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# miniDSP Flex



## Product Overview

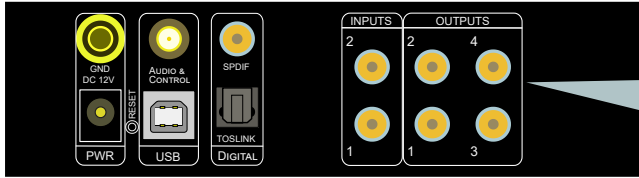
The **miniDSP Flex** is a stereo-input, four-channel output compact high-resolution audio processor. It features stereo analog inputs, two digital inputs, USB audio, Bluetooth streaming with LDAC™ and aptX™ HD codecs and automatic Bluetooth input selection, and an OLED front panel with physical volume control.

## The Flex family

There are several versions of the 2-in 4-out miniDSP Flex with different I/O configurations. Refer to the [Flex product page \(https://www.minidsp.com/products/minidsp-in-a-box/flex\)](https://www.minidsp.com/products/minidsp-in-a-box/flex) for the complete list.

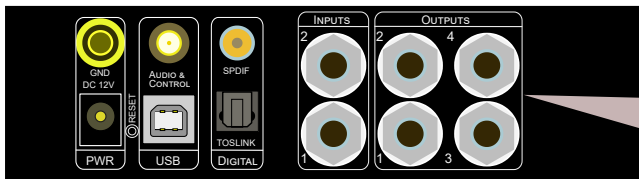
## Common Inputs

SPDIF  
TOSLINK  
USB Audio  
Bluetooth Audio



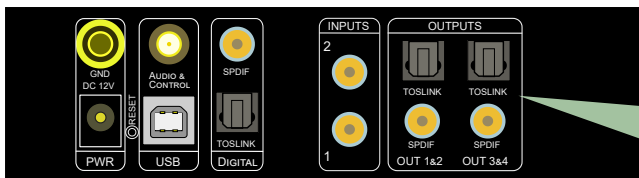
### Flex

Our standard model with stereo analog input and four channels of analog output, all on RCA connectors. The perfect tiny digital/analog preamp and room correction device.



### Flex/Balanced

For those with balanced equipment whether audiophile, studio, or on-the-go professional sound use. TRS jacks keep the compact profile and are easy to adapt.



### Flex/Digital

For specialized needs including driving active speakers with digital input, use with separate DACs, or to capture an analog source into a digital system.

## Dirac Live upgrade

The **miniDSP Flex** can be upgraded to run stereo (two-channel) Dirac Live® room correction. This requires an additional purchase for the Dirac Live license. You can either purchase the miniDSP Flex with Dirac Live already activated, or purchase the Dirac Live upgrade at a later time from within the Device Console. Refer to the instructions here:

- [Convert to Flex \(DL\)](#)

Note that the upgrade applies *per device*.

## Typical applications

The miniDSP Flex has a wide range of applications in home and professional audio. This section illustrates a few of them.

Figure 1 shows the miniDSP Flex used as a digital preamp with subwoofer integration. The Flex provides accurate and flexible integration between the subwoofers and the main speakers as well as comprehensive EQ and tuning options. This is a very cost-effective way to build a complete audio system that includes all the benefits of modern DSP technology. Add the optional Dirac Live software upgrade for world-class room correction.

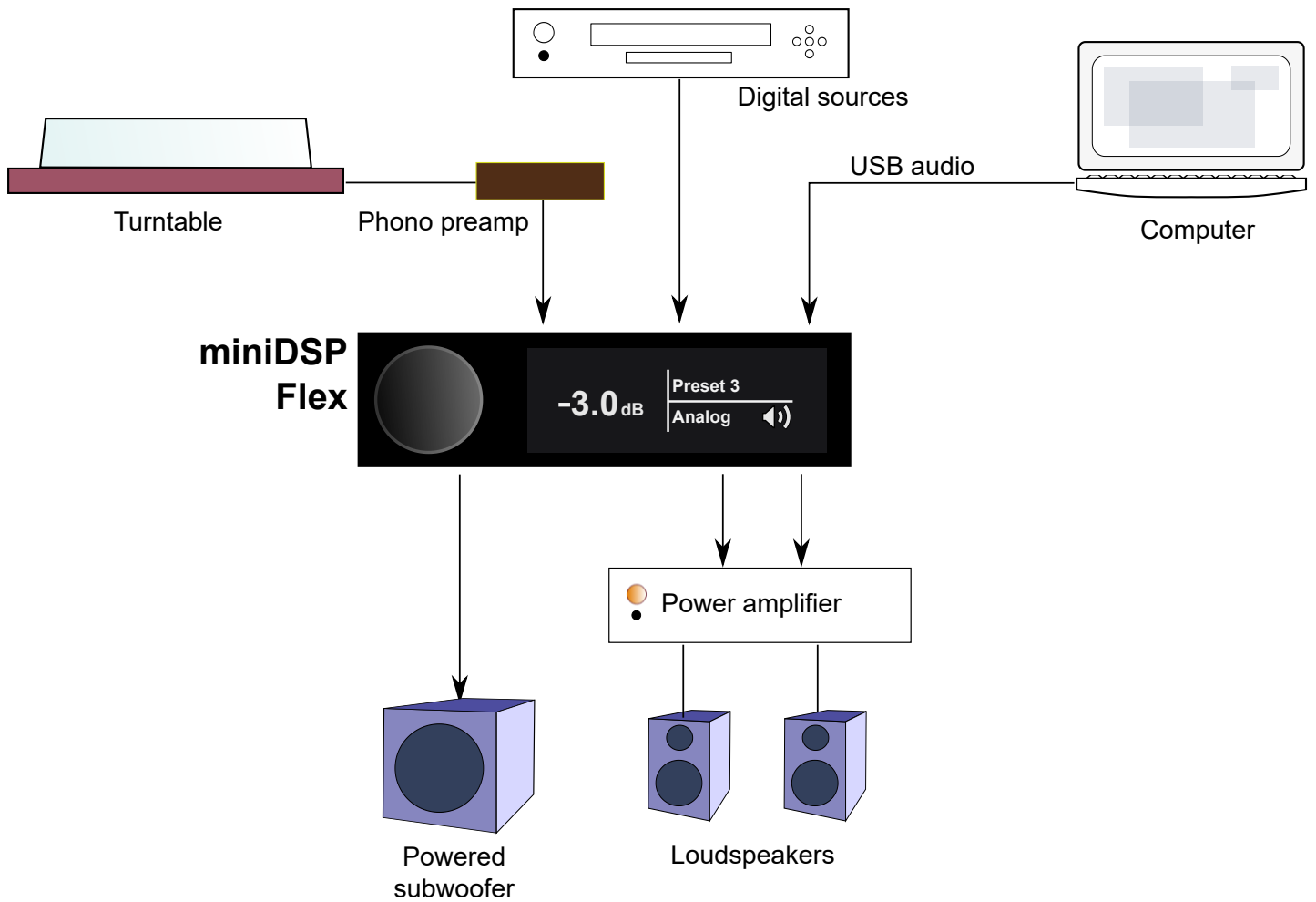


Figure 1. miniDSP Flex as preamp with subwoofer integration

Figure 2 illustrates a similar use of the miniDSP Flex as a digital preamp, but the output channels have instead been configured to act as crossover for a pair of active 2-way speakers. Amplification can be via a multichannel power amplifier as shown, or a pair of stereo amplifiers.

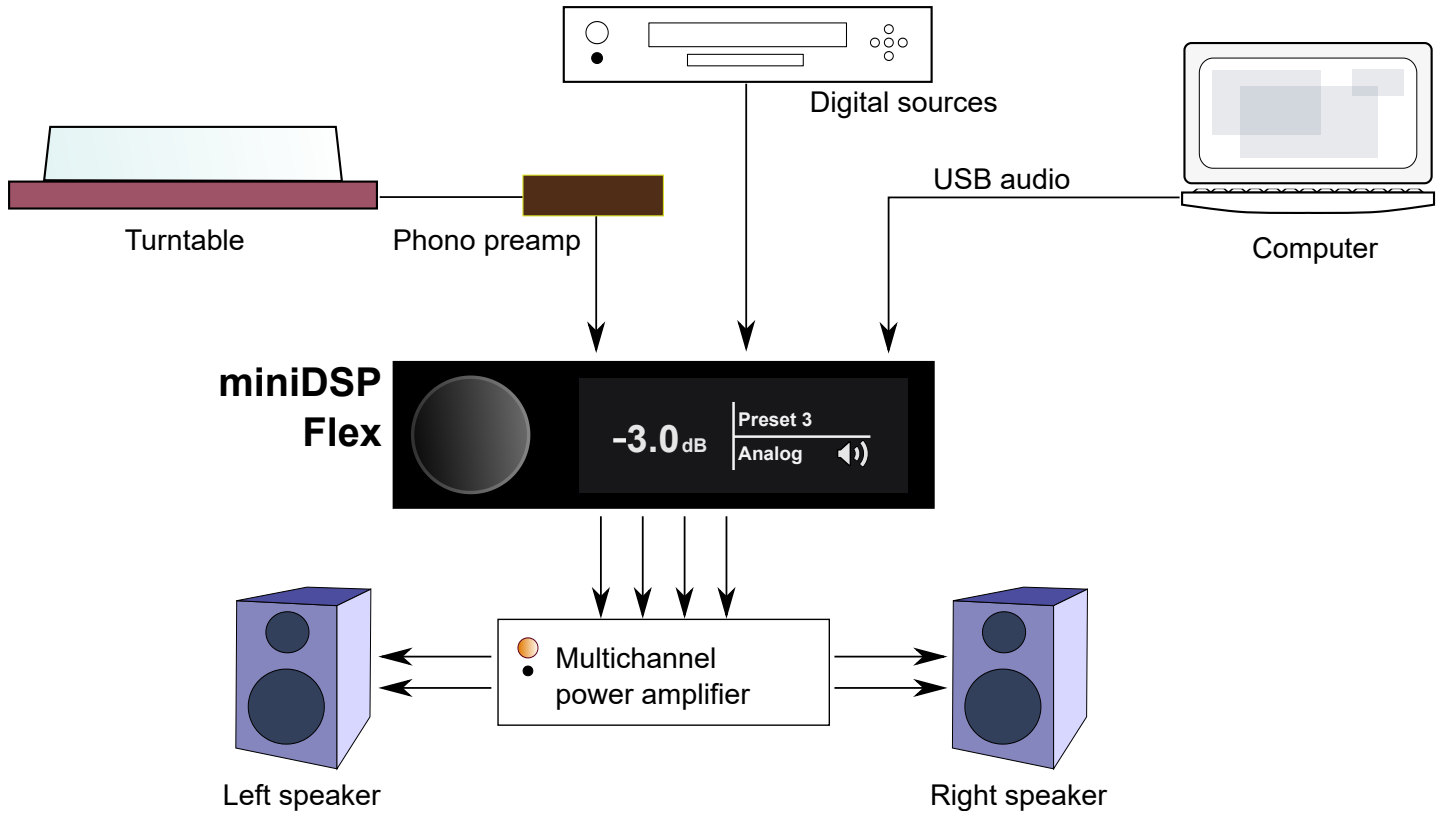


Figure 2. miniDSP Flex as preamp and active crossover

In Figure 3, the miniDSP Flex has been used as an accessory in a home theater system, to manage multiple subwoofers. Driven from the A/V receiver's subwoofer output, the miniDSP Flex can be used to independently adjust gain, delay and parametric EQ of each subwoofer for optimum multi-sub performance.

