

darTZeel NHB-18NS/ NHB 108 Model 2

MARTIN COLLOMS ACHIEVES A LONG-HELD AMBITION TO GET HIS HANDS ON THIS PRE/POWER AMPLIFIER COMBINATION FROM SWISS DESIGNER HERVÉ DELÉTRAZ. HE LOOKS INTO THE TECHNOLOGY, FINDS MUCH TO LIKE IN THE CAPTIVATING SOUND, AND WE HEAR FROM THE DESIGNER ABOUT THE GENESIS OF THE REMARKABLE PREAMPLIFIER



darTZeel NHB-18NS Mk2 Preamplifier

While previously I had only heard darTZeel's products at shows, by all accounts the original version of the NHB-18NS sounded very good, though some critics did feel that its user interface was rather idiosyncratic, lacking any calibrations or indication of volume settings. Also, non-optimal matching transformers were employed for the balanced line inputs and outputs.

These issues have been resolved in the current Mk2 implementation, which is a substantial redesign of the original of some 15 years ago. However, it still embodies the same essential principles, derived from designer Hervé Delétraz's concept of a direct-coupled symmetrical, wideband, transistor-based amplifier circuit core, without the usual loop/global feedback.

The preamp's line-gain circuits use seven selected transistors per channel in complementary Class A biased push-pull, and the output is now sufficiently powerful to drive the Zeel pre/power connection system exclusive to darTZeel: operating at the ultra-wideband, low noise and particularly low impedance of 50 Ohms, it uses custom, selected MIL grade, and very slim coax cables terminated in matching, locking high-reliability BNC connectors.

Given the elevated performance target, selection of these proprietary cables would seem a no-brainer for the potential purchaser: the inherent specified bandwidth of this interface approaches 500MHz which will ensure almost reflection-free operation in an extended 'audio' band, say up to 50kHz. A pair of 1.5m lengths of 50 Ohm BNC Zeel cables are priced

The System

Constellation Inspiration 1.0 pre, Townshend Allegri Plus and Reference control units; Naim NAP500DR power amplifier, Constellation Performance Centaur II 500 Stereo Power amplifier, Naim SuperLine phono pre, with Linn LP12 player with Keel chassis and Radikal motor control, Naim ARO arm, Lyra Delos cartridge, Naim Uniti Core network server and S/PDIF source; Linn Klimax Katalyst streamer-DAC; NAIM ND555 Streamer-DAC, 555 PS DR x2, Wilson Audio Sabrina, Sasha DAW, Magico S-5II, Quad ESL63, BBC LS3/5a (15ohm) speakers; Naim FRAIM racks; Transparent XL MM2, Naim NAC A5 speaker cables, Naim Super Lumina, Transparent MM2 and Van den Hul Carbon TFU interconnect cables.

at £998, which actually seems quite fair for such an audiophile solution, and the low rated impedance should also help suppress cable microphony, potentially increasing dynamic resolution.

Earlier preamplifier models may be upgraded at the Swiss factory to this latest Mk2 specification for 12,000 Swiss francs plus shipping. This will bring a raft of changes, including a new front panel, the micro-controller circuit board with a new CPU, and a revised and more informative display showing volume and input data.

Layers of information are also added for input sensitivity and volume offsets, while the volume control itself is now better weighted and smoother, aided by frictionless magnetic detents. Finally, the infrared receiver for the remote control is more sensitive, with a much wider angle of reception.

The internal signal wiring has been upgraded to single strand silver/Teflon, and the enhanced microprocessor implements input gain and matching adjustments via solid-state optical switches, thus avoiding mechanical contacts. Hervé regards the latter as anathema, and has done his best to keep them to an absolute minimum in his entire connected amplifier system.

There's also improved battery management, the preamp being designed to run on internal power, freed from mains effects. The internal lithium iron phosphate (LiPo) batteries, selected for the best sound quality and long service life, act beneficially as very low noise, low impedance regulators.

Recharge management

The preamp will run for about eight hours on a full charge, while recharge management – using the supplied small, hum-free mains unit – is automatic. When in 'charge' mode, which should rarely be required during listening sessions, the upgraded charger/power supply also sounds better than before, but the overall sound quality is undoubtedly optimal when the preamp is operating in pure battery mode. That eight hours assumes an average illumination brightness of 50-60%, if the auto-dim is engaged, the display brightening on any instruction.

When, after some years' use, battery replacement is necessary, this can be done by the owner, the packs being located under the top cover. Owners of the original version of the preamp, which used sealed lead acid batteries, can also take advantage of an update to LiPo power.

Given the low signal levels in a preamp, this use of battery power is a short cut to the best dynamic range, lowest system noise floor and maximum transparency, and designer Delétraz has mastered this tricky – and expensive, given the need for charge-management – technique. Automatic

disconnection from the mains during operation is a key feature of this 'off-line' preamplifier design.

Known losses from low-level input signal switching are avoided by providing each input with its own equaliser/amplifier, so the opto-electronic source selection can be made at line level, switching volts instead of microvolts. Versatile input configurations may be user-specified via plug-in cards, for example adding separate left and right phono inputs.

These are fully adjustable via a rear panel control: helped by mild muting, automatic when adjusting phono settings, this may even be done on the fly with the music playing!

LEDs illuminate momentarily to guide this, so when the 'phono' toggle is pushed left, one of two columns, of LEDs is lit, indicating whether an equalising function is on or off. The left column is for the Neumann EQ, the right row signifies that the custom Delétraz infrasonic filter is engaged, this less intrusive than the usual IEC filter at 20 Hz.

'Level Two' is accessed by a quick push of the 'Level One' toggle, holding for a few seconds, then releasing. Level Two being confirmed by a single LED. The left column is for loading, with engraved numbers 300, 150, 100, 75, 50, 43 in Ohms while the right column refers to gain in dB e.g. 72, 69, 66, 63, 60, and 57 db. However the load setting is a trifle awkward, needs a bit of practice and you do need easy, well illuminated access to the rear panel.

In addition, if the phono equalisation cards are withdrawn by an engineer any load value may then be soldered in, even none, which choice defaults to 47k Ohm. Thus almost any known cartridge may be accommodated.

Custom specification

To order, up to six stereo inputs can be configured. Our sample was delivered in the customary 'factory' configuration, with MC/MM phono cartridge inputs and three pairs of separate line input modules, two for RCA single ended and one pair for XLR balanced. The outputs include the usual SE 'line' via WBT Nextgen RCA sockets, here from a low 75 Ohms source impedance, then XLR balanced, and finally 3X Zeel outputs per channel (e.g. for multiple power amps) and finally the stereo 'record' output (also on RCA WBT connectors).

