



# CEDAR DNS 4

**RESOLUTION** takes a look behind the scenes at the genesis of CEDAR's latest dialogue noise suppressor

For some people, CEDAR Audio and its products are still synonymous with audio restoration, whether for sound archives and libraries or remastering content for re-release on high quality digital media. Others know CEDAR exclusively in post. But for many years, the company's largest market has been in the area of noise suppression for production sound, broadcast and live sound.

CEDAR's dialogue noise suppressors started out as replacements for analogue noise reduction units in postproduction studios, and early units such as the DNS1000 and DNS 1500 sported faders that allowed users to control the amount of signal identified as noise and the way in which this was then suppressed. These were highly successful, and an Academy Award testified to the importance of the DNS1000 in film and video production.

These products — as well as the Pro Tools oriented DNS2000 and DNS3000 — used what would now be viewed as a basic form of machine learning to perform noise recognition. But in 2012, the company released a DNS product that used a more advanced ML algorithm, taking control away from the user and handing it over to the machine. Often referred to as a form of AI (although erroneously so) the Learn algorithm made it possible for CEDAR to manufacture products with

a minimum of physical controls, but which were capable of producing results that were often superior to those obtained by a human.

The 8-channel rackmount DNS 8 Live was a breakthrough for several reasons. Firstly, Learn made it possible for non-expert users to obtain high quality results, avoiding the artefacts that occur when noise reduction is incorrectly applied. Secondly, by removing the need to ride faders and find sweet spots for each of its controls, setup times could be greatly reduced. Thirdly, a 'Detail' mode allowed experienced users to set up specific and independent noise identification and noise reduction characteristics for each channel, which is ideal in situations such as studios where the ambient noise differs from microphone to microphone. And finally, CEDAR's DNS products have always had near-zero latency, which makes them uniquely useful where lip-sync has to be maintained. Consequently, the DNS 8 Live was quickly adopted worldwide by news and sports broadcasters as well as companies producing content such as reality TV and games shows.

By removing the need for anything more than a knob to dial in the desired amount of noise attenuation, Learn also made it possible to design a smaller dialogue noise suppressor for applications such as production recording and live

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interviews in noisy environments. So perhaps it was no surprise when CEDAR announced the DNS 2, a two-channel unit that was small enough to fit in a kit bag, yet offered a pair of ultra-low-noise microphone preamps with optional phantom power, and could be powered using industry-standard 12V supplies. Within a few months this had become CEDAR's most successful product, and it remains a vital component of many sound recordists' kits, whether working on the latest blockbuster movie or broadcasting from a war zone somewhere in the world.

### More channels requested

Nevertheless, almost as soon as CEDAR launched the DNS 2, they were approached by customers who wanted more channels of dialogue noise suppression in the same footprint. There was another rackmount product in development at the time, the CEDAR DNS 8D but, once this was



/ Phantom power is available on mic inputs

/ Mini XLRs are preferred by CEDAR's customers

released, the company was able to turn its attention to the concept of a functionally larger DNS 2. It soon became apparent that marrying two of the existing units in as small a box as possible was not the right way forward. For example, once the channel count exceeded two, a different type of GUI was needed. Furthermore, there were many possible I/O configurations with different combinations of mic, line and digital inputs as well as analogue and digital outputs. There were other decisions to be made that would influence the size of the unit. The DNS 2 uses a standard XLR4 as its power connector, but many potential users expressed a preference for the smaller connector used by many battery packs. Then there was question of audio connections. The DNS 2 used full-sized XLRs for its inputs and outputs but market research showed that, to minimise the space needed, mini XLRs were now preferable. Armed with this and various other items of information, the team was ready to design the latest portable DNS, which they decided should have four channels so users could record up to four channels of noise suppressed audio, or two channels of processed audio and two 'isos' without having to jump through any hoops. For obvious reasons, the new product was named the DNS 4.

With the specification and physical parameters decided, development began. All was proceeding well... and then the global silicon shortage hit. The original design of the DNS 4 used components that initially had delivery times of 12 weeks, which then became 26 weeks, and then a year, and then two years, until eventually some major components became unobtainium. At this point, CEDAR must have been tempted to become a pure software company, but there are some jobs for which software isn't a solution, especially when latency is an issue. So a redesign was undertaken, boards were laid out again, wheels were reinvented, and the project moved forward. Of course, every time that the processors or microcontrollers within a device such as the DNS 4 are changed, the firmware also has to be rewritten, and this can take as long as — or even longer than — the changes to the hardware. But here we are in September 2022 and, despite the challenges, the DNS 4 has arrived.