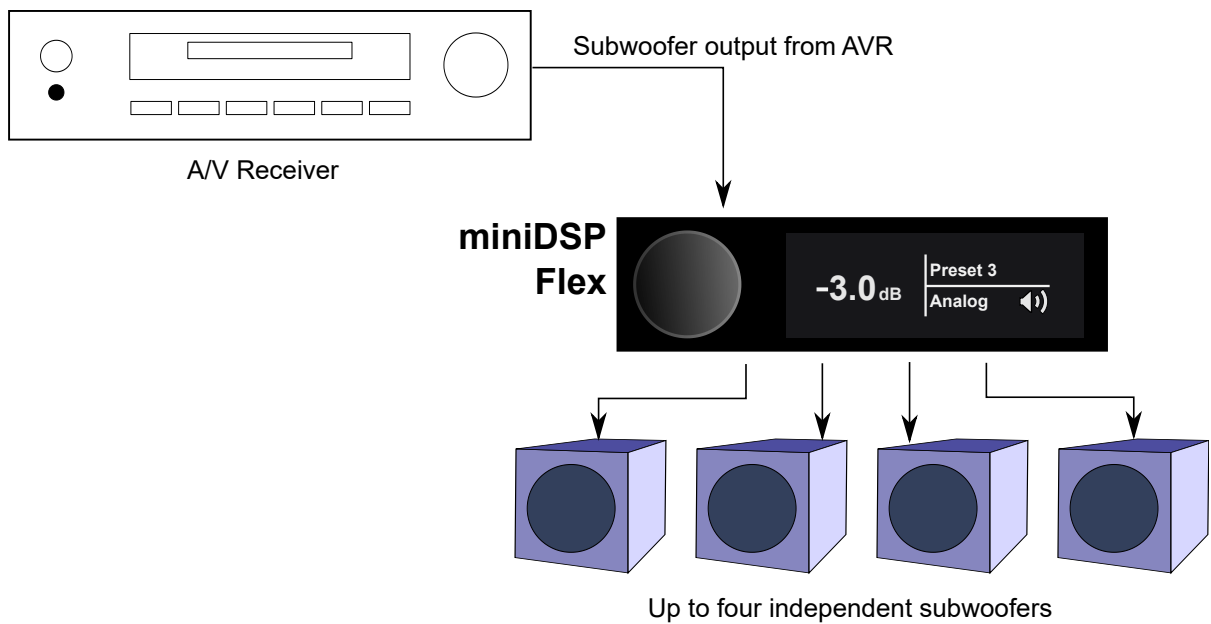


Figure 3. miniDSP Flex for multi-sub management



# Software Installation

The miniDSP Flex is configured with software running on a PC or Mac.

## System requirements

### Windows

- Windows 10 or later, with all updates installed
- At least a dual core i3, i5, or i7 processor, or AMD equivalent
- At least 4 GB RAM
- One free USB 2.0 port
- Internet connection

### macOS

- OS X 10.11 (El Capitan), or macOS 10.12 (Sierra) or later
- At least a dual core i3, i5, or i7 processor, or an Apple ARM processor (M1/M2/Pro/Max)
- At least 4 GB RAM
- One free USB 2.0 port
- Internet connection

#### Info

Intel and Apple ARM processors are supported with separate binaries.

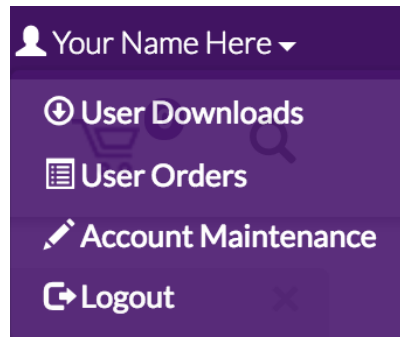
## Download the miniDSP software

If you purchased your Flex directly from miniDSP, your software will be available from the [User Downloads](https://www.minidsp.com/userdownloads) (<https://www.minidsp.com/userdownloads>) 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 Flex from a miniDSP dealer, you will receive a coupon together with the product. Redeem this coupon at this page:

- [Redeem your miniDSP software \(https://www.minidsp.com/support/redeem-coupon\)](https://www.minidsp.com/support/redeem-coupon)

The User Downloads link is visible from the drop-down menu at the top right of the website:



Navigate to the **miniDSP Device Console** section and select the download according to your platform: Windows, macOS with Intel CPU, or macOS with Apple ARM CPU.

## Install the miniDSP software

### Install on macOS

1. Double-click on the downloaded **miniDSP Device Console-x.y.z.dmg** image file to open it. (The version number x.y.z embedded in the file name will change over time.)
2. Drag the miniDSP Device Console application icon to your Applications folder.



3. To run the miniDSP Device Console, locate it in the Applications 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.

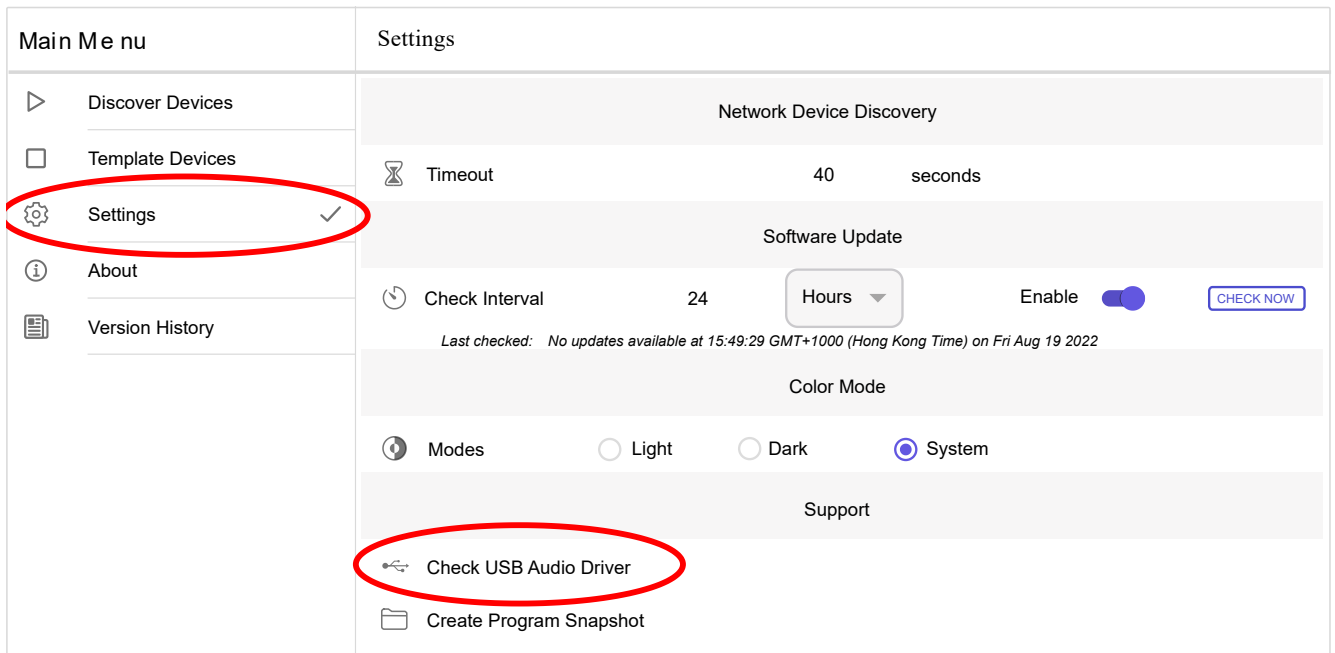
#### **i** Info

The macOS version of miniDSP Device Console is installed for all users on the computer.

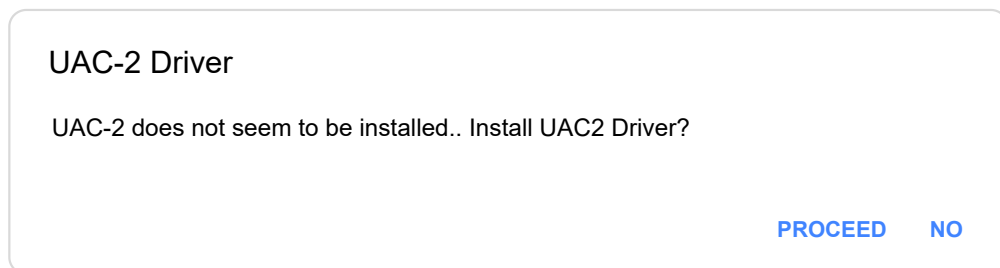
### Install on Windows

1. Double-click on the downloaded **MiniDSP Device Console Setup x.y.z.exe** installer to run it. (The version number x.y.z embedded in the file name will change over time.)
2. Install the miniDSP UAC2 USB Audio driver:

- a. Start miniDSP Device Console.
- b. Navigate to the Settings screen and select **Check USB Audio Driver**:

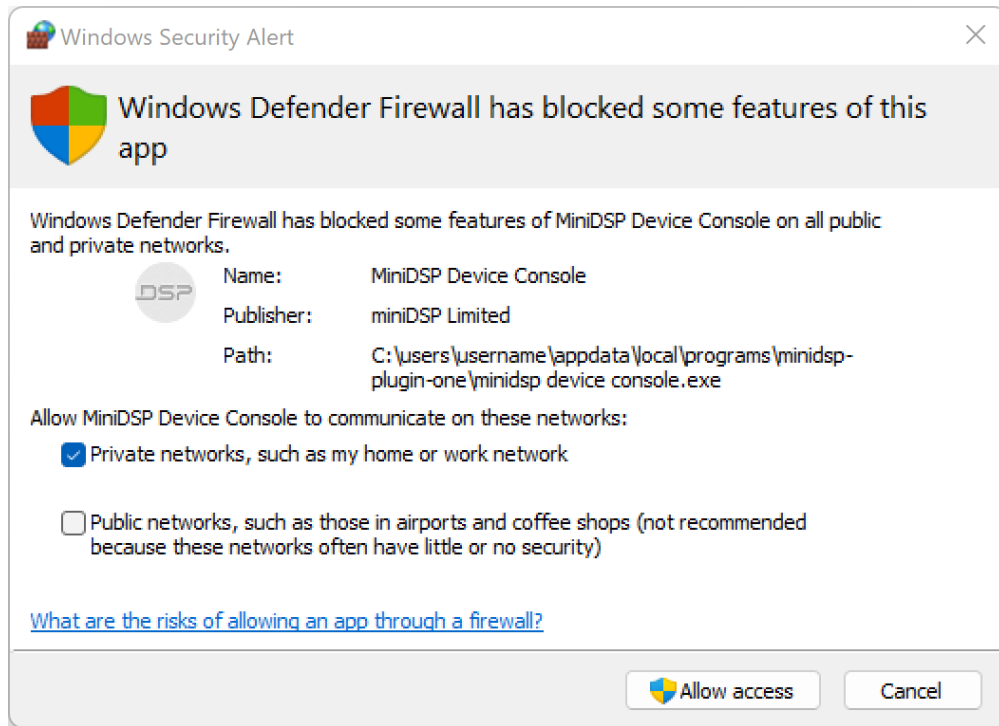


If the UAC2 driver is not installed, Device Console will offer to install it. If you have previously installed the miniDSP UAC2 driver but it is not up to date, Device Console will offer to install the latest version. In either case, click **PROCEED**.



