

DDRC-88D

8-CHANNEL AUDIO PROCESSOR

WITH DIRAC LIVE[®] TECHNOLOGY

AND OPTIONAL UPGRADE FOR BASS MANAGEMENT AND CROSSOVER

Digital I/O version with AES/EBU or S/PDIF

User Manual





Revision history

Revision	Description	Date
0.1	First draft	31 July 2017
1.0	Public release	4 Sept 2017
1.1	Updated for S/PDIF option, IP address field, miniDSP remote, various minor corrections	27 August 2018

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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 *DDRC-88D* audio processor, you will require a Windows or Apple Mac computer with the following minimum specification:

Windows

- 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/Win10
- Two free USB 2.0 ports

Mac OS X

- Intel-based Mac with 1 GHz or higher processor clock speed
- 2 Gigabytes (GB) of RAM or higher
- Keyboard and mouse or compatible pointing device
- OS X 10.9 (Mavericks) to macOS 10.13 (High Sierra)
- 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 DDRC-88D has passed the test performed according to European Standard EN 55022 Class B.

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 easier.

1 PRODUCT OVERVIEW

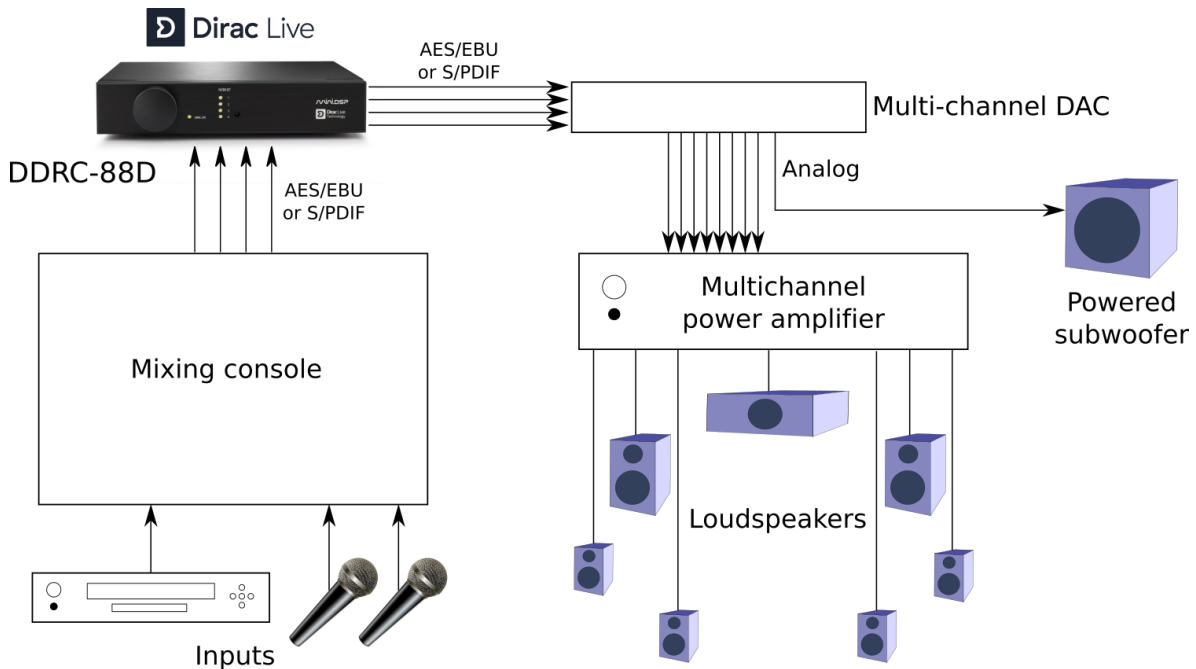
Thank you for purchasing a miniDSP *DDRC-88D* 8-channel digital audio processor powered by Dirac Live®, the world’s premier room correction solution. The onboard floating-point SHARC processor provides time and frequency correction of 8 channels together with optional bass management and active crossover configurations. Inputs and outputs are digital via AES/EBU or S/PDIF, provided on a DB-25 connector with breakout cable.

The *DDRC-88D* is a member of the miniDSP [Dirac Series](#) of audio processors. Deploying a *DDRC-88D* will:

- Improve imaging and immersion
- Improve clarity of music and dialog
- Reduce listening fatigue
- Remove resonances and room modes

1.1 TYPICAL SYSTEM CONFIGURATION

In studio or sound reinforcement applications, the *DDRC-88D* is typically connected between a mixing console and a multichannel DAC, as shown below. Each channel can be set for either full-range or subwoofer operation, and active multi-way systems can also be implemented.



The *DDRC-88D* can also be used for multi-room/multi-zone correction with a stereo source. See the application note on our website, [Multi-zone DRC with the *DDRC-88D* Dirac Live® processor](#).

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 *DDRC-88D* 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 *DDRC-88D* 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.

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.

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 wave front 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.

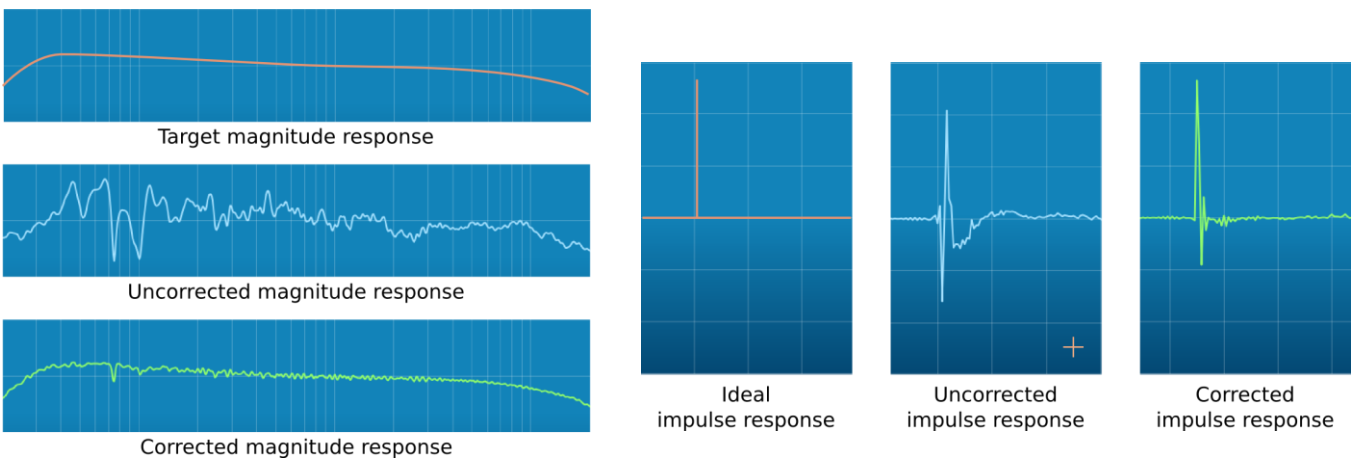
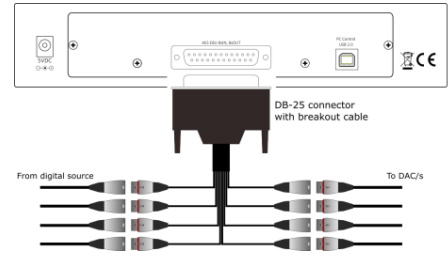


Illustration of Dirac Live[®] magnitude and impulse response correction

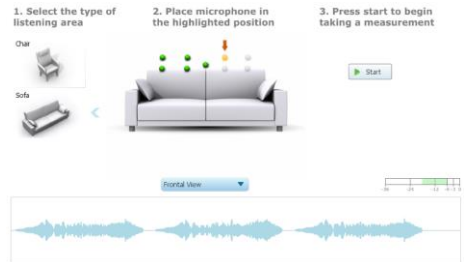
1.3 CONFIGURATION STEPS (BASIC MODE)

The steps for configuring the *DDRC-88D* audio processor with Dirac Live® are summarized as follows:

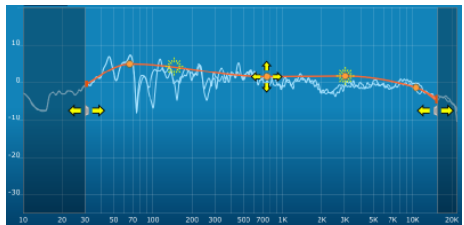
1. Connect the *DDRC-88D* audio processor into your system and install software. See Section 2, Hardware Connectivity and Section 3, Software Installation.



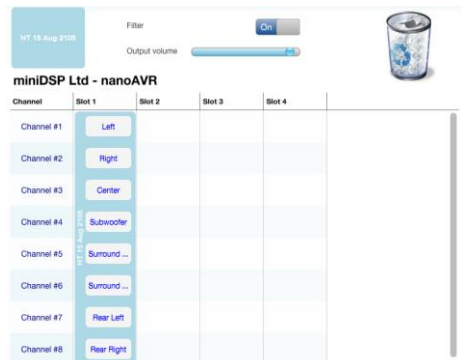
2. Run a series of acoustic measurements using the **Dirac Live Calibration Tool for miniDSP** program, to capture the acoustic behavior of your speakers and room. See Section 5, Acoustic Measurement for Dirac Live.



3. Generate digital room correction filters that will be executed by the *DDRC-88D* processor. Up to four filter sets can be downloaded into the processor for easy real-time recall and auditioning. See Section 6, Dirac Live Filter Design.



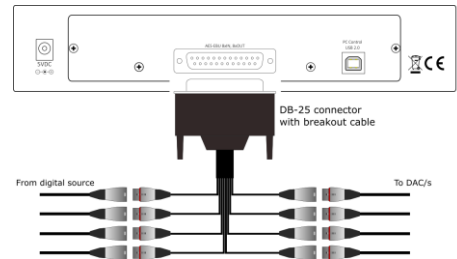
4. Once the digital room correction filters are designed and downloaded, the computer can be disconnected for normal listening. See Section 7, Using the DDRC-88D Audio Processor.



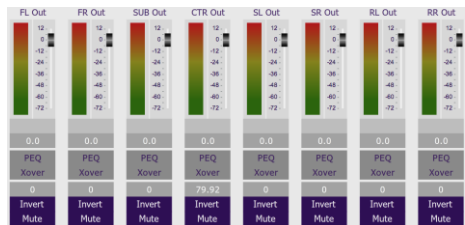
1.4 CONFIGURATION STEPS (ENHANCED/BASS MANAGEMENT MODE)

The steps for configuring the *DDRC-88D* audio processor with Dirac Live® and the optional enhanced/bass management mode upgrade are summarized as follows:

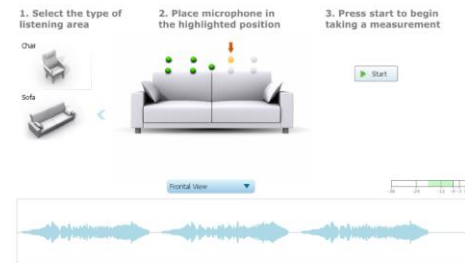
1. Connect the *DDRC-88D* audio processor into your system and install software. See Section 2, Hardware Connectivity and Section 3, Software Installation.



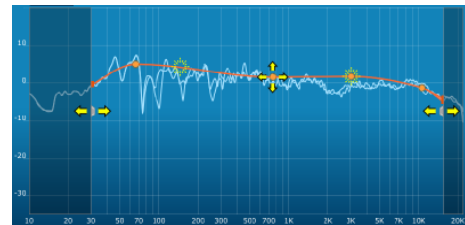
2. Configure output channel processing with the DDRC-88BM plugin. This sets up individual control of each output channel in order to implement (for example) active crossovers or multisub management. See Section 8, Enhanced/Bass Management Mode.



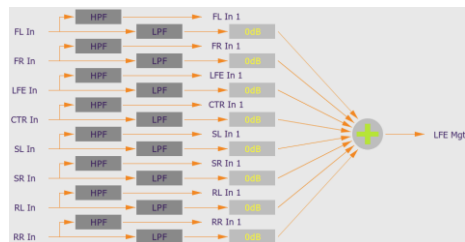
3. Run a series of acoustic measurements using the **Dirac Live Calibration Tool for miniDSP** program, to capture the acoustic behavior of your speakers and room. See Section 5, Acoustic Measurement for Dirac Live.



4. Generate digital room correction filters that will be executed by the *DDRC-88D* processor. Up to four filter sets can be downloaded into the processor for easy real-time recall and auditioning. See Section 6, Dirac Live Filter Design.



5. Configure bass management in the DDRC-88BM plugin (if required). See Section 8, Enhanced/Bass Management Mode.



6. The computer can be disconnected for normal listening. See Section 7, Using the DDRC-88D Audio Processor.

2 HARDWARE CONNECTIVITY

All connections to the *DDRC-88D* are made on the rear panel.

2.1 DIGITAL INPUT AND OUTPUT

Up to eight digital channels can be connected via the supplied DB-25 breakout cable. The *DDRC-88D* can be ordered with digital I/O in either AES/EBU or S/PDIF format. Note that the internal circuitry is different in either case, so use only the interface type marked on the rear panel above the DB-25 connector.

Input sample rate

All inputs have asynchronous sample rate conversion (ASRC) and accept sample rates from 32 to 192 kHz. Each pair of channels can have a different sample rate.

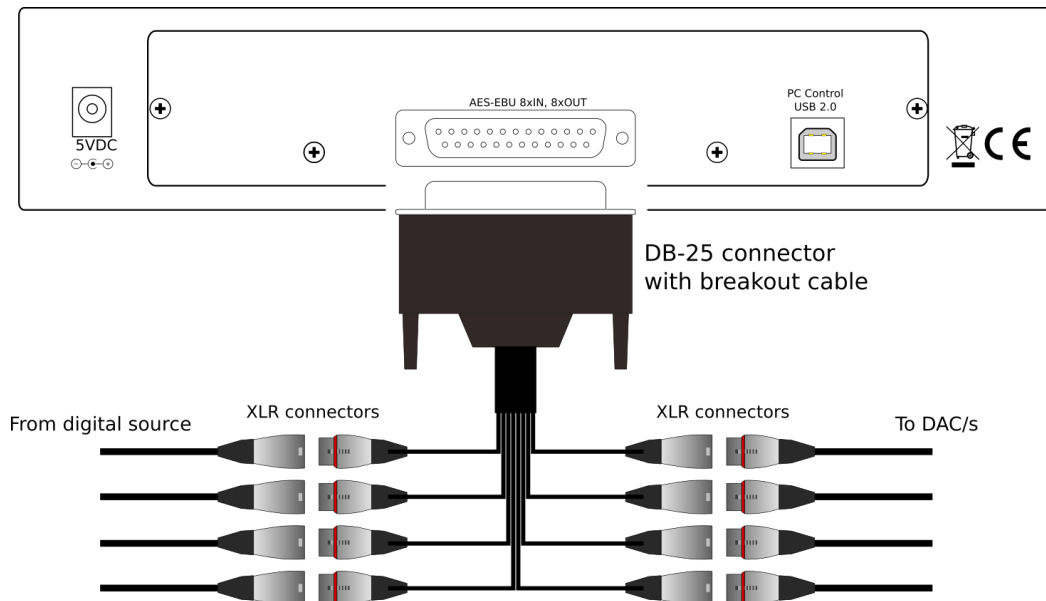
Output sample rate

All outputs run at the sample rate of input channels 1 and 2. If there is no signal on input channels 1 and 2, all output channels run at 48 kHz.

Note that the internal sample rate is 48 kHz regardless. An asynchronous sample rate conversion on the output channels is used to produce data at the sample rate detected on input channels 1 and 2, thus preserving the sample rate integrity of the system as a whole.

2.1.1 AES/EBU version

Four AES/EBU digital inputs and four AES/EBU digital outputs are present on the DB-25 connector using the TASCAM pinout.



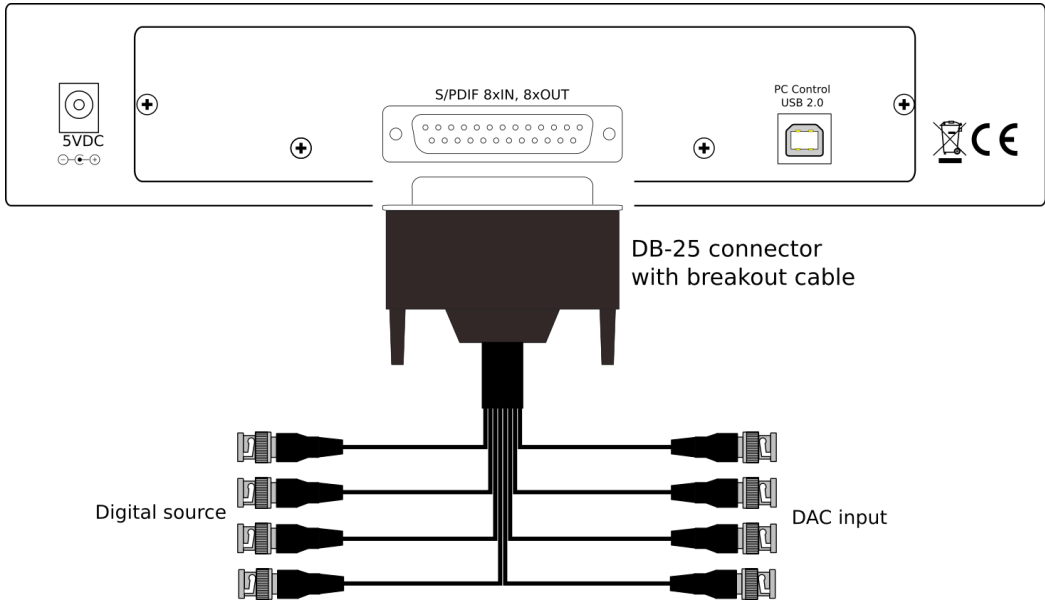
The supplied breakout cable has the following channel assignment:

Channels	Color
In 1&2	Purple
In 3&4	Blue
In 5&6	Green
In 7&8	Orange
Out 1&2	Yellow
Out 3&4	Red
Out 5&6	Grey
Out 7&8	Brown




2.1.2 S/PDIF version

For the S/PDIF version, digital inputs and outputs are both terminated with male BNC connectors. Where possible, connect these directly to the source equipment or DAC(s). BNC female-female couplers and additional cables can be used to extend the breakout cable if necessary.



