REVIEW

NAIM ND 555

NETWORK PLAYER

Reviewer Jez Ford

As we lugged three boxes — two large heavy ones, and a medium lighter one — from the car up the many steps to the music room, we couldn't help thinking that this seemed a lot of weight for a streaming source. The heavier boxes contained not one but two required components — Naim's new top-of-the-heap ND 555 network player itself, and then the CD 555 PS, a unit for which the suffix is more descriptive than the prefix, it being the required standalone power supply as supplied for review (this was the DR version, now redesignated the 555 PS DR).

The third and lighter box contained two black accessories boxes, one of which yielded a pair of finger-thick cables terminated in large multi-pin Burndy ring-locking connectors, and the other opening to reveal a remote control, documentation, three antennas, and one more cable with equally dramatic terminations — closer inspection revealed it was in fact an extremely highly engineered version of a kettle mains lead. This super-kettle-cable (Naim's Power-Line, to use its proper handle) didn't, however, directly power the component we were preparing to review, the ND 555; it connected to the CD 555 PS, and from this the pair of thick cables then connected to the ND 555 itself.

Why two cables? Because they deliver separate supplies to the ND 555's digital section (the inputs through to the DAC) and the analogue sections (the current-to-voltage converter and analogue filter section).

Phew. Naim clearly doesn't mess around when it comes to power provision.

HIGH 500

But then this is, of course, Naim's range-topping 500 Series. It offers the best Naim can deliver, ready to play through an amplifier of the level of its NAP 500 amplifier first introduced in 2000, even the extraordinary Naim Statement pre-power introduced in 2014 (and previously featured in these pages). The 500 Series is Naim's 'elite' range and is, to quote the company, "the result of a single-minded pursuit of musical performance with a narrow focus on enhancing the aspects of music that matter to us most: pace, rhythm, timing and ultimately, emotive power."

Had we been reviewing one of the other two network players recently introduced by Naim — the $9750 NDX 2 or the relatively entry-level $4750 ND5 XS2 — then less portage would have been required for these more conventional components; the 500 Series components take everything to the next level.

QUALITY PLUS CONVENIENCE

All three of the new network music players take the streaming abilities developed for Naim's popular Mu-so wireless speakers to a new hi-fi level. Yet they share an interesting combination of convenience and quality — there's Spotify Connect and Chromecast onboard, Bluetooth and AirPlay too, so there are many paths to playback, some of better inherent quality than others.

To experience the best that the ND 555 has to offer, you should play files over your network, using Naim's app for navigation, or Roon, which is increasingly the discerning audiophile's control and server software of choice. In this way you can enjoy up to 32-bit/384kHz PCM playback, and up to quad-speed DSD. And when doing so, you won't be fretting over the many technical innovations and modifications that Naim has packed into the circuits, as described below and by Steve Sells, Naim's Head of Engineering for Electronics, in our interview overleaf. Instead you'll simply be loving your music. Because we thought the Naim ND 555 sounded simply thrilling.

TECH FEST

So let's get into that tech. As noted, high-quality power provision is a key priority. In addition to "the best external power supply we've ever made", the ND 555 makes extensive use of Naim's DR discrete-component voltage regulators, which have a low current draw and promise both lower noise and much faster voltage recovery than the previously used monolithic regulator.

"We have four DR regulators dedicated to powering the DAC," Steve Sells tells us in our interview (see p36). *"These are placed directly under the DAC on a separate PCB. The DAC is sensitive to noise on its power supply and the DR regulator had a dramatic effect on the sound quality."* The DRs also feed the sensitive analogue circuits; there are, in all, 13 of these DR regulators in the NP 555.

Naim highlights also the use of low-voltage differential signalling (LVDS) to route both the digital audio signal and the clock; it says this low-noise, high-speed method minimises timing errors because of its speed and also reduces radiation thanks to its low noise.

And there is a large buffer of RAM onboard, sufficient to store a full five minutes of red-book CD audio to guard against any bottleneck in streaming; Naim nicely calls this a 'stream-catcher'.

This allows a new system of master clocking to be employed, with the DAC clock rather than the source governing the rate at which audio data is streamed in. The clock is kept close to the DAC chips and sent to the streaming card again using the high-speed low-noise LVDS signalling. Again Steve Sells goes into more detail on these in our interview at the end of this review.