Note: we recommend that you accept the default installation location.

The first time you run the miniDSP Device Console, 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.

**i Info**

The most recent miniDSP processors require the UAC2 driver to be at least version 5.40. If you have difficulty with the UAC2 driver or control panel, use **Check USB Audio Driver** to make sure that you have the latest version.

**i Info**

The Windows installation of miniDSP Device Console is for a single user. If it needs to be run in more than one account on your PC, it will need to be installed for each account.

# The miniDSP Device Console



The miniDSP Device Console ("DC") is the new configuration and control software for miniDSP audio processors. It replaces the earlier "plugin" control software. In contrast to the earlier software, Device Console provides:

- A single software program to control all miniDSP processors
- Over-the-air (OTA) self-updates
- Detection and installation of firmware upgrades for your processor
- Purchase and activation of Dirac Live upgrades (where applicable)

If you have not used Device Console with your Flex before, you will need to perform a one-time migration procedure. See [Migrating to DC](#).

## Finding connected devices

The **Discover Devices** screen displays devices connected to your computer, or which have a network-accessible control interface.

<b>Main Menu</b>	<b>Choose your device:</b> Devices plugged into your network / USB are shown below.
<input checked="" type="checkbox"/> Discover Devices ✓	 <b>Flex Eight</b> Serial#: 900001 USB VID: 10066 PID: 18
<input type="checkbox"/> Template Devices	 <b>SHD</b> Serial#: 902607 USB VID: 10066 PID: 69
<input type="checkbox"/> Settings	
<input type="checkbox"/> About	
<input type="checkbox"/> Version History	

### Info

For network control, the miniDSP Flex requires that a miniDSP Wi-DG be connected to its USB port.

### Tip

If your device is connected to a Wi-DG but is not visible here, confirm that you have updated the firmware on your Wi-DG to the latest version.

## Connecting to a device

To connect to a device for editing and control, click on its name. While the device is connected, the Device Console displays three main areas:

- The *global control* area has items that are not specific settings of the processor for the current preset. These items are described on this page.
- The *input channels* area displays a control strip for each input channel. See [Input channels](#).
- The *output channels* area displays the routing from input to output channels, and a control strip for each output channel. See [Signal routing](#) and [Output channels](#).

The screenshot shows the Device Console interface for a miniDSP Flex device, organized into three main sections:

- Global control:**
  - Device name: Flex
  - Connection: DISCONNECT button
  - Master Volume: -41.5 dB slider
  - Input Source: TOSLINK dropdown
  - Presets: 1, 2, 3 (selected), 4 buttons; RENAME, IMPORT, EXPORT, RESET, RESET-ALL buttons
  - Firmware: Display Versions, Refresh DSP Firmware, Refresh XMOS Firmware buttons
  - Model Conversion: Convert To Flex (DL) button
- Input channels:**
  - Input 1: RMS-Meter (dBFS) -14.0, Gain (dB) 0, PEQ, MUTE buttons
  - Input 2: RMS-Meter (dBFS) -43.1, Gain (dB) 0, PEQ, MUTE buttons
- Output channels:**
  - Output 1: INPUT 1 selected, 0 dB, PEQ, CROSSOVER, FIR, Delay (ms) 0, Gain (dB) 0, INVERT, MUTE, COMPRESSOR, RMS-Meter (dBFS) -18.9
  - Output 2: INPUT 2 selected, 0 dB, PEQ, CROSSOVER, FIR, Delay (ms) 0, Gain (dB) 0, INVERT, MUTE, COMPRESSOR, RMS-Meter (dBFS) -32.4
  - Output 3: INPUT 1 selected, 0 dB, PEQ, CROSSOVER, FIR, Delay (ms) 0, Gain (dB) 0, INVERT, MUTE, COMPRESSOR, RMS-Meter (dBFS) -3.5
  - Output 4: INPUT 1 selected, 0 dB, PEQ, CROSSOVER, FIR, Delay (ms) 0, Gain (dB) 0, INVERT, MUTE, COMPRESSOR, RMS-Meter (dBFS) -42.9

If this is the first time you have used Device Console with your miniDSP Flex, Device Console will check for an existing preset that was created with the older MiniDSP-2x4-HD "plugin" user interface. If found, Device Console will automatically import it. This is done on a preset-by-preset basis.

When you are done, click DISCONNECT.

### Tip







Once you have switched to miniDSP Device Console, don't use the older MiniDSP-2x4-HD "plugin" user interface to connect to the miniDSP Flex any more.

## Using template devices

The **Template Devices** screen displays the complete list of devices supported by Device Console. This can be used to explore features of a processor that you do not have, or to edit your processor settings when you are not able to connect to it.

A template device "mirrors" the real device, so that you can edit your settings while not connected. That is, while you are editing the real device, the current preset is copied to the corresponding template device whenever you change presets and when you disconnect. You can then edit those settings in the template device.


To edit a template device, click on it.

Main Menu	Tem plate Devices
<ul style="list-style-type: none"> <li>▶ Discover Devices</li> <li>☐ Template Devices ✓</li> <li>⚙ Settings</li> <li>ℹ About</li> <li>📄 Version History</li> </ul>	<div style="display: flex; align-items: center;">  <div style="margin-left: 10px;"> <p>DDRC-24</p> <hr/> </div> <span style="margin-left: auto;">&gt;</span> </div> <div style="display: flex; align-items: center;">  <div style="margin-left: 10px;"> <p>Flex</p> <hr/> </div> <span style="margin-left: auto;">&gt;</span> </div> <div style="display: flex; align-items: center;">  <div style="margin-left: 10px;"> <p>Flex (DL)</p> <hr/> </div> <span style="margin-left: auto;">&gt;</span> </div> <div style="display: flex; align-items: center;">  <div style="margin-left: 10px;"> <p>Flex Eight</p> <hr/> </div> <span style="margin-left: auto;">&gt;</span> </div> <div style="display: flex; align-items: center;">  <div style="margin-left: 10px;"> <p>Flex Eight (DL)</p> <hr/> </div> <span style="margin-left: auto;">&gt;</span> </div> <div style="display: flex; align-items: center;">  <div style="margin-left: 10px;"> <p>SHD</p> <hr/> </div> <span style="margin-left: auto;">&gt;</span> </div>

When you are done editing in the template device, click FINISH.

When you connect to your real device again, Device Console detects that you have edited the template and asks you if you want to use the settings from the edited template. Or, you can discard the changes you made in the template and revert to the settings that your device had the last time you were connected to it. This is done on a preset-by-preset basis:

Settings have changed ✕

 **Different settings have been found for Flex. Would you like to:**

Possible reasons:  
\* The settings for Preset-1 in the template device has been changed since last time this Flex was connected.

→ **Apply the changes from Preset-1 in the template to the Flex**  
(Last Modified: 8/29/2022, 3:46:22 PM)

→ **Continue and use current setting.**  
(Last Modified: 8/29/2022, 1:22:17 PM)

→ **Initialize to default Settings**

→ **Disconnect**

### Info

You will see a similar dialog if you edit the settings of your device using a different computer or the older "plugin" user interface (the latter is not recommended once you have migrated to the miniDSP Device Console).

### Info

If you have more than one device of the same type, only one of them can be edited using the template device. If you have more than one device of the same type or need to edit your devices from more than one computer, you will need to manage your presets by exporting them to and importing them from files. See [Importing and Exporting](#).

## Settings

These settings are for Device Console itself (and not any connected processor).



Main Me nu	Settings
▶ Discover Devices	Network Device Discovery
□ Template Devices	⌚ Timeout 40 seconds
⚙ Settings ✓	Software Update
ℹ About	🕒 Check Interval 24 Hours Enable <input checked="" type="checkbox"/> <a href="#">CHECK NOW</a>
📄 Version History	<i>Last checked: No updates available at 15:49:29 GMT+1000 (Hong Kong Time) on Fri Aug 19 2022</i>
	Color Mode
	🎛 Modes <input type="radio"/> Light <input type="radio"/> Dark <input checked="" type="radio"/> System
	Support
	🔌 Check USB Audio Driver
	📁 Create Program Snapshot

The **Modes** selection sets the DC to display with a light theme, a dark theme, or with the same theme as your operating system (Windows or macOS). If you choose the System option, you may need to quit Device Console and restart it for the change to take effect.

The **Check USB Audio Driver** feature checks if you have the miniDSP UAC2 audio driver installed, and that it is the latest version. It appears on *Windows* only. See [Installation](#) for more information.

The **Create Program Snapshot** feature is used to help miniDSP support diagnose issues you may be having with your unit. See [Obtaining Support](#).

## Input sources

To select the input source, drop down the selector menu.

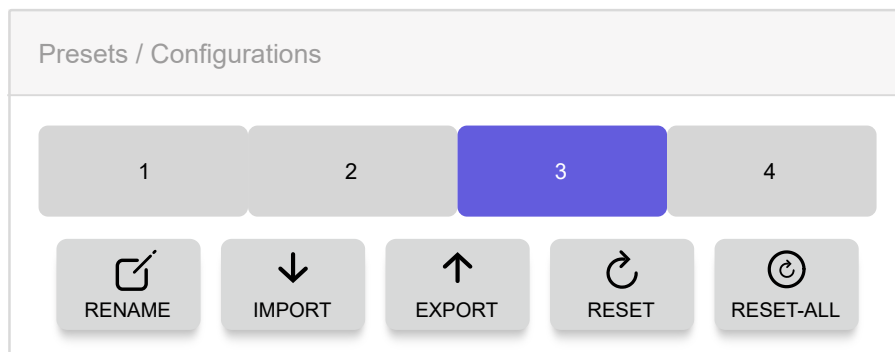
The selectable inputs can set up by clicking on the CUSTOMIZE SELECTION button. Any input source can be enabled or disabled here.

Please choose selectable Audio Source

Analog	<input checked="" type="checkbox"/>
TOSLINK	<input checked="" type="checkbox"/>
SPDIF	<input type="checkbox"/>
USB	<input checked="" type="checkbox"/>
Bluetooth	<input type="checkbox"/>

If an input is disabled, it cannot be selected here, from the front panel, or by remote control. This is a convenience feature so that unused inputs do not need to be cycled through.