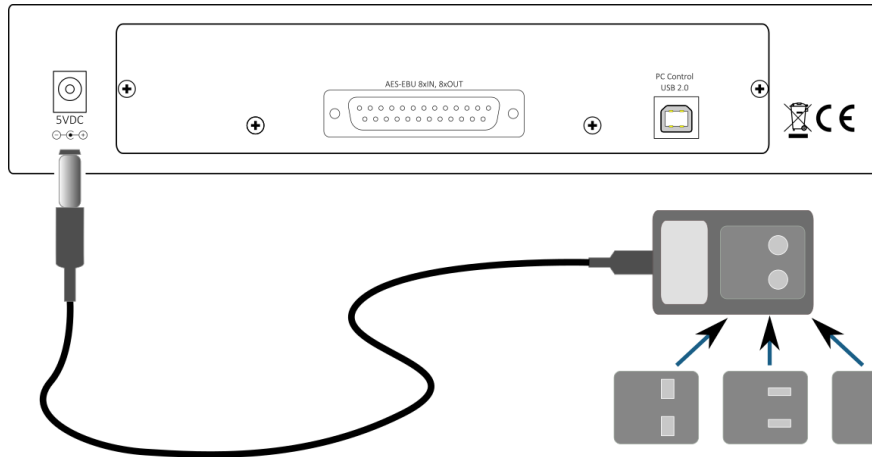
The supplied breakout cable has the following channel assignment:

Channels	Color
In 1&2	Purple
In 3&4	Blue
In 5&6	Green
In 7&8	Orange
Out 1&2	Yellow
Out 3&4	Red
Out 5&6	Grey
Out 7&8	Brown



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.



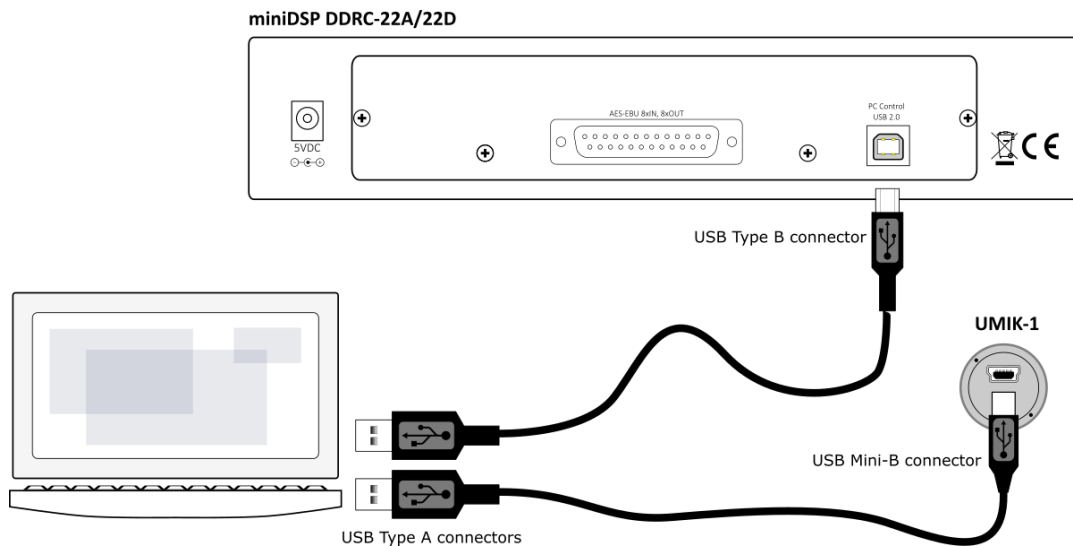
Apply power to the *DDRC-88D* only after all input and output connections have been made. The *DDRC-88D* uses little power and can be left powered on all the time.

2.3 USB

To configure the *DDRC-88D* using **Dirac Live Calibration Tool for miniDSP**:

- Connect the USB port of the *DDRC-88D* to a USB 2.0 port on your computer using the supplied cable.
- Connect a miniDSP UMIK-1 to a second USB port on your computer.

Note: the miniDSP UMIK-1 is the only measurement microphone that can be used with the *DDRC-88D* and **Dirac Live Calibration Tool for miniDSP**. Other USB microphones or microphones connected to external soundcards cannot be used.



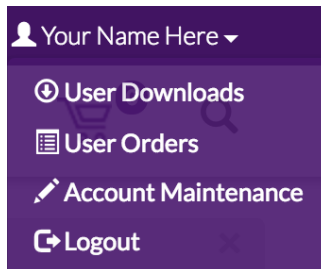
3 SOFTWARE INSTALLATION

If you purchased your product directly from miniDSP, your software will be available from the [User Downloads](#) section of the miniDSP website when your order ships. You will need to be logged into the website with the account you created when purchasing to access the download.

If you purchased your product from a miniDSP dealer, you will receive a coupon together with the product. Redeem this coupon and select the Plugin Group “Dirac Series” at the link below:

- <https://www.minidsp.com/support/redeem-coupon>

The User Downloads link is visible from the dropdown menu at the top right of the website page:



Navigate to the **Dirac Series** section and then to **DDRC-88BM Software**. There you will find a single download containing all software. Download this file and unzip it on your computer (on Windows, right-click and select “Extract All..”; on Mac, double-click). The folder containing the software has a name like **DDRC-88-BM_v2_1** and will contain the following folders:

Dirac Live

This folder contains the installers for **Dirac Live Calibration Tool for miniDSP (DLCT)** multichannel version, which is used to perform the Dirac Live calibration, including taking measurements, generating correction filters, and loading them into the DDRC-88D. There are separate Windows and Mac versions.

Plugins

This folder contains the installers for the **DDRC-88BM plugin**, used to set up non-Dirac signal processing, configure remote control codes and perform various other maintenance operations on the DDRC-88D. There are separate Windows and Mac versions.

firmware

This folder contains the firmware for the DDRC-88D. miniDSP may occasionally provide updated firmware to improve functionality and performance – see Section 9.2 MCU Firmware update for the upgrade procedure.

3.1 DIRAC LIVE LICENSE ACTIVATION

As of version 1.2.0 of Dirac Live Calibration Tool, license activation is done automatically when DLCT recognizes a valid Dirac Live license code in the hardware unit itself. No separate manual activation step is required.

3.2 INSTALLATION — WINDOWS

3.2.1 Possible Windows installation issues

The miniDSP software requires that a number of other frameworks be installed for it to work. For Windows 7 and later, these packages should be installed automatically. For earlier versions of Windows, please download and install the following frameworks before attempting to install any miniDSP software. You can also manually install these if you receive an error message that required software is missing.

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

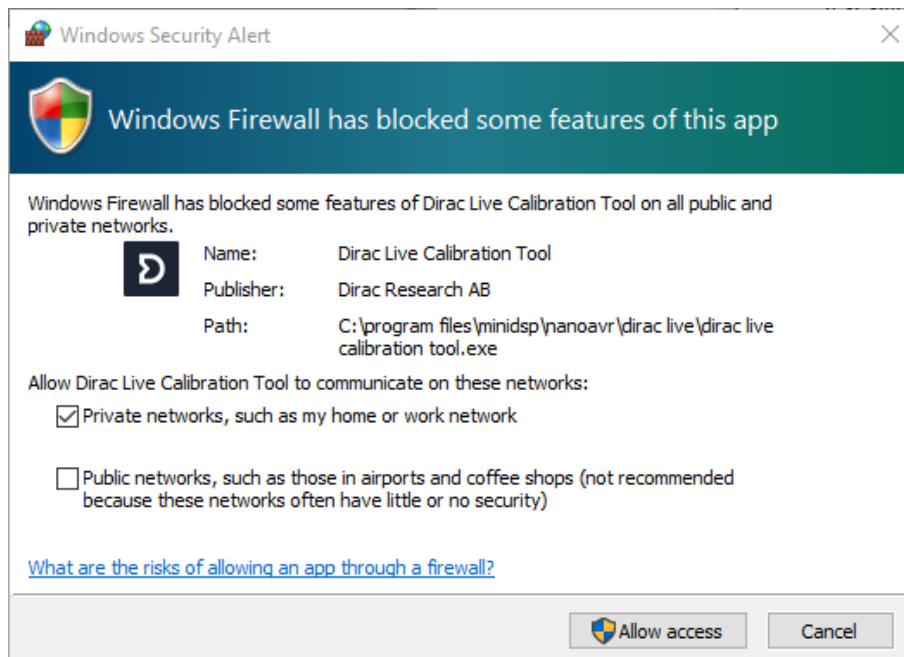
3.2.2 DDRC-88BM plugin installation

1. Navigate to the **Plugins** folder of the software download and then to the **Windows** folder.
2. Double-click on the **DDRC_88_BM_v2_1.exe** installer program to run it (the version number v2_1 may be different). We recommend that you accept the default installation settings.

3.2.3 Dirac Live Calibration Tool (DLCT) installation

1. Navigate to the **Dirac Live** folder of the software download and then to the **Windows** folder.
2. Double-click on the installer to run it. The installer will have a name similar to **Dirac Live Calibration Tool (8 channels) v1.2.1.8426 Setup.exe** (the version number starting with v1.2... may be different). We recommend that you accept the default installation settings.

The first time you run DLCT, you may see a warning from Windows Firewall as shown below. If so, ensure that “Private networks...” is checked and “Public networks...” is not checked. Then click on “Allow access.”

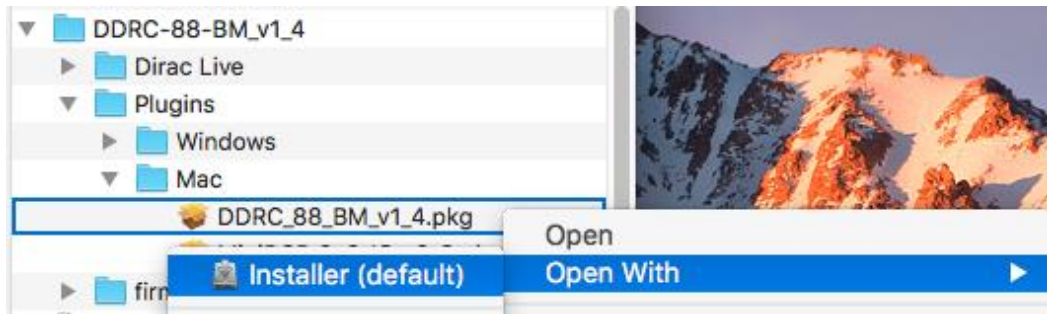


3.3 INSTALLATION — MAC

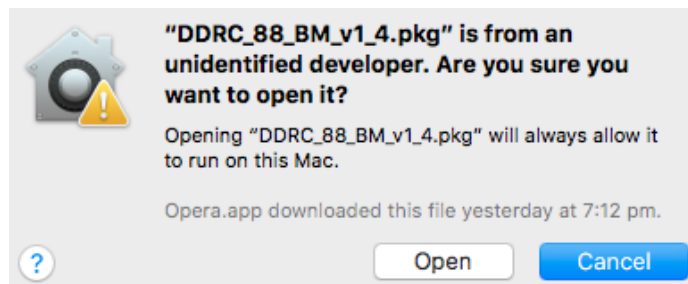
3.3.1 Possible Mac installation issues

If double-clicking on an installer brings up a message that the installer cannot run, use this alternate method:

1. Right-click on the installer (or click while holding the Control key).
2. On the menu that pops up, move the mouse over the “Open With” item and then click on “Installer (default).”



3. The following window will appear. Click on “Open.”



3.3.2 DDRC-88BM plugin installation

1. Navigate to the **Plugins** folder of the software download and then to the **Mac** folder.
2. The installer program is named **DDRC_88_BM_v2_1.pkg** (the version number v2_1 may be different). To run it, double-click on it, or right-click and open as described above. We recommend that you accept the default installation settings.
3. To run the DDRC-88BM plugin, locate **DDRC-88-BM.app** in the Applications -> miniDSP folder and double-click on it. To make it easier to run in future, right-click on its dock icon and select Options -> Keep in Dock.

3.3.3 Dirac Live Calibration Tool (DLCT) installation

1. Navigate to the **Dirac Live** folder of the software download and then to the **Mac** folder.
2. The installer program will have a name similar to **Dirac Live Calibration Tool (8 channels) v1.2.1.8426.mpkg** (the version number starting with v1.2... may be different). To run it, double-click on it, or right-click and open as described above. We recommend that you accept the default installation settings.
3. To run DLCT, locate **Dirac Live Calibration Tool.app** in the Applications -> miniDSP -> nanoAVR folder and double-click on it. To make it easier to run in future, right-click on its dock icon and select Options -> Keep in Dock.

4 THE DDRC-88BM PLUGIN

The DDRC-88BM plugin is the software program that interfaces with the DDRC-88D for all control functions *except* for Dirac Live calibration. It can operate in two modes:

- Basic mode. Dirac Live is enabled but the optional bass management and crossover functionality is not.
- Enhanced/bass management mode. Dirac Live is enabled as well as bass management and crossover functionality. See Section 8, Enhanced/Bass Management Mode for further information on this functionality.

If you purchased a DDRC-88D in basic mode and later upgrade to enhanced/bass management mode, you will need to perform the upgrade procedure described on page 62.



Be sure to quit **Dirac Live Calibration Tool for miniDSP** before starting the **DDRC-88BM plugin**. Running both programs at the same time may result in communication conflicts and odd behavior.

4.1 PLUGIN USER INTERFACE – BASIC MODE

Upon starting the plugin, the main user interface appears. The screenshot below shows the user interface with the key areas highlighted.

The screenshot shows the DDRC-88 2.1 software interface. Key areas are highlighted as follows:

- Main menu:** A green box highlights the top menu bar with options: File, Restore, Help, IR Remote.
- Configuration selection:** A blue box highlights the 'Configuration Selection' area with buttons for Config 1, Config 2, Config 3, and Config 4.
- Selection tab:** A red box highlights the 'Dirac' tab in the selection bar, which also includes LFE Mgt, Routing, Mixer, and Outputs.
- Master control:** A purple box highlights the 'Connect' and 'Mute' buttons, along with the IP address field and 'Auto' checkbox.
- Main configuration window:** An orange box highlights the main control area, which includes a table for Dirac Live parameters and a 'Dirac Live OFF' button.

	Input	Gain	Delay	Output
Dirac 1	[Slider]	[Slider]	[Slider]	[Slider]
Dirac 2	[Slider]	[Slider]	[Slider]	[Slider]
Dirac 3	[Slider]	[Slider]	[Slider]	[Slider]
Dirac 4	[Slider]	[Slider]	[Slider]	[Slider]
Dirac 5	[Slider]	[Slider]	[Slider]	[Slider]
Dirac 6	[Slider]	[Slider]	[Slider]	[Slider]
Dirac 7	[Slider]	[Slider]	[Slider]	[Slider]
Dirac 8	[Slider]	[Slider]	[Slider]	[Slider]

At the top of the screen are a set of menus and buttons, which are described on following pages. Below that, on the **Dirac** tab, is a display of the Dirac Live parameters. This tab is active in both basic and enhanced/bass management modes.

The four other tabs (“LFE Mgt,” “Routing,” etc.) are not active in basic mode. They can be viewed when the plugin is offline (see next page) in order to provide you with a preview of the enhanced/bass management functionality.

4.2 MASTER CONTROL

The DDRC-88BM plugin can communicate with the processor using either USB or over the network. For USB communication, connect the DDRC-88D to a USB 2.0 port on your computer. Then click on the Connect button:



If you are running the plugin in enhanced/bass management mode, a dialog box with additional connection options may appear. See page 45.

For networked communication with the processor, a miniDSP [Wi-DG Wifi/Ethernet to USB bridge](#) must be used together with the **IP Address** and **Auto** fields. See the [Wi-DG User Manual](#) for details.

If connection is successful, the Connect button will change to a green tick as shown above. For the sake of brevity, this state is referred to as “online” whereas the earlier state with the circular arrows is referred to as “offline.” In addition, the Master Volume field will display the current volume setting:



When the plugin is online, the **Mute** button disables all audio output:



The Dirac Live button turns Dirac Live filtering on and off. (A Dirac Live correction filter must have been loaded into the currently selected configuration for this to work.)



4.3 CONFIGURATION/FILTER SET SELECTION

Once correction filters have been loaded into the DDRC-88D, the four configuration selection buttons can be used to select between them.

If the plugin is operating in enhanced/bass management mode, these buttons *also* select the processing data for the four other tabs (“LFE Mgt,” “Routing,” etc.). Because these different configurations contain data that has already been loaded into the flash memory of the hardware unit, they are also often referred to as “presets.”

Configuration/preset selection can also be done with the front panel encoder or an infrared remote control – see Section 7, Using the DDRC-88D Audio Processor.

By default, configuration 1 is selected:



4.4 DIRAC LIVE INFORMATION

In basic mode, the only active tab in the interface is **Dirac**. Note that Dirac Live calibration is performed with the separate program **Dirac Live Calibration Tool for miniDSP (DLCT)**, as described in Sections 5 and 6. Once calibration has been performed, you can quit DLCT and run the plugin to view Dirac Live delay and gain settings and real-time levels.

In the DDRC-88BM plugin, this tab displays the gains and delays of the Dirac Live filters loaded into the DDRC-88D. (The plugin must be online to display them.) These gains and delays were calculated by DLCT during its Optimize phase and cannot be changed by the user – they are “read only.” Here is an example:

	Input	Gain	Delay	Output	
Dirac 1	-103 dBFs	-0.3 dB	1.23 ms	-191 dBFs	Dirac Live ON
Dirac 2	-109 dBFs	-1.4 dB	1.13 ms	-199 dBFs	
Dirac 3	-92 dBFs	0 dB	0.48 ms	-181 dBFs	
Dirac 4	-109 dBFs	-0.4 dB	0 ms	-194 dBFs	
Dirac 5	-109 dBFs	-2 dB	3.73 ms	-199 dBFs	
Dirac 6	-109 dBFs	-1.6 dB	3.63 ms	-200 dBFs	
Dirac 7	-116 dBFs	0 dB	0 ms	-116 dBFs	
Dirac 8	-116 dBFs	0 dB	0 ms	-116 dBFs	

Note that the displayed gains and delays are applied even when Dirac Live filtering is turned off.

The **Input** and **Output** columns display the current signal level at the inputs and outputs of the Dirac Live processing block.

The button is used to turn Dirac Live processing on and off.