Dominant in the set of controls is volume, offering fine resolution 0.5dB steps over a range of 85dB: scaled +18.5dB to 0dB and then down to -58dB, it uses an encoded, microprocessor calibrated and controlled, contactless optical audio attenuator. Channel balance covers a +/- 9.5dB range, also in 0.5dB steps, with the plasma dot matrix numeric display shining palely through a metallic gold tinted transparent window. Machined

from a solid alloy block, and held comfortably in the hand, the NHB-18NS remote control provides access to volume and mute only.

The single rear panel charging connector might suggest that the power is common to both channels, in fact the design is built in true double mono with wholly separate supplies. One channel is on the right, the other on the left, with every input and output on its own card; instead of a connecting backplane, supplies and outputs are hard wired with sliver/Teflon, the avoiding the interposition of unwanted connector contacts. The floor of the unit carries the multiple power supplies.

The casing is machined from thick aluminium alloy panels, deeply anodised, the considerable 24kg overall mass being supported on a trio of vibration absorptive feet crowned in a white rubbery polymer. While the preamp front panel appears simple, the balance control doubles to access the menu system via presses and rotation: in addition to the input parameters already mentioned, unity gain setting is also available for any input, and even channel balance may be preset for each if required. Practiced simultaneous depression of both volume keys on the remote control temporarily enables adjustment of channel balance from the handset.

Sound Quality: Preamplifier

While the bulk of my auditioning of the NHB-18NS Mk2 was with the matching power amplifier, I did try it with some other electronics. While undoubtedly very good, sweet, well timed and exceptionally transparent, undoubtedly this preamp came into its own when it was connected to the power amp using the darTZeel 50 Ohm cable.

Comparing with known references, this preamplifier does sound rather like a very neutral and highly regarded single ended vacuum tube design. It is singularly lacking in fatigue, has a

most natural timbre and suits any kind of music, sounding consistently upbeat, highly detailed and is musically entertaining. The noise floor is really low, especially regarding hum which is entirely absent: this is noticeable in the very deep soundstages possible but also in the exceptionally subtle and natural textures heard in the bass, which is entirely uncorrupted by mains related hum and noise.

Preamplifier Conclusion

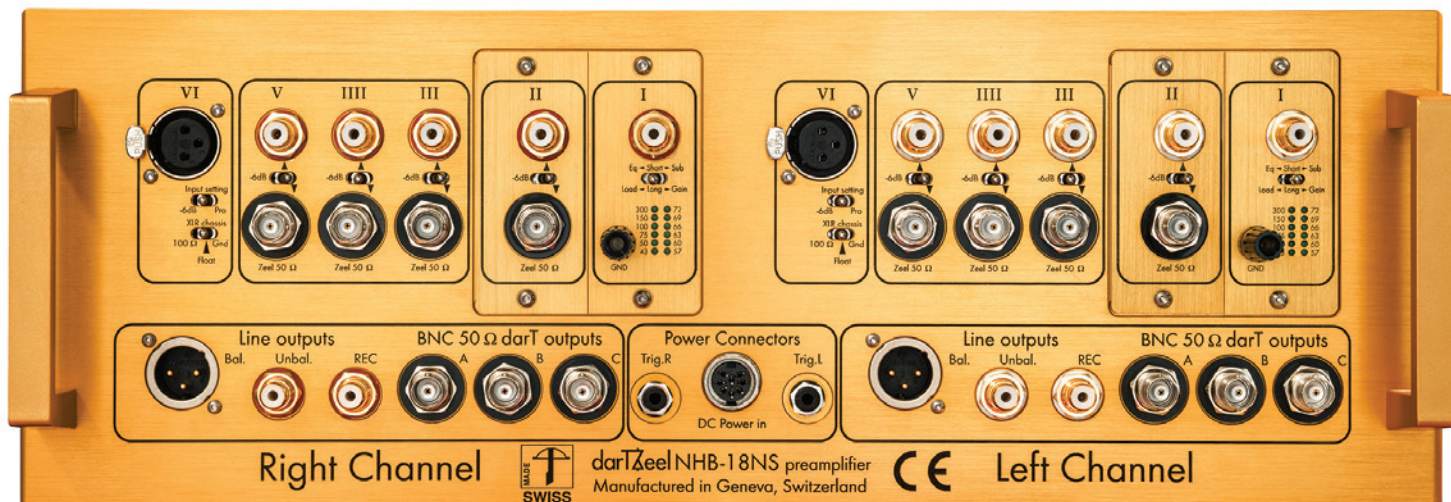
Considering the substantial price, and notwithstanding the elevated Swiss Franc, this Dartzeel preamplifier packs quite an audiophile punch. The sound quality is very good to excellent, and always musically satisfying regardless input used and the operating mode. The fine phono stage is something of a bonus, comparing well with separates in the £10,000 -£15,000 range and I found that it was most convenient to have it as built-in unit, avoiding additional power and signal cables, and thus gaining a certain quality advantage.

