

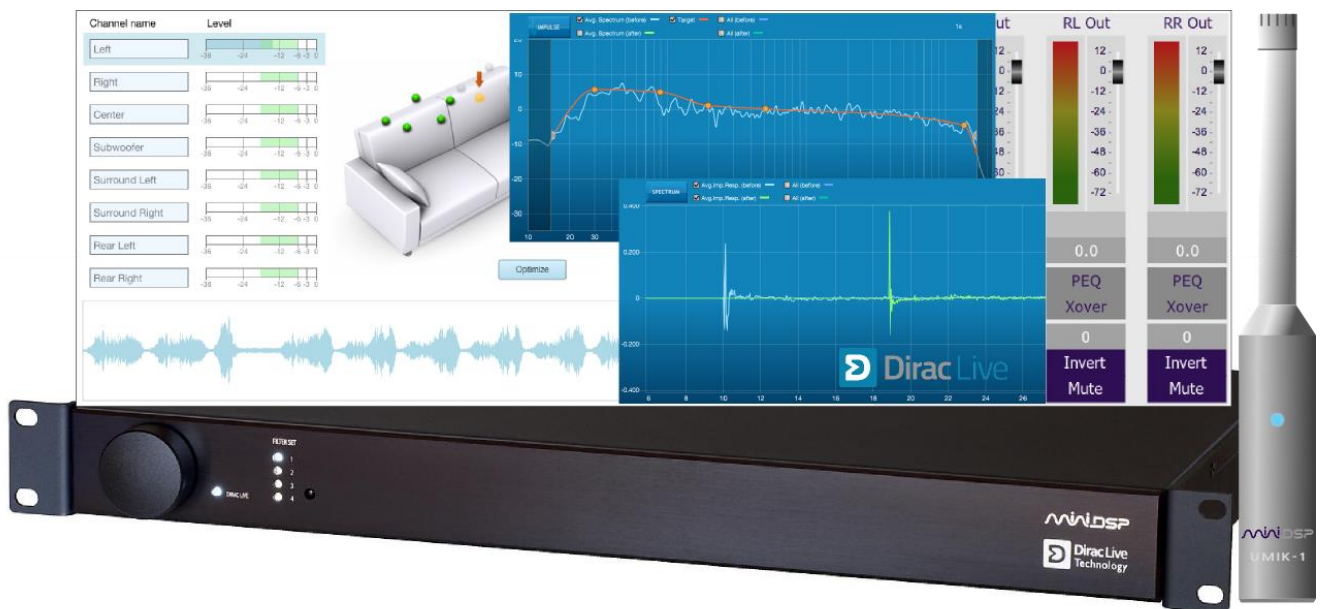
DDRC-88A

8-CHANNEL AUDIO PROCESSOR

WITH DIRAC LIVE[®] TECHNOLOGY

AND OPTIONAL UPGRADE FOR BASS MANAGEMENT AND CROSSOVER

User Manual





Revision history

Revision	Description	Date
0.1	First draft	25 November 2014
0.2	Preliminary pre-release version	5 December 2014
0.3	Draft pre-release for comment	20 January 2015
0.4	Second draft pre-release for comment	28 January 2015
1.0	First public release	2 February 2015
1.1	Updated firmware update procedure	20 May 2015
1.2	Update for Mac software	11 July 2015
1.3	Updated Output & Levels tab	16 July 2015
1.4	Update for Dirac license removal	10 Sept 2015
1.5	Minor update to gain structure	6 October 2015
1.6	Added information for DDRC-88BM plugin	9 May 2016
1.7	Unified DDRC-88BM plugin replaces DDRC-88 utility, this manual supersedes both the earlier DDRC-88A manual and the separate DDRC-88BM manual	29 August 2016
2.0 alpha	Simplified license activation procedure, revised installation procedure, improved integration of plugin and DLCT, added plugin design guide, revised remote control.	20 October 2016
2.0	2.0 final. Added Mute LED, links to app notes.	28 January 2017
2.1	Updated for IP address field/Wi-DG, miniDSP remote	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-88A* 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-88A has passed the test performed according to European Standard EN 55022 Class B.

PACKAGE CONTENTS

Your *DDRC-88A* package includes:

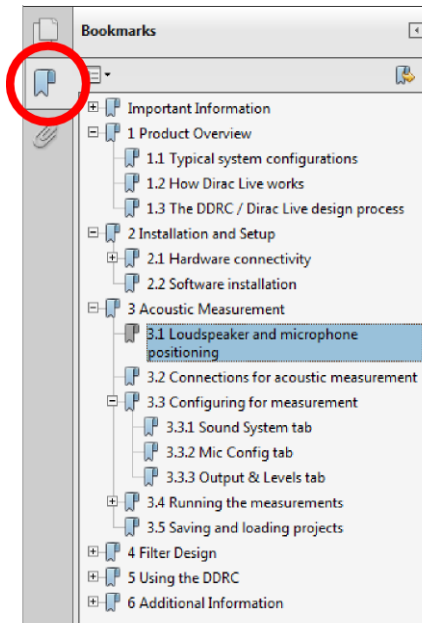
- One *DDRC-88A* audio processor
- One universal 12 VDC power supply
- One USB cable for computer connectivity (1.5m)
- One UMIK-1 calibrated measurement microphone with USB cable
- One tripod microphone stand
- One full license for **Dirac Live Calibration Tool for miniDSP**

A NOTE ON THIS MANUAL

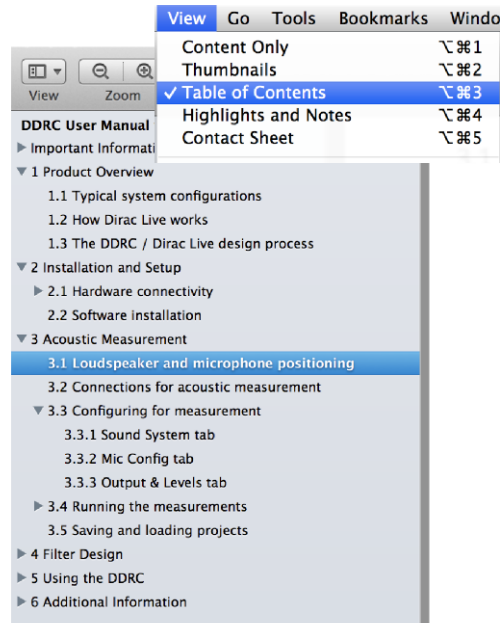
This User Manual is designed for reading in both print and on the computer. If printing the manual, please print double-sided. The embedded page size is 8 ½” x 11”. Printing on A4 paper will result in a slightly reduced size.

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

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



Adobe Reader on Windows



Preview on Mac

1 PRODUCT OVERVIEW

Thank you for purchasing a miniDSP *DDRC-88A* audio processor powered by Dirac Live®, the world’s premier room correction solution. We are delighted to offer you this software and hardware combination, the fruit of extensive research and development and years of experience in sound system tuning.

The *DDRC-88A* is an 8-channel digital audio signal processor (DSP) running the Dirac Live® room correction algorithm. The onboard floating-point SHARC processor provides time and frequency correction of a 7.1 monitoring, home theater or multichannel audio system. Inputs and outputs are analog, available as both single-ended signals connected via RCA jacks, and as balanced signals via Phoenix terminal blocks.

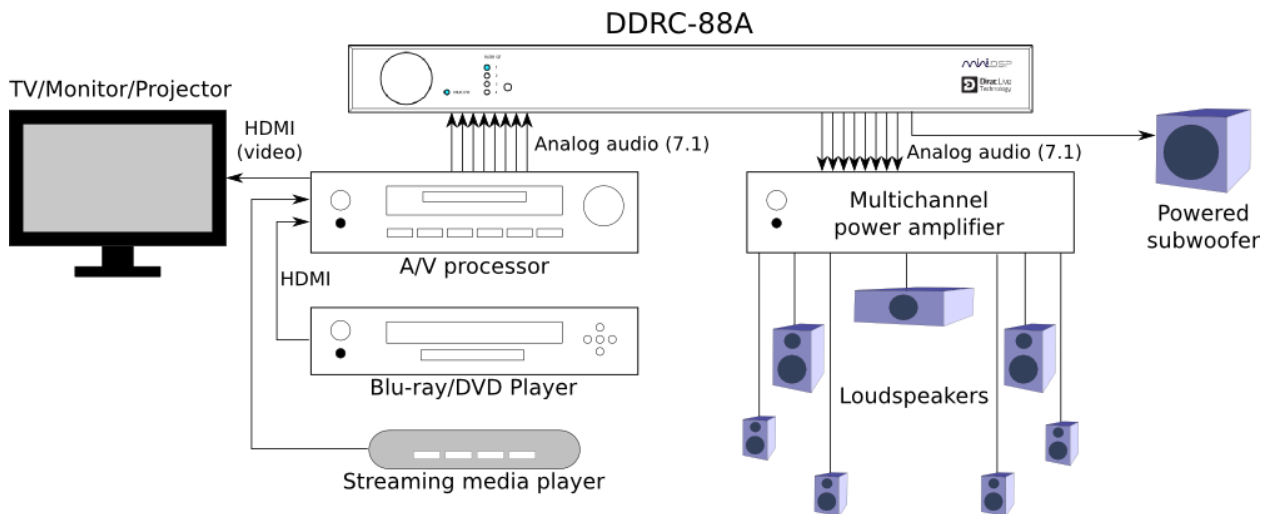
The *DDRC-88A* is a member of the miniDSP [Dirac Series](#) of audio processors. Deploying a *DDRC-88A* will:

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

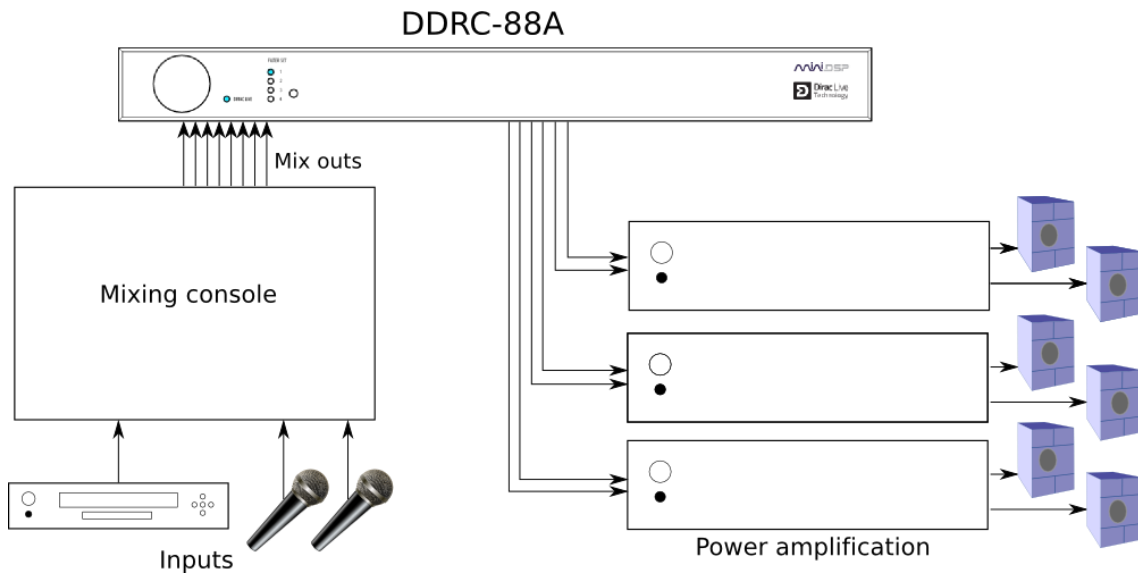
The *DDRC-88A* can be used anywhere an 8-channel room correction processor is required, such as in home theaters, recording and mastering studios, performance venues, places of worship, and so on. An optional enhanced/bass management software upgrade provides additional advanced functionality such as bass management, active crossovers, and multi-sub configuration.

1.1 TYPICAL SYSTEM CONFIGURATIONS

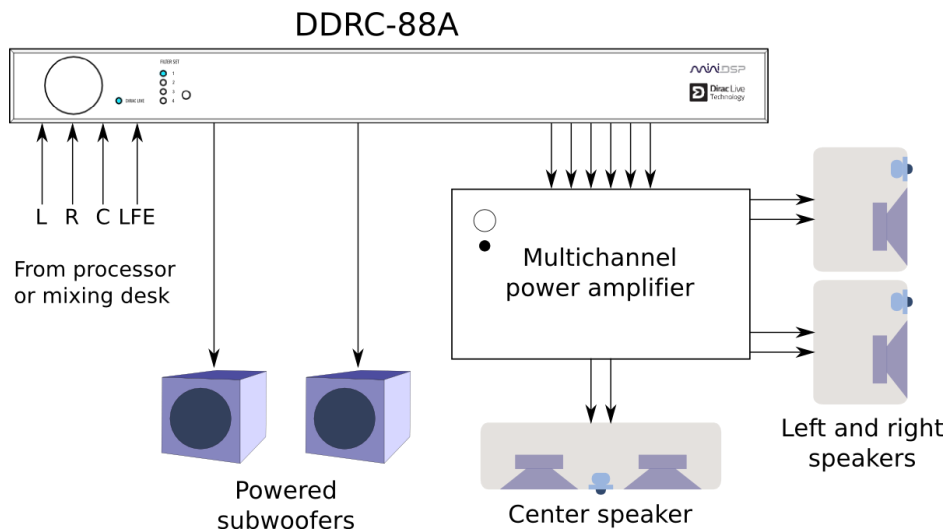
The *DDRC-88A* is inserted between line-level analog sources and power amplification. In a typical home theater application, line-level signal to the *DDRC-88A* is produced by an A/V receiver or processor with one or more source devices connected, and the amplification is typically a multichannel power amplifier. A source such as a Blu-ray player with multichannel analog outputs can instead be connected directly to the *DDRC-88A*.



In studio or sound reinforcement applications, the *DDRC-88A* is typically connected between a mixing console and power amplification, as shown below. Individual channels can be set for either full-range or subwoofer operation.



In its enhanced mode of operation, the DDRC-88A is capable of a number of other signal processing functions, such as bass management and active crossovers. The diagram below illustrates an application in which the DDRC-88A implements active crossovers for the left, right and center speakers, as well as managing two subwoofers. Where necessary, additional units can be used to attain the necessary number of output channels.



The DDRC-88A 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-88A 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-88A* 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-88A* 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 wavefront to the listener. Late reflections are left largely untouched, being corrected only for their spectral coloration, as they contribute to a larger, more enveloping soundstage.

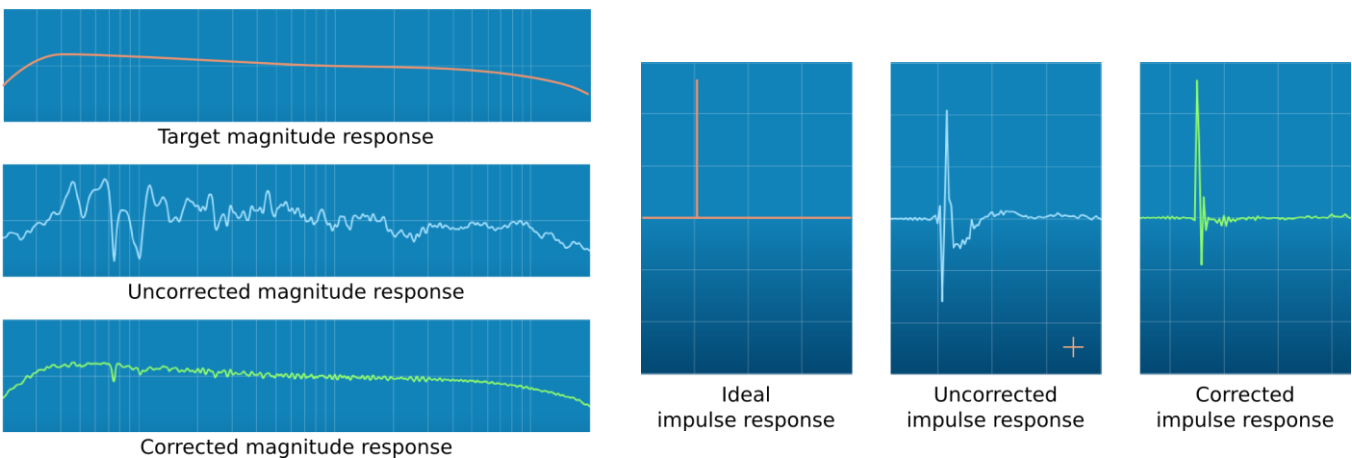
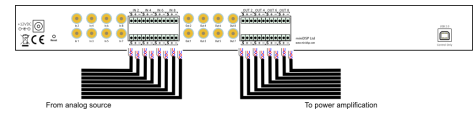


Illustration of Dirac Live[®] magnitude and impulse response correction

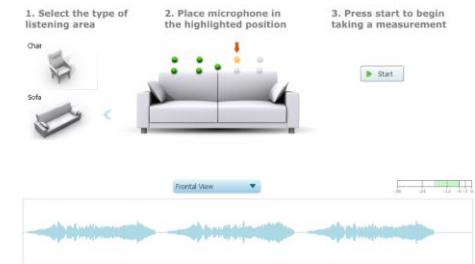
1.3 CONFIGURATION STEPS (BASIC MODE)

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

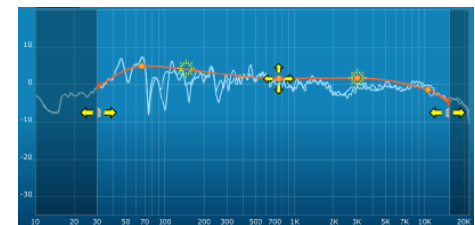
1. Connect the *DDRC-88A* audio processor into your system and install software. See Section 2, Hardware Connectivity and Section 3, Software Installation.



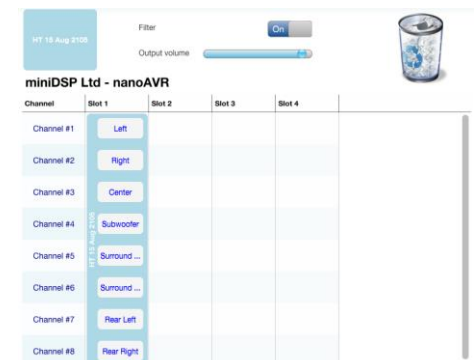
2. Run a series of acoustic measurements using the **Dirac Live Calibration Tool for miniDSP** program, to capture the acoustic behavior of your speakers and room. See Section 5, Acoustic Measurement for Dirac Live.



3. Generate digital room correction filters that will be executed by the *DDRC-88A* 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.



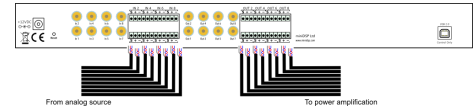
4. Once the digital room correction filters are designed and downloaded, the computer can be disconnected for normal listening. See Section 7, Using the DDRC-88A Audio Processor.



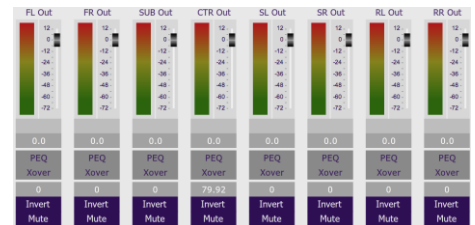
1.4 CONFIGURATION STEPS (ENHANCED/BASS MANAGEMENT MODE)

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

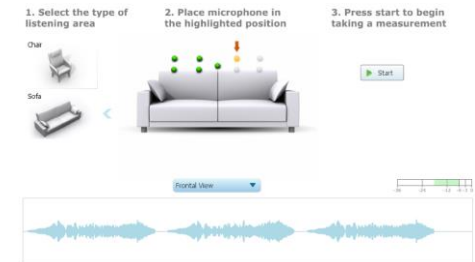
1. Connect the *DDRC-88A* audio processor into your system and install software. See Section 2, Hardware Connectivity and Section 3, Software Installation.



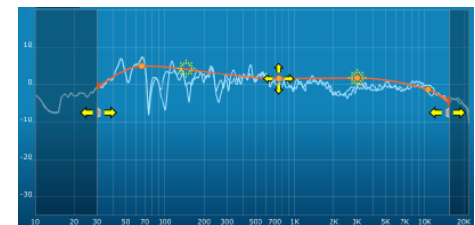
2. Configure output channel processing with the DDRC-88BM plugin. This sets up individual control of each output channel in order to implement (for example) active crossovers or multisub management. See Section 9, Enhanced/Bass Management Mode.



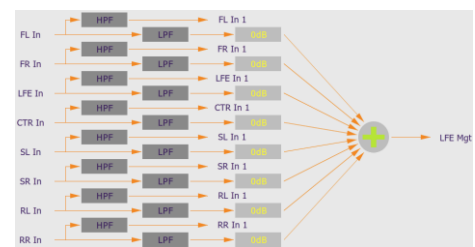
3. Run a series of acoustic measurements using the **Dirac Live Calibration Tool for miniDSP** program, to capture the acoustic behavior of your speakers and room. See Section 5, Acoustic Measurement for Dirac Live.



