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bhi

NES10-2 MK4

DSP Noise Cancelling Speaker
Operating Manual



Note:

No user serviceable parts inside. Warranty void if speaker opened. When listening using headphones, care must be taken when switching the noise cancellation off, as high volumes of noise will be present. Prolonged exposure to high sound levels may lead to hearing damage. bhi accept no responsibility to damage to hearing through incorrect operation of this equipment.



WEEE Statement for correct disposal of this product: (Applicable in the European Union and other European countries with separate collection systems). This marking shown on the product or its literature, indicates that it should not be disposed of with other household wastes at the end of its working life. To prevent possible harm to the environment or human health from uncontrolled waste disposal, please separate this from other types of wastes and recycle it responsibly to promote the sustainable reuse of material resources. Household users should contact either the retailer where they purchased this product, or their local government office, for details of where and how they can take this item for environmentally safe recycling. Business users should contact their supplier and check the terms and conditions of the purchase contract. This product should not be mixed with other commercial wastes for disposal.

6. Approvals

European conformity information

- A sample of this product has been tested and found to conform to the following European Directives:

73/23/EEC – Low Voltage (safety) Directive

89/336/EEC – EMC Directive

7. bhi Support

Every bhi noise cancelling speaker comes with a 12 month guarantee against defective materials and workmanship.

If you do have a problem then please refer to the troubleshooting section 4. If you have not resolved your problem then please contact us on +44(0)1444870333 or go to the contact us page at www.bhi-ltd.com

Before you make your call please have the following to hand:

- ✓ Your serial number (found at the back of the speaker)
- ✓ Details of when and where you purchased the noise cancelling speaker
- ✓ Your address & contact number

Most queries can be sorted out over the telephone, if not we will arrange with you to have your speaker sent back to us for analysis, repair or replacement (if within 12 months from date of purchase, if outside the guarantee period an estimate of the cost of repair will be given).

For contact details please refer to back cover of this manual.

If you have any suggestions for improvements please complete and return the customer feedback form.

ParaPro EQ20 audio DSP range with Parametric Equalisation. Precise audio adjustment to compensate for hearing loss.



EQ20-DSP/EQ20B-DSP



EQ20/EQ20B

- 20W audio and parametric equalisation on all units
 - Powerful high-performance audio processing system
 - DSP noise cancelling and Bluetooth versions available
 - Simple control of all DSP functions
 - Two separate mono inputs or one stereo input
 - Use with passive speakers or headphones
 - Fine-tune the audio to maximise your enjoyment
 - Four models EQ20, EQ20B, EQ20-DSP, EQ20B-DSP
- High-performance audio processing with first-class DSP noise cancelling for a great listening experience

Order code: EQ20 20W audio and parametric equalisation.

Order code: EQ20B 20W audio and parametric equalisation and Bluetooth.

Order code EQ20-DSP 20W audio, parametric equalisation and DSP noise cancelling.

Order code: EQ20B-DSP 20W audio, parametric equalisation, DSP noise cancelling and Bluetooth.

PSU12-2A-WW 12V DC world-wide power supply

Important Information

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Switch Box

Order code: 1042 Switch Box

Need to connect more than one piece of equipment to your bhi noise cancelling speaker or module?



Switch box front view



Switch box rear view

Features:

- Allows 6 pieces of equipment to be connected to a Noise Eliminating Speaker, In-line Module or existing extension speaker
- 3 Inputs - loaded at 8 ohms
- 3 Un-loaded inputs (for low level signals)

NEDSP1901 audio DSP PCB install modules

The NEDSP1901 modules incorporate the latest bhi NEDSP900 DSP noise reduction module. The small size allows it to be retrofitted into existing equipment or designed in to new equipment.