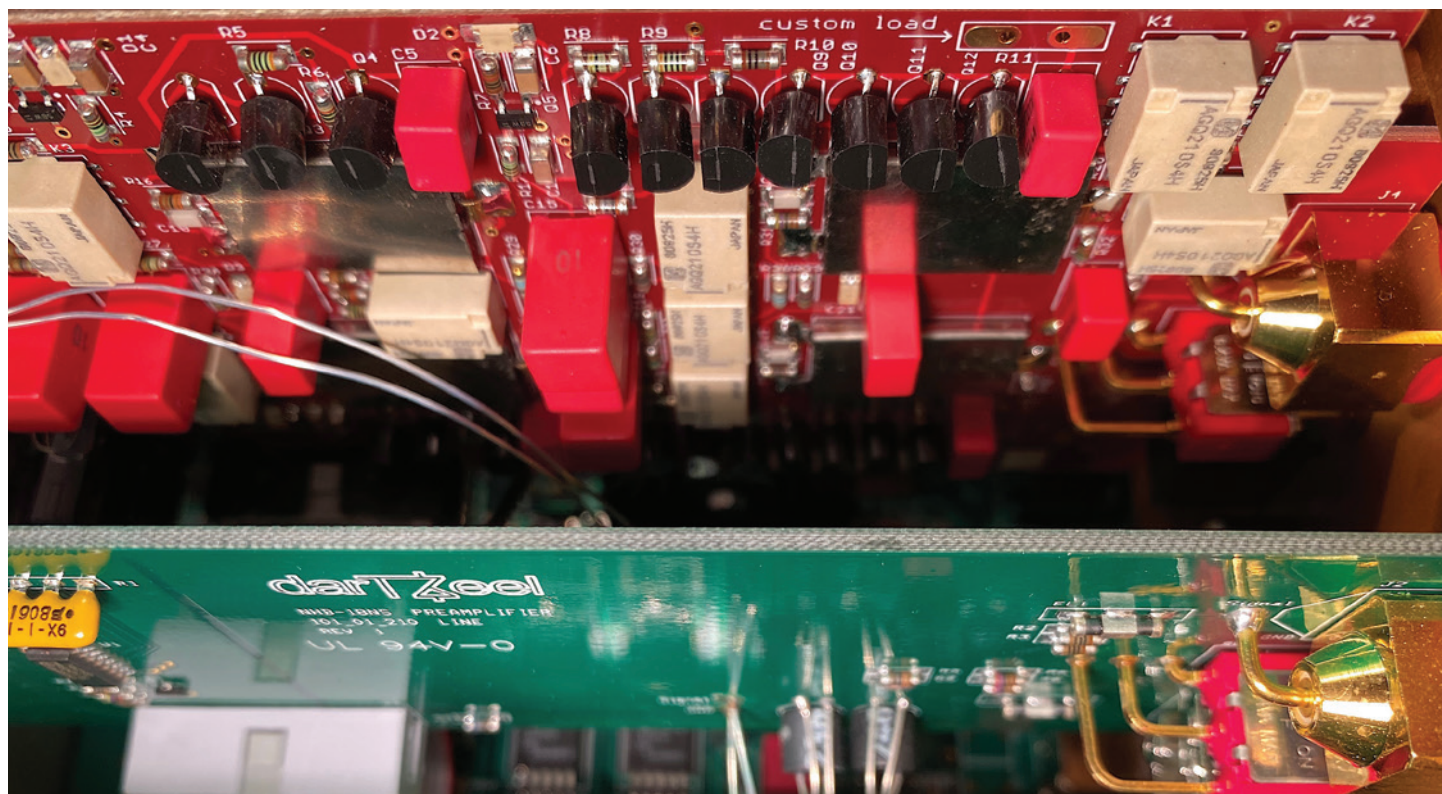
The line stage is also highly versatile with multiple output options, including Phono/RCA SE, XLR balanced, and not least the proprietary, well priced and excellent sounding Zeel pre/power connection. The almost honeyed, highly analogue sounding timbre was most rewarding as were the huge, transparent well focused soundstages. The absence of audible noise or powerline hum made analogue disc replay especially memorable.

Here is a clear Swiss definition of musical audiophile excellence.

Sound Quality: Pre-Power Line input

Distinguishing the darTZeel sound from the common herd required neither subtle discrimination of fine differences, nor splitting of hairs. This product carves its own musical identity, consistent both for the preamp and power amplifier. It is as different from the general run





A glimpse inside the preamp, the phono board with single strand silver connections

of amplification as the Quad electrostatic is from most moving coil loudspeaker designs, and what sets both examples apart are a readily discernible absence of unnatural sounds or 'colour' in the reproduction. You quickly learn that this obvious neutrality also partners exceptional transparency.

This quality is subtle, but if you're familiar with both live sound and high-end audio it's unmistakable: usually this target of greater realism is almost invariably and tantalisingly just out of reach. When you operate at this quality level you frequently experience promising hints of musical improvement, in one aspect or another, but with this amplifier combination you can readily hear the result of a comprehensive assault on the causes of errors in audio amplification – simply, it's a significantly more dynamic, revealing, and natural sound quality.

First listening required no effort on the part of this critic: everything I threw at it was rendered in a most familiar way, but simply with better music reproduction. Before attempting to analyse some of the intricacies of the pre-/power combination with 50 Ohm *Link Cable* interconnects, driving the Magico S5II/SPods, it was possible to identify by omission some sound quality limitations with previous amplification.

The improvement could not be considered marginal: the quality gain was presented as firmly as you could wish for. Notable is rendering of the subtle sense of place, of atmosphere, of residual

acoustic and of ambience which may be captured on recordings: while this is audible with many amplifiers, the darTZeel duo does it differently, with a palpable feeling of being present in the recording space. The ambience is almost real, sounding warm and natural and decidedly three dimensional: remarkably offers a recognisable stereo stage where the venue space breathes somehow, differing from the more common vaguer impression of 'something more' going on at the back of the recorded acoustic.

Experiments with setup

Proof of the quality of this product, and the importance of optimised set up, was obtained when initial results – though very good indeed – undershot my anticipated level of emotional involvement and timing. I have to admit to some perplexity and disappointment, as I tried detaching all the cables and reinstalling them, revealing that the first install had unwittingly looped one interconnect cable channel with one of the mains cables. Correcting that error brought a far from trivial gain in timing and musicality.

I noted a that a trio of rubber composition feet are fitted to both the power and preamp. I then experimented with my own trusted Alto Extremo Fat Boy II feet. Located on my triple stack Naim FRAIM stand (one of three sets) I noted a moderate gain in timing and syncopation, but also bass tunefulness, from what was already a very good level, here using a trio of Alto Extremo Fat Boy

II (HIFICRITIC JAN | FEB | MARCH 2012) support feet under the preamp, bypassing the rubber composition feet fitted as standard. However, for the power amp, located on the Artesania floor stand, these sophisticated footers offered little further improvement and were set aside.

The Formal Auditioning

Beginning with Jan Garbarek on CD – *There Were Swallows from Twelve Moons* –, Manu Kache’s amazing drumming flowed with a lyrical yet assertively powerful beat. The track was revealed as if a new experience, showing first rate spatiality, highly focused depth layering, and a massive soundstage, the recorded acoustic beautifully illuminated into the far corners.

Transient attack and decay were beautifully revealed, while those fast, crisp leading edges were exemplary and had no added edge or hardness. This amplification will play loud while showing no perceptible change, but there was so much detail there was little need to wind up the volume.

Imaging was revelatory, a focused dimensional space imbued with detail, here clearly illuminated, reminiscent of a Vermeer, an old master effect where there is no false brightness or sheen. There is also more than a hint of the open-sounding, micro-detailed rendition possible from Stax electrostatic headphones when driven by triode amplification. And when the music calls for attack this darTZeel combo delivers in spades, yet its phrasing is as lyrical as you could wish.

An old classic, Miroslav Vitous’s 2003 *Universal Syncopations* ECM CD, was replayed as if I had never heard it properly before: it was captivating, dynamic, with tuneful and beautifully-timed bass viol playing, revealing a spacious, very detailed and recording. *Stay* – from the Blue Nile’s *A Walk Across the Rooftops*, ripped from an early CD in WAV to the Naim UnitiCore, came up fresh, as if remastered: I am reminded of the typical improvement observed for a good master on CD when upgraded to a fresh 24bit/96kHz rendering of the master tape.