4. Generate digital room correction filters that will be executed by the *DDRC-88A* 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 9, Enhanced/Bass Management Mode.



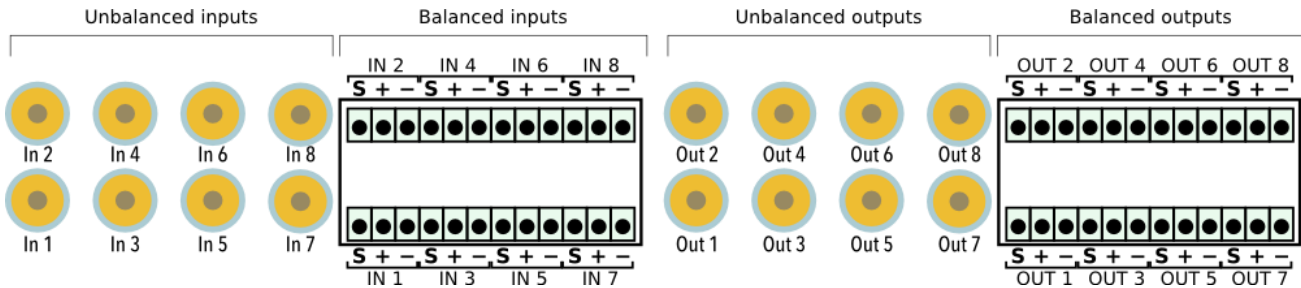
6. The computer can be disconnected for normal listening. See Section 7, Using the DDRC-88A Audio Processor.

2 HARDWARE CONNECTIVITY

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

2.1 ANALOG INPUT AND OUTPUT

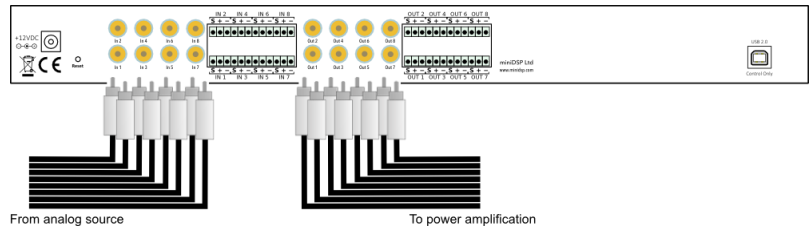
Up to eight channels can be connected to the *DDRC-88A*. Be sure to take careful note of the channel numbering:



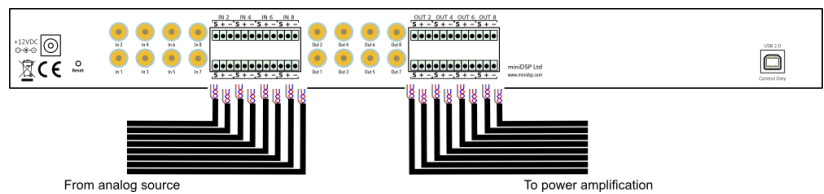
On the **input** side, it is *very* strongly recommended that all connections be of the same type – i.e. balanced or unbalanced. The Dirac Live algorithm equalizes levels on all channels, and a mixture of balanced and unbalanced connections on the *input* side will require special gain adjustment steps after Dirac Live calibration.

On the **output** side, a mixture of balanced and unbalanced connections can be used if desired. Doing so may necessitate additional work to check and adjust system gain structure. For more information on gain structure, see [Gain structure](#) starting on page 46.

Unbalanced connections are made directly to the RCA jacks.

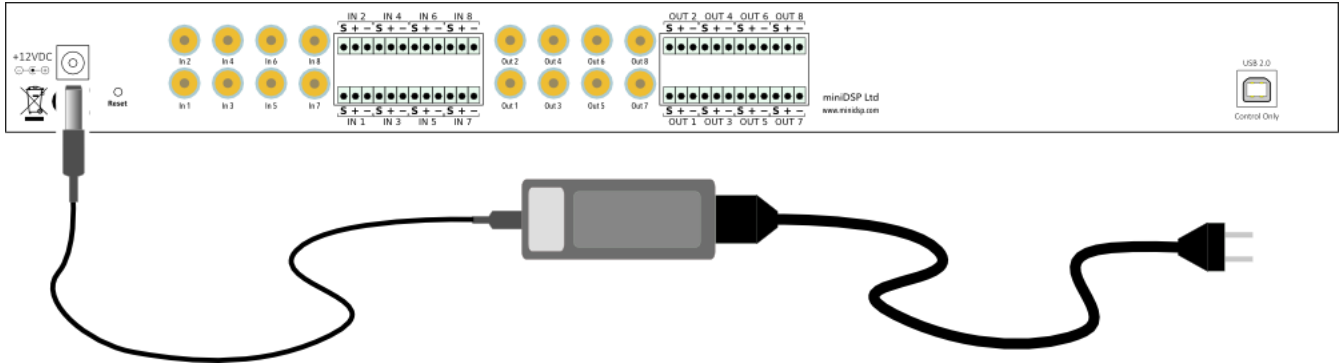


Balanced connections are made by connecting bare wire ends to the push-in Phoenix terminal blocks. For advice on using these, see [Balanced wiring tips](#) on page 70.



2.2 DC POWER

Fit the supplied IEC cable to the 12 VDC power supply. Plug the AC mains plug into the power outlet, and then plug the DC connector into the **+12VDC** socket on the rear panel of the *DDRC-88A*.



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

If powered on and off, the following turn-on/turn-off sequence is recommended:

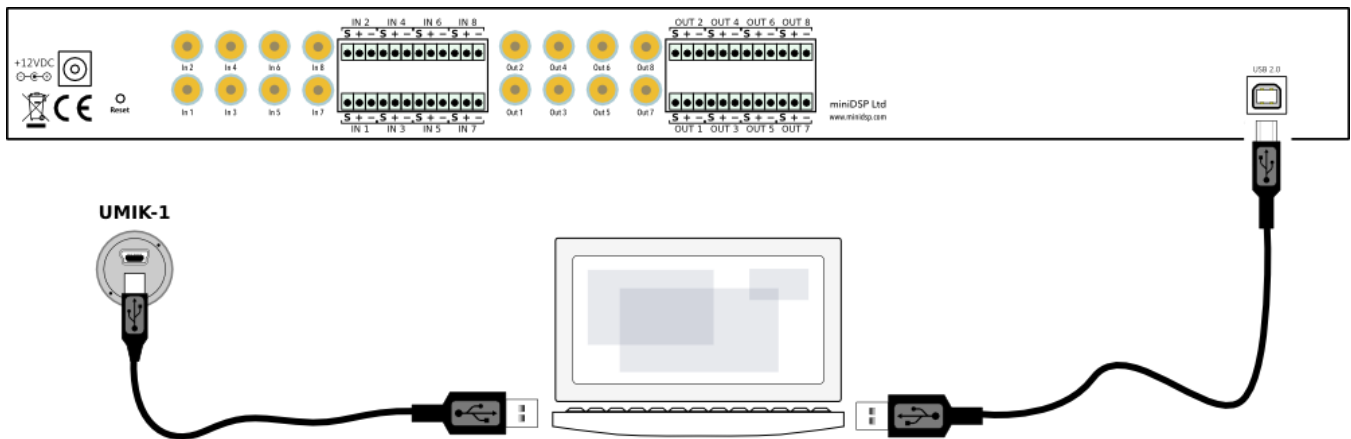
- On: Power on line-level equipment, including the *DDRC-88A*, then turn on power amplification.
- Off: Turn power amplification off, then power off line-level equipment, including the *DDRC-88A*.

2.3 USB

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

- Connect the USB port of the *DDRC-88A* 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-88A* and **Dirac Live Calibration Tool for miniDSP**.



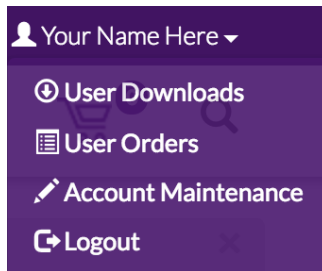
3 SOFTWARE INSTALLATION

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-88A. 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-88A. There are separate Windows and Mac versions.

firmware

This folder contains the firmware for the DDRC-88A. miniDSP may occasionally provide updated firmware to improve functionality and performance – see Section 10.4 MCU Firmware update for the upgrade procedure. It is also installed when upgrading an earlier unit to use the DDRC-88BM plugin.

3.1 DO YOU NEED A FIRMWARE UPGRADE?

When you receive your DDRC-88A, check the rear panel. If it has a green label marked “V2.2”, then you do **not** need to upgrade any firmware prior to proceeding. Simply follow the procedures on pages 18 and 19 to install the software.



If you do **not** have a green label marked “V2.2”, then you must upgrade the internal firmware. Follow these steps:

1. Install the DDRC-88BM plugin. See pages 18 and 19.
2. Upgrade the main I/O board firmware. See Section 10.3 starting on page 72.
3. Upgrade the SHARC daughterboard firmware. See page 79 for Windows and page 81 for Mac.
4. Install Dirac Live Calibration Tool. See pages 18 and 19.



You must update **all** firmware and software for the DDRC-88A to function correctly afterwards. This applies whether or not you are using the plugin in enhanced/bass management mode. You can not do a partial update.



If you were previously using the **DDRC-88 Utility**, we strongly recommend that you uninstall it after completing the upgrade to avoid the possibility of accidentally running it and corrupting the DSP code (which can potentially cause damage to your system).

3.2 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.

If you have previously used a miniDSP Dirac Live product and used the manual license activation process, be aware that this is no longer necessary. Note also that automatic license activation will apply to all miniDSP Dirac Live units in the field.

3.3 INSTALLATION — WINDOWS

3.3.1 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).

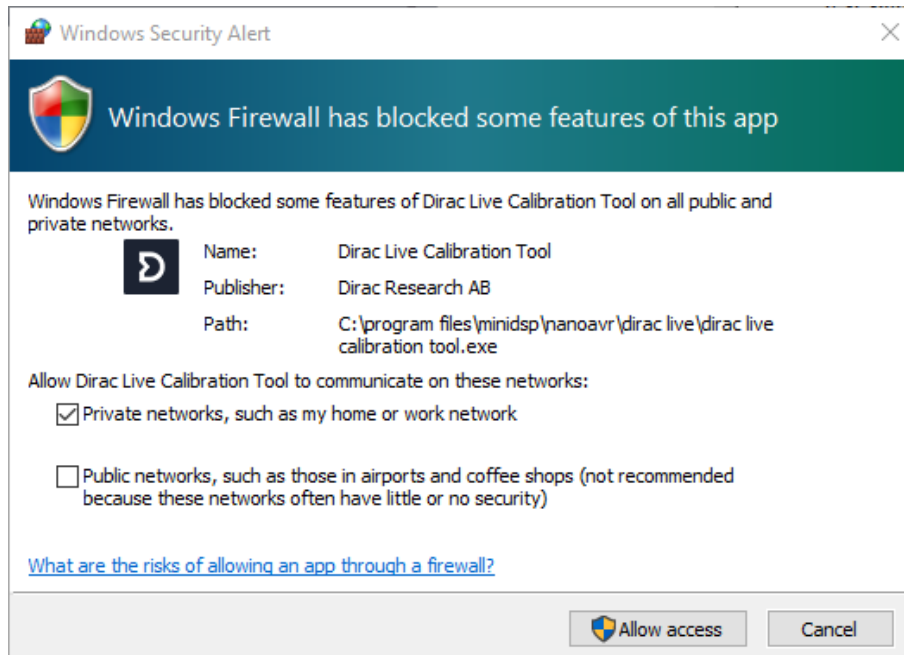
3.3.2 DDRC-88BM plugin installation

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.

3.3.3 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.”

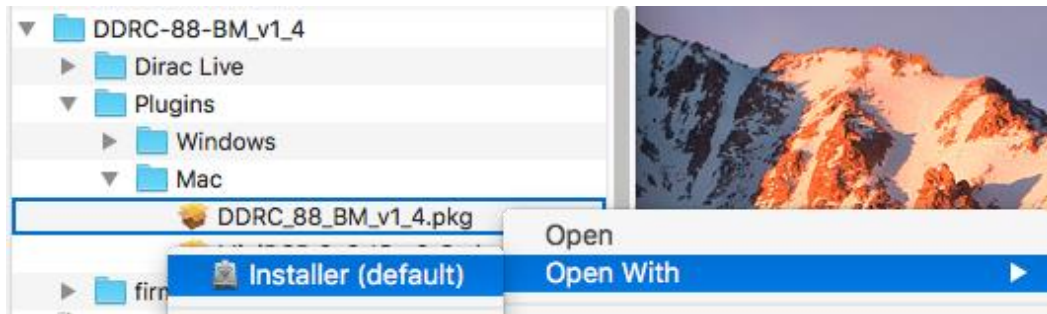


3.4 INSTALLATION — MAC

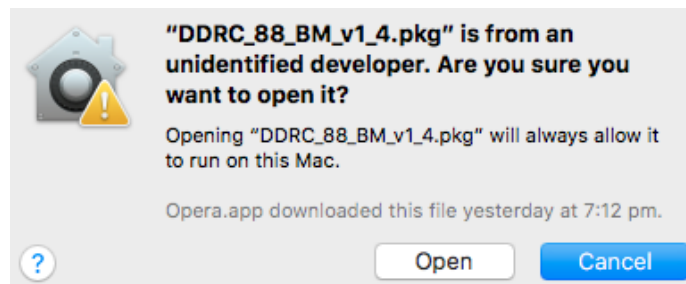
3.4.1 Possible Mac installation issues

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.”



3.4.2 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.

3.4.3 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-88A 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 9, Enhanced/Bass Management Mode for further information on this functionality.

If you purchase a DDRC-88A in basic mode and later upgrade to enhanced/bass management mode, you will need to perform the upgrade procedure described on page 83.



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.

Main menu

Configuration selection

Selection tab

Main configuration window

Master control

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

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-88A 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 58.

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-88A, 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 been already 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-88A 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-88A. (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. (In order to pass audio through without gain and levels adjustment, you will need to leave an empty slot on the **Export** tab of DLCT. Then select the corresponding configuration with the remote control or front panel control.)

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.



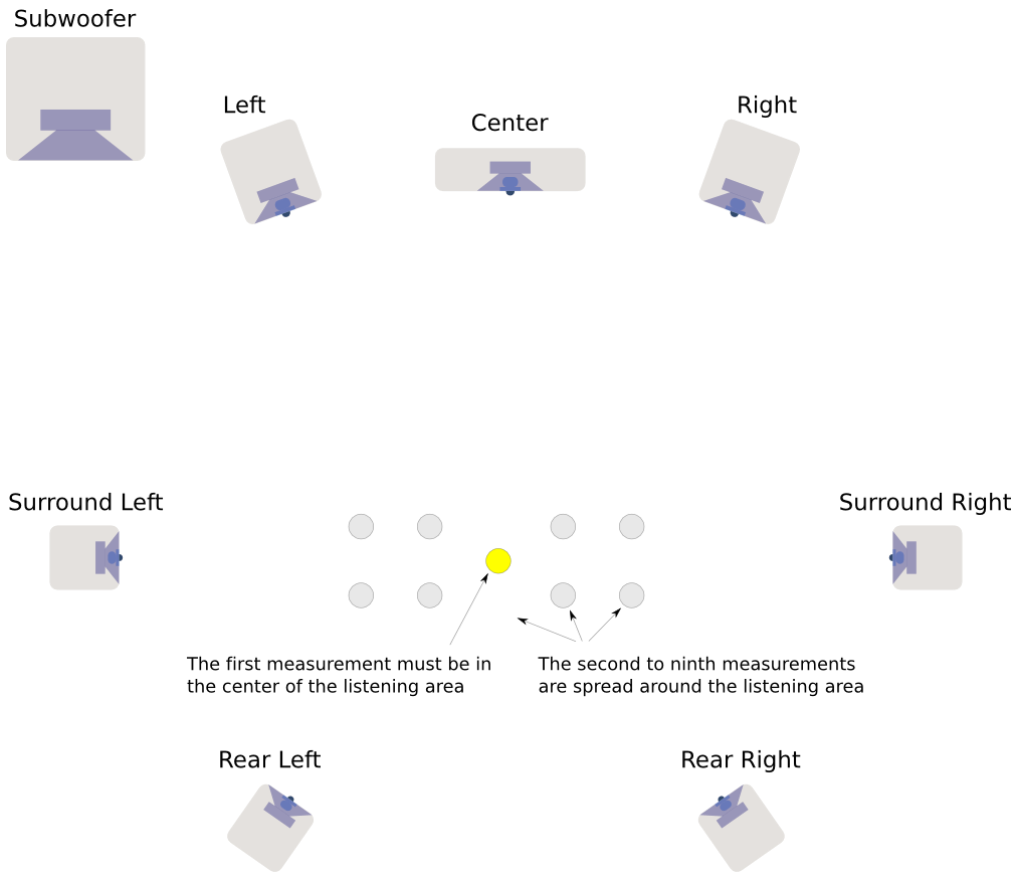
5 ACOUSTIC MEASUREMENT FOR DIRAC LIVE

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 9, Enhanced/Bass Management Mode.

5.1 LOUDSPEAKER AND MICROPHONE POSITIONING

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



Typical home theater measurement setup

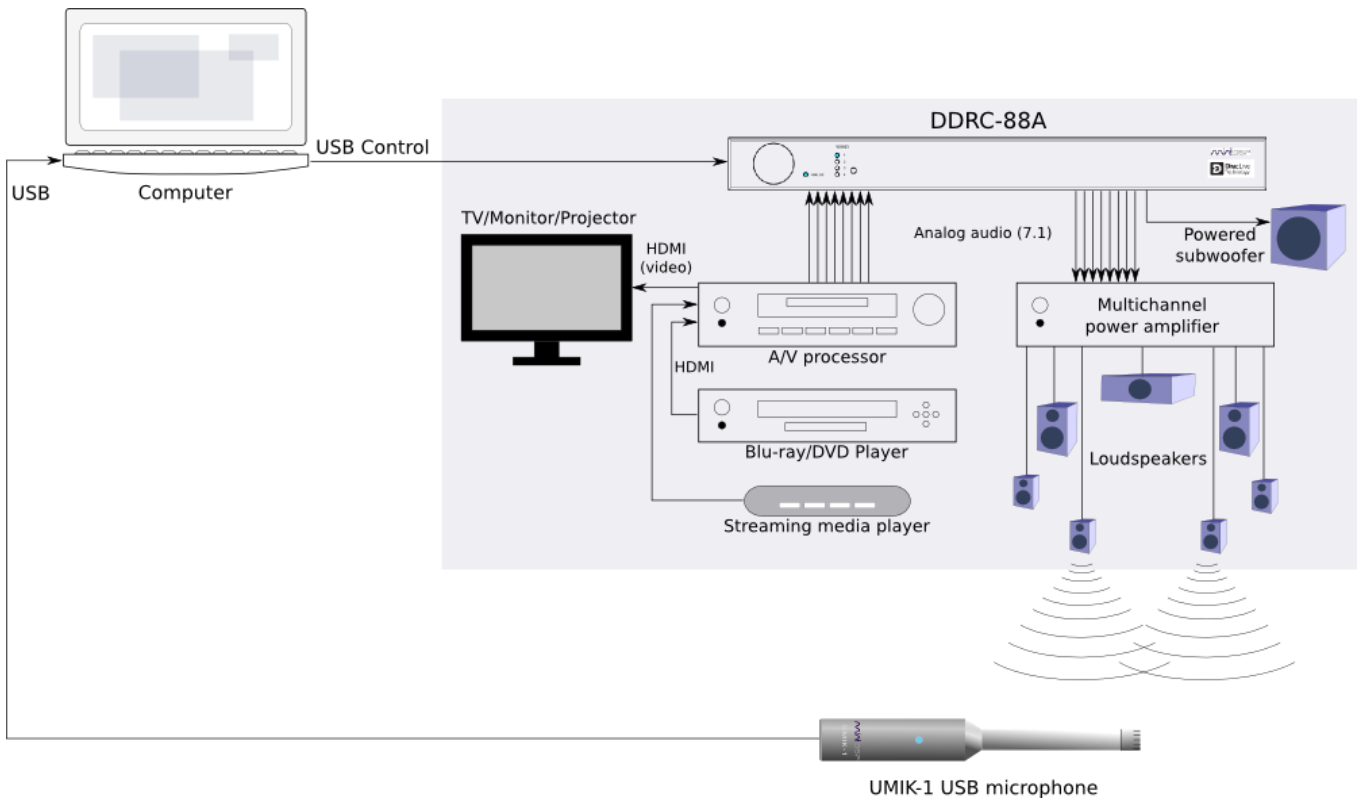
A total of nine measurements are needed, with the microphone located in different positions in the room and pointed vertically (that is, at the floor or ceiling). The first measurement must be taken at the central location of the listening area, as this location sets the levels and delays of each speaker. 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-88A* 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 USB extension (up to a total USB cable length of 5 meters) can be used. 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 27).

