

DDRC-24

ULTRA-COMPACT 2-IN 4-OUT AUDIO PROCESSOR WITH DIRAC LIVE® ROOM CORRECTION TECHNOLOGY

User Manual



Revision history

Revision	Description	Date
2.0	Updated for Dirac Live 2/3, DiracLive documentation moved to separate miniDSP Dirac Live User Manual .	30 June 2020
2.1	Adobe AIR and Flash no longer needed	1 February 2021

SUPPORTED OS



If you are unable to run the above versions of the Windows or macOS operating system, you will need to use the original version of Dirac Live (“Dirac Live 1”) with your DDRC-24 processor. Please refer to the [DDRC-24 User Manual Legacy Support](#) version.

Note: Use of Dirac Live with macOS Mojave and Catalina requires some manual workarounds, which are documented in this manual.

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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 support.minidsp.com.

System Requirements

To configure the miniDSP audio processor, you will require a Windows PC or Apple Mac OS X computer with the following minimum specification:

Windows

- **Microsoft® Windows® 10**, latest version with all updates
- Intel Pentium III or later, AMD Athlon XP or later
- 2 Gigabytes (GB) of RAM or higher
- Keyboard and mouse or compatible pointing device
- Two free USB 2.0 ports

Mac OS X

- **macOS 10.14 Mojave or 10.15 Catalina**, latest version with all updates
- 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
- Two free USB 2.0 ports

Disclaimer/Warning

miniDSP cannot be held responsible for any damage that may result from the improper use of this product or incorrect configuration of its settings. As with any other product, we recommend that you carefully read this manual and other technical notes to ensure that you fully understand how to operate this product. The miniDSP audio processor is a powerful tool, and misuse or misconfiguration, such as incorrectly set gains or excessive boost, can produce signals that may damage your audio system.

As a general guideline, you should perform the initial configuration of the miniDSP audio processor before enabling audio through any connected output device or amplification. Doing so will help ensure that the software is correctly configured.

Finally, note that the miniDSP audio processor is a very flexible device, and many of the questions we receive at the tech 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 support. Thanks 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.

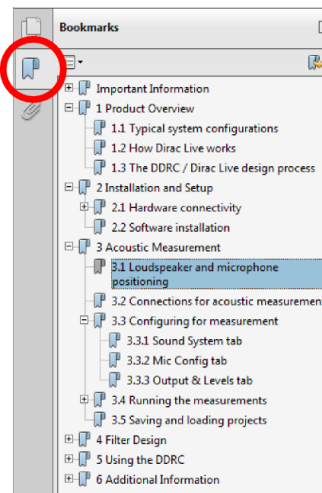
CE Mark Statement

The DDRC-24 has passed the test performed according to European Standard EN 55022 Class B.

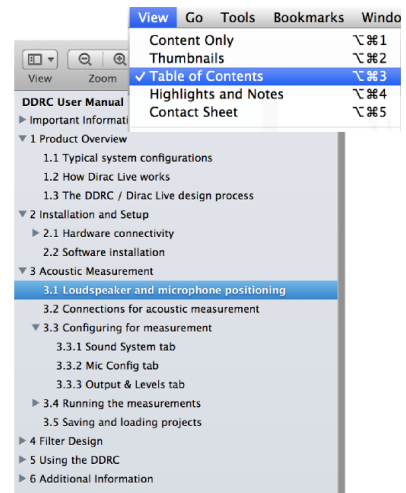
A note on this manual

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

For reading on the computer, we have included hyperlinked cross-references throughout the manual. In addition, a table of contents is embedded in the PDF file. Use the View menu (Preview on Mac) or the bookmarks sidebar (Adobe reader on Mac and Windows) to view this table of contents.



Adobe Reader on Windows



Preview on Mac

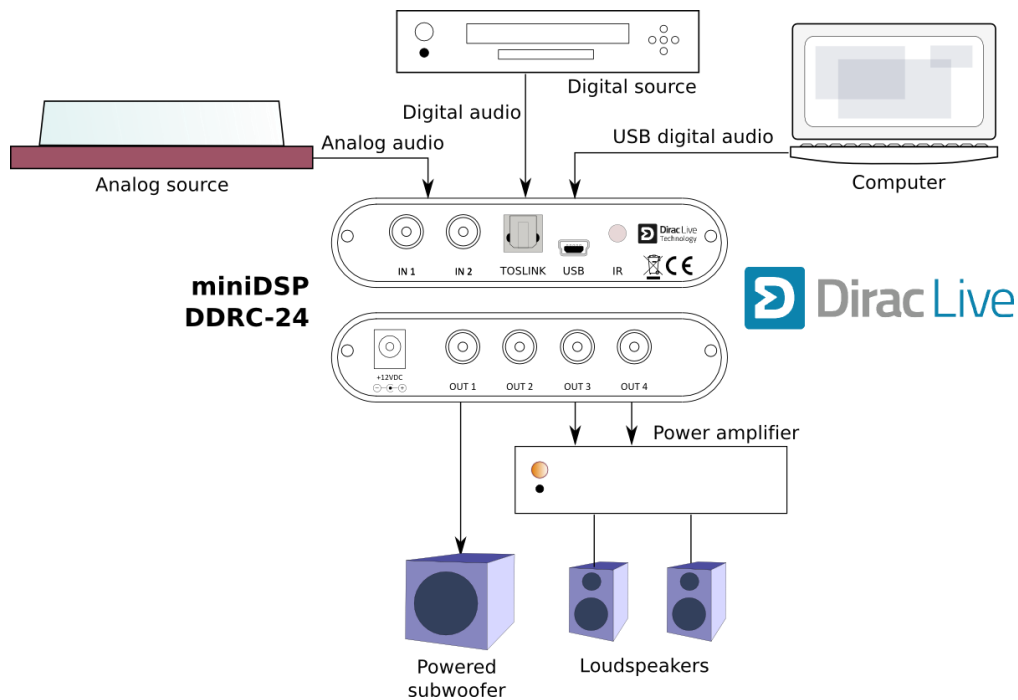
1 PRODUCT OVERVIEW

Thank you for purchasing a miniDSP DDRC-24 audio processor powered by Dirac Live®, the world’s premier room correction solution. We are delighted to offer you this extremely compact yet powerful software and hardware combination, the fruit of extensive research and development and years of experience in sound system tuning.

The miniDSP DDRC-24 offers not only a two-channel Dirac Live® room correction processor, but also an input-output matrix mixer and a powerful set of DSP audio processing functions on each output channel. This allows the DDRC-24 to be used for correction of a stereo signal, integration of one or two subwoofers, or to implement a combined two-way crossover and room correction processor. Combined with its selection of analog, optical digital, and asynchronous USB (up to 192 kHz) inputs, the miniDSP DDRC-24 offers an unprecedented level of audio processing performance for its size and price bracket.

1.1 TYPICAL APPLICATION

In the typical application shown below, the miniDSP DDRC-24 acts as preamp and room correction/subwoofer integration processor. Volume control is accomplished with a remote control by using the DDRC-24’s remote learning feature.

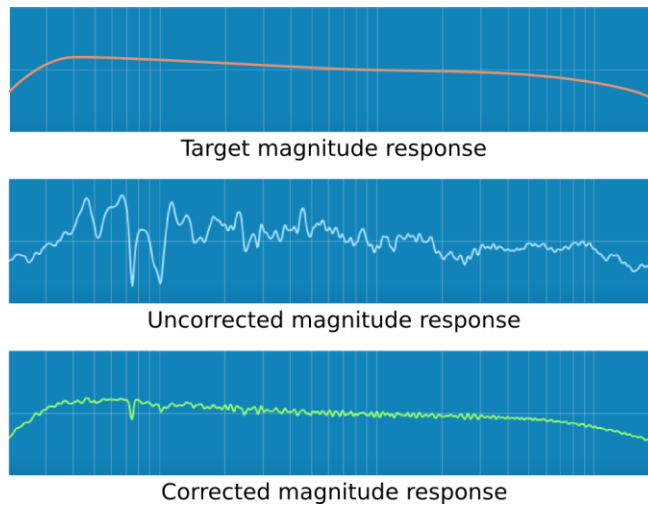


Many other system configurations are possible with the miniDSP DDRC-24. See the [Plugin configuration guide](#) (pages 21 to 26) for examples.

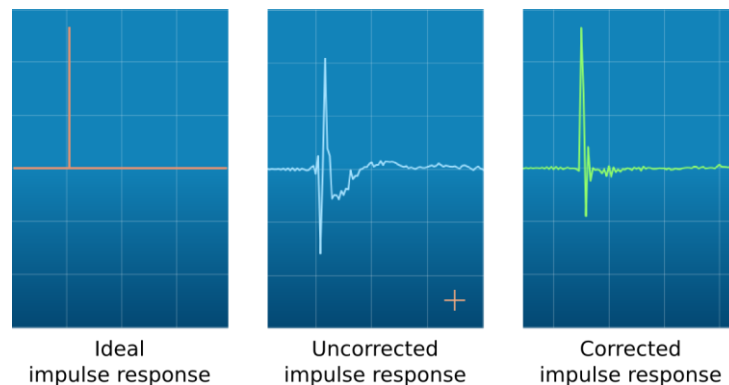
1.2 DIRAC LIVE

The DDRC-24 processor executes Dirac Live® digital room correction, from [Dirac Research](#). Dirac Live’s mixed-phase filtering technology will improve the imaging of your system, minimize the effects of room modes and resonances, and improve dynamics and clarity.

To accomplish its remarkable improvement in listening quality, the **DiracLive** application steps you through the procedure for taking measurements around your listening area. Dirac Live® employs a sophisticated analysis algorithm to make the optimal correction across the *whole* listening area, not just at a single point. The user has full control over the target frequency response. Measurements are taken with a calibrated acoustic measurement microphone, the miniDSP UMIK-1.¹



In addition to correcting magnitude response, 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. Correcting the impulse response makes the speaker in the room behave much more like an ideal loudspeaker. The impulse response is a critical factor for accurate sound-staging, clarity and bass reproduction.



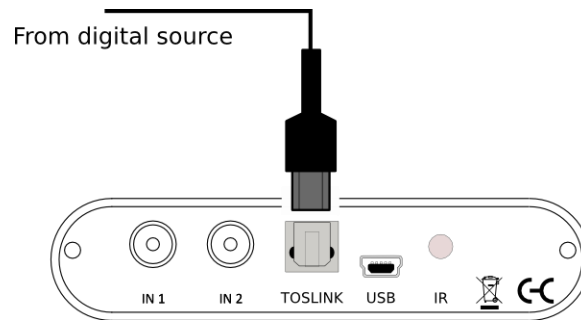
Dirac Live calibration is described in the separate [miniDSP Dirac Live User Manual](#).

¹ We recommend that you add a UMIK-1 to your order if you do not already have one.

2 HARDWARE CONNECTIVITY

2.1 DIGITAL INPUT

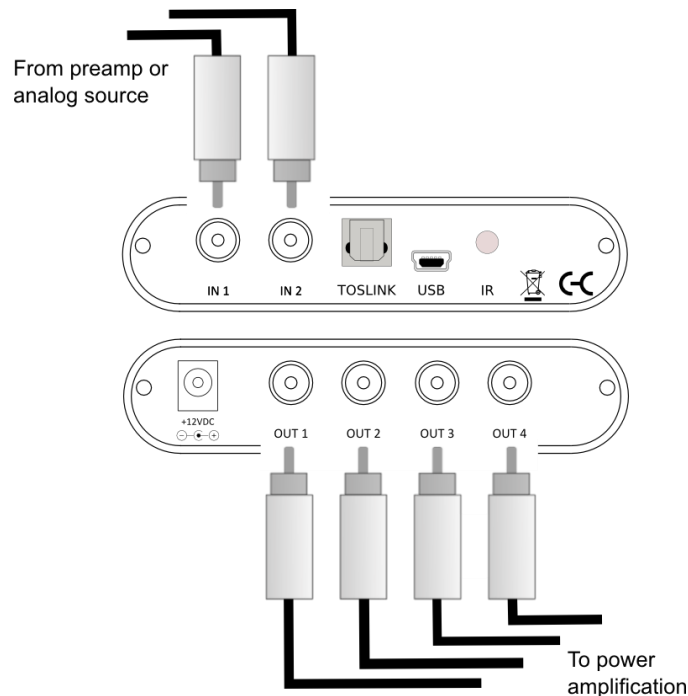
Connect a single digital source to the optical (TOSLINK) connector. Thanks to its asynchronous sample rate convertor (ASRC), all sample rates between 44.1 and 192 kHz are accepted.



Note: the digital input accepts only a stereo PCM digital signal. It does not accept encoded or multichannel digital audio (such as Dolby Digital or DTS).

2.2 ANALOG INPUTS AND OUTPUTS

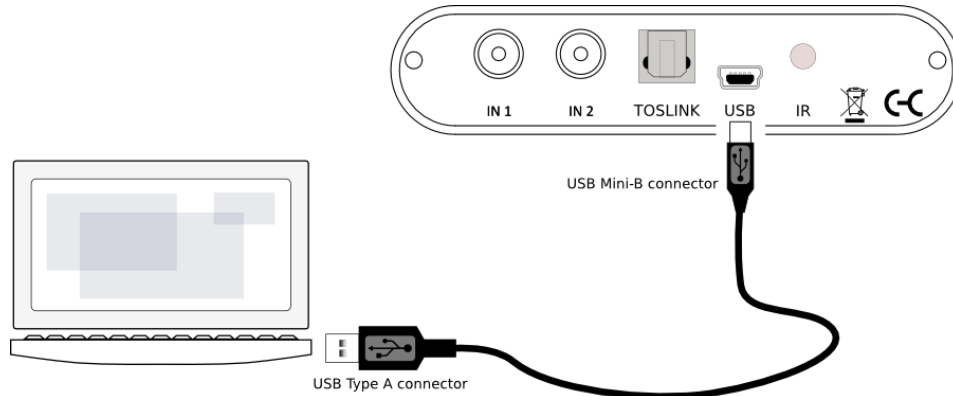
Connect an analog source or preamplifier to the RCA connectors on the front panel, and connect the four analog outputs to power amplification or subwoofer(s). Be sure to take careful note of the channel numbering shown in this diagram and on the rear panel.