The module has 8 user selectable levels of noise reduction. There is the NEDSP1901-PCB basic version and the NEDSP1901-KBD pre-wired version. The KBD version is operated via a single pushbutton on the pre-wired wiring assembly and is suitable for amateur radio installs. It comes with a complete fitting kit (mounting bracket, keyboard label and a detailed installation manual). Order code: NEDSP1901-PCB (basic pcb version). Order code: NEDSP1901-KBD (pre-wired version)



Noise Cancelling Headphones *Order code: NCH*

These active noise reduction (ANR) headphones reduce the ambient background noise so you can enjoy your listening experience more.

Features:

- Noise cancelling on/off switch with LED
- Discrete battery holder AAA size. (Battery included)
- Neodymium drivers
- Sensitivity 110dB
- Frequency Reponse: 20-20000Hz
- Noise reduction:12-15dB
- Maximum Input: 40 mW



HP-1 Wired Stereo Headphones

Features:

- Comfortable over-ear dynamic stereo headphones
- Lightweight foldable design
- Adjustable headband
- Soft leatherette ear pads
- ¼" jack adapter supplied

Order code: HP1



1. Overview

1.1 bhi

bhi Ltd design, develop and manufacture Digital Signal Processing (DSP) noise cancelling products and other specialist electronics products for radio and voice communications.

1.2 Introduction

The bhi DSP noise cancelling speakers greatly improve the speech quality in radio and voice communications. They are very suitable for use in many applications where high background noise stops you from clearly hearing what is being said. The NES10-2MK4 will enable the user to listen and concentrate "**stress-free**". Suitable applications where bhi DSP noise cancelling speakers and noise cancelling technology will be of great benefit to the user include radio amateur base stations, CB radios, two-way radios, HF radios, marine radio communications, scanners, intercoms, base stations and hands-free car kits.

The bhi NES10-2MK4 amplified DSP noise cancelling speaker is compact and easy to install and incorporates the latest bhi DSP noise cancelling technology, which is fully adaptive to any change in noise levels and interference. The noise cancelling can be switched on or off and there are 8 user selectable noise cancellation levels.

The **NES10-2MK4** mounts like any standard external speaker and is powered by any 10 to 18V DC unregulated power source or low noise switch-mode power supply. You can use the optional bhi **PSU12-2A-WW** external power supply or **1030-VEPL** in-vehicle adapter.

The NES10-2MK4 is supplied with an integral 2m audio lead terminated with a 3.5mm mono jack plug ready for immediate use.

1.3 Audio DSP Noise cancellation

The bhi DSP noise cancelling processes the incoming audio signal and then differentiates the speech from the noise. The unwanted noise and interference is then attenuated to leave only the speech.

The following diagrams are taken from actual audio signals and illustrate how the audio signal is being processed.

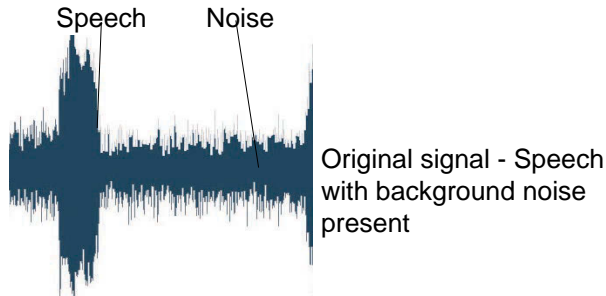


Figure 1. Audio signal before processing.

Dual In-Line amplified DSP noise cancelling in-line module with dual channel DSP noise cancellation. The Dual In-Line module caters for both mono/stereo speaker level and stereo line level audio input signals. Powered speakers can be connected to the stereo "Line Out" socket, and a passive speaker can be connected to the 7W amplified mono "Audio Out" socket.



Use in line with headphones or a loudspeaker.

Order code: *Dual In-Line*

Compact In-Line Order code: *Compact In-Line*

The bhi Compact In-Line DSP noise cancelling module works with headphones or a speaker. It is easy to set up so you can enjoy your listening experience straight away. Simple controls perform all the functions enabling you to adjust the audio to suit your conditions and listen stress free.