5.2.2 Subwoofer settings

We recommend that 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-excursion should be left in place.

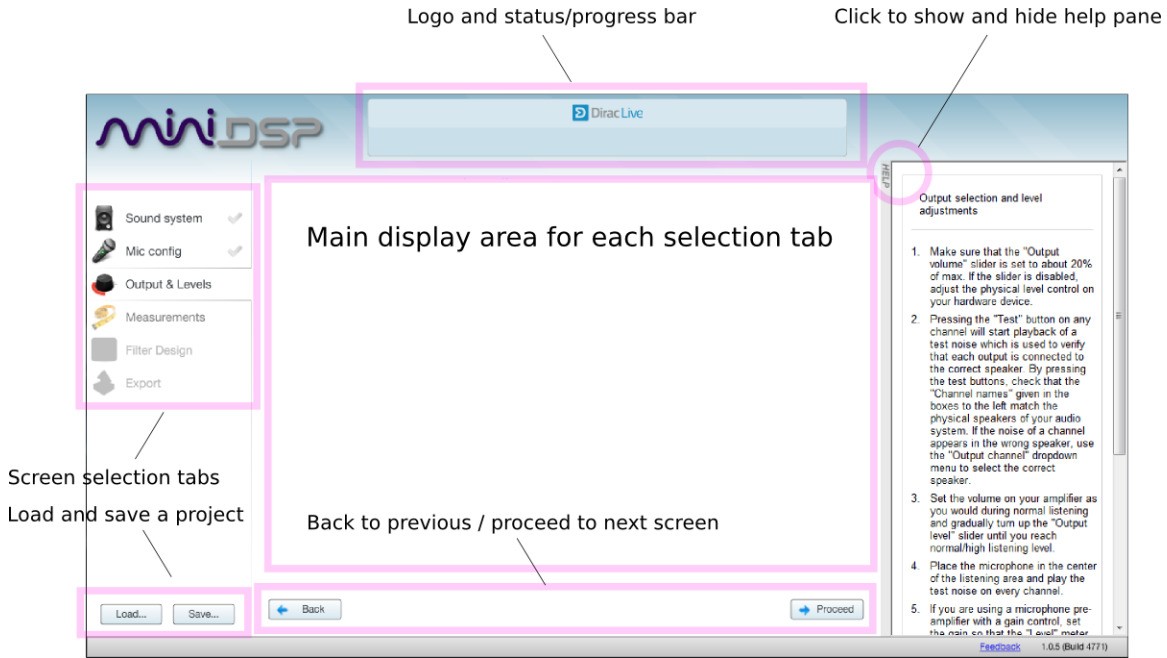
If the subwoofer’s low pass filter is an important part of the overall bass management in the system, it can be re-enabled after completing Dirac Live calibration and loading correction filters into the *DDRC-88A*.

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

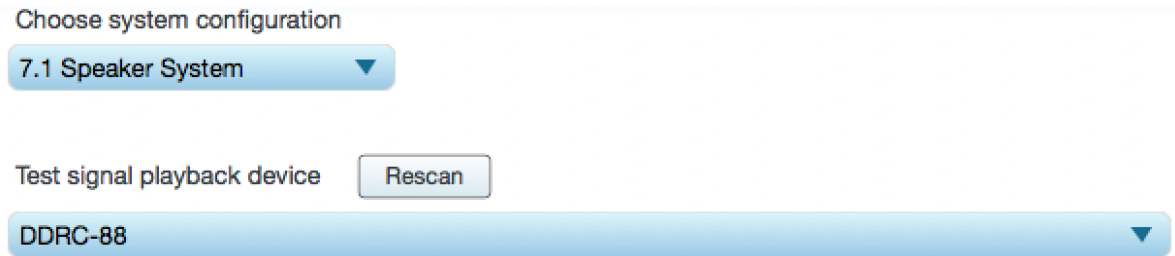
Click on the small Help divider at the right of the screen to open a pane with help on the currently selected tab. Click on the divider again to close the help pane.

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.

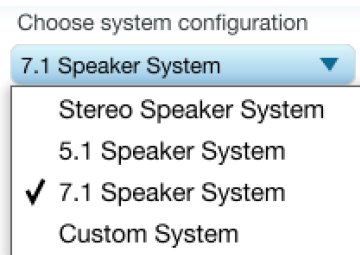
5.3.2 Sound System tab



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 (that is, external equipment is providing this gain) or if a different speaker configuration is required, use **Custom System**. (See [Custom System configuration](#) on page 29 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-88A* processor.

If the entry for **DDRC-88** is not showing, check that your *DDRC-88A* 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 10.6, 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

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-88A* and the *nanoAVR DL*.)

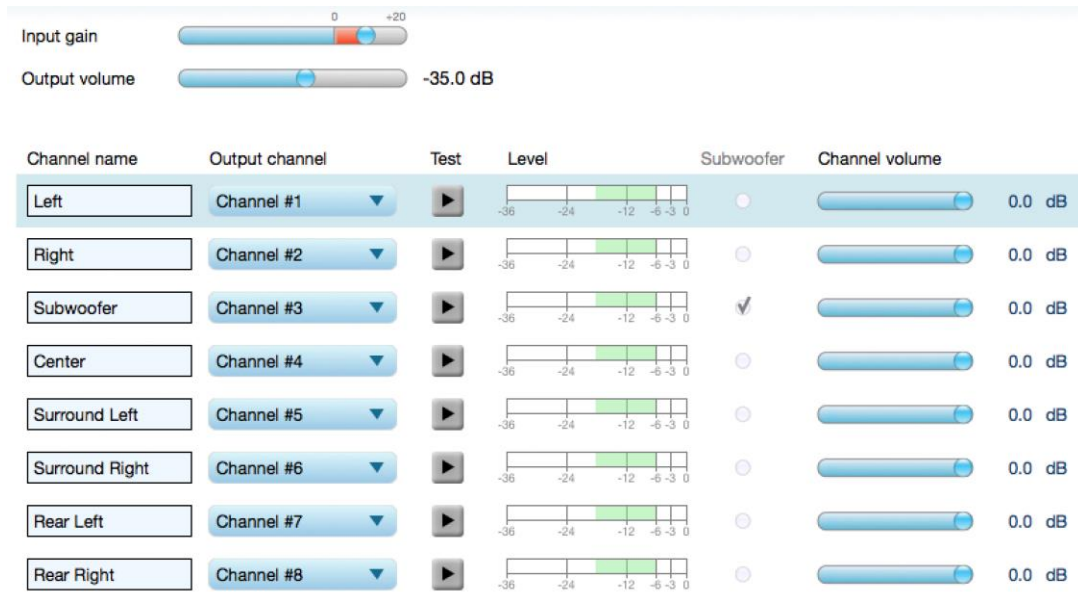
Then click on the **Load File** button and select your calibration file.



For home theater 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.

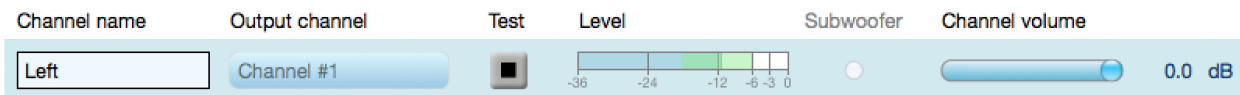
Once you have verified that this tab is correct, click the **Proceed** button.

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 a gain structure problem. In that case, please refer to the section [Optimizing gain structure](#) starting on page 50.

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:

- Your 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-88A* 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.

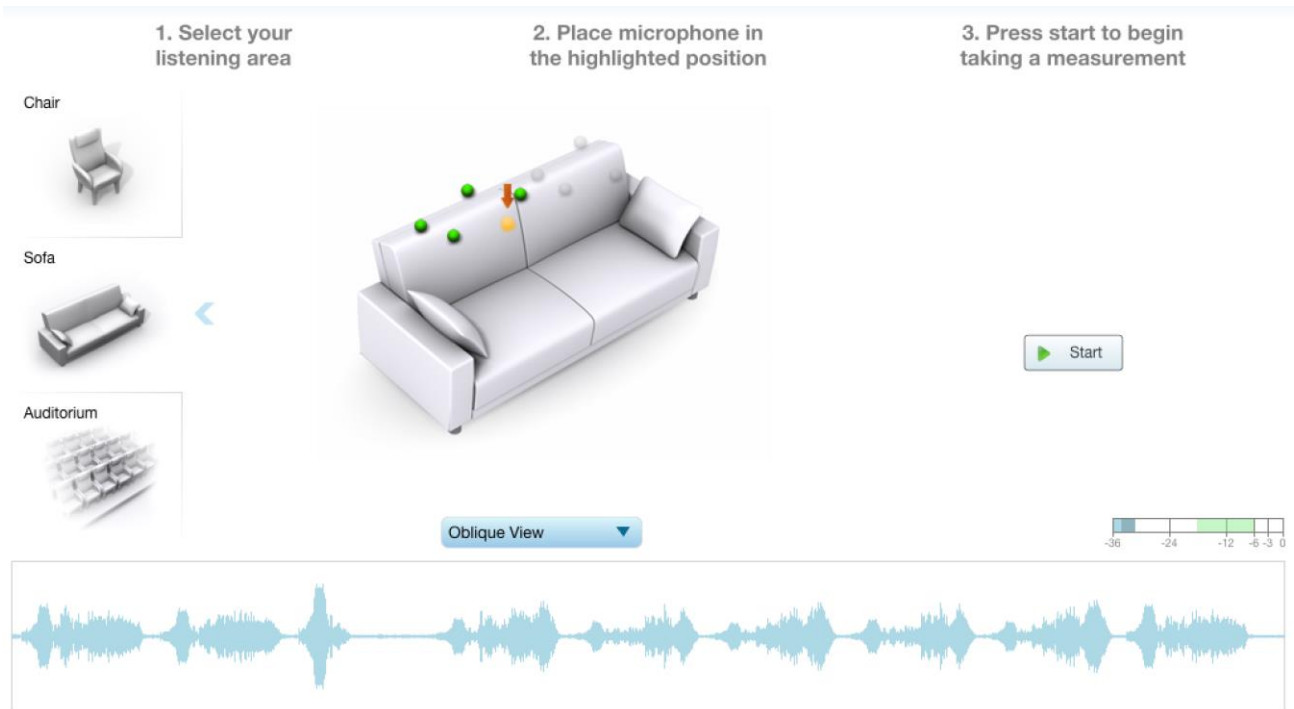
Subwoofer

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-88A* does not calibrate for a 10 dB LFE alignment gain on the subwoofer channel. This gain, if required, must therefore be provided by external equipment. If in doubt, check the specifications of your equipment and refer to [LFE alignment gain](#) on page 52 for more information.

5.4 RUNNING THE MEASUREMENTS

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

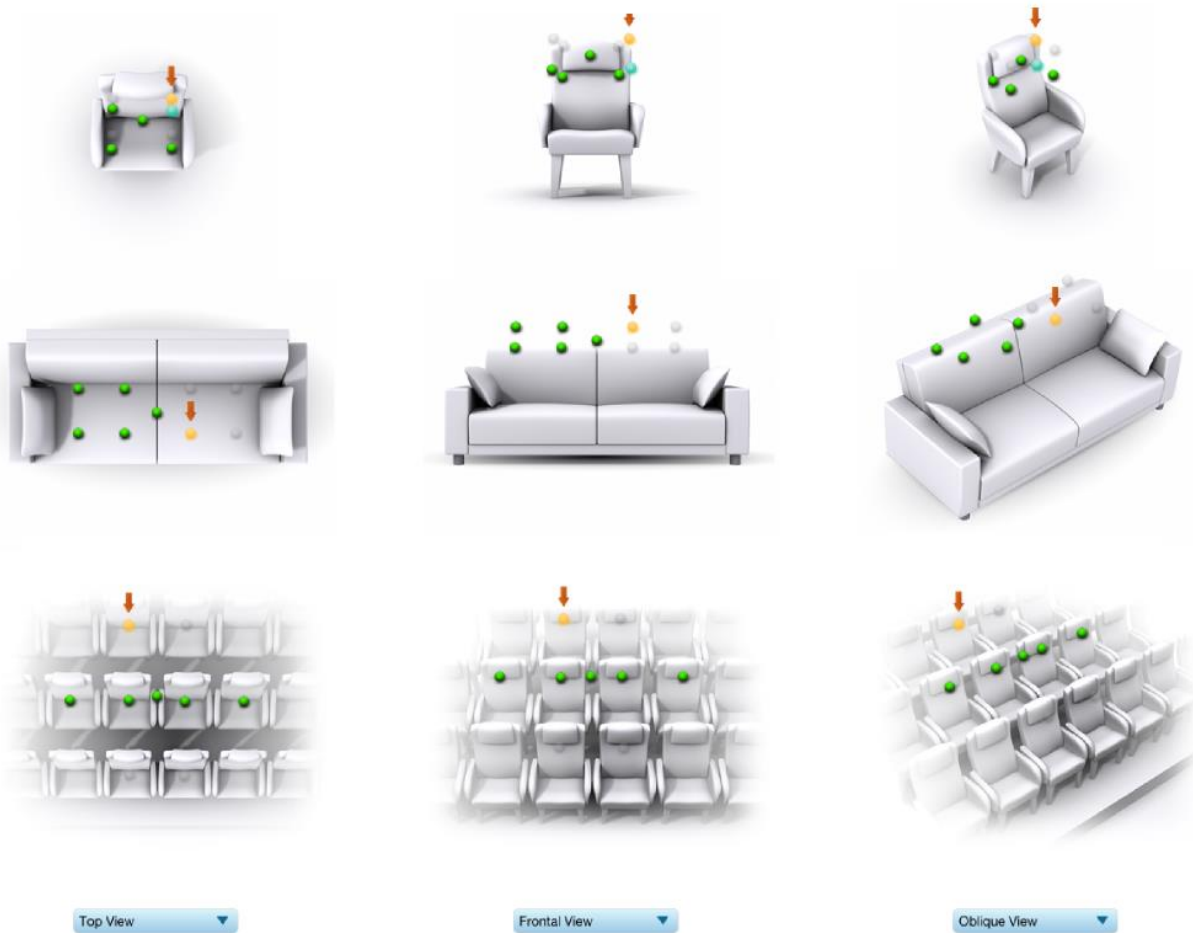


Measurements should be performed under good conditions if possible. While the measurement technique used by Dirac Live is quite robust, low-frequency noise (traffic, machinery, aircraft, storms) in particular can adversely affect measurement accuracy. A high level of ambient noise can degrade signal 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.

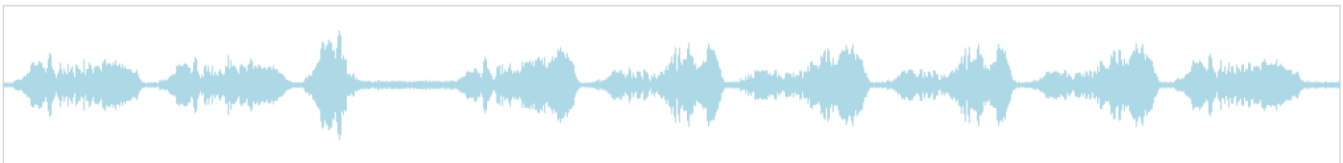
A different set of locations other than those indicated by the visual guide and the above guidelines can be used if necessary. The important thing is to ensure that the measurement locations are spread out over the whole listening area and that the microphone is moved a sufficient distance vertically 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-88A* 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:

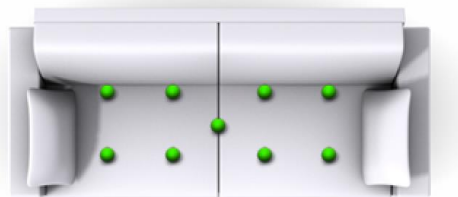
- The measurement signal is too low to ensure a clean capture.
- The measurement signal is too high and the audio signal has exceeded the maximum level (clipping). This is shown in red on the signal graph.

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.

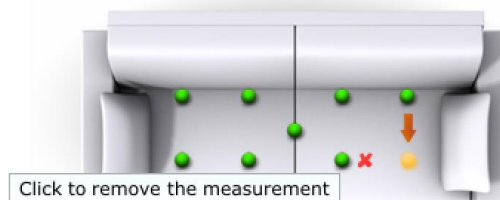
Note: it is good practice to save the project periodically while performing measurements (see [Saving and loading projects](#) below).



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.

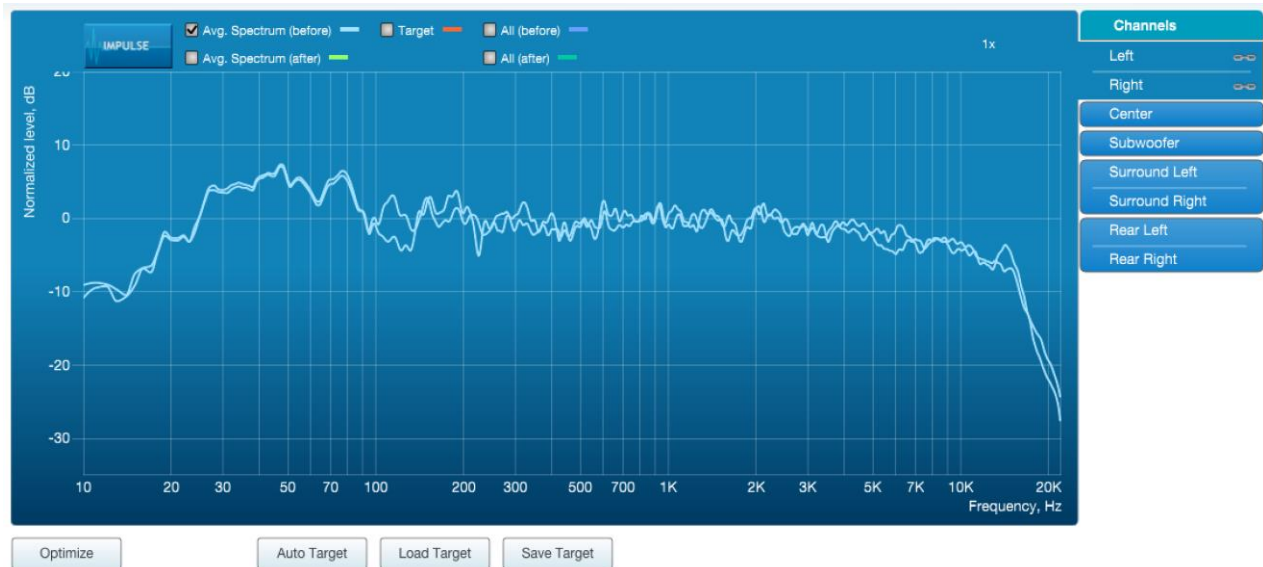
5.5 SAVING AND LOADING PROJECTS

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 37.

