilities. Consequently, this provided an interesting observation which is a non-definitive testimonial: given a competent CD player/DAC handling well-engineered musical productions, good ole' PCM can approach the perceived resolution and overall sound quality of up-to-the-minute high-res digital; there's life in the old disc yet, my friends.

CONCLUSION

With a deepening pool of DSD material and the ever-growing uptake of file-driven content by consumers, can the NADAC be considered a milestone in digital playback design? Well, many of the NADAC's competing products are offering PCM and multiples of DSD resolution; they're also taking the high-res road at full steam ahead. So what makes NADAC different? What sets it apart from the thriving DAC throngs, aside from its recognition by some of the best studios as a superlative music production tool, is its ability to be incorporated into a network via its Ravenna Ethernet protocol. This provides practical and sonic opportunities that elevate the Merging Technologies NADAC to a whole 'nutha level in terms of practical functionality and resoundingly superior sonic performance.

NAS drives, distributed audio, the internet and any music server are a lightning-fast, virtually jitter-free Ethernet cable away, converging at the NADAC for transition from PCM and up to DSD256. Merging Technologies… indeed. ***Edgar Kramer***

MERGING TECHNOLOGIES NADAC DAC

Brand: Merging Technologies
Model: NADAC
Category: Network attached DAC
RRP: $16,500
Warranty: Two Years
Distributor: ATT Audio Controls
Address: 1/174 Clarke Street
Northcote VIC 3070
T: (03) 9481 1244
E: frank@attaudiocontrols.com
W: www.attaudiocontrols.com

Faultless DSD playback
Totally effortless sonics
State-of-the-art resolution, transparency and tonal truth via DSD

Lack of USB interface
Poor display screen

TEST LAB REPORT: See page 90
Test results apply to review sample only.

LABORATORY TEST RESULTS

Newport Test Labs did all its testing of the Merging Technology NADAC via its SPDIF input, using both CD-standard 16-bit/44.1kHz test signals and 24-bit/48kHz AES-17 test signals. Obviously, the NADAC returned superior performance with the higher-fidelity AES-17 test signals, but it proved to be no slouch with CD-standard signals. Frequency response for example, with CD-standard signals, was ruler-flat out to 2kHz, then rolled off very slightly to be 0.1dB down at 20kHz.

The frequency response became even flatter and more extended with the AES-17 test signals (Graph 6) but the high frequencies were still 0.1dB down at 20kHz. Both these results were gained using the 'Fast' filter. The 'Slow' filter rolls off the high frequencies a little faster, but no earlier.

Channel separation was outstandingly good using either test standard, and essentially similar irrespective of the standard. The tabulated 16-bit/44.1kHz results show separation was 145dB at 1kHz and still 126dB at 20kHz. Channel balance was incredibly good across the entire bandwidth, with the 'reportable' 1kHz figure coming in at 0.009dB. Channel phase was almost equally good, returning a perfect result (zero interchannel phase error) at 1kHz, and only 0.01° out at 20Hz and 0.67° at 20kHz. Same-channel phase error (group delay) was typical for the DAC Merging Technologies is using: 180° for 1–20kHz and 5.39° for 20–1kHz. Non-linear interchannel phase errors were very low, ranging from 115dB to 127dB, as you can see from the tabulated results.

Signal-to-noise ratios were outstanding, though in this case are being given a 'leg up' by the extraordinarily high output voltage of the NADAC, which in its 'high-output mode' (you can alternatively select a low-output mode if you wish) delivers more than 6 volts, as per the tabulated results. *Newport Test Labs* measured signal-to-noise ratio at 116dB unweighted and 122dB A-weighted using 16-bit/44.1kHz, with the A-weighted figure improving to 126dB when tested at a 24-bit/48kHz sample rate.

Linearity errors were exceedingly low, with the NADAC correctly reproducing signals at the exact level they were recorded, though some small errors can be seen the tabulated results, the largest of which is a 0.06dB error at –70dB, followed by a 0.04dB error at –80.70dB. At all other levels below –60dB, the errors were between 0.01dB and 0.03dB, while at higher recorded levels, there were no errors at all: the NADAC scored perfect results.