SPKR8 8 Ohm
8 Watt speaker



LSPKR 4 Ohm 20
Watt 4" speaker



EXTSPK25 8 Ohm
25 Watt speaker

Other products available from bhi:

DESKTOP DSP noise cancelling speaker

Order code: DESKTOP

10 Watts audio - Rotary volume and filter level controls – 8 ohm speaker level input and separate line level input - headphone socket - Audio/LED indication of filter level, volume and overload - Noise reduction 9 to 35dB - 12V DC to 18V DC power - Weight 1.9Kg, dims 200(H) x 150(D) x 160(W)mm.

Order code: DESKTOP



DSPKR

10 Watt DSP noise cancelling speaker



10 Watts audio output power - Fully Adaptive noise cancelling 8 to 35dB - Simple pushbutton control of DSP functions - Input overload & separate volume control - 10 to 16V DC operation - Up to 6 Watts input - Dims: 135(W) x 130(H) x 85 (D)mm, Weight 0.85Kg. Order code DSPKR

GroundBreaker

The bhi **GroundBreaker** solves RFI and ground loop issues by isolating the ground on your external audio equipment from the ground of the radio. 8 Ohm, 16 Ohm & 10k Ohm mono and stereo versions available.



Processed speech

Speech signal with reduced noise for clearer and more intelligible speech

Figure 2. Audio signal after processing.

1.4 Unpacking

Check that the following items are included in the package:

- NES10-2MK4 Noise eliminating speaker
- Grey rotary filter knob
- 2 fixing screws
- 4 self adhesive rubber feet
- 1 fused DC power lead
- User manual
- Customer feedback card

Optional extras if ordered (see section 5):

2. NES10-2MK4

2.1 Controls

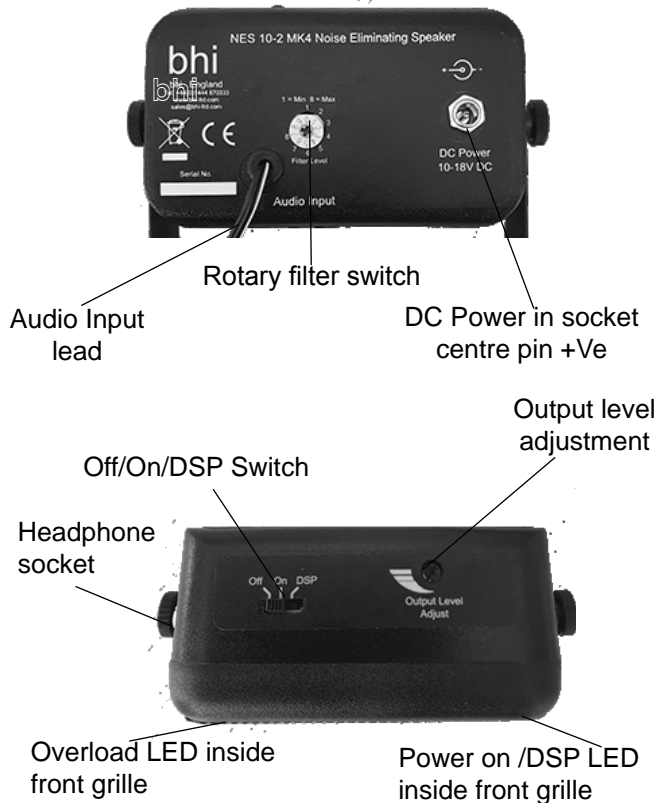


Figure 3. NES10-2MK4 Controls

Audio Adaptors: Audio adaptors for use when connecting the NES10-2 MK4 to various radios and audio equipment

Radio connector	Adaptor required	Order Number
6.35mm (1/4") mono socket	6.35mm mono plug - 3.5mm mono socket	ADP-P001
6.35mm (1/4") stereo socket	6.35mm stereo plug - 3.5mm mono socket	ADP-P002
3.5mm jack stereo socket	3.5mm stereo plug - 3.5mm mono socket	ADP-P003
Phono socket	phono plug - 3.5mm mono socket	ADP-P004