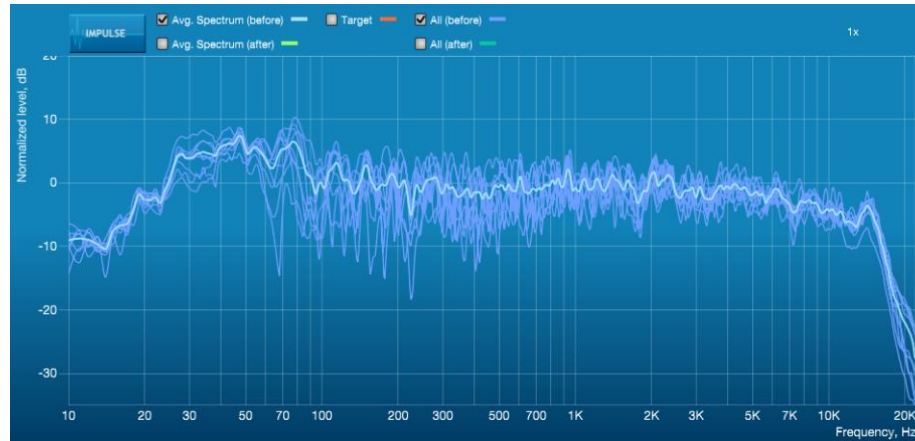
All (before)

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

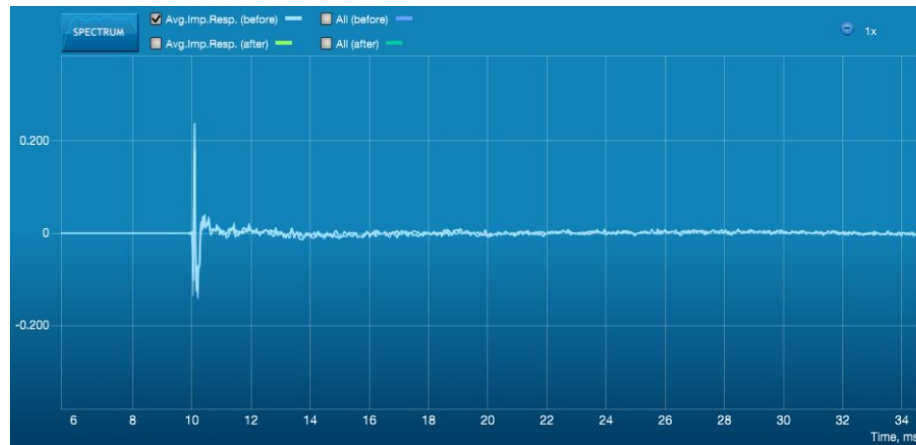
All (after)

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:



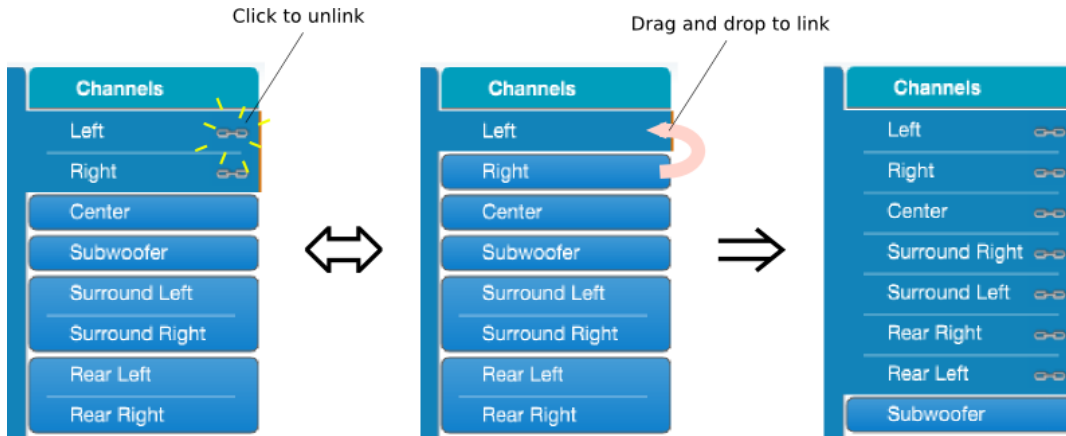
To display the impulse response instead of the magnitude response, click on the **Impulse** button at the top left of the display. All nine individual impulse responses can be shown as well as the average response. The predicted responses after correction can be viewed after filters are generated with the **Optimize** button (see [Generating correction filters](#) on page 40).



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.



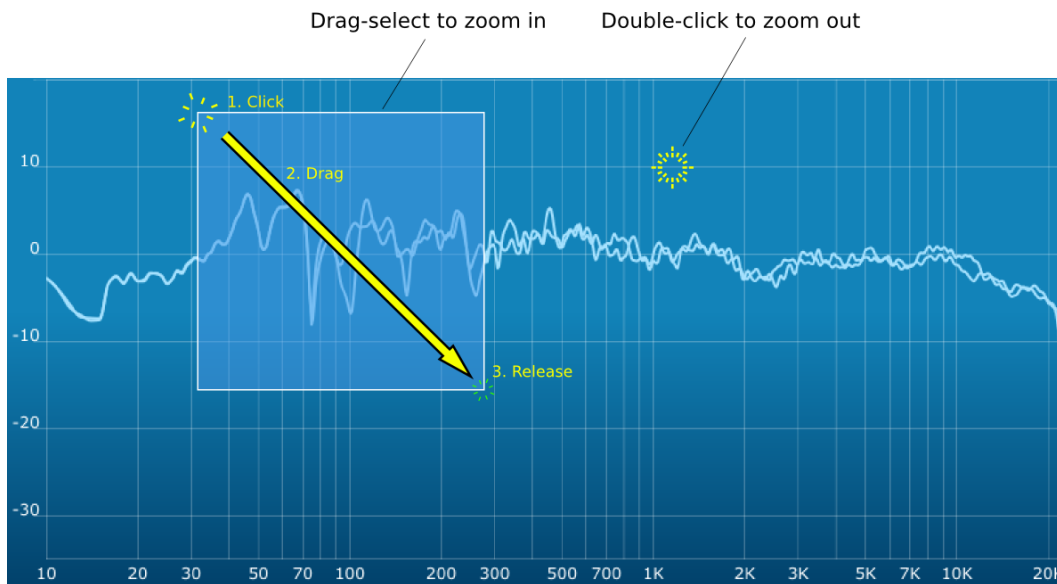
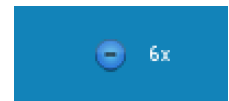
To unlink a channel, click on its chain icon. It will then be unlinked from the other channels. To link it to another channel or groups of channels, drag its tab on top of the channel or group of channels that you want it linked to.



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-88A* 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 39.

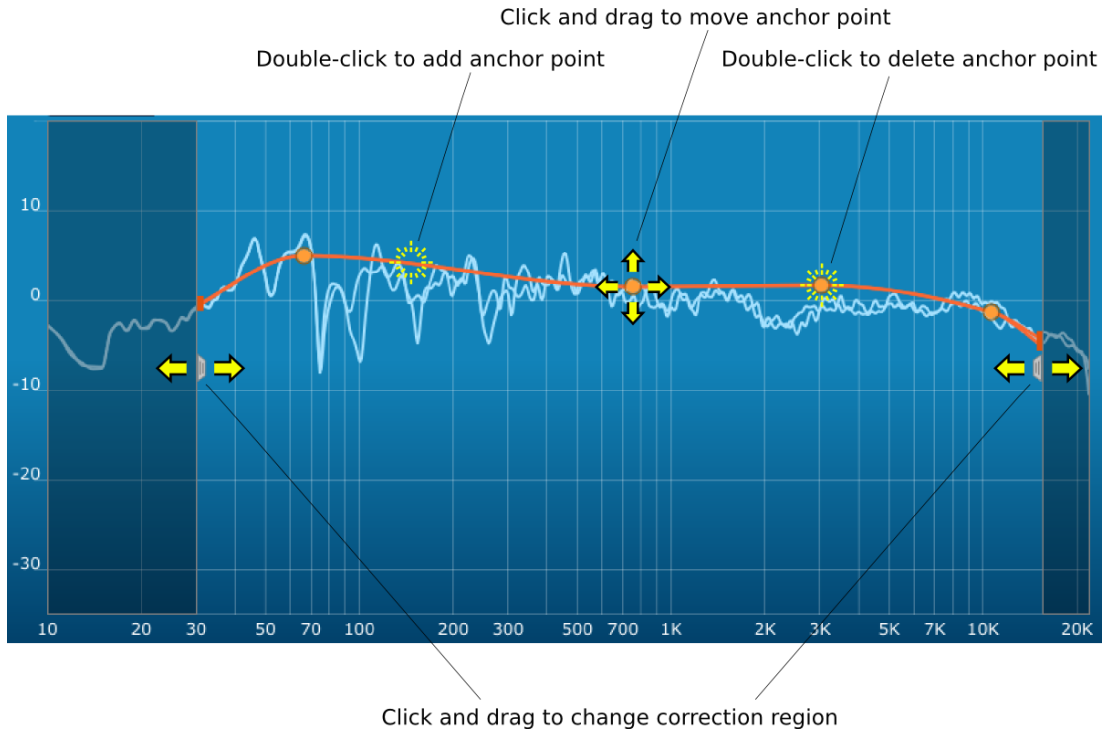
6.2.2 Editing the target curve

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

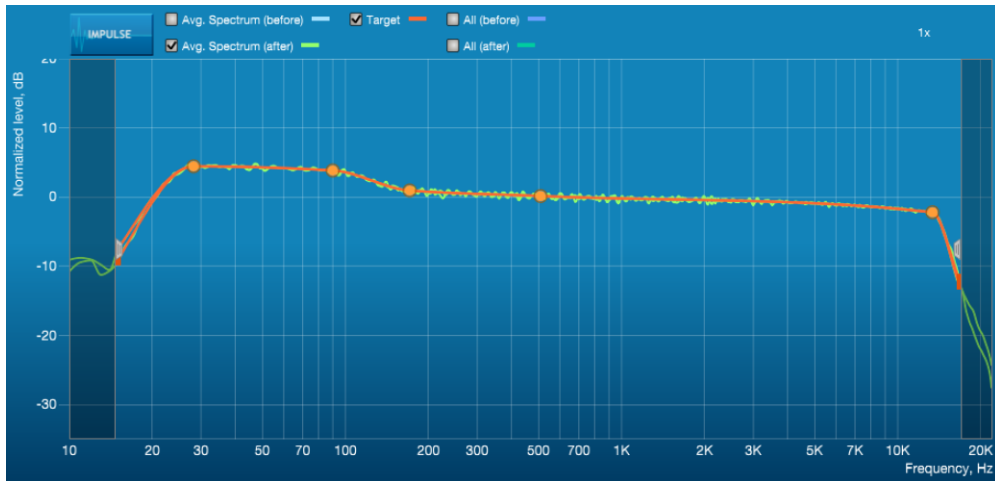
To allow you to experiment with different target curves, you can save a target curve to a file and reload it at a later time. Click on the **Save Target** button to save the target curve of the currently displayed channel or group of channels.

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.)

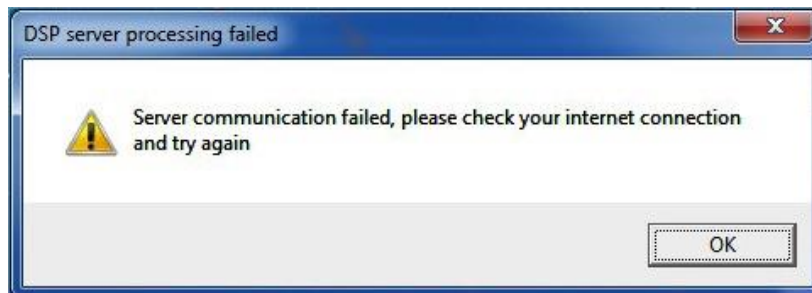
6.3 GENERATING CORRECTION FILTERS

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 miniDSP software interface. At the top left, there is a blue box labeled "HT 1 Jan 2016". To its right is a "Filter" toggle switch set to "On" and an "Output volume" slider set to "-6.0 dB". On the far right is a trashcan icon. Below these controls is the title "miniDSP Ltd - DDRC-88BM". The main area 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 be also be adjusted by the front panel control knob or an infrared remote control.

7 USING THE DDRC-88A AUDIO PROCESSOR

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

7.1 CONFIGURING SOURCE EQUIPMENT

Because of the effect of the Dirac Live algorithm, the settings required in source equipment may differ to the settings used prior to deploying the *DDRC-88A*.

7.1.1 Level trims

Dirac Live aligns the gain of all channels. The level trims of all channels in the source equipment should therefore all be set to the same value (typically 0 dB).

If you have used the **5.1 Speaker System** or **7.1 Speaker System** configuration and find that your subwoofer is much too loud, it may be that your source equipment has applied a 10 dB LFE alignment gain. A quick solution is to reduce the subwoofer trim level by 10 dB. For more information, see [LFE alignment gain](#) on page 52.

7.1.2 Subwoofer channel gain

If your source equipment has a switchable 10 dB gain on the subwoofer output, your choice will interact with the system configuration chosen in the **Output & Levels** tab.

- If you chose the **Custom System** configuration (and are playing content with an LFE channel encoded 10 dB lower), enable the 10 dB of gain.
- If you chose the **5.1 Speaker System** or **7.1 Speaker System** configuration, disable the 10 dB of gain.

For more information, see [LFE alignment gain](#) on page 52.

7.1.3 Bass management

If you are using bass management, follow the instructions of the equipment manufacturer to reconfigure bass management after performing your Dirac Live calibration. The bass management settings that you had prior to including the *DDRC-88A* in your system may no longer be valid due to the changes in system response introduced by Dirac Live.

7.1.4 Delays/speaker distance

Dirac Live calculates the relative delays between all channels and corrects for any differences. In the source equipment, all delays (or equivalently, speaker distance) should therefore be set to the same value, so that the delays calculated by Dirac Live are effective.

7.1.5 Room correction and EQ

Turn off any room correction in the source equipment. Dirac Live performs a full set of sophisticated room correction optimization algorithms, and “adding” additional room correction in the source equipment will not improve the result, and quite possibly make it worse.

EQ that is being used for room correction should also be turned off. If EQ is being used for subjective tuning, note that target curves (see [Designing your target curve](#)) can be used to create different filter sets for different

subjective effect. We therefore recommend that target curves be used to tailor the sound on all channels to your liking first, and only then apply EQ in the source equipment if there is a need for rapid “on the fly” subjective EQ adjustments.

7.1.6 Other processing

Any other processing can be applied in the same manner as you did prior to deploying the *DDRC-88A* in your system. In a home theater context, this includes down-mixing (for example from 7.1 to 5.1), up-mixing (including decoders such as Dolby Pro Logic), and “effects” such as hall or ambience simulators. In a studio or sound reinforcement context, effects such as reverberation can continue to be used as before. Compressor/limiters used to protect power amplifiers should, however, remain connected between the *DDRC-88A* and the power amps.

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)



7.2.1 Status indicators

The current status of the *DDRC-88A* 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).

7.2.2 Front panel controls

The *DDRC-88A* 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-88A recognizes commands from the optional miniDSP remote:

Source

Has no effect with the DDRC-88A.

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-88A 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.

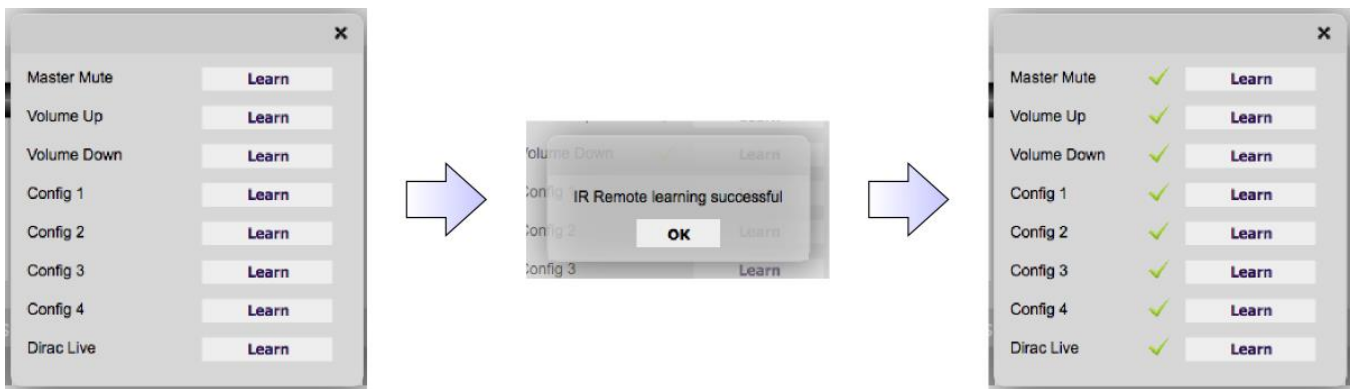


7.3.3 Programming a third-party remote

Alternatively, the DDRC-88A 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 GAIN STRUCTURE

When deploying a DSP solution in your audio system, a topic that becomes more important than with analog equipment is *gain structure*. This means that the signal levels throughout the system should be set high enough to maximize digital resolution and minimize noise, but not so high as to result in clipping and distortion.

The *DDRC-88A* provides a great deal of flexibility in matching with other equipment. In addition to providing balanced and unbalanced inputs and outputs, input sensitivity and output gain can be selected to adapt to different equipment. The *DDRC-88A* ships with a conservative gain structure that will rarely result in clipping, but you may wish to adjust these settings for your own installation. This section explains gain structure and how to optimize it.

8.1 GAIN STRUCTURE OVERVIEW

Figure 6.1 below illustrates the elements that affect gain and gain structure (for a single channel). The source/processor has a master volume control and typically a user-settable trim control on each output channel. It may also have an additional 10 dB gain on the LFE channel. The *DDRC-88A* has a master volume control and an internal trim control (not visible to the user). In addition, there are per-channel settings for input sensitivity and output gain. Finally, the power amplifier itself may have a master gain control or a level trim on each channel.

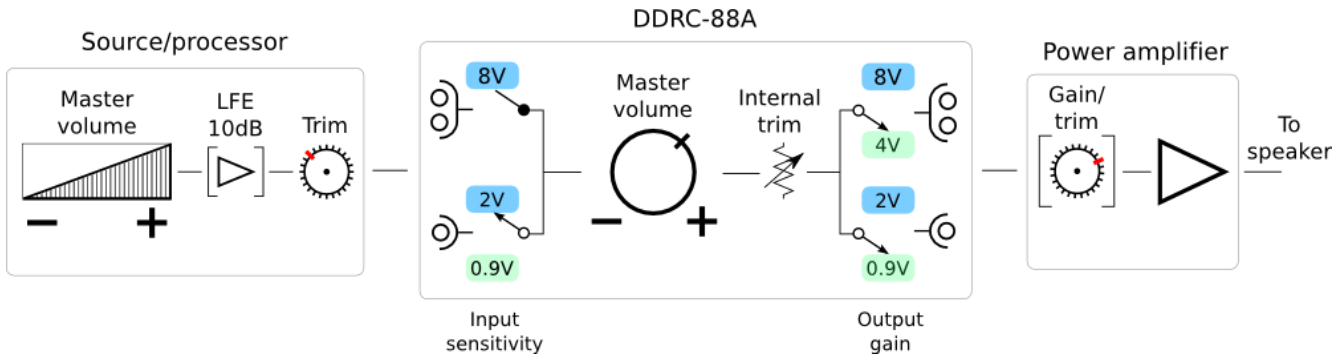


Figure 6.1. Overview of gain structure through the system

8.2 CHOOSING GAIN STRUCTURE SETTINGS

The *input sensitivity* is the voltage that generates a full-scale digital input signal to the *DDRC-88A*'s DSP (digital signal processor). The *output gain* setting specifies the voltage that results from a full-scale digital output signal from the DSP.

The best choice of input sensitivity and output gain settings can be determined in two ways: by the output level of the source and the input sensitivity of the amplifier, or by the resulting input-output gain of the *DDRC-88A*. We suggest initially using Figure 6.2 as follows:

1. Knowing the maximum output level of your source equipment, run a line across to either *Unbalanced input* or *Balanced input*. The best input sensitivity is the one that your line intersects. If you are in the red zone, limit the master volume control on your source equipment to avoid overloading the *DDRC-88A* input.
2. Compare the maximum output level of your source equipment with the input sensitivity of your amplification, and choose the lowest number. Then run a line across to either *Unbalanced output* or *Balanced output*. The best output gain setting is the one that your line intersects. (With this recommendation we allow the *possibility* that the *DDRC-88A* may overdrive the amplifier. Since Dirac Live will tend to reduce output levels somewhat, over-driving it is unlikely in practice.)

If your equipment offers a choice of unbalanced or balanced inputs or outputs, this diagram can also be used to help choose which type of connection to use. Note that there is no sensitivity adjustment for balanced inputs (the only available choice is 8 VRMS). In addition, if an input channel is set for 0.9V sensitivity, a balanced connection can **not** be made to that channel.



All input channels must have the same type of connection (balanced or unbalanced) and the same input sensitivity setting. (Output channels can have a mix of balanced and unbalanced connections and a mix of output gain settings. If using a mix, always do a [Gain structure optimization](#).)



Changing connection type or gain structure settings of individual channels will invalidate all of your existing Dirac Live projects. Therefore, if making a change to gain structure, you must either change all channels in the exact same way, or completely redo your Dirac Live calibration afterwards.

If, after performing an initial calibration with **Dirac Live Calibration Tool for miniDSP**, you find that the input-output gain is not suitable for your system, then refer to Figure 6.3 to choose different settings that match your desired input-output gain.

