

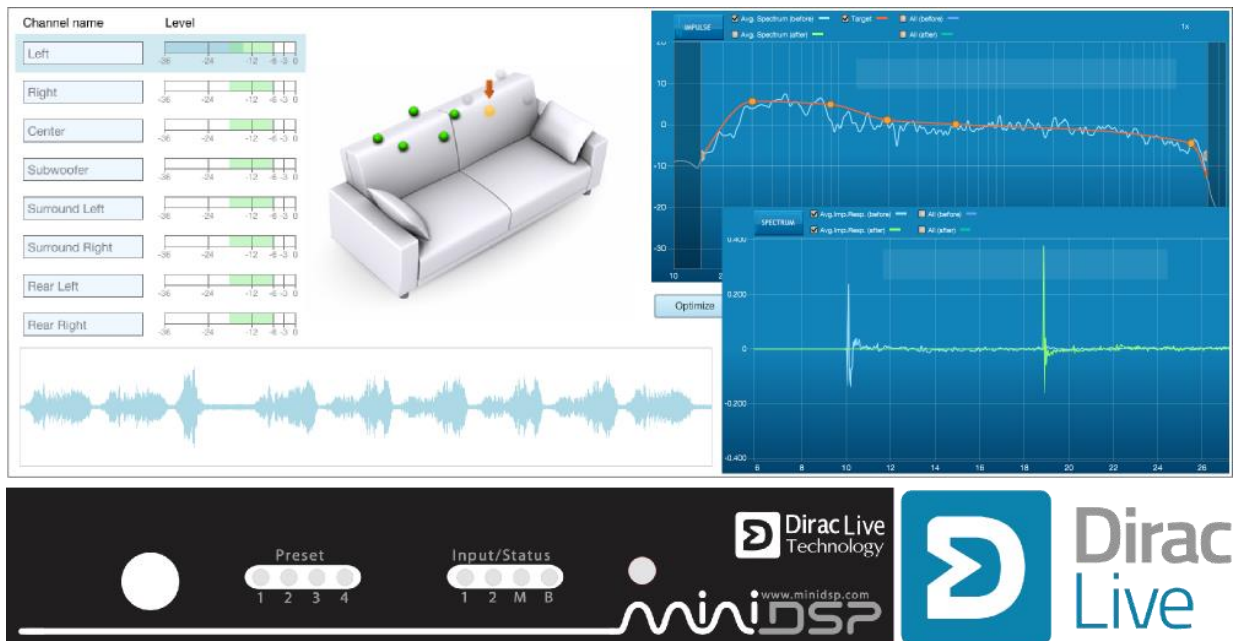
NANOAVR DL

8-IN 8-OUT HDMI AUDIO PROCESSOR

WITH DIRAC LIVE[®] TECHNOLOGY

User Manual

PRELIMINARY AND SUBJECT TO CHANGE



Revision history

Revision	Description	Date
0.1	First version	23 August 2014
0.2	Revised for licensing	28 August 2014

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IMPORTANT INFORMATION

Please read the following information before use. In case of any questions, please contact miniDSP via the support portal at minidsp.desk.com.

SYSTEM REQUIREMENTS

To configure your *NanoAVR DL* HDMI audio processor, you will require a Windows PC with the following minimum specification:

- Intel Pentium III or later, AMD Athlon XP or later
- 2 Gigabytes (GB) of RAM or higher
- Keyboard and mouse or compatible pointing device
- Microsoft® Windows® Vista® SP1/Win7/Win8
- Microsoft® .NET framework v3.5 or later
- Two free USB 2.0 ports

DISCLAIMER/WARNING

miniDSP cannot be held responsible for any damage that may result from the improper use or incorrect configuration of this product. Please read this manual carefully to ensure that you fully understand how to operate and use this product, as incorrect use or use beyond the parameters and ways recommended in this manual have the potential to cause damage to your audio system.

Please also note that many of the questions we receive at the technical support department are already answered in this User Manual and in the online [application notes](#) on the miniDSP.com website. So please take the time to carefully read this user manual and the online technical documentation. And if an issue arises with your unit, please read through the [Troubleshooting](#) section first. Thank you for your understanding!

WARRANTY TERMS

miniDSP Ltd warrants this product to be free from defects in materials and workmanship for a period of one year from the invoice date. Our warranty does not cover failure of the product due to incorrect connection or installation, improper or undocumented use, unauthorized servicing, modification or alteration of the unit in any way, or any usage outside of that recommended in this manual. If in doubt, contact miniDSP prior to use.

FCC CLASS B STATEMENT

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

Warning: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Notice: Shielded interface cable must be used in order to comply with emission limits.

Notice: Changes or modification not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

CE MARK STATEMENT

The nanoAVR DL has passed the test performed according to European Standard EN 55022 Class B.

PACKAGE CONTENTS

Your *NanoAVR DL* package includes:

- One *NanoAVR DL* HDMI audio processor
- One universal 5 VDC power supply with interchangeable power pins
- One USB cable for computer connectivity
- One license for **Dirac Live Calibration Tool for miniDSP**
- One printed Quick-start Guide

A NOTE ON THIS MANUAL

This User Manual is designed for reading in both print and on the computer. If printing the manual, please print double-sided. The embedded page size is 8 ½" x 11". Printing on A4 paper will result in a slightly reduced size.

For reading on the computer, we have included hyperlinked cross-references throughout the manual. In addition, a table of contents is embedded in the PDF file. Displaying this table of contents will make navigation much easier:

- In Adobe Reader on Windows, click on the "bookmarks" icon at the left. The table of contents will appear on the left and can be unfolded at each level by clicking on the "+" icons.
- In Preview on the Mac, click on the **View** menu and select **Table of Contents**. The table of contents will appear on the left and can be unfolded at each level by clicking on the triangle icons.

1 PRODUCT OVERVIEW

Thank you for purchasing a *NanoAVR DL* HDMI audio processor powered by Dirac Live®, the world's premier room correction solution. We are delighted to offer you this software and hardware combination, the fruit of extensive research and development and years of experience in sound system tuning.

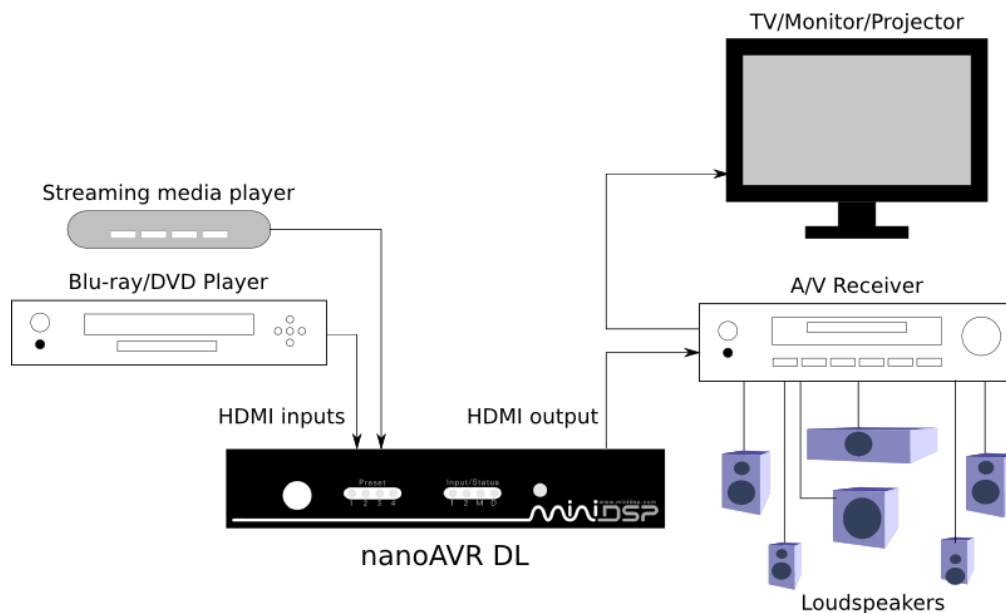
The *nanoAVR DL* is a 2-input HDMI 1.4a switch combined with a sophisticated digital audio signal processor (DSP) running the Dirac Live® room correction algorithm. The onboard floating-point SHARC processor allows full time and phase correction of a 7.1 home theater or multichannel audio system using linear PCM (LPCM) audio.

The *nanoAVR DL* is one of the products in the miniDSP [Home Theater Series](#) of audio processors. Deploying a *nanoAVR DL* processor in your home theater system will:

- Improve the imaging and immersion
- Improve clarity of music and dialog
- Produce a tighter bass
- Reduce listening fatigue
- Remove resonances and room modes
- Reduce early reflections

1.1 TYPICAL SYSTEM CONFIGURATION

The *nanoAVR DL* typically connects between an HDMI source such as a Blu-ray player and an A/V receiver. The second HDMI input allows connection of other devices such as media streaming devices, computer-based media players, and so on. Video from the selected input is switched directly to the output, with no video processing applied to the signal.



Computer connectivity is used to perform acoustic measurements and generate digital room correction filters. Up to four sets of correction filters can be stored on the *NanoAVR DL* processor and recalled from the front panel or via an infrared remote. Once the processor is fully configured, the computer is no longer needed.

1.2 HOW DIRAC LIVE[®] WORKS

The miniDSP *NanoAVR DL* HDMI audio processor includes Dirac Live[®], a premium mixed-phase room correction technology. This technology is used not only in home stereo and home theater systems but also in cinemas, recording studios, and luxury cars.

As with any room correction system, Dirac Live[®] corrects the system's *magnitude response* (often referred to imprecisely as "frequency response"). In contrast to fully automated systems, Dirac Live[®] corrects the magnitude response towards a user-adjustable *target response*. The target response takes account of the natural frequency range of the loudspeaker system and the normal effects of loudspeaker dispersion on the measured *in-room* magnitude response.

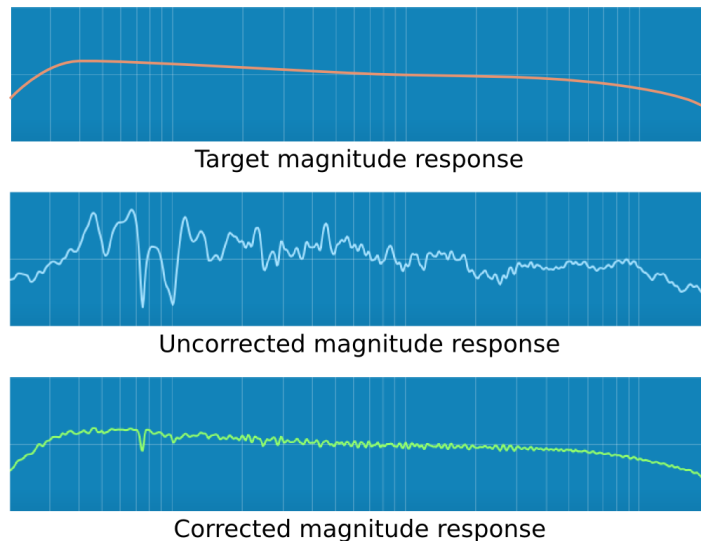


Illustration of Dirac Live[®] magnitude response correction

In addition, Dirac Live[®] corrects the system's *impulse response*, which reflects how the system responds to a sharp transient such as a drumbeat. Reflections, diffraction, resonances, misaligned drivers, and so on, all combine to smear out the transient. An ideal loudspeaker has none of these, so correcting the impulse response makes the speaker in the room behave much more like that ideal loudspeaker. The impulse response is a critical factor for accurate sound-staging, clarity and bass reproduction. Dirac Live[®] employs a sophisticated analysis algorithm to make the optimal correction across the *whole* listening area, not just at a single point.

