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## The van den Hul voltage tester; Operating instructions:

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The van den Hul voltage tester is a unique device that will come in handy in fine-tuning your audio installation to minimise its residual ground currents; However, it also serves as a voltage, phase and cable-interruption checker with all kinds of electrical appliances in and around the house:

- Works without a battery, thus is always ready for use !
- Its liquid crystal display safely senses and indicates the voltage relative to your body (=ground), that is present at any object touched with its screwdriver blade.
- It measures 12V to 230V, AC and DC in 12, 36, 55, 110 and 220V indication steps and also can indicate the presence of electric fields.
- Very sensitive and safe: Its leakage current is less than 3  $\mu$ A.
- Do not use with AC or DC voltages exceeding 250 Volts !
- The van den Hul voltage tester is equipped with two measurement modes:

### 1. Direct test mode = Voltage measurement:

When touching the 'Direct Test' button and pressing its screwdriver blade to any metal part under test, the highest figure that lights up on the display indicates the voltage present. A somewhat more precise voltage reading can be obtained by considering the intensity of the highest voltage displayed. Looking at the display from a different angle may help here.

### 2. Inductance / Break-point Test mode = Electric field indication:

Press the 'Inductance / Break-point Test' button and point the screwdriver blade towards the object under test, not necessarily touching it with the blade. Here, the display's "spark" symbol (intensity) indicates the presence of electric fields that are radiated from appliances and cabling. This function is useful to trace voltage carrying cabling, cable interruptions, electric fields and static electricity.

### About residual ground currents flowing in your installation:

Due to the fact that most audio equipment in your installation is powered by the mains voltage, an unavoidable hum voltage residual is induced on all cabinets and audio grounds. At all audio devices these residual voltages are of different magnitude (or phase) and will balance out by means of ground currents flowing through the shields of your interconnecting cables. Generally, these ground currents are in the same order of magnitude as the audio signal currents being transferred (microAmperes), and thus are likely to interfere, thereby reducing transparency and imaging. With the van den Hul voltage tester, you can simply fine-tune your audio system to eliminate, or at least strongly reduce, these residual ground currents and thus improve your system's performance.

### Fine-tuning your audio system using the van den Hul voltage tester:

Note: To perform the fine-tuning correctly and without problems in a single pass, the reader is strongly advised to be fully acquainted with the parts below (points **1** through **4** and "**Hints**") before applying the optimisation procedure to an audio installation.

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### The optimisation procedure:

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1. First, each audio device in your installation needs to be made completely electrically isolated from its environment; Remove (disconnect) all interconnect and other cabling from the equipment in your installation (even your tuner's antenna and loudspeaker cables) and unplug all mains plugs. Also make sure that no other possible current paths between your equipment or to ground remain (for instance occurring along metal housings directly contacting each other or along metal supports). Further, make sure to turn down all your volume controls.
2. With the tester (pressing the 'Direct Test' button), find the phase (=hot) on all mains outlets that power your audio equipment and mark it.
3. With each audio device in your installation to be optimised now repeat the following steps (**A** through **C**):

*Note: When testing any audio device, all other equipment in your installation must be kept unplugged from mains.*

- A. Plug into mains, switch ON and use the tester's 'Direct Test' button to measure the residual voltage present on the local audio ground, with its screwdriver blade pressed against any of the device's line level input's or output's (RCA/Cinch) outer metal shield connection (=audio ground). (For instance measure at your CD player's

right or left channel's output shield).

- B. Switch OFF, reverse the device's mains plug polarity by turning the plug 180 degrees, plug in and switch ON. Now again measure the residual voltage as described at point **A**.
  - C. The mains plug polarity position producing the lowest residual voltage minimises the device's residual ground currents. Switch OFF, and unplug the mains connection. Mark the plug's side that was connected to the mains outlet's phase (already marked at point **2**) in the optimum position found. With both your mains plugs and outlets marked, the optimum plug polarity always easily can be retrieved. Continue at point **A** with the following audio device until all the equipment in your installation has been optimised for minimal residual voltages.
4. Having completed point **3**, reconnect all wiring while routing your mains cables as far away as possible from the interconnects, loudspeaker cables and all audio device's cabinets. This to keep the mains cables' electrical stray fields from inducing additional hum voltages. Residual ground currents now have been minimised and your installation should sound cleaner. Also, if present at all, audible mains related disturbances such as clicks and so on will be reduced.

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### Some hints:

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- In some countries, mains plugs equipped with a ground pole can not be reversed. In most cases the related audio equipment will thus be grounded to mains, and does not need to be optimised for polarity. With mains grounded equipment the tester will indicate a zero voltage residual on the audio ground.
- To get the most accurate and objective reading of the residual voltage present on any device, please note the following:
  - When measuring, touch the device under test only with the voltage tester. Also do not touch any other electrical appliances with your body.
  - Route the mains cables from each device under test as straight away as possible from the device itself to reduce the cables' electrical stray field influence on the measurement; The mains cable stray fields unwantedly increase the device's residual voltage.
  - Considering the intensity of the highest voltage indicated on the tester's display helps you to get more precise voltage readings; Looking at the tester's display from a different angle may help here. (Always use the same angle to be more accurate when comparing residual voltages in different mains plug polarity positions).
- When, despite having taken the hints above into account, no different voltage readings between both mains plug polarities can be obtained:
  - Remove the device from the vicinity of other electrical appliances and cabling, or at least disconnect those from the mains.
  - Improve your body's grounding by touching either central heating, water tap, mains ground (or even a wall or the floor) with your other hand; This however will only rarely be necessary.
- When getting no voltage reading at all, the device under test must be having a contact to ground. When this is due to connection to a grounded outlet you do not need to optimise this device, since all its residual currents will be drained to ground anyhow. When the device is not grounded to mains, check whether the device has contact to ground in another way (for instance occurring along metal housings directly contacting each other or along metal supports); Try to remove this parasitic ground contact.
- In some cases in the optimal mains plug position the minimal residual voltage remains as high as halve your mains voltage or higher; Directly touching these devices may be dangerous (risk of shock) as there is a high leakage from the mains; The device probably has been designed to need connection to a mains outlet equipped with a ground contact, which then you MUST provide. If it does not have a mains plug with a ground contact, running a wire from one of its cabinet's screws to mains ground, central heating or water tap (always first unplug the device from mains) may solve the problem. Verify with the voltage tester.

*Note: When connecting more than one audio device to ground in your installation, risk of introducing ground loops exists.*

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When all actions mentioned above are performed properly and according to their description, safety risks are kept to a minimum. Van den Hul B.V. however denies liability for damage or harm of any direct or indirect nature resulting from, or occurring through, activities triggered by this manual; Always think twice and be very careful when working with the mains voltage! Always use the voltage tester in direct test mode to check whether dangerous voltages are present.

## We wish you lots of success with your van den Hul voltage tester !

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