2.3 USB

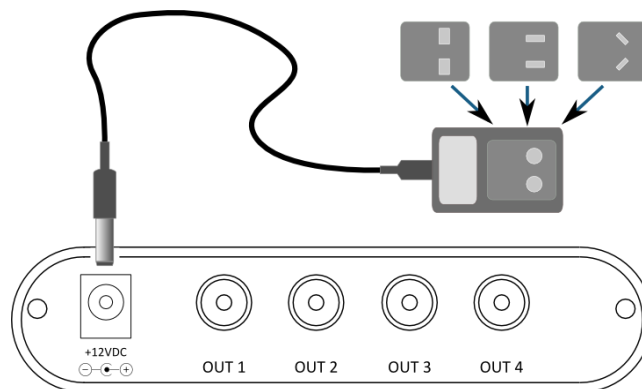
Connect the USB (Type B mini) port of the DDRC-24 to a free USB 2.0 port of your computer using the supplied cable. The USB connection is used for:

- Configuration with the DDRC-24 plugin and the DiracLive application, and
- Streaming audio from a computer or other device such as a music streamer, at up to 192 kHz.



2.4 DC POWER

The supplied 12 VDC power supply includes a set of interchangeable power pins (for USA, UK, Europe and Australia). Fit the correct pins for your country. Connect the DC plug to the 12 VDC power socket.



Apply power to the processor only after all input and output connections have been made. The processor uses very little power and so can be left powered on. If powered on and off, the following sequence is always recommended:

- On: Power on line-level equipment, including the DDRC-24, then turn on power amplification.
- Off: Turn power amplification off, then power off line-level equipment, including the DDRC-24.

3 SOFTWARE INSTALLATION

The DDRC-24 is configured with software running on a PC or Mac. There are two sets of software to download and install, from live.dirac.com and from [miniDSP.com](https://www.minidsp.com).

3.1 WINDOWS 10

This section describes software download and installation for Windows 10.



The software described in this section runs on the latest version of Windows 10 **only**. Other versions of Windows are not supported by the current version of Dirac Live. If you are running an unsupported version of Windows, refer to the [DDRC-24 User Manual Legacy Support](#) version.

3.1.1 Download and install the DiracLive application

Download the **DiracLive** application for Windows 10 from <https://live.dirac.com/download/>.

Double-click on the downloaded installer to run it. It will have a name like **DiracLive v3.0.0 Setup Windows.exe**. We recommend that you accept the default installation settings. Do not run the application yet.

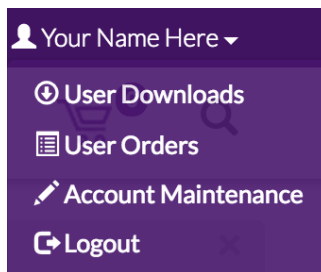
3.1.2 Download the miniDSP software

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

If you purchased your processor from a miniDSP dealer, you will receive a coupon together with the product. Redeem this coupon 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:



Navigate to the **Dirac Series** section and then to **DDRC-24 Software**. Download the zip file under the heading **DDRC-24 software for Dirac 2.0**.

After downloading, unzip the file (right-click and select “Extract All...”). The unzipped download has a name like **DDRC_24_v1_10_Dirac2**. (The version number embedded in the folder name may be different.)

3.1.3 Install the miniDSP software

3.1.3.1 Possible Windows installation issues

The miniDSP software requires that a number of other frameworks be installed for it to work. These packages should be installed automatically, but you can manually install them if you receive an error message that required software is missing.

- [Microsoft .NET framework](#) (version 3.5 or later)
- Microsoft Visual C++ 2010 Redistributable Package: for [x86](#) (32-bit Windows) or [x64](#) (64-bit Windows).

3.1.3.2 Install the plugin

1. Navigate to the **Plugins** folder of the software download and then to the **Windows** folder.
2. Double-click on the plugin installer to run it. It will be named **DDRC_24.exe**. We recommend that you accept the default installation settings.

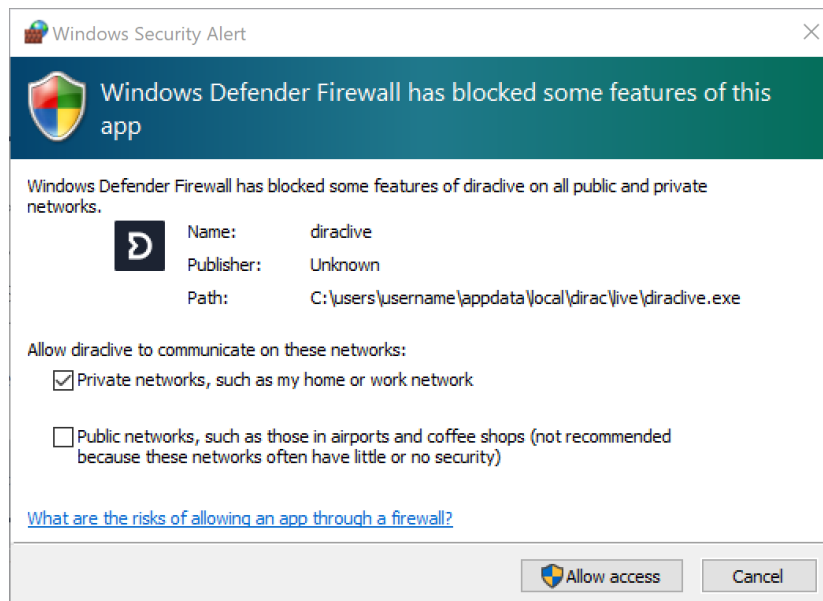
3.1.3.3 Install the UAC2 driver

1. Connect the processor to the computer using the supplied USB cable, and power it on.
2. Navigate to the **WinDrivers** folder of the software download and double-click on the driver installer:
 - **miniDSP_UAC2_v4.67.0_2019-08-15_setup.exe**

(The version number and date embedded in the filename may be different.)

We recommend accepting the default installation location. Once driver installation completes, click **Finish**.

Note: the first time you run the DDRC-24 plugin and the DiracLive application, you may see a Windows Firewall warning such as the one below. Ensure that “Private networks...” is checked and “Public networks...” is not checked. Then click on “Allow access.” This warning dialog may appear more than once.



3.2 MACOS 10.14 MOJAVE AND 10.15 CATALINA

This section describes software download and installation for MacOS 10.14 Mojave and 10.15 Catalina.



This software described in this section runs on macOS 10.14 Mojave and 10.15 Catalina **only**. Other versions of OS X / macOS are not supported by the current version of Dirac Live. If you are running an unsupported version of OS X / macOS, refer to the [DDRC-24 User Manual Legacy Support](#) version.

3.2.1 Download and install the DiracLive application

Download the **DiracLive** application for macOS from <https://live.dirac.com/download/>.

Double-click on the downloaded file to unzip it. Then double-click on the unzipped installer file to run it. It will have a name like **DiracLive v3.0.0 Setup Darwin.app**. We recommend that you accept the default installation settings. Do not run the application yet.

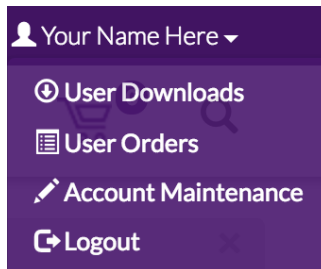
3.2.2 Download the miniDSP software

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

If you purchased your processor from a miniDSP dealer, you will receive a coupon together with the product. Redeem this coupon 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:



Navigate to the **Dirac Series** section and then to **DDRC-24 Software**. Download the zip file under the heading **DDRC-24 software for Dirac 2.0**.

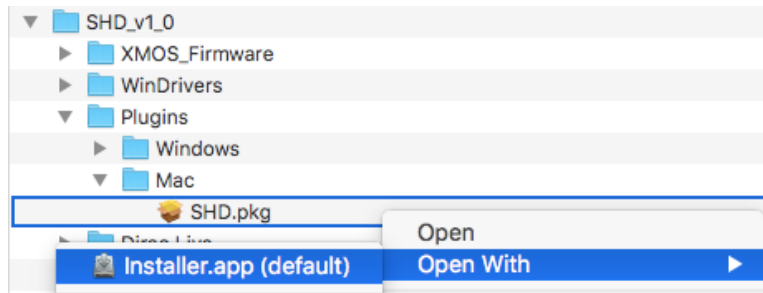
After downloading, unzip the file (double-click on it). The unzipped download has a name like **DDRC_24_v1_10_Dirac2**. (The version numbers embedded in the folder name may be different.)

3.2.3 Install the miniDSP software

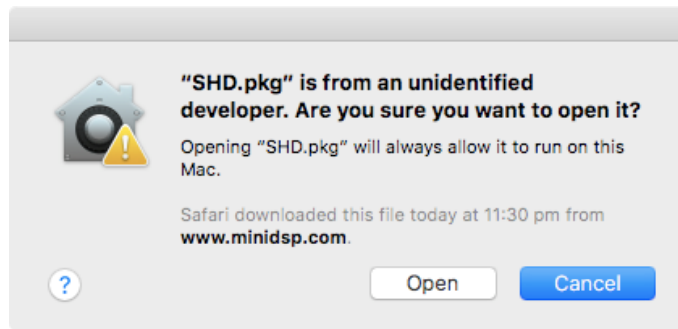
3.2.3.1 Possible Mac installation issues

If double-clicking on the 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. Move the mouse over the “Open With” item and then click on “Installer (default).”



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



3.2.3.2 Install the plugin

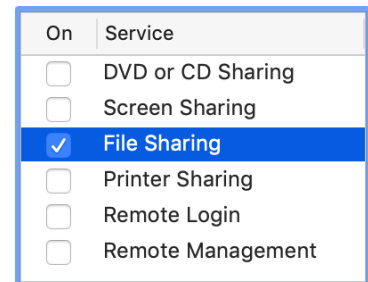
3. Navigate to the **Plugins** folder of the software download and then to the **Mac** folder.
4. The installer is named **DDRC-24.pkg**. To run it, double-click on it, or right-click and open as described above. We recommend that you accept the default installation settings.
5. To run the plugin, locate it 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.

3.2.3.3 Enable file sharing for device discovery

To enable device discovery, open System Preferences, go to Sharing, then enable File Sharing as shown at right.

Notes:

- a) This step is not always necessary and may depend on your Mac’s configuration or your home network setup.
- b) If you wish, you can turn File Sharing off again after completing your Dirac Live calibration.



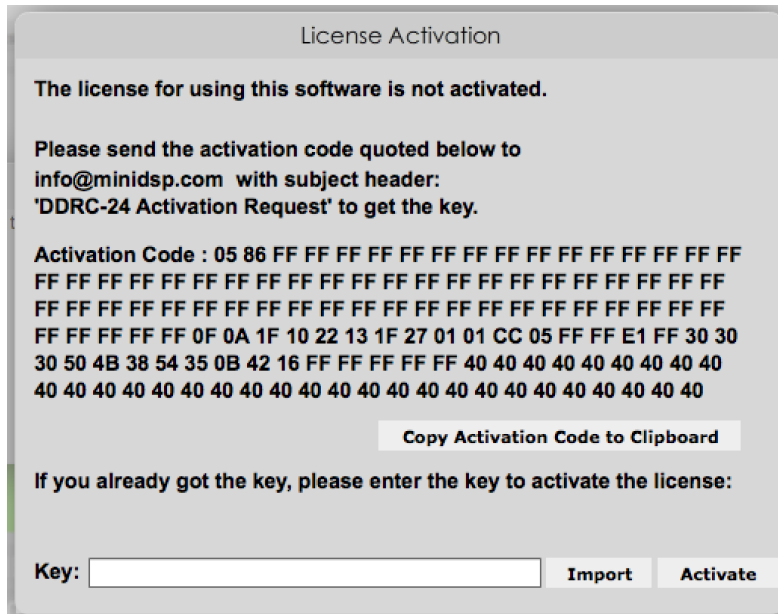
3.3 2x4 HD TO DDRC-24 UPGRADE

If you have purchased an **upgrade** to convert a miniDSP 2x4 HD to a DDRC-24, follow the steps below. (If you purchased a DDRC-24, you do not need to do anything on this page.)

6. Update the firmware to the DDRC-24 version. The procedure is described in [Firmware upgrade](#) starting on page 45. You *must* use the firmware file included in the DDRC-24 software download, in the **XMOS_Firmware** folder. It will have a name like **DDRC-24_XMOS_v1.11.bin** (the version number "v1.11" may change).
7. Power-cycle the hardware unit: remove power, wait a few seconds, and then reconnect power.
8. Start the **DDRC-24 plugin**. Click the **Connect** button (towards the top right).



9. The following screen will appear:



10. Click on the button “Copy Activation Code to Clipboard.”
11. Send an email message to info@minidsp.com with the Subject line “DDRC-24 Activation Request.” In the body of the email message, paste the activation **code** from the above step.
12. 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.) This file contains a key text string consisting of 128 pairs of letters separated by spaces (total 256 letters). Save this file to disk.
13. Click the “Import” button and select the received activation key file to import into the plugin. If successful, you will then see a connection dialog box similar to the one on page 17. Click on “Reset ALL to defaults.”
14. The **Connect** button will change as shown:



4 CONFIGURING WITH THE DDRC-24 PLUGIN

The DDRC-24 processor is configured with the **DDRC-24** plugin / user interface program. Configuration of the DDRC-24 using the plugin must be done prior to performing Dirac Live calibration. This section provides a summary of the plugin and how to use it.



During *initial* configuration of the processor, it is strongly recommended that any connected amplification be powered off.