Differences between the impulse responses of the two loudspeakers at the listening position will also affect soundstage and imaging. The more similar the impulse responses, the more easy it is to "trick" the brain into thinking that the loudspeakers are not really there, and that the sound emanates from a virtual stage spanned by the physical speakers.

Dirac Live® accomplishes this using *mixed-phase filters* – filters that match a desired magnitude response *and* generate a customized impulse response. This contrasts with the *minimum-phase* and *linear-phase* filters that are commonly used in audio applications. While minimum-phase and linear-phase filters are relatively easy to design, they are tightly constrained in their impulse response characteristics – neither can make a desired change to the magnitude response independently of controlling the impulse response. In some cases, they may even make things worse.

Mixed-phase filters are more difficult to design, but the audible performance of Dirac Live® is due to its success in using mixed-phase filters to make the system response across the *whole* listening area more closely resemble that of an ideal speaker. The energy from the direct wave and from early reflections is optimally combined to arrive as a single wavefront to the listener. Late reflections are left largely untouched, being corrected only for their spectral coloration, as they contribute to a larger, more enveloping soundstage.

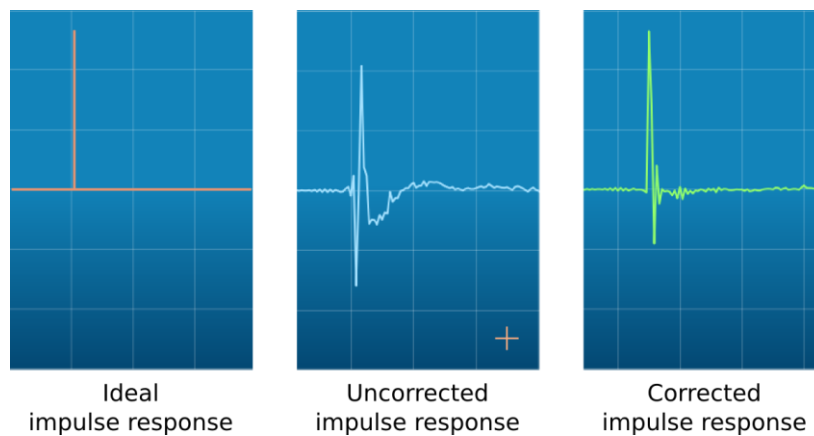
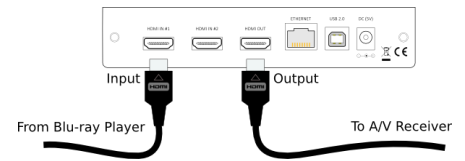


Illustration of Dirac Live® impulse response correction

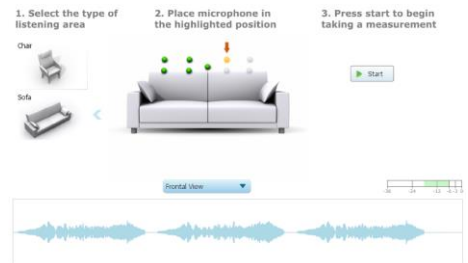
1.3 NANOAVR DL / DIRAC LIVE® CONFIGURATION STEPS

The steps for configuring the *NanoAVR DL* HDMI audio processor with Dirac Live® to optimize your home theater system is summarized as follows:

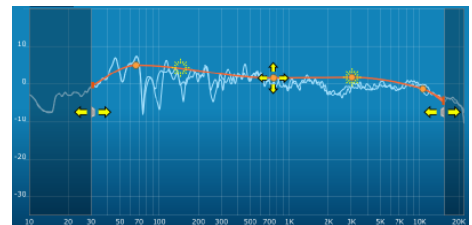
1. Connect the *NanoAVR DL* audio processor into your system and install software. See [Section 2, Installation and Setup](#).



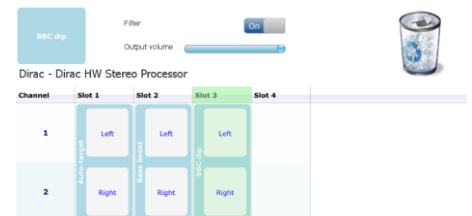
2. Run a series of acoustic measurements using the **Dirac Live Calibration Tool For miniDSP** program, to capture the acoustic behavior of your speakers and room. See [Section 3, Acoustic Measurement](#).



3. Generate digital room correction filters that will be executed by the *NanoAVR DL* processor. Up to four filter sets can be downloaded into the processor for easy real-time recall and auditioning. See [Section 4, Filter Design](#).



4. Once the digital room correction filters are designed and downloaded, the computer can be disconnected, as computer connectivity is not required for normal listening. See [Section 5, Using the NanoAVR DL HDMI audio processor](#).



2 INSTALLATION AND SETUP

2.1 SOFTWARE INSTALLATION AND LICENSE ACTIVATION

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2.1.1 Framework installation

Prior to installing the software, download and install the following frameworks. You will need to accept the license agreements in order to successfully complete the installation. If you haven't updated these recently, check that you have the latest versions prior to running the miniDSP install programs.

- [Microsoft .NET framework](#) (version 3.5 or later)
- Latest version of [Adobe Flash](#)
- Latest version of [Adobe Air](#)
- Microsoft Visual C++ 2010 Redistributable Package: for [x86](#) (32-bit operating system) or [x64](#) (64-bit operating system).

2.1.2 Software installation

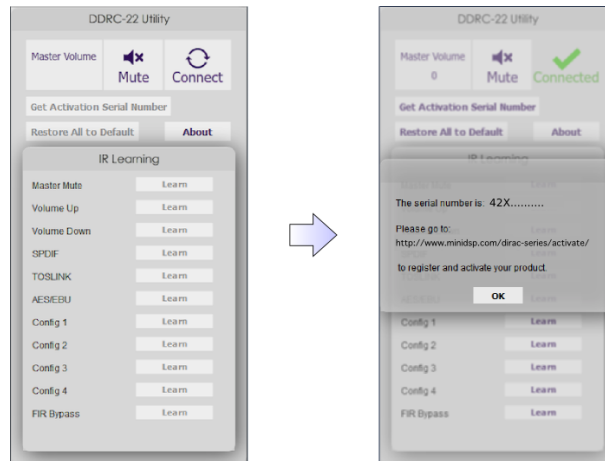
When you receive notification that your order has shipped, your installation software downloads will be available at the *User Downloads* section of the miniDSP website, under the *NanoAVR DL* heading.

<http://www.minidsp.com/userdownloads>

Download two installation zip files: the **Dirac Live Calibration Tool for miniDSP**, and the **nanoAVR DL Configuration Plugin**. Unzip each file and double-click to run each installer. Follow the on-screen instructions to complete installation.

2.1.3 License activation

1. Start the miniDSP **NanoAVR DL** utility program. It will appear as shown on the left below.
2. Connect your *NanoAVR DL* processor to your computer via USB, then click on the **Connect** button. It will change to a green tick.
3. Click on **Get Activation Serial Number**. The program will get your unique serial number from the connected nanoAVR DL and display it, as shown on the right below.



4. Using this serial number, activate your license on the miniDSP Dirac Live activation page:

<http://www.minidsp.com/dirac-series/activate/#activate>

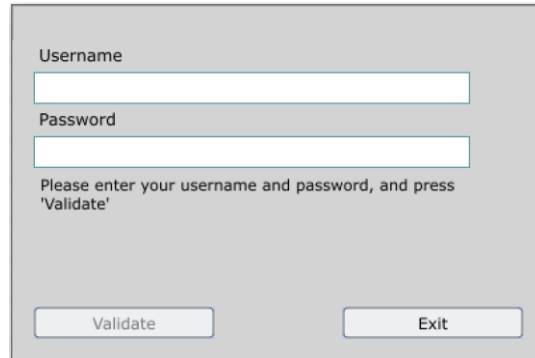
If you have not purchased a Dirac Live license before, use the **New User** screen on the left. If this is not your first Dirac Live license, use the screen on the right.

Notes:

1. The email address and username used during license activation and validation are not related to your user account on miniDSP.com. To activate and validate a Dirac Live licence, you must create an account on the Dirac server using the form at left above.
2. If you purchase more than one *NanoAVR DL* or *Dirac Series* processor, each will need to be activated with its unique serial number. Use the screen on the right and enter the serial number of each processor, and they will in turn be added to your license.

2.1.4 License validation

Start the **Dirac Live Calibration Tool For miniDSP** program. It will ask you to validate your software license. Enter the license credentials that you obtained in the above step, and then click on **Validate**:



The image shows a license validation dialog box with a light gray background. At the top, it has a label 'Username' above a white text input field. Below that is a label 'Password' above another white text input field. Underneath the password field is the text 'Please enter your username and password, and press \'Validate\''. At the bottom of the dialog, there are two buttons: 'Validate' on the left and 'Exit' on the right.

You will need to be connected to the Internet to validate your license. Any active firewalls will need to have HTTP (normal web traffic) enabled.



The **Username** in the validation screen must be the *email address* that you used in the activation screen above. It is not your miniDSP website username.

2.1.5 License Upgrade

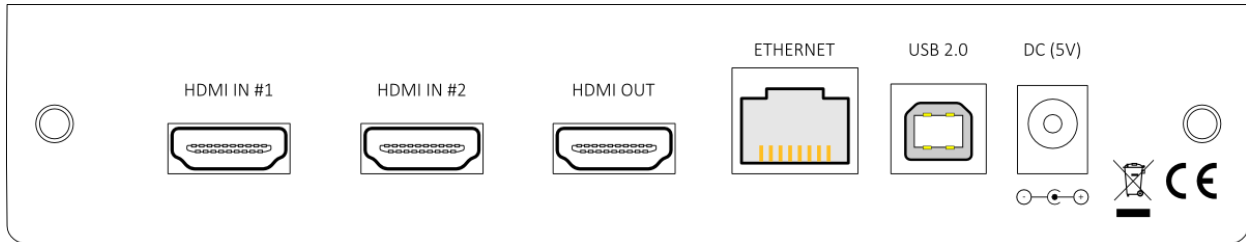
The nanoAVR DL can be purchased in two versions:

- A trial version, which allows full use of the **Dirac Live Calibration Tool for miniDSP** and 36 hours of audio playback. This is a low-risk method for purchasers to evaluate the effectiveness of the Dirac Live® software in their own system. At the completion of the trial period (or any time before), the purchaser has the option of:
 - a. Purchasing an upgrade to the full Dirac Live® license, removing any playback restrictions, or
 - b. Loading the nanoAVR HD firmware into the hardware and continuing to use the unit with the nanoAVR BM plugin.
- The full version, which allows unlimited use of **Dirac Live Calibration Tool for miniDSP** and audio playback from the beginning.