## Using presets



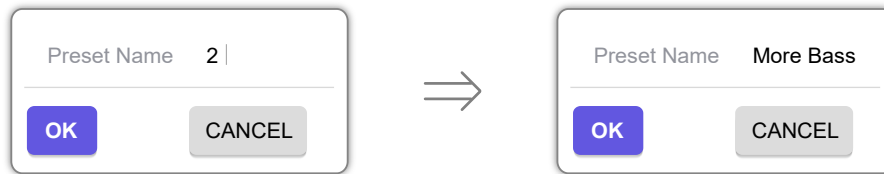
The miniDSP Flex has four onboard presets, each of which contains all of the settings for audio processing except items controlled by the front panel and remote control (volume, mute, input source).

### Selecting a preset

Click on the desired preset number. Or if you have renamed the presets, its name.

### Renaming

Select the preset, then click the RENAME button. Enter the desired name, then click OK. The name can be up to 12 letters long.



### Info

The preset name is displayed in the Device Console **only**. The front panel of the Flex will still display "Preset 1" through "Preset 4".

## Importing and exporting

To import a preset from a file, click the IMPORT button, then navigate to a saved preset file and click **Open**. The preset will be loaded from the file. If Device Console is currently connected to the miniDSP Flex, the preset will also be sent to the Flex.

To export a preset to a file, click the EXPORT button. Navigate to the desired location in the file system, change the file name if desired, and click **Save**.

### Info

It is not possible to load a preset *from* the Flex back to the Device Console. We strongly recommend always exporting your presets to files when they are complete, to ensure that you don't lose them in future.

### Tip

To copy all settings from one preset to another, export the first preset to a file, select the second preset, and then import the file that you just saved.

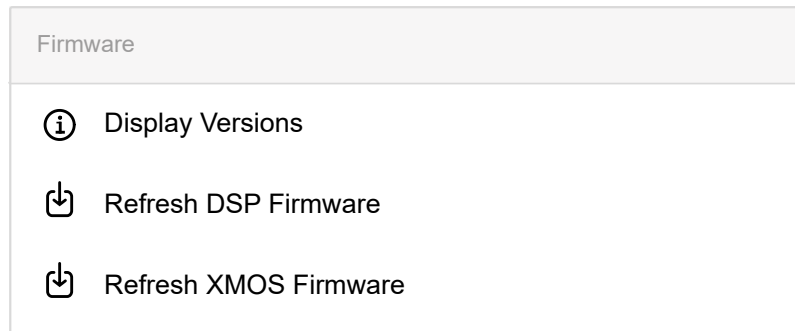
## Resetting

To reset the current preset to default values, click the RESET button.

To reset all four presets to default values, click the RESET-ALL button.

## Firmware updates

miniDSP Device Console will check for firmware updates when a device is connected, and notify you if one is available. To manually update the firmware, click the **Refresh DSP Firmware** and **Refresh XMOS Firmware** button.



### Tip

You do not need to use these buttons in normal operation. They are there in case your Flex has issues and/or miniDSP Support instructs you to refresh the firmware.

## Convert to Flex (DL)

Dirac Live is an optional upgrade to the miniDSP Flex. You can purchase and activate the upgrade from within the miniDSP Device Console.

To purchase the Dirac Live upgrade, click on **Convert to Flex (DL)** in the Device Console sidebar:



Read the information and warning notices and click through if you wish to proceed.

The upgrade is a two-step process: 1. purchase; 2. activate.

### Upgrade to Dirac Live

#### Step-1: Purchase Dirac Live Upgrade

Jump directly to Step-2 if completed purchase already.

Click to buy Dirac Upgrade online for Flex

**BUY UPGRADE**

Click to display Activation Code for trouble-shooting purpose



#### Step-2: Upgrade to Dirac-Live

Please enter the activation key from miniDSP to activate the license

User can enter the activation key online if this computer is connected to the Internet. Otherwise, the activation key can be loaded from file.

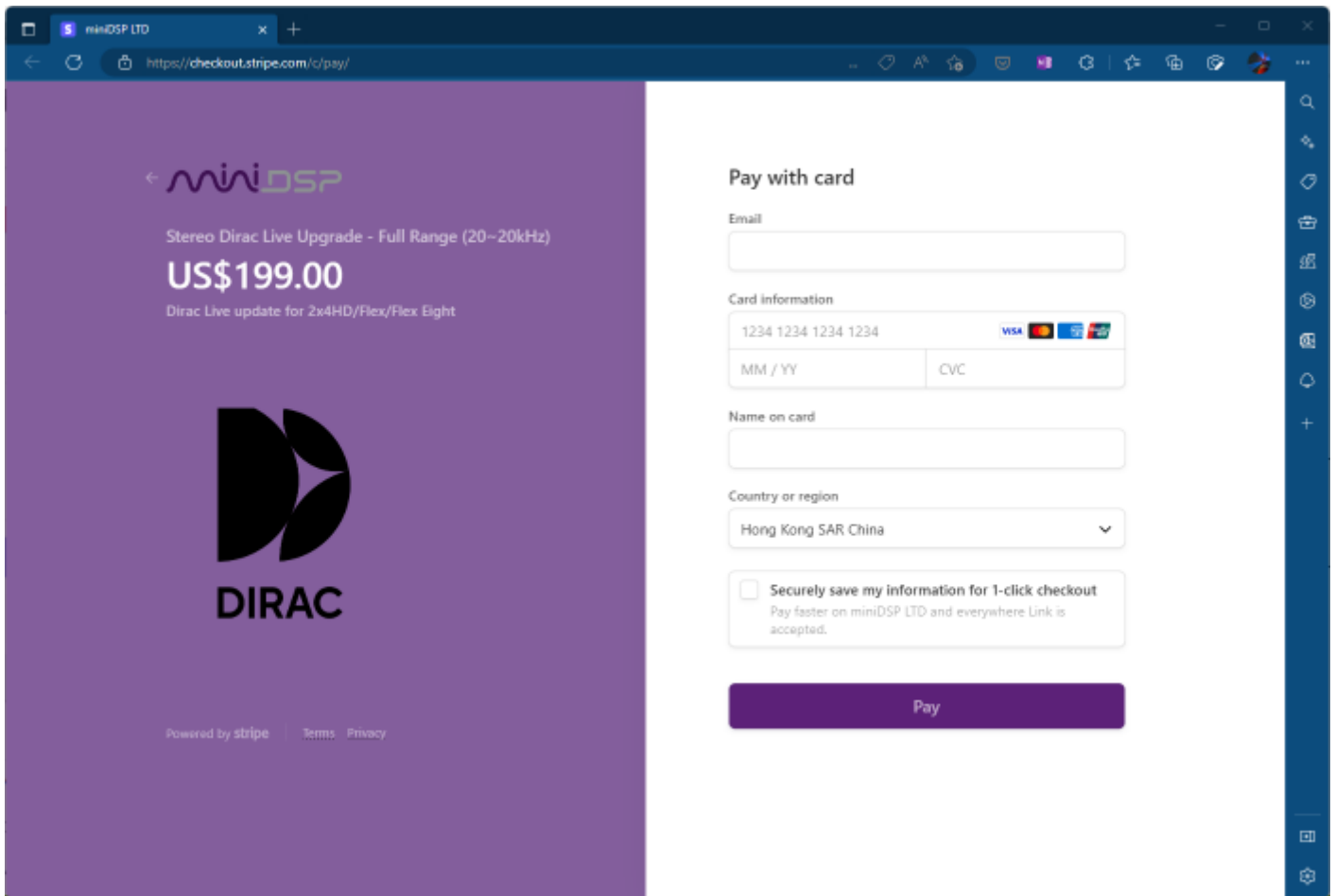
RETRIEVE KEY ONLINE

LOAD FROM FILE

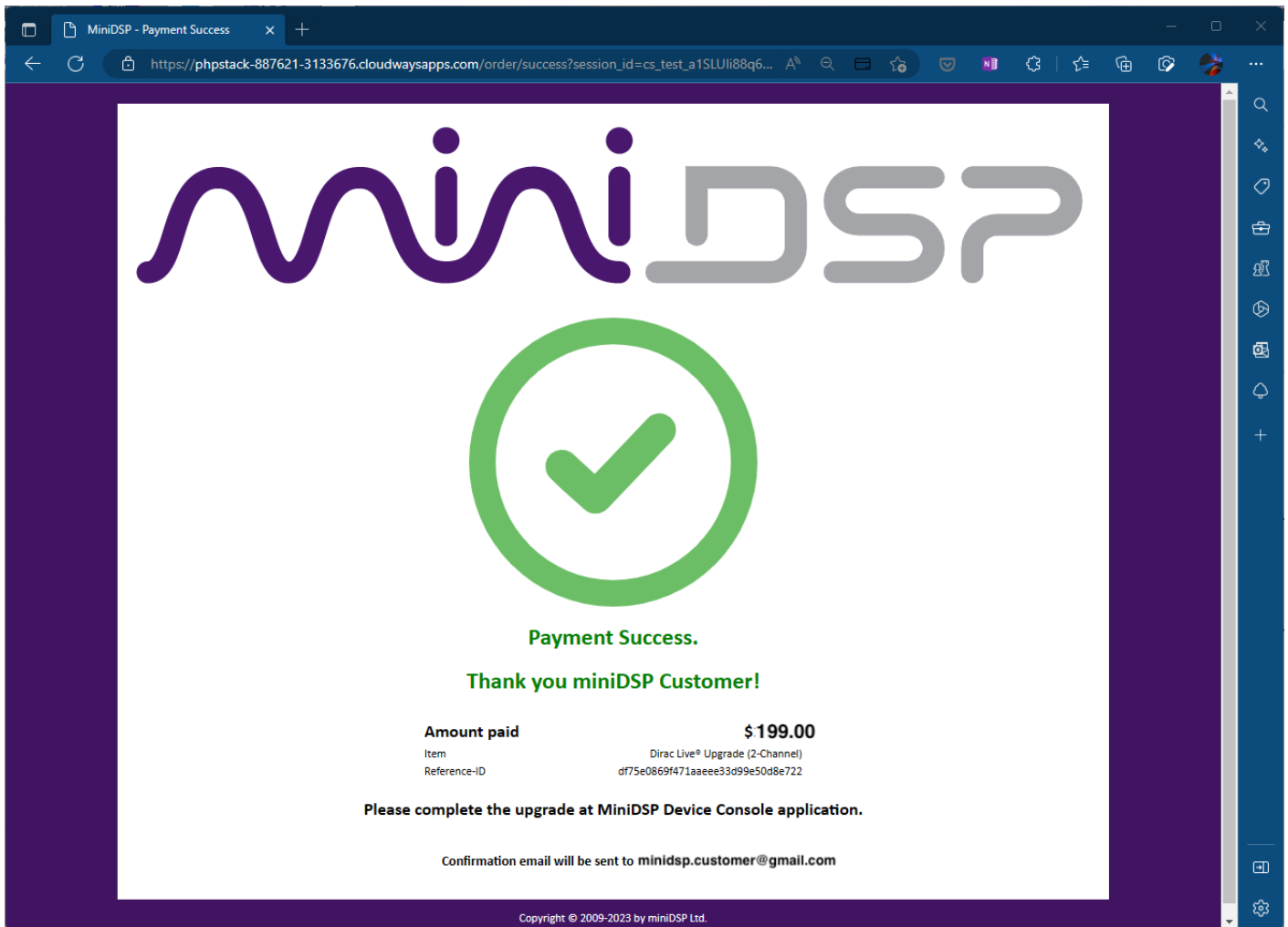
**ACTIVATE**

### 1. Purchase the Dirac Live upgrade

Click on **BUY UPGRADE**. A browser window will open on stripe.com. Enter your payment details and click **Pay**.