Announced on 1st September and shown for the first time at the IBC2022 Convention, it's the planned four channel unit that uses the smaller power connector and mini XLRs preferred by CEDAR's customers. It offers four input channels — either two mics and two line inputs, four line inputs or four digital inputs, four independent processing channels, and four line level or digital outputs. Its dual mic preamps have an admirable dynamic range of better than 102dB and, if they share the performance of the DNS 2's mic pres, they should sound very good indeed. Their +48V phantom power also offers up to 10mA per microphone, so should power most if not all of the mics that you may want to use with the unit. Analogue to digital conversion is driven by an internal 48kHz clock or can be synchronised to external equipment in the range 40kHz to 100kHz, and produces a 24-bit signal at the chosen sample rate. The processing resolution is 40-bit floating point, and both 24-bit digital and analogue outputs are provided.



/ The DNS 4 will be much in demand for location sound

At just 185 x 130 x 45mm and weighing in at a very manageable 750g, the DNS 4 is not much larger or heavier than the DNS 2 and will drop just as easily into a kit bag as its predecessor — maybe even more so thanks to the need for smaller connectors. But production recording and broadcasting isn't its only use, and there's little doubt that some units will find homes with broadcasters who have no need for the eight channels and remote control capabilities of the DNS 8D, and perhaps some smaller studios who will benefit from the flexibility of a hardware unit that can be used in-house for interviews and voice-overs as well as on the occasional trip into the field.

### Simple, compact and portable

Operating it couldn't be simpler. When using the analogue inputs, you can determine the gains for each channel independently and whether the optional 18dB/oct high-pass filter for each is engaged. You can also group channels to use the same setup and processing parameters if you wish, and an optional split mode directs input 1 to internal channels 1 and 3, and input 2 to internal channels 2 and 4 so that you can process each signal in two ways, including passing the audio 'unmolested' as an iso. Having set the unit up as needed, there are then just two processing parameters for each channel — its Attenuation and its Bias. These have the same meaning as on previous DNS products, with the Bias predisposing the algorithm to detect more or less noise at any given moment, and the Attenuation determining how much of the noise is removed. An OLED displays all of this information on a single page as well providing level and performance metering.

As for the processing itself, CEDAR is always seeking to improve upon its noise reduction technologies. The version in the DNS 4 is a further refinement of the DNS 2 algorithm and, having listened to the production prototype, it's clear that the performance is at least as good as that of its

predecessor, providing a significant amount of noise suppression without introducing any of the artefacts associated with traditional dehissers and denoisers. You can, of course, over-process, but rather than obtaining the twittering and underwater artefacts that engineers have come to know and hate over the years, the worst that happens is that the signal becomes a bit dull and lifeless. But when it's used correctly, voices retain their quality while the noise is pushed back to a degree that would have been unthinkable a few years ago. And all this happens in a box that you stick in your pocket and power from a battery.

When working in a studio or on location, noise is an almost unavoidable problem and — whether broadcasting live or recording — there are many occasions when it's impossible to go back and 'do it all again'. By providing the ability to suppress noise with minimal setup effort and no unpleasant artefacts, the DNS 4 can be more than just a noise reduction unit; it speeds workflow and can save on costs. But those of us working in post needn't worry. CEDAR is always mindful that superior results might be achieved elsewhere if the time and the budget allows, which is why the split mode is such a fundamental feature of the product's design.

CEDAR Audio is now approaching its 34th birthday, and it must seem to younger sound engineers that the company is part of the permanent furniture of the pro-audio industry. It still works with the libraries and archives that numbered among its earliest customers, and its CEDAR Cambridge systems remain at the forefront of their field, processing vast amounts of audio for clients ranging from film companies to government security organisations. But its DNS products — both in hardware and in their Emmy Award winning plug-in form — are by far its most widely used, and the DNS 4 fills the gap between the DNS 2 and the DNS 8D very nicely indeed. 📍

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