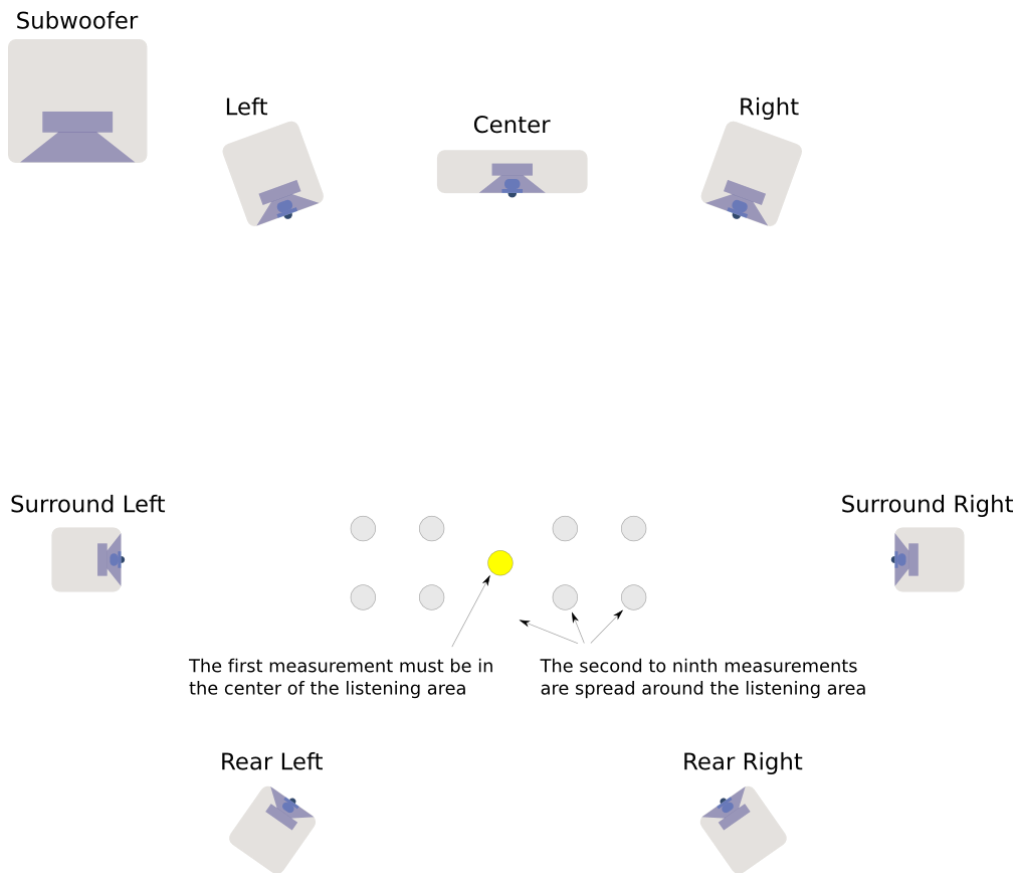
5 ACOUSTIC MEASUREMENT FOR DIRAC LIVE

The **Dirac Live Calibration Tool For miniDSP** uses a set of measurements made in your listening room to gather all the acoustical information about your room and speakers that it needs to calculate the correction filters.

If you have purchased the enhanced/bass management mode upgrade and intend to configure individual output channels with crossovers or filters, you must do that before running a Dirac Live Calibration. See Section 8, Enhanced/Bass Management Mode.

5.1 LOUDSPEAKER AND MICROPHONE POSITIONING

Prior to performing acoustic measurements, loudspeaker and subwoofer positioning should be optimized. In particular, the location of the subwoofer will have a large impact on 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®.



Typical home theater measurement setup

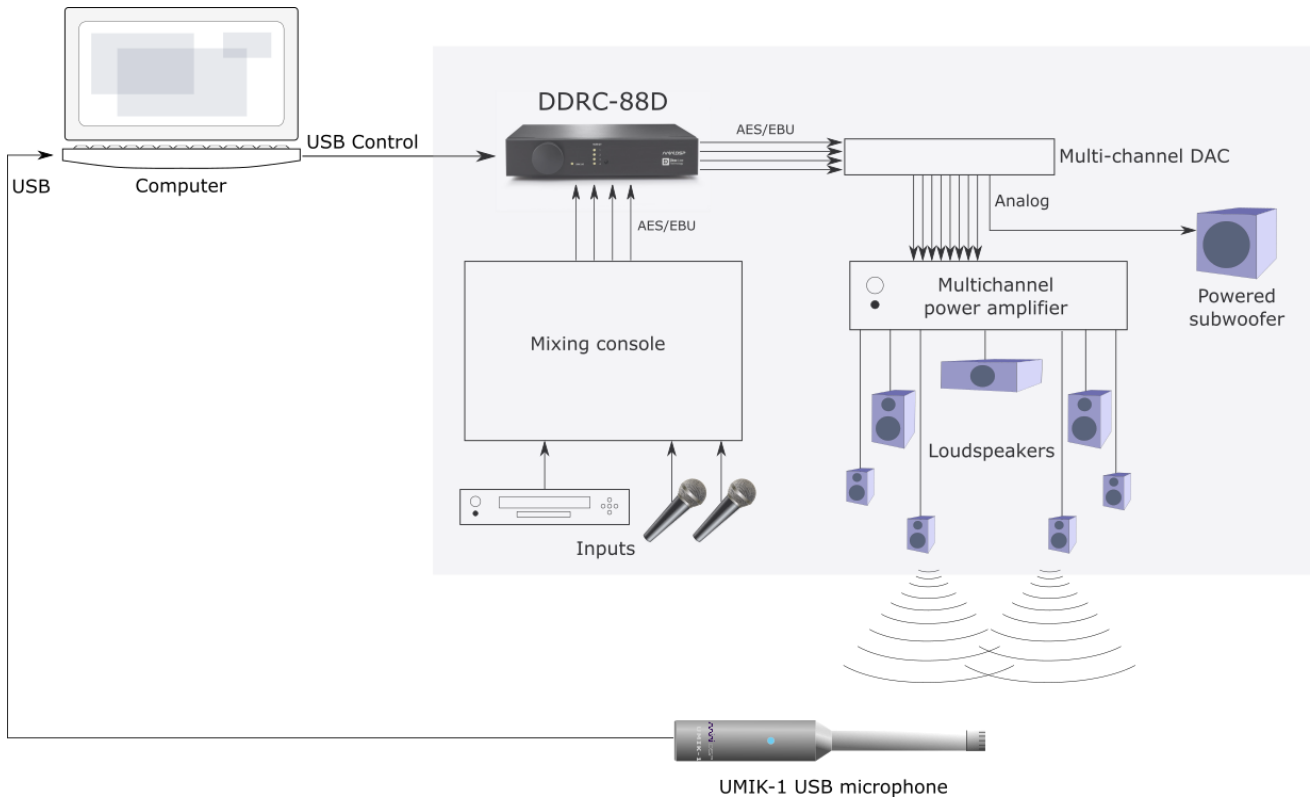
A total of nine measurements are needed, with the microphone located in different positions in the room and pointed vertically (that is, at the floor or ceiling). The first measurement must be taken at the central location of the listening area, as this location sets the levels and delays of each speaker. While this location will usually be an equal distance from both speakers, Dirac Live® will adjust in cases where it is not. Eight more measurements are then taken at locations spread around the listening area and at different heights from the floor.

5.2 PREPARING FOR ACOUSTIC MEASUREMENT

5.2.1 Connections and microphone placement

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

- Connect the supplied USB (type A to type B) cable from the *DDRC-88D* to a USB port on the computer.
- Connect a USB cable (type A to mini type B) from the UMIK-1 to a USB port on the computer.



Place the UMIK-1 microphone into a microphone stand and position the computer and cabling so that there is enough freedom of movement to move the microphone into the needed locations. A small tripod stand is supplied with the UMIK-1, but a larger stand with boom arm can be used if desired. If necessary a longer USB cable can be used (up to a total USB cable length of 5 meters). In larger spaces, an active USB repeater may be needed. We recommend that the microphone be oriented vertically (pointed at the floor or ceiling) and the “90 degree” calibration file used (see [Mic Config tab](#) on page 24).

5.2.2 Subwoofer settings

We recommend that during calibration the low pass filter of the subwoofer be disabled if possible, or set to its highest frequency if it cannot be disabled. Any EQ on the subwoofer should be disabled or set “flat.” High pass filters used to protect the driver from over-exursion should be left in place.

If the subwoofer’s low pass filter is an important part of the overall bass management in the system, it can be re-enabled after completing Dirac Live calibration and loading correction filters into the *DDRC-88D*.

5.3 CONFIGURING FOR MEASUREMENT

Start Dirac Live Calibration Tool for miniDSP (DLCT).



Be sure to quit the **DDRC-88BM plugin** before starting **Dirac Live Calibration Tool for miniDSP**. Running the two programs at the same time will result in communication conflicts and odd behavior.



Logo and status progress bar

This area shows a progress bar with current status when the program is performing calculations. If the program seems unresponsive at any time, check the status here.

Screen selection tabs

Each tab selects a different step of the calibration process. These are generally worked through in order, from top to bottom. This section covers the first four tabs; the final two are covered in [Dirac Live Filter Design](#).

Load and save a project

A set of measurements can be saved to a file and reloaded at a later time. See [Saving and loading projects](#).

Back / Next

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

Help open/close

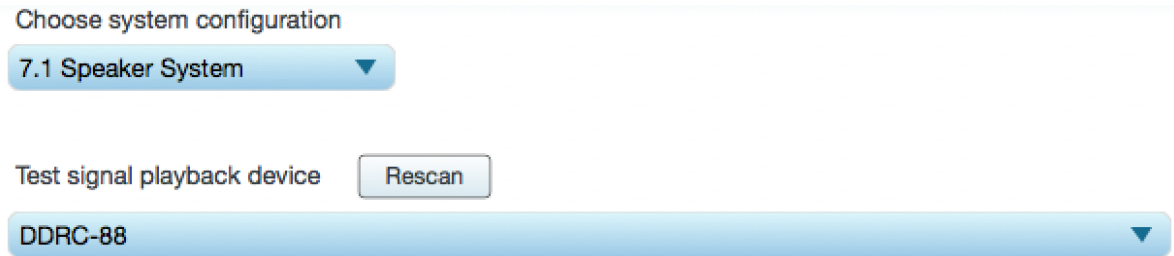
Click on the small Help divider at the right of the screen to open a pane with help on the currently selected tab. Click on the divider again to close the help pane.

5.3.1 Select the configuration/preset (enhanced/bass management mode)

If you are running the plugin in enhanced/bass management mode **and** have changed the settings on the **Mixer** or **Outputs** tabs away from the defaults, then you must ensure that you have selected the correct configuration/preset prior to running measurements for Dirac Live calibration.

If you are running the plugin in basic mode, or have not made changes to the **Mixer** or **Outputs** tabs, then it does not matter which configuration/preset is selected.

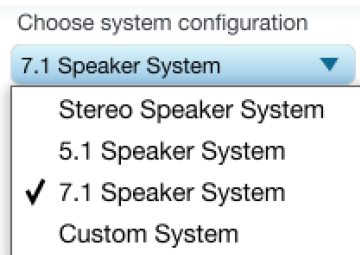
5.3.2 Sound System tab



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

Choose system configuration

Use the dropdown menu to select your system configuration.



For multi-channel surround-sound, use **5.1 Speaker System** or **7.1 Speaker System** if it is desired that Dirac Live calibrate for a 10 dB “LFE alignment gain” to the subwoofer channel. If the calibration for LFE alignment gain is not required or if a different speaker configuration is required, use **Custom System**. (See [Custom System configuration](#) on page 26 for further information.)

Test signal playback device

Preset to **DDRC-88**. This will ensure that test signals are sent into your audio system via the *DDRC-88D* processor.

If the entry for **DDRC-88** is not showing, check that your *DDRC-88D* processor is connected via USB and powered on, click the **Rescan** button, and then use the drop-down menu to select **DDRC-88**. If that still doesn’t work, see Section 9.4, Troubleshooting.

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

5.3.3 Mic Config tab

Recording device: Umik-1 Gain: 12dB

Recording channel: 1

Microphone calibration file: 7001870_90deg.txt

Load file Clear

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

Recording device

Preset to the **UMIK-1**.

If the UMIK-1 is not showing, ensure that the UMIK-1 is connected securely to the computer via USB, then go back to the **Sound System** tab and click on **Rescan**. Then use the drop-down menu to select the UMIK-1.

Umik-1 Gain: 12dB

✓ Umik-1 Gain: 12dB

<<None>>

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. Ensure that you download both the regular calibration file and the "90-degree" calibration file. (The latter is generated specifically for use with miniDSP's multi-channel Dirac Live® processors such as the *DDRC-88D* and the *nanoAVR DL*.)

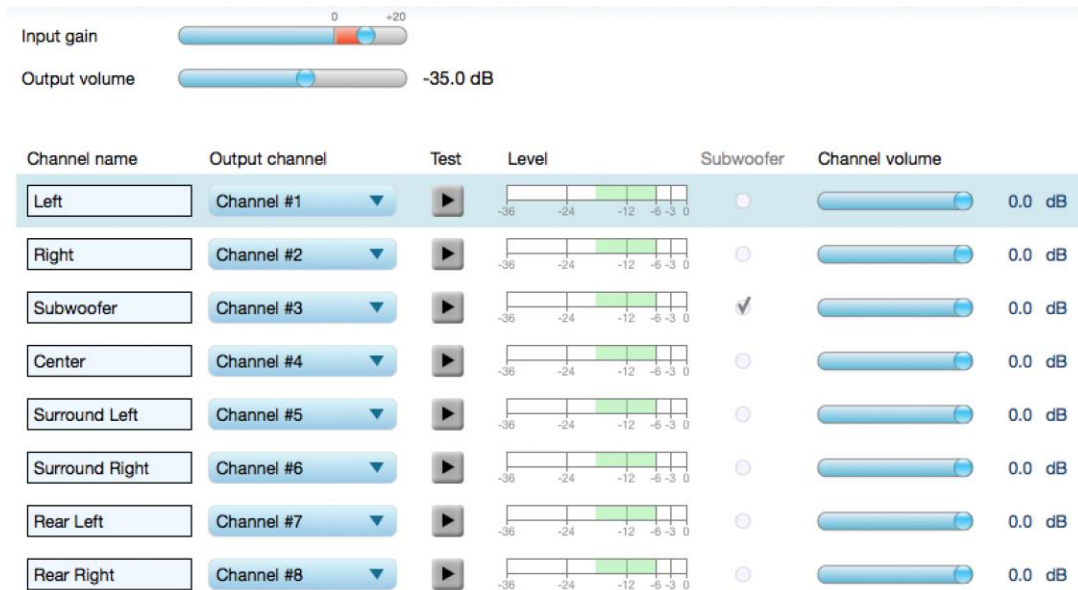
Then click on the **Load File** button and select your calibration file.



For surround sound applications, it is best to use the 90-degree calibration file as this is created specifically for the vertical microphone orientation. This file is downloaded with the suffix "_90deg" in the file name.

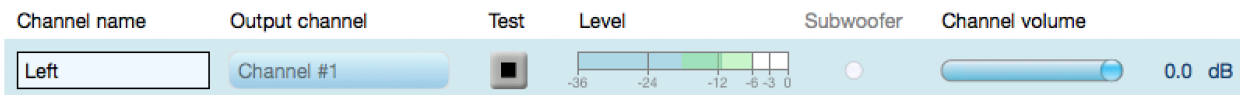
Once you have verified that this tab is correct, click the **Proceed** button.

5.3.4 Output & Levels tab



The **Output & Levels** tab is used to set the signal levels used in the subsequent measurements. We recommend following this procedure:

1. Set the **Output volume** slider all the way down, at -80 dB.
2. Click on the **Test** button for the left channel and gradually increase **Output volume**. You should hear pink noise playing from the left speaker. Continue to increase 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.
3. Set the **Input gain** slider so that the blue bar on the level meter is about in the middle of the green section, or around -12 dB:



4. Click again on the **Test** button for the left channel to stop the test signal.
5. Click on the **Test** button for each of the remaining channels. If any channel is not in the green zone, use the **Channel volume** sliders to adjust the relative volume of the channels. (Some readjustment of **Input gain** and **Output volume** may also be needed.)

Note: if large adjustments are required to the **Channel volume** sliders, you may have an issue with gain structure in downstream electronics, and gain levels in e.g. amplifiers should be adjusted for a more uniform set of readings.

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

5.3.5 Custom System configuration

On the **Sound System** tab, choose the **Custom System** configuration if any of the following apply:

- The system does not fit any of the three predefined configurations (Stereo, 5.1, 7.1).
- You want to use a different channel mapping than the default.
- You do not want the *DDRC-88D* to calibrate for a 10 dB LFE alignment gain on the subwoofer channel.

After choosing **Custom System**, you will need to select the number of channels that you want to use.



When you get to the **Output & Levels** tab, it will show controls for the number of channels that you selected:

Channel name	Output channel	Test	Level	Subwoofer	Channel volume
Front Left	Channel #1			<input type="radio"/>	
Front Right	Channel #2			<input type="radio"/>	
Rear Left	Channel #3			<input type="radio"/>	
Rear Right	Channel #4			<input type="radio"/>	
Subwoofer	Channel #5			<input checked="" type="checkbox"/>	

Channel name

Type any name you like for each channel.

Output channel

By default, each input channel maps to the same numbered output channel (input channel 1 to output channel 1, and so on). The dropdown selectors can be used to change this mapping. Note that DLCT will not let you assign more than one output channel to each input channel.

If your custom system configuration has less than eight channels, inputs and outputs are assigned in sequential order. For example, for a 4.1 channel system, connect to inputs and outputs 1 through 5.

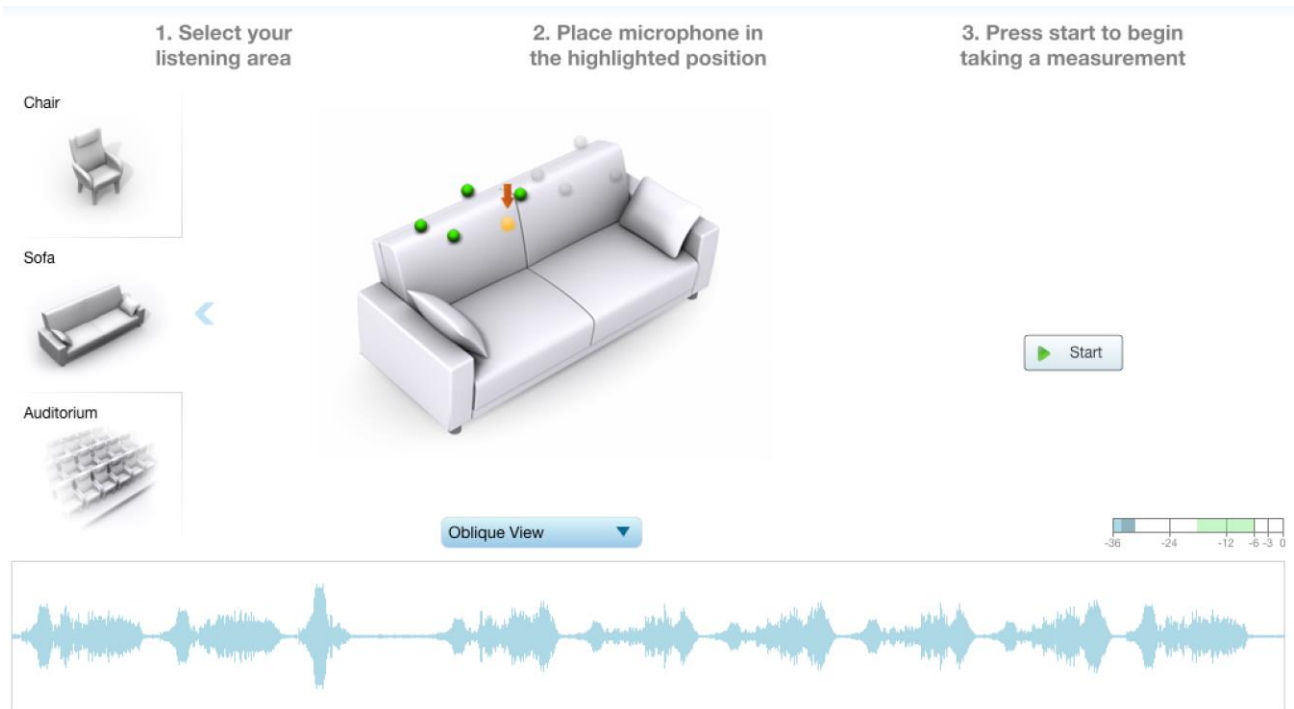
Subwoofer

The subwoofer checkbox tells the Dirac Live analysis algorithm to use a different method to detect the impulse on that channel, which in turn affects the delay that will be assigned to that channel. This is needed because of the limited frequency response of the subwoofer.