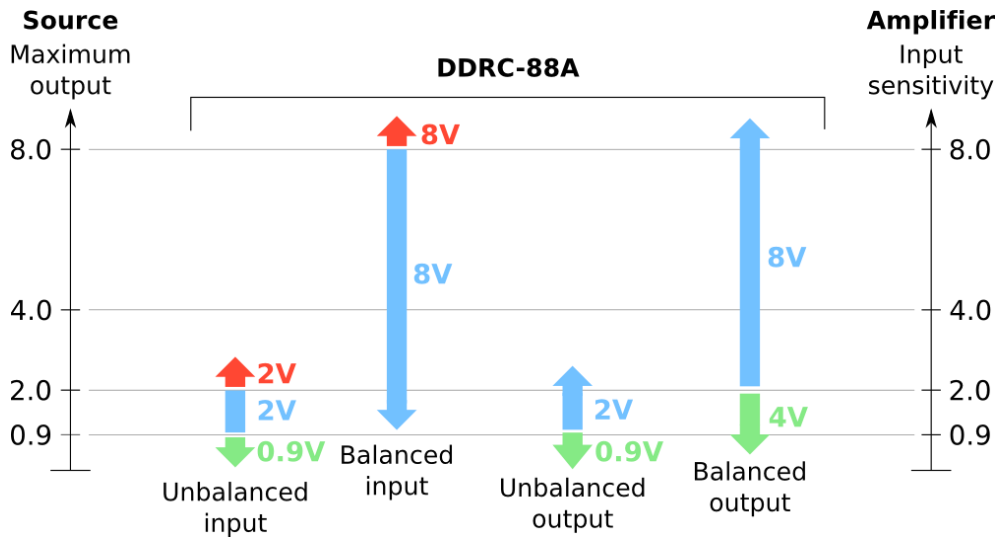


Figure 6.2. Gain structure settings based on input and output levels

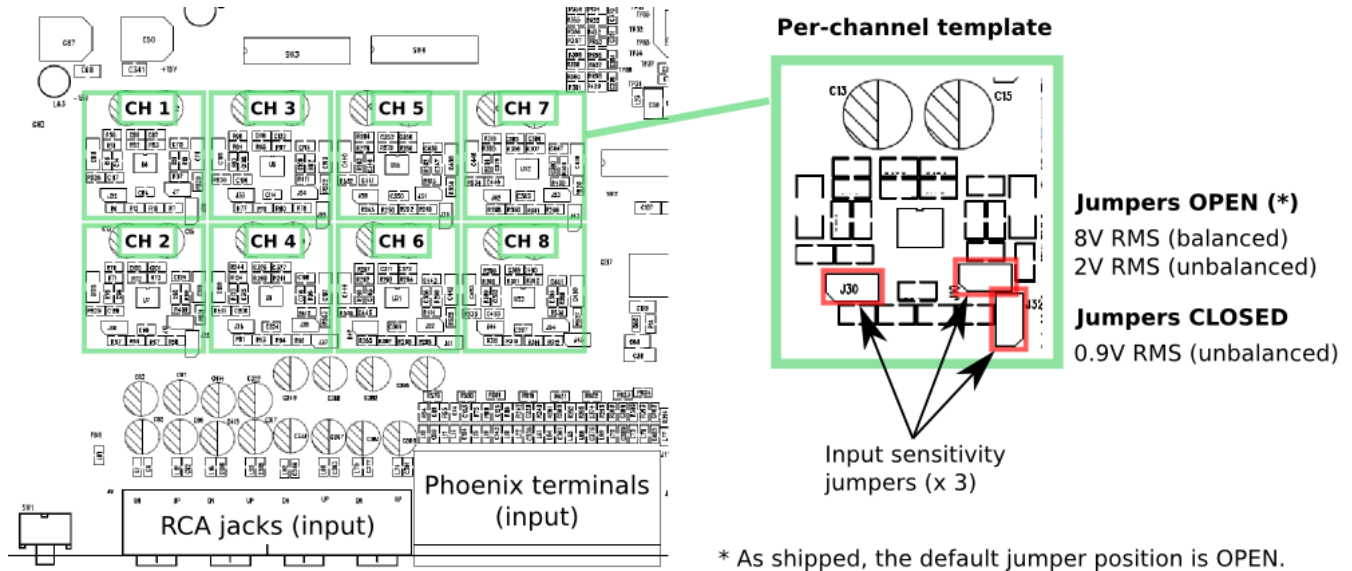
		Unbalanced output		Balanced output	
Setting		0.9V	2V	4V	8V
Unbalanced input	0.9V	0 dB	6 dB	12 dB	18 dB
	2V	-6 dB	0 dB	6 dB	12 dB
Balanced input	8V	-18 dB	-12 dB	-6 dB	0 dB

Gain values are simplified to give exact multiples of 6dB.

Figure 6.3. Input-output gain determined by connection type and gain structure settings

8.2.1 To change input sensitivity

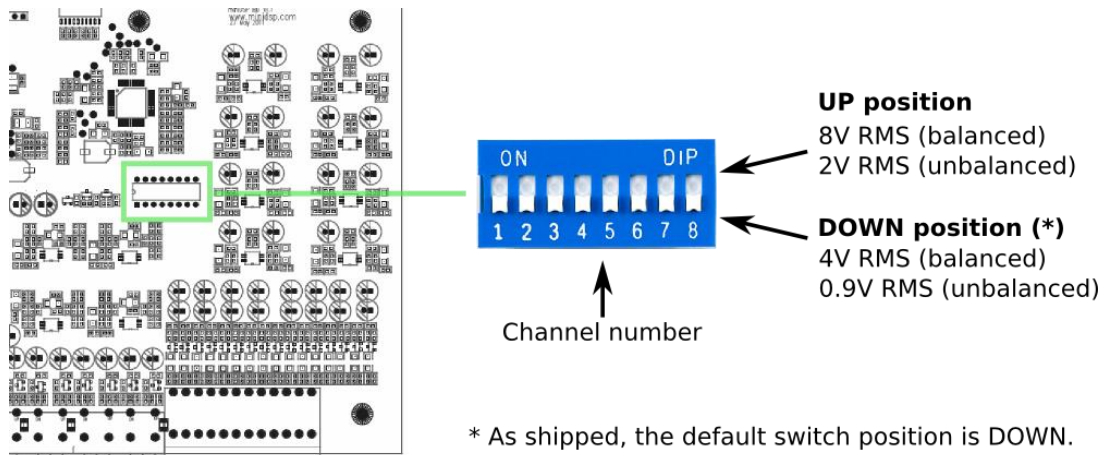
Input sensitivity can be changed for **unbalanced connection only**, by moving a set of three jumpers on each channel. The diagram below illustrates the location of the jumper headers for each channel. For each channel that is to be changed, lift the jumpers and replace them in either the OPEN position (jumper pushed onto one pin only) or CLOSED position (jumper pushed onto both pins).



Do not make a balanced connection to the input of any channel with jumpers in the CLOSED position.

8.2.2 To change output gain

A set of eight DIP switches located on the main circuit board select the output gain of each channel. The switches can be set independently for each channel, and affect output gain for both the balanced and unbalanced output connections to that channel.



8.3 OPTIMIZING GAIN STRUCTURE

If the acoustic output level of different channels shows substantial differences (greater than 6 dB), then there may be room to improve the gain structure of your system. Follow the procedure below carefully. Note that:

- You must not adjust the **Channel volume** sliders away from the maximum at any point in this procedure.
- It is not necessary to get all test meter readings at exactly the target level. The aim of the procedure is simply to reduce gain differences between channels, not to eliminate them.
- In step 6, there is a judgment call on which channels should have increased gain and which should have reduced gain.
- It is possible that you will get to step 7 and realize that there is nothing you can do to improve the gain structure of your system.



Changing the connection type or gain structure settings of individual channels will invalidate all of your existing Dirac Live projects. You will need to discard all existing projects and filter sets after completing this procedure, and redo your Dirac Live calibration.

8.3.1 Procedure for optimizing output gain

1. If your amplifiers have gain controls, set them all to maximum (including the subwoofer).
2. Quit and restart **Dirac Live Calibration Tool**.
3. On the **Output & Levels** tab, set all **Channel volume** sliders to maximum. Do not move them again while performing this procedure.
4. Set the **Output volume** low and turn on the test signal for channel 1. Adjust **Output volume** and **Input gain** so the meter reads in the middle of the green area i.e. -12 dB.
5. Turn on the test signal for the remaining channels and note the level of the test signal on the meter (for example, -6 dB, -15 dB, etc).
6. Determine the target level for each channel:
 - a. The speaker channels should all have the same target level.
 - b. If the **Custom System** configuration is used, the subwoofer target is the same as the speakers.
 - c. If the **5.1** or **7.1** configuration is used, the subwoofer target is 6 dB higher than the speakers. For example, if the speaker target is -12 dB, the subwoofer target is then -6 dB.
7. Using the tables on the next page, decide on the best method to change the gains of each channel to get closer to the target values.
8. Power off the power amplifiers and the *DDRC-88A*, and make the changes.
9. Power on the *DDRC-88A* and the power amplifiers, restart **Dirac Live Calibration Tool**, and re-run the levels check on the **Output & Levels** tab.

8.3.2 To increase output gain

Before	After	Gain change (approx.)
DIP switch DOWN	Dip switch UP	+6 dB
Unbalanced connection	Balanced connection (*1)	+12 dB (*2)
Unbalanced connection	Balanced to unbalanced adapter (*3)	+6 dB

- *1. This change can be made only if your amplifier has balanced inputs.
- *2. This gain change applies in the typical case in which the amplifier has the same sensitivity/gain on both balanced and unbalanced input connections. Some amplifiers have half the sensitivity on the balanced inputs, in which case this connection change will result in a +6 dB gain change. Please check the specifications of your amplifier.
- *3. See page 70 for wiring.

8.3.3 To reduce output gain

Before	After	Gain change (approx.)
Amplifier gain full	Amplifier gain reduced	-variable
DIP switch UP	Dip switch DOWN	-6 dB
Balanced connection	Unbalanced connection (*4)	-12 dB (*5)
Balanced connection	Balanced to unbalanced adapter (*4,*6)	-6 dB (*7)

- *4. This change can be made only if your amplifier has unbalanced inputs.
- *5. This gain change applies in the typical case in which the amplifier has the same sensitivity/gain on both balanced and unbalanced input connections. Some amplifiers have half the sensitivity on the balanced inputs, in which case this connection change will result in -6 dB gain change. Please check the specifications of your amplifier.
- *6. See page 70 for wiring.
- *7. This gain change applies in the typical case in which the amplifier has the same sensitivity/gain on both balanced and unbalanced input connections. Some amplifiers have half the sensitivity on the balanced inputs, in which case this connection change will have no useful effect. Please check the specifications of your amplifier.

8.4 LFE ALIGNMENT GAIN

“Known as the LFE channel (for Low Frequency Effects), it handles bass created specifically for subwoofer boom effects and may also carry low frequency information from the other channels in order to enrich the overall soundtrack.”

5.1-Channel Production Guidelines, Dolby Laboratories Inc.

“The LFE channel is recorded with a level offset of –10 dB. This offset is compensated for in the reproduction system, where the LFE loudspeaker has an acoustic output (within its low frequency passband) of +10 dB with respect to the other channels.”

[Recommendation ITU-R BR.1384-2 : Parameters for international exchange of multi-channel sound recordings with or without accompanying picture](#), International Telecommunication Union.

8.4.1 The LFE channel and the DDRC-88A

As noted in the quote above, the LFE channel is recorded 10 dB lower than the speaker channels. On replay, a signal in the LFE track must therefore produce 10 dB more *acoustic* output than the same signal in one of the speaker tracks. If we were to assume that the monitoring system (amplifiers, speakers, and subwoofer) were initially calibrated so that the same electrical input signal delivered the same acoustic output from all channels, then the channel that plays the LFE content (i.e. the subwoofer channel) must have 10 dB of electrical gain added to it, somewhere between the bitstream decoder and the subwoofer driver.

This additional 10 dB gain we will refer to as the “LFE alignment gain,” since it is there to align the level of LFE acoustic output with the output from the speakers. (Bass management is discussed below.)

In a studio environment, where calibration of the monitoring system is likely, the mixing desk typically includes an additional 10 dB of gain between the recording output and the monitoring output. With that said, subwoofers designed for studio use often include an “LFE +10 dB” gain switch, specifically to cater for those situations in which the mixing desk does not have this facility.

In a home theater environment, *a priori* calibration of the amplifier/speaker system is unlikely. Nonetheless, A/V receivers and processors typically apply 10 dB of gain to the subwoofer output. In other cases, such as players with analog output, the source does not apply the LFE alignment gain and the subsequent electronics (receiver or subwoofer amplifier) is expected to provide it instead. SPL calibration is done for the whole replay chain, and may be a manual process involving test signals and adjusting subwoofer gain, or an automated process whereby onboard software adjusts the subwoofer trim level.

The *DDRC-88A* caters to all of these situations. If the *DDRC-88A* is to “ignore” the whole question of LFE alignment gain, choose the **Custom System** configuration. Every channel will be treated as equal (in terms of gain) by Dirac Live, and the onus is on external equipment to provide 10 dB of alignment gain – usually in the source equipment, but it can also be done in the subwoofer amplifier after Dirac Live calibration has been completed.

If, on the other hand, the *DDRC-88A* is to be “aware” of the need for LFE alignment gain, then choose the **5.1 Speaker System** or **7.1 Speaker System** configuration. In this case, Dirac Live will calibrate for 10 dB higher acoustic output on the subwoofer channel by adjusting its internal trim on the subwoofer channel. This does *not*

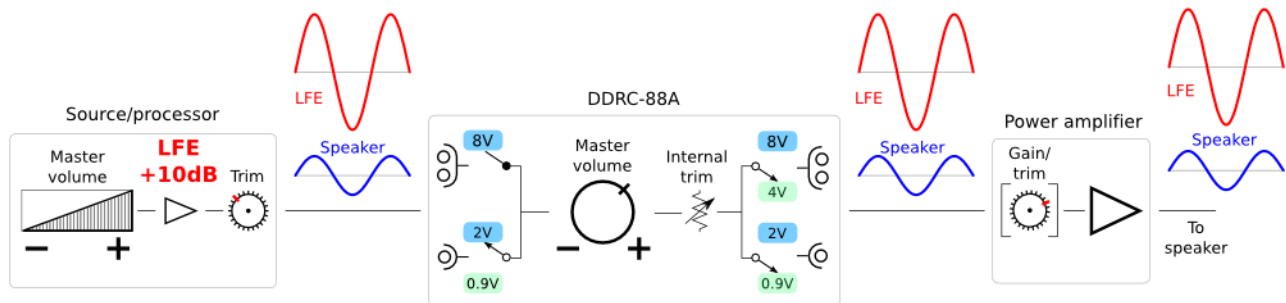
necessarily mean that the *DDRC-88A* will apply 10 dB of gain to its subwoofer channel – that is determined by the calibration process.

8.4.2 LFE effect on gain structure

In the gain structure optimization procedure on page 50, we recommend that for the **5.1 Speaker System** or **7.1 Speaker System** configurations, the target level of the subwoofer be set 6 dB higher (*1) than the speaker channels. This will push the bulk of the 10 dB LFE alignment gain into the subwoofer amplifier, which will in turn result in an input-output gain on the *DDRC-88A* subwoofer channel of about unity. (Assuming the input sensitivity is the same as the output gain setting.)

Purely in terms of gain structure, this is better than applying the extra gain in the source equipment. This is illustrated in Figure 6.4 below. At the top, with 10 dB of gain applied in the source/processor, the subwoofer signal is 10 dB higher than the speaker signal at the *DDRC-88A* inputs and outputs. At the bottom, with the 10 dB extra gain applied in the subwoofer amplifier, we still have the required 10 dB greater subwoofer output, but the subwoofer signal at the *DDRC-88A* inputs and outputs is aligned with the level on the speaker channels.

+10 dB gain in source/processor (Custom System configuration)



+10 dB gain in subwoofer amplifier (5.1 or 7.1 Speaker System configuration)

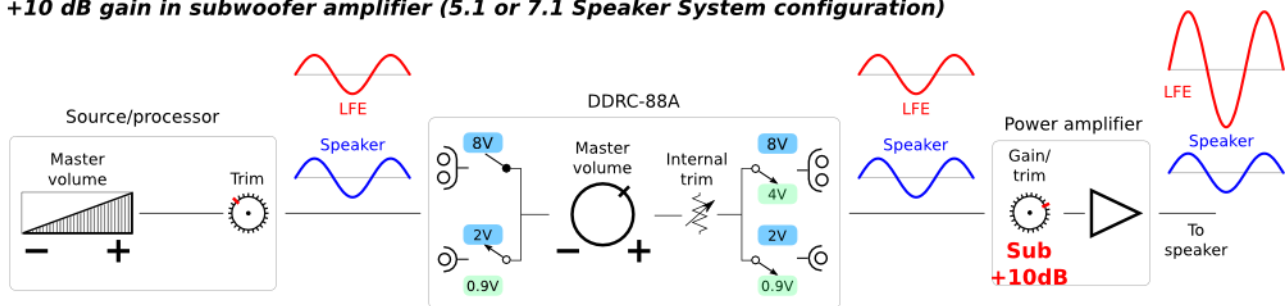


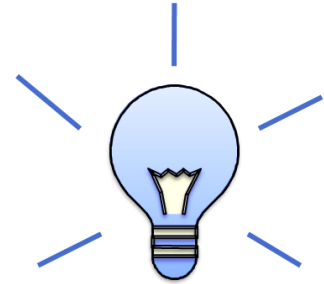
Figure 6.4. Illustrating signal levels depending on where LFE alignment gain is applied

(*1. The suggested 6 dB higher target level is only an approximation—the resulting input-output gain of the subwoofer channel depends on the bandwidth of the subwoofer and its measured in-room response. A more precise setting would require measuring the electrical output of the *DDRC-88A* after calibration, but this is unlikely to be necessary nor it is something that can be covered in this manual.)

8.4.3 LFE gain structure problems

The difference in signal levels for **Custom Configuration** is likely not a problem in practice, in most systems. If, however, you do experience issues with distortion on the subwoofer channel at high playback levels, it may be that you are clipping the subwoofer output of the source equipment or the subwoofer input of the *DDRC-88A*. Here are two possible remedies:

- Reduce the level of the subwoofer trim in the source equipment and increase the gain on the subwoofer amplifier by the same amount. If you do this, you will need to remember to set the subwoofer gain back to its previous position if you redo your Dirac Live calibration.
- Remove the 10 dB alignment gain from the source equipment completely, and use the **5.1 Speaker System** or **7.1 Speaker System** configuration. If your source does not have a 10 dB gain switch/setting, you should be able to accomplish the same thing by setting the subwoofer trim control to -10 dB. You will need to redo the gain structure optimization procedure on page 50 and your Dirac Live calibration as described in Sections 5 and 6.



8.4.4 Bass management and LFE alignment gain

When redirected bass from the speaker channels is mixed with the LFE channel, it is mixed at a relative level of -10 dB. After 10 dB LFE alignment gain is applied to the mixed signal, the redirected bass is at the correct level again. The whole discussion above therefore applies regardless of whether the subwoofer output from the source equipment is carrying only the LFE content, or bass-managed content that includes the LFE content mixed with bass from the speaker channels.

If mixing of redirected bass is performed digitally, there is a danger of clipping the signal. The LFE signal already uses the full-scale digital range, so adding in bass from another seven channels, even reduced by 10 dB, could exceed the maximum digital signal level. To avoid this, the LFE is reduced prior to mixing by 5 dB and the redirected bass from the speaker channels is reduced by 15 dB. After D/A conversion, 15 dB of gain is applied in the analog domain (10 dB alignment gain, plus another 5).

Some consumer equipment, however, does not apply the 15 dB of analog gain. This is more likely in front-end equipment like DVD/Blu-ray players. If a unit like this is connected directly to the *DDRC-88A* inputs and bass management is used, you will need to:

- Use the **5.1 Speaker System** or **7.1 Speaker System** configuration for 10 dB of LFE alignment gain, and
- Add another 5 dB of gain by:
 - Raising the subwoofer trim level in the source/processor by 5 dB, or
 - Adding 5 dB of gain in the subwoofer amplifier after completing Dirac Live calibration.

9 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. There are additional application notes on our website that give specific examples of plugin usage:

- [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.

9.1 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.

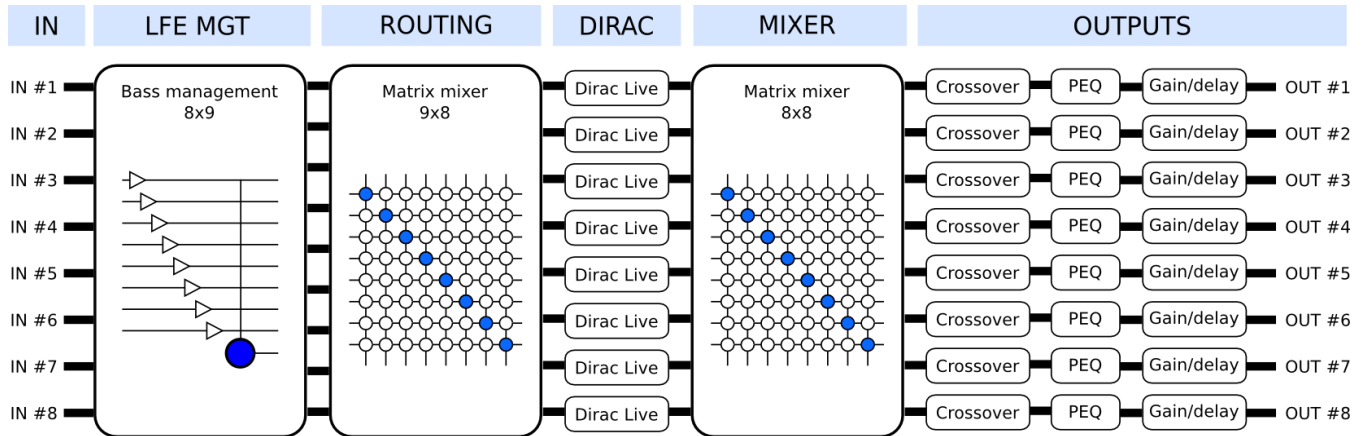
The screenshot shows the DDRC-88 2.1 software interface. Key areas are highlighted as follows:

- 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.
- Main configuration window:** An orange box highlights the main display area for the 'Outputs' tab, which shows eight speaker channels (FL Out, FR Out, SUB Out, CTR Out, SL Out, SR Out, RL Out, RR Out). Each channel has a vertical level meter, a gain knob, a PEQ Xover control, and 'Invert' and 'Mute' buttons.
- Master control:** A purple box highlights the top right corner, containing 'Connect', 'Mute', 'IP address', 'Auto', and 'Master Volume' controls.