If you have purchased the trial version and wish to upgrade to the full license, then please go to the **nanoAVR DL** product page on the miniDSP website, select “License Upgrade”, and add it to your shipping cart.

2.2 HARDWARE CONNECTIVITY

All connections to the nanoAVR DL are made on the rear panel.

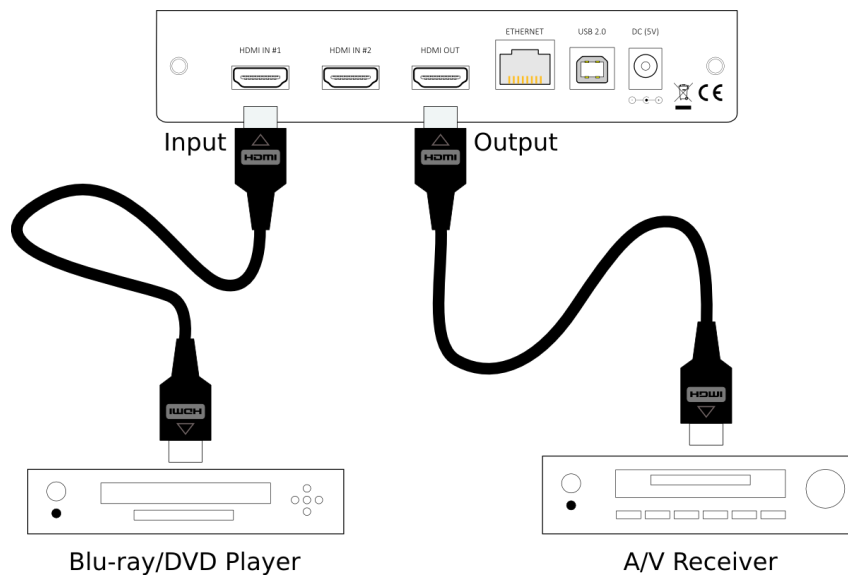


2.2.1 HDMI input and output

Two HDMI connections are available for input, and one for output. The input connectors can be connected to any HDMI source such as a Blu-ray or DVD player. Other sources may include media streaming devices, gaming consoles, and computers with an HDMI port[†]. The output connector will be connected to an HDMI input on an A/V receiver (AVR) or A/V preamplifier (AVP).



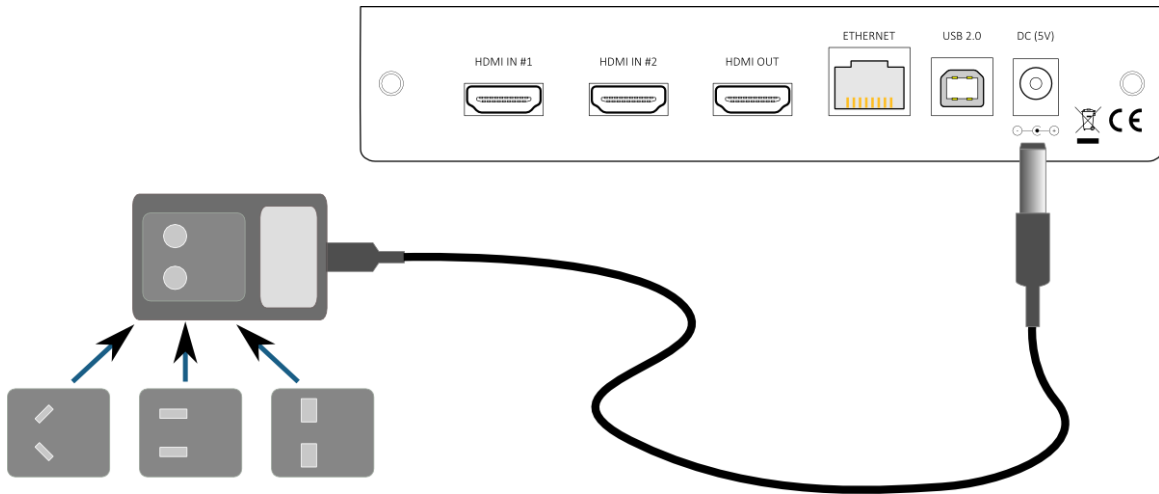
Ensure that your HDMI sources are set to produce linear PCM (also referred to as PCM, L-PCM, or LPCM) on their HDMI outputs. The nanoAVR DL does not decode compressed formats such as Dolby and DTS.



[†] Apple Macs with a Thunderbolt port can be connected to the nanoAVR with the use of a Thunderbolt to HDMI adapter cable.

2.2.2 DC Power

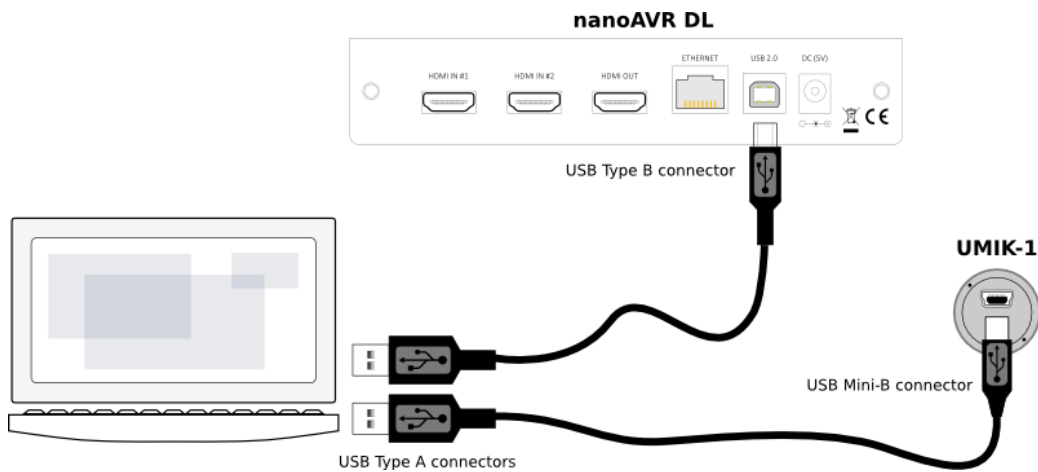
The supplied 5 VDC power supply includes a set of interchangeable power pins. Fit the correct pins for your country. Connect the DC plug to the 5 VDC power socket.



HDMI units communicate with a set of “hand-shaking” signals in order to establish the capabilities of each device. It is recommended that for at least the first time the system is powered up with the nanoAVR connected, equipment is powered on in this order: TV, AVR, nanoAVR DL, source/player.

2.2.3 USB

To configure the nanoAVR via USB, connect the USB port of the nanoAVR to a USB 2.0 port on your computer using the supplied cable.

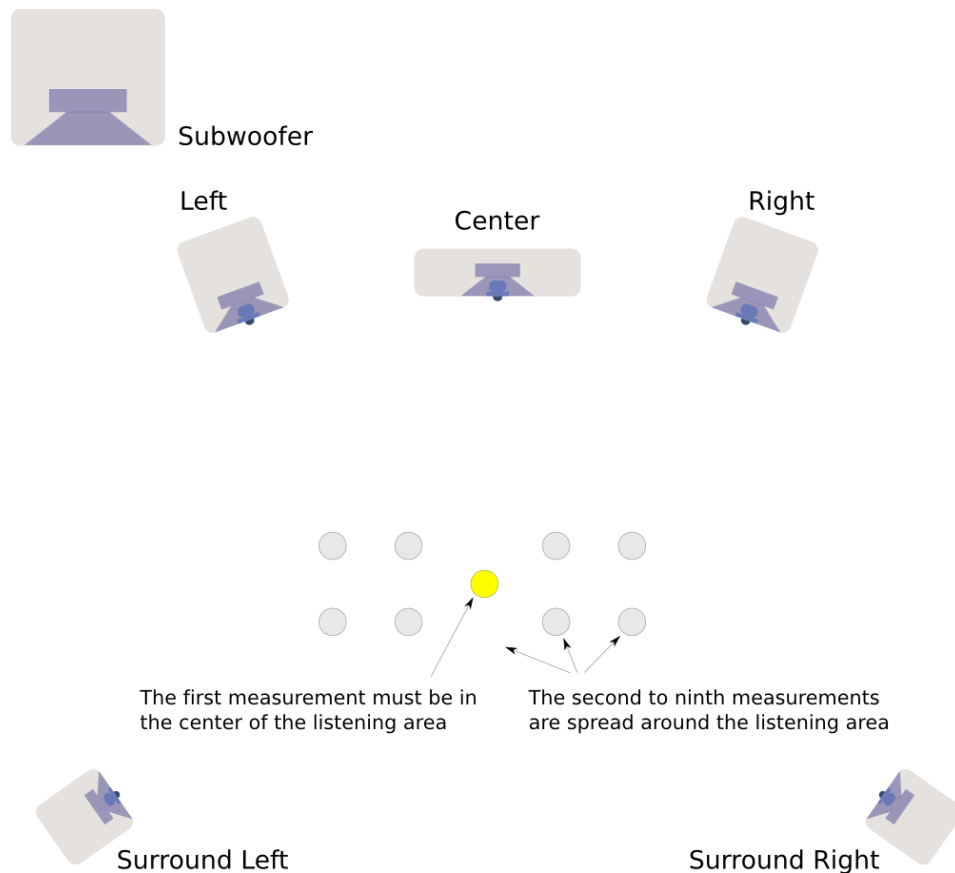


3 ACOUSTIC MEASUREMENT

The **Dirac Live Calibration Tool For miniDSP** uses a set of measurements made in your listening room to calculate correction filters for all speaker channels. The measurements are made using the *NanoAVR DL* HDMI audio processor and the supplied UMIK-1 measurement microphone. No additional hardware or connectivity is required.

3.1 LOUDSPEAKER AND MICROPHONE POSITIONING

Prior to performing acoustic measurements, loudspeaker and subwoofer positioning should be optimized. In particular, the location of the subwoofer within the room will have a large impact on the smoothness of bass response. With Dirac Live®, you have more freedom with loudspeaker and subwoofer placement, but the best result will still be achieved if optimal placement is used together with Dirac Live®.