Reminder: in **Custom System** configuration, the *DDRC-88D* does not calibrate for a 10 dB LFE alignment gain on the subwoofer channel. If this gain is required it can be added after calibration if, for example, the subwoofer has a 10 dB LFE gain switch.

5.4 RUNNING THE MEASUREMENTS

Acoustic measurements are performed on the **Measurements** tab.

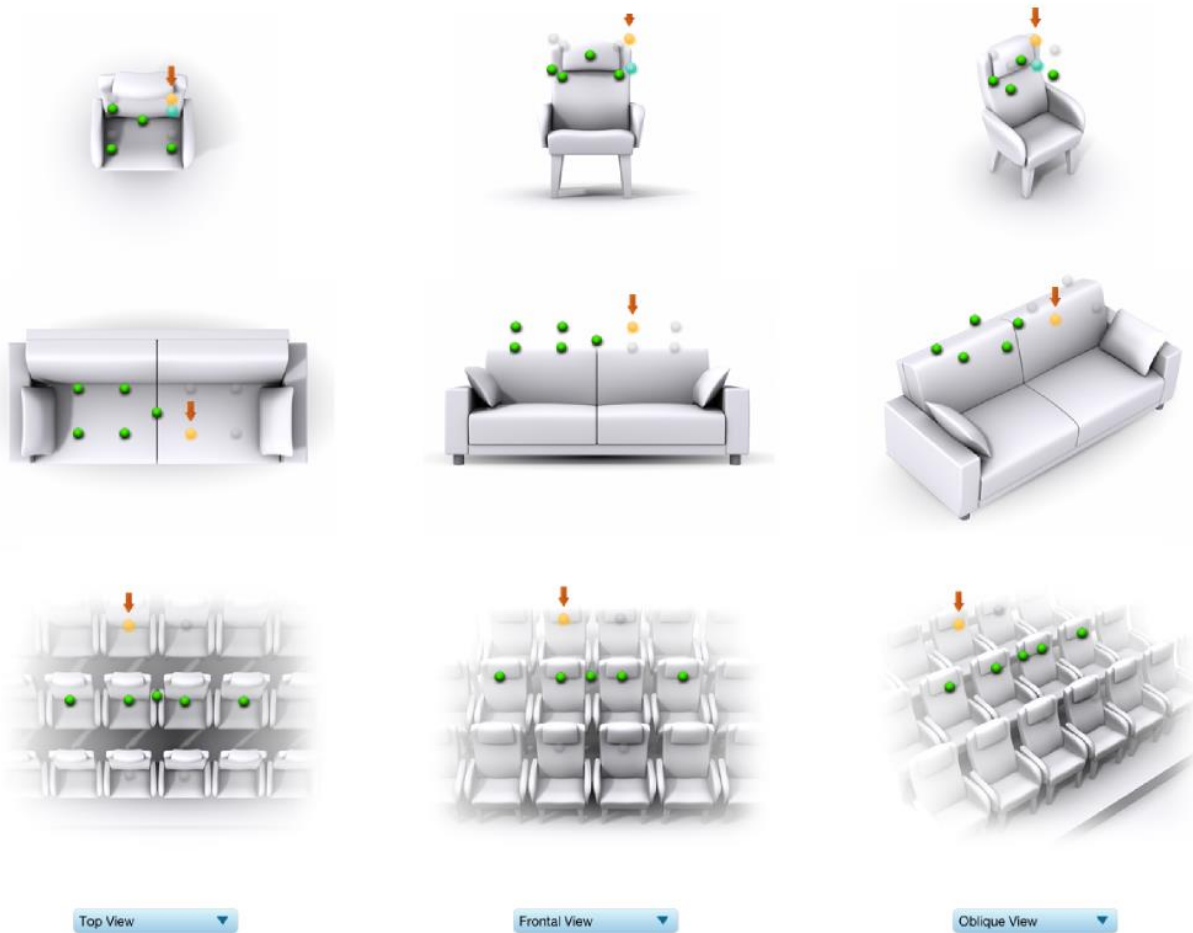


Measurements should always be performed under good conditions. While the measurement technique used by Dirac Live is quite robust, low-frequency noise (traffic, machinery, aircraft, storms) in particular can adversely affect measurement accuracy. A high level of ambient noise can degrade signal to noise ratio and prevent the algorithm from analyzing the test sweep signal properly. Minimize the effect of any external noise, ensure that measurement signal levels are adequate, and/or choose a suitable time for performing measurements.

5.4.1 Listening environment

The **Measurements** tab presents three different listening environments as a visual guide to positioning the microphone for each of the nine measurements: **Chair**, for a single listening seat; **Sofa**, for multiple listening seats; and **Auditorium**, for a large dedicated home theater or larger venue with staggered seating. Use the icons at the left of the screen to select the listening environment.

The center of the screen contains a pictorial representation of the selected listening environment, with dots marking the recommended 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 a suitable location.



While the visual guide indicates a suitable set of microphone locations, these locations can be varied to suit individual circumstances. It is, however, imperative that the first measurement is taken in the center of the listening area, as this measurement is used to set the levels and delays of each channel. The subsequent eight measurements should be well spread out over the entire listening area so that Dirac Live can acquire a good set of measurements that capture the acoustic behavior of the room. Placing all microphone locations too close to each other may result in “over-correction” that will sound dry and dull.

For example, if using the **Chair** listening environment, spread the microphone positions over a circle with a diameter of a meter (three feet). Vary the height of the microphone up and down by 30 cm (one foot) from the initial position. If using the **Sofa** or **Auditorium** listening environment, again spread the measurement locations over the full listening area and vary microphone height by a significant amount.

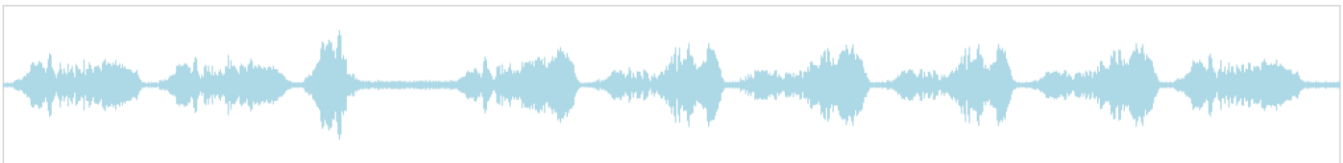
A different set of locations other than those indicated by the visual guide and the above guidelines can be used if necessary. The important thing is to ensure that the measurement locations are spread out over the whole listening area and that the microphone is moved a sufficient distance vertically as well as horizontally.

In some cases, such as when the listening area is very close to the loudspeakers or the loudspeakers have a very narrow dispersion pattern, 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.

5.4.2 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 *DDRC-88D* will generate a test signal, audible as a frequency sweep through the left speaker, then the right, and so on through all channels. Finally, the frequency sweep plays through the left speaker again.

While the measurement proceeds, the time-domain response graph of the captured audio signal is displayed at the bottom of the measurement tab. (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.)



After completion of the measurement sweeps, 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 errors are related to signal level:

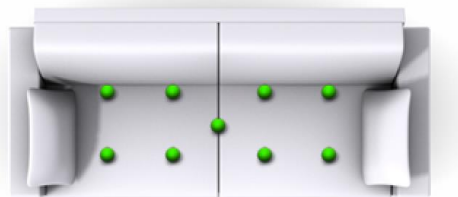
- The measurement signal is too low to ensure a clean capture.
- The measurement signal is too high and the audio signal has exceeded the maximum level (clipping). This is shown in red on the signal graph.

In either case, go back to the **Output & Levels** tab and adjust **Output volume**, **Input gain**, or the **Channel volume** slider for the channel that caused the problem. Then re-run the measurement. (You do not need to redo the measurements you have already successfully completed.)

5.4.3 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. Then click on **Start** again. Repeat this process until all nine locations have been successfully measured.

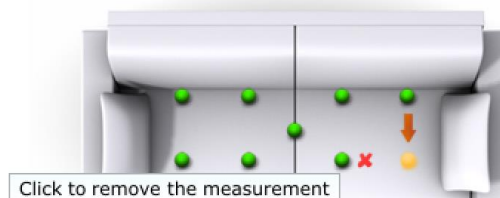
Note: it is good practice to save the project periodically while performing measurements (see [Saving and loading projects](#) below).



5.4.4 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.



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!

Once all nine measurements have been successfully completed, click the **Proceed** button.

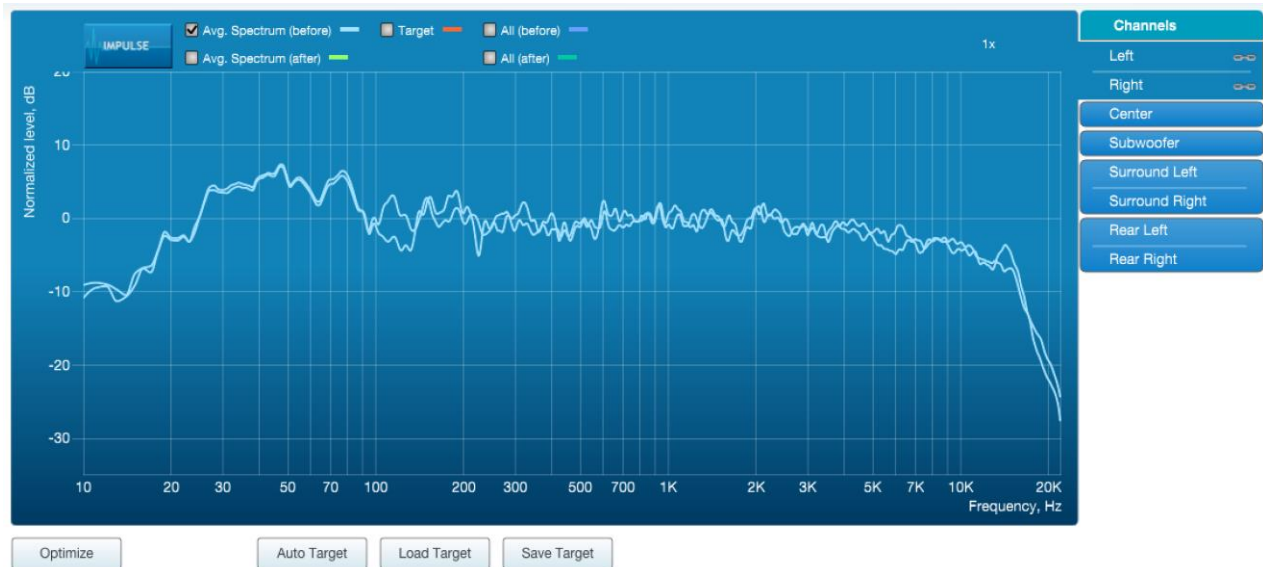
5.5 SAVING AND LOADING PROJECTS

Each set of measurements and the associated configuration settings are called a *project*. The project should be saved at regular intervals by clicking on the **Save** button. The default location for project files is **My Documents\MiniDSP\nanoAVR\Projects** (Windows) or **Documents/MiniDSP/nanoAVR/Projects** (Mac).

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, or to redo any of the measurements. (Note: if you wish to change between the **Chair**, **Sofa**, or **Auditorium** listening environments, you will need to start a new project.)

6 DIRAC LIVE FILTER DESIGN

The **Filter Design** tab shows sets of graphs for the various channels. Click on the tabs at the right to display the response graphs for different sets of channels (left and right, center, subwoofer, and surrounds, in the case of 5.1 and 7.1 systems). For each set of graphs, a number of variants can individually be turned on and off with the checkboxes above the graphs.



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 be viewed only 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](#) on page 34.

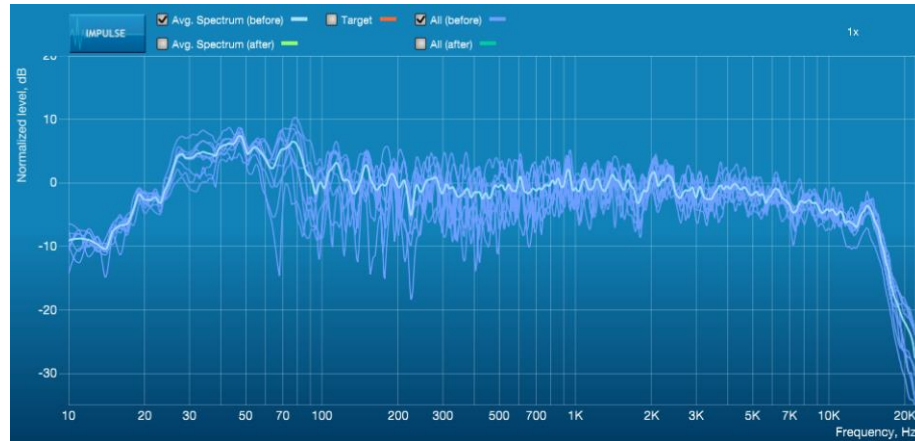
All (before)

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

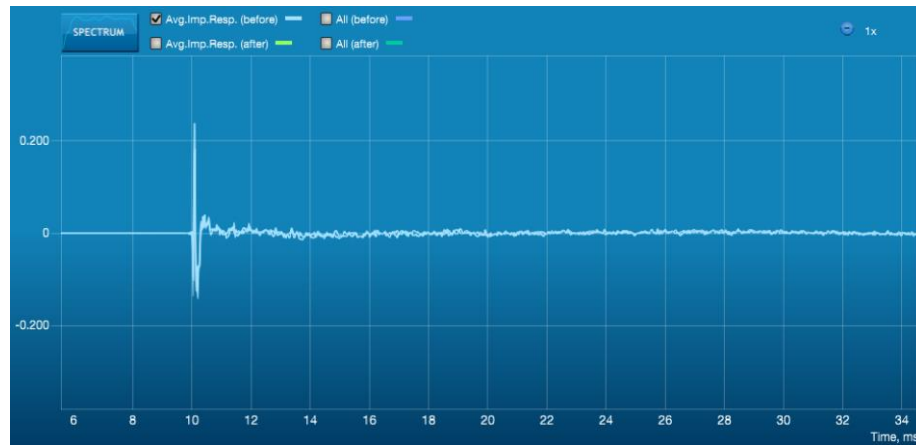
All (after)

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

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



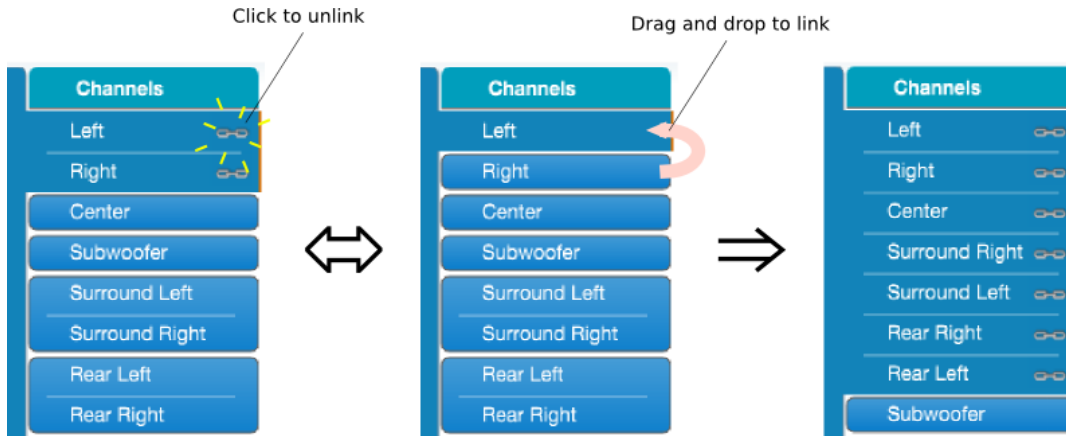
To display the impulse response instead of the magnitude response, click on the **Impulse** button at the top left of the display. All nine individual impulse responses can be shown as well as the average response. The predicted responses after correction can be viewed after filters are generated with the **Optimize** button (see [Generating correction filters](#) on page 37).



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

6.1 WORKING WITH GRAPHS

Initially, the left and right front channels are shown. Some channels are linked together, as indicated by the small “chain” icons on the tabs at the right of the graph. When channels are linked, their graphs display together, and they share the same target curve. By default, the front left and right, surround left and right, and rear left and right channels are linked.



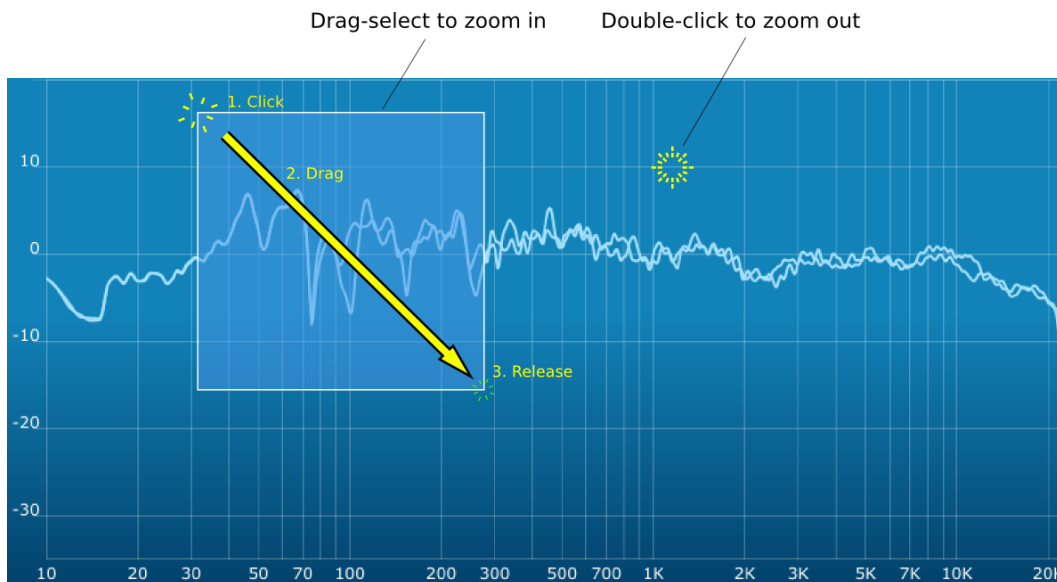
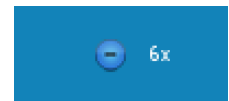
To unlink a channel, click on its chain icon. It will then be unlinked from the other channels. To link it to another channel or groups of channels, drag its tab on top of the channel or group of channels that you want it linked to.