Qobuz streaming had just added the latest Mahler 7, recorded at 24bit/96kHz HD on BIS, with Vänskä conducting the Minnesota Orchestra, sounding full bodied, spatially well-focused and natural, yet satisfyingly dynamic: here the darTZeel combo ably conveyed this high quality of this transparent recording and the fine performance.

These amplifiers sounded consistently more natural than much of their peer group, with a more open bandwidth, deeper and wider soundstages and with crisp yet subtle transient attack and definition. I was strongly reminded of product I reviewed for *Stereophile* in the late 1990s, the low and zero feedback vacuum state Cary designs

Preamplifier Specifications

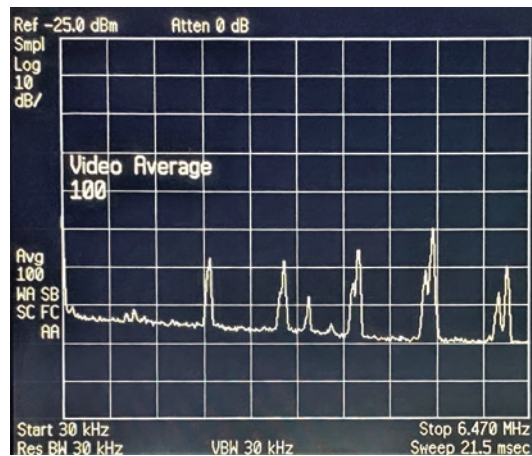
Line Gain	Up to + 11 dB
Phono Gain	54 to 72 dB line (up to 83 dB gain at output)
Analog Input Impedances	Zeel BNC 50 Ohms, RCA line > 30 k Ohms,
XLR Line > 15 k Ohms.	
Phono MC	43 Ohms up to 47K ohms
Line Output impedances	RCA 75 Ohms, art BNC = 50 Ohms, XLR < 600 Ohms, REC OUT < 150 Ohms
Frequency Response (line)	5 Hz - 500 kHz, +0, -1 dB
Rise Time	< 0.5 μs, Slew Rate > 24 V/μs, peak-peak
Total Harmonic Distortion (THD)	< 1 % from 10 Hz to 100 kHz (within the output dynamic range)
Temporal Distortion	None, at any level and load, as specified above
Channel separation	better than 80 dB from 20Hz to 20kHz
Signal to noise ratio	Line; > 92 dB (A), Phono w/factory settings > 70dB (A),
Power consumption	7 - 77 watts depending on charge conditions

Size: 440 x 335 x 170 (WxDxH mm)
Overall depth with handles: 415mm

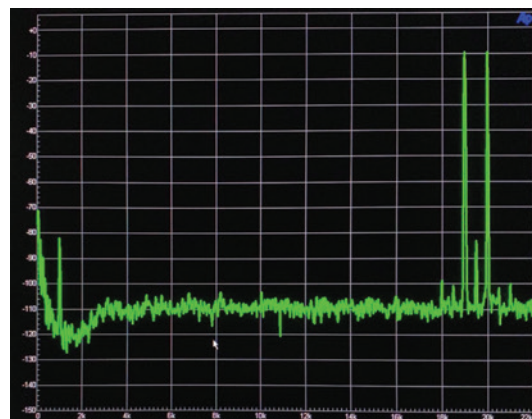
Weight 24 kg, power supply 3 kg.

Price NHB-18NSS Preamplifier including MC phono stage and with long life recharging lithium battery power supply, remote control with Bal I/O, SE I/O, DTZ x3 O £38,998

Low level RFI on darTZeel preamp



HF Intermodulation preamp, balanced 2V





darTZeel production

employing large triodes in single-ended (non-push/pull) mode. These demonstrated a liquid timbre, were naturally dynamic, which also example hinted at the outer limits of sound quality possible from known sources, e.g here a further layer of the faintly mechanical veneer overlaying sound replay is somehow stripped off.

Sound quality Pre- Power: Disc MC input

I linked up my Linn LP12 Radikal/Lyra LP combo and was frankly delighted with the results. There was a surprising precision to the sound, not in any way hard or fatiguing, but somehow more closely connected to the recorded event. This was particularly noticeable with direct cut pressings, which have a greater degree of immediacy when compared with tape and digitally derived masters, and this superior quality was conveyed very well.

Old discs come up fresh as if a step closer to the cut master. Somehow the darTZeels organise the music replay so that the low level background clutter of many an analogue disc recording is pushed back out of harm's way, leaving the musical performance centre stage. While some LP reproduction can be informative and exciting but

also too much of an edge of the seat experience, with the darTZeels you feel comfortably placed in row 10, there to enjoy performances in their entirety. Bass was tuneful and punchy, the mid open and very natural while the treble was well detailed, but also nicely integrated into the overall effect, with soundstages wide and deep with a convincing sense of space and atmosphere.

Essentially neutral in timbre, and not sounding in any way solid state, the phono input threw a big but very well focused sonic picture, while soloists were well placed, unambiguous in location and possessed of much innate character. Better still, this lively, expressive sound had fine drive, matched with an involving foot-tapping beat helping to convey a live monitoring experience.

Unless you were exceptionally committed to LP replay, I suspect that for most audiophiles this phono input will do very well indeed, its superior dynamic expression a key feature, creating a consistently lively effect, with loud-soft contrasts explicit and very low fatigue. Above all, this was not an academic dissection of diverse recordings, rather a celebration of the quality of musical performance. Classical, jazz and rock were equally well served

here, with back catalogue from the 60s and 70s coming up fresh with superior sound quality than I had previously thought present, and no exaggeration of the inevitable occasional flaws on old, well-used vinyl surfaces. These unremastered original LPs have a certain creamy naturalness about them, a quality in danger of being forgotten in a sea of digital media delivery methods.

Overall Conclusions

This beautifully crafted Swiss pre/power combination has been highly developed to deliver unusually natural and musically entertaining sounds. It is involving, pure in texture, most unfatiguing and delights the ear. An Audio Excellence rating is well deserved.

**HIFICRITIC Preamp Lab results:
darTZeel NHB-18NS Mk2**

With a double mono construction, good channel separation is to be expected and I was not disappointed. Likewise, with the battery supply there was no trace of power line hum on any output, and it was refreshing to audition and lab test a design where it was entirely absent: residual hum, even if not directly audible, can mask some degree of tunefulness and expression in the bass.