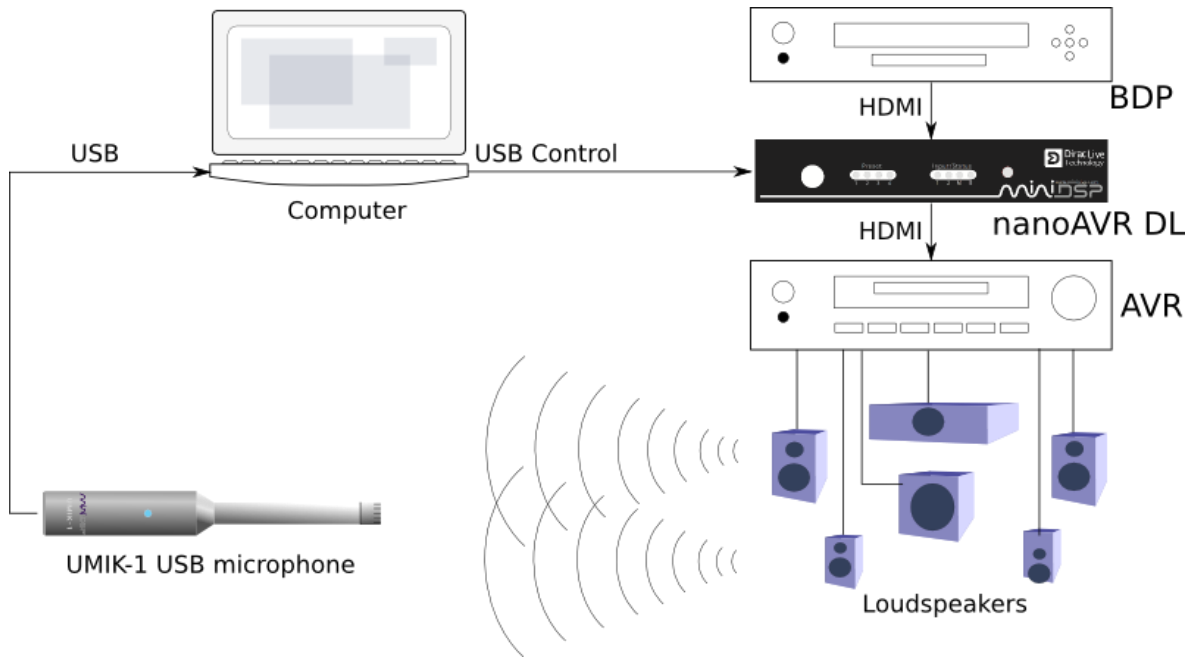


A total of nine measurements must be taken, with the microphone located in different positions in the room and pointed vertically. The first measurement must be taken at the central location of the listening area, as this location sets the levels and delays of each speaker. Eight more measurements are then taken at locations spread around the listening room and at different heights from the floor.

3.2 CONNECTIONS FOR ACOUSTIC MEASUREMENT

The figure below shows a typical connection diagram for performing acoustic measurement. No changes to existing audio connections are needed. Simply:

1. Connect the supplied USB (type A to type B) cable from the nanoAVR DL to a USB port on the computer.
2. Connect the supplied USB (type A to mini type B) cable from the UMIK-1 to a USB port on the computer.



Place the UMIK-1 microphone into the microphone stand. Position the computer and cabling so that there is enough freedom of movement to move the microphone into the needed locations.



3.3 CONFIGURING FOR MEASUREMENT

Start **Dirac Live Calibration Tool For miniDSP** (if it is not already running).



Ensure that no other programs are running that may attempt to communicate with the nanoAVR DL hardware unit, such as the **nanoAVR DL** utility or the nanoAVR plugin, as this may result in communication conflicts or other errors.



Logo and status progress bar

This area shows a progress bar with current status when the program is performing calculations.

Screen selection tabs

Each tab selects a screen that is shown in the main display area. These are generally worked through in order, from top to bottom. This section covers the first four tabs; the final two are covered in [Filter Design](#).

Load and save a project

Each measurement project can be saved to a file and reloaded at a later time. See [Saving and loading projects](#).

Back to previous / proceed to next

Use these two buttons to advance to the next screen when each is complete, or to go back to the previous screen to make alterations. The tabs at the left can also be clicked on directly.

Help open/close

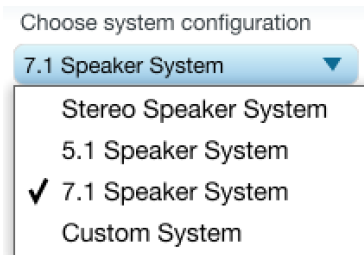
Click on the small Help divider at the right of the screen to open a pane with help on the currently selected tab. Click on the divider again to close the help pane.

3.3.1 Sound System tab

On the **Sound System** tab, set the following parameters.

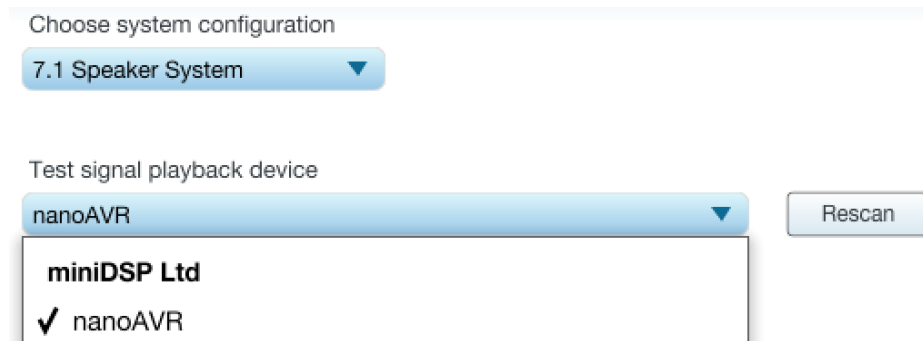
Choose system configuration

Use the dropdown menu to select your system configuration. For multi-channel use, usually **5.1** or **7.1** will be selected. If you have a system configuration other than 5.1 or 7.1, use the Custom System option (see [Custom System configuration](#) below).



Test signal playback device

Preset to **nanoAVR (miniDSP Ltd)**. This will ensure that test signals are sent into your audio system via the *NanoAVR DL* processor. (If this is not present, check that your *NanoAVR DL* processor is connected via USB and powered on, and click the **Rescan** button.)



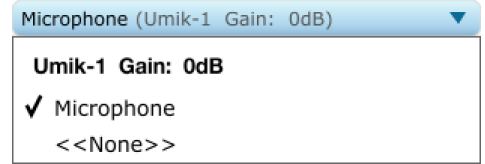
Once you have verified that this screen is correct, click the **Proceed** button.

3.3.2 Mic Config tab

On the **Mic Config** tab, set the following parameters.

Recording device

Preset to the **UMIK-1**. (If this is not present, ensure that the UMIK-1 is connected securely to the computer via USB, and go back to the **Sound System** tab and click on **Rescan**. Then select the “Microphone” item underneath “UMIK-1”, as shown at right.)



Recording channel

Select **1** from the drop-down menu.

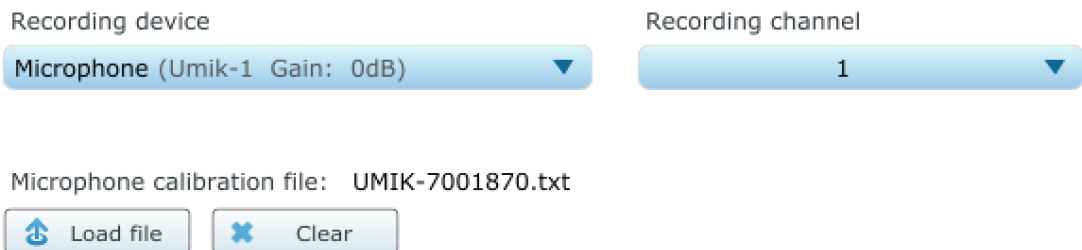
Microphone calibration file

Each UMIK-1 measurement microphone is individually calibrated to ensure accuracy. To download the unique calibration file for your microphone, go to the [UMIK-1 page](#) and enter your microphone's serial number. It is in the form xxx-yyyy and labelled on the microphone. Select the option to download the 90-degree calibration file, and use "Save As" in your browser to save the data to a text file – for example, UMIK-7001870.txt.

Then click on the **Load File** button and select your calibration file.



For accurate results, it is important that the 90-degree calibration file be used, as this is created specifically for the vertical microphone orientation.

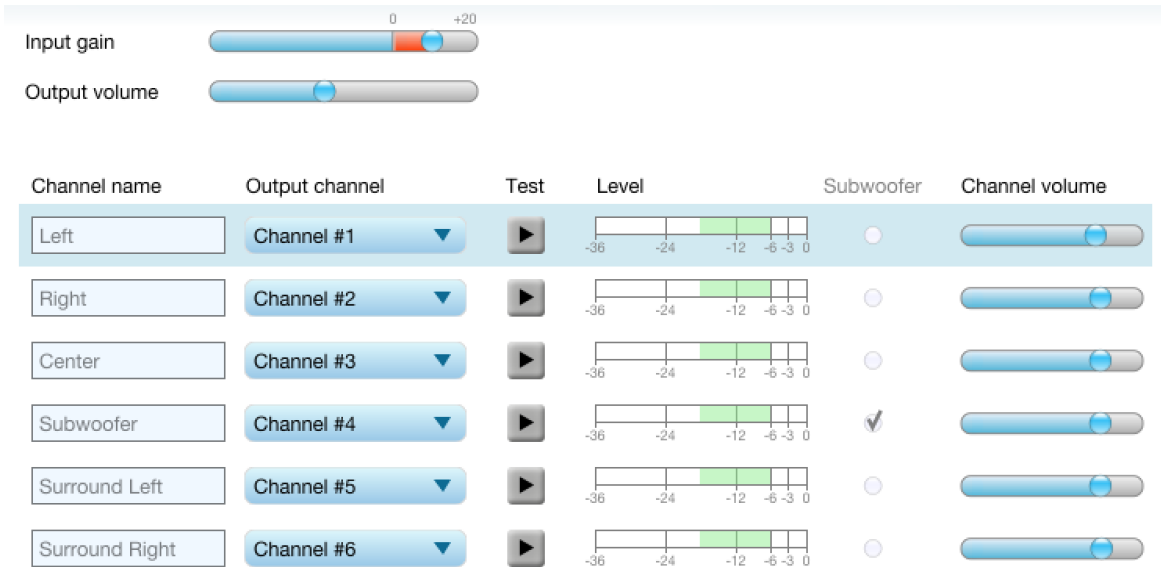


Once you have verified that this screen is correct, click the **Proceed** button.

3.3.3 Output & Levels tab

On the **Output & Levels** tab, set **Output volume** quite low. If you have another volume control “down-stream” of the nanoAVR DL, set it about halfway (or -20 dB if digital) and increase it later if needed.

Click on the **Test** button for the left channel and gradually increase the output volume until it is at a moderate level, such that your voice would have to be raised to converse with someone sitting next to you.



Now increase the **Input gain** slider until the blue bar on the level meter reaches up into the green section:



Click again on the **Test** button for the left channel to stop the test signal. Then click on the **Test** button for each of the remaining channels. If necessary, adjust the **Channel volume** so that the test signal level is in the green.