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 target curves and filter sets, you can experiment with different target curves for different channel groups.

The response graphs can be viewed at a larger scale. To zoom in and out:

- 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.



6.2 DESIGNING YOUR TARGET CURVE

The *target curve* is the desired in-room magnitude response with the *DDRC-88D* processor performing digital room correction.

6.2.1 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](#) on page 36.

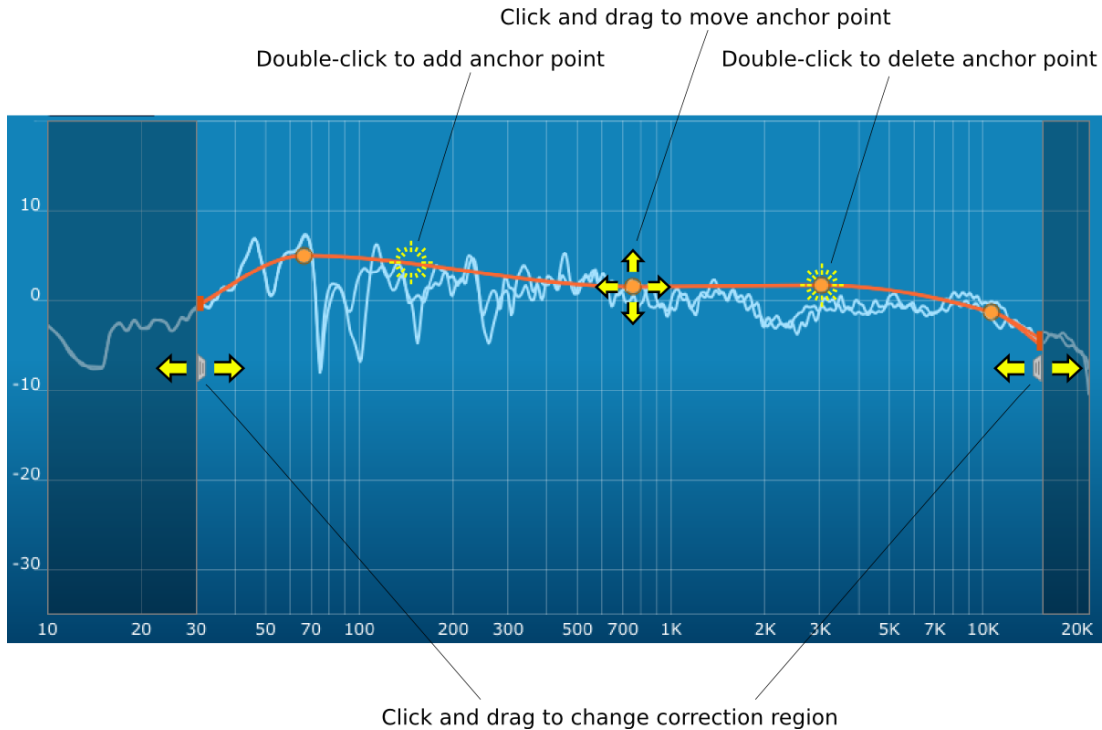
6.2.2 Editing the target curve

You can edit the target curve to produce any desired magnitude response. 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 magnitude response correction. You can adjust the frequency range for your system and preferences. 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 region of correction, 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 in [Working with graphs](#).

6.2.3 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 loudspeakers and depending on your listening habits. As a general rule, a home theater system should use bass management 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 left and right 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 above shows up on only one side, you can try unlinking channels and making separate adjustments.

6.2.4 Saving and loading target curves

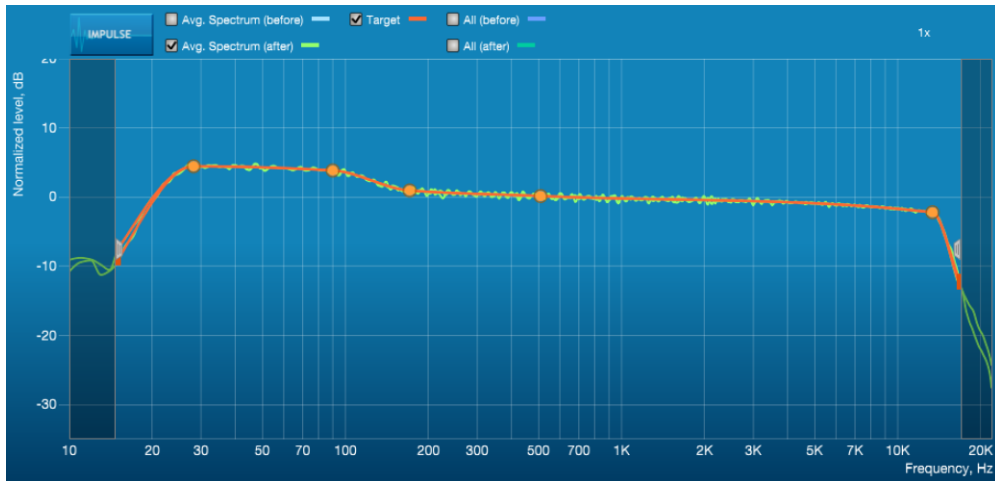
To allow you to experiment with different target curves, you can save a target curve to a file and reload it at a later time. Click on the **Save Target** button to save the target curve of the currently displayed channel or group of channels.

To load a target curve, click on **Load Target**. The currently displayed channel or group of channels will have its target curve updated. (Loading a target will erase the current target curve, so be sure to save it first if needed.)

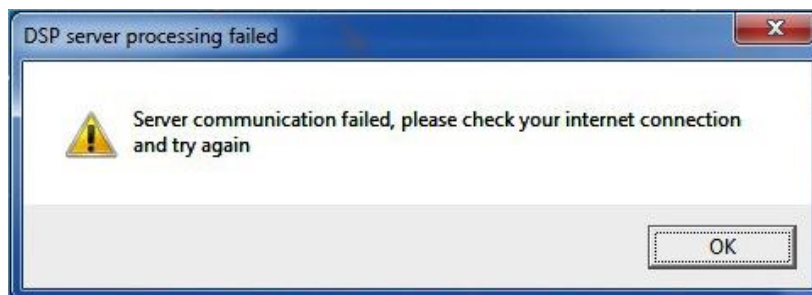
6.3 GENERATING CORRECTION FILTERS

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

The status bar will update as the algorithm progresses. The entire algorithm may take some time to complete, 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.)



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:



Once the filters are generated, click the **Proceed** button.

6.4 LOADING FILTER SETS

The **Export** tab initially shows four empty “slots” for filter sets (a filter set is one filter for every 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 (in this example labeled “HT 1 Jan 2016”) and drop it onto an empty slot (*).
- To remove a filter set, click on its name (oriented vertically), drag it from the slot and drop it on the trashcan icon at the top right.



If you are running the plugin in enhanced/bass management mode, you must load the filters into the same slot as the preset selected when running the Dirac Live calibration measurements.



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 screenshot shows the software interface for miniDSP Ltd - DDRG-88BM. At the top, there is a filter set box labeled "HT 1 Jan 2016", a "Filter" toggle switch set to "On", and an "Output volume" slider set to "-6.0 dB". To the right is a trashcan icon. Below these controls is a table with 8 channels and 4 slots.

Channel	Slot 1	Slot 2	Slot 3	Slot 4
Channel #1	Left			
Channel #2	Right			
Channel #3	Subwoofer			
Channel #4	Center			
Channel #5	Surround ...			
Channel #6	Surround ...			
Channel #7	Rear Left			
Channel #8	Rear Right			

The two main controls on this tab are:

Filter

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

Output volume

Move the slider to adjust the master volume of the processor. Output volume can also be adjusted by the front panel control knob or an infrared remote control.

7 USING THE DDRC-88D AUDIO PROCESSOR

Once the desired correction filters have been downloaded into the *DDRC-88D* audio processor, the computer is not required and can be disconnected.

7.1 CONFIGURING SOURCE EQUIPMENT

Dirac Live aligns the gain and delay of all channels. Any settings to this effect in the source equipment should therefore be disabled.

7.2 FRONT PANEL

The front panel and/or an infrared remote can be used to control:

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



STATUS INDICATORS

The current status of the *DDRC-88D* is indicated by a set of LEDs:

Dirac Live Dirac Live® filtering is enabled. This LED also blinks when the unit is muted.

Filter Set Indicates the currently selected filter set (1 through 4).

FRONT PANEL CONTROLS

The *DDRC-88D* audio processor uses a minimalist physical control design with a single control knob.

To change the volume

Rotate the control knob clockwise to increase the volume, and counter-clockwise to decrease it.

To change the selected filter set

Briefly press the control knob. The current **Filter Set** LED blinks quickly. Rotate the control knob until the desired **Filter Set** LED is blinking. Press the control knob again, and the selected LED will remain steady.

7.3 INFRARED REMOTE CONTROL

Once configuration is complete, the computer is not required and can be disconnected. An infrared remote can be used to control volume, mute, preset selection, and to turn Dirac Live processing on and.

7.3.1 miniDSP remote

By default, the DDRC-88D recognizes commands from the optional miniDSP remote:

Source

Has no effect with the DDRC-88D.

1, 2, 3, 4

Switches to the selected preset. Note that it takes a few seconds for the preset selection to complete, while the processor loads the new filters from its flash memory into the DSP.

[Bell]

Enables or disables Dirac Live filtering. Dirac Live filtering will be effective only on presets for which Dirac Live filters have been loaded.

Vol

Reduce or increase the volume.

Mute

Mutes and unmutes audio output.



7.3.2 Apple remote

The DDRC-88D also recognizes the Apple Remote, with the key assignments shown at right.

The commands **Config Inc** and **Config Dec** change the selected configuration preset up or down. For example, if the currently selected preset is **1**, pressing **Config Inc** changes it to **2**. Note that it takes a few seconds for the preset selection to complete, while the processor loads the new filters from its flash memory into the DSP.

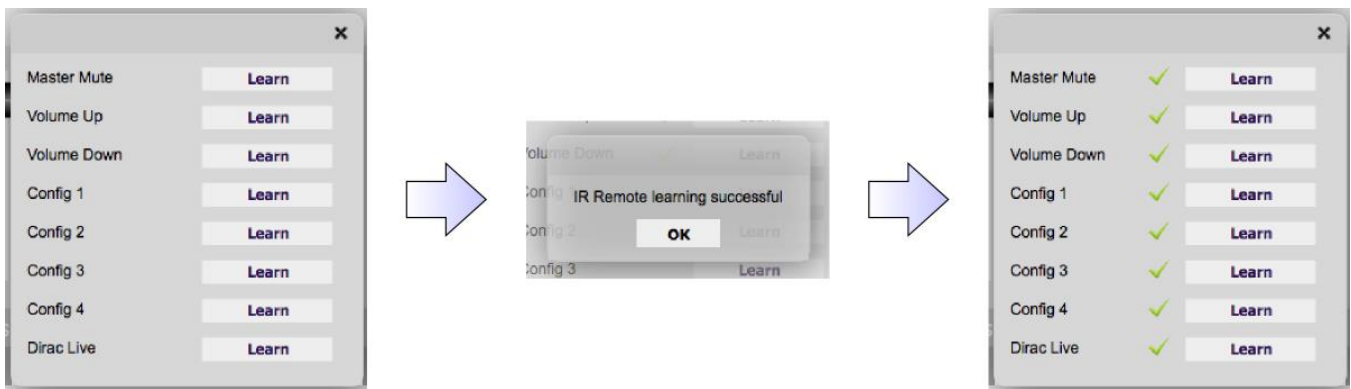


7.3.3 Programming a third-party remote

Alternatively, the DDRC-88D can “learn” the control codes of your current remote if it supports one of the following remote control codes:

- NEC
- Sony
- Philips RC6

To initiate the learning process, run the DDRC-88BM plugin and click **Connect**. Drop down the IR Remote menu and select **IR learning**. Click on the **Learn** button for an operation, and then press the desired button on the remote control. If the code is accepted, a dialog will appear to show that the code was recognized. Click OK, then a green tick will appear next to the command.



If the processor does not recognize the remote control code, then it will time out and display a message saying that IR learning failed.

Once programmed, check that the programmed buttons perform the expected function. Note that miniDSP remote and Apple remote commands will not be recognized once a different remote code has been learned.



- To "unlearn" a command, press the **Learn** button and wait for the plugin to time out.
- To restore the default miniDSP and Apple remote commands, “unlearn” all commands.

8 ENHANCED/BASS MANAGEMENT MODE

In enhanced/bass management mode, the DDRC-88BM plugin has a powerful set of additional signal processing functions. This section acts as a reference for these functions. While the following applications notes are written for the DDRC-88A (analog I/O version), they also apply to the DDRC-88D:

- [Implementing active speakers with the DDRC-88BM](#)
- [Optimizing multiple subwoofers with the DDRC-88BM and Multi-Sub Optimizer](#)
- [Bass management with the DDRC-88BM](#)

Note that acoustic measurement capability will be required to properly configure and use the DDRC-88BM plugin – see the [Acoustic Measurement](#) section of the application notes library on our website for details.

8.1 PLUGIN USER INTERFACE – ENHANCED/BASS MANAGEMENT MODE

Upon starting the plugin, the main user interface appears. The screenshot below shows the user interface with the key areas highlighted.



You cannot run the **DDRC-88BM plugin** at the same time as **Dirac Live Calibration Tool for miniDSP**. Attempting to do so may result in odd behavior. Ensure that you quit one before starting the other.

At the top of the screen are a set of menus and buttons, which are described on following pages. Below that is a set of tabs, which select the processing to configure. These tabs correspond to the sections of the signal flow diagram described on the next page. In the main part of the screen is the display for each of the tabs.

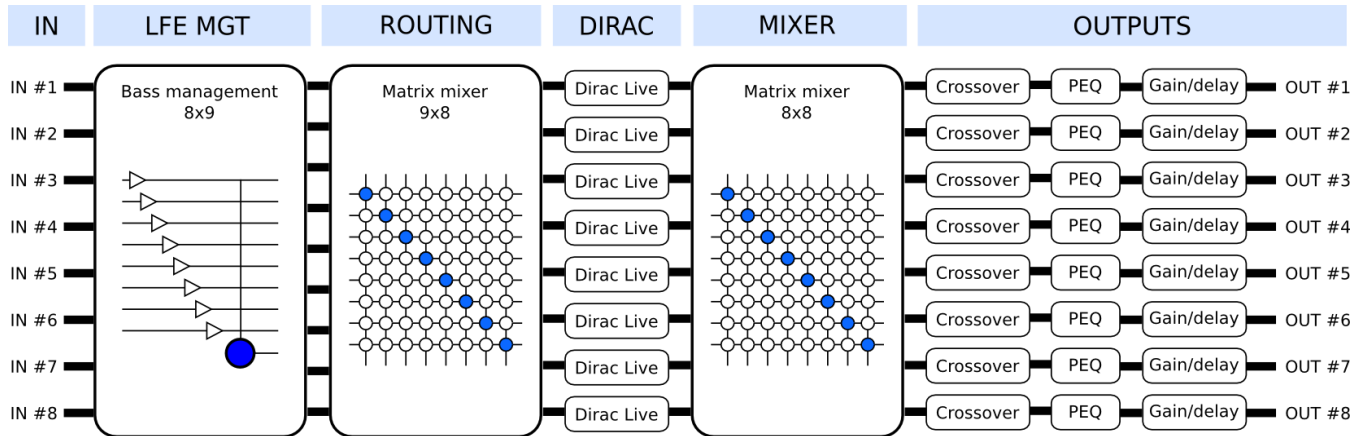
The screenshot shows the DDRC-88 2.1 software interface. Key areas are highlighted as follows:

- Main menu:** A green box highlights the top menu bar containing 'File', 'Restore', 'Help', and 'IR Remote'.
- Configuration selection:** A blue box highlights the 'Configuration Selection' area with tabs for 'Config 1', 'Config 2', 'Config 3', and 'Config 4'.
- Selection tab:** A red box highlights the 'Outputs' tab in the bottom navigation bar.
- Master control:** A purple box highlights the top right area containing 'Connect', 'Mute', 'IP address', 'Auto', and 'Master Volume'.
- Main configuration window:** An orange box highlights the main display area showing eight speaker channels (FL Out, FR Out, SUB Out, CTR Out, SL Out, SR Out, RL Out, RR Out). Each channel has a vertical frequency response graph, a gain slider (set to 0.0), a 'PEQ Xover' button, and an 'Invert Mute' button.

Once the DDRC-88D has been configured, the plugin is no longer required, as source and preset selection can be done with the front panel or a remote control (see pages 39 and 40). If desired, however, the user interface can remain online during use for real-time (“live”) adjustment of the settings.

8.2 SIGNAL FLOW

The signal flow diagram of the DDRC-88BM when in enhanced/bass management mode is shown in the diagram below.



LFE Mgt

The eight input channels are each routed to a low pass filter and summed to provide the subwoofer signal. In addition, each channel is optionally high pass filtered.

Routing (pre-Dirac)

The eight high pass filtered channels and the subwoofer signal are routed into a 9-into-8 matrix mixer. Each input signal to this block can be mixed at any level to each output.

Dirac

The DRC block implements the Dirac Live room correction algorithm. Dirac Live is configured with the separate program **Dirac Live Calibration Tool for miniDSP**. This tab will show the level and delay that Dirac Live has assigned to each channel. See page 19.

Mixer (post-Dirac)

A second matrix mixer (8-into-8) routes the Dirac Live output signals to the output channels. This enables arbitrary mixing of room-corrected signals to output channels.

Outputs

Each output channel has a full suite of miniDSP’s audio processing functionality, including parametric EQ, high/low (crossover) filters, gain and delay.