The data is over-sampled at exact multiples to a rather extreme 40-bit accuracy before being fed to the DAC, which is, perhaps surprisingly, a Burr-Brown PCM1704. This is a discontinued DAC; Texas Instruments, which bought Burr-Brown Corporation back in 2000, stopped making them five years ago and had considered them superseded as early as 2004. But Naim considers the PCM1704 to have exceptional sound quality, being a true R2R ladder DAC using repetitive arrangements of precise resistor networks; extremely accurate trimming of the resistors is required to achieve this high performance. Newer delta-sigma DACs are easier to manufacture and may measure better, says Naim, but it considers the PCM1704 to be the best-sounding DAC chip ever made (and specifically uses only the highest-performing PCM1704U-K variant in the ND 555). When production ceased, Naim acquired a stockpile of these DACs while it could, though in order to keep the ND 555 on its books and have enough spares on hand, it admits that this may be the last commercial product ever to use this iconic device.

One potential issue — this type of DAC design won't handle the continuous one-bit stream of DSD directly, so DSD streams are converted in the ND 555 to PCM by the SHARC DSP. But this is 352.8kHz, 40-bit floating point PCM, later upsampled to 705.6kHz/24-bit for the DAC conversion, and since it is low-pass filtered to remove DSD's ultrasonic noise, the result might even improve on performance. (That nearly all DSD has been previously converted from PCM anyway is a separate discussion — see our interview with Bricasti's Brian Zolner in this issue.)

> "Maybe there is something different here, something beyond, something which is delivered by the cumulative details to which Naim dedicates its engineering team and time."

▽ DIGITAL INPUTS AND AN OUTPUT SUPPLEMENT A SURPRISING LEVEL OF NETWORK CONNECTIVITY INCLUDING SPOTIFY, CHROMECAST, BLUETOOTH, AIRPLAY, APP CONTROL AND ROON-READINESS.

Physical design, both in terms of layout and in terms of construction, is addressed with similar levels of attention to detail. The PCBs are suspended on sprung sub-chassis systems with heavy brass plates (heavy, like several-kilograms-of-brass heavy, which explains much of the weight of the product, the mass delivering a low natural frequency for the six steel-coil springs which support the plate) to minimise the effects of microphony. Steve Sells notes he's particularly proud of the way the digital circuits have been enclosed within a nested Faraday cage, a six-sided aluminium box within the main enclosure that will protect the analogue circuits from RF emissions, the only holes being small cut-outs where wire connections pass through.

Naim's 'next-level' philosophy for the 500 Series applies even at the retail level, long after the components have left Naim's UK HQ.

"It takes a special level of expertise to properly demonstrate the 500 Series," says Naim; "all have undergone intensive training to earn the title of 500 Series Specialist". There are 13 such retailers listed across Australia.

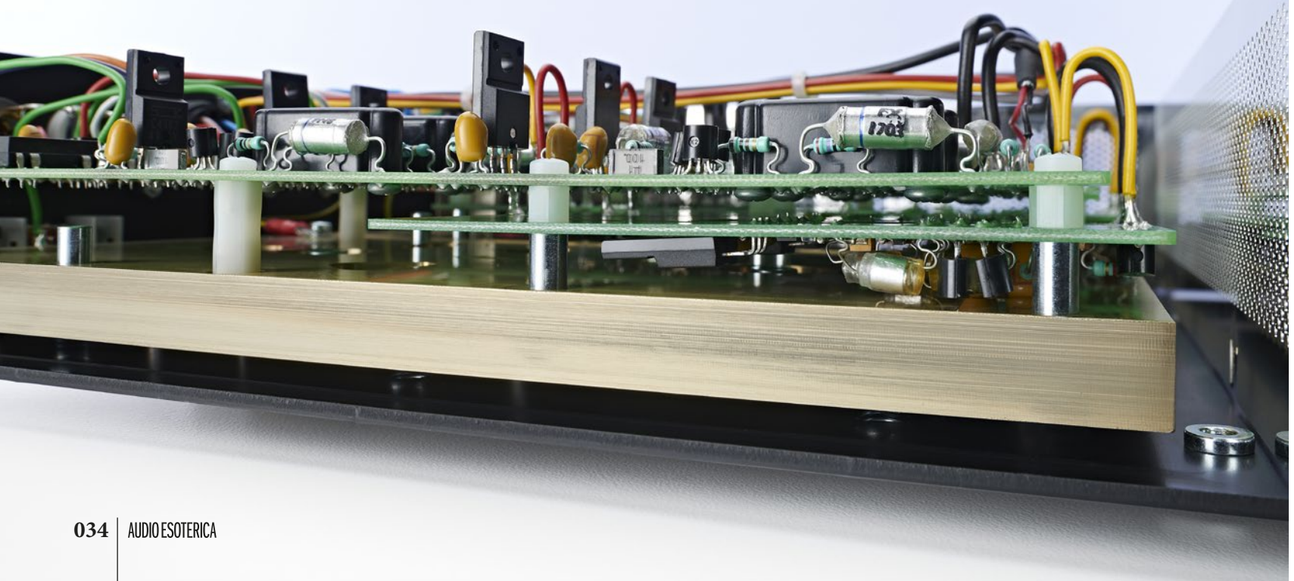
SET-UP AND LISTENING

We had, thankfully, been pre-advised to remove the transport screws, and we had checked the Quick Start Guide for reference as well, which added the sensible tip not to invert the player while doing this. We made a bridge of it between two boxes so that it didn't even require tilting.