Overall distortion was remarkably low as you can see from the tabulated result showing it to be 0.001% for a full-scale 1kHz signal. Spectrum analysis (Graph 1) revealed this to be primarily third harmonic distortion, though a second harmonic is present at –126dB (0.00005%), a fifth harmonic at –120dB (0.0001%) and a seventh harmonic at –131dB (0.00002%). This, of course, is a 'worst-case' result as music signals will never be recorded at 0dB. Graph 2 shows distortion at a –20dB recorded level, which is around the level most music is recorded, and all that's visible is a single third harmonic distortion component, at –120dB (0.0001%).

Newport Test Labs checked the NADAC's DAC at very low recorded levels and it returned the excellent performance you can see in Graph 3 (–91.24dB), where there are the expected distortion components (caused by the test signal not being dithered) plus you can see noise is more than 140dB down and there's very little jitter. Dithering almost exactly the same test signal (–90.31dB) removes the distortion entirely, and moves the noise floor to just above –140dB. (Graph 4). An excellent result. Also excellent was the NADAC's performance with a CCIF-IMD test signal (Graph 5) where there's no regenerated signal at 1kHz at all (therefore a perfect result), and only two HF sidebands, one at 18kHz and the other at 20kHz, both of which are fully 120dB (0.0001%) down. There's also almost no output at higher frequencies, just a few sampling-frequency-related spikes around 40kHz. You can see from the tabulated results showing 24-bit/48kHz performance, overall IMD was around –107dB (0.00044%) at low frequencies and –110dB (0.00031%) at high frequencies.

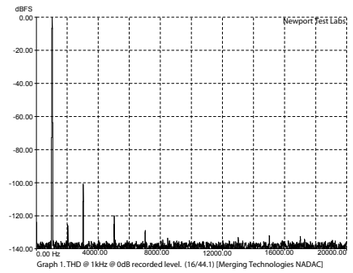
The effect of the user-adjustable filtering is shown to good effect in the two oscillograms showing the Merging Technologies NADAC's performance with a 1kHz square wave (16-bit/44.1kHz). First, you can see from the time-reversed ringing on the 'steep'-filtered waveform that Merging is using a standard 'off-the-shelf' oversampling filter. Then you can also see that although the 'slow' filter removes almost all the ringing, so the wave looks more analogue-like, there's still a time-reversal caused by the use of a standard over-sampling technique. Overall, the Merging Technologies NADAC DAC delivered excellent results on the *Newport Test Labs* test bench.

Merging Tech/NADAC 16-bit/44.1kHz Test Results

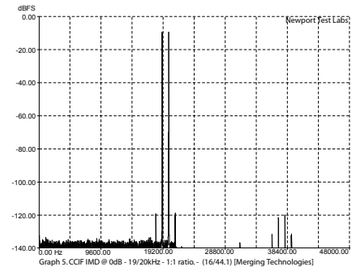
Analogue Section	Result	Units/Comment
Output Voltage (High Ouput Option)	6.1053 / 6.1124	volts (Left Ch/ Right Ch)
Frequency Response	–3dB @ 8Hz/-1dB @16kHz	Also see graph
Channel Separation	143 / 145 / 126	dB at 16Hz / 1kHz / 20kHz
THD+N	0.001%	@ 1kHz @ 0dBFS
Channel Balance	0.009dB	@ 1kHz @ 0dBFS
Channel Phase	0.01 / 0.00 / 0.67	degrees at 16Hz / 1kHz / 20kHz
Group Delay	+180.0 / –5.39	degrees (1–20kHz / 20–1kHz)
Signal-to-Noise Ratio (No Pre-emph)	116 / 122	dB (unweighted/weighted)
De-Emphasis Error	Not Fitted	at 1kHz / 4kHz / 16kHz
Linearity Error @ –60.00dB / –70.00dB	0.00 / 0.06	dB (Test Signal Not Dithered)
Linearity Error @ –80.59dB / –85.24dB	0.01 / 0.01	dB (Test Signal Not Dithered)
Linearity Error @ –89.46dB / –91.24dB	0.03 / 0.03	dB (Test Signal Not Dithered)
Linearity Error @ –80.70dB / –90.31dB	0.04 / 0.02	dB (Test Signal Dithered)
Power Consumption	0.29 / 16.23	watts (Standby / On)
Mains Voltage During Testing	239 – 254 volts	(Minimum – Maximum)

Merging Tech/NADAC (AES-17 Standard using 48kHz/24-Bit)