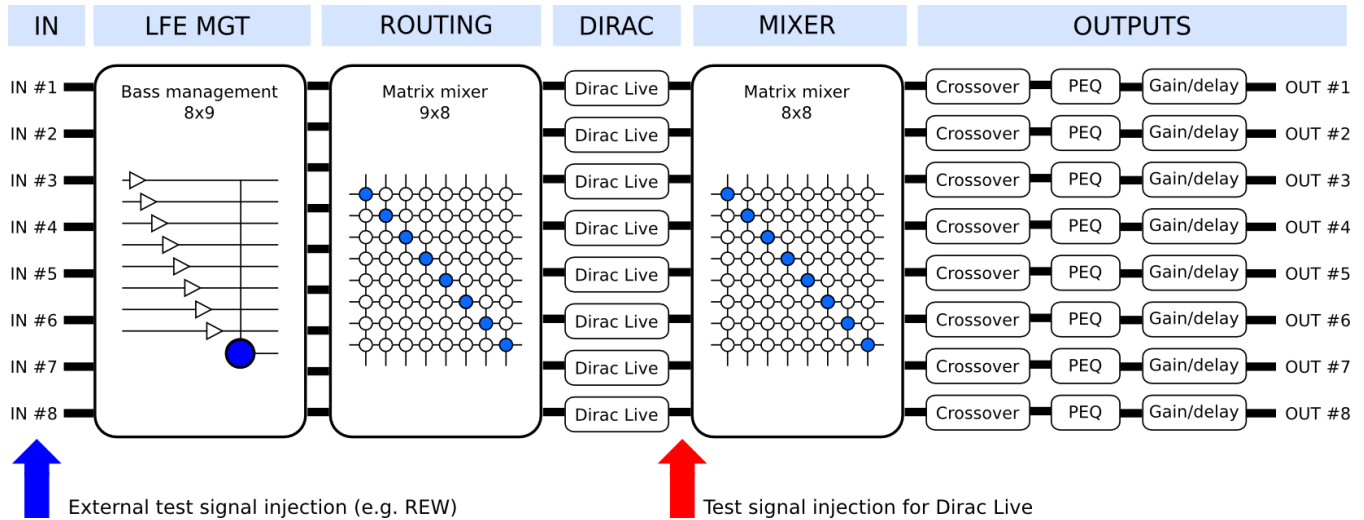
8.3 PLUGIN DESIGN/CONFIGURATION GUIDE

The DDRC-88BM plugin is an extremely powerful and flexible tool. To understand how to utilize it effectively, it is important to understand how test/measurement signals are injected into the signal processing flow.

The diagram below shows the signal flow diagram with a red arrow at the point where the Dirac Live test signal is injected. This occurs on the **Measurements** tab of Dirac Live Calibration Tool (DLCT). Thus, the signal received at the microphone will include the effects of the Mixer, the output channel processing, the speaker, and the room. Dirac Live will calibrate for the effect of all of these.

Shown on the diagram in blue is where the test signal is injected if using an external measurement program (such as REW). In this case, the test signal passes through all of the processing blocks, including Dirac Live. Therefore:

- If using an external test signal to set up the output channels in applications like active speakers, the Dirac Live filters on that preset must be unloaded (dragged onto the trashcan icon).
- If using an external test signal to accurately set up bass management, this must be done after Dirac Live calibration, and on the same preset.



In summary, the best general approach to configuring the DDRC-88D with the enhanced/bass management functionality is as follows:

1. Use the plugin to configure the output channels. In designing an active speaker, this may mean locating the speaker to minimize the effect of reflections.
2. With the speakers and subwoofer(s) positioned in their final location, perform a Dirac Live calibration (as described in Sections 5 and 6).
3. Use the plugin to configure bass / management (if required).

8.4 CONNECTING AND CONFIGURATIONS

The DDRC-88BM plugin can communicate with the processor using either USB or over the network. For USB communication, connect the DDRC-88D to a USB 2.0 port on your computer. Then click on the Connect button:

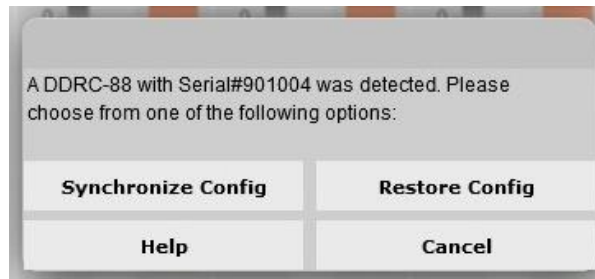


For networked communication with the processor, a miniDSP [Wi-DG Wifi/Ethernet to USB bridge](#) must be used together with the **IP Address** and **Auto** fields. See the [Wi-DG User Manual](#) for details.

If connection is successful, the button changes to a green tick as shown above and the plugin is now online. When the plugin is online, any changes made in the DDRC-88BM plugin are immediately transferred to the processor and will be heard in the audio signal.

8.4.1 Connection options

The first time you connect, or if you have made any changes to any data in the user interface, the following dialog box will appear. It is recommended that the *first* time you connect, use **Restore Config** to ensure a known starting state. Thereafter, use **Synchronize Config**.



Synchronize Config

Download the data for the currently selected configuration into the DDRC-88D. Note that this applies only to data that can be changes in the DDRC-88BM plugin — Dirac Live filters are not changed by doing this. After downloading the configuration data, the plugin is online.

Synchronize and Upgrade

This is similar to Synchronize Config, but also upgrades the internal data of the DDRC-88D. This option may appear after downloading and installed an updated version of the plugin.

Restore Config

Restore the data in the currently selected configuration to the factory defaults. Note that this applies only to data that can be adjusted in the DDRC-88BM plugin — Dirac Live filters are not changed by doing this. When using this option, connected amplification should be muted or turned off until you have set the configuration to a working state. Configuration data will be lost, so if needed, ensure that you have saved the configuration to a file prior to using this option. After restoring, the plugin is online.

Help This option brings up a help screen explaining the options.

Cancel This option cancels the attempt to connect to the DDRC-88D. The plugin will remain offline.

8.4.2 More about configurations

The effect of changes made in the user interface falls into two categories:

The plugin is online

The user interface is “live” – that is, any changes made to the audio processing parameters in the user interface are downloaded immediately to the DDRC-88D. The effect of these changes will thus be audible as the changes are made.

The plugin is offline

Changes made to the audio processing parameters in the plugin user interface will be made locally only. The next time the plugin goes online, these parameters will be downloaded to the processor (as long as the **Synchronize Config** button is selected).



The configuration contained in the miniDSP hardware unit cannot be uploaded back to the computer. Therefore, you **must** save your configuration to a file if you wish to recover from any changes you make while offline.

8.4.3 Selecting a configuration

The current configuration is selected by one of the four buttons in the Configuration Selection area. By default, configuration 1 is selected:

Configuration Selection: **Config 1** Config 2 Config 3 Config 4

To switch to a different configuration, click on a different button. There are two cases:

The plugin is online

Audio processing will switch to the parameters of the selected configuration. If, however, parameters of the selected configuration have been changed since the last time that configuration was synchronized, then a dialog will appear asking you if you want to synchronize.

The plugin is offline

The user interface will update to show the parameters of the newly selected configuration. If this configuration is changed in the user interface, it will be downloaded to the processor the next time it is synchronized.

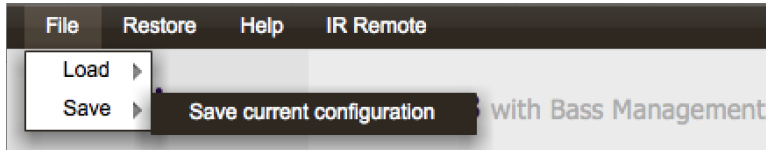


We recommend that all configurations be selected and checked/initialized prior to passing audio through the DDRC-88D, to ensure that audio processing parameters are in a known state.

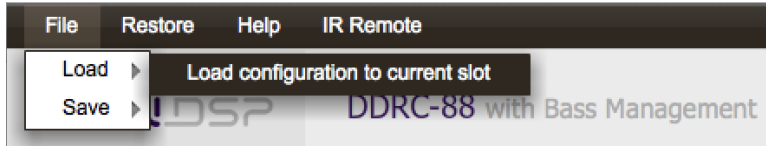
8.4.4 Saving and loading configurations

Configurations can be saved to and loaded from files. Each configuration is stored in a separate file. It is strongly recommended that each configuration that you program into the DDRC-88BM be saved to a file, to ensure that the data is not lost if the DDRC-88D is inadvertently reset. A configuration file stores all of the DDRC-88BM audio processing parameters except for the master volume setting.

To save the currently selected configuration to a file, drop down the File menu, then select **Save** and then **Save current configuration**. In the file box, select a location and name of the file, and save it.



To load a configuration, first select the configuration preset that you wish to load the parameters into. Then drop down the File menu, select **Load**, and then **Load configuration to current slot**.



If the plugin is online, the new configuration data will be downloaded to the DDRC-88D immediately. If the plugin is offline, the data will be loaded into the user interface only, and will be downloaded to the DDRC-88D the next time it is synchronized.



To copy a configuration from one preset to another, simply save the configuration to a file, then select a different preset and load the file.



A stored configuration contains the data for the DDRC-88BM plugin **only**. It does not contain a Dirac Live filter set. To change the Dirac Live filters, use the **Export** tab of the **Dirac Live Calibration Tool for miniDSP**.

8.4.5 Relationship with Dirac Live

Each configuration preset in the DDRC-88BM plugin corresponds to the same-numbered filter set configured in Dirac Live Calibration Tool. For example, if the remote control or front panel is used to select preset 3, then both DDRC-88BM configuration 3 and Dirac Live filter set 3 are loaded for audio processing.

The stored configuration file contains the data for the DDRC-88BM plugin only. The Dirac Live filters must be loaded separately using **Dirac Live Calibration Tool for miniDSP**.

8.4.6 Restoring to defaults

Configurations can be reset to the factory defaults from the **Restore** menu. There are two options:

Factory Default

Reset all four configuration presets to the factory default settings.

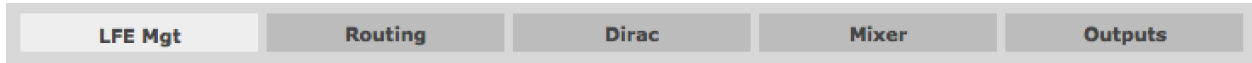
Current Configuration Only

Reset only the currently selected configuration preset to the factory default settings.

If the plugin is online, the configuration data on the processor (all or just one configuration, as selected) will also be reset to factory defaults. Otherwise, the reset will take place in the user interface only, and the new configuration data will be downloaded to the processor next time it is synchronized.

8.5 SIGNAL PROCESSING TABS

In enhanced/bass management mode, the row of five selection tabs is fully enabled:



Each tab selects the information/control display for the key blocks shown in the signal flow diagram on the previous page. Each is described in detail in following sections, except for the **Dirac** tab which is described on page 19.

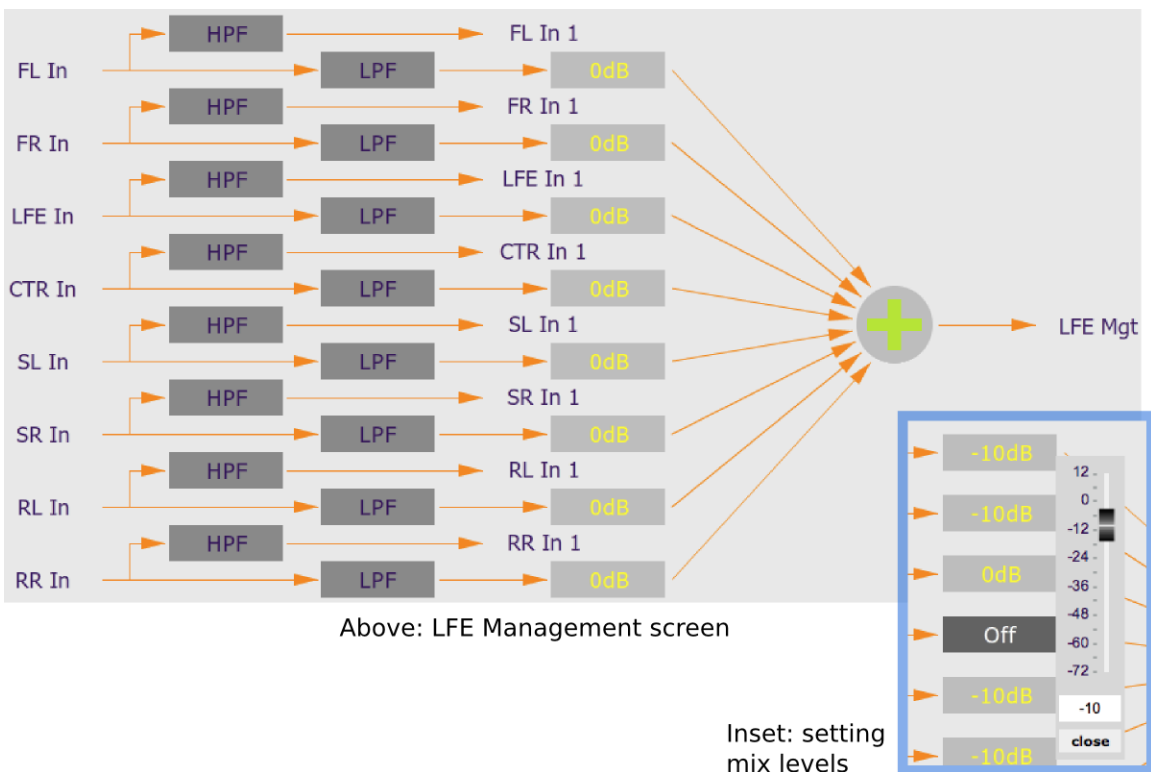
Note that the tabs are usually set up from right to left – that is, the output channels are configured, then Dirac Live calibration is performed, then the bass management is set up.

8.6 LFE MGT

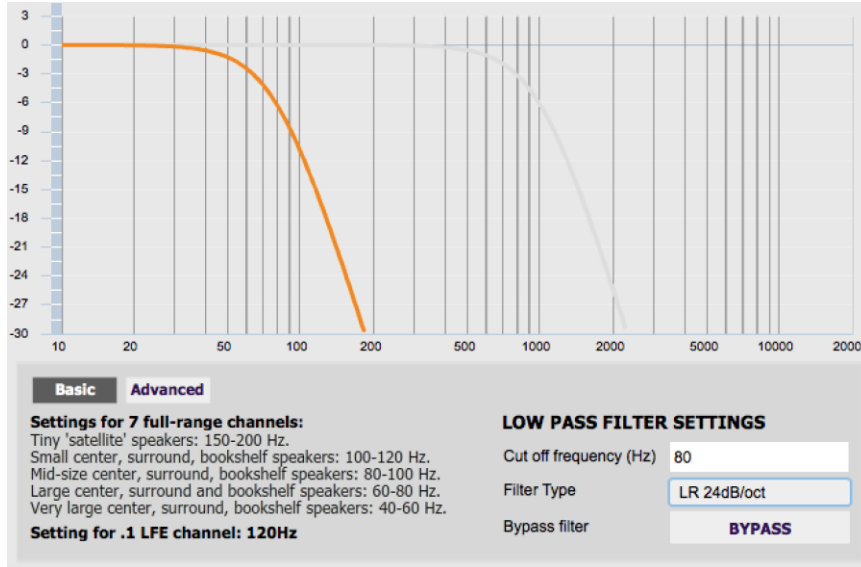
When movies are mixed for the cinema, each speaker is specified as a full bandwidth channel—that is, 20 Hz to 20 kHz, although 40 Hz to 18 kHz for the speakers is considered acceptable in cinema and the mixing studio (see the Grammy paper “[Recommendations For Surround Sound Production](#)”). The Low Frequency Effects (LFE) channel is used for high-level low-frequency content and is fed to dedicated subwoofers in order to avoid overloading the speakers.

In a typical home theatre system, some or all of the speakers are not capable of reproducing frequencies down to 40 Hz, let alone 20 Hz. The solution is *bass management*, where low frequencies are filtered out from the speaker channels and sent to the subwoofer instead.

This is the LFE Mgt screen:

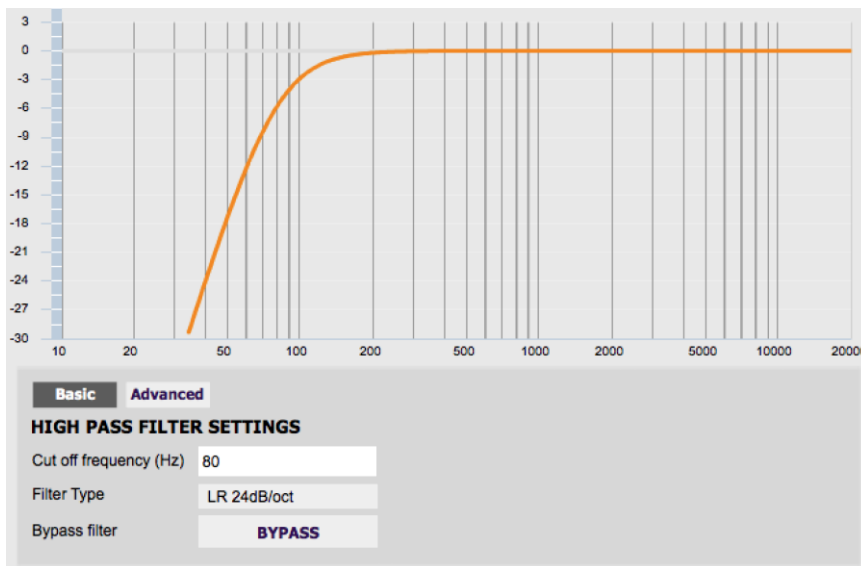


To generate the subwoofer (“LFE Mgt”) signal, the input channels are low pass filtered in the **LPF** blocks, and then summed together. The controls for each **LPF** block are similar to those seen in the **Xover** blocks in the output channels, but only have a single low pass filter and are limited to a maximum slope of 24 dB/octave.



The gain control blocks (labelled with the attenuation, such as "0 dB" or "-10 dB") set the levels at which the low pass filtered signals from each channel are mixed together. To set the gain, right-click on the box and use the slider, or type directly into the entry box. Then click **Close**. To turn off low frequency mixing for a channel, simply click on the gain control box to set it to **Off**.

The **HPF** blocks are used to create matching high pass filters for each channel. The high-pass filtered signals are passed through to the **Routing** tab.



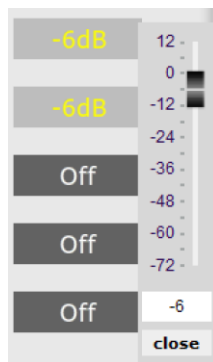
8.7 ROUTING

This tab mixes or routes the input channels and the LFE Mgt signal, and send them to the Dirac Live processing algorithm. The input channels are labeled along the left, and the output channels are labeled along the top. There are 9 input channels and 8 output channels. Here is the default setting:

	Dirac 1	Dirac 2	Dirac 3	Dirac 4	Dirac 5	Dirac 6	Dirac 7	Dirac 8
FL In 1	0dB	Off	Off	Off	Off	Off	Off	Off
FR In 1	Off	0dB	Off	Off	Off	Off	Off	Off
LFE In 1	Off	Off	0dB	Off	Off	Off	Off	Off
CTR In 1	Off	Off	Off	0dB	Off	Off	Off	Off
SL In 1	Off	Off	Off	Off	0dB	Off	Off	Off
SR In 1	Off	Off	Off	Off	Off	0dB	Off	Off
RL In 1	Off	Off	Off	Off	Off	Off	0dB	Off
RR In 1	Off	Off	Off	Off	Off	Off	Off	0dB
LFE Mgt	Off	Off	Off	Off	Off	Off	Off	Off

At each crosspoint of the matrix, the input channel (labels along the left) is mixed into the corresponding output channel (labels along the top) if the lettering is highlighted in yellow. The crosspoint is turned on and off by clicking on it. Any number of input channels can be mixed to each output channel.