Upon starting the plugin, it brings up a screen with various controls and a main configuration area:

The screenshot shows the DDRC-24 v1.9d2 software interface. Key components are annotated as follows:

- Main menu:** File, Restore, Help, IR Remote
- Configuration selection:** Config 1, Config 2, Config 3, Config 4
- Selection tab:** Routing, Outputs
- Main configuration window:** Dirac Inputs (Dirac 1, Dirac 2) and Routing table.
- Master control:** Connect, Mute, IP address, Auto, Master Volume, Start Dirac Live Software, Dirac Live OFF

	Output1	Output2	Output3	Output4
Dirac 1	0dB	0dB	Off	Off
Dirac 2	Off	Off	0dB	0dB

This section describes the key features of the plugin and provides an application-specific guide to configuring it. For detailed information about each of the plugin's features, see Section 8.

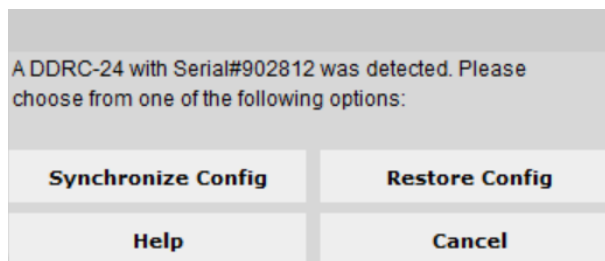
4.1 SYNCHRONIZING WITH THE PROCESSOR

Connect the DDRC-24 to a USB 2.0 port on your computer. Then click on the **Connect** button:



If successful, the button changes 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.” When the plugin is online, any changes made in the DDRC-24 plugin are immediately transferred to the DDRC-24 and will be heard in the audio signal.

The first time you connect, or if you have made any changes to any data in the plugin, a dialog box will appear:



Restore ALL to default

This option will appear the very first time you connect. It is strongly recommended that you select this option the first time. After restoring all data to defaults, the plugin is online.

Synchronize Config

Download the data for the currently selected configuration into the DDRC-24. Note that this applies only to data that can be changed in the DDRC-24 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 processor. This option may appear after downloading and installing 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 changed in the DDRC-24 plugin — Dirac Live filters are not changed by doing this. When using this option, any connected equipment should be muted or powered 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 processor. The plugin will remain offline.

4.2 KEY FEATURES

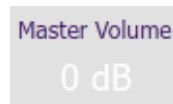
This section summarizes the key features of the plugin. For detailed information, see Section 8.

4.2.1 Master control

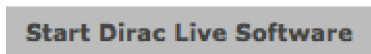
Once the plugin is online, the items in the Master Control area are active. The **Mute** button disables all audio output:



The **Master Volume** display shows the current volume setting. The master volume can be set directly by clicking here and typing a new value. It can also be set with a remote control:



The **Start Dirac Live Software** button starts the separate **DiracLive** application. When this button is pressed, the DDRC-24 plugin will disconnect from the DDRC-24 processor and then start up **DiracLive**.



You **must** start the DiracLive application from within the DDRC-24 plugin using the **Start Dirac Live Software** button. If you open the DiracLive application by itself, it will not be able to detect the DDRC-24 processor.

The **Dirac Live** button turns Dirac Live processing on and off. This function can also be accessed with a remote control and from within the DiracLive app:



The **IP Address** and **Auto** fields are for use with networked control of the plugin using the miniDSP [WI-DG Wifi/Ethernet to USB bridge](#). See the [Wi-DG User Manual](#) for details.

4.2.2 Configuration/preset selection

The set of data that controls the back-end processing is called a *configuration*. This includes crossovers, parametric EQ and the routing matrix. It does not include the master volume or mute status.

Four configurations are stored onboard. The currently selected preset is indicated by a dark background:

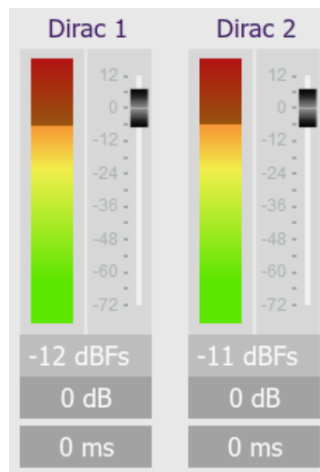


To switch to a different preset, just click on the desired button:



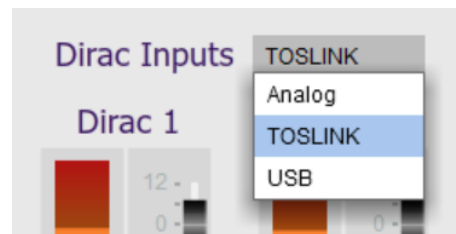
4.2.3 Inputs

The **Routing** tab displays two input channel status strips. Note that these are status only – there are no user-adjustable controls. They are active only when the plugin is online. For more information, see page 31.



4.2.4 Input selection

When the plugin is online, the currently selected input appears next to the "Dirac Inputs" label. Click on the current input name to drop down a selector menu, from which you can select a different input. The input can also be selected with a remote control – see page 28.



4.2.5 Matrix mixer

The matrix mixer on the Routing tab directs input channels (along the left) to output channels (along the top). To turn on routing for a cross point, click on that cross point. Both inputs can be mixed to each output if desired, and the mix level can be set individually for each input. For more information, see page 31.

	Output1	Output2	Output3	Output4
Dirac 1	0dB	0dB	Off	Off
Dirac 2	Off	Off	0dB	0dB

4.2.6 Outputs

The **Outputs** tab displays a row of four output channel control strips. All output channels are identical.

Output1	Output2	Output3	Output4
12 0 -12 -24 -36 -48 -60 -72	12 0 -12 -24 -36 -48 -60 -72	12 0 -12 -24 -36 -48 -60 -72	12 0 -12 -24 -36 -48 -60 -72
-9 dBFs	-14 dBFs	-8 dBFs	-13 dBFs
0.0	0.0	0.0	0.0
PEQ	PEQ	PEQ	PEQ
Xover	Xover	Xover	Xover
Comp	Comp	Comp	Comp
0	0	0	0
Invert	Invert	Invert	Invert
Mute	Mute	Mute	Mute

Each channel has an individual gain adjustment slider, and a graphical and numerical display of the current signal level on that channel.

A comprehensive set of signal processing functions is accessed with the buttons PEQ, Xover, and Comp. Each channel also has individual invert and mute controls, and a signal delay of up to 30 ms. These are described in detail in Section 8.

4.3 CONFIGURING BACK-END PROCESSING

If you intend to run a configuration that is more than straight stereo room correction processing, then you will need to configure the back-end processing prior to running Dirac Live calibration. Typically, this applies to applications such as subwoofer integration and two-way active speakers.



If you are using straightforward stereo room correction processing with a pair of speakers, you don't need to read the rest of this section. In that case, proceed to Dirac Live calibration using the separate [miniDSP Dirac Live User Manual](#).

4.3.1 Signal flow

To understand how the DDRC-24 combines Dirac Live with miniDSP's audio processing, refer to the signal flow diagram in Figure 1:

- One of the stereo input sources is selected by the user and passed to two channels of Dirac Live processing for digital room correction.
- The outputs from Dirac Live, labeled "Dirac 1" and "Dirac 2" in the plugin UI, are routed and mixed to the four output channels.
- Each output channel has a comprehensive set of DSP functions. These are all optional – you can configure them if you want to, according to your particular application.

As indicated in Figure 1, the processor is configured by two different software applications. The **DiracLive** application runs room measurements and loads correction filters into one of four presets. The **DDRC-24 plugin** configures back-end processing for each of the four presets. When a preset is selected (e.g. with the front panel or remote control), the corresponding Dirac Live filters **and** the plugin configuration are loaded into the working DSP memory.

While the description of the signal processing flow is from inputs to outputs (left to right in the diagram), the order in which you configure the processor is usually the reverse, for reasons described on the next page.

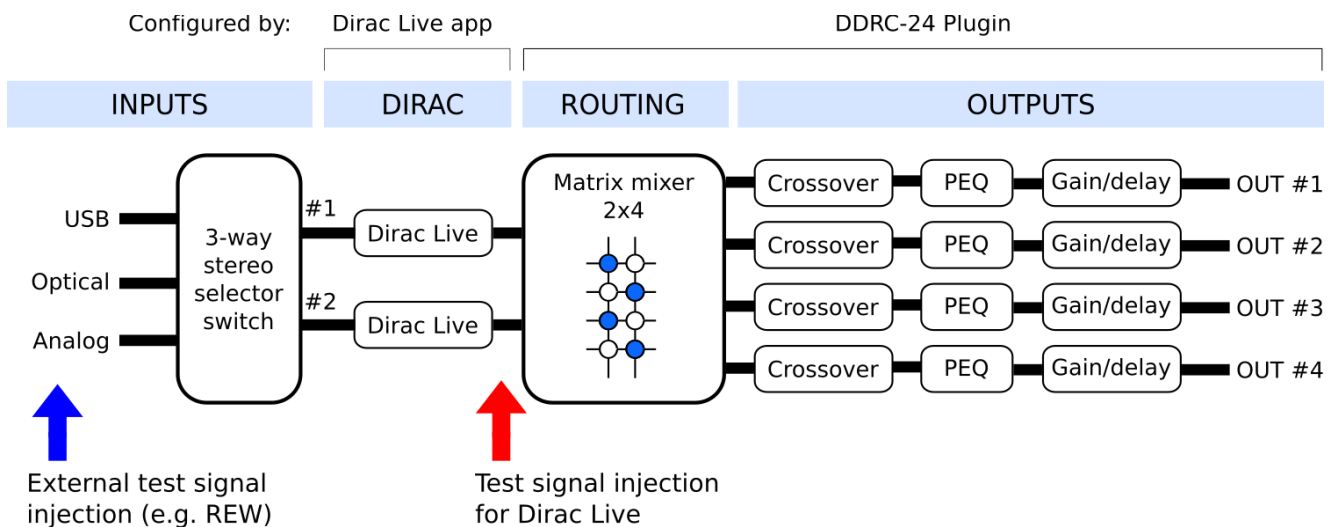


Figure 1. DDRC-24 signal flow diagram

4.3.2 Configuration procedure

The Dirac Live test signal originates in the Dirac Live blocks, so it “sees” the output channel processing configured by the DDRC-24 plugin. Crossovers or parametric EQ set up in the output channels will affect the response that Dirac Live measures.

However, if using an external application such as REW (Room EQ Wizard) to help set up the plugin, its test signal will pass through the Dirac Live blocks *and* the output channel processing. Therefore, the measured response will be affected by any loaded Dirac Live filters as well as crossover and parametric EQ in the output channels.

The procedure for configuration is therefore as follows:

1. Configure the output channels and routing matrix first. While some types of configuration, such as subwoofer integration, can often be done successfully without acoustic measurement, in general it is best to use acoustical measurement taken with REW or a similar program. For the sake of a concrete example, let’s say this is done in preset 1.



If Dirac Live filters have been loaded into preset 1, the delay and gain calculated by Dirac Live are still applied even if Dirac Live is turned off. It’s therefore best to use a preset that hasn’t had Dirac Live filters loaded at all.

2. Save the configuration to a file.
3. Check to make sure that preset 1 is selected. Then start the **DiracLive** application and run a calibration. When you export the Dirac Live filters, export them to slot 1.

If you wish to set up multiple slots with different Dirac Live target curves, use this extended procedure:

1. Configure the output channels and routing matrix.
2. Save the configuration to a file.
3. Load that configuration file into presets 2 and 3 (for example).
4. Select preset 1 and run Dirac Live calibration. Export the filter into slot 1.
5. Change the target curve. Export the filters into slot 2.
6. Change the target curve. Export the filters into slot 3.

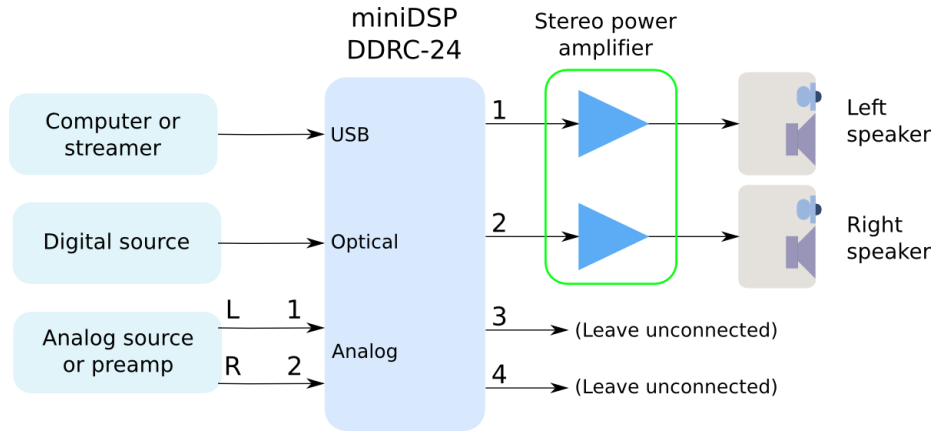
The above is typical for most users. More advanced users may wish to have a different back end configuration in different presets. For example, you may have a different crossover frequency. The above principles still apply: each Dirac Live filter should be loaded into a slot that has same back-end processing as when the measurements were taken.

4.4 PLUGIN CONFIGURATION GUIDE

The miniDSP DDRC-24 is adaptable to many system configurations. This section gives examples of several common system types and shows how to configure the DDRC-24 plugin for each. For full details of the referenced signal processing blocks, see Section 8.