As set, the RIAA equalisation for a moving coil cartridge was very good, accurate to +/-0.3dB from 30Hz to 20kHz, with better than 0.1dB channel balance. Fine overload margins were observed. There was slight lift at high frequencies, to about 2dB by 40kHz, also with some mild infrasonic filtering of -2.5dB at 20 Hz increasing to -6dB by 10Hz, perfectly sensible in my view. The typical MC cartridge response in a well-matched tonearm will lift somewhat at frequencies below 25Hz, so this is about right. MC signal to noise ratio was very good at 68.3dB unweighted, 75.3dB 'A' weighted.

Line S/N was an excellent 79.5 dBA for the lower IHF 0.5V input level. Line input total harmonic distortion was well below audible thresholds at better than -78dB, 0.012% for IHF 0.5V and still just -75.4dB at the higher 2V input level.

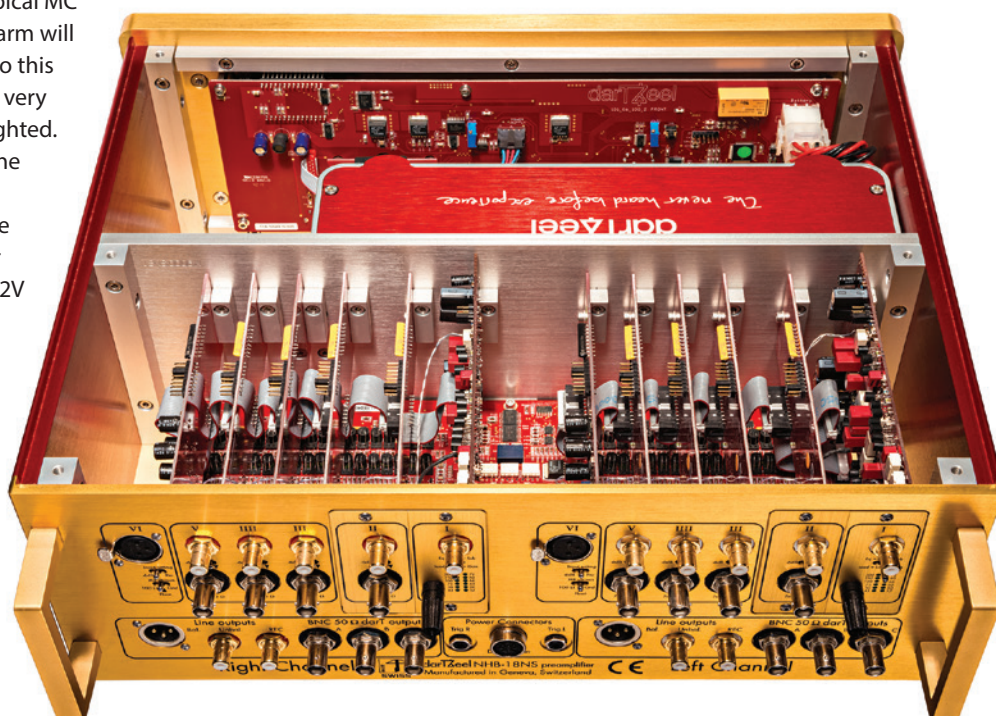
The distortion type was desirably low order with analysis showing 2nd dominant at -89dB, with third harmonic at just -94dB. High frequency intermodulation was also excellent at -88.2dB via line/aux (0.5V output) while that for the MC disc input was also very good at -66dB, 0.05%. As hoped for internal line hum artefacts were entirely absent throughout. Channel separation was better than 110dB at 20Hz, 102dB at 1kHz and a still very fine 84 dB at 20kHz.

Input/output matching was very good, while the custom 'Zeel' outputs were a low 50 Ohms, as advertised. The balanced line output impedance was a low 160 Ohms and single ended near 100 Ohms and thus load tolerant, while the line input loading was an easy to drive 60kOhm (approx.). There was a hint of spread spectrum noise centred on 6kHz at a very low and inaudible -110dB which just might be at trace of leakage from the microprocessor.

Checking with a microwave bandwidth spectrum analyser up to 1GHz, there was a little more RFI detected, a 'comb' in the band up to 10MHz, which interestingly came and went with successive 0.5dB steps of the volume control. The level was again low enough not to cause concern.

Input overload, via aux, was a fine 5.7V. Line input frequency response was very wide indeed and thus highly uncoloured, measuring just less than 0.2dB down at 10 Hz and 0.017 dB down at 20 kHz. Wideband, the upper rolloff was very high at 200kHz for just -1.5dB, indicative of no coloration from this source. I checked the noise and hum levels on battery, with and without the mains power supply connected to the line, and could find no measurable difference, so the internal battery isolation technique works really well.

The optical volume control is superbly calibrated, with channel balance held to better than 0.1dB, and typically 0.05dB over the massive 0.5dB step control range which is calibrated. DC offset was mild, 6mV/0.2mV L/R though I would have liked a bit less.





darTZeel NHB-108 Model 2

Many fine amplifiers have been designed by the rule book, such as it is: each designer may well attempt to distinguish their interpretations from others by several methods including the application of what I might term bluntly as brute force. These could include an attempt at very wide frequency response, or vanishingly low distortion, perhaps particular kinds of preferred output device or extreme output power, the latter from various combinations of high voltage and increased output current.

An inherently good amplifier may well be contrived to sound better when driving certain more difficult, overly taxing loudspeaker loads by doubling or tripling the number of output transistors or FETs. Essentially the resulting current sharing amongst the semiconductor devices maintains internal gain for lowered distortion and offers more stable thermal conditions under power cycling. Conversely the increased complexity, matching and tracking of the output devices, controlling operating points such as idling and bias under dynamic conditions, can also reduce the benefit to overall fidelity. And there are some beautifully voiced moderate sized amplifiers which do not scale well when morphed to higher powers. The key components of a good design of power amplifier are contrived to work in a particular harmony, and it may be found that a particular recipe which delights at 70W/ 8 Ohms does not scale so well if designed to a higher power.

Many loudspeaker manufacturers, have engaged in unseemly competition to get more bass extension and higher peak sound levels without sufficient regard to the amplifier and its interfaces which are required to supply greater audio power, especially more current. Relying on the flawed assumption that large amplifiers can supply almost unlimited current,

at least on paper, since they are described as 'voltage sources', rock steady in the face of increasing peak current demand, the loudspeaker design which relies on this behaviour can be in turns, smaller, or have deeper bass, or may play louder, or all these things in mutually graded combinations. However these 'gains' may be won at a price.