Then we connected the separate power supply. The first time you connect one of the chunky Burndy connector cables (Burndy is a New Hampshire company which has been in the business of connecting electrical devices since 1924), there is much studying of its geometry to be done before roughly aligning the pins with each other and pushing the plug home, then turning the ring-lock into place with a satisfying click. It takes only a couple of tentative connections before you realise how solid the Burndy system is, and start shoving them home like a pro.

All three power cables in place, with the third one given the cleanest possible connection direct to the frankly dubious power supply of Sydney's North Shore (just the 246.2V coming through on the morning of set-up), we powered up the power supply. The ND 555 also lit up in response, with a fiery colour splash on its five-inch front-panel screen, soon replaced by a monochrome set of source icons.

▽ SPRUNG SUB-CHASSIS WITH THE HEAVY BRASS PLATE SHOWING; THIS IS SUPPORTED BY SIX STEEL-COIL SPRINGS. 'COULD YOU MAKE IT ANY HEAVIER?' WE ASKED NAIM'S STEVE SELLS...



We waved the wonderfully weighty and stylish aluminium-cased remote control in its direction, not that waving was required, since Naim has moved to Zigbee radio frequency remote control, replacing its traditional infra-red remotes, and removing the need for line-of-sight between the remote handset. Nice, although it didn't seem to work; none of the keys moved the display selection between the various icons, and none of the stars and squares and rectangles on the remote buttons would coax the front-panel screen into motion. Back to the Guide... oh, you have to pair it, like in the olden days. Hold this button, that button, two Hail Marys and an Abracadabra, and the remote is working.

Now, says the Guide, download the app!

Naim's apps have been through quite radical deconstruction in recent years. Not long ago our sister publication *Sound+Image* gave its 'App of the Year' award to Naim for a remarkable app which scraped the internet for information on whatever was playing and presented what looked like an on-screen CD booklet with track listings, album and band information (sure you could Google all that, but it was a lovely presentation).

That's all gone now; perhaps Roon has cornered the market in scraped info, and Naim's current app is instead rather more utilitarian. This is not a bad thing; it's fast, solid and reliable — once you've mastered the Naim iconography. While that remote control presents just the symbols, which we confess we find less than self-explanatory (unless you're accustomed to Naim's quirky track-record of doing things 'our way'), both the app and the front panel display include text labels to show what's available. The star means favourites, yes; four squares with one filled means multiroom, natch; a beaming box means internet radio; a box with a down arrow means digital input… Owners will, of course, learn these soon enough.

As mentioned, however, Naim's app is not the only way to address the ND 555. It's fully Roon Ready, and popped up immediately in Roon's audio devices list, ready to be configured. Three times, in fact, since it also appears as a Chromecast and an AirPlay device.) All our listening notes were made using Roon operation; we would have done more with Naim's app but an output issue curtailed our listening before we got there. But from that week with the ND 555 on Roon, we were already convinced by the performance. At first, when we were A-B switching between this and our favourite but significantly cheaper USB DAC, we had thought it less than dramatically differentiated. On the 'New Blood' orchestral version of Peter Gabriel's *Intruder* (24/96), there seemed at first very little difference between our reference and the ND 555… until things rose to climax. Then our reference DAC slightly flattened the sound, losing the sense of space around the individual elements, whereas the Naim's delivery remained entirely three-dimensional and clear.

Them Crooked Vultures' *New Fang* is a blistering track which can similarly wall up on lesser gear; the 555 allowed the Kashmir-like left-channel strings to rise above the rhythmic lock between John Paul Jones and Dave Grohl, while the vocal held solid in its own little bullhorn-Elvis world: this is a 21st century *Black Dog*, and its energy can simply overload and smear all too easily. Not here. Every piece in the whole was kept utterly clear, simultaneously isolated but connected. We've never heard it better.