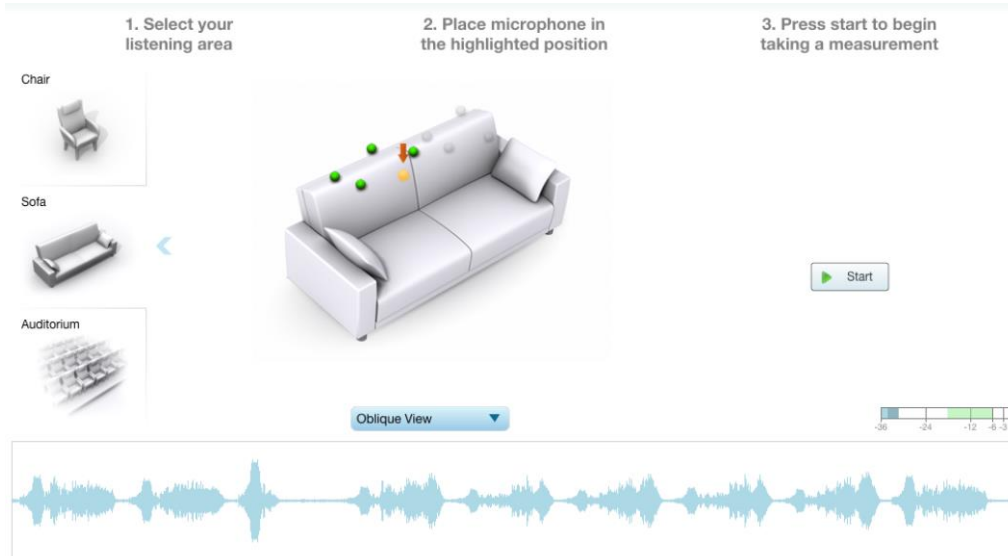
When done, click the **Proceed** button.

3.4 CUSTOM SYSTEM CONFIGURATION

[In preparation]

3.5 RUNNING THE MEASUREMENTS

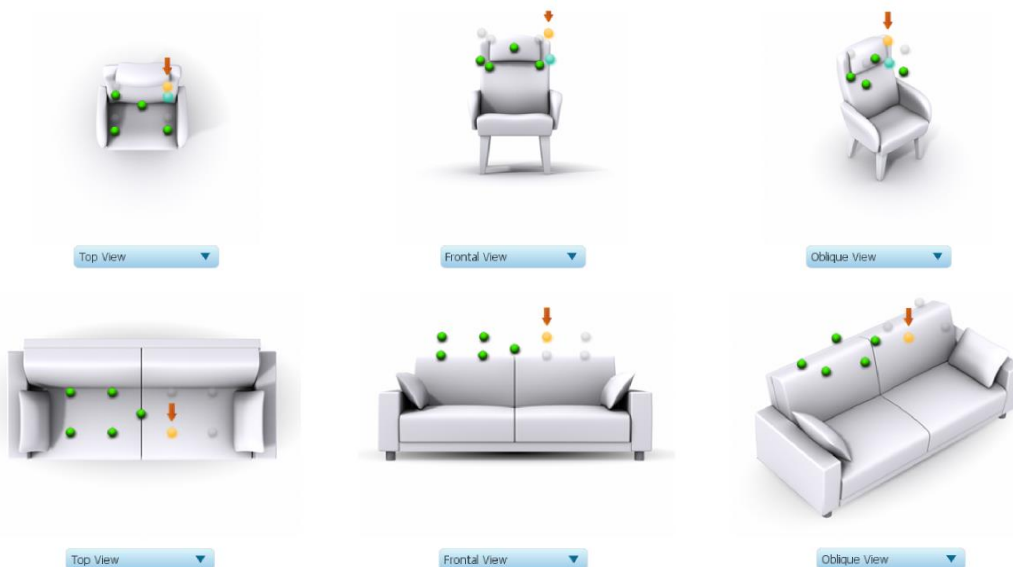
Measurements are performed on the **Measurements** screen.



3.5.1 Listening environment

The **Dirac Live Calibration Tool For miniDSP** presents two different listening environments as a visual guide to positioning the microphone for each measurement: **Chair**, for a single listening seat, and **Sofa**, for multiple listening seats. Select a listening environment by clicking on the chosen icon.

The center of the screen contains a pictorial representation of the selected listening environment, with dots marking the microphone locations. Completed measurements are shown in green, while the next measurement to be done is highlighted in yellow and has a red arrow marker pointing to it. A drop-down menu underneath selects three different views, which should be used to help you place the microphone in the correct location.



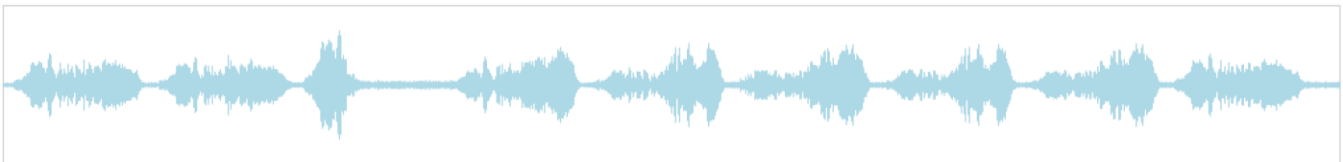
Note that it is important that measurements are performed over a sufficiently broad area. If the measurement area is too small, the result may be over-correction that will sound dry and dull. If using the **Chair** listening area, spread the microphone positions over a circle with a diameter of at least a meter (three feet). The microphone should be varied in height from the central position by at least 30 cm (one foot) up and down. If using the **Sofa** listening environment, spread the measurement locations over the full listening area and vary the height up and down by at least 30 cm (one foot).

While the locations indicated are recommended, you can use a different set of locations if necessary. The important thing is to ensure that the measurement locations are spread over the whole listening area and that the microphone is moved a sufficient distance vertically as well as horizontally.

In some cases, such as when the listening area is very close to the loudspeakers, the size and in particular the height of the measurement area can be reduced, to avoid discrepancies caused by varying output response from the speakers themselves.

3.5.2 Executing measurements

With the microphone in place at the central location and pointed vertically (that is, towards the ceiling or floor), click on the **Start** button. The *NanoAVR DL* HDMI audio processor will generate a test signal, audible as a frequency sweep through the left speaker, then the right, and then the left again. While the measurement proceeds, the time-domain graph of the captured audio signal is displayed at the bottom of the measurement screen. (This graph is related to the magnitude response but is not the same display. Its purpose is to verify that the recorded signal level is in a suitable range.)



At the completion of the measurement, the status bar will update with a progress indicator as the program performs calculations on the measurement. If the measurement was successfully captured, the red arrow marker will advance to the next location to be measured.

If the program indicates that the measurement was not successful, you will need to take corrective action. The most common error is related to signal level:

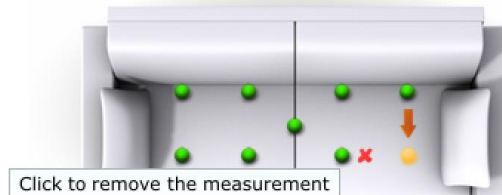
- The measurement signal is too low to ensure a clean capture.
- The measurement signal is too high and the audio signal has exceeded the maximum level (clipping). This is shown in red on the signal graph.

In either of the above cases, go back to the **Output & Levels** tab and adjust the output volume or microphone input gain. Then re-run the measurement. (You do not need to redo the measurements you have already successfully completed, even if you change volume or gain.)

3.5.3 Viewing and redoing measurements

Click on the green dot for any completed measurement to display its measured time-domain response graph.

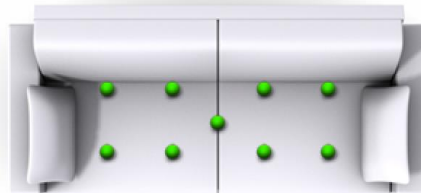
After clicking on a green dot, a small red “X” will appear next it. Click on the “X” to delete the measurement. The status bar will indicate that the program is recalculating parameters.



To redo a measurement, delete it, move the microphone to the appropriate location, and click on **Start**. Note: if more than one measurement is deleted, the marker will move to the lowest-numbered one.

3.5.4 Completing the measurements

After each successful measurement, the location marker (red arrow) will advance to the next location. Move the microphone to that location, using the three views (top, front, oblique) as a guide to positioning it in the correct location. Then click on **Start** again. Repeat this process until all nine locations have been successfully measured.



Note that it is good practice to save the project periodically while performing measurements (see [Saving and loading projects](#) below). Once all nine measurements have been completed, you can advance to the **Filter Design** screen by clicking on the **Proceed** button or directly on the **Filter Design** tab at the left.



It is important that all nine measurements are completed in order to ensure best results from the optimization algorithm. Being patient and thorough will pay audible dividends!

3.6 SAVING AND LOADING PROJECTS

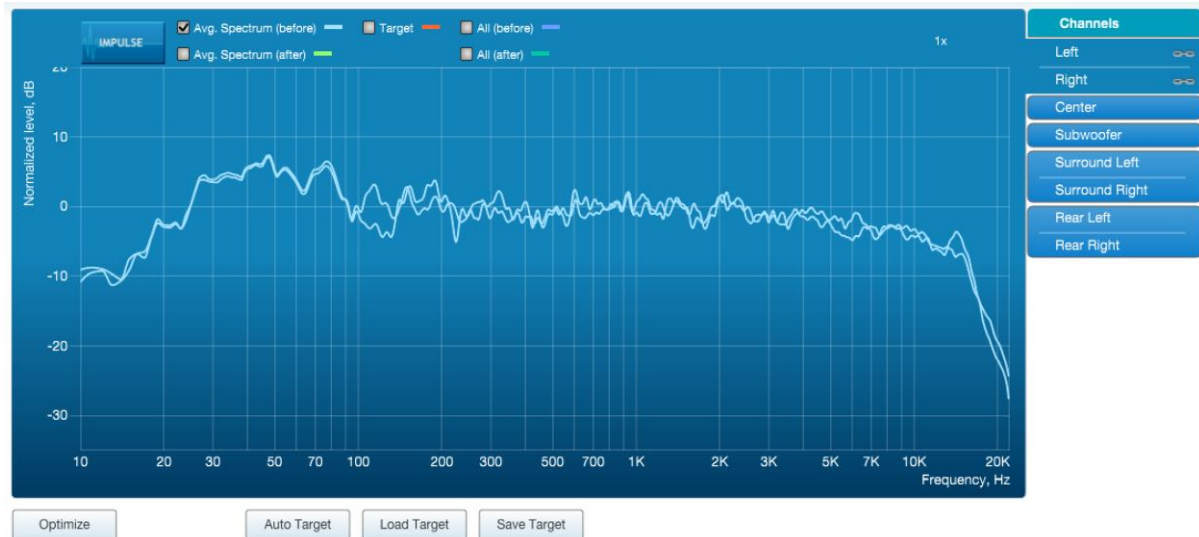
Each set of measurements and the associated configuration settings are a single *project*. The project should be saved at regular intervals. This is done by clicking on the **Save** button. The default location for project files is **My Documents\MiniDSP\Projects**.

A project can be reloaded at any time by clicking on the **Load** button. This enables you to generate new correction filters for different target curves at a later date (see [Filter Design](#)), or to redo any of the measurements. (Note: if you wish to change from the **Chair** to the **Sofa** listening environment, or vice versa, you will need to start a new project.)

4 FILTER DESIGN

Once the full set of measurements has successfully been taken, **Dirac Live Calibration Tool For miniDSP** has the acoustical information it needs about your loudspeakers and listening room to create the correction filters.