More current, worse sound

The underlying parameter in all this is current, amperes, and in the broad picture the more current required, the worse the sound. Some argue that the industry was at its best when loudspeakers were rated at 16 Ohms and the then tubed amplifiers were essentially voltage sources when matched to the speakers with sensibly sized output transformers. A 16 Ohm loudspeaker load was defined for the purposes of good matching and optimal system headroom as having a +/-20% tolerance, a range of 12.8 to 19.2 'Ohms'. Clearly contact and cable resistance is rather less of a concern in this arrangement as the current requirement is moderate. 100 watts comes in at just 2.5 amps RMS, kind to contacts and cables.

In the late 1950s the introduction of the power transistor changed all this as early devices could not stand much power rail voltage, perhaps a tenth of a valve rating, but did offer some current. To help out, the European standard (DIN) allowed for 4ohm specified loudspeakers to make better use of the current resource. Well, an 8 Ohm speaker may have a 6.4 Ohm minimum (sadly almost never found) and a 4 Ohm speaker may dip to 3.2 Ohms by the agreed standards rating. (Even so, some reference loudspeakers have measured with worst case minima bottoming out at an effective 1.5 Ohms at

some frequencies and even less in some particularly aberrant cases. As such the matching cable, contacts, and connections, and not least the amplifiers are thus stretched on a cruel rack of high peak current. It is very likely that sound quality suffers.)

A rated 200W maximum into a nominal 8 Ohms, requiring 40 V RMS, will – when operating in the face of the worst impedances found in some modern and costly loudspeakers – have to provide momentary powers requiring nearly 40 amps at critical frequencies. Designing for low loudspeaker impedance, with the resulting high peak current requirement, can be shown to impair subjective dynamics, increase distortion, reduce image depth, impair bass definition and increase vibration from the loudspeaker due to its inherent lowered absolute efficiency. It also raises the current draw from the mains, further stressing internal supplies, connectors, and cables.

More current, more copper

Loudspeaker cables will need additional copper, especially for longer runs, inevitably get stiffer and less wieldy, and thus more easily conduct vibrations back to the amplifier, while ultra-low contact resistance and a high maintained tightness of connections also has an important part to play. Higher current also results in more electromagnetic induced vibration and noise in the speaker cables. And this arises so the frequently inaccurate specifications for a loudspeaker might claim a dB or two of extra sensitivity.

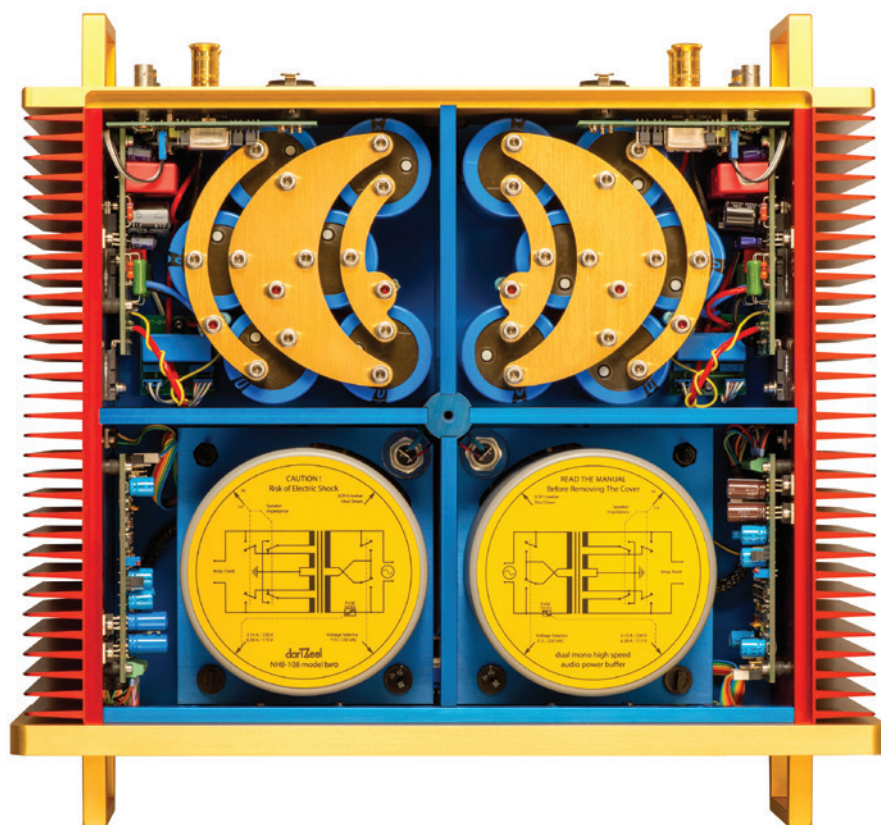
Or, on a trivial note, so that it could sound just a shade louder than the supposed competition in a switched A/B comparison: simple specmanship.

While those low impedances may well steal a modicum of greater loudness for your loudspeaker, it is potentially won at expense to several aspects of fidelity. For example at the point of clipping or overload, the effect is unlike any other distortion, here heard as a momentary ‘cracking’ on heavy drum transients, with an accompanying blanking of detail.

Into this design maelstrom came Hervé Delétraz, a newly-qualified electronics designer boasting a fine graduation piece: an advanced Class D ‘switching technology’ audio power amplifier design for which he was highly commended. However, his intense childhood experiences with music and audio reproduction made him aware his advanced graduation piece actually sounded nowhere near good enough, and extended further development proved disappointingly unrewarding. As a result, he was driven to consider an alternative conventional ‘linear’ design, noting that a power amplifier could employ a range of technologies including output devices from bi-polar, thermionic (tubes) to FETs, and in a number of wondrous combinations.

Then began an obsessional period of prior art research and technical investigation with the objective of creating a powerful, neutral, linear solid state amplifier and with classic virtues: no crossover distortion, ultra-wide bandwidth, powerful drive, great dynamic headroom, low order distortion confined to the ‘zero’ feedback triode valve type, with no loop negative feedback. It considered impossible by traditional audio engineers, but bogies such as transient intermodulation, phase shift due to internal delay and other issues were addressed directly, drawing some inspiration from Matti Ojala’s historic research on transient intermodulation distortion..

Some of these features could be found in the audio industry’s catalogue of amplification but never in the quantity and combination Delétraz instinctively felt was required for sound quality improvement. Moreover his obsessional research also encompassed the innate sound of various electronic components, the effects of protection circuits, power transformer issues – of which there are many –, and the sound of different reservoir capacitors and rectifier diodes, wire and circuit tracking. In fact, he was aware of the sound quality influence of every aspect of build, components and circuitry, including the final constructed topology. In short, he wanted to distil the musical essence of the single ended, zero feedback triode and combine it with conventional hard-driving solid state amplifier muscle.