Once the DDRC-88A 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 43 and 44). If desired, however, the user interface can remain online during use for real-time (“live”) adjustment of the settings.

9.2 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 22.

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.

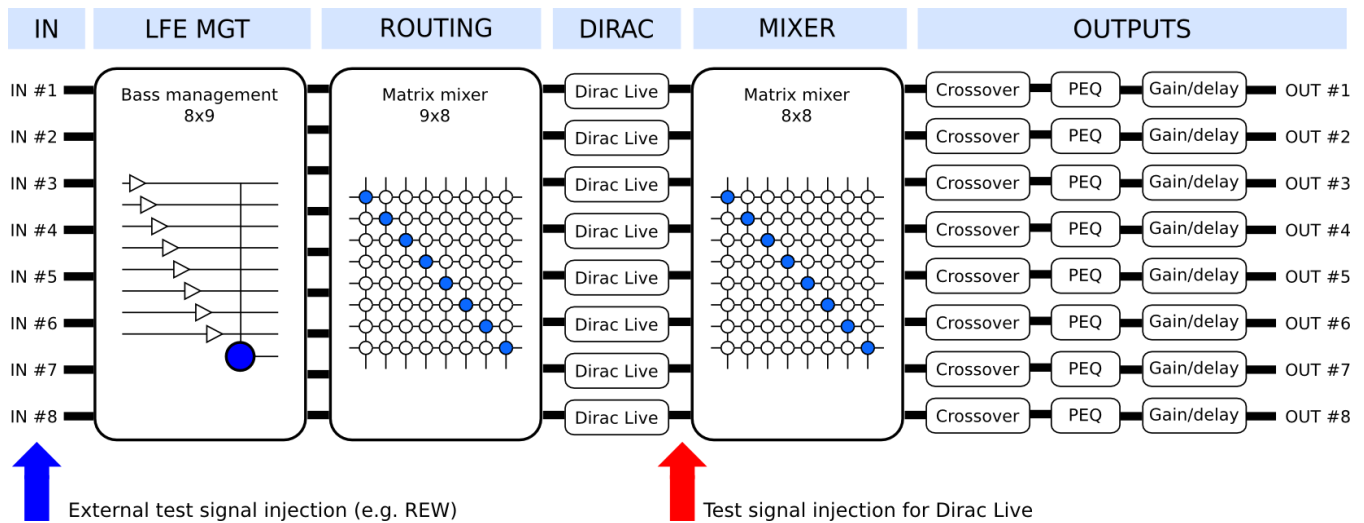
9.3 PLUGIN DESIGN/CONFIGURATION GUIDE

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-88A 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).

9.4 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-88A to a USB 2.0 port on your computer. Then click on the Connect button:

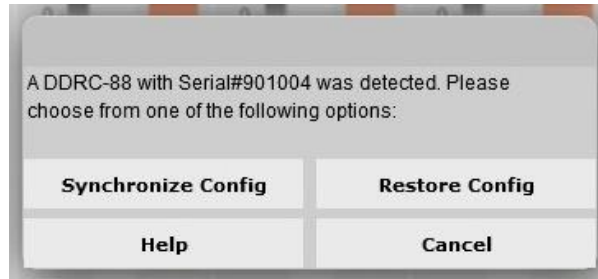


For networked communication with the processor, a miniDSP [Wi-DG Wifi/Ethernet to USB bridge](#) must be used together with the **IP Address** and **Auto** fields. See the [Wi-DG User Manual](#) for details.

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.

9.4.1 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-88A. 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-88A. 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-88A. The plugin will remain offline.

9.4.2 More about configurations

The effect of changes made in the user interface fall 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-88A. 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.

9.4.3 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.

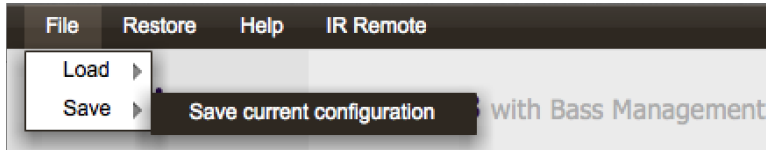


We recommend that all configurations be selected and checked/initialized prior to passing audio through the DDRC-88A, to ensure that audio processing parameters are in a known state.

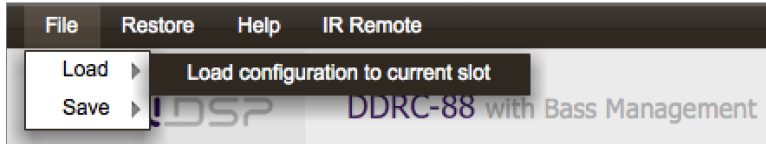
9.4.4 Saving and loading configurations

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-88A 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-88A immediately. If the plugin is offline, the data will be loaded into the user interface only, and will be downloaded to the DDRC-88A 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**.

9.4.5 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**.

9.4.6 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.

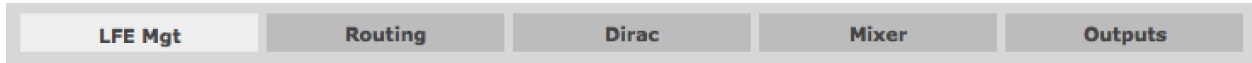
Current Configuration Only

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.

9.5 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 22.

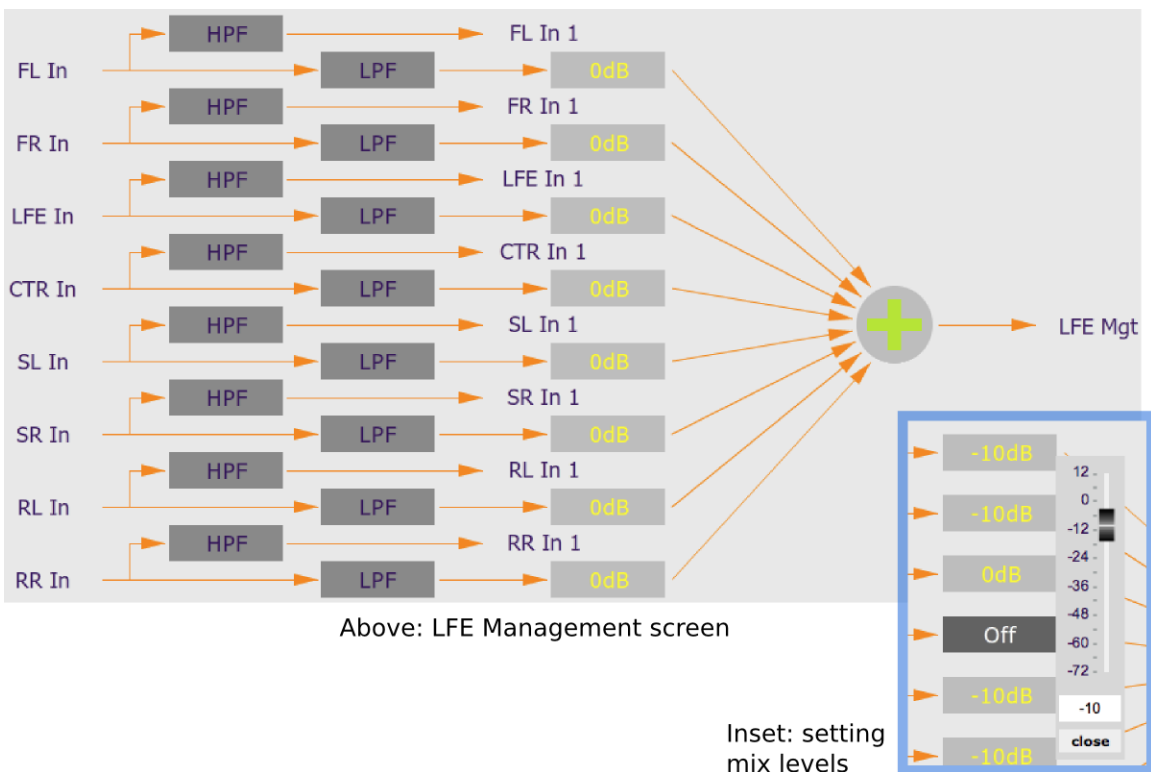
Note that the tabs are usually set up from right to left – that is, the output channels are configured, then Dirac Live calibration is performed, then the bass management is set up.

9.6 LFE MGT

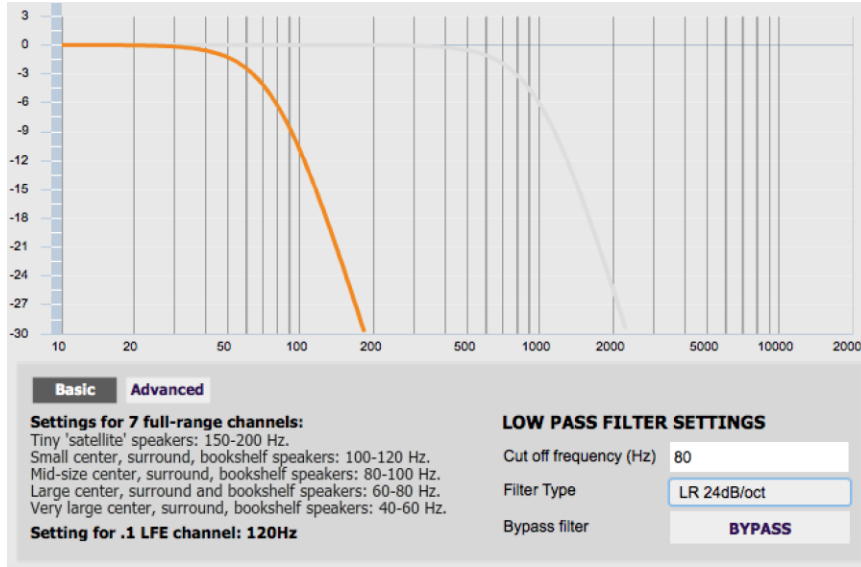
When movies are mixed for the cinema, each speaker is specified as a full bandwidth channel—that is, 20 Hz to 20 kHz, although 40 Hz to 18 kHz for the speakers is considered acceptable in cinema and the mixing studio (see the Grammy paper “[Recommendations For Surround Sound Production](#)”). The Low 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:

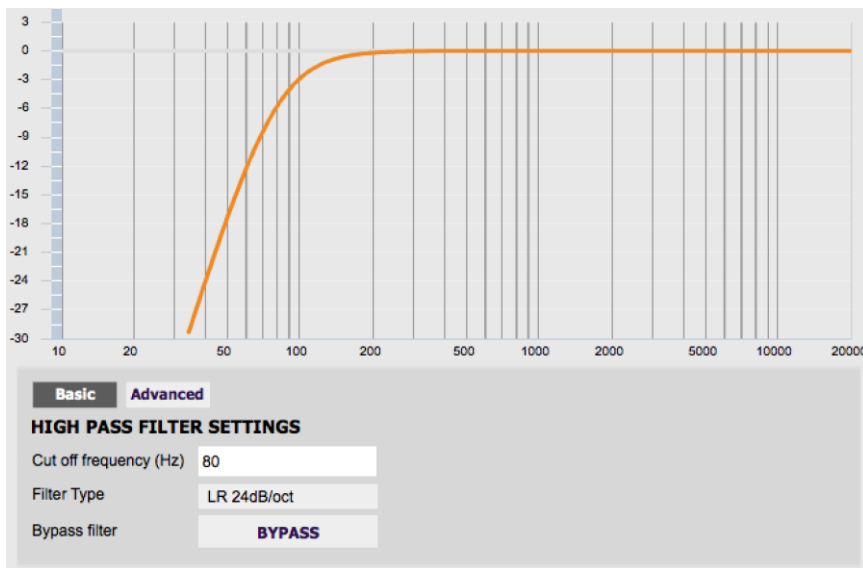


To generate the subwoofer (“LFE Mgt”) signal, the input channels are low pass filtered in the **LPF** blocks, and then summed together. The controls for each **LPF** block are similar to those seen in the **Xover** blocks in the output channels, but only have a single low pass filter and are limited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



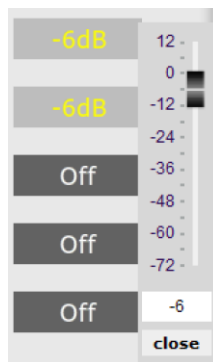
9.7 ROUTING

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).

9.8 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.

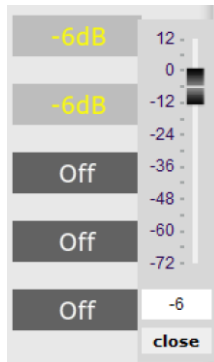


This is the default setting:

	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 home theater 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.

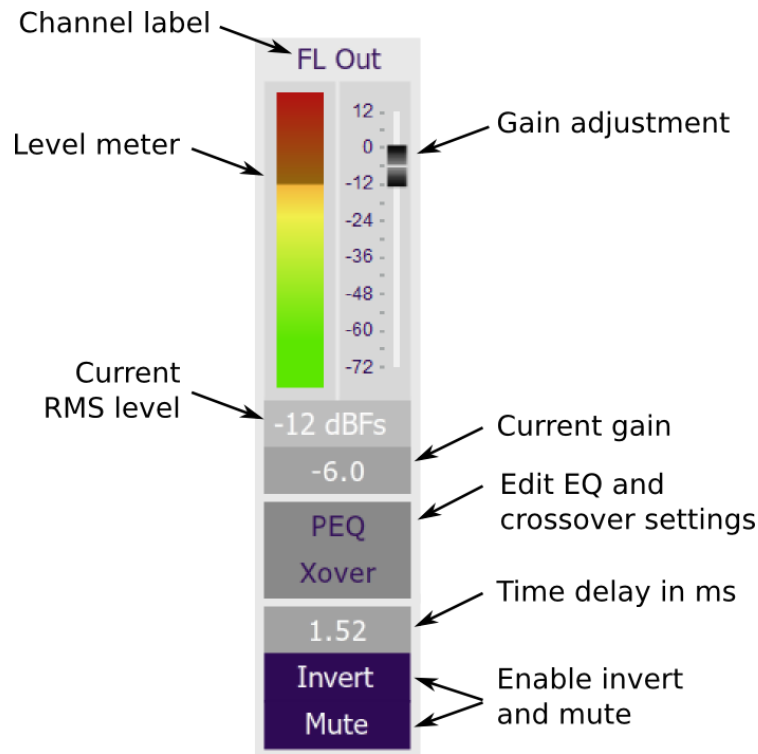
The gain of the signal being mixed can be adjusted at each crosspoint to a value between -72 and +12 dB.



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

9.9 OUTPUTS

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



9.9.1 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).

9.9.2 Gain control and level monitoring

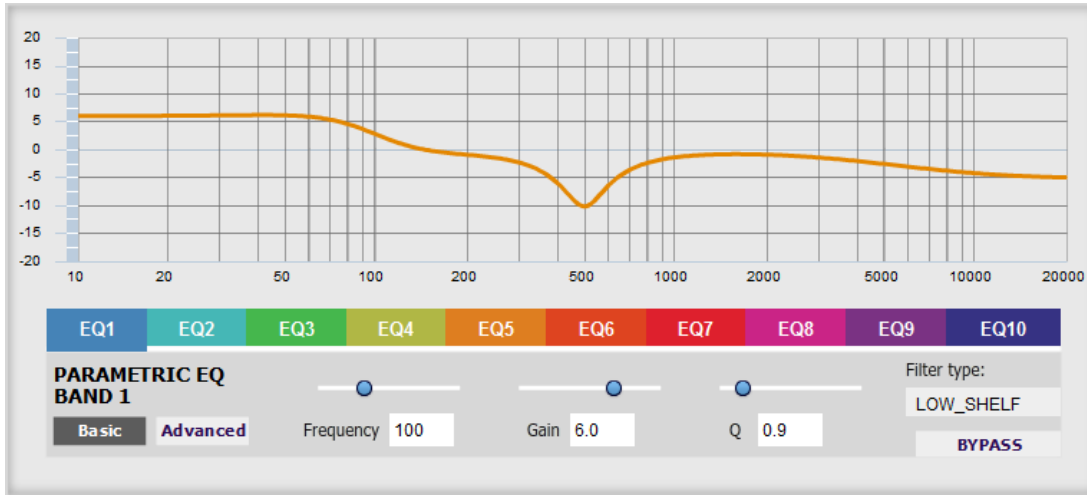
The gain of each channel can be adjusted by moving the Gain Adjustment slider, or by typing the desired gain into the Current Gain text box. The maximum gain setting is 12 dB, and the minimum gain setting is -72 dB. (0 dB, the default, is unity gain or no change in level.)

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.

9.9.3 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.

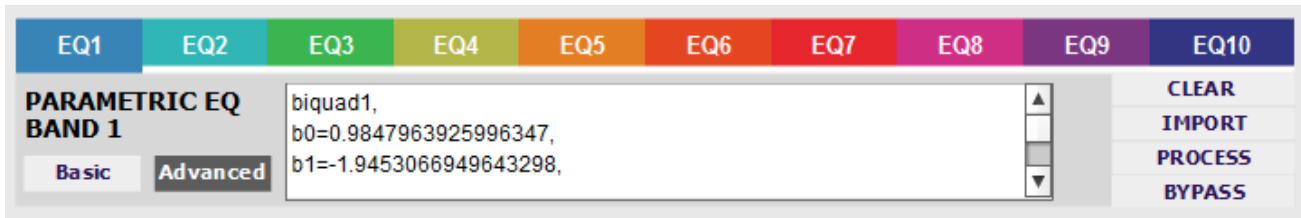
Each filter has three parameters that control its location and shape. These parameters can be entered directly as numerical values, or by using the sliders:

- 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.

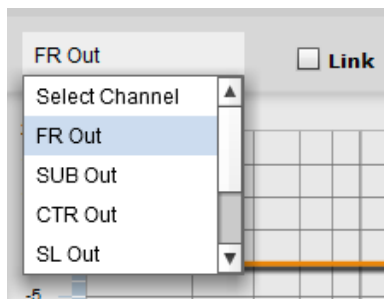
Q controls the “sharpness” of the filter. For the PEAK and SUB_EQ filter types, lower Q gives a shallower peak or dip, while higher Q gives a narrower peak or dip. For the HIGH_SHELF and LOW_SHELF filter types, Q controls how quickly the filter transitions from no gain to maximum gain.

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](#).

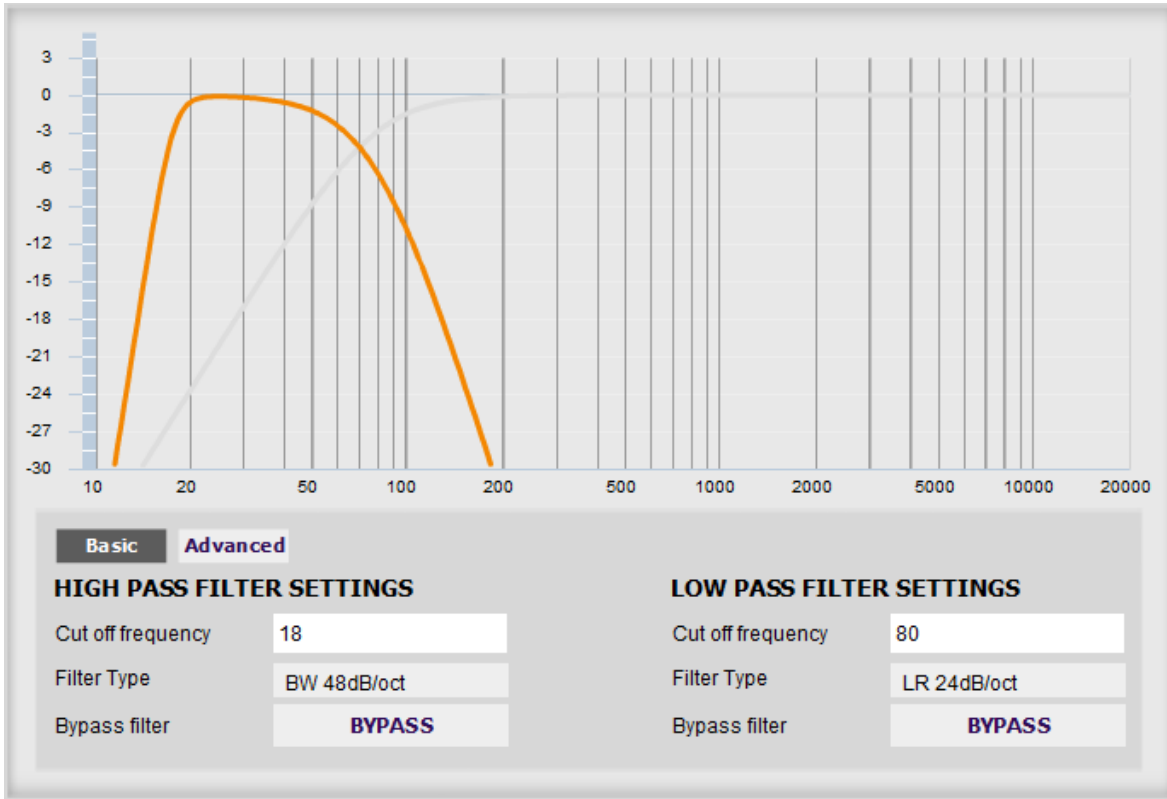


Each channel can be linked to one other channel. When a channel is linked to another, the PEQ settings of that channel are mirrored to the other. Typically, the corresponding left and right channels are linked: front left and right, surround left and right, and rear surround left and right. To link a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



9.9.4 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.