The **Filter Design** screen shows a number of plots that can individually be turned on and off with the checkboxes near the top of the screen.



Avg. spectrum (before)

The average of the measured magnitude responses. These plots are shown in light blue.

Avg. spectrum (after)

The predicted average magnitude response after correction. These plots are shown in green, and can only be viewed after filters have been generated with the **Optimize** button.

Target

The target curve – that is, the desired in-room magnitude response. This curve is user-adjustable so you can fine-tune it to best suit your speakers, room, and preferences. See [Designing your target curve](#) below.

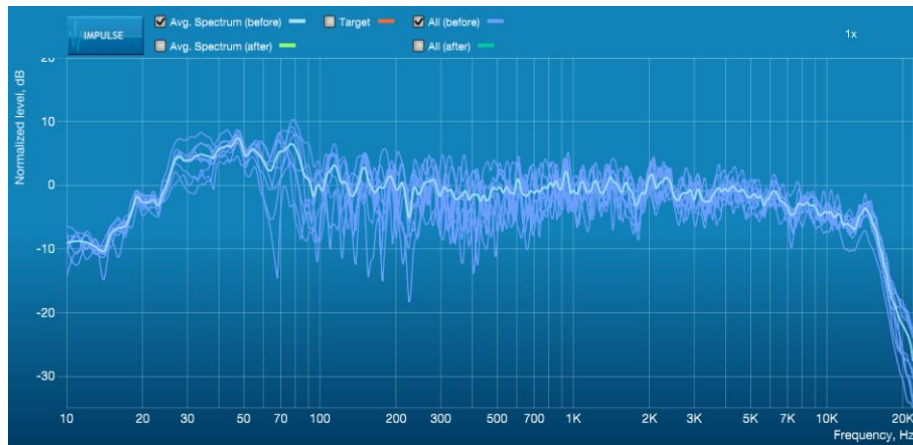
All (before)

All of the measured magnitude responses. These plots are shown dark blue.

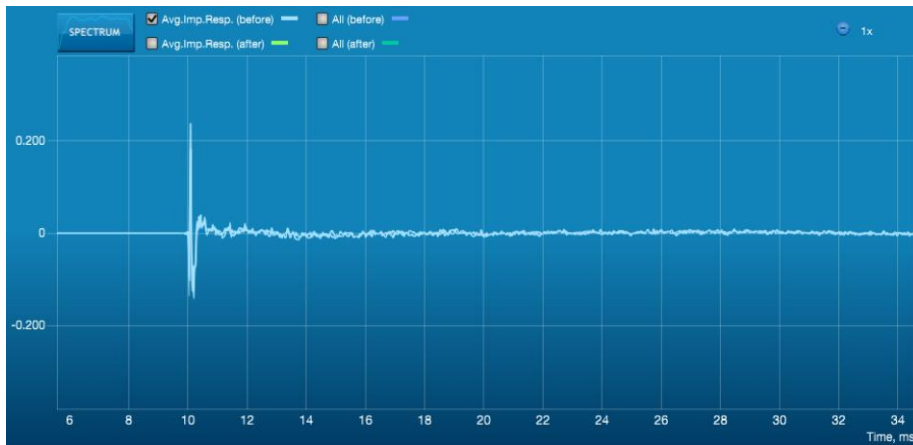
All (after)

The predicted magnitude responses after correction. These plots are shown in dark green, and can only be viewed after filters have been generated with the **Optimize** button.

The graphs showing all nine measurements are useful for seeing how much variation is shown across the listening area:



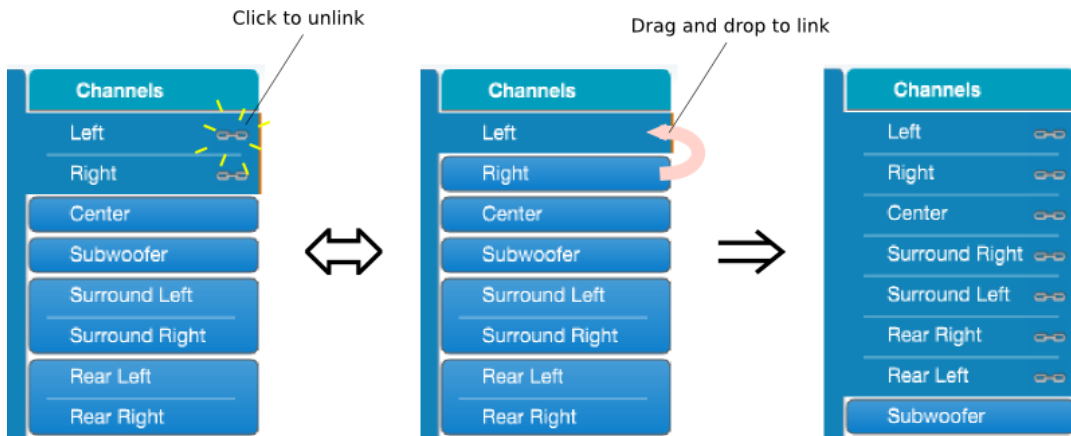
To display the impulse response instead of the magnitude response, click on the **Impulse** button at the top left of the display. As with the magnitude response, the average measurement can be shown as well as all nine measurements. The predicted responses after correction can be viewed after filters are generated (see [Generating correction filters](#) below).



To return to the magnitude response, click on the **Spectrum** button.

4.1 WORKING WITH GRAPHS

The set of tabs to the right controls which channels are shown on the graphs. Initially, the left and right front channels are shown and by default, the front left and right, surround left and right, and rear left and right channels are linked, as indicated by the small “chain” icons. (When two or more channels are linked, they all share the same target curve – see [Designing your target curve](#) below).



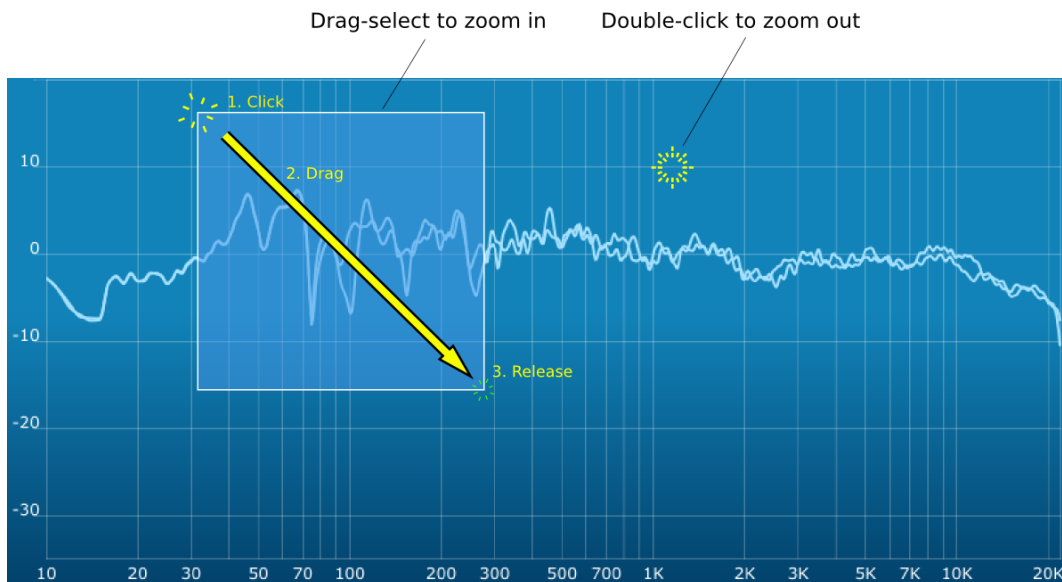
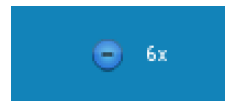
To unlink a channel, simply click on its chain icon. It will then be unlinked from the other channels. To link it to another channel or groups of channels, simply drag its tab on top of the channel or group of channels that you want it linked to.



Initially, you may wish to link all speaker channels together, as shown at right in the diagram above, as this will make it easier to experiment with target curves. Once you are up and running with filter sets, you can experiment with different target curves for different speaker sets.

The magnitude and impulse response graphs show the graphs corresponding to the selected channel, or group of channels. They can be viewed at a larger scale. To zoom in and out on the response graphs:

- Drag-select a region of the graph to zoom in on it. (Click the left button, move the mouse while holding the button, release the button.) You can then drag-select a region again to zoom in further.
- Double-click on the graph to zoom back out to the previous zoom level, or click on the small “-” sign next to the zoom indicator at the top right of the display.



4.2 DESIGNING YOUR TARGET CURVE

The *target curve* is the desired in-room frequency response with the *NanoAVR DL* processor performing digital room correction.

4.2.1 The Auto Target

When first viewing the **Filter Design** tab, an estimated target curve suitable for your speakers is shown as the red curve. This calculated target curve can be restored at any time by clicking on the **Auto Target** button.



Note: restoring the auto target will erase the current target curve. If you wish to keep it, you can save it to a file – see [Saving and loading target curves](#) below

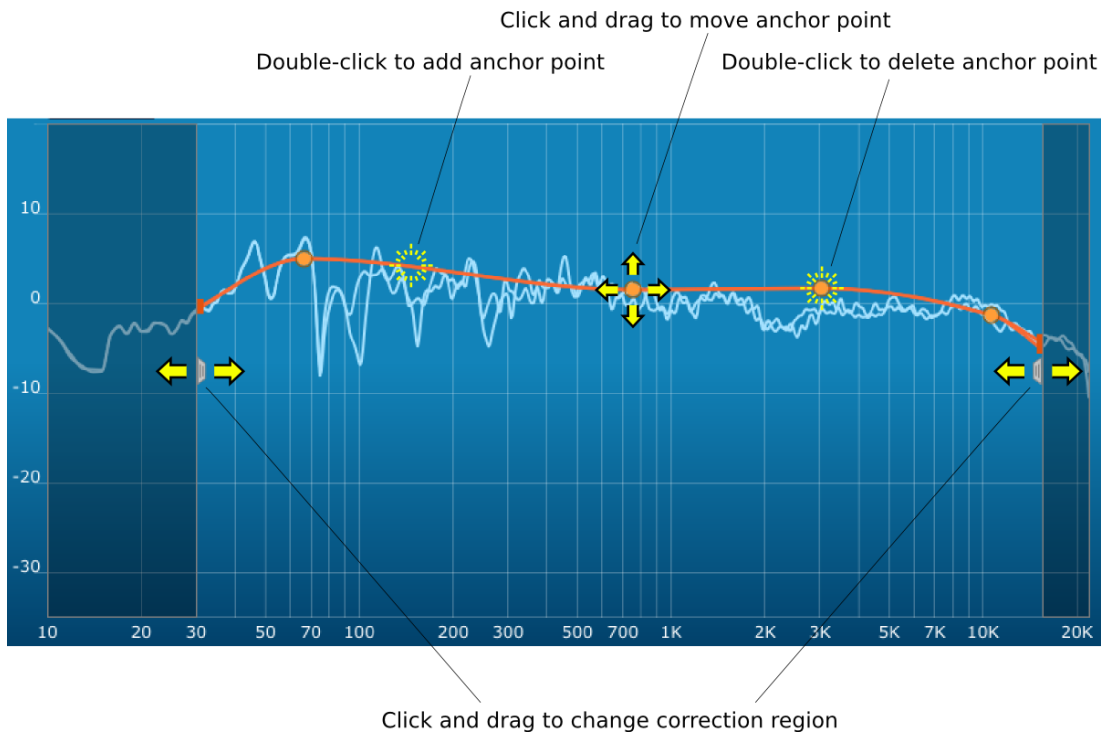
4.2.2 Editing the target curve

You can edit the target curve to set any desired magnitude response (see [Guidelines for target curve design](#) below). This is done with the use of *anchor points*, shown as orange dots on the curve:

- Drag an anchor point to move it.
- Double-click on the target curve to add an anchor point.
- Double-click on an anchor point to delete it.