At each crosspoint, the gain of the signal being mixed can be adjusted to a value between -72 and +12 dB. To adjust the gain, right-click on the cross-point and a gain control will appear. Adjust the gain with the slider, or by typing in the value directly. This screenshot shows the gain control, with two input channels mixed to one output channel, each at -6 dB:



Note: To rename an input channel, click on its label and type in a new name (maximum of eight characters).

8.8 MIXER

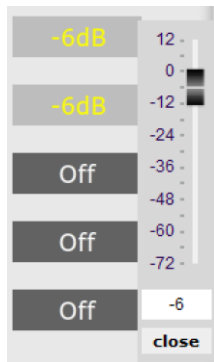
This tab mixes the eight signals from the Dirac Live processing and routes them to the individual output channels. The input channels are labeled along the left and the output channels are labeled along the top.

This is the default setting:

	FL Out	FR Out	SUB Out	CTR Out	SL Out	SR Out	RL Out	RR Out
Dirac 1	0dB	Off	Off	Off	Off	Off	Off	Off
Dirac 2	Off	0dB	Off	Off	Off	Off	Off	Off
Dirac 3	Off	Off	0dB	Off	Off	Off	Off	Off
Dirac 4	Off	Off	Off	0dB	Off	Off	Off	Off
Dirac 5	Off	Off	Off	Off	0dB	Off	Off	Off
Dirac 6	Off	Off	Off	Off	Off	0dB	Off	Off
Dirac 7	Off	Off	Off	Off	Off	Off	0dB	Off
Dirac 8	Off	Off	Off	Off	Off	Off	Off	0dB

In a typical straightforward surround sound application, each channel from Dirac Live is routed directly to each output channel. In more sophisticated configurations, each output from Dirac Live might be routed to multiple output channels to implement active loudspeakers, or for multiple subwoofers.

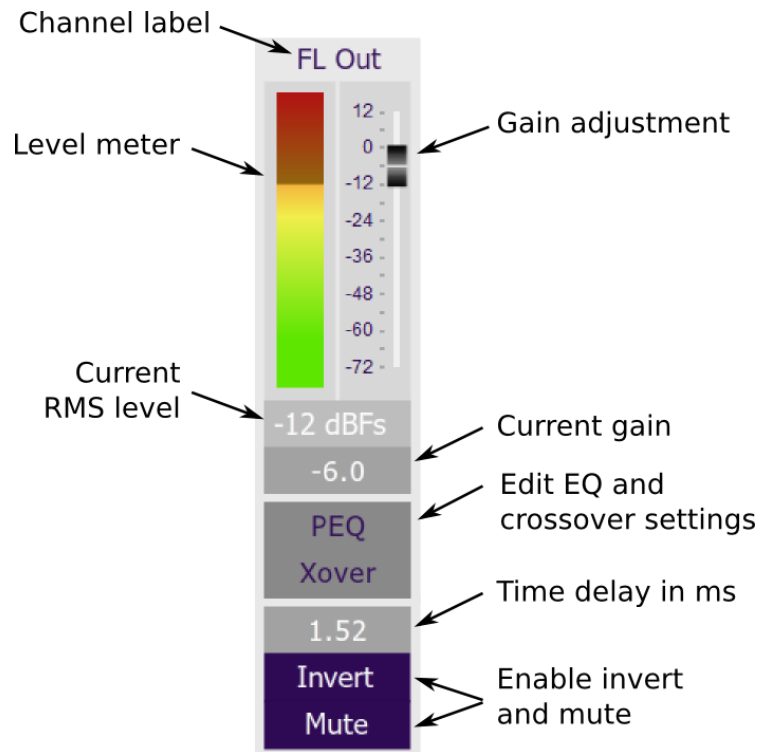
The gain of the signal being mixed can be adjusted at each crosspoint to a value between -72 and +12 dB.



Note: To rename an output channel, use the **Outputs** tab.

8.9 OUTPUTS

The **Outputs** tab provides full control over each output channel. Each channel has a “strip” of controls:



8.9.1 Channel label

The name of each output channel is shown at the top of the channel strip. To rename a channel, click on the channel label and type a new name (up to eight characters).

8.9.2 Gain control and level monitoring

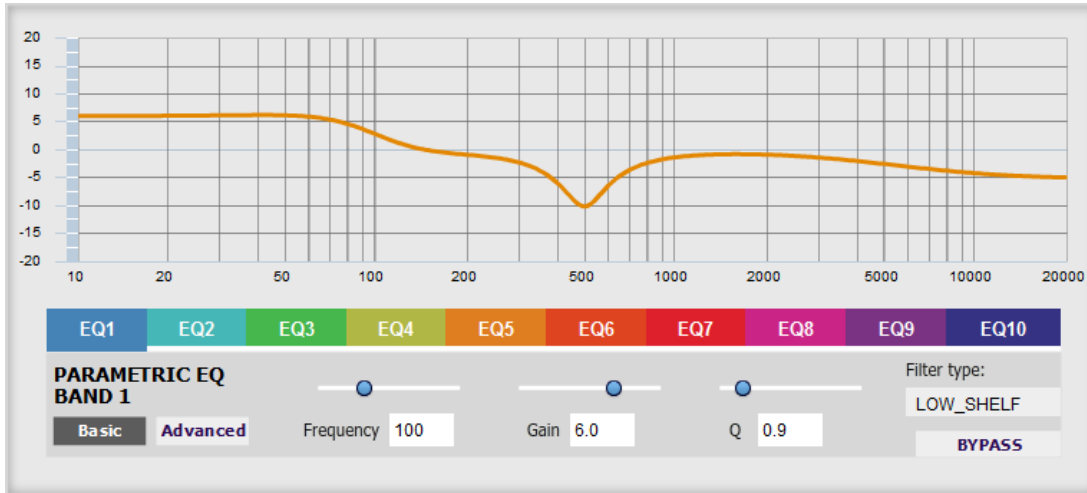
The gain of each channel can be adjusted by moving the Gain Adjustment slider, or by typing the desired gain into the Current Gain text box. The maximum gain setting is 12 dB, and the minimum gain setting is -72 dB. (0 dB, the default, is unity gain or no change in level.)

The signal level on each output channel displays in two locations: on the bar-graph meter, and as a numeric value (in dB relative to full scale) in the RMS Level box. The RMS level displays only when the plugin is online.

The level meters are useful in many situations. For example, when adding filters with boost, monitor the level meters with typical signals and maximum levels to ensure that there is no clipping. The meters can also be used during normal operation to monitor for or to help locate level or gain structure problems.

8.9.3 Parametric EQ

Parametric equalization (PEQ) is a flexible type of equalization filter. It can be used to correct for errors in loudspeaker output, to compensate for acoustic room effects, and to tailor the overall system response for best sound. Click on the PEQ button to open the parametric equalizer settings window:



In the center of the window is a frequency response graph that illustrates the combined response of all enabled parametric filters on that channel. The screenshot above shows a response curve created with a low-shelf boost filter at 100 Hz, a dip at 500 Hz, and a high-shelf cut filter at 5000 Hz.

There are ten filters per channel, each of which is displayed by clicking on the buttons **EQ1**, **EQ2**, and so on. Each filter can be set to one of four types:

- PEAK** Create a dip or a peak in the frequency response.
- LOW_SHELF** Reduce or increase part of the frequency spectrum *below* a given frequency.
- HIGH_SHELF** Reduce or increase part of the frequency spectrum *above* a given frequency.
- SUB_EQ** Create a dip or a peak in the frequency response at low frequencies (10 to 50 Hz). This filter type is similar to PEAK but gives more accurate results for low frequencies. Note that activating any SUB_EQ filter reduces the number of available filters on that channel from ten to nine.

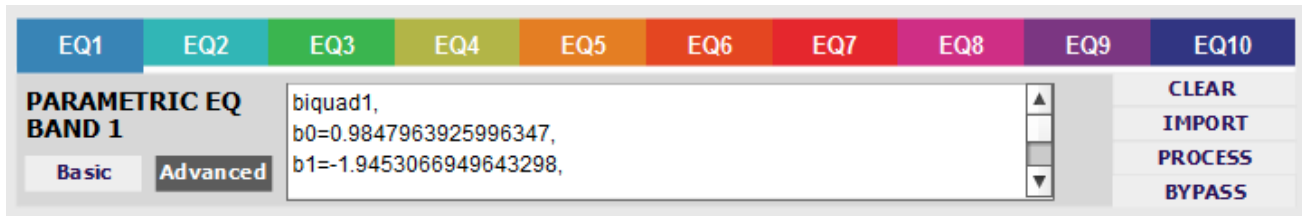
Each filter has three parameters that control its location and shape. These parameters can be entered directly as numerical values, or by using the sliders:

- Frequency** For the PEAK and SUB_EQ filter types, this is the center frequency of the peak or dip. For the HIGH_SHELF and LOW_SHELF filter types, this is the frequency at which the gain is half of the set value.
- Gain** For the PEAK and SUB_EQ filter types, this is the gain in dB at the center frequency. For the HIGH_SHELF and LOW_SHELF filter types, this is the gain in dB reached at high or low frequencies respectively.

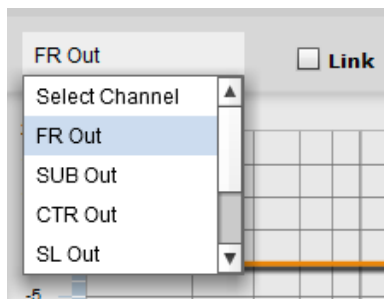
Q controls the “sharpness” of the filter. For the PEAK and SUB_EQ filter types, lower Q gives a shallower peak or dip, while higher Q gives a narrower peak or dip. For the HIGH_SHELF and LOW_SHELF filter types, Q controls how quickly the filter transitions from no gain to maximum gain.

To disable or enable a filter, click on the **Bypass** button. A filter will also have no effect if its gain is set to 0.0.

Other filter types can be created by switching to **Advanced** mode. In this mode, the coefficients of each filter “biquad” are entered individually. The coefficients will need to be calculated by a filter design program. A useful spreadsheet for a number of filter types is available on the miniDSP.com website – see the application note [Advanced Biquad Programming](#).

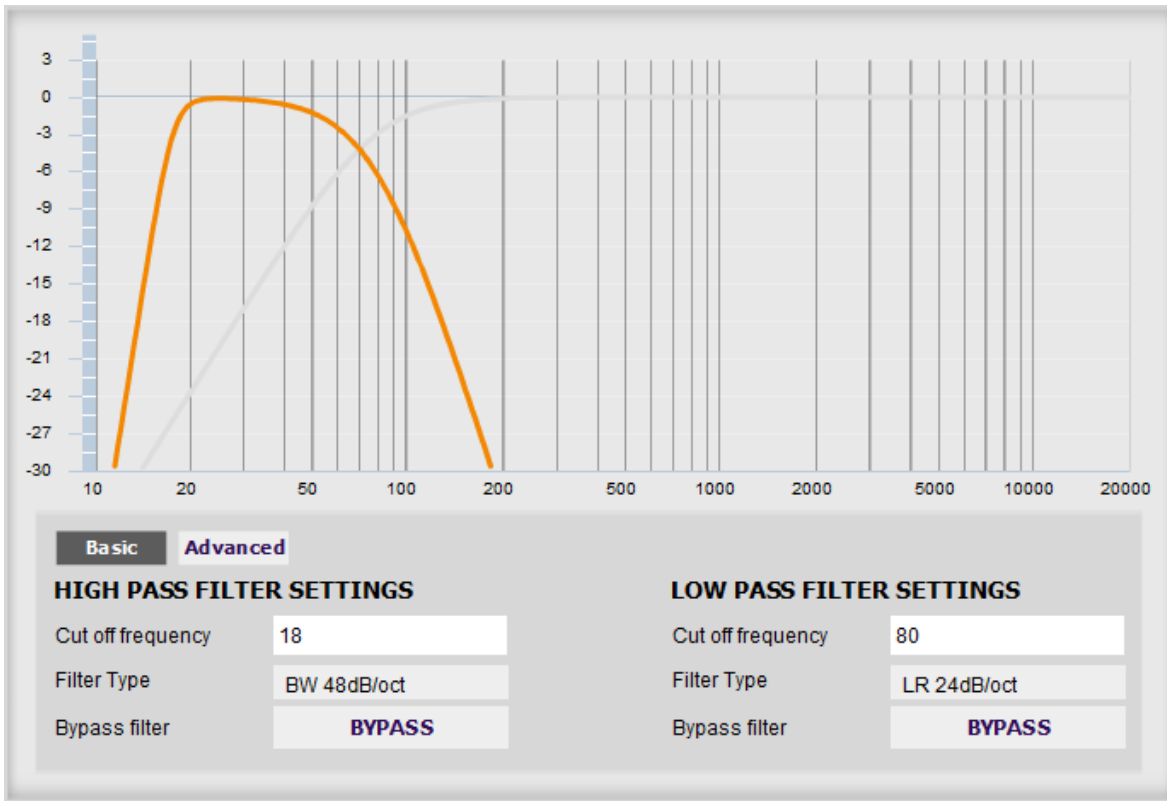


Each channel can be linked to one other channel. When a channel is linked to another, the PEQ settings of that channel are mirrored to the other. Typically, the corresponding left and right channels are linked: front left and right, surround left and right, and rear surround left and right. To link a channel, select the other channel from the drop-down menu at the top left of the PEQ screen, and click the Link checkbox.



8.9.4 Crossover settings

Each output channel has independent high pass and low pass filters. Click on the **Xover** button to open the crossover settings window:



By default, the crossover filters are bypassed (disabled). Click on the **Bypass** button to enable and disable a crossover filter. There is one filter for high pass (low cut) and one for low pass (high cut). The above example shows a pair of filters for the subwoofer channel with an 18 Hz high pass filter and an 80 Hz low pass filter.

Each filter can be set to one of a range of filter types and slopes. The filter type determines the shape of the filter around the crossover point, and the filter slope (expressed in dB/octave) determines how steep the filter cutoff is. The available filter types and slopes are:

Butterworth (BW)

Available in 6, 12, 18, 24, 30, 36, 42, and 48 dB/octave, Butterworth crossover filters are 3 dB down at the cutoff frequency.

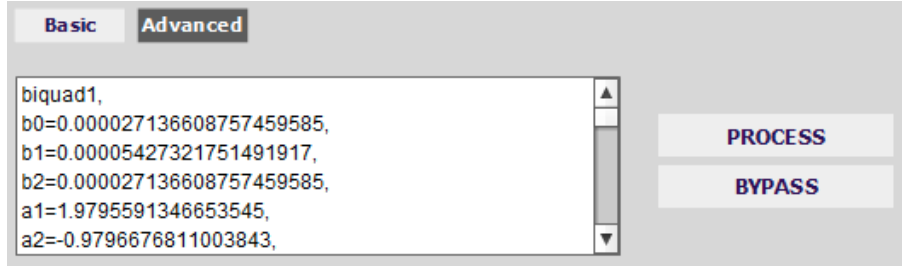
Linkwitz-Riley (LR)

Available in 12, 24, and 48 dB/octave, Linkwitz-Riley crossover filters are 6 dB down at the cutoff frequency.

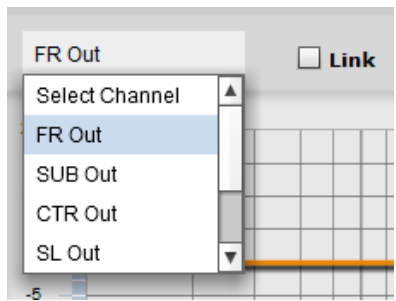
Bessel

Available in 12 dB/octave only, a Bessel filter gives a more gradual roll off through the crossover region.

For other types of filter and filter slopes, use **Advanced** mode. This mode allows you to enter the coefficients of eight biquads directly into the interface. The coefficients will need to be calculated by a filter design program. A useful spreadsheet for a number of filter types is available on the miniDSP.com website – see the application note [Advanced Biquad programming](#).

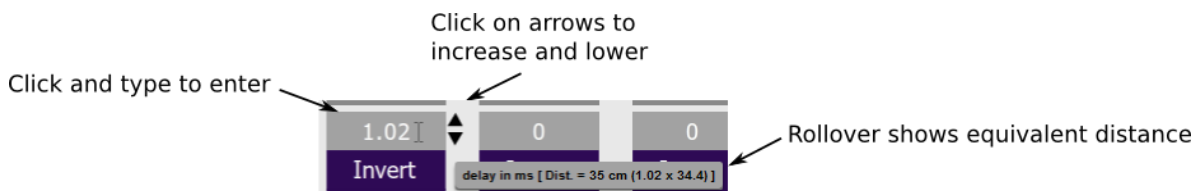


Each channel can be linked to one other channel. When a channel is linked to another, the crossover settings of that channel are mirrored to the other. Typically, the corresponding left and right channels are linked: front left and right, surround left and right, and rear surround left and right. To link a channel, select the other channel from the drop-down menu at the top left of the **Xover** screen, and click the Link checkbox.



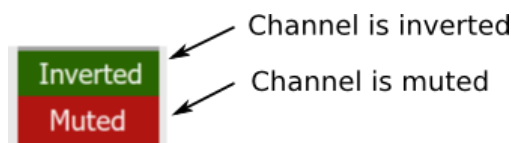
8.9.5 Time delay

A delay of up to 1000 ms (1 second) can be applied to each output channel. To set the delay, click in the delay entry box for a channel. The delay value can be entered numerically, and the up and down arrows can be used to change the delay in small (0.02 ms) increments.



8.9.6 Invert and mute

Each channel can be inverted in polarity, and individually muted. When either of these options is selected, the display changes color and the label of the button reflects the current state.



9 ADDITIONAL INFORMATION

9.1 SPECIFICATIONS

Computer connectivity	Driverless USB 2.0 control interface for Windows and Mac OS X
Digital inputs	<p>4 x AES/EBU (8 channels) on DB-25 connector (Tascam pinout) OR 4 x S/PDIF (8 channels) on DB-25 connector.</p> <p>Asynchronous sample rate conversion on each input, sample rates from 32 to 192 kHz accepted.</p>
Digital outputs	<p>4 x AES/EBU (8 channels) on DB-25 connector (Tascam pinout) OR 4 x S/PDIF (8 channels) on DB-25 connector.</p> <p>If there is a signal on input channels 1 and 2, all output channels have asynchronous sample rate conversion applied to match that sample rate. Otherwise, all output channels operate at 48 kHz.</p>
Audio sample rate / Resolution	<p>Input/output resolution: 24-bit integer</p> <p>Sample rate: 48 kHz</p>
Audio processing	32-bit floating-point processor
Storage/Presets	4 filter sets stored, selectable from front panel or IR remote
Infrared remote	<p>“Learning remote” capabilities (NEC, Philips, Sony, Apple)</p> <p>Controls master volume, mute, filter set selection, Dirac Live® filtering enable</p>
Power supply	5 VDC single supply @ 600mA, 2.1 mm center-positive
Dimensions (H x W x D)	41.5 x 214.5 x 206 mm

9.2 MCU FIRMWARE UPDATE

miniDSP may occasionally provide an update to the DDRC-88D MCU firmware to enable new features. To update the MCU firmware, first download **and install** the latest version of the **DDRC-88BM plugin** from the **User Downloads** section of the miniDSP website. Then follow the instructions below for your platform.