Remarkably, his power amplifier project first saw the light of day in 2000, with a retelling of his design endeavours over six issues of *Stereophile*, also disclosing a prototype schematic from his published and thus protected patent application. Some of the measurement results for this prototype were extraordinary. With no global negative feedback to assist, the bandwidth was still approaching an unheard-of DC to 500kHz (the present example under review doubles that internally to 1MHz!).

Particular features helping set it aside from the herd included a huge mains transformer, the best reservoir capacitors available, a strict internal grounding hierarchy, symmetrical all-bipolar transistor circuitry, no global negative feedback, no coupling capacitors, and just six semiconductor junctions in the direct path from input to output. In fact, a total lack of the dodges and short cuts commonly used to improve the measurements and output power seen with so much of the competition.

Few exotic components

In the Swiss tradition, Delétraz has since perfected the casework, with no ferromagnetic parts for minimal interaction with the operating circuits; instead, there's stainless steel, aluminium and hardened glass. And the only exotic components are Kimber Teflon insulated wire, silver for the inputs, and copper for the outputs and internal supply wiring. Knowing that switch contacts each have a small loss, other goals for the design included an absence of switches, fuses or relays in the signal path, plus a high input impedance to optimise source quality through minimal loading. The amplifier also offered a low output impedance for the optimal loudspeaker interface.

Inherently direct coupled, in practice the amplifier has a very low cut-off, set at 0.2 Hz at -3 dB, ensuring almost zero phase shift in the bass (and very little in the treble). And finally, there is no potentially intrusive electronic protection.

Perhaps unsurprisingly the very first prototype blew up – new-born power amp designs often do. A little more circuit analysis fixed the issue, and five years of obsessive effort neared its conclusion with the approach of serial manufacture. The original design of the NHB-108 is patented worldwide, but its published conception in *Stereophile* means it has also been pirated for some years on the Chinese market for a just a few thousand dollars, and of unknown build quality, sound, reliability or serviceability. If a second-user '108 power amplifier seems too cheap to be true, it probably is.

Hervé didn't get everything right with the original NHB-108 prototype but the performance was sufficiently outstanding to win him the support he needed to found darTZeel. With effective fine tuning

for the production version bringing him success, this has led to many further amplifier designs.

The NHB-108 Model 2 power amplifier is distinctive if colourfully presented, its aluminium casework anodised in red and a deep gold, and comes complete with rack handles at front and back affording some protection for the comprehensive array of connections. Outputs (4ohm -16 ohm) are gold-plated heavy-duty WBT binding posts, gold plated and able to accept spades, bare wire or 4mm plugs. Mains input is via an IEC 13A socket while both fault and overload protection are internal and electronic.

As with the Mk2 preamp, the current power amp is the result of a comprehensive design revision. New circuitboards offer a more extended frequency range, claiming 'deeper bass, enriched mid and treble quality', topped out with a 50% increase in rated power output, the amp now delivering 2x150 W into 8 ohms and a still generous if not quite double 8 ohm power of 2x250W into 4 ohms. If the anticipated loading is still is more severe a loudspeaker matching switch for speakers of 2.5ohm minimum impedance and lower adds a further margin of protection. Sources indicate that this upgraded stereo amplifier is more or less a mildly downsized version of the fabled NHB 468 monoblocks (delivering 465W/8ohms), albeit with fewer output transistors.

Internal screening

The all-alloy chassis is divided into four well screened compartments – two per channel – with the individually screened toroidal transformers to the front carrying associated input wiring pictograms showing the double primary and multiple secondary windings. Massive gold-plated bus bars shine through the optional smoked glass cover, these electrically unifying the banks of selected reservoir capacitors.

The amplifier circuits proper occupy the remaining space. with internal signal wiring in Teflon-coated single-strand pure silver.

Unusually, there are three input choices: RCA/ phono at 50kohms via the noted WBT Next Gen Phono sockets, then Neutrik XLR balanced signal connection with improved isolating/matching input transformers, and finally the proprietary 50 ohm BNC terminated input discussed in the overview of the preamp.

The circuit is all discrete transistor, symmetrical and complementary. Protection is electronic, part crowbar and fused for secondary protection, and not invasive in the signal path. The outputs are also symmetrical, complementary with power BJTs by Motorola. The generous finned heatsinks are located to the sides. It runs fairly cool and without fans.

Price Notes overall range

NHB-108B MODEL TWO Power Amp	£39,995
NHB-18N55S Preamplifier including MC phono stage, battery power supply, RC, Bal-I/O, SE-I/O, DTZ-O	£38,998
DTZ-L1.5 1.5m Stereo set darTZeel Link Cable	£998
LHC-208SS integrated Streaming Amplifier (200W Stereo), RC, 3SE-I, 1DTZ-IN, Headphone Jack, 1xRJ45 Network, USB, 2xSPDIF, 2xTOS Link	£16,998
CTH-8660SS Integrated Amp (220W Stereo), RC, SE-I/Bal-I	£24,000

HIFICRITIC Power amp lab results:

darTZeel NHB-108B Model Two

With a rated output of 150W+150 W 8 Ohm, 225 W/ch 4 Ohms, I measured 2x 162W before clipping, 8 Ohms, and single per channel 240W into 4 Ohms. Thanks to its double mono power supplies two channel working did not affect the results. This is certainly a powerful single box power amp and for a 0.1 % distortion limit you could still get 2x130W 8 Ohms.

The bandwidth is amazingly wide, just as advertised and on square wave drive showed a miniscule 2uS risetime, this according with a very wide 0.5MHz bandwidth. There was negligible overshoot on capacitive loading, it was stable both on 0.1uF and 2uF here showing very little overshoot. An accurate channel balance of 0.02dB was noted over the whole frequency range. The Zeel input gave fine results, comparable with the SE input.

Distortion, while not super low, is still well below audible thresholds: For example, high frequency intermodulation was a moderate 0.04% at 4W output and by 0.1W it had fallen to an excellent -76dB, 0.015%. Total harmonic distortion remained low at typically 0.05%, largely independent of frequency. For example, at 1kHz 1W, as expected from a zero loop feedback design, the distortion components were of desirably low harmonic order, e.g. -66dB 2nd, -86dB 3rd, -88dB 4th, -89dB 5th. There was some DC offset at the output terminals, 82mV left, 12mV right channel, insufficient to cause concern.