The regions to the left and right of the response graphs that are shaded in a darker color are excluded from correction. You can adjust the range of frequency correction for your system and environment. For example, low-frequency noise (traffic, machinery) may be present in some environments, so it is best to adjust the frequency range to exclude these frequencies from the correction. Or, you may be happy with the in-room response at higher frequencies, so you can set the frequency region to limit correction to the modal region (up to 300 Hz, in a typical room).

To alter the frequency region, drag the grey handles on either side of the graph. Note that you can't drag these handles over an anchor point, so you may need to move or delete an anchor point that is "in the way."



If channels are linked, the same target curve is used for that group of linked channels. To create a separate target curve for a single channel, unlink it as described above in [Working with graphs](#).

4.2.3 Guidelines for target curve design

Care should be taken to create a target curve that works well with your speakers and room, as well as suiting your personal preferences. Small changes to the target curve can have significant effects on the tonal quality of the system, so it is important that you experiment with different target curves to find the optimum.

If you initially don't achieve a satisfactory result, please ensure that you have spread your measurements over a sufficiently large area and with sufficient variation in height. The following guidelines will help you understand how to adjust your target curve.

Low-frequency extension and boost

All loudspeakers have a natural low-frequency roll off. Setting the target curve to boost the region below the speaker's natural roll off frequency *may* result in overdriving the speakers, especially with smaller home theater loudspeakers and depending on your listening habits. As a general rule, a home theater system should use bass management in the receiver to direct low frequency content to the subwoofer.

The auto-target estimates the low-frequency roll-off and curve. You should determine by listening whether this estimate is suitable for your system, and adjust the target curve accordingly.

High-frequency “tilt”

The target curve is the desired measured response of loudspeakers *in a room*, In contrast to measurements made of a loudspeaker during its design under anechoic (measured in free space) conditions. While high-quality loudspeakers are usually designed for a flat on-axis anechoic response, these same speakers when placed into a listening room will tend to have a downward-sloping or “tilting” response at high frequencies, due to the effects of limited dispersion at high frequencies and greater acoustic absorption.

A completely flat in-room response is therefore usually not desirable and will tend to sound thin or bright. Start with a target curve that follows the natural behavior of your speakers in your room, and then experiment with greater or lesser degrees of tilt in the treble region to obtain the most natural timbral balance.

Low-frequency adjustment

A completely flat response at low frequencies, with complete elimination of peaks due to room modes, may sound light in the bass. Often, a slight increase in the target curve below 100 Hz will give a more balanced sound, yet without introducing audible irregularities in bass response.

Magnitude response dips

In some cases, it may be helpful to adjust the target curve to follow dips in the magnitude response. This can occur where, for example, the listening area is very close to the speakers and the measurements exhibit a dip caused by the vertical response of the speakers themselves. In such a case, adjusting the magnitude response to follow the dip will avoid making the speakers sound worse elsewhere in the room. (You may also wish to try a different set of measurement locations.)

Unlinking channels

Usually, the corresponding left and right channels (front left and right, surround left and right, and rear left and right) should remain linked for target curve adjustment, to ensure that both sides produce the same response across the listening area. In certain unusual circumstances, such as where the magnitude response dip discussed in the previous point shows up on only one side, you can try unlinking channels and making separate adjustments.

4.2.4 Saving and loading target curves

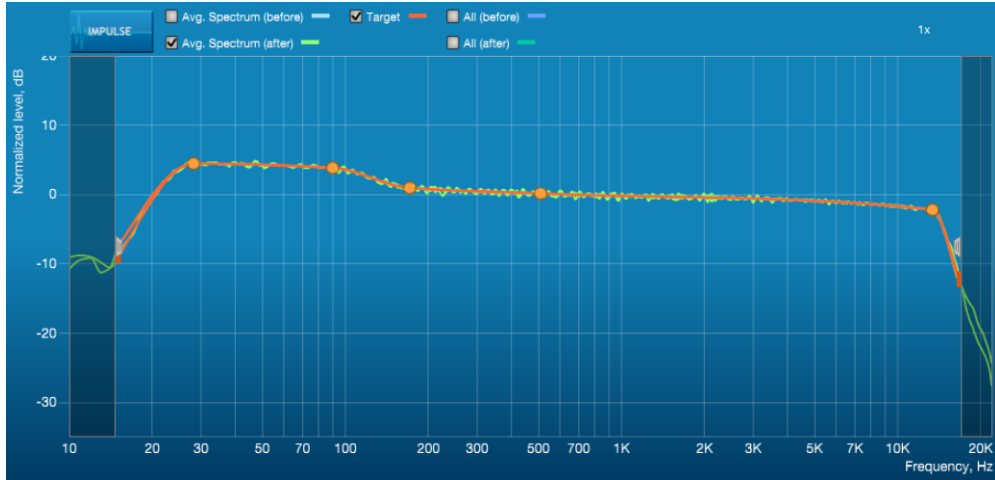
To allow you to experiment with different target curves, you can save a target curve to a file and reload it at a later time. The default directory for these is **C:\Users\[User]\AppData\Roaming\Dirac\OEM\MiniDSP\Targets**, but you can store them in any location in your file system. To save a target curve, click on the **Save Target** button. If the left and right channels are linked, then the shared target curve will be saved to the file. If the channels are not linked, then the currently visible target is saved to the file.

To load a target curve, click on **Load Target**. Note that loading a target will erase the current target, so be sure to save it first if needed. If the currently displayed channel is linked, then the target curve will be loaded to all channels in that group. If the channels are not linked, then the target will be loaded to the currently visible channel.

4.3 GENERATING CORRECTION FILTERS

Once you have a target curve set to your satisfaction, click on the **Optimize** button.

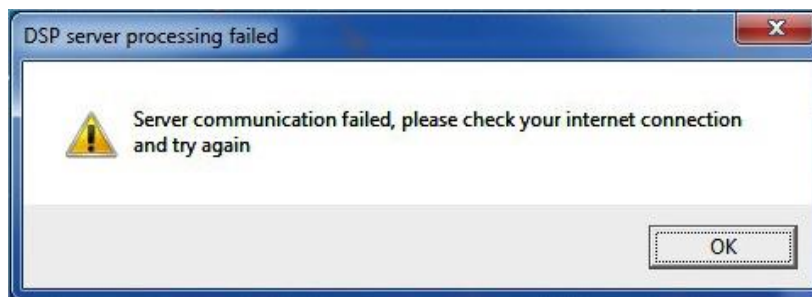
The status bar will update with progress of the algorithm. Execution may take some time, depending on the speed of your computer. When the algorithm completes, the predicted average magnitude response will be shown in green. (The predicted impulse response can be viewed by clicking on the **Impulse** button.)



To download the generated filters into the *NanoAVR DL* HDMI audio processor, click the **Proceed** button or on the **Export** tab on the left.



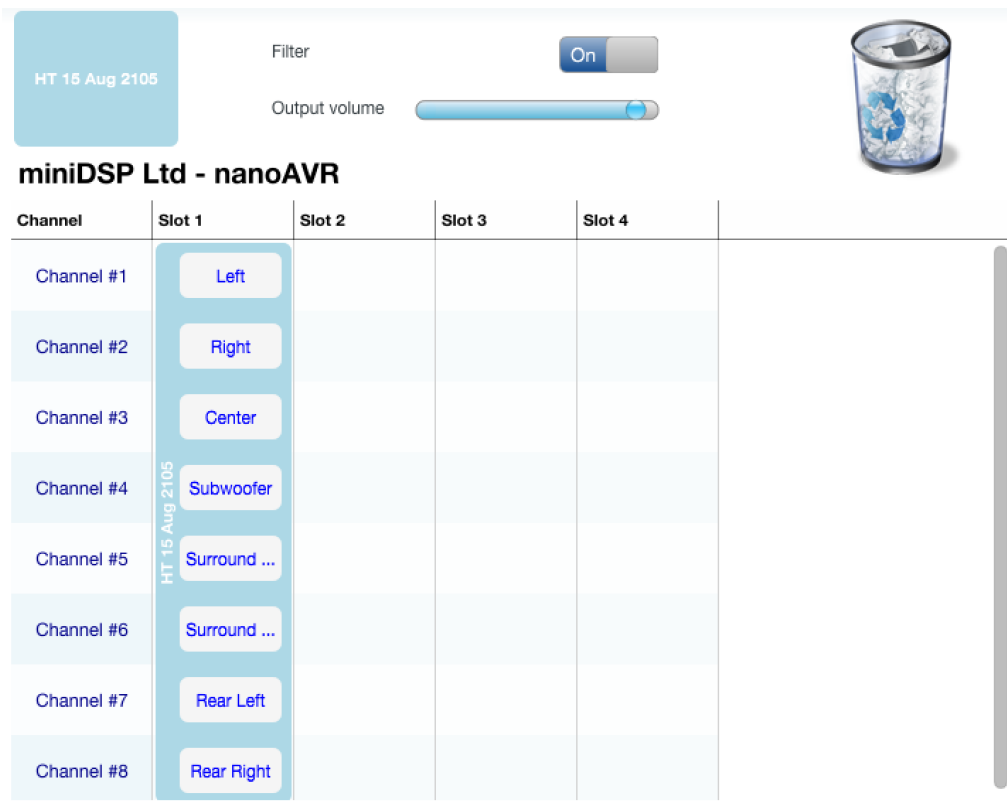
The **Dirac Live Calibration Tool For miniDSP** will contact the Dirac license server to verify its license, so you will need to be connected to the Internet to perform this step. If a firewall is in place, it must allow HTTP (normal web traffic) to pass. Otherwise, an error such as the following may appear:



4.4 DOWNLOADING AND MANAGING FILTER SETS

The **Export** screen initially shows four empty “slots” for filter sets (a filter set is one filter for the left channel and one filter for the right channel). Filter sets are managed with a “drag and drop” metaphor:

- To load the most recently generated filter set into the processor, drag the box at the top left (labeled “Auto target” in the example) and drop it onto an empty slot.
- To remove a filter set, click on its name (oriented vertically at the left), drag it from the slot and drop it on the trashcan icon at the top right.
- To load a filter set into a slot that already has filters loaded, first delete the loaded filter set by dragging it onto the trashcan icon. Then drag and drop the current filter set onto the now-empty slot.