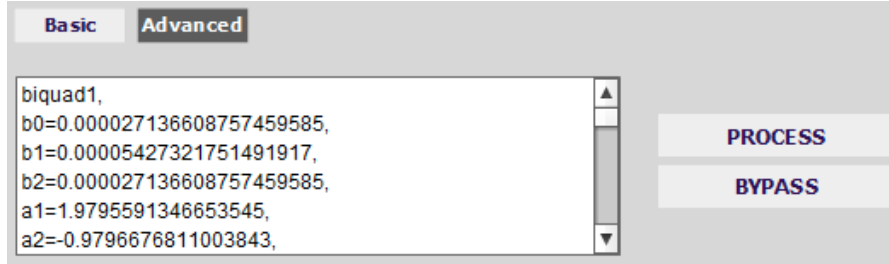
Linkwitz-Riley (LR)

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

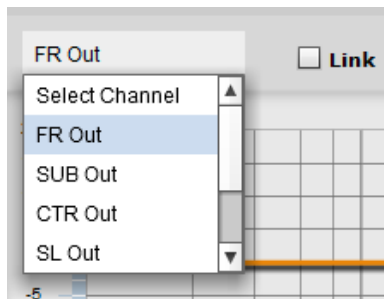
Bessel

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](#).

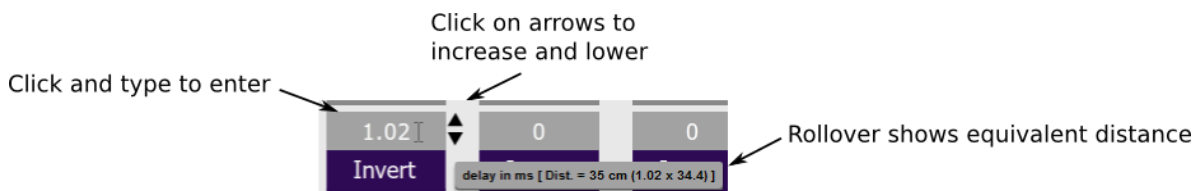


Each channel can be linked to one other channel. When a channel is linked to another, the crossover settings of that channel are mirrored to the other. Typically, the corresponding left and right channels are linked: front left and right, surround left and right, and rear surround left and right. To 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.



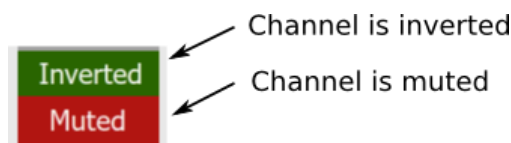
9.9.5 Time delay

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.



9.9.6 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.

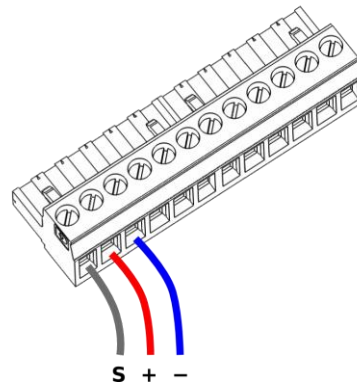


10 ADDITIONAL INFORMATION

10.1 BALANCED WIRING TIPS

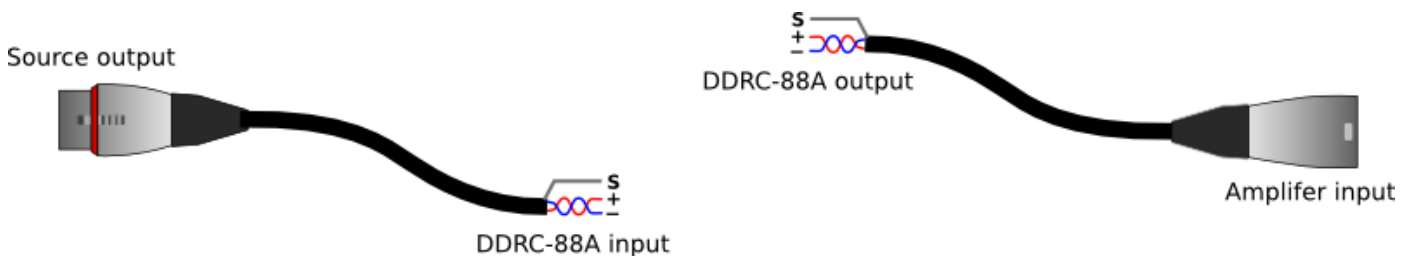
10.1.1 Phoenix terminal blocks

To make balanced connections, remove the terminal blocks from the rear of the *DDRC-88A*. Connect individual wires from a shielded pair cable to each set of screw terminals as shown below. After all connections to the terminal block are secure, firmly re-insert the terminal blocks.



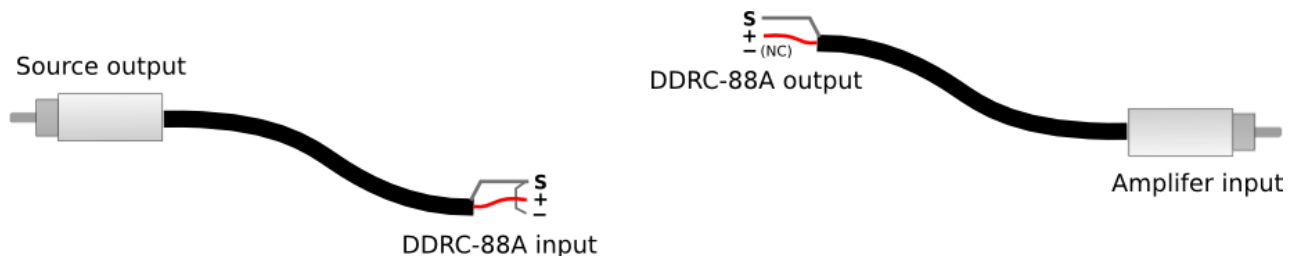
10.1.2 XLR adapters

If connecting the *DDRC-88A* to equipment that uses XLR connectors, suitable cabling can be made by cutting XLR-XLR or microphone cables in two. The two halves are then used for input and output, as shown here:



10.1.3 RCA adapters

In certain special cases, it can be helpful to connect a balanced input or output of the *DDRC-88A* to an unbalanced (RCA) connection on the source or power amplifier. The connection scheme is shown below. Note that the cable shield must be connected to the '-' terminal on the *DDRC-88A* input, whereas on the output side, the '-' terminal is not connected.





10.2 SPECIFICATIONS

Computer connectivity	Driverless USB 2.0 control interface for Windows and Mac OS X
Analog inputs	8 x Balanced (Terminal Block) or 8 x Unbalanced (RCA) inputs <ul style="list-style-type: none">• Maximum balanced input voltage: 8 VRMS• Maximum unbalanced input voltage: 2.0 or 0.9 VRMS (jumper selectable)
Analog outputs	8 x Balanced (Terminal Block) and 8 Unbalanced (RCA) outputs <ul style="list-style-type: none">• Maximum balanced output voltage: 8.0 or 4.0 VRMS (DIP switch selectable)• Maximum unbalanced output voltage: 2.0 or 0.9 VRMS (DIP switch selectable)
Input impedance	Unbalanced: 10 k Ω Balanced: 47 k Ω
Output impedance	Unbalanced: 560 Ω Balanced: 1.12 k Ω (560 Ω each signal pin)
Audio sample rate / Resolution	Input/output resolution: 24-bit integer Sample rate: 48 kHz
Audio processing	32-bit floating-point processor
Storage/Presets	4 filter sets stored, selectable from front panel or IR remote
Infrared remote	“Learning remote” capabilities (NEC, Philips, Sony, Apple) Controls master volume, mute, filter set selection, Dirac Live® filtering enable
Power supply	12 VDC single supply
Dimensions (H x W x D)	41.5 x 429 x 252 mm; 1RU height

10.3 MAIN I/O BOARD FIRMWARE UPDATE

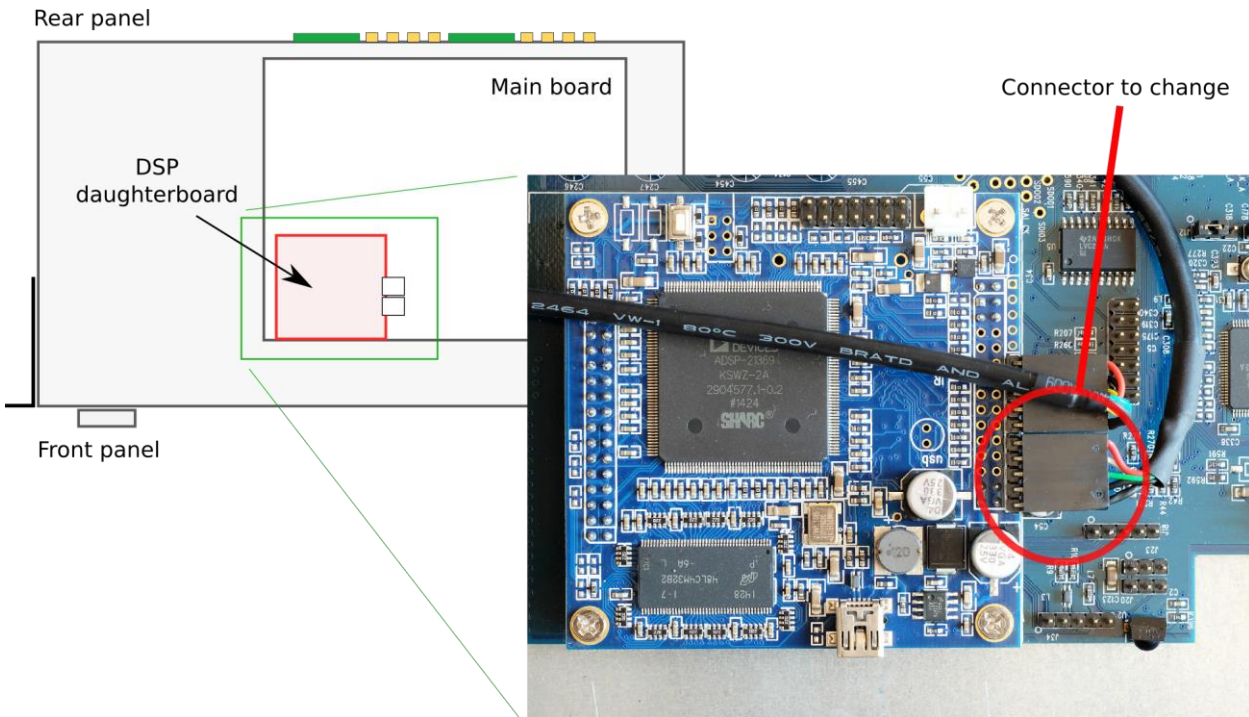
The procedure described in this section is a necessary update for all DDRC-88A units loaded with main board firmware less than Version 2.2. All currently shipping units are loaded with Version 2.2, and are marked with a green label “V2.2” (see photograph on page 17).

If you have a green label “V2.2” on your unit, you do not need to perform this procedure.

10.3.1 Prepare for installation

Place the DDRC-88A on a flat level surface. Remove power and all other connections.

1. Remove the six cross-head screws (two on the rear, and two on each side on the rack ears). Hinge up the top panel from the rear and then lift it up to remove it completely from the unit.
2. With the front panel of the DDRC-88A facing you, view the DSP daughterboard and the connecting cables. The location of the connector that will need to be moved is indicated in this diagram and photograph:

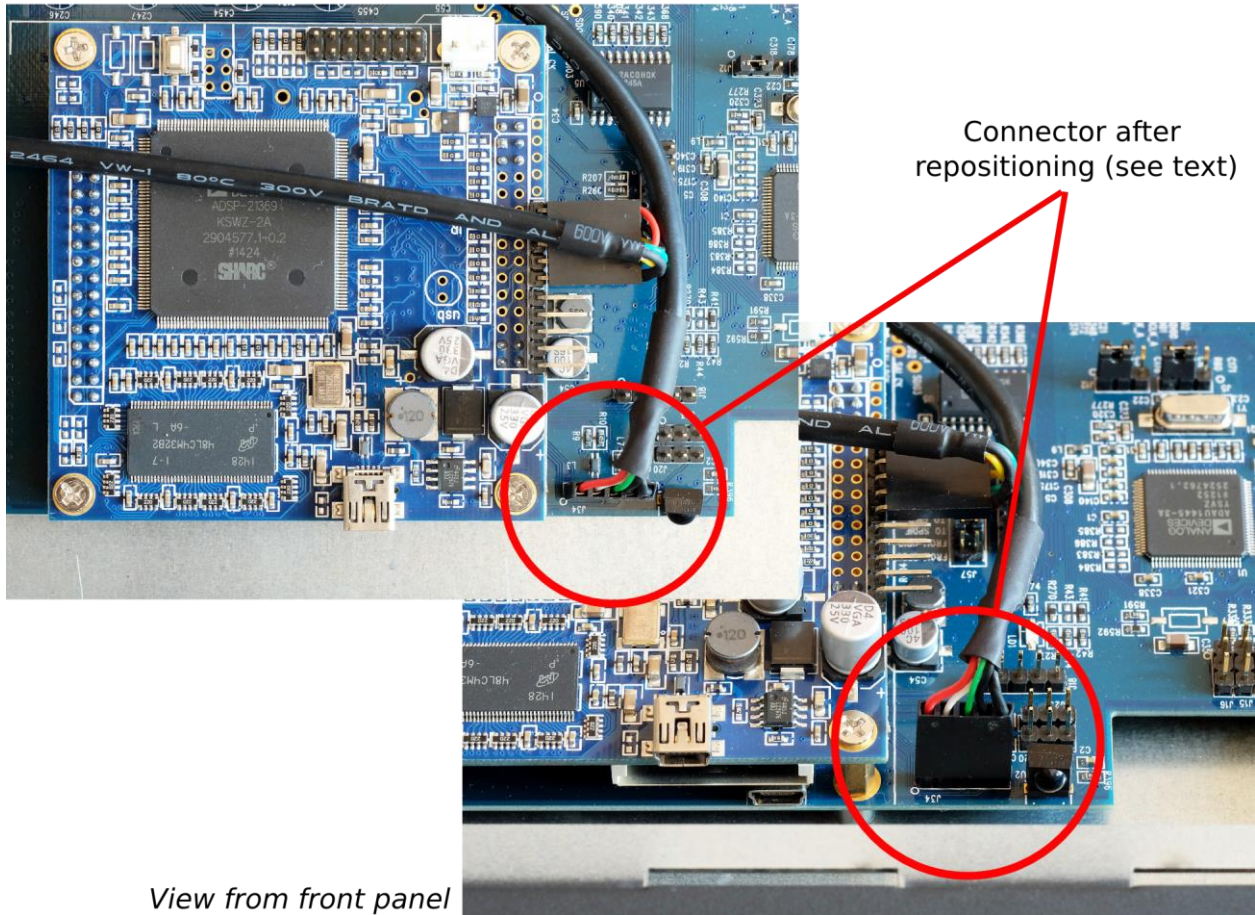


3. Carefully unplug the connector (the one closest to the bottom of the photograph above) from the daughterboard. *Grasp it by the connector body to remove it. Do not simply pull on the wires.* You may need to wriggle it *slightly* to help ease it off.

4. Reconnect the plug to the 5-pin header on the main board, labeled “J34,” below and to the right. This is shown in the photograph below (two different views). *Ensure that the five pins are correctly seated.*

Note carefully the orientation of the connector: the red wire is nearest to the DSP daughterboard.

View from top of board



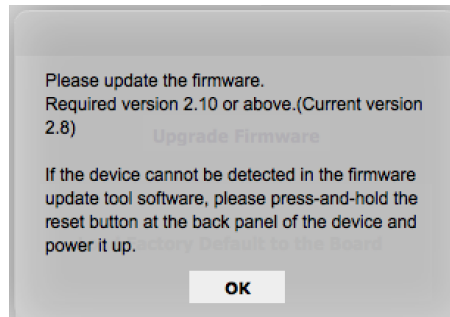
Do not force the connector. If it does not slide on with a small amount of pressure, you have not positioned the connector correctly and will damage it if you try to force it on.

10.3.2 Update the main I/O board firmware - Windows

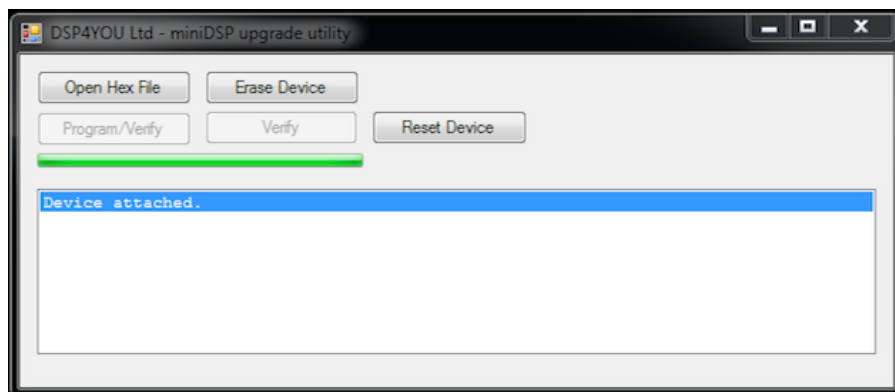
1. Apply power to the DDRC-88A and connect the rear panel USB port to your computer with a USB cable.
2. Navigate to the **Plugins** folder of the software download and then to the **Windows** folder.
3. Double click on the **MiniDSP_8x8_IO_v2_3.exe** installer and step through it.
4. The MiniDSP-8x8-IO utility will automatically run when the installer completes:



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. Jump ahead to step 6.
 - b. If your unit **does** require a firmware upgrade, a warning dialog will pop up. Click OK:



- c. The DDRC-88A will automatically be put into boot loader mode and the miniDSP upgrade utility will start. The status area should display "Device attached".



- d. Click on the **Open Hex File** button and select the **miniDSP_2x8_8x8_v2.10_release.hex** file in the **firmware** folder of the download.

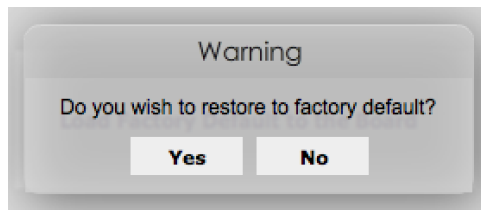


You **must** select the correct firmware file. Check the file name carefully.

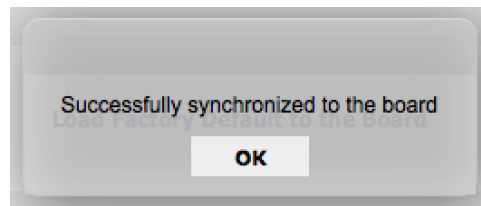
- e. Click on the **Program/Verify** button. The status bar will indicate progress. **Do not disconnect the USB cable or remove power** from the processor while this runs!
- f. After the status indicates that the verify has completed successfully, click on the **Reset Device** button, and then quit the upgrade utility.
- g. Return to the MiniDSP-8x8-IO utility. (If there is a dialog informing "Connection to DSP closed," click on **OK**.) Click on the **Connect** button. It will change to a green tick.



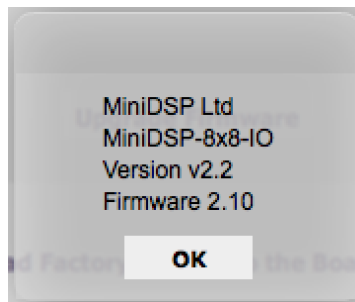
- 6. Click on "Load Factory Default to the Board." At the warning, click Yes.