We sampled the new Streisand album 'Walls', the ND 555 delivering it lush yet clean, resisting an edginess to her vocal on the title track which our reference DAC had added; things were more natural through the Naim.

By the time we had balled our eyes out at a recent live version of *Wild West Hero* by Jeff Lynne's ELO, and then tranced out entirely through Ry Cooder/VH Bhatt's *Ganges River Blues* at 24/96, we thought — well yes, maybe there is something different here, something beyond, something which is delivered by the cumulative details to which Naim dedicates its engineering team and time.

CONCLUSION

We didn't get to listen quite as long as we'd have liked, but our week with the ND 555 in our system included enough moments of magic that we were entirely convinced by its ability to consistently thrill, by the quality of its conversion, and the extreme efforts at ensuring the results are delivered at the highest, cleanest and lowest-noise levels of performance.

Naim's second greatest achievement is to bundle this with such ease of use. Via Naim's own app or using Roon, you can run the many music sources from your phone or tablet, shifting from Tidal to your own tunes, even shouting 'Hey Google, play Miles Davis on the Naim' and having your Google device have Chromecast pop the ND 555 into Spotify Connect mode. There's multiroom operation possible — a 'party mode' addresses up to six Naim streaming products under control of the app.

This is not an audiophile-only device. It requires no effort and just a little familiarity (those remote symbols) to operate. It offers everyman ease of operation backed by sensational audio performance. A triumph.

SPECIFICATIONS

NAIM ND 555

Audio inputs: 2 × optical digital (to 24-bit/96kHz); 1 × coaxial RCA (to 24bit/192kHz); 1 × coaxial BNC (to 24bit/192kHz); 2 ×USB-A; Chromecast built-in; Apple AirPlay; Bluetooth (including aptX HD); UPnP; Roon Ready
App services: Spotify Connect, Tidal, internet radio vTuner premium 5
Format support: WAV to 32-bit/384kHz; FLAC, AIFF, ALAC to 24-bit/384kHz; DSD 64 and 128; MP3, AAC, OGG, WMA, M4A.
Audio outputs: 1 × RCA pair, 1 × 5-pin DIN
Remote control: Zigbee RF4CE (Metal)
Networking: Ethernet (10/100Mbps), Wi-Fi (802.11 b/g/n/ac)
Dimensions (WHD): 432 × 87 × 314mm
Weight: 12.25kg
Price: ND555 $25,500; 555 PS DR $13,250
Contact: N. A. Distributors on 02 8005 0670 or visit www.naimaudio.com.au

INTERVIEW

Steve Sells is Naim's Technical Director of Electronics, overseeing the development of Naim's electronics, including the legendary Statement amplifier. We asked him to clarify some of our questions about the ND 555.

AUDIO ESOTERICA: *So the ND 555 — could you possibly make it any heavier?*
STEVE SELLS: There's another trillion kg of copper in the ground waiting to be made into Naim brass suspension systems... so we could have! Such self-control…

AE: *In a nutshell then, what are you most proud of, regarding the ND 555?*
SS: For me it's the sound performance and hearing the evangelical feedback from customers. They have been patiently waiting for the 555 to add 500 series quality streaming to their 500 series systems.

During development it was seeing the new ideas come to life from 'sketch books dreams' to reality, such as the master clocking, the nested faraday cage and the DR regulators directly below the DAC.

AE: *The master clock arrangement applies only to network sources, rather than SPDIF/USB inputs — does that mean the ND 555's best performance is via the network? This will include Roon-controlled playback, presumably?*
SS: We do find the UPnP is typically the best sounding source; however great care is taken over S/PDIF. We did two years of research and design during the development of the original Naim DAC to optimise S/PDIF conversion. We designed a switched 'fixed clock' buffer system. For all intents and purposes it plays and processes the digital audio as if the DAC was the timing master and not the slave. The ND555 uses our third generation of the same principle and isolates 100% of the incoming jitter from the S/PDIF to the DAC. It's a super Roon end-point too.

AE: *Are the advantages greatest when playing high-res or equally valid with CD and below CD-quality music?*
SS: Master clocking minimises timing errors irrespective of the incoming signal. Certainly for lower than CD quality there's bigger effects to worry about.

AE: *LVDS (Low Voltage Differential Signalling) is mentioned as being used for I2S in both clock signals to the streaming card, and for audio data, is that right? Can you explain the advantages? — some might think lower voltage would mean higher relative noise.*
SS: I can see how this can appear counter-intuitive. However the LVDS digital signal is relatively robust, unlike an analogue signal. By reducing the digital signal's amplitude, the electromagnetic and PSU noise is reduced. The sensitive analogue circuits then operate in an electrically quieter environment. The LVDS digital transmission is perfectly transparent and will not drop a 'bit'.