The Stripe payment page redirects to an acknowledgement screen:



You will also receive an email receipt.

### i Info

After you press the **Buy Upgrade** button, miniDSP Device Console will wait for an acknowledgement from the payment system. If you decide not to proceed with the upgrade, click the back-arrow button near the top left of the purchase screen and the Device Console will return to normal operation.



If you just close the payment window, Device Console will wait 30 minutes for the acknowledgement; in that case, quit and restart the Device Console application.

## 2. Activate the Dirac Live upgrade

After payment completes, return to the miniDSP Device Console window. You will see acknowledgement of successful payment:

**Notice**

Payment received.Thank you!

Reference ID: fd4874987fa8e8c6ba87634

**OK**

Click OK to return to the upgrade screen.

### Upgrade to Dirac Live

---

#### Step-1: Purchase Dirac Live Upgrade

Jump directly to Step-2 if completed purchase already.

Click to buy Dirac Upgrade online for Flex BUY UPGRADE

Click to display Activation Code for trouble-shooting purpose

---

#### Step-2: Upgrade to Dirac-Live

Please enter the activation key from miniDSP to activate the license

User can enter the activation key online if this computer is connected to the Internet. Otherwise, the activation key can be loaded from file.

```
00 00 001E FF FF FF FF FF FF FF FF FF FF FF FF FF FF EF FF FF FF FF FF FF FF EF FF FF FF FF FF FF FP FF FF FP FF
FF FF FF FP FP FF FF FF FF FF FF FP EF FP FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF 15 09 09 013A 24 1F 27 010105 00 FF FF
50 55 4B 32 36 OC 23 1C FF FF FF FF FF FF 40 40 40 40 40 40 40 40 40 40 40 40 40 40 40 40 40 40 40 40 40 40 40 40
```

RETRIEVE KEY ONLINE
LOAD FROM FILE
ACTIVATE

Click on **RETRIEVE KEY ONLINE** to retrieve the activation key. Then click **ACTIVATE** to activate the upgrade on your Flex.

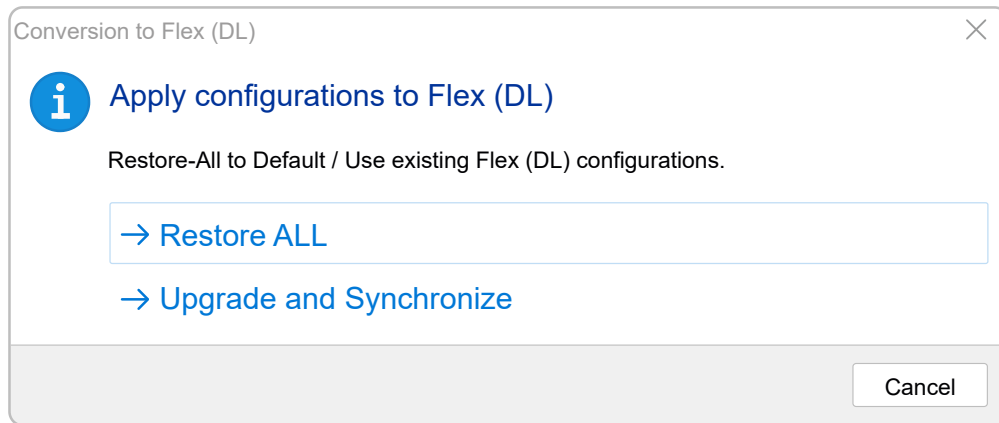
**Tip**

Retrieving the activation key online requires an active Internet connection. If you have a device that needs to be activated while offline, save the activation key file that was attached to the purchase acknowledgement email onto a USB stick. On the device to be activated, click **LOAD FROM FILE** and select the file from the USB stick.

After activating, the Flex will restart. When it comes back online, it will appear in the Device Console list of devices as a Flex (DL).



The miniDSP Flex presets will not be converted to the Flex (DL). When reconnecting, you can choose to either restore all presets to their default values or to use existing Flex (DL) presets.



 **Tip**

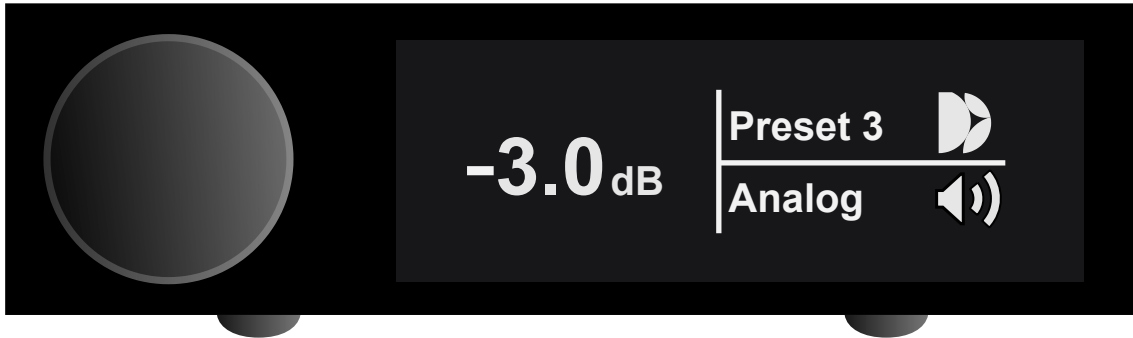
Be sure to use the Flex (DL) version of the manual/help after you have completed the upgrade.

# Basic Operation

# Front and rear panels

## Basic operation

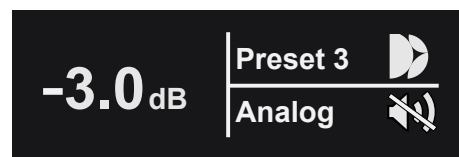
The front panel and rotary encoder provide access to the key features of the miniDSP Flex. These can also be accessed with a remote control.



- To change the volume, rotate the encoder. The volume changes in 0.5 dB steps. Minimum volume is -127.5 dB and maximum volume is 0.0 dB.
- To select a preset, press the encoder knob once, then rotate until the desired preset number is displayed. Either press the encoder again or wait for a second. The display will show "Pls wait..." while the new preset is being loaded, and then return to normal.
- To select an input source, press the encoder knob twice, then rotate the encoder until the desired input source is displayed. Either press encoder knob or wait for a second and the display will return to normal with the new input selected.
- To mute output, press and hold the encoder knob. When the display changes to show "Mute?," release the knob. To unmute, repeat this procedure.



Not muted



Muted

- To put the Flex into standby, press and hold the encoder knob. When the display changes to show "Standby?," release the knob. To take it out of standby, press the encoder knob.

### Tip

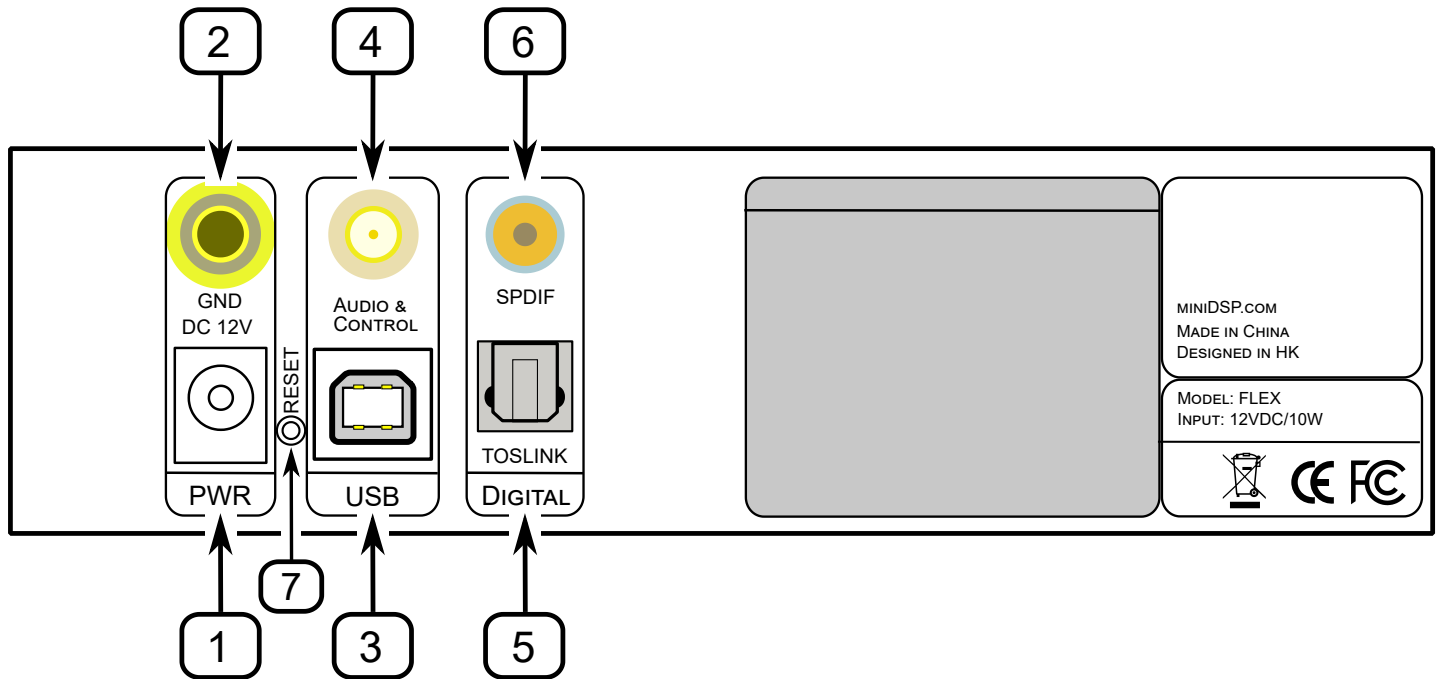
All these operations can also be performed with the remote control.