4.4.1 Stereo room correction

In a stereo room correction configuration, the plugin is set up to route the selected input through to output channels 1 and 2. This diagram illustrates the connections:



On the **Outputs** tab:

- Rename the output channels (from left to right) to “Left”, “Right”, “Unused” and “Unused”.
- Mute channels 3 and 4 (labeled “Unused”).
- Check that the crossover filters of channels 1 and 2 (“Left” and “Right”) are bypassed:



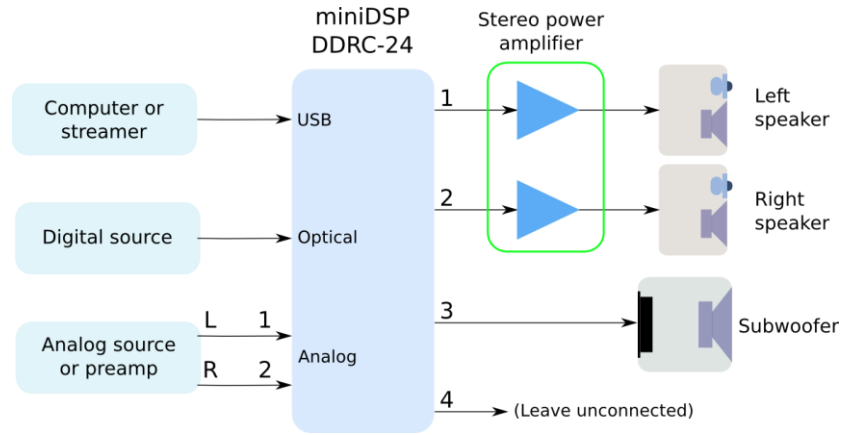
On the **Routing** tab, set the matrix like this:

	Left	Right	Unused	Unused
Dirac 1	0dB	Off	Off	Off
Dirac 2	Off	0dB	Off	Off

After you have set up the DDRC-24 plugin, save your configuration to a file. Then run the Dirac Live calibration as described in the [miniDSP Dirac Live User Manual](#).

4.4.2 Stereo room correction and subwoofer integration

In a stereo room correction with subwoofer integration configuration, the plugin is set up to route low frequencies from the left and right inputs to a single subwoofer output. This diagram illustrates the connections:

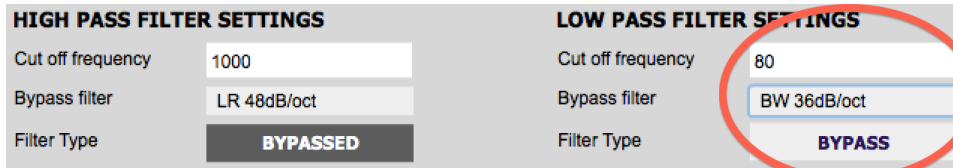


On the **Outputs** tab:

- Rename the output channels (from left to right) to “Left Sp”, “Right Sp”, “Sub” and “Unused”.
- Mute channel 4 (“Unused”).
- Set a high pass crossover filter on channels 1 and 2 (“Left Sp” and “Right Sp”). For example:



- Set a low pass crossover filter on channel 3 (“Sub”). For example:



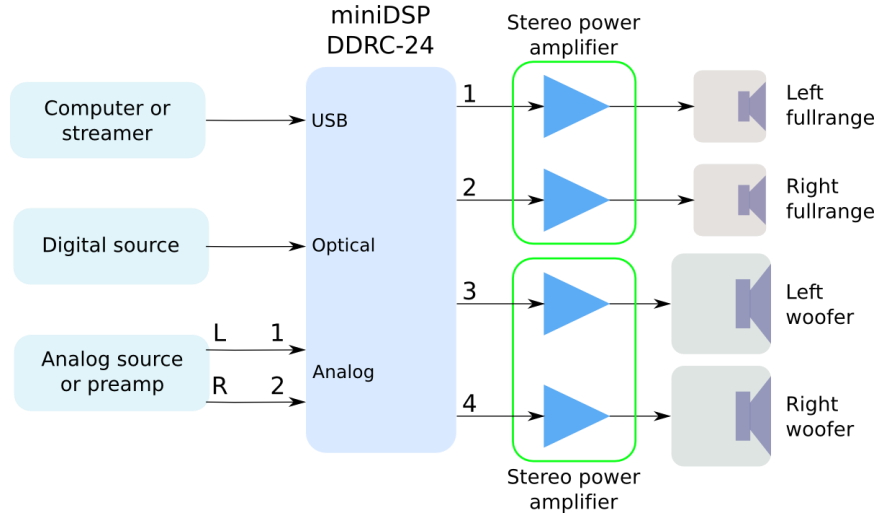
On the **Routing** tab, set the matrix like this:

	Left Sp	Right Sp	Sub	unused
Dirac 1	0dB	Off	0dB	Off
Dirac 2	Off	0dB	0dB	Off

You may need to do measurements with Room EQ Wizard (or a similar program) to fine-tune your subwoofer crossover settings, as described in our DDRC-24 Sub integration note [at this link](#). After you have set up the DDRC-24 plugin, save your configuration to a file. Then run a Dirac Live calibration as described in the [miniDSP Dirac Live User Manual](#).

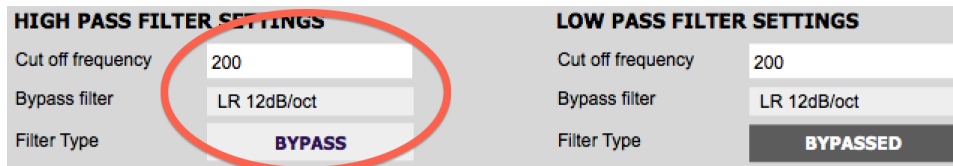
4.4.3 Stereo room correction and stereo supporting woofers/FAST

In a configuration with two full range speakers supplemented by supporting woofers (sometimes known as “FAST”), the plugin is set up to split the frequency range to the woofer and full range speakers. This diagram illustrates the connections:

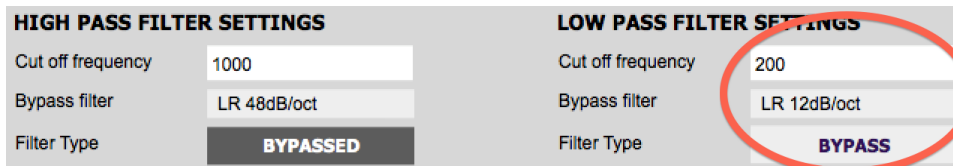


On the **Outputs** tab:

- Rename the output channels (from left to right) to “Left FR”, “Right FR”, “Left W” and “Right W”.
- Set a high pass crossover filter on channels 1 and 2 (“Left FR” and “Right FR”). For example:



- Set a low pass crossover filter on channels 3 and 4 (“Left W” and “Right W”). For example:



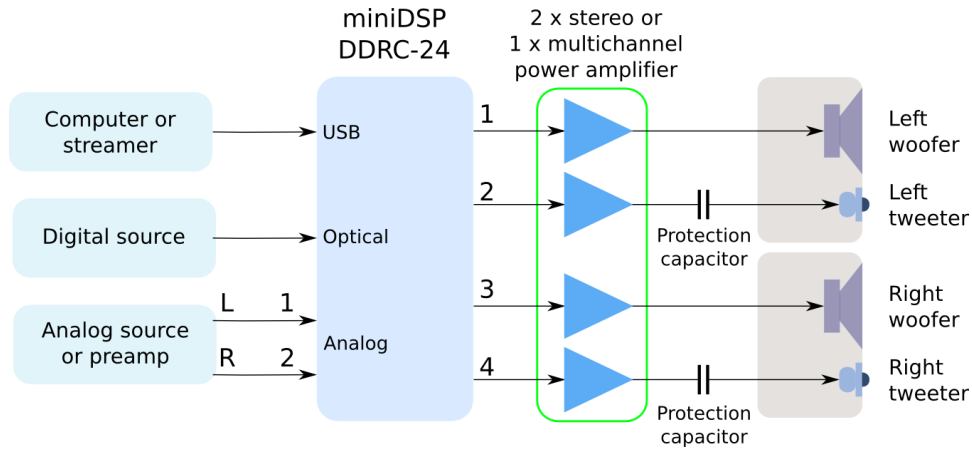
On the **Routing** tab, set the matrix like this:

	Left FR	Right FR	Left W	Right W
Dirac 1	0dB	Off	0dB	Off
Dirac 2	Off	0dB	Off	0dB

You may need to do measurements with Room EQ Wizard (or a similar program) to fine-tune your crossover settings. After you have set up the DDRC-24 plugin, save your configuration to a file. Then run a Dirac Live calibration as described in the [miniDSP Dirac Live User Manual](#).

4.4.4 Stereo room correction and two-way active speaker

The miniDSP DDRC-24 can implement a two-way active speaker as well as provide room correction. This diagram illustrates the connections:



On the **Outputs** tab, rename the output channels (left to right) to “Left W”, “Left Tw”, “Right W” and “Right Tw”.

On the **Routing** tab, set the matrix like this:

	Left W	Left Tw	Right W	Right Tw
Dirac 1	0dB	0dB	Off	Off
Dirac 2	Off	Off	0dB	0dB

On the **Outputs** tab again:

- Use Room EQ Wizard or a similar program to measure each individual driver (woofer and tweeter) and equalize their response flat with the PEQ blocks. This procedure is the same as for the 2x4 HD, as described in our app notes [at this link](#).
- Set up your high pass and low pass crossover filters. This procedure is the same as for the 2x4 HD, as described in our app notes [at this link](#). This is a typical low pass setting for the woofers:

HIGH PASS FILTER SETTINGS		LOW PASS FILTER SETTINGS	
Cut off frequency	80	Cut off frequency	3000
Bypass filter	BW 24dB/oct	Bypass filter	LR 24dB/oct
Filter Type	BYPASSED	Filter Type	BYPASS

This is a typical high pass setting for the tweeters:

HIGH PASS FILTER SETTINGS		LOW PASS FILTER SETTINGS	
Cut off frequency	3000	Cut off frequency	5000
Bypass filter	LR 24dB/oct	Bypass filter	LR 48dB/oct
Filter Type	BYPASS	Filter Type	BYPASSED

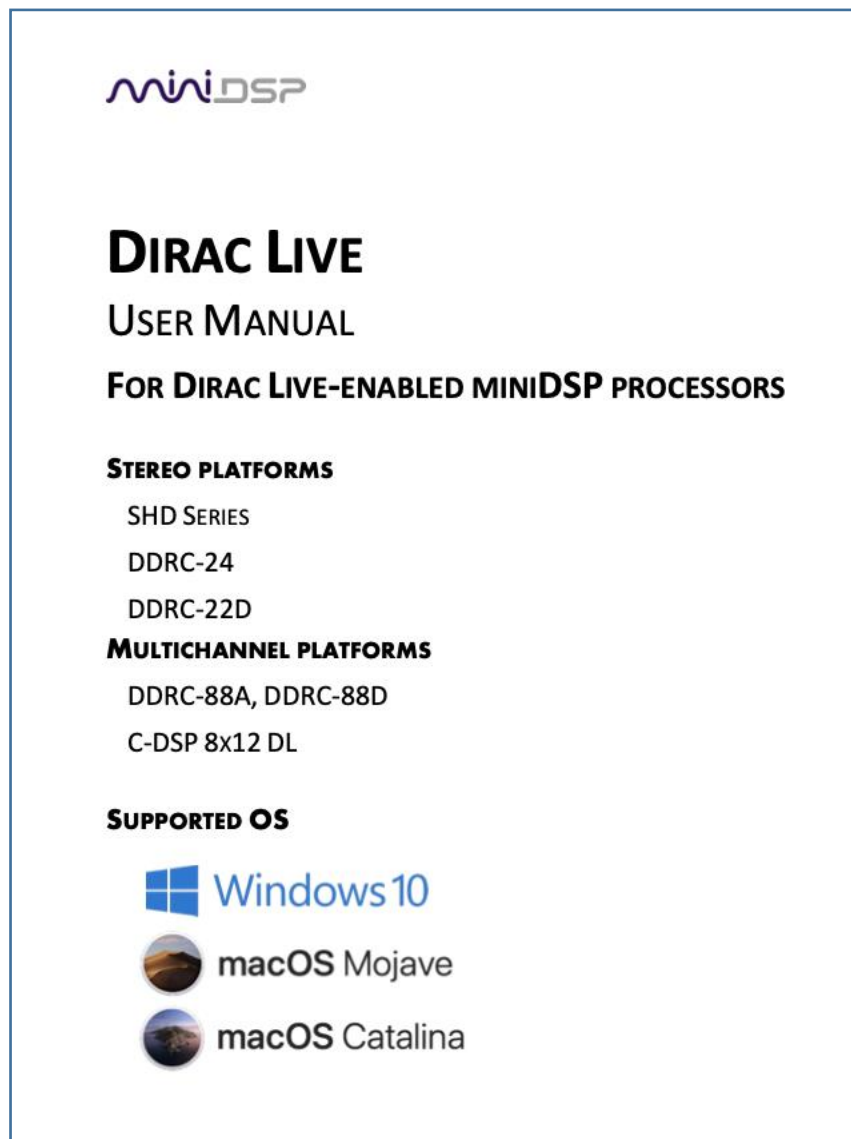
After you have set up the DDRC-24 plugin, save your configuration to a file. Then run a Dirac Live calibration as described in the [miniDSP Dirac Live User Manual](#).

5 DIRAC LIVE CALIBRATION

Dirac Live calibration with the miniDSP DDRC-24 is described in the separate [miniDSP Dirac Live User Manual](#). It can be downloaded from the [DDRC-24 product page](#) on our website.



Be sure to start the DiracLive application from within the DDRC-24 plugin using the **Start Dirac Live Software** button. If you open the DiracLive application by itself, it will not be able to detect the DDRC-24 processor.



6 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, input selection, and to turn Dirac Live processing on and. The optional miniDSP remote can be used with the DDRC-24:

Source

Cycles through the input sources.

1, 2, 3, 4

Switches to the selected preset. Note that it takes a few seconds for the preset selection to complete.

[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. Each press changes the volume in 0.5 dB. Holding down a button will accelerate volume change to 3 dB steps.

Mute

Mutes and unmutes audio output.