1.75Volts input at 1kHz returned 160W/ 8Ohms per channel, compatible with a range of preamps and sources, while channel balance was an excellent 0.01dB throughout. Measured via the balanced input channel separation was excellent, 103.5dB at 20Hz, 90.5 dB at 1kHz, and a still fine 66dB at 20kHz. Noise levels were low relative to 1W, e.g. -97.2dB unweighted including hum, and 107.7 dB CCIR(1k) and 97dBA.

139 mV into the RCA input raised 1Watt into 8 Ohms, with a very wide frequency response as claimed. I measured -0.14dB at 10Hz, -0.01dB at 20Hz, then it was flat to 20kHz, -0.01dB. 100kHz was -0.34dB down and even 200kHz was only -0.1 dB (a slight easing of the rolloff). While I did not audition

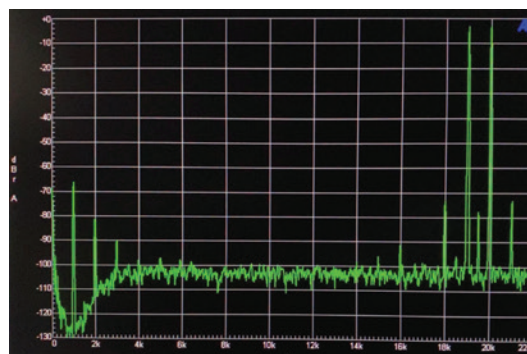
the balanced inputs, here measured distortion was a little higher at typically 0.1%, -60dB, possibly masking the full potential. Output impedance was a moderate 0.37 Ohms for 1kHz rising very slightly to 0.4 Ohms at the 20Hz and 20kHz extremes.

These results show a powerful very wide bandwidth amplifier, load tolerant, also with low distortion of any kind, including harmonic, intermodulation or slew related. In particular, distortion was of low harmonic order considered more musically consonant than the usual higher order findings. This was consistent with the listening experience.

Specifications NHB-108B MODEL TWO power amplifier

Nominal Output Power	150 watts RMS @ 8 ohms 225 watts RMS @ 4 ohms
Power Stage Gain	26 dB @ 8 ohms
Analog Input Impedances	BNC Zeel 50 ohms, 1 Hz to 1 MHz, RCA line > 30 k Ohms, 5Hz to 100kHz XLR > 30 k Ohms
Speaker Output Impedance	< 0.33 ohms from 20 Hz to 20 kHz (measured under 8 ohms)
Frequency Response	0.8 Hz - 600 kHz, +0, -3 dB
Rise Time	< 0.8 µs, Slew Rate > 88 V/µs, peak-peak
DC Output Voltage	± 50 mV
Total Harmonic Distortion (THD)	< 1 % from 7 Hz to 77 kHz
Temporal Distortion	None, at any level and load, as specified above
Crosstalk	< - 90 dB from 20Hz to 20kHz
Signal to noise ratio	> 112 dB (A) @ nominal power
Power consumption	50 watts @ idle, 900 watts @ maximum output power
Size in mm	440 x 350 x 170 (WxDxH)
Total depth with handles	415mm
Size in inches	17.32 x 13.78 x 6.7 (WxDxH)
Total depth with handles	16.4 inches
Net weight	30 kg
Finish	Red with gold facia and backplates
Price	£39,995
Manufacturer	darTZeel Audio, URL: dartzeel.com
UK Distributor	Absolute Sounds
URL	absolutesounds.com
Tel	+44(0)208 971 3909

HF Intermodulation power amp 5W



darTZeel NHB-18NS preamplifier: A short design story by Hervé Delétraz

When the NHB-108 Model One power amplifier was first introduced in New York in 2002, it had taken me 16 years research to ready it for production. Now we needed a companion preamplifier, one whose design philosophy would be closest to the NHB-108. And that is when many questions arose: traditionally, simply selecting inputs and adjusting the volume involves a good number of contacts, switches, relays, and other links, and I knew that each and every connector contact and switch introduces some loss in quality.

In the alternative, such as some kind of semiconductor switch and volume arrangement, the signal would likely pass through a matrix of semiconductor junctions, which I also consider would not be the best approach to my target of quality, “zero contact”. So, I came up with the idea of using light operated components, the fabled light dependent resistors (LDRs). These components were well known from the 1960s, and are still used in professional audio, especially in dynamic compressors, for their intrinsic stepless response.

No one had used them in high-end audio to switch input sources or to manage the dynamic range of a volume control system, due to the residual non-linearity of this type of component, and also the large variation even between components of the same batch. Nevertheless by 2003, I managed to build a prototype preamp with home-made LDR/LED assemblies, with fine linearity over a very wide dynamic range of 100 dB, accuracy better than 0.2 dB over the entire range, and channel accuracy in the range of 0.15 dB overall.

We introduced this design during T.H.E. 2004 show in Las Vegas, but it was extremely difficult to mass-produce as several ancillary components had to be added and fine-tuned for each assembly. The final version is even more complex than that, and the software programming to manage the whole thing is still more sophisticated but the result is a particular transparency to the musical signal which remains unmatched.

With this “philosophical imperative” to avoid contacts in the signal path resolved, I imagined it was possible to go further. Again, based on the technology of the original NHB108 Model One, the patented audio circuit topology has been adapted to the processing

and control of preamp signals. And from that line stage design, we have gone even further in developing a phono preamp and RIAA equaliser, in its 8th generation in the current NHB-18NS.

The power supplies in this unusual preamplifier are pure linear analogue and are fed from an ultra-low noise battery pack specially developed by us and manufactured by one of the leaders in this field. In normal operation the preamp is disconnected from the mains, and its inevitable noise contribution. The LiFePO₄ chemistry offers the highest number of operating cycles and which cannot catch fire in the event of a short circuit. Battery power provides complete disconnection from the electrical grid: when battery mode – the default – is activated, an optical link controls the relays to the transformer in the external power supply unit, thus physically disconnecting the preamp from the wall completely.

Concerned about losses in the connection and interface between the preamp and power amp, I had conceived of an impedance matched transmission line interface as early as 1999 and published a technical paper on the subject 2001. There was nothing revolutionary in this concept, already used in telecommunications for decades, but to my knowledge it not been applied to audio reproduction systems. This method of matching the impedances from source, the cable itself, and the receiver, allows the electrical signal to be transported without any temporal or frequency alteration, for frequency ranges far exceeding the hearing capabilities of the entire animal kingdom. This resulted in the proprietary 50ohm Zeel cable interface option for pre-power connection.

Finally, for those not acquainted ... *NHB* means ‘Never Heard Before’ and the *NS* bit means ‘No Switch’.