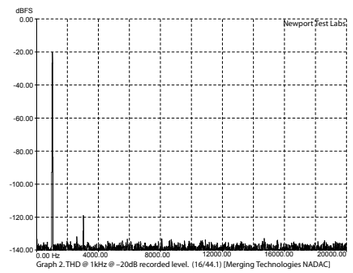
Digital Section	Result	Units/Comment
Out of Band Spurious Components	–123.084dB	
Suppression of Imaging Components	–116.402dB	(Worst Case)
Level Dependent Logarithmic Gain	–12.093dB	
Intermodulation Distortion (1)	–110.417dB	18kHz/20kHz 1:1 Ratio
Intermodulation Distortion (2)	–107.088dB	41Hz/7993Hz 4:1 Ratio
Low Level Noise Modulation	+13.914dB	Worst Case
Idle Channel Noise	–125.431dB	CCIR-RMS weighting
Signal-to-Noise Ratio	–126.422dB	CCIR-RMS weighting
Power Line Products	–149.642dB	50Hz
Non-Linear Interchannel Crosstalk (a)	–127.758dB	3kHz (2nd-order ref 17kHz/20kHz)
Non-Linear Interchannel Crosstalk (b)	–124.016dB	6kHz (3rd-order ref 17kHz/20kHz)
Non-Linear Interchannel Crosstalk (c)	–115.714dB	10.040kHz (2nd re 40Hz/10kHz)
Non-Linear Interchannel Crosstalk (d)	–107.650dB	10.080kHz (3rd re 40Hz/10kHz)
Absolute Phase	Switchable	Normal/Inverted



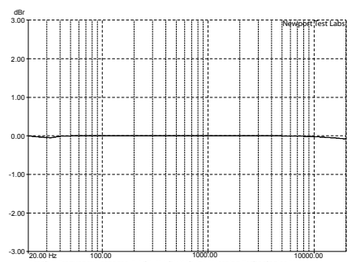
Graph 1. THD @ 1kHz @ 0dB recorded level. (16/44.1) [Merging Technologies NADAC]



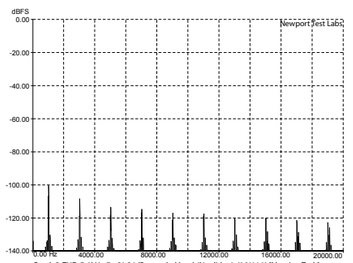
Graph 5. CCIF IMD @ 0dB - 19/20kHz - 1:1 ratio. - (16/44.1) [Merging Technologies]



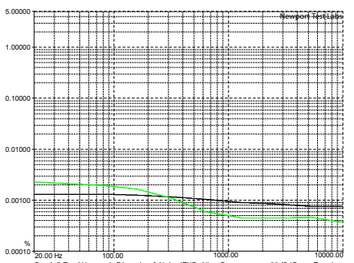
Graph 2. THD @ 1kHz @ –20dB recorded level. (16/44.1) [Merging Technologies NADAC]



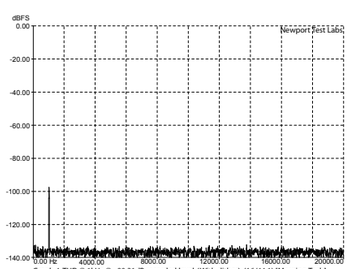
Graph 6. Frequency Response @ 0dB. (24-bit/48kHz) [Merging Technologies/NADAC]



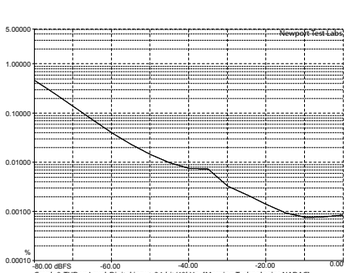
Graph 3. THD @ 1kHz @ –91.24dB recorded level. (No dither) (16/44.1) [Merging Tech]



Graph 7. Total Harmonic Distortion & Noise (THD+N) vs Frequency at –20dB (Green Trace) and –1dB (Black Trace). Digital input. 24-bit/48kHz. [Merging Technologies NADAC]



Graph 4. THD @ 1kHz @ –90.31dB recorded level. (With dither) (16/44.1) [Merging Tech]



Graph 8. THD vs Level. Digital input. 24-bit/48kHz. [Merging Technologies NADAC]

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TEST REPORT

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