Adaptors for connecting earhones/headphones to NES10-2 MK4

Headphone connector	Adaptor required	Order number
3.5mm jack stereo plug	3.5mm stereo socket - 3.5mm mono plug	ADP-S001
6.35mm (1/4") mono plug	6.35mm mono socket - 3.5mm mono plug	ADP-S002
6.35mm (1/4") stereo plug	6.35mm stereo socket - 3.5mm mono plug	ADP-S003

5. Accessories and other products

Optional Extras

The following items are available from bhi as optional extras for use with the NES10-2MK4. If you would like to order any of these items then please contact us (see the back page of this document for contact details), or order on-line at www.bhi-ltd.com.

Power:

PSU12-2A-WW	12V DC 2A international mains power adaptor
1030-VEPL	Vehicle power adapter
1030-2WVA	2 way vehicle power adaptor
1030-VEPL6	6m vehicle power adapter

Audio:

1030-EXLE	Audio Extension lead (2M)
ALD-001	3.5mm - 3.5 mm mono audio lead 1.2M long.
ALD-002	3.5mm - 3.5mm mono audio lead 2.5M long.
ALD-003	Phono - phono lead mono lead 1.2M long.
ALD-004	3.5mm Stereo - 2 x phono lead 1.2M long.
ALD-007	3.5mm stereo audio plug lead 1.2M long.

2.2 Description

Note: Fit grey filter level select knob into switch body on rear of speaker prior to using your speaker. Ensure that you line up the indent on the top of the knob with the arrow on the switch body.

1. The rotary noise cancellation filter level switch allows the user to select between 8 different settings, level 1 giving the least amount of noise cancellation and level 8 providing the most. The unit is normally factory set to level 6. The switch settings are shown on the rear of the speaker (see page 12).
2. The power socket allows the user to connect the NES10-2MK4 to the bhi power supply (optional extra) or any suitable 10 to 18V DC power source (min 500mA), with a suitable 2.1mm power connector, centre pin positive.
3. The speaker has a 2m audio lead terminated with a 3.5mm mono jack plug. This lead connects to the external speaker socket or earphone socket of your equipment.
4. Output level adjust: This sets the output to the NES10-2MK4 amplifier. It should be set so that the audio level is the same whether the NES10-2MK4 is switched on or off. This is approximately the mid-range of the control and allows for extra audio gain if required. Normally once set this control does not require any further adjustment depending on the input level from

the radio equipment that is connected to the speaker.

5. LED indicators: The power “On” LED illuminates red when power is applied and changes to green when the noise cancellation is active. The overload LED lights if the audio input is overloading the speaker and will cause audio distortion. If this happens reduce the audio input from your radio equipment until the LED goes off.

Power Off/On/DSP	State Indicator	Action
Off	LED off	Audio bypass straight through from radio
On	Red	Speaker powered. Just amplified audio with no DSP filter
DSP filter	Green	DSP on. Select filter level using knob on rear of unit
Off/On/DSP	Overload LED flashing	Reduce audio input level until LED stops flashing

6. Power Off/On/DSP switch: This three position switch turns the speaker and noise cancellation on and off, and should be in the “Off” position prior to using the speaker. When the speaker is in the “Off” position the audio bypasses the DSP electronics and the speaker will act as a normal extension speaker.

8. Headphone socket: Connect a 3.5mm mono earpiece or stereo headphones using one of the optional audio adaptors (see section 5). This socket can also drive another loudspeaker. When a connector is inserted into this socket the internal speaker is muted.

What adjustments do I need to make during use?
None. Once the NES10-2 is set to your personal settings no further adjustments should be necessary.

Can the speakers be used with a switch mode power supply? Yes as long as it a good quality low noise supply like the bhi PSU12-2A-WW.