The DDRC-24 can also “learn” the control codes of your current remote if it supports one of the following remote control codes:

- NEC
- Sony
- Philips RC6
- Apple (old silver remote only)

To initiate the learning process, 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, the status will change to show a tick, as shown at right.



To “unlearn” a command, press the **Learn** button and wait for the plugin to time out. Note that you cannot “learn” the miniDSP remote – if you program another remote and want to revert to using the miniDSP remote, simply “unlearn” all codes.



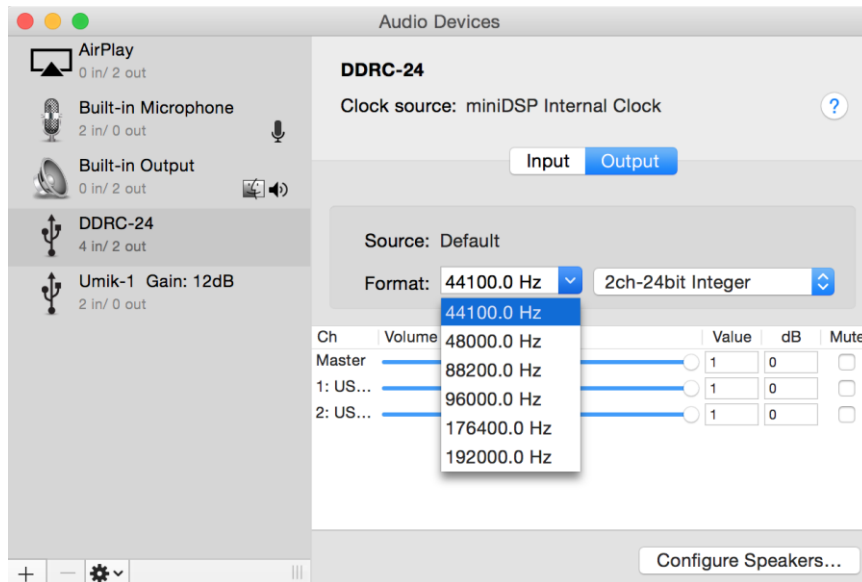
Master Mute	✓	Learn
Volume Up	✓	Learn
Volume Down	✓	Learn
Analog	✓	Learn
TOSLINK	✓	Learn
USB	✓	Learn
Config 1	✓	Learn
Config 2	✓	Learn
Config 3	✓	Learn
Config 4	✓	Learn
Dirac Live	✓	Learn

7 USB AUDIO

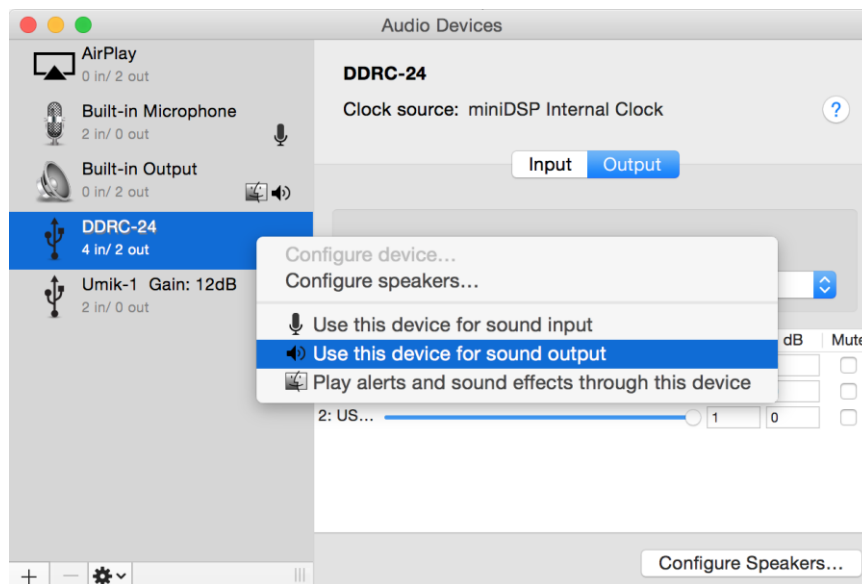
The miniDSP DDRC-24 accepts stereo PCM audio at sample rates of 44.1, 48, 88.2, 96, 176.4, and 192 kHz on its USB audio input. The same USB connector is used both for streaming audio and configuration.

7.1 MAC OS X

Open the program **Audio MIDI Setup** (in **Applications->Utilities**). Clicking on “DDRC-24” in the list on the left hand side will show the input and output channels and allow sample rate and word length to be set.

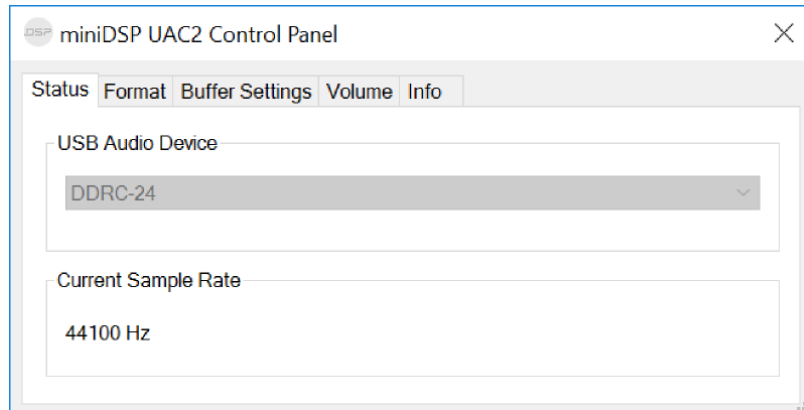


To set the DDRC-24 as the default audio output device, right-click and select “Use this device for sound output”. Individual audio playback programs may allow the DDRC-24 to be selected independently of the system default.



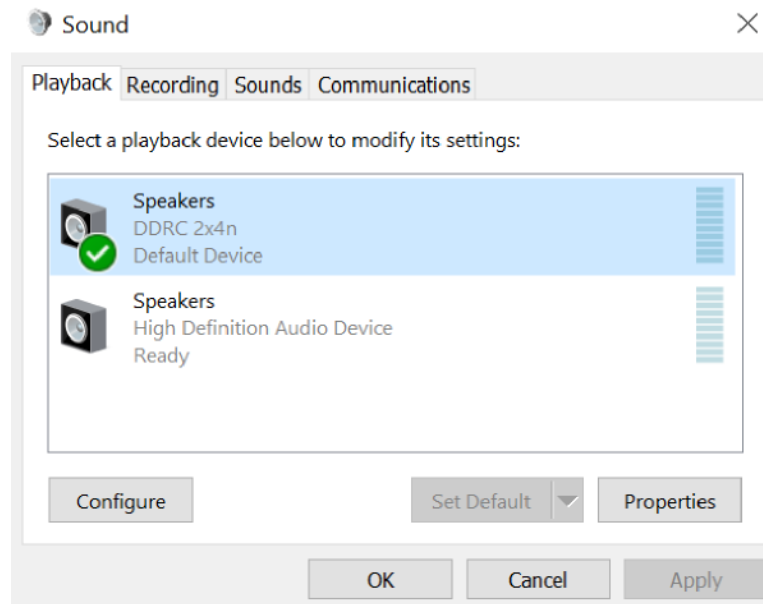
7.2 WINDOWS

Open the UAC Control Panel from the Windows Start menu. This control panel allows you to set a number of options, such as word length (Format tab) and buffer size (Buffer tab). We recommend that you leave these settings at their defaults.



If you are having an issue with inadequate output volume over USB playback, check the Volume tab.

To set the DDRC-24 as the default output device, open the Windows Control Panel and navigate to the Audio Devices section. On the Output tab, select DDRC 2x4n and click on the “Set Default” button. Individual audio playback programs may allow the DDRC-24 to be selected independently of the system default.



8 PLUGIN REFERENCE

This section provides full details on each of the plugin processing blocks.

8.1 INPUT CHANNEL STATUS

Each input channel strip displays useful information about the levels and Dirac settings on that channel. The plugin must be online to display information here.

Channel label

The name of the channel. These are set to “Dirac 1” and Dirac 2” and cannot be renamed.

Level meter, Current RMS level

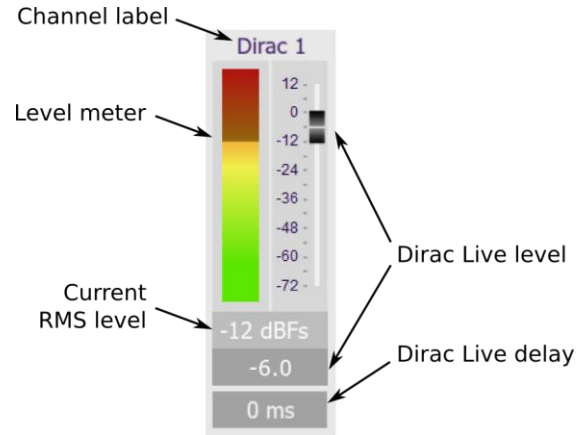
Displays the current signal level in real time.

Dirac Live level

Graphical and numerical display of the gain (in dB) that Dirac live has set for this channel.

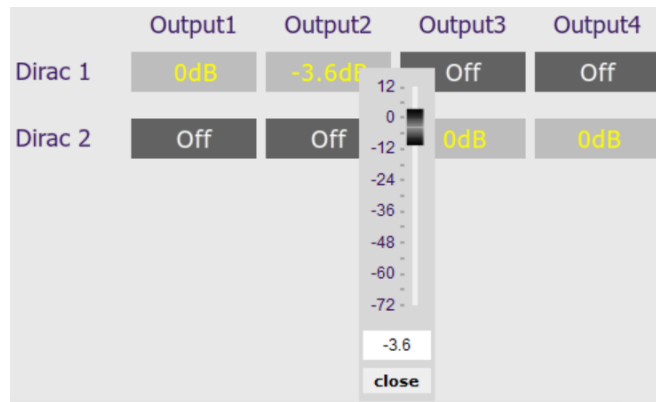
Dirac Level delay

Numerical display of the delay (in milliseconds) that Dirac live has set for this channel.



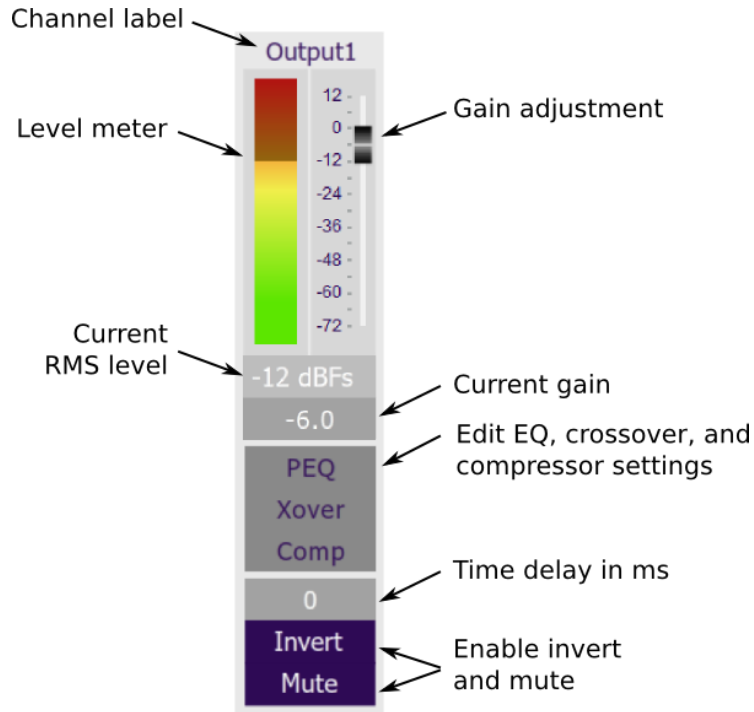
8.2 ROUTING

The **Routing** matrix mixer is used to direct input channels (along the left) to output channels (along the top). To turn on routing for a cross point, click on that cross point. At each cross-point, 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, then click **close**.



8.3 OUTPUT CHANNELS

Each output channel has a complete "strip" of controls.



8.3.1 Channel label

Each output channel has a customizable label, which is shown at the top of the channel strip. This label also appears on the **Routing** matrix. To change the label, click on it, type a new label (up to eight characters), and press the Return key.

8.3.2 Level metering and gain adjustment

Level meter, current RMS level

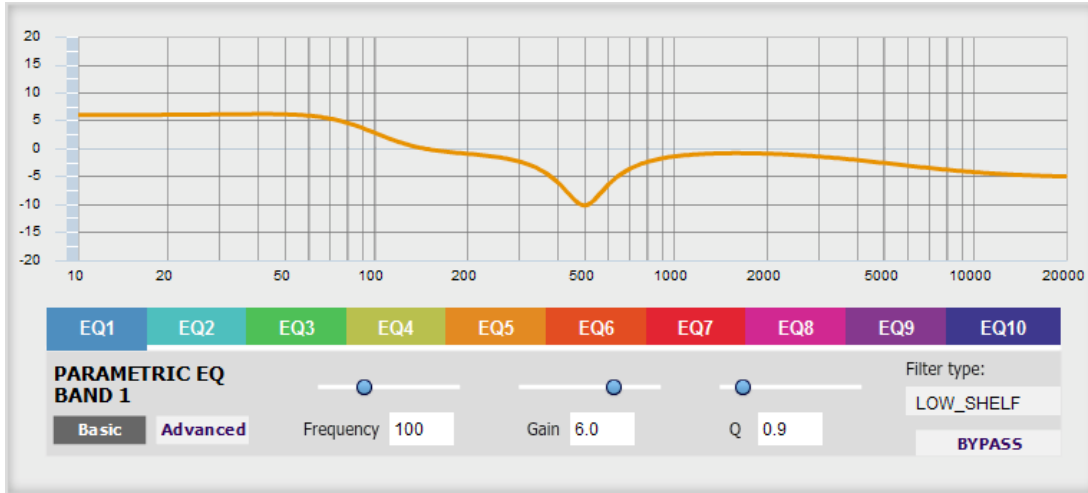
Display the current signal level both graphically and numerically in real time. (The plugin must be online to display signal levels.)