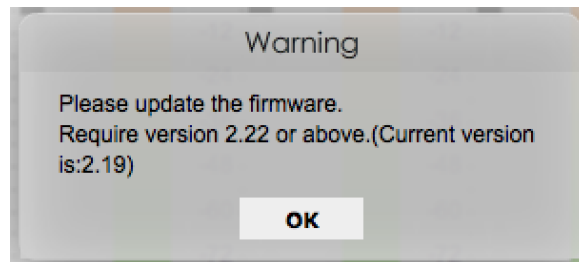
This procedure must also be performed when first using the DDRC-88BM plugin with a DDRC-88D that does not have a green label indicating “V2.2” or later. This applies to both basic mode and enhanced/bass management mode.



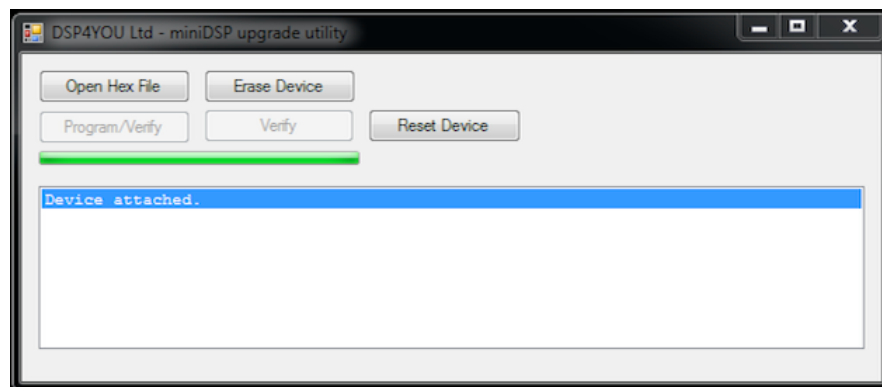
DO NOT DISCONNECT THE USB CABLE OR POWER FROM THE *DDRC-88D* WHILE FIRMWARE UPDATE IS IN PROGRESS. DOING SO MAY “BRICK” YOUR *DDRC-88D*.

9.2.1 Windows

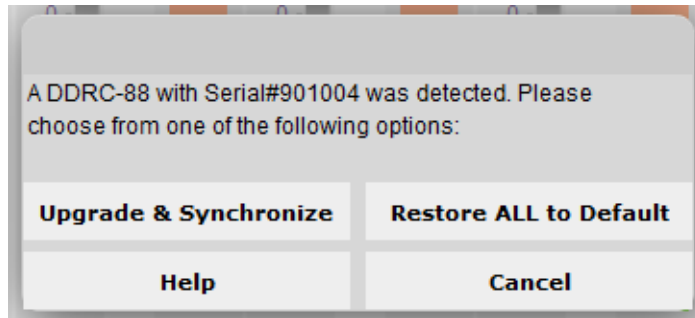
1. Download and install the latest version of the DDRC-88BM plugin.
2. Connect the DDRC-88D to your computer via USB and power it on.
3. Start the **DDRC-88BM plugin**.
4. If you have previously used the DDRC-88BM plugin and have configurations that need to be saved, save them to files now.
5. Click on the **Connect** button.
 - a. If your unit does **not** require requires a firmware upgrade, the connect button will change to a green tick and you do not have to proceed any further.
 - b. If your unit **does** require a firmware upgrade, a warning dialog will pop up. Click OK:



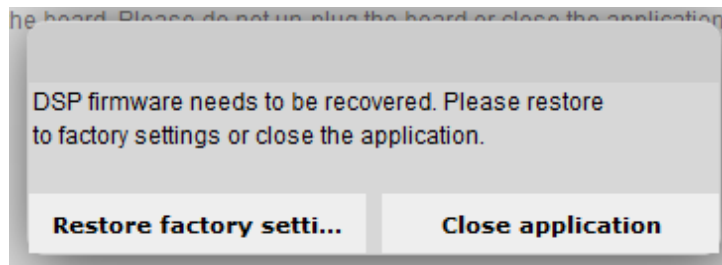
6. The DDRC-88D will automatically be put into boot loader mode and the miniDSP upgrade utility will start. The status area should display “Device attached”.



7. Click on the **Open Hex File** button and select the .hex file in the **firmware** folder of the download. It will have a name like **ENC_DDRC88BM_Ver2.22_SS.hex**.
8. Click on the **Program/Verify** button. The status bar will indicate progress. **Do not disconnect the USB cable or remove power** from the processor while this runs!
9. After the status indicates that the verify has completed successfully, click on the **Reset Device** button, and then quit the upgrade utility.
10. Return to the **DDRC-88BM** plugin. (If there is a dialog informing "Connection to DSP closed," click on **OK**.) Click on the **Connect** button.
11. You **may** see the following dialog. This can occur if you upgraded from an earlier DDRC-88D unit without bass management. (If this does not appear, skip the next step.)



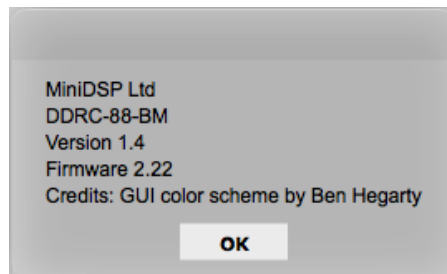
12. If the dialog appears, click on **Restore ALL to Default**. (If you click on **Upgrade & Synchronize**, the plugin will detect a mismatch and you will need to click **Restore factory settings** in the dialog shown below.)



13. When the plugin connects, the **Connect** button will change to a green tick.

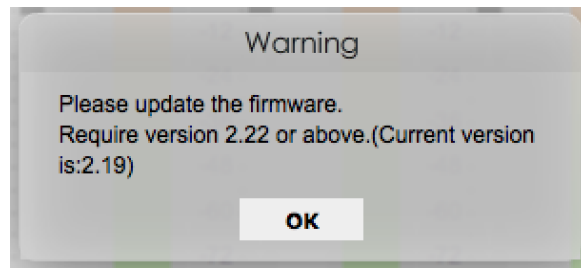


14. Drop down the Help menu and select **About...** to verify the new firmware version.

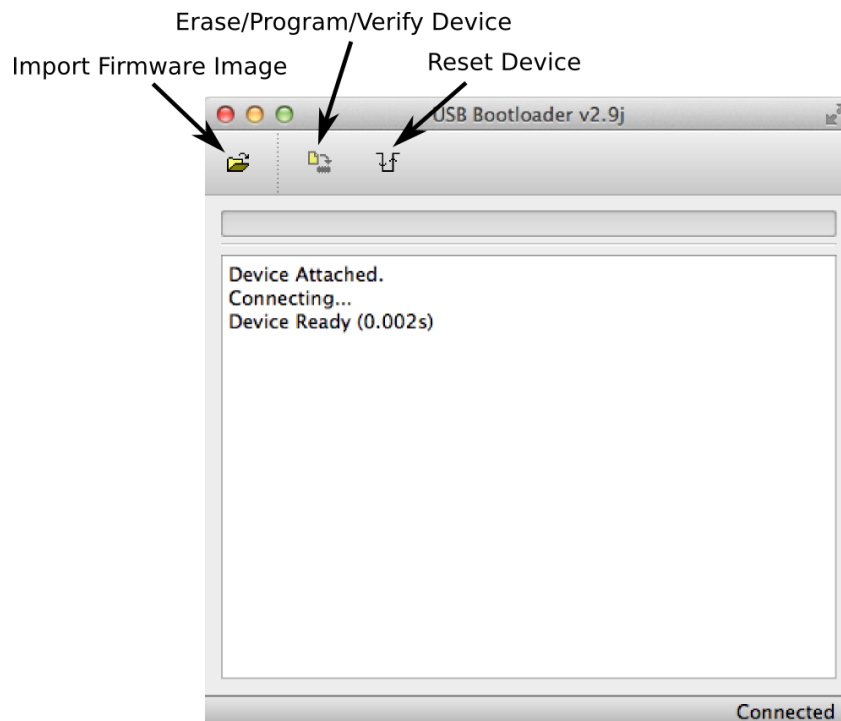


9.2.2 Mac OS X

1. Download and install the latest version of the DDRC-88BM plugin.
2. Connect the DDRC-88D to your computer via USB and power it on.
3. Start the **DDRC-88BM plugin**.
4. If you have previously used the DDRC-88BM plugin and have configurations that need to be saved, save them to files now.
5. Click on the **Connect** button.
 - a. If your unit does **not** require requires a firmware upgrade, the connect button will change to a green tick and you do not have to proceed any further.
 - c. If your unit **does** require a firmware upgrade, a warning dialog will pop up. Click OK:

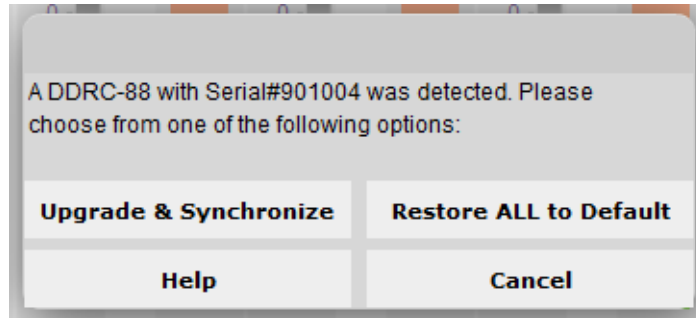


6. The DDRC-88D will be put into boot loader mode and the miniDSP bootloader program will start. The status area should display "Device attached" and then "Device Ready."

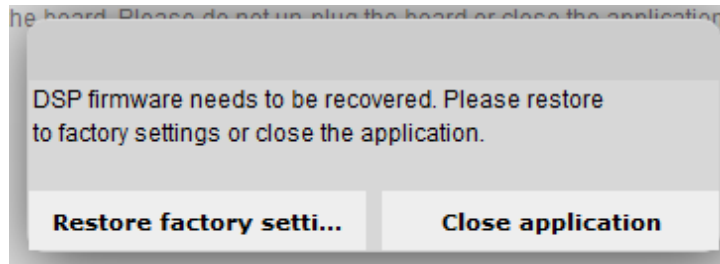


7. Click on the **Import Firmware Image** button and select the .hex file located in the **firmware** folder of the download. It will have a name like **ENC_DDRC88BM_Ver2.22_SS.hex**.

8. Click on the **Erase/Program/Verify Device** button. The status display will indicate progress. **Do not disconnect the USB cable or remove power** from the processor while this runs!
9. After the status indicates that the verify has completed successfully, click on the **Reset Device** button, and then quit the bootloader program.
10. Return to the **DDRC-88BM** plugin. (If there is a dialog informing "Connection to DSP closed," click on **OK**.) Click on the **Connect** button.
11. You **may** see the following dialog. This can occur if you upgraded from an earlier DDRC-88D unit without bass management. (If this does not appear, skip the next step.)



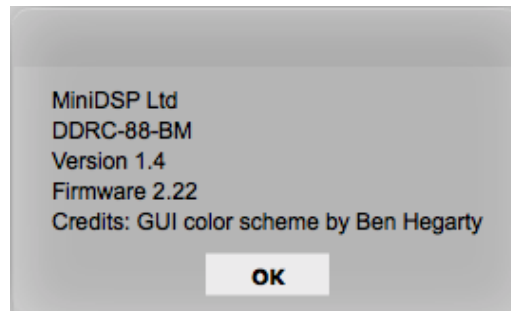
12. If the dialog appears, click on **Restore ALL to Default**. (If you click on **Upgrade & Synchronize**, the plugin will detect a mismatch and you will need to click **Restore factory settings** in the dialog shown below.)



13. When the plugin connects, the **Connect** button will change to a green tick.



14. Drop down the Help menu and select **About...** to verify the new firmware version.



9.3 ACTIVATING ENHANCED/BASS MANAGEMENT MODE

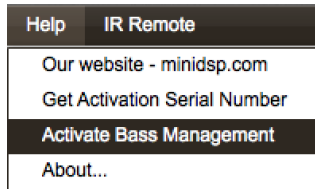
The following procedure converts a DDRC-88D from basic mode to enhanced/bass management mode. It only needs to be applied to a DDRC-88D that was purchased in basic mode, after later purchasing the plugin upgrade from the miniDSP website:

- <https://www.minidsp.com/products/dirac-series/ddrc-88bm>

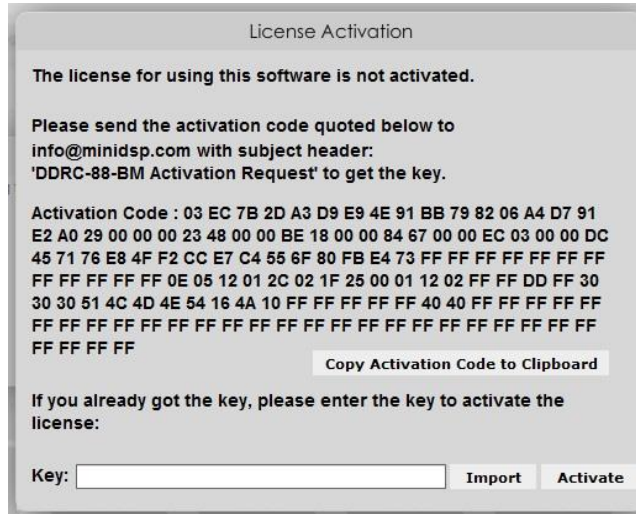


The DDRC-88D must be running the current firmware *before* doing this step. See Section 9.2 MCU Firmware update.

1. Download and install the latest version of the DDRC-88BM plugin from the miniDSP.com website.
2. Start the plugin and click the **Connect** button.
3. Drop down the Help menu and select “Activate Bass Management”.



4. The following screen will appear:



5. Click on the button “Copy Activation Code to Clipboard.”
6. Send an email message to info@minidsp.com with the Subject line “DDRC-88-BM Activation Request.” In the body of the email message, paste the activation **code**. miniDSP will respond in normal (Hong Kong) working hours with an activation **key** file (.txt file). (Please note that this is not an automated process.) The activation key file contains a key text string consisting of 128 pairs of letters separated by spaces (total 256 letters).
7. Click the “Import” button and select the received activation key file to import into the plugin. If successful, you will then see the normal connection dialog box (as on page 45).

9.4 TROUBLESHOOTING

The following table lists the most common causes of issues with the *DDRC-88D*. If following this table does not provide a solution, see [Obtaining Support](#).

DDRC-88BM plugin

1	Cannot install software	<ul style="list-style-type: none"> a. Confirm that you downloaded and installed the required frameworks first (see Software Installation).
2	Plugin running in background but not showing	<ul style="list-style-type: none"> a. The Adobe Air environment may need a network connection the first time you run a plugin. Close the plugin program, ensure that your computer has a network connection, and restart the plugin. b. The Adobe Air environment may require a version update. Download the latest version from http://get.adobe.com/air/.
3	Plugin cannot connect	<ul style="list-style-type: none"> a. Check that the USB cable to the DDRC-88D is firmly connected b. Reset the processor by power-cycling the unit.
4	No signal showing on Dirac Live input meters	<ul style="list-style-type: none"> a. Check the cabling from your source. b. Check that your source is playing audio and that it is not muted or have volume control turned down. c. Check that the plugin is synchronized with the hardware unit.
5	Low audio on outputs	<ul style="list-style-type: none"> a. Check all downstream cabling (DAC, amplification, speakers). b. Check that amplifiers are turned on and that any volume controls are turned up. c. Check that the input and output meters are showing signal. d. Check that master mute is not enabled. e. Check the master volume level. f. Check that your crossover frequencies are correct e.g. that you don't have high pass and low pass frequencies incorrectly set. g. Check that the matrix mixer is sending the correct inputs to the correct outputs.
6	Audio sounds distorted	<ul style="list-style-type: none"> a. Check the output meter and ensure that you are not overloading the outputs. If necessary, reduce the output gain and/or the amount of boost in the EQ blocks.
7	Audio is coming through the wrong outputs	<ul style="list-style-type: none"> a. Check downstream cabling (DAC, amplification, speakers). b. Check that you have correctly set up the matrix mixer to send the correct inputs to the correct outputs.
8	Cannot reload a configuration	<ul style="list-style-type: none"> a. Confirm the file format of your file (.xml). b. Confirm the version of the file.

Dirac Live Calibration Tool

1	The DDRC-88D doesn't appear in the Sound System tab	<ol style="list-style-type: none"> Check that the USB cable to the DDRC-88D is firmly connected. Check that you are not running the DDRC-88BM plugin. Check that you have the miniDSP version of the software installed, called Dirac Live Calibration Tool For miniDSP. Go to the Sound System tab and click the Rescan button.
2	The measurement test signal produces no output	<ol style="list-style-type: none"> Ensure that the DDRC-88D processor is connected correctly into the audio system. Check that the downstream amplification is powered on. Check that the downstream amplification is not muted and doesn't have gain/trim controls set to zero. Quit DLCT, open the DDRC-88BM plug and click Connect. Connect an analog source to the inputs, and confirm that signal levels are seen on output meters.
3	No input from measurement microphone	<ol style="list-style-type: none"> Check that the USB cable to the UMIK-1 is securely seated. Check that the UMIK-1 is selected in the Mic Config tab. Remove any USB hubs and extensions.
4	Insufficient recording level	<ol style="list-style-type: none"> Increase microphone level in the Output & Levels tab. 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. Increase system output volume.
5	Unable to generate correction filters (Optimize button)	<ol style="list-style-type: none"> Check that your computer is connected to the Internet and able to pass HTTP (web) traffic. Check that you do not have any other program running that is attempting to communicate with the DDRC-88D, such as the DDRC-88BM plugin.

9.5 OBTAINING SUPPORT

- Check the forums on minidsp.com to see if this issue has already been raised and a solution or solutions provided.
- Contact miniDSP via the support portal at minidsp.desk.com with:
 - The product information obtained from **DDRC-88BM plugin (Help -> About...)** and **Dirac Live Calibration Tool for miniDSP (Sound System tab)** while the plugin is online.
 - A clear explanation of the symptoms you are seeing.
 - A description of the troubleshooting steps you performed (see Troubleshooting on page 63) and the results obtained.