Sometimes I can hear watery type noises in the audio
When listening to weak signals with high levels of noise or just noise with a high filter level the processed audio may sound a little strange. This is normal operation as the DSP is working hard to remove the high levels of noise. Adjust the filter level to a lower setting to try and minimise this running water effect audio noise. Note: The bhi DSP noise cancelling technology is able to identify the speech part of the signal from the noise part and is therefore much better at handling weak noisy speech signals than other types of noise cancelling technology.

See the FAQs section on our website www.bhi-ltd.com for further help and information.

Try transmitting again. If the problem is cured, try removing the first ferrite to see what happens. If the problem persists then move to power lead suppression.



Figure 8. Power lead suppression with ferrite fitted

Try transmitting again. If the problem persists, then move to the next step. If the problem is cured, try removing the previous ferrite(s). Shortening the power lead may also improve the situation. Fit another ferrite at the other end of the power lead to see if this helps further.

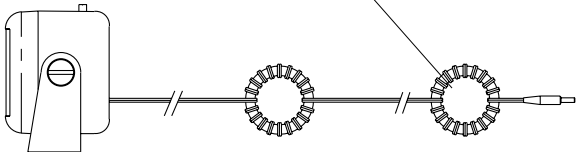


Figure 9. Additional power lead suppression

Try transmitting again, if the problem is cured, try removing the previous ferrite(s).

Another solution is the new bhi **GroundBreaker**. This product solves RFI and ground loop issues by isolating the ground on your external audio equipment from the ground of the radio. The unit is easy to install and fits in between your radio and audio equipment. see page 22 for more information.

2.3 Specification

Noise attenuation	- 8 to 40dB
Number of DSP filter levels	- 8
Tone reduction	- up to 65dB
Audio input power	- 5W rms max
Audio output power	- 5W rms max
Audio connection	- Integral 3.5mm mono jack plug, 2m lead.
Headphone connection	- 3.5mm mono jack socket
DC power	- 10-18V DC 500mA
Size	- 110 x 65 x 55mm
Weight	- 0.45Kg

2.4 Connection

For use with radio communication equipment, follow the diagrams and procedures on page 12 onwards. For in vehicle use fit the speaker in a suitable location using the bracket and fixing screws supplied and follow the correct rules for vehicle installation to ensure there are no audio interference issues. **Note:** *It is recommended that this is carried out by a qualified vehicle technician.*

The speaker is supplied with four rubber feet. These can be attached to the bottom of the mounting plate to prevent it from marking surfaces.



Plug in 3.5mm audio lead to radio equipment

For suitable audio adaptors see section 5



Rubber feet
x 4

Fixing Screws
x2

2.1mm power
connector
centre +Ve



Optional in-vehicle
power lead

Optional PSU12-2A-WW
12V DC mains power
adaptor



Figure 4. NES10-2MK4 connections

Operators voice can be heard when transmitting
All bhi products operate correctly under normal working conditions. However if problems with feedback or ground loop issues are experienced during transmission then the following measures may help.

1. Reduce the volume on the radio equipment
2. Connect the speaker to a separate power supply (available from bhi - see section 5).
3. Ferrites

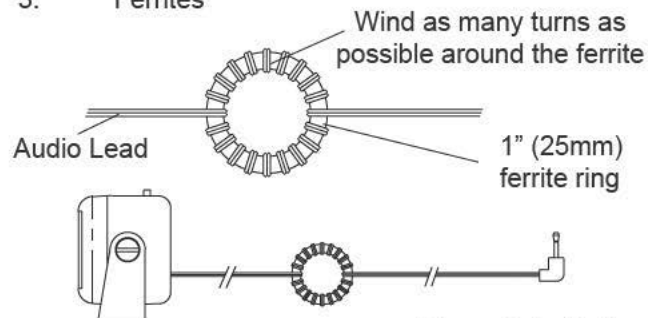


Figure 6. Audio lead

If problem persists then fit another ferrite at the other end of the lead close to the audio connector

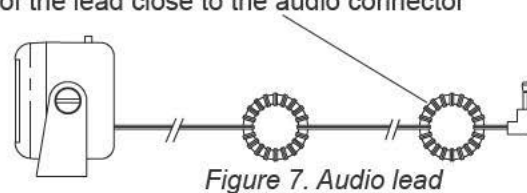


Figure 7. Audio lead

- With the noise cancellation switch in the off position, make sure that you have the output level control on the NES10-2MK4 set around around half. Now tune your radio communications equipment until you have a good clear signal with good volume.