The two main controls on this screen are:

Filter

Turn this on to enable the Dirac Live® correction filters.

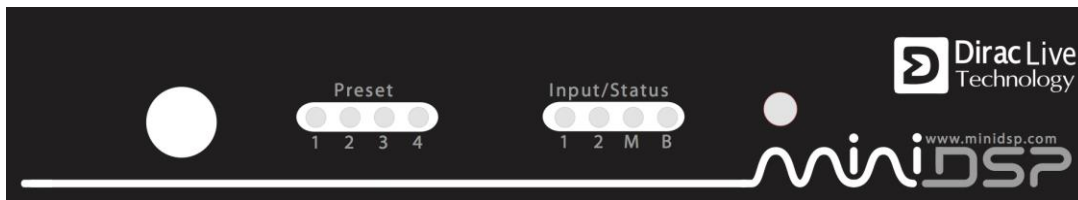
Output volume

Adjust the slider to adjust the output volume of the processor. Once the computer is disconnected, output volume can also be adjusted or by remote control (see [Infrared remote control](#) below).

5 USING THE NANOAVR DL HDMI AUDIO PROCESSOR

Once the desired correction filters have been downloaded into the *NanoAVR DL* HDMI audio processor, the computer is not required and can be disconnected. The front panel and/or an infrared remote can be used to control:

- Filter set selection
- HDMI input selection
- Master volume (remote control only)
- Master mute (remote control only)
- Dirac Live® filtering bypass(remote control only)



5.1 STATUS INDICATORS

The current status of the nanoAVR DL is indicated by a set of LEDs:

Preset	Indicates the currently selected filter set (1 through 4).
Input	Indicates the currently selected HDMI input (1 or 2).
M	Master mute is enabled.
B	Dirac Live® filtering is bypassed.

5.2 FRONT PANEL CONTROLS

The nanoAVR uses a minimalist physical control design with a single control button.

To change the selected filter set

Briefly press the control button. The selection LED blinks quickly. Briefly press the button to move to the next filter set, and repeat until the desired LED is lit. Press and hold the control button, and the LED will now remain steady.

To change the selected input

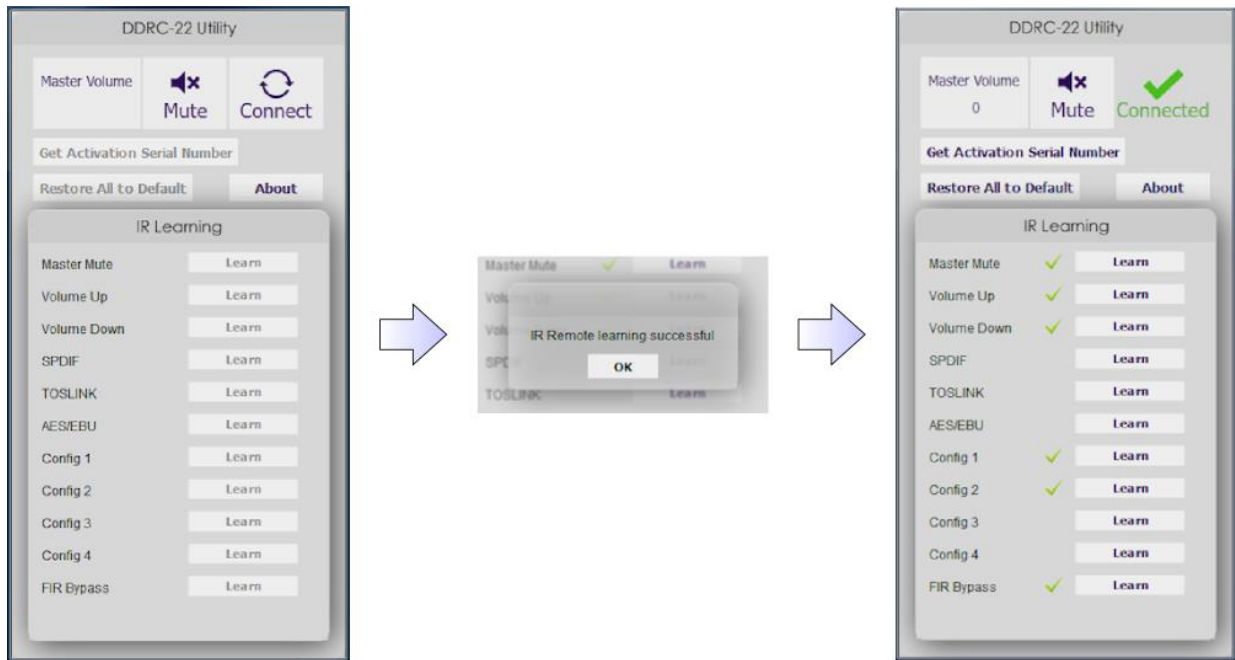
Press and hold the control button. The LED indicating the selected HDMI input will switch to the other input. Release the button.

5.3 INFRARED REMOTE CONTROL

Many standard and programmable remote control units can be used with the NanoAVR DL processors. Instead of adding another remote to your collection, the processor can “learn” the control codes of your current infrared (IR) remote if it supports one of the following remote control codes:

- NEC
- Sony
- Philips RC6
- Apple Remote

Learning is done with the **nanoAVR DL** utility program. After starting the program, click on the **Connect** button. To initiate learning, simply click on one of the function buttons in the **IR Learning** box (**Master Mute**, **Volume Up**, and so on). Then point your remote at the processor and click on the button that you want to use for that function. A dialog will appear to show that the code was recognized. If the processor does not recognize the remote control code, then it will time out and display a message saying that no IR code was detected.



6 ADDITIONAL INFORMATION

6.1 SPECIFICATIONS

Computer connectivity	Driverless USB 2.0 control interface for Windows and Mac OS X Ethernet control (RJ45 / 100Mbps) with ZeroConf support (autoIP/DHCP)
HDMI inputs	2 x HDMI 1.4a selectable from software, front panel or IR remote
HDMI Outputs	1 x HDMI 1.4a output
Audio sample rate / Resolution	Input/output resolution: 24-bit integer, 8-channel linear PCM Maximum input sample rate: 192kHz DSP internal processing path: 48 kHz
Audio processing	32-bit floating-point processor
Video support	Video pass-through of selected source (i.e. no video processing) 36-bit / 3D support / HDCP embedded keys
Storage/Presets	4 filter sets stored, selectable from front panel or IR remote
Infrared remote	“Learning remote” capabilities (NEC, Philips, Sony, Apple) Controls master volume, mute, HDMI input selection, filter set selection, Dirac Live® filtering bypass
Power supply	5 VDC single supply @ 600mA, 2.1 mm center-positive
Dimensions (H x W x D)	31 x 161 x 110 mm

6.2 TROUBLESHOOTING

The following table lists the most common causes of issues with the nanoAVR DL. If following this table does not provide a solution, see [Obtaining Support](#) below.

Item#	Symptoms	Troubleshooting recommendation
1	The nanoAVR doesn't appear in the Sound System tab	<ul style="list-style-type: none"> a. Check that the USB cable to the nanoAVR DL is firmly connected. b. Check that you do not have any other program running that is attempting to communicate with the nanoAVR DL, such as the

		<p>nanoAVR DL utility program or the nanoAVR plugin.</p> <p>c. Check that you have the miniDSP version of the software installed, called Dirac Live Calibration Tool For miniDSP.</p> <p>d. Go to the Sound System tab and click the Rescan button.</p>
2	The measurement test signal produces no output	<p>a. Check the Output volume slider.</p> <p>b. Ensure that the <i>NanoAVR DL</i> processor is connected correctly into the audio system.</p> <p>c. Check that the downstream device has the <i>NanoAVR DL</i> processor selected for input.</p> <p>d. Check that any downstream volume control is not set to zero.</p> <p>e. Check that no downstream device is muted.</p>
3	No input from measurement microphone	<p>a. Check that the USB cable to the UMIK-1 is securely seated</p> <p>b. Check that the UMIK-1 is selected in the Mic config tab.</p>
4	Insufficient recording level	<p>a. Increase microphone level in the Output & Levels tab.</p> <p>b. Go to the Control Panel and view the Recording tab of the Sound pane. Select the UMIK-1 and view its Properties. In Levels, set the gain to 100.</p> <p>c. Increase system output volume.</p>
5	Unable to generate correction filters (Optimize button)	<p>a. Check that your computer is connected to the Internet and able to pass HTTP (web) traffic.</p> <p>b. Check that you do not have any other program running that is attempting to communicate with the nanoAVR DL, such as the nanoAVR DL utility program or the nanoAVR plugin.</p>
6	No audio or video while playing	<p>a. Check that all HDMI cables are securely seated.</p> <p>b. Check that HDMI cables are plugged into the correct inputs and the correct outputs.</p> <p>c. Check that each unit (TV, AVR, nanoAVR) has the correct HDMI input selected.</p> <p>d. Power-cycle the complete system. Turn off all equipment and after waiting a minute, turn equipment on again in the following order: TV/display, AVR or AVP, nanoAVR DL, source/player. Leave a few seconds between powering on each unit.</p>
7	Video but no audio	<p>a. Check that your source/player is set to output Linear PCM over HDMI (the nanoAVR DL does not decode compressed formats such as Dolby or DTS).</p> <p>b. Check that the nanoAVR processor is not muted.</p> <p>c. Check that the nanoAVR processor master volume control is</p>

		<p>not turned down.</p> <p>d. Check that the downstream device has the <i>NanoAVR DL</i> processor selected for input.</p> <p>e. Check that the HDMI output device (AVR or AVP) doesn't have its volume control set very low or to zero.</p> <p>f. Check that the HDMI output device (AVR or AVP) is not muted.</p>
8	Cannot install software	<p>a. Confirm that you downloaded and installed the required frameworks first (see Software Installation).</p>

6.3 MCU FIRMWARE UPGRADE

miniDSP may periodically provide an update to the nanoAVR DL MCU firmware to enable new features. The most recent MCU firmware is always included in the installation folder of the plug-in download.

To update the MCU firmware, first download the latest version of the plug-in from the User Downloads section of minidsp.com and install the plugin. Then navigate to the directory **C:\Program Files (x86)\miniDSP\nanoAVR-DL\firmware_tools\Windows**. Read the instructions in the file *Firmware Upgrade Steps* to update the firmware. Do not disconnect the nanoAVR or shutdown your computer while firmware update is in progress.

Note that the firmware upgrade tool is, as of publication of this User Manual, available on Windows only.

Provided firmware update was successful, you can now continue to use the nanoAVR DL as before.

6.4 OBTAINING SUPPORT

1. Check the forums on minidsp.com to see if this issue has already been raised and a solution or solutions provided.
2. Contact miniDSP via the support portal at minidsp.desk.com with:
 - a. The specific product you are having an issue with (in this case, nanoAVR DL).
 - b. A clear explanation of the symptoms you are seeing.
 - c. A description of the troubleshooting steps (see [Troubleshooting](#) above) you performed and the results obtained.