Gain adjustment, current gain

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.)

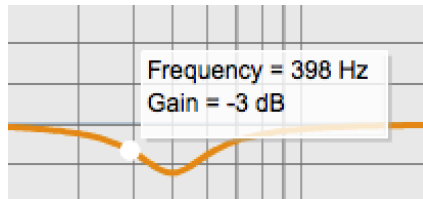
8.3.3 Parametric EQ

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:



There are ten parametric EQ filters on each output channel. The window displays a frequency response graph showing the combined response of all enabled parametric filters on that channel. For example, 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.

Hovering the mouse over the curve brings up an overlay showing the frequency and the gain at that frequency.



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, corresponding channels on the left and right are linked: for example, left and right tweeter and left and right woofer. To link a channel, select the other channel from the drop-down menu at the top left of the **PEQ** display, and click the **Link** checkbox.



EQ band selection

Click on the tabs **EQ1**, **EQ2**, etc. to display the parameters for that filter.

Basic/Advanced

By default, each filter is in basic mode, and shows the controls described below. Advanced mode enables custom biquad programming for almost infinite flexibility in filter implementation. This is described in [Custom biquad programming](#) on page 38.

Filter type

Selects the type of filter:

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.

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. A filter has no effect if its gain is set to 0 dB. Gain can be adjusted in increments of 0.1 dB up to +/- 16 dB.

Q

Q controls the “sharpness” of the filter. For the PEAK and SUB_EQ filter types, lower Q gives a broader 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.

Bypass

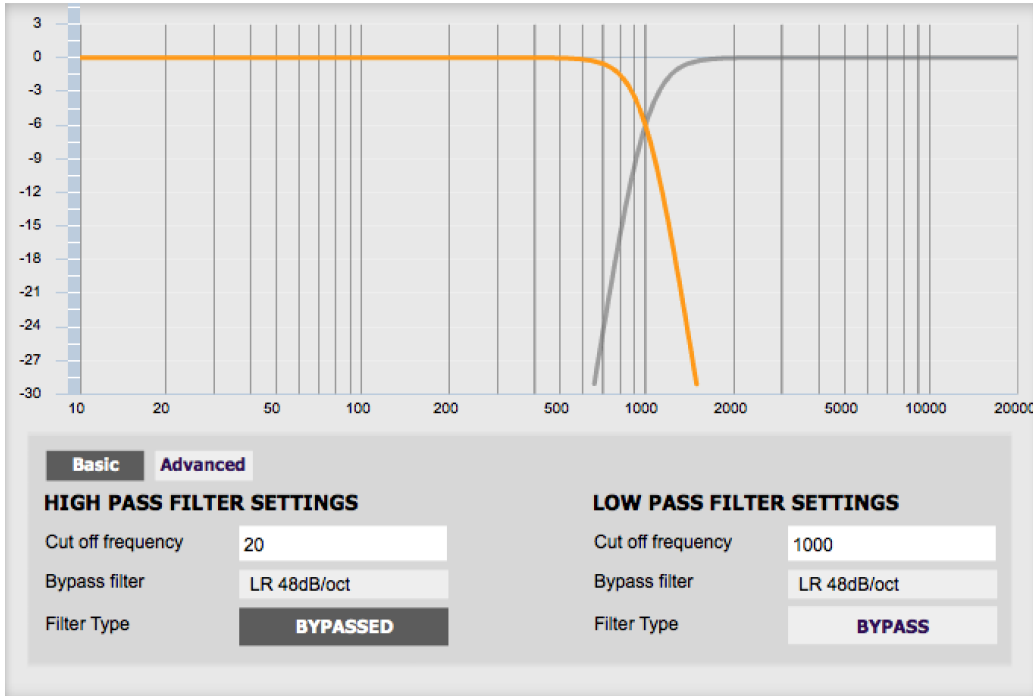
The **Bypass** button enables or disables a filter. The filter is bypassed if the button is "lit". (Note that all other filters are still operational unless individually bypassed.) A filter will also have no effect if its gain is set to 0.0.



8.3.4 Crossover

Each output channel has independent high pass and low pass filters. See the [Plugin configuration guide](#) for some example uses of crossover filters.

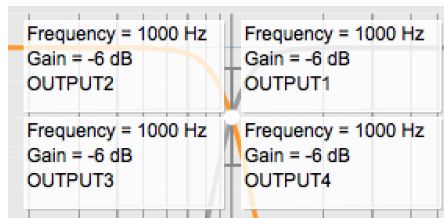
Click on the **Xover** button to open the crossover settings window:



Crossovers “split” the frequency band to send to different drivers. In a two-way loudspeaker, a *low pass* filter is used to remove high frequencies from the signal sent to the woofer, and a *high pass* filter is used to remove low frequencies from the signal sent to the tweeter. When integrating a subwoofer, high pass filters are used on the speakers and a low pass filter on the subwoofer. A crossover filter can also be used to limit low frequency content delivered to a speaker or subwoofer, to help protect it from over-excursion.

Unlike conventional analog crossovers, the flexibility of DSP allows a completely arbitrary mix of different filter slopes and types. Filters can be set at any frequency, or disabled completely. This allows maximum flexibility in matching your crossover to the acoustic characteristics of the loudspeaker drivers.

The current channel is displayed in orange, with the others displayed in grey. Hovering the mouse over the curve brings up an overlay showing the frequency and the attenuation at that frequency.



Basic/Advanced

By default, the crossover is in basic mode, and shows the controls described below. Advanced mode enables custom biquad programming for almost infinite flexibility in crossover filter implementation. This is described in [Custom biquad programming](#) on page 38.

Cutoff Frequency

Sets the nominal cutoff frequency of the crossover. In actual fact, the crossover has a more or less gradual transition from “full on” to “full off,” as determined by the filter slope.

Filter type

Selects the type and slope of the filter. The steeper the slope, the more quickly frequencies above or below the cutoff frequency are attenuated. There are three types of filter:

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.

Bypass

Clicking on the **Bypass** button disables or enables that high pass or low pass filter. The filter is bypassed when the button is "lit".



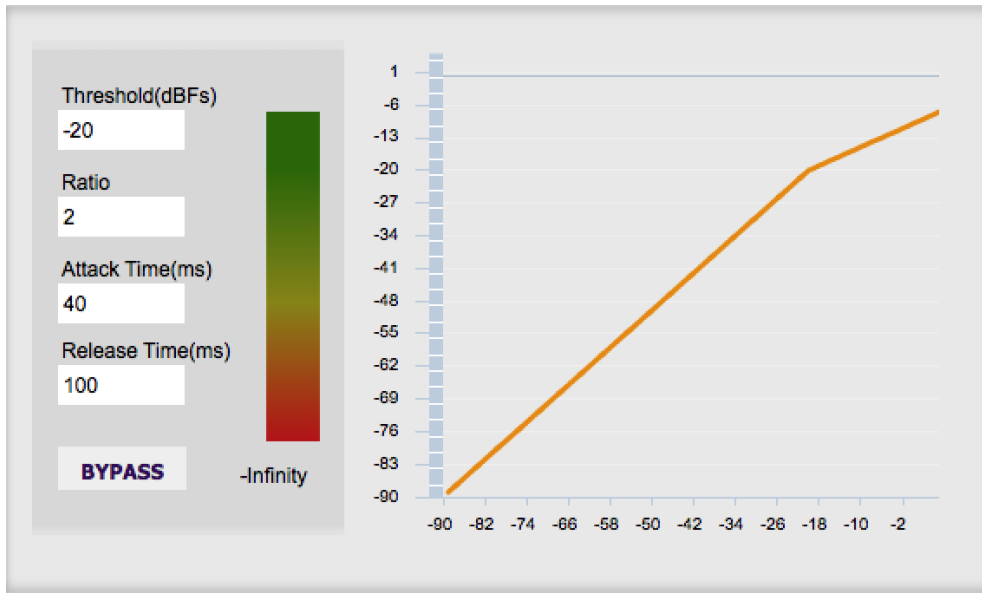
Each channel can be linked to one other channel. When a channel is linked to another, the crossover settings of that channel are mirrored to the other. Typically, the corresponding drivers on the left and right channels are linked: left and right tweeter, left and right woofer, and so on. To link a channel,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



8.3.5 Compressor

The compressor reduces the gain of an output channel when the audio signal reaches a certain level as specified by the **Threshold** parameter. The gain of the channel will be progressively reduced as the signal increases above the threshold, according to the **Ratio** parameter. This can be used to limit the power delivered to speakers and thus reduce the risk of damage from overdriving.

This screenshot shows an example Compressor setting:



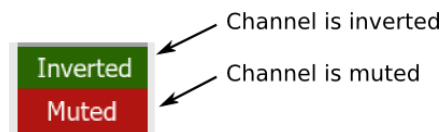
(Note that the compressor algorithm is bypassed by default, so click on the **Bypass** button to see the curve as shown here.)

In this example, the threshold is set to -20 dB, so the compressor will activate when the signal on that channel reaches -20 dB (relative to full output). The ratio is set to 2, so if the input signal level to the compressor then increases by 10 dB, the output level will increase by only 5 dB. If the input signal level to the compressor is at full scale (0 dB), then the output level will be limited to -10 dB.

Two additional parameters control the action of the compressor: the attack time and the release time. These two parameters govern how quickly the compressor activates when the signal level exceeds the threshold, and how quickly it deactivates when the signal level reduces. The optimum settings may need to be tuned by ear. For more information, see the Wikipedia article [Dynamic range compression](#).

8.3.6 Invert and mute

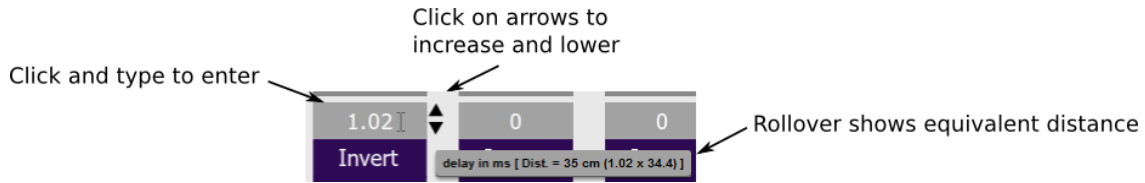
Each channel can be inverted in polarity, and individually muted. When either of these options is selected, the visual indicator on the button is "lit":



8.3.7 Time delay

A delay of up to 30 ms 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. The maximum time delay of 30 ms corresponds to a distance of approximately 10.3 meters (about 35 feet).

The time delay corresponds to a distance. This distance is shown in centimeters below the entry box.



Note: The Dirac Live analysis algorithm *also* sets the time delay on the left and right channel. The time delay on the output channels should be used to time-align drivers (in the case of a two-way loudspeaker) and to optimize subwoofer integration (when the DDRC-24 is being used to drive one or more subwoofers).

8.4 CUSTOM BIQUAD PROGRAMMING

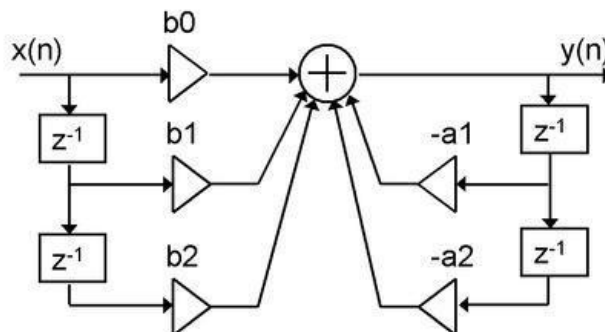
Custom biquad programming is available in the PEQ and Crossover blocks. Its purpose is to allow you to directly provide the low-level parameters aka *biquad coefficients* that control the digital filters of the processor, thus providing an almost infinite degree of flexibility.

For example, you can create hybrid crossovers with staggered cutoff frequencies, create parametric EQ filters beyond those provided in the easy-to-use “basic” interface, implement a Linkwitz transform, or mix crossover and EQ biquads in the same block.

8.4.1 What’s a “biquad”?

A biquad is the basic unit of processing that is used to create digital filters. It can be described either with an equation or with a signal flow diagram, as shown here:

$$H(z) = \frac{b_0 + b_1 z^{-1} + b_2 z^{-2}}{1 + a_1 z^{-1} + a_2 z^{-2}}$$



A single biquad like this can perform a great many functions, including all of the functions of a single parametric EQ filter, one 6 or 12 dB/octave high pass or low pass filter, and more. Biquads are combined in series (cascaded) to create more complex filters. The function that each biquad performs is determined by just five numbers: $a1$, $a2$, $b0$, $b1$, and $b2$. These numbers are called the *coefficients*.

8.4.2 Using custom biquad programming

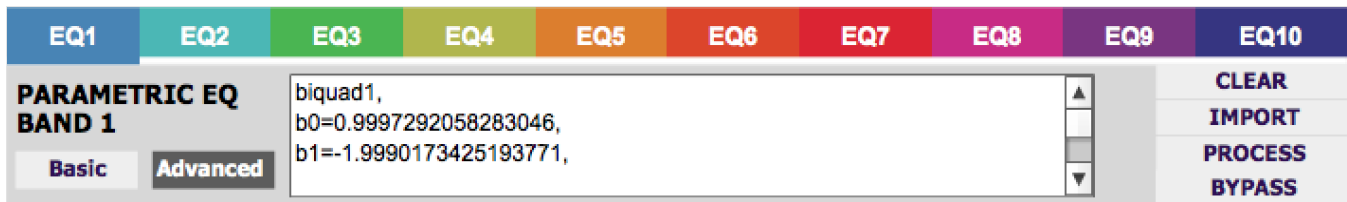
Each crossover block and PEQ filter has a selector that switches it to advanced mode:



In advanced mode, the biquad coefficients can be pasted directly into the user interface. These coefficients must be calculated using a design program – see [Biquad design software](#) for suggestions.