## Rear panel connections

### Warning

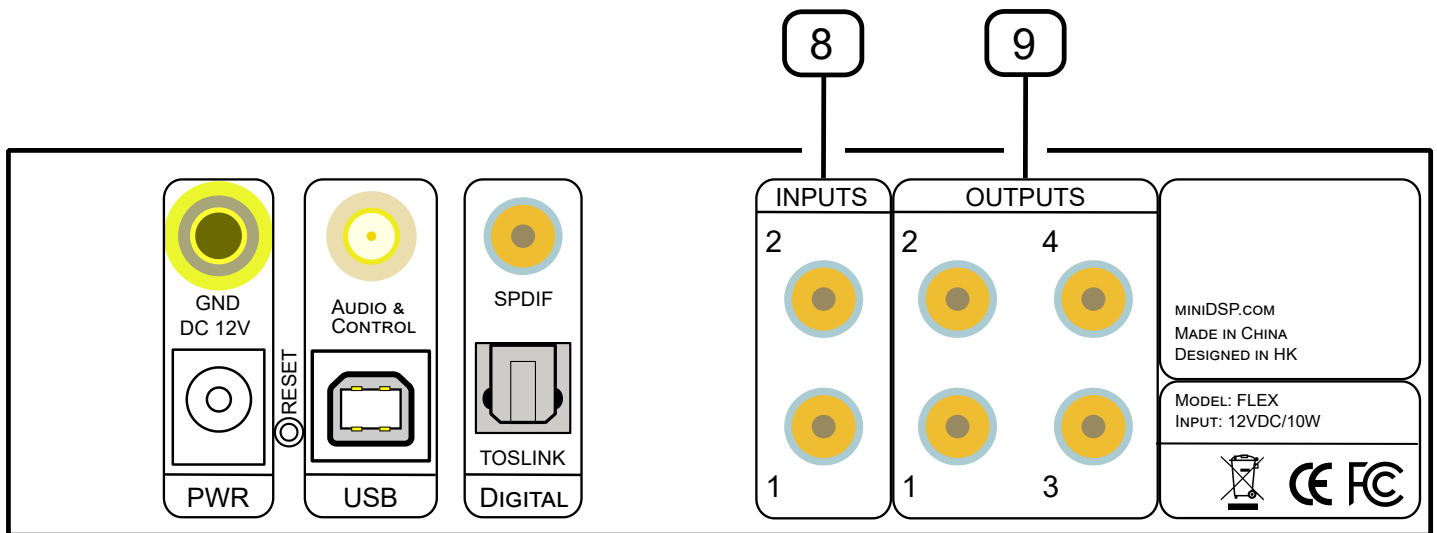
Apply power to the miniDSP Flex only after all input and output connections have been made.

### All versions



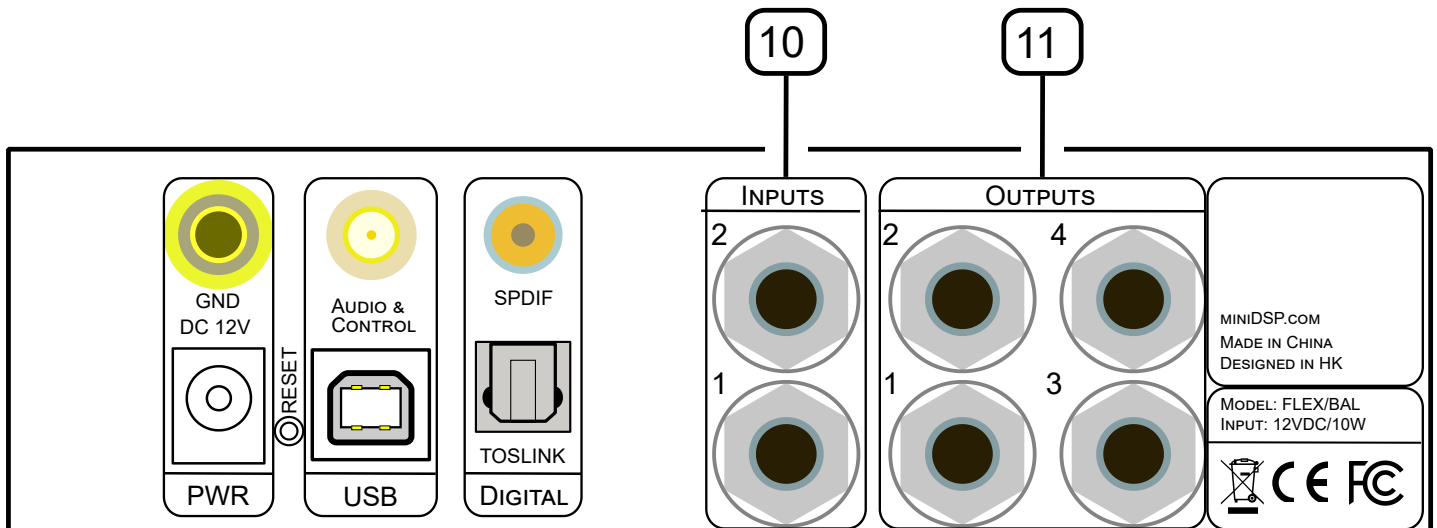
1. **DC power.** The supplied 12 VDC power supply includes a set of interchangeable power pins for USA, UK, Europe and Australia. Fit the correct pins for your country. Connect the DC plug to the 12 VDC power socket.
2. **Ground lug.** This can be connected to an external electrical ground if it is necessary to ground the chassis of the Flex. This need is uncommon, and most of the time it can be left unconnected.
3. **USB port** for control and audio streaming. Connect to an available USB port on your computer. This port can also be connected to a network streamer with USB output for audio playback.
4. **Bluetooth antenna.** Screw on the supplied Bluetooth antenna here.
5. **Optical digital input.** Connect a digital source using a TOSLINK optical cable. Sample rates from 32 up to 216 kHz are supported.
6. **Coax digital input.** Connect a digital source using an RCA cable. Sample rates from 32 up to 216 kHz are supported.
7. **Reset button.** For use in specific circumstances only. See the *Trouble-shooting and Support* section.

### miniDSP Flex



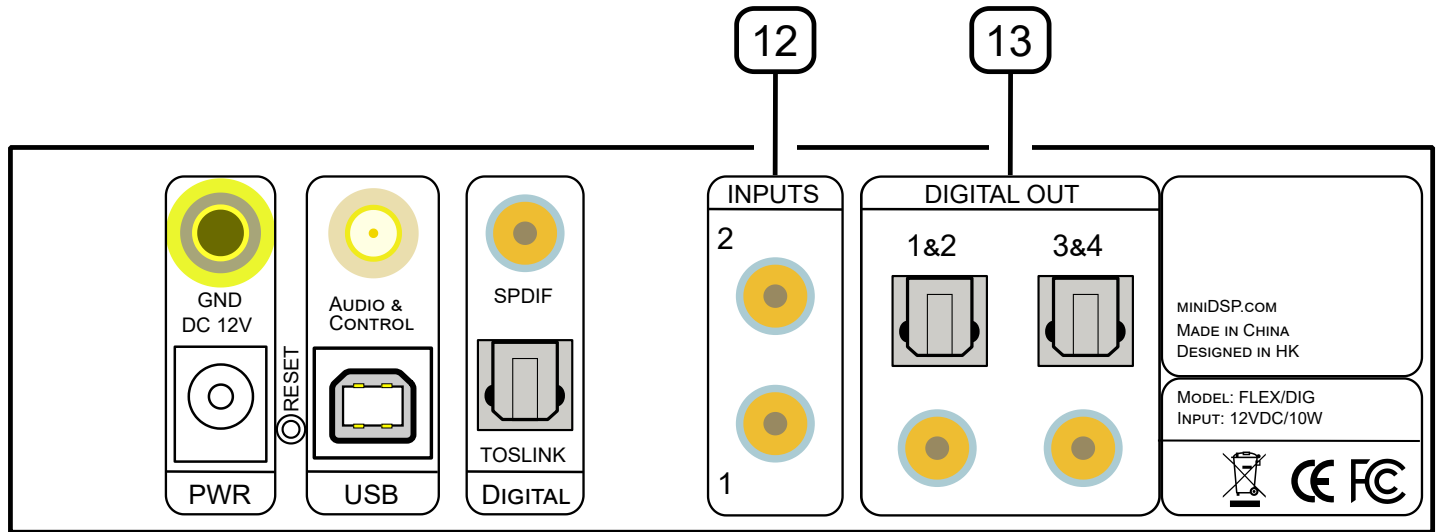
8. **Analog inputs.** Connect an analog source here using RCA cables. Typically, the left channel is connected to input 1 and the right channel is connected to input 2. The maximum input voltage is 2.0 Vrms.
9. **Analog outputs.** Connect equipment such as a power amplifier and subwoofer using RCA cables. Typically, output 1 is the left channel and output 2 is the right channel. See Section 6.4 for a variety of other connections. The maximum output voltage is 2.0 Vrms.

## Flex/Balanced



10. **Balanced analog inputs.** Connect an analog source here. The input jacks are balanced TRS (1/4" tip-ring-sleeve) connectors, so XLR to TRS adapter cables can be used to connect to equipment with XLR outputs. Typically, the left channel is connected to input 1 and the right channel is connected to input 2. The maximum input voltage is 4.0 Vrms.
11. **Balanced analog outputs.** Connect equipment such as a power amplifier, active speakers and subwoofer here. The output jacks are balanced TRS (1/4" tip-ring-sleeve) connectors, so TRS to XLR adapter cables can be used to connect to equipment with XLR inputs. Typically, output 1 is the left channel and 2 is the right channel. See Section 6.4 for a variety of other connections. The maximum output voltage is 4.0 Vrms.

## Flex/Digital



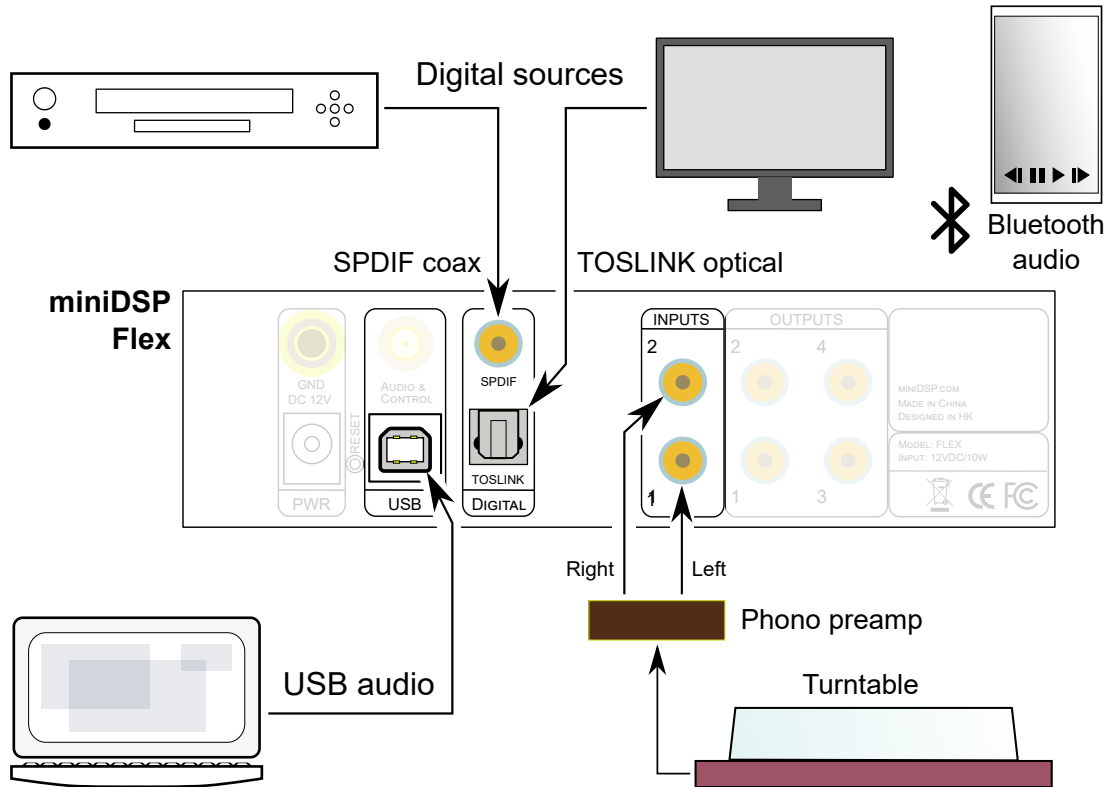
12. **Analog inputs.** Connect an analog source here using RCA cables. Typically, the left channel is connected to input 1 and the right channel is connected to input 2. The maximum input voltage is 2.0 Vrms.
13. **Digital outputs.** Connect to a DAC, a home theater receiver, or active speakers with digital input. Each digital connection carries two output channels – output channels 1 and 2, or output channels 3 and 4. The TOSLINK and SPDIF outputs for each pair of channels carry the same signal and are both active at the same time. The sample rate on the digital outputs is **96 kHz** (miniDSP Flex (without Dirac Live)).

