

NEDSP1962-KBD

This is an amplified DSP noise-cancelling module from bhi, which may be retrofitted to your extension loud speaker.

Introduction

Noise-cancelling headphones and loudspeakers have been around for some time, and many years ago, when I travelled regularly for work to East Africa, I invested in a pair so that I could listen to music without the intrusion of the aeroplane's engines. On one occasion, a fellow passenger, sat next to me and who was swearing incessantly, was excluded from my 'bubble' thanks to my headphones!

Be that as it may, noise-cancelling technology has useful applications in telecommunications in general, and specifically in amateur radio.

Last night, I was working SSB on 80m and the background noise, as measured on my S meter, was fluctuating between 8 and 9. When a station came back to me from Somerset, the QSO was limited to exchange of details and location and could not be continued because of the high noise levels. It is not just on this band where this is a problem, although it does seem to be the worst band for noise here in my rural location in North Yorkshire; the other HF bands and VHF and beyond have their issues with noise as well.

But what is noise? An excellent article on this topic may be found at [1]. It addresses the issues of natural noise, as well as man-made noise and how these can be assessed in one's station. For readers wishing to know more about this topic, I recommend this article which provides a good primer for further research and study.

Before describing the NEDSP1962, let me briefly outline the physical principles behind noise reduction technology. Whilst it is difficult to deal with noise at radio frequencies, the end user, so to speak, is the ear which is subjected to noise at audio frequencies following the process of detection and demodulation. The resultant sound waves have qualities of phase, amplitude, and frequency; the frequency determining the pitch, and the amplitude the loudness of the sound. Noise-reducing technology exploits the principle of 'destructive interference'. This is a phenomenon that occurs when two waves with the same frequency are out of

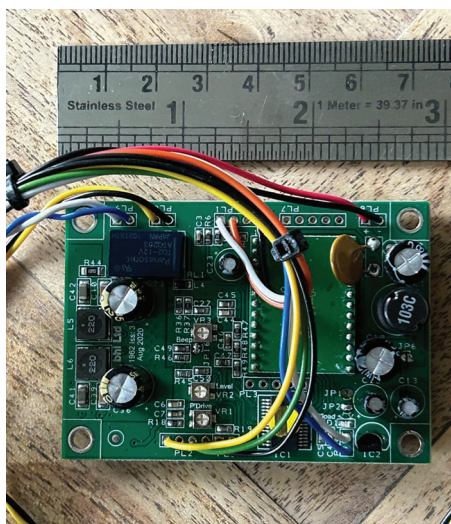


FIGURE 1: The uninstalled board with attached wiring. Note VR1-3 which require adjustment following installation.

phase by 180°. Added together, the waves tend to cancel each other out, completely if of the same amplitude, and this results in an overall reduction in sound pressure. Further details may be found at [2], [3], and [4].

NEDSP1962

This is an amplified digital signal processing (DSP) noise-cancelling module that can be retrofitted into many different types of extension speaker, as well as into older radios and transceivers. DSP technology can identify speech from within a noisy signal and may provide up to 40dB of noise reduction and 65dB of tone reduction. The manufacturer, bhi, is a leading name in this type of technology and has many products on the market. NEDSP1962 (NED) incorporates a full audio signal chain with 16-bit analogue-to-digital converters (ADC) and digital interfaces. The audio amplifier

stage is provided by a Texas Instruments TPA3111D1PWPP mono Class-D audio power amplifier, which has an efficiency of 94%, thereby obviating the need for a heat sink. Being Class D, neither of the output wires must have any connection to ground.

The module has eight settable noise cancellation levels between 9 and 40dB. It can reduce a heterodyne tone by up to 65dB, has a frequency response from 50Hz to 5kHz, and up to 7.5W audio power output into 4Ω. It needs a DC supply between 10V and 18V. A comprehensive instruction and installation manual is included with the NED which is well set out and easy to understand.

On opening the box...

Having reviewed the product description, I was surprised by the large size of box delivered to my house. This was because Graham, the firm's director, had sent me a Yaesu SP-8 speaker into which the NED had been wired, as well as a boxed NED unit for installation in another piece of equipment. The NED itself is quite small, measuring just 70mm x 50mm x 12mm. The beauty of the system is that it can be retrofitted into, what I have reason to believe, can be *any* radio or transceiver. The NED is supplied with a 1030-FPL fused DC power lead and a full mounting kit with bhi labels. The uninstalled unit is shown in **Figure 1**, and in **Figure 2** the keyboard switch assembly can be seen. The unit installed into the Yaesu SP-8 speaker is shown in **Figure 3**. The keyboard switch assembly fixed to the outer casing of the speaker is shown in **Figure 4**. The manual, which can also be downloaded at [5], is comprehensive and clearly explains how to install and set up the unit. One important point is highlighted in the manual: the output level must be set so that it sounds the same whether the module is switched on or off.

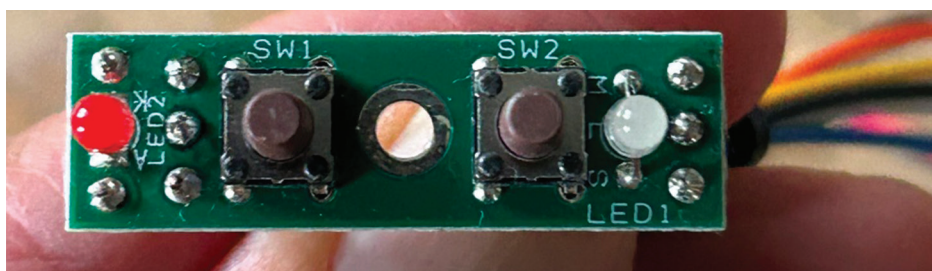


FIGURE 2: The small keyboard switch assembly which requires mounting on a speaker chassis or transceiver front or rear panel.