Parametric EQ advanced mode

In the parametric EQ blocks, advanced mode allows each individual filter to be specified by its biquad coefficients. After pasting in the coefficients, click on the **Process** button.



Parametric EQ file import (REW integration)

Multiple biquads in the parametric EQ block can be set at once by importing a coefficient file. This file can be generated by Room EQ Wizard (REW) or by other programs. The design program must be set for a **48 kHz** sample rate. The number of filters is limited to a maximum of ten.

This example illustrates the correct file format:

```

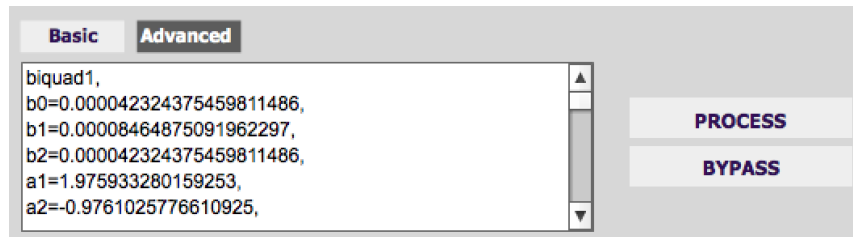
biquad1,
b0=0.998191200483864,
b1=-1.9950521500467384,
b2=0.996920046761057,
a1=1.9950521500467384,
a2=-0.9951112472449212,
biquad2,
b0=0.999640139948623,
b1=-1.9981670485581222,
...
biquad3,
...
biquad4,
...
biquad10,
b0=1.0010192374642126,
b1=-1.9950555192569264,
b2=0.9940580112181501,
a1=1.995060938714333,
a2=-0.9950718292249559
    
```

Note that the last line must not have a comma at the end. If the file has less than ten biquads, then only that number of biquads will be imported. For example, if importing a file with six biquads, the first six filters will be set, and the last four will not be changed. (Note: if the last line ends with a comma, that counts as an extra biquad.)

If the file contains more than ten biquads, then an error will be reported and no filters will be changed.

Crossover advanced mode

The **Crossover** blocks have eight biquads for each output channel. In **Advanced** mode, all eight biquads need to be specified. After pasting in the coefficients, click on the **Process** button for them to take effect.



8.4.3 Biquad design software

Following are programs that can be used to design your biquad coefficients.

8.4.3.1 Biquad calculation spreadsheet

The community-developed biquad calculation spreadsheet allows many filter types to be calculated, including notch filters, Linkwitz transforms, and filters with arbitrary Q-factor. Access this spreadsheet here (requires Microsoft Excel):

- http://www.minidsp.com/images/fbfiles/files/All_digital_coefs_v1-20101026.zip

8.4.3.2 Room EQ Wizard (REW)

Room EQ Wizard is a free acoustic measurement and analysis tool, available for Windows, Mac and Linux platforms. It includes the ability to automatically generate a bank of parametric EQ biquads based on a measurement. These coefficients can be saved to a file from REW and loaded directly into a PEQ bank in a miniDSP plugin. Room EQ Wizard can be downloaded here:

- <http://www.roomeqwizard.com/#downloads>

For guidance on using this feature, please refer to the app note [Auto EQ with REW](#).

8.5 WORKING WITH CONFIGURATIONS

The data that controls the audio processing is called a *configuration*. The processor stores four configuration presets in its internal memory, which can be selected from the plugin or via remote control.

8.5.1 Online and offline mode

Initially, the plugin is *offline*. When the **Connect&Synchronize** button is used, the plugin downloads configuration data into the processor and goes *online*. Changes made in the plugin user interface therefore fall into two categories:

The plugin is online

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

The plugin is offline

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



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

8.5.2 Selecting a configuration

The active configuration is selected by one of the four Configuration Selection buttons:



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 configuration.

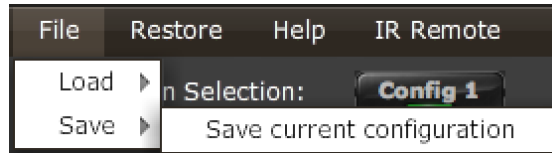
The plugin is offline

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.

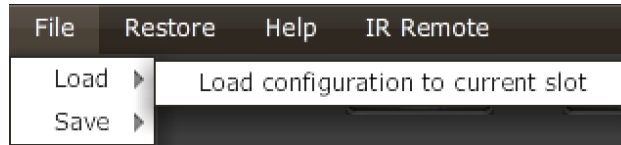
8.5.3 Saving and loading configurations

Configurations can be saved to and loaded from files. Each configuration is stored in a separate file. It is *very* strongly recommended that each configuration programmed into the processor be saved to a file, to ensure that the configuration is not lost if the processor is inadvertently reset.

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 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 processor immediately. If the plugin is offline, the data will be loaded into the user interface only, and will be downloaded to the processor the next time it is synchronized.



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

8.5.4 Relationship with Dirac Live

Each configuration preset in the DDRC-24 plugin corresponds to the same-numbered filter set configured in the DiracLive application. For example, if the remote control or front panel is used to select preset 3, then both DDRC-24 configuration 3 and Dirac Live filter set 3 are loaded for audio processing.

The stored configuration file contains the data for the DDRC-24 plugin only. The Dirac Live filters must be loaded separately using the DiracLive application.



8.5.5 Restoring to defaults

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

Factory Default

Reset all four configuration presets to the factory default settings.

Current Configuration Only

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

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

8.6 KEYBOARD SHORTCUTS

The **DDRC-24** plugin supports the use of the keyboard for many operations.

Tab

The Tab key moves the focus from the current user interface element to the next. A blue-grey surrounding box usually indicates the user interface element with the focus. Shift-Tab moves the focus in the opposite direction.

Up/down arrows

The up/down arrow keys (and in some cases, the left/right arrow keys) adjust the value of many parameters, if they have the focus:

- Gain adjustment
- Crossover frequency and filter type
- PEQ filter frequency, gain, and Q

Space

The Space bar toggles buttons that have two states, such as **Bypass**, **Invert**, and **Mute**, if they have the focus.

9 ADDITIONAL INFORMATION

9.1 SPECIFICATIONS

Computer connectivity	Driverless USB 2.0 control interface for Windows and Mac OS X
USB audio input and output	XMOS asynchronous USB audio, 44.1 to 192 kHz, USB Audio Class 2 compliant. ASIO driver for Windows, driverless for Mac OS X.
Digital audio Input	TOSLINK optical. A high quality onboard Asynchronous Sample Rate Converter ensures compatibility with most sample rates, from 20–216kHz.
Analog audio inputs	Unbalanced stereo (2 channels) analog audio on RCA connectors <ul style="list-style-type: none"> - Max input of 4V or 2V RMS, jumper-selectable - Input impedance: 10kΩ - THD+N: 0.003% (RCA to USB) - Dynamic range: 102dB
Analog audio outputs	Unbalanced analog audio (4 channels) on RCA connectors <ul style="list-style-type: none"> - Max output: 2V RMS - Output impedance: 560Ω - THD+N: 0.001% (USB to RCA) - Dynamic range: 103dB
Audio resolution	24-bit input and output resolution, 48 kHz internal sample rate
Audio processing	32-bit floating-point processor. Flexible matrix mixer, Dirac Live [®] , user-programmable IIR filtering, individual delays and gains per channel.
Filtering capabilities	Dirac Live mixed-phase filtering. User-programmable IIR filters: high pass and low pass crossover filters up to 48 dB/octave per output channel; ten biquad filters (parametric) EQ per output channel – peaking, low-shelf, and high-shelf types.
Storage/presets	All output channel settings controllable in real time from software user interface. 4 onboard presets stored in local flash memory.
Infrared remote	“Learning remote” capabilities (NEC, Philips, Sony)
Power supply	12 VDC single supply @ 300mA, 2.1 mm center-positive
Dimensions (H x W x D)	27 x 119 x 107 mm

9.2 TROUBLE-SHOOTING PLAYBACK ISSUES

No sound during volume calibration

If you get no sound while on the Volume Calibration tab of DiracLive, first make sure that you increase the volume slider in the UI (the leftmost one).

If there is still no sound, double-check that output cabling is connected to the right connectors on the rear panel and to the correct inputs on downstream equipment. Make sure that downstream equipment (e.g. amplifiers) is not muted, turned down, or turned off.

No sound during playback

If you get no sound while playing music, first quit DiracLive if it is open, and start the DDRC-24 plugin.

If there is no signal on the input meters

1. Check which input source you have selected. If that doesn't provide the solution, double-check the connection and cabling between the source(s) and the DDRC-24.

If there is signal on the input meters, but no signal on the output meters

1. Check the master volume setting.
2. Check that the DDRC-24 is not muted (Mute button at top right of the interface).
3. Check your Routing and make sure that you are routing inputs through to outputs.
4. Check your crossover settings.

If there signal on the output meters, but still no sound

1. Check that output cabling is connected to the right connectors on the rear panel and to the correct inputs on downstream equipment (e.g. amplifiers).
2. Check that downstream equipment (e.g. amplifiers) is not muted, turned down, or turned off.

Strange soundstage

If the soundstage width is very narrow, check that you have not summed left **and** right input channels and routed the sum to the left and right speaker. This will result in a mono signal and hence a narrow soundstage.

If the soundstage is "weird", check the routing and crossover settings, and make sure that left and right are consistent. If you are implementing an active speaker, also double check the connections on the rear panel.

Distortion

If audio playback is distorted, you may have too much gain internal to the DSP. Dirac Live can apply up to 10 dB of gain, so the output level should be kept lower than -10 dB to *guarantee* that there is no distortion with a full-scale input signal.

This issue typically occurs when volume control is being done downstream of the DDRC-24 processor. If so, set the DDRC-24 processor master volume at -10 dB, and then use the downstream equipment to control volume.

9.3 FIRMWARE UPGRADE

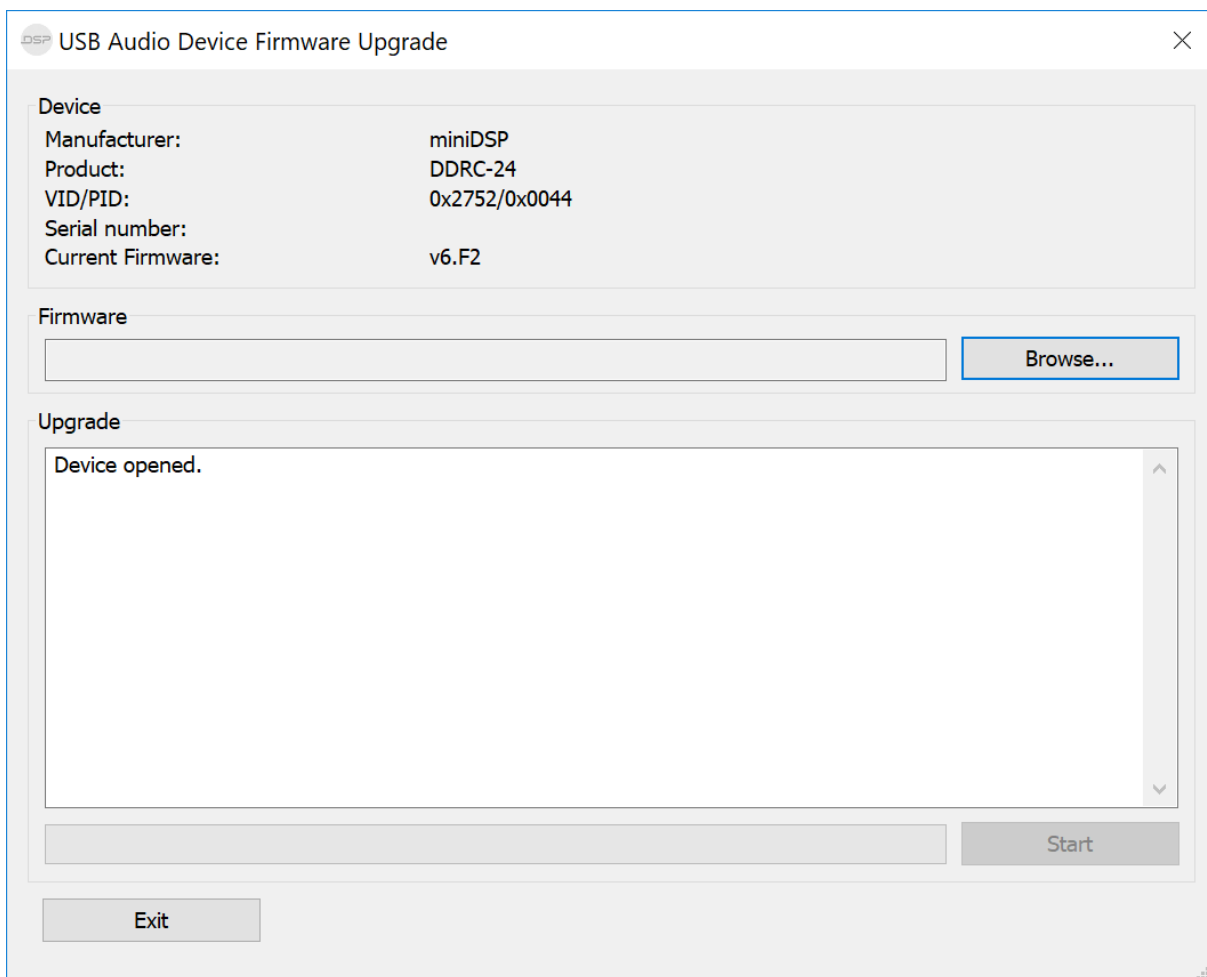
miniDSP may occasionally provide an upgrade to the DDRC-24 MCU firmware to enable new features. To upgrade the MCU firmware, first download the latest version of the DDRC-24 software package from the **User Downloads** section of the miniDSP website, then extract it on your computer (on Windows, right-click and select “Extract All...”; on Mac, double-click).