# Playing Audio

The miniDSP Flex has a range of input sources and output connections. This section provides an overview of the basics so you can quickly get started with playing audio.

## Connecting sources

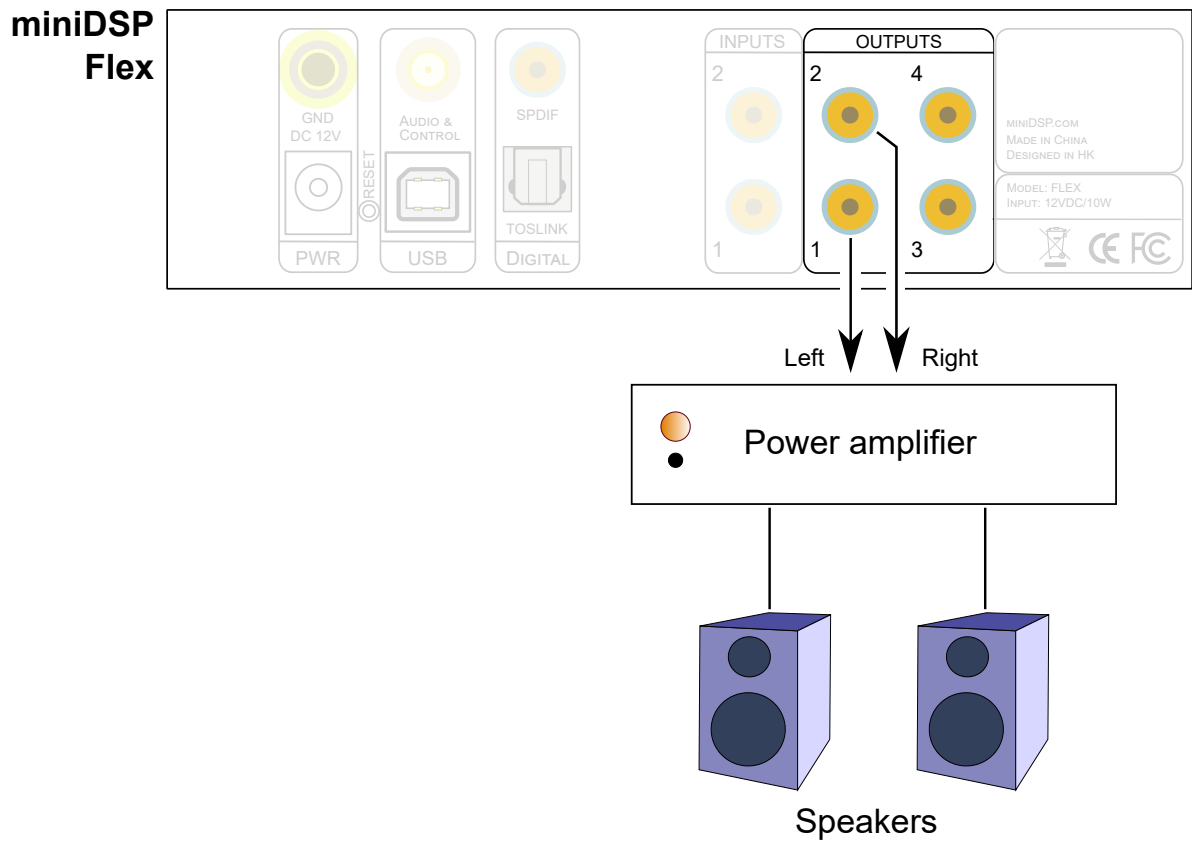
The diagram below shows the audio sources that can be connected to the miniDSP Flex.



Connecting audio sources to the miniDSP Flex

## Connecting an amplifier and speakers

The diagram below illustrates a basic connection of a stereo amplifier and a pair of speakers to the miniDSP Flex. Since the default settings of the Flex route the input channels to output channels 1 and 2 with no crossovers active, you can make this connection for initial testing and listening.



*Connecting a stereo amplifier and speakers to the miniDSP Flex*

Of course, more complex connections are possible using the additional outputs. In that case, the internal processing will need to be set up using the miniDSP Device Console. Refer to the *Signal Flow* and *DSP Reference* sections for details.

#### Warning

Ensure all equipment is powered off when making audio connections.

#### Warning

Before playing audio for the first time, turn the volume down using the front panel encoder. Increase it gradually after audio playback starts.

## Bluetooth audio

The miniDSP Flex includes the LDAC (<https://www.sony.net/Products/LDAC/>)™ and aptX™ HD Bluetooth codecs for high-fidelity Bluetooth™ audio.



### **i** Info

LDAC is an audio coding technology developed by Sony that enables the transmission of High-Resolution (Hi-Res) Audio content, even over a Bluetooth connection. Unlike other Bluetooth compatible coding technologies such as SBC, it operates without any down-conversion of the Hi-Res Audio content<sup>[^3]</sup>, and allows approximately three times more data<sup>[^4]</sup> than those other technologies to be transmitted over a Bluetooth wireless network with unprecedented sound quality, by means of efficient coding and optimized packetization.

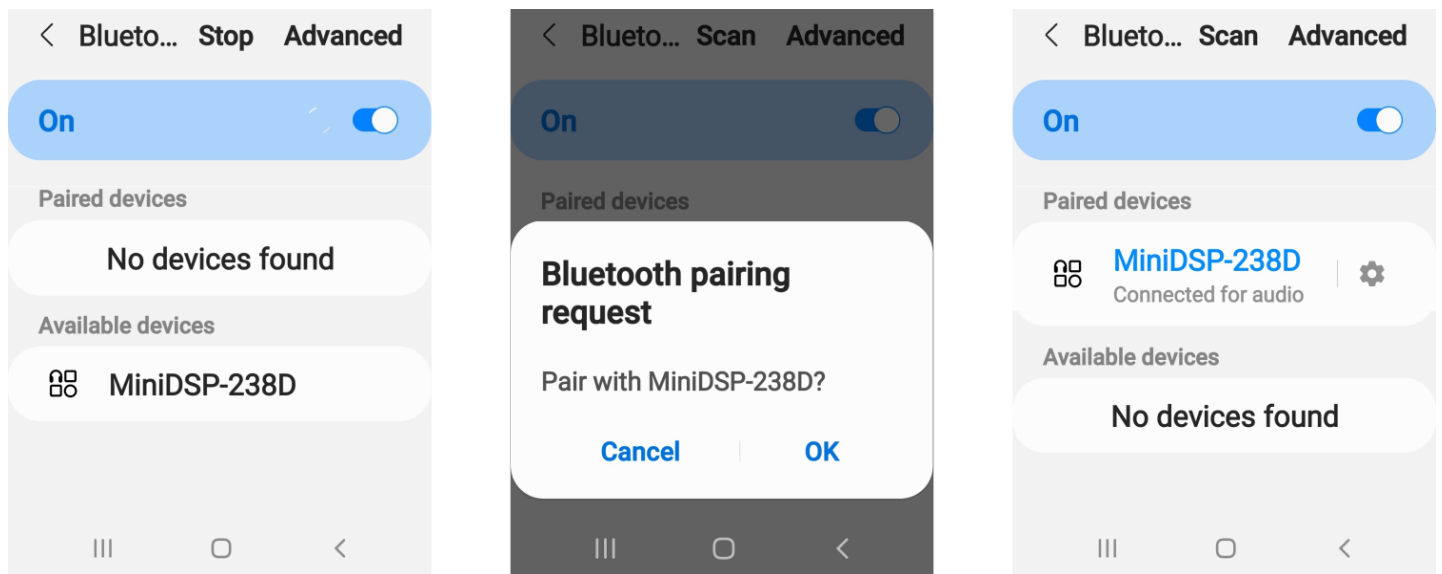
LDAC is supported on recent Android devices. If your device does not support LDAC, you can still pair it with the miniDSP Flex, but Bluetooth audio will use a lower bitrate codec.

aptX™ HD is designed to deliver high definition (HD) audio over Bluetooth, to help you get the very most from your music.

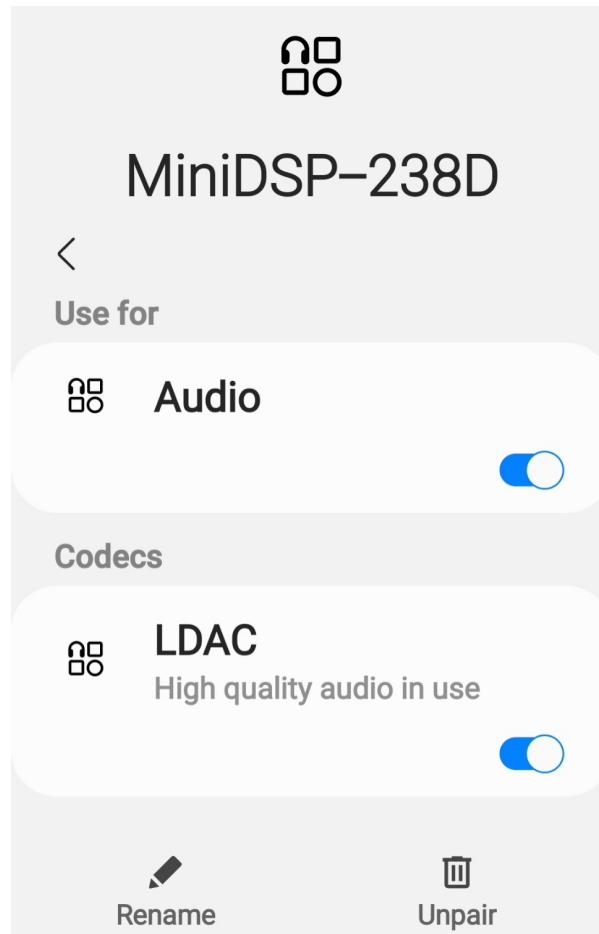
Pairing your mobile device with the miniDSP Flex is essentially the same as pairing it with other Bluetooth audio devices such as headphones or your car.