The volume from the speaker is low and cannot be increased:

- The NES10-2MK4 is designed to work with the external speaker sockets of radio communications equipment, and will also work with some earphone, line out and headphone sockets. There may be occasions where the signal output is not enough to process the signal effectively. bhi have other noise cancelling products that will work with lower signal levels. Check out these products on our website for more information.

Sometimes there is a short delay before the noise cancellation is active

- This is due to the time the DSP takes to start processing the signals. This gives the opportunity to check that the DSP is not taking out any detail from the signal.

Sometimes there is a noise when the speaker first powers up

- This is caused by the DSP processing starting up and is nothing to worry about. Switch mode power supplies can often cause this noise on power-up.

2.5 NES10-2MK4 basic set-up procedure and operation

1. Ensure that the Off/On/DSP switch is “Off”. Connect the fused DC power lead or a suitable 10 to 18V DC power supply to the power socket at the back of the NES10-2MK4. **Note:** *Make sure the centre pole of your power supply connector is connected to positive (+ve).*
2. Connect the 3.5mm mono jack plug lead of the NES10-2MK4 to the 3.5mm mono extension speaker socket of your radio. If your external speaker socket is not a 3.5mm mono jack socket suitable adapters are available from bhi. Check out page 21 to select the correct audio adapter.
3. Switch the power supply on and then move the speaker Off/On/DSP switch to “on”. The front panel LED should be illuminated red. Switch to “DSP”. The LED will go green. When “Off” the audio bypasses.
4. The output level control on the top is factory set but you may need to adjust this so that the output volume from the speaker is about the same when the speaker is powered off or on.
5. Ensure that the grey control knob is fitted to the noise cancelling switch as per the instructions on page 14. The filter level is normally set to level 6 but use the table on page 14 to select a suitable level.

Filter Level	Attenuation
1	8dB
2	12dB
3	16dB
4	20dB
5	25dB
6	30dB
7	35dB
8	40dB

Note:

Remove the small grey filter select knob from the small red plastic accessories bag inside the NES10-2MK4 and carefully press fit into the switch body at the rear, making sure to line up the mark on the knob with the arrow on the switch.

- Turn the radio equipment on and set the audio volume to your own personal taste, making sure that you are not overdriving the speaker and causing distortion. Adjust the output level using the small control knob on the top of the speaker if you need increase or decrease the audio output on the speaker. Tune into a station. *Note: there may be a small delay and audio click before audio is heard when you first power on the speaker. This is normal.*
- Move the Off/On/DSP switch between “Off” and “DSP” to hear the difference and the effect of the bhi DSP noise cancelling on the signal. The front panel LED changes from red to green indicating when the noise cancellation is active.
- Adjust the filter level if required to remove higher levels of noise and improve the intelligibility and clarity of the signal to suit your conditions.

3. Troubleshooting/FAQs

Speaker doesn't work at all, no sound from the speaker when powered:

- Check that the power connector on your power supply is suitable for the power socket on the speaker (12V DC 2.1mm, centre positive).
- Check that you have switched your radio communication equipment on and that you have a signal for the speaker to process. To verify this switch the speaker to “Off” or remove the audio connector from the external speaker socket on your radio equipment.
- Check that the LED on the front of the speaker is illuminated green, when the noise cancellation is on.

The speaker works but the noise cancellation doesn't appear to improve the audio quality of the signal:

- Check that the LED on the front of the NES10-2MK4 changes from red to green when the noise cancellation is switched off and on. Check that you have a good audio signal from the radio equipment. Now switch the noise cancellation on, you should clearly hear the difference now.