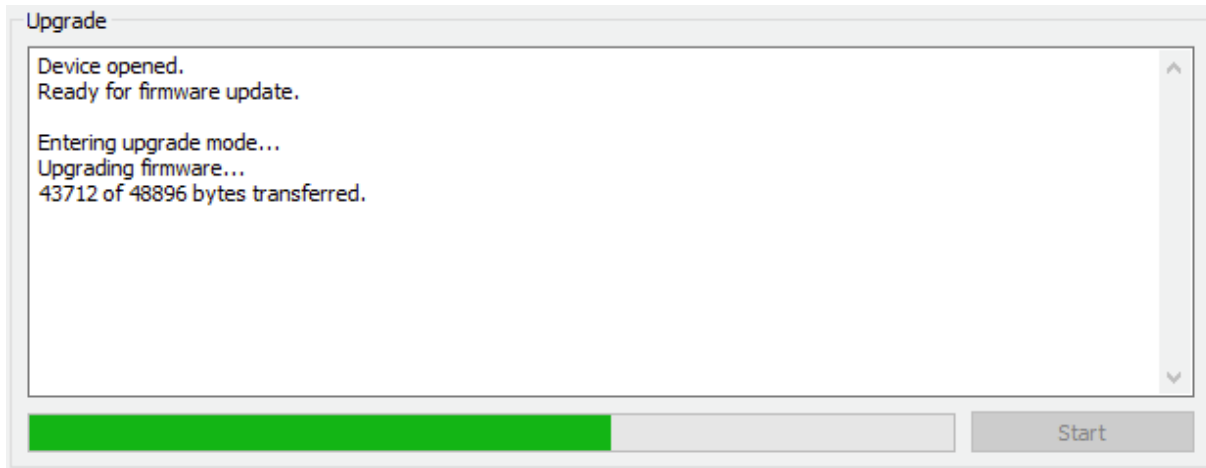
DO NOT DISCONNECT THE USB CABLE OR POWER FROM THE *DDRC-24* WHILE FIRMWARE UPGRADE IS IN PROGRESS. DOING SO MAY “BRICK” YOUR *DDRC-24*.

9.3.1 Windows

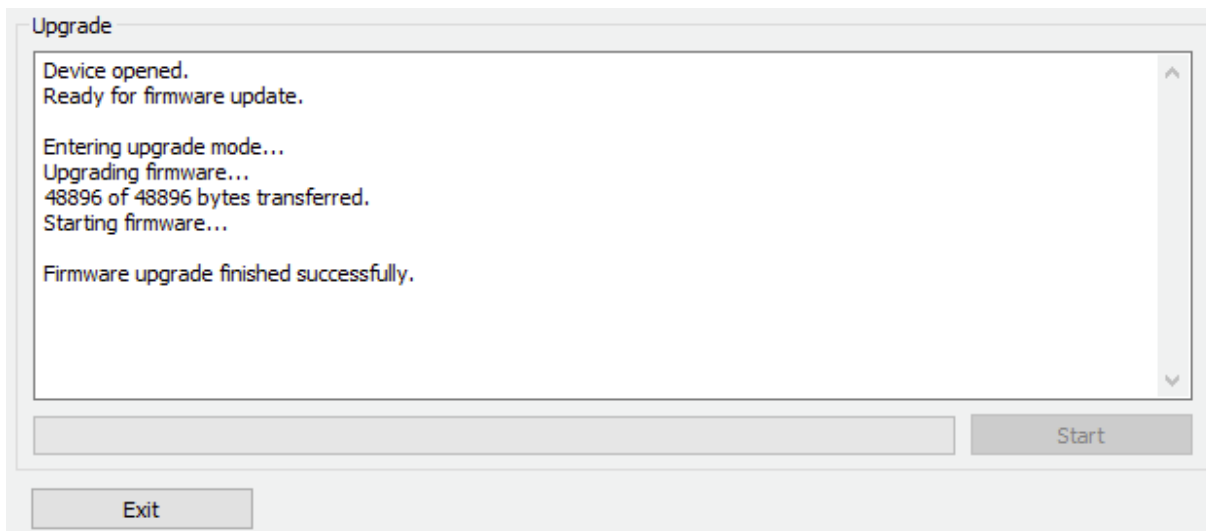
1. Connect the DDRC-24 to your computer via USB (if not already connected) and power it on.
2. Navigate to the **XMOS_Firmware\Firmware_Upgrade_Tools\Windows\miniDSPUAC2Dfu** folder of the software download.
3. Double-click on the **miniDSPUAC2Dfu.exe** program to run it:



- Click on the **Browse** button, navigate to the folder **XMOS_Firmware** in the plugin download folder, and select the firmware file. It will have a name like “DDRC-24_XMOS_v1.7.bin.” (The version number “v1.7” may change.)
- Click on the **Start** button.
- You will get a progress bar as upgrade proceeds:



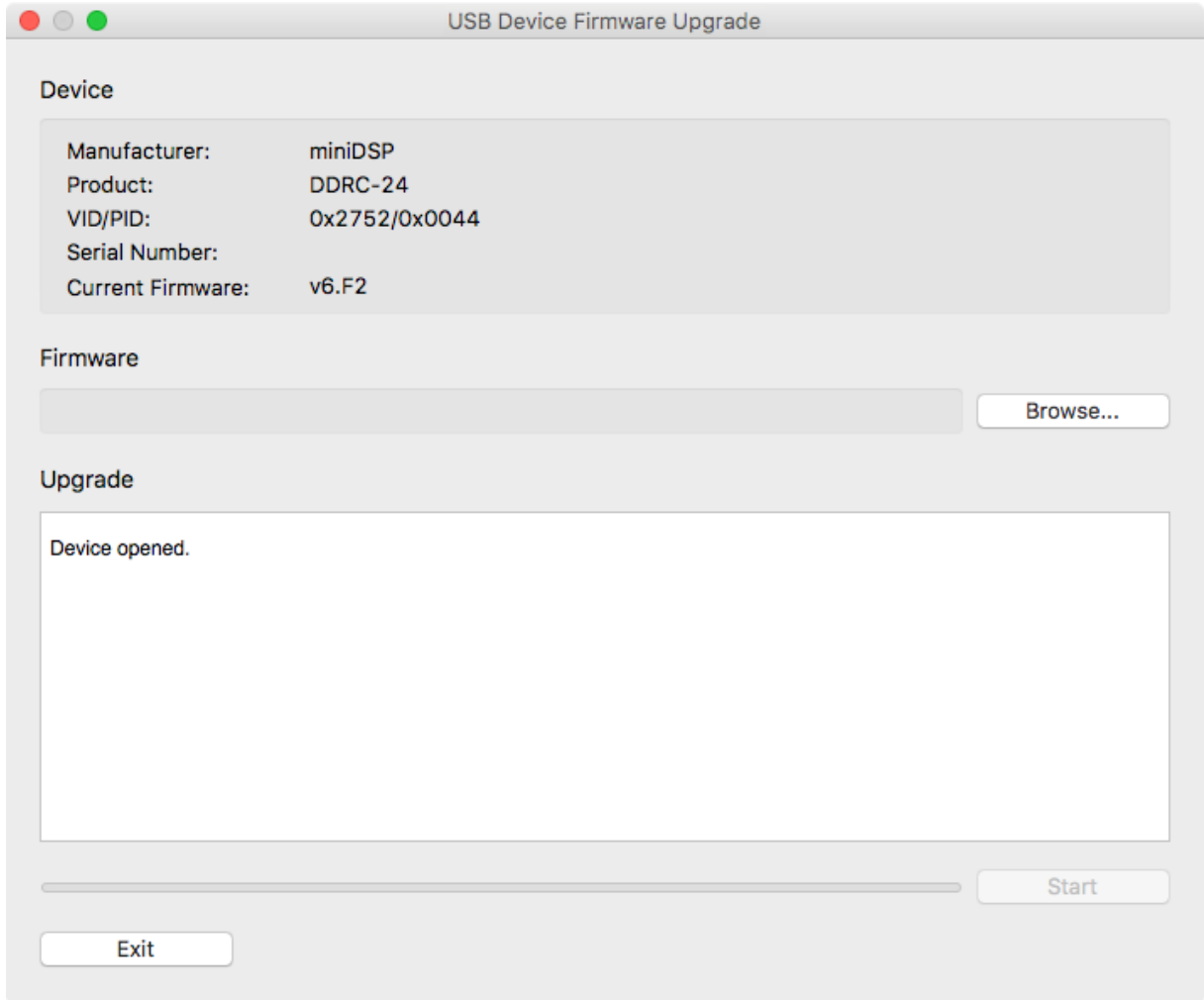
- Once the firmware upgrade completes, you will see a message that the upgrade completed successfully:



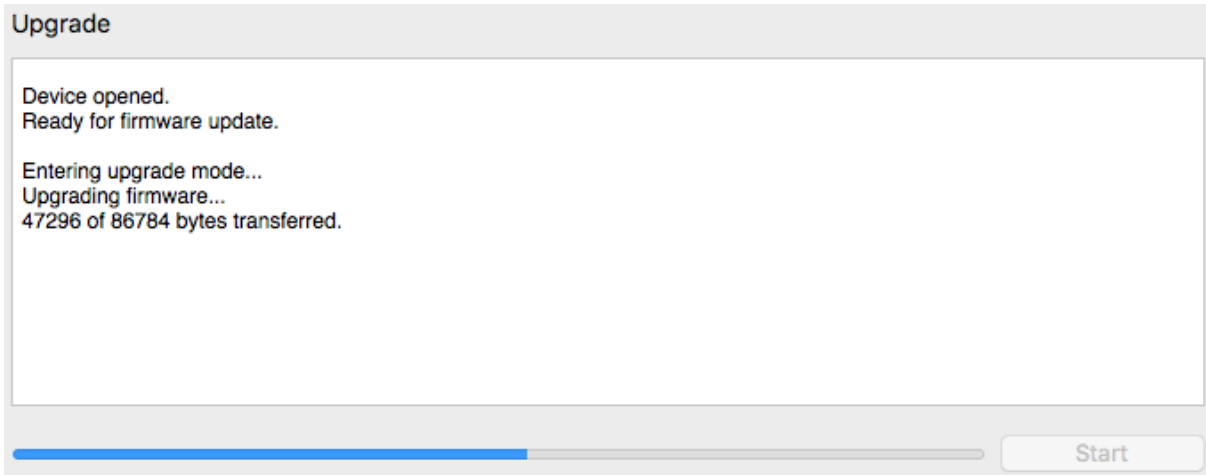
- Click on **Exit**.
- That's it! You're done. You can now use your DDRC-24 with the new functionality.

9.3.2 macOS / OS X

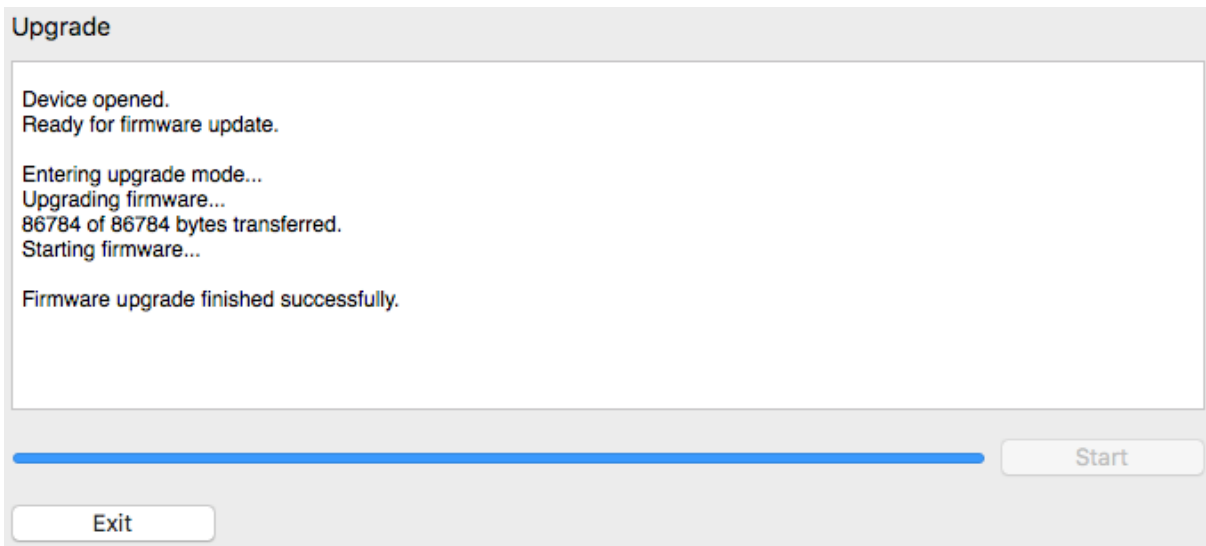
1. Connect the DDRC-24 to your computer via USB (if not already connected) and power it on.
2. Navigate to the **XMOS_Firmware/Firmware_Upgrade_Tools/Mac** folder of the software download.
3. Double-click on the **DFU Utility.app** program to run it:



- Click on the **Browse** button and select the firmware file from the **XMOS_Firmware** folder of the software download. It will have a name like “DDRC-24_XMOS_v1.7.bin.” (The version number “v1.7” may change.)
- Click on the **Start** button.
- You will get a progress bar as the upgrade proceeds:



- Once the firmware upgrade completes, you will see a message that the upgrade completed successfully:



- Click on **Exit**.
- That's it! You're done. You can now use your DDRC-24 with the new functionality.



9.4 OBTAINING SUPPORT

1. Check the forums on minidsp.com to see if this issue has already been raised and a solution provided.
2. Contact miniDSP via the support portal at support.minidsp.com with:
 - a. The product information obtained from the DDRC-24 plugin's About button and the DiracLive application.
 - b. A clear explanation of the symptoms you are seeing.
 - c. A description of troubleshooting steps (see Trouble-shooting playback issues) performed and your results.