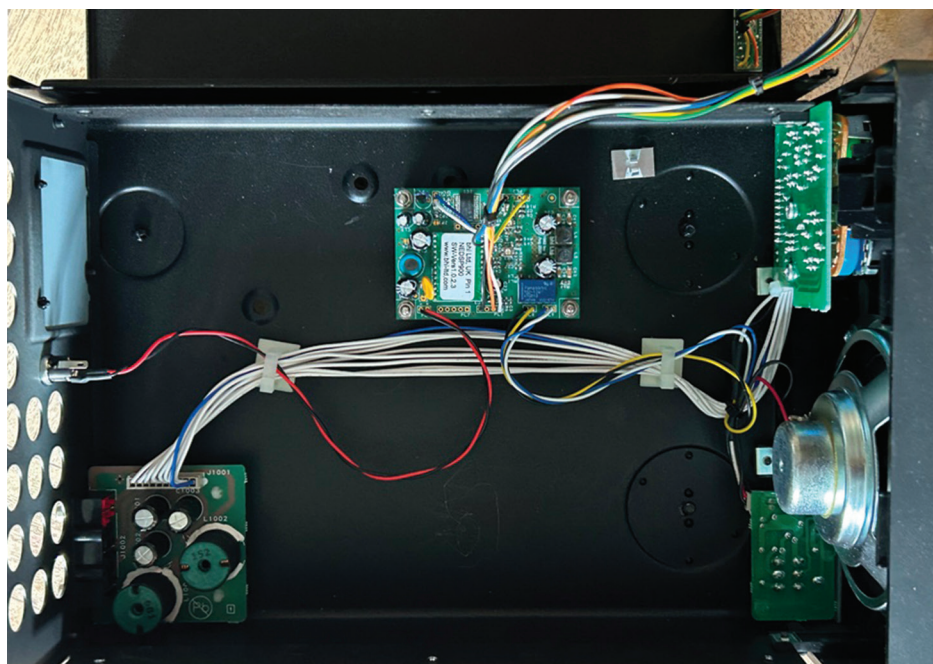


FIGURE 3: The NED module installed within the Yaesu SP-8 speaker box.



FIGURE 4: The keyboard switch assembly has been fitted to the outer casing of the speaker.

In use

Following installation in the rig of your choosing, it is recommended that you set up the unit as follows:

1. Ensure that the NEDSP1962-KBD module is un-powered.
2. Connect the module to an appropriate speaker unit.
3. Connect the speaker to an audio source.
4. Set the source audio to a typical audio level.
5. Press and hold the 'Power On/Off' button for about 1s to power up the module. The mode LED will light (green for the four-level mode and orange for the eight-level mode). You will hear beeps

and see the LED flash the same number of times as the current noise filter level.

6. Make sure that the overload LED is not illuminating on audio peaks. If it is, reduce the source audio level.
7. Adjust VR2 (the output level) until the audio volume is about the same as when the module is switched off.
8. Adjust the audio source to check that the audio output level changes commensurately and that the overload LED does not flash.

Whilst I did not fit the spare unit into another rig, having seen the how it had been installed into the Yaesu speaker, I would not anticipate that anyone would have difficulty

fitting the board or the keyboard switch assembly.

The keyboard assembly comprises two push buttons, one serving as the on/off switch whilst the other selects modes. There are also two LEDs. The left hand one is red and serves to indicate overloading or a fault, whilst the right is a tri-coloured device which indicates the mode.

On the main PCB, there are three variable resistors; VR1 adjusts the piezo sounder level, VR2 adjusts the audio output volume, and VR3 adjusts the beep volume. The input has a range of sensitivity from 70mW to 3W, with output power of 7W.

Conclusion

I have had an opportunity of using the NED on a number of rigs on all of the HF bands (except 30m) and in my opinion it does reduce noise very significantly and can make signals which are already noisy clearly readable. Furthermore, it can reveal signals hidden in the noise. By this I mean that, if the board is switched off and there is the usual background noise, switching on the unit will reveal a station obscured within the noise and make it workable.

I am impressed by the system and have already approached Graham about buying one for myself. The unit costs £139.96 including VAT and can be obtained direct from the manufacturer [6].

My thanks to Graham Somerville for the loan of the equipment.

References

- [1] 'The Background Noise on the HF Amateur Bands', RSGB: <http://rsgb.org/main/files/2018/01/180116-Noise-leaflet-issue-2.3.pdf>
- [2] Arik,S., Karakurt, B. 'Active Noise Control: Theory and Applications', Journal of Acoustics (2019), 76(5), 1123-1135
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- [4] Altabar, A.M., Benassi,O. 'Acoustic Properties of Noise-Cancelling Speakers: An Exploratory Study', International Journal of Audio Engineering (2021), 8(2), 46-58
- [5] <https://bhi-ltd.com/downloads/manuals.html>
- [6] info@bhi-ltd.com

Paul Marks, G8FVK
pmarks4550@aol.com