AE: *From your white paper: "The task of the analogue output filter is to provide sufficient attenuation by this frequency to reduce the content of image frequencies in the ND 555's output to insignificant levels." Can you explain "image frequencies"?*
SS: Another term used to describe the 'image frequencies' is 'beat frequencies'. The best analogy we'll have all heard is a twin propeller aeroplane. For example if one engine is rotating at say 1000rpm and the other at say 1060rpm there is a 60rpm difference — the same as one hertz. Here you would hear the propeller noise beating at 1Hz making a 'huummmMMMmmmMMMmmmMMMmmm' sound.

Back to digital audio: before digital filters, beat frequencies were difficult to engineer out. In these very early first generation CD players playing at 20kHz beating with the sample rate of 44.1kHz would make a tone at 24.1kHz that the analogue filter would try and remove. Now we oversample 16x to 705.6kHz and the max audio signal frequency with an input sample rate of 352.6kHz is 176.4kHz. Therefore the lowest beat frequency is 705.6kHz -176.4kHz = 529.2kHz.

AE: *The separate and significant power supply: how does a digital source benefit from such extreme high quality power provision? Does it require high current as well as high quality? If not, wouldn't a smaller but still high quality power supply suffice?*
SS: Adding a separate high quality PSU has two benefits. One is removing the iron and copper toroidal transformer from the same box as the delicate DAC and analogue circuits. The transformer has stray magnetic fields and also mechanical vibration caused by magnetostriction. Secondly the separate low noise supplies prevent noise from one circuit section interfering with another circuit — for example the streamer module interfering with the DAC clock of I2V.

Looking further into detail, feeding elements such as the actual DAC itself with ultra clean power has great benefits. The DAC is sensitive to noise on its power supply. The DR regulator had a dramatic effect on the sound quality. We have four DR regulators dedicated to powering the DAC; these are placed directly under the DAC on a separate PCB. The DRs also feed the analogue circuits which are also sensitive to noise. None of the circuits require lots of power, it's all about how clean they are. We like to use simple audio circuits and let them work in the best environment, clean of noises. As opposed to using more complex circuits with lots of feedback and simpler PSUs etc.

△ INSIDE THE ND 555 — THE NESTED FARADAY 'CAGE' FOR THE DIGITAL CIRCUITS CAN BE SEEN AT TOP RIGHT.

Analogue circuits have inputs that will be amplified other than the main audio input — from the PSU rails, magnetic and RF, physical vibrations and thermal… we work hard to minimise the other unwanted sources of noise.

AE: *How sensitive to input voltage and ambient conditions are Naim components and power supplies? (e.g. On set-up day we had 246V from the mains... and an ambient temperature something over 30C. Australia!)*
SS: We design the input mains to tolerate -10% on 220V and +10% on 240V giving a usable range of 198V to 264V. Certainly as the mains voltage increases the internal heat dissipation increases and the transformer can get closer to saturation. We test new products in our environmental chamber that goes from -40 to +85. We do some little tricks inside to minimise temperature variation effects. One trick is to put sensitive components such as matched pairs of transistors under little thermal covers. These keep the temperature difference between parts more consistent as the outside temperature increases.

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Some devices can improve their performance as they get warmer. Transistors can work better. When we talk about 'warm up' it can mean more than just physically warming up. One of the large effects of warm up is the chemical reaction in capacitors as their dielectric forms. This is the insulation part between the two plates of a capacitor.

We also analyse in CAD how circuits perform over a wide range of temperature. Here we use analysis called 'Monte Carlo analysis'. An output from this may show the response of say a filter at different temperature; we can observe the variation and ensure it's within tolerance at all temperatures.

AE: *Why no XLR balanced outputs?*
SS: We designed the ND 555 to work primarily with the NAC 552 pre-amplifier. The 552 has single-ended inputs only.

The PCM1704 being a single-ended output DAC also means all circuits are single-ended. A balanced output in this case would mean an additional circuit to generate the 'cold' signal. We normally try to avoid additional circuits. Certainly with the 555 being typically sited close to the 552 there will be no problems with noise pick-up.

AE: *This is the first Zigbee remote for Naim? Is this the beginning of a range-wide change?*
SS: The ND555 remote is technically the second — the one shipped with Uniti is the first. However they are identical, except that the 555 remote has a meticulously machined aluminium outer and has green lights to reflect the materials used on the main units. We will use the ZigBee remote for all new products. It's bi-directional and goes through walls.

Interview: Jez Ford