- 7. When the completion message below displays, click on OK and then quit the program.



- 8. Click on the **About** button to confirm the new firmware version.



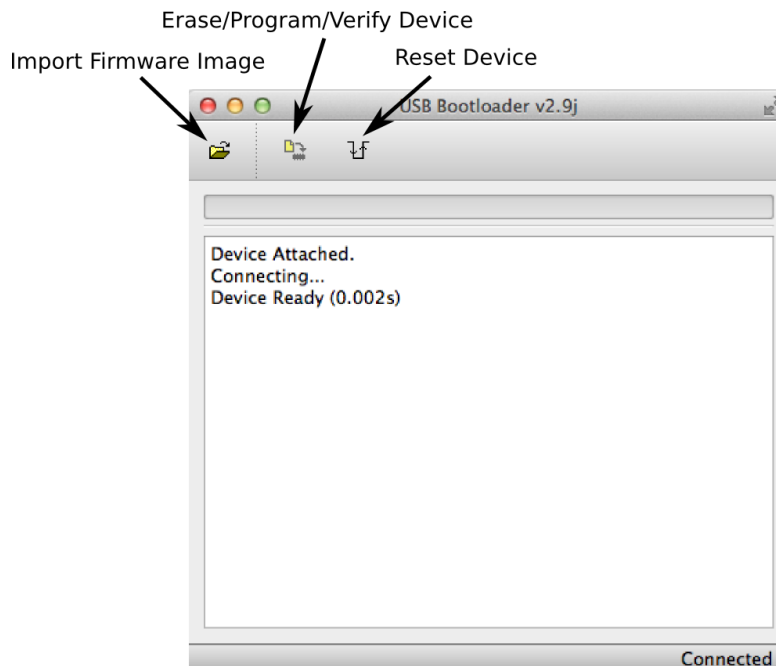
- 9. You can now uninstall the MiniDSP-8x8-IO program, as it is no longer needed. Use the Uninstall feature of the Windows Control Panel.

10.3.3 Update the main I/O board firmware - Mac

1. Apply power to the DDRC-88A and connect the rear panel USB port to your computer with a USB cable.
2. Navigate to the **Plugins** folder of the software download and then to the **Mac** folder.
3. Double-click on the **MiniDSP_8x8_IO_v2_3.pkg** installer program to run it.
4. The MiniDSP-8x8-IO utility will automatically run when the installer completes:



5. Click on the **Connect** button.
 - a. If your unit does **not** require a firmware upgrade, the connect button will change to a green tick. Jump ahead to step 6.
 - b. If your unit **does** require a firmware upgrade, a warning dialog will pop up. Click OK.
 - c. The DDRC-88A will automatically be put into boot loader mode and the miniDSP upgrade utility will start. The status area should display “Device attached” and then “Device Ready.”



- d. Click on the **Import Firmware Image** button and select the **miniDSP_2x8_8x8_v2.10_release.hex** file in the **firmware** folder of the download.

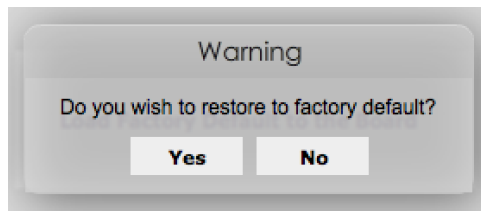


You **must** select the correct firmware file. Check the file name carefully.

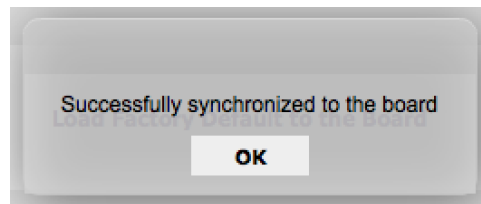
- e. Click on the **Erase/Program/Verify Device** button. The status bar will indicate progress. **Do not disconnect the USB cable or remove power** from the processor while this runs!
- f. After the status indicates that the verify has completed successfully, click on the **Reset Device** button, and then quit the upgrade utility.
- g. Return to the MiniDSP-8x8-IO utility. (If there is a dialog informing "Connection to DSP closed," click on **OK**.) Click on the **Connect** button. It will change to a green tick.



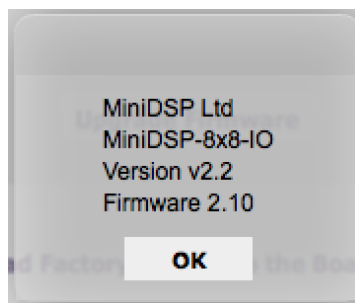
- 6. Click on "Load Factory Default to the Board." At the warning, click Yes.



- 7. When the completion message below displays, click on OK and then quit the program.



- 8. Click on the **About** button to confirm the new firmware version.

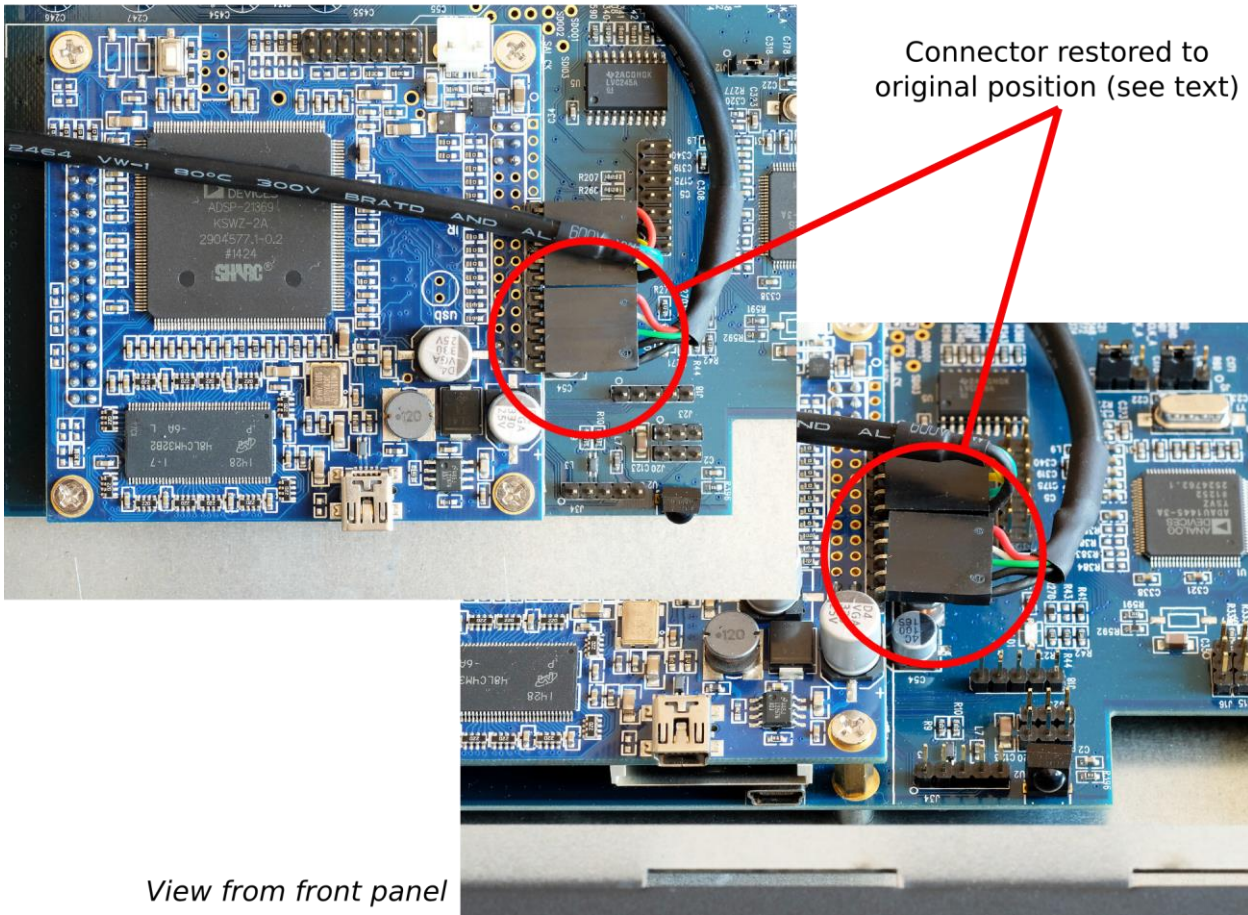


- 9. You can now uninstall the MiniDSP-8x8-IO program, as it is no longer needed. Locate it in the Applications/MiniDSP folder and drag it to the Trash.

10.3.4 Restore the connectors and close up

1. Remove power from the DDR8-88A.
2. Grasp the body of the five-pin connector and pull it straight up. *Do not pull on the wires.*
3. Reposition the connector as shown in the photographs below, and push it onto the five-pin header until it has seated properly. Note carefully the orientation of the connector: the red wire is nearest to the other connector.

View from top of board



4. Replace the lid and re-install the six screws.

10.4 MCU FIRMWARE UPDATE

miniDSP may occasionally provide an update to the DDRC-88A 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.

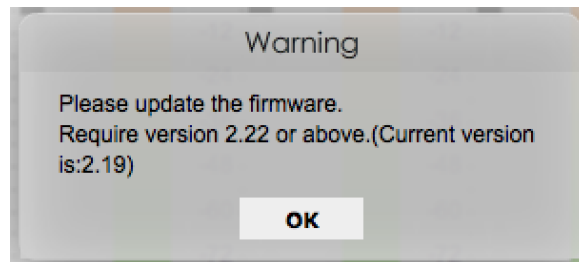
This procedure must also be performed when first using the DDRC-88BM plugin with a DDRC-88A that does not have a green label indicating “V2.2” or later. This applies to both basic mode and enhanced/bass management mode.



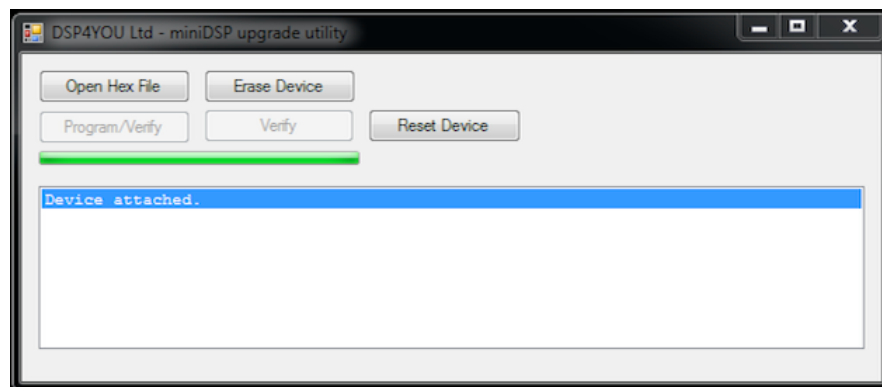
DO NOT DISCONNECT THE USB CABLE OR POWER FROM THE *DDRC-88A* WHILE FIRMWARE UPDATE IS IN PROGRESS. DOING SO MAY “BRICK” YOUR *DDRC-88A*.

10.4.1 Windows

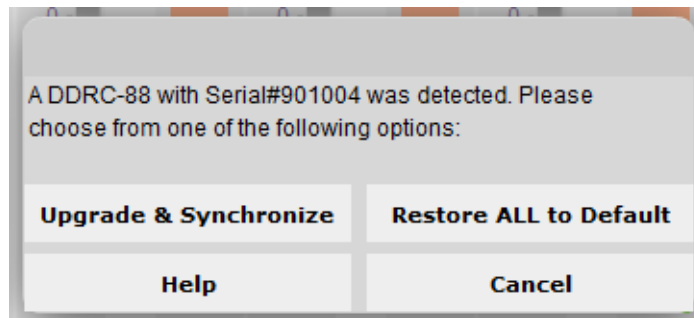
1. Download and install the latest version of the DDRC-88BM plugin.
2. Connect the DDRC-88A to your computer via USB and power it on.
3. Start the **DDRC-88BM plugin**.
4. If you have previously used the DDRC-88BM plugin and have configurations that need to be saved, save them to files now.
5. Click 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:



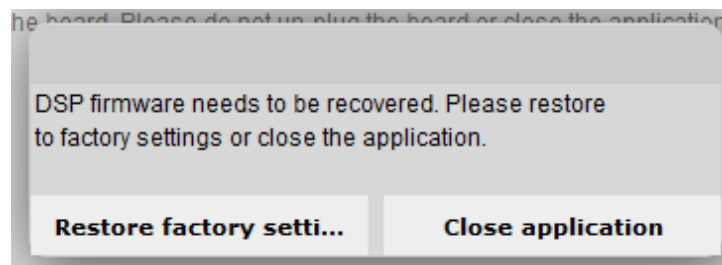
6. The DDRC-88A will automatically be put into boot loader mode and the miniDSP upgrade utility will start. The status area should display “Device attached”.



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-88A unit without bass management. (If this does not appear, skip the next step.)



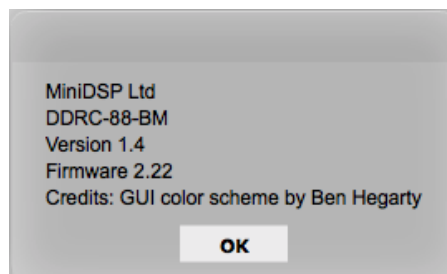
12. If the dialog appears, click on **Restore ALL to Default**. (If you click on **Upgrade & Synchronize**, the plugin will detect a mismatch and you will need to click **Restore factory settings** in the dialog shown below.)



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

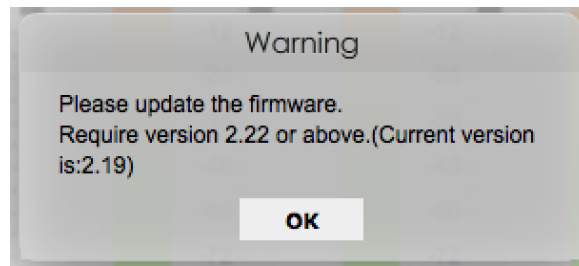


14. Drop down the Help menu and select **About...** to verify the new firmware version.

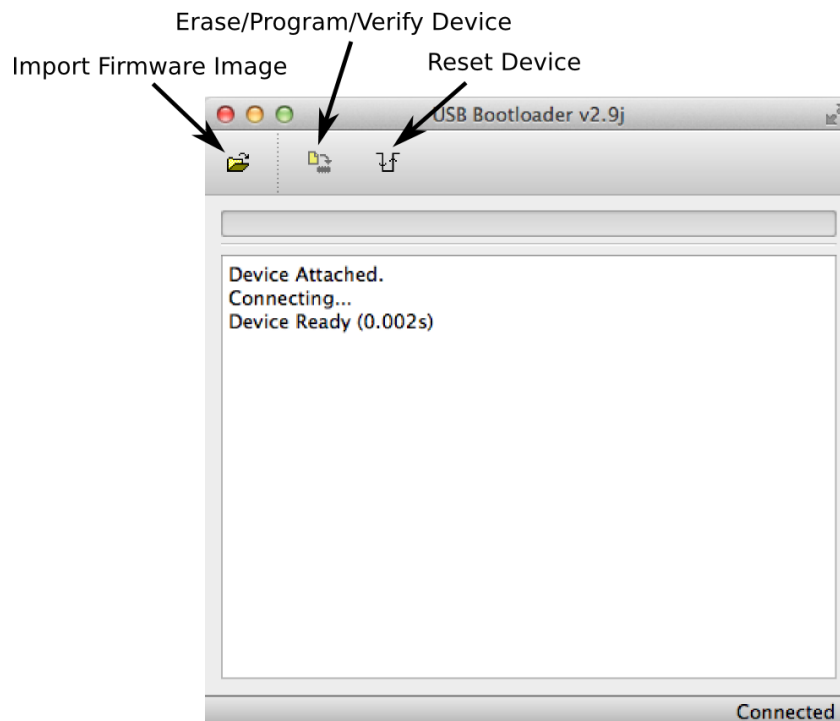


10.4.2 Mac OS X

1. Download and install the latest version of the DDRC-88BM plugin.
2. Connect the DDRC-88A 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:

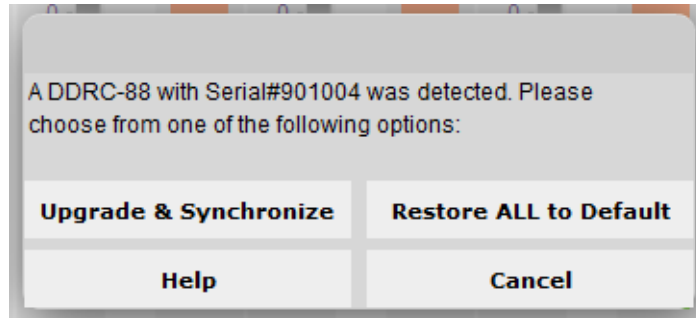


6. The DDRC-88A will be put into boot loader mode and the miniDSP bootloader program will start. The status area should display "Device attached" and then "Device Ready."

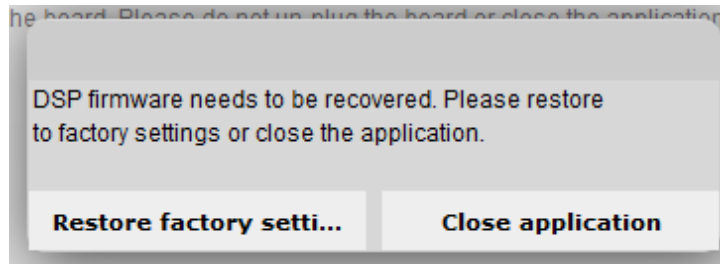


7. Click on the **Import Firmware Image** button and select the .hex file located in the **firmware** folder of the download. It will have a name like **ENC_DDRC88BM_Ver2.22_SS.hex**.

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-88A unit without bass management. (If this does not appear, skip the next step.)



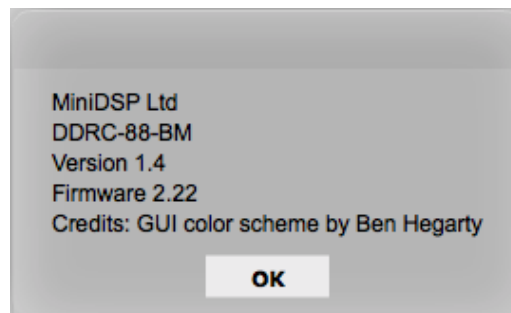
12. If the dialog appears, click on **Restore ALL to Default**. (If you click on **Upgrade & Synchronize**, the plugin will detect a mismatch and you will need to click **Restore factory settings** in the dialog shown below.)



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.



10.5 ACTIVATING ENHANCED/BASS MANAGEMENT MODE

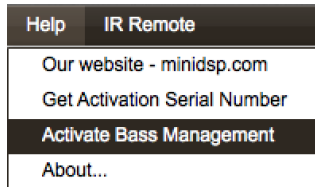
The following procedure converts a DDRC-88A from basic mode to enhanced/bass management mode. It only needs to be applied to a DDRC-88A that was purchased in basic mode, after later purchasing the plugin upgrade from the miniDSP website:

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

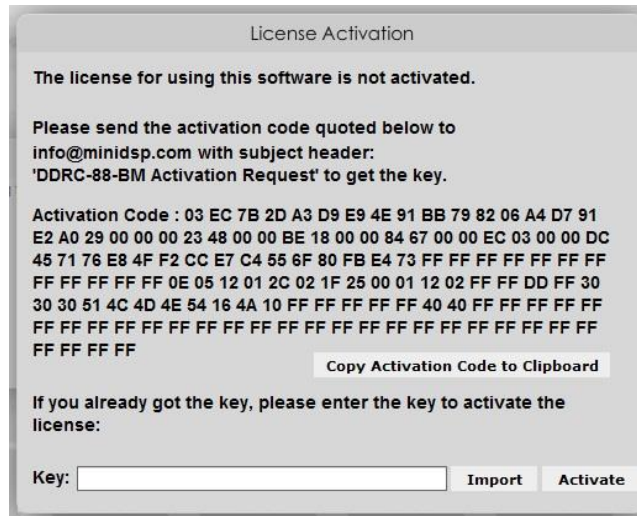


The DDRC-88A must be running the current firmware *before* doing this step. See Sections 10.3 Main I/O board firmware and 10.4 MCU Firmware update.

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 58).

10.6 TROUBLESHOOTING

The following table lists the most common causes of issues with the *DDRC-88A*. 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-88A 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 the cabling from the processor to your amplifiers. b. Check that your 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 the cabling from the processor to your amplifiers. 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-88A doesn't appear in the Sound System tab	<ol style="list-style-type: none"> Check that the USB cable to the DDRC-88A 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-88A 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-88A, such as the DDRC-88BM plugin.

10.7 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 84) and the results obtained.