To put the miniDSP Flex into pairing mode:

1. Press the encoder button on the miniDSP Flex twice and rotate it until the display shows "Bluetooth."
2. Press and hold the encoder and the display will change to "BTPairing." The miniDSP Flex is now in pairing mode.
3. Open the Bluetooth Settings on your mobile device to pair with the miniDSP Flex. The exact appearance will vary depending on your specific device, but this series of screenshots illustrates a typical sequence:



1. If your device supports LDAC, enable it by using the gear icon:



When Bluetooth audio is selected as the source, the usual front panel display will display the source (lower right corner) as one of:

#### **BT(C)**

The miniDSP Flex is paired over Bluetooth.

#### **BT(NC)**

No Bluetooth device is paired.

#### **BT(P)**

The miniDSP Flex is in pairing mode.

Once paired, the miniDSP Flex will receive and play the audio stream from the paired device. If the Bluetooth input is not selected when you start audio playback, the miniDSP Flex will automatically switch to the Bluetooth input source when audio is Bluetooth detected.

## About USB Audio

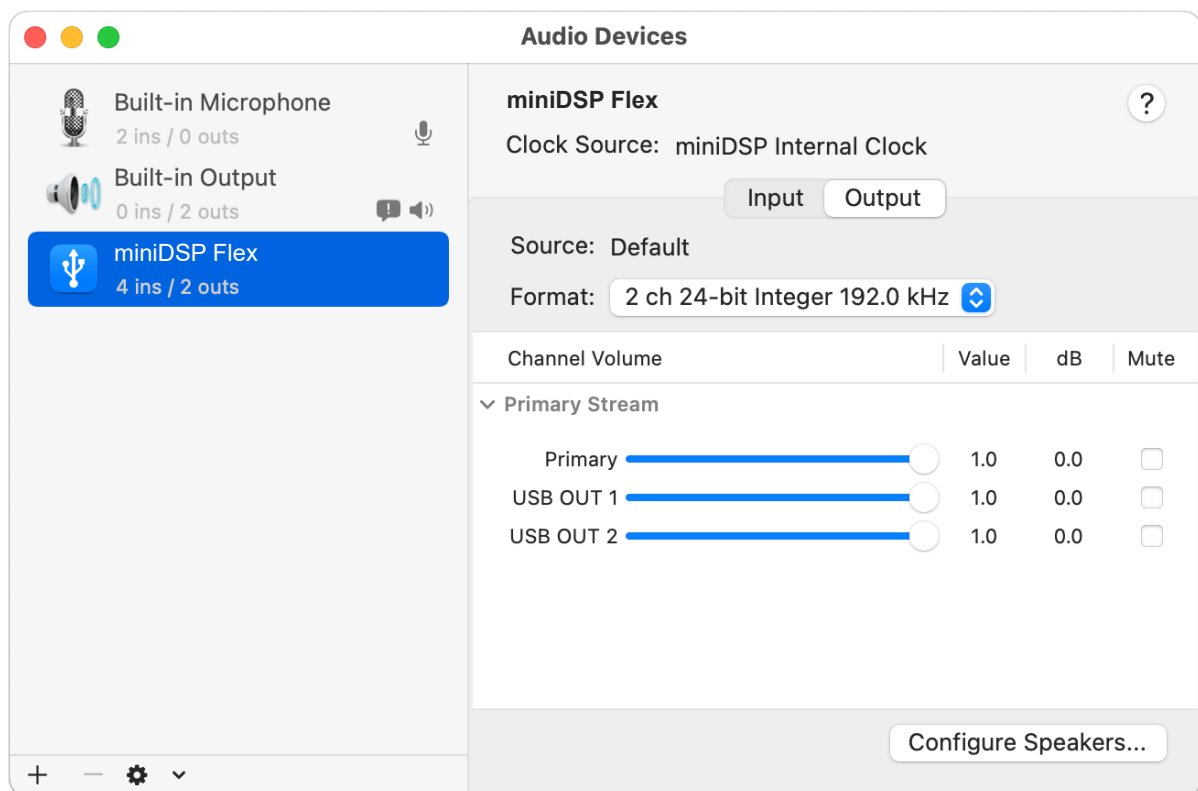
The miniDSP Flex accepts stereo PCM audio at sample rates of 44.1, 48, 88.2, 96, 176.4, and 192 kHz over USB. The same USB connector is used for playing USB Audio as well as for configuration.

To play USB Audio from a computer, use the supplied cable to connect the USB 2.0 (Type B) port of the miniDSP Flex to a free USB port on your computer. Alternatively, connect a network streamer to the USB port. For an example using the Raspberry Pi, see this application note on our website:

- Streaming to a miniDSP 2x4HD or DDRC-24 with a Raspberry Pi 3A+ (<https://www.minidsp.com/applications/audio-streaming/raspberry-pi-streaming>)

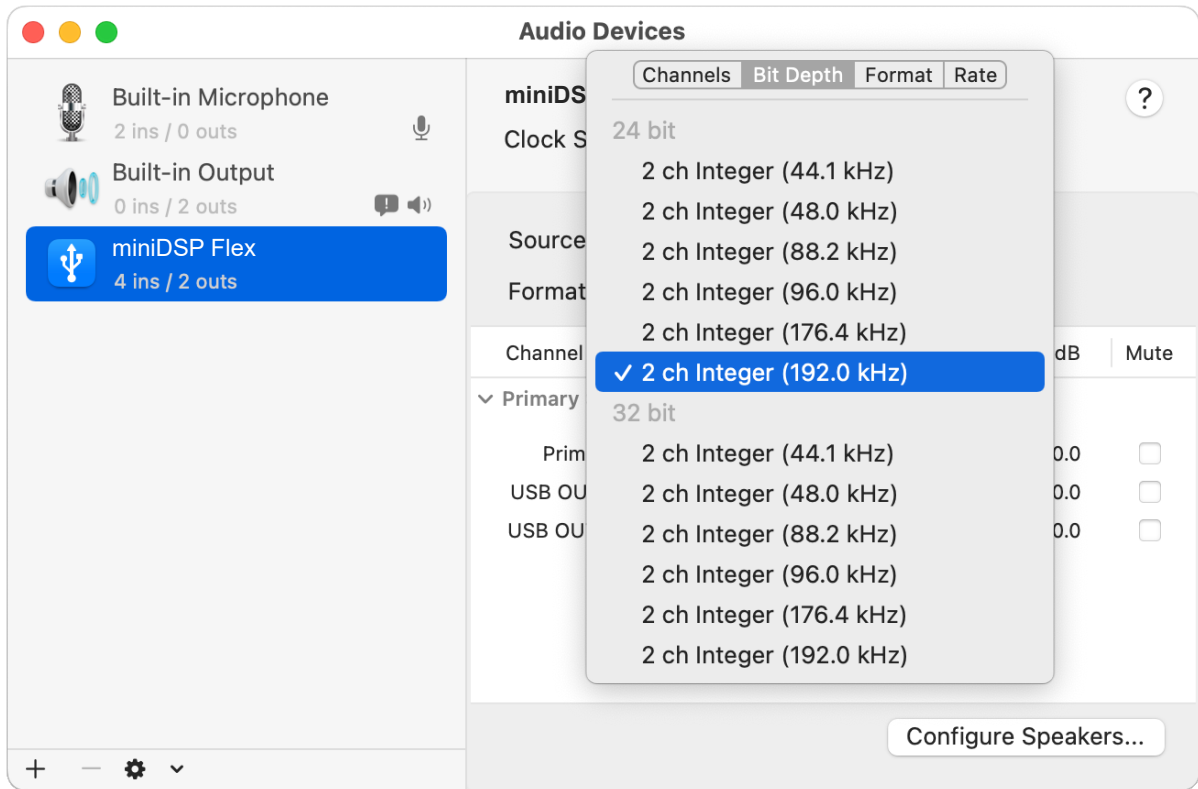
## macOS

The miniDSP Flex is USB Audio compliant, so no drivers need to be installed to play audio on macOS. Open **Audio MIDI Setup** (in **Applications->Utilities**) and click on its name in the list on the left-hand side.



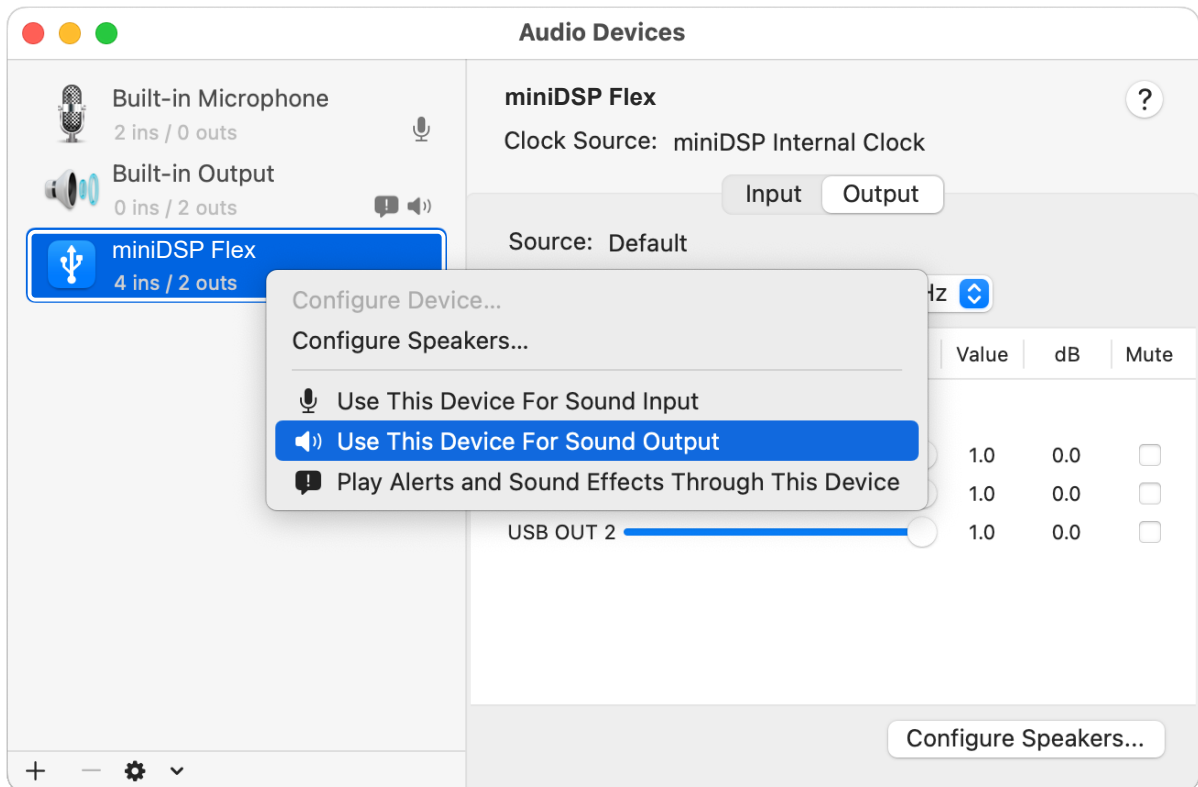
### Set sample rate

Click on the selector next to **Format** to bring up the sample rate and bit depth selector. Sample rates up to 192 kHz can be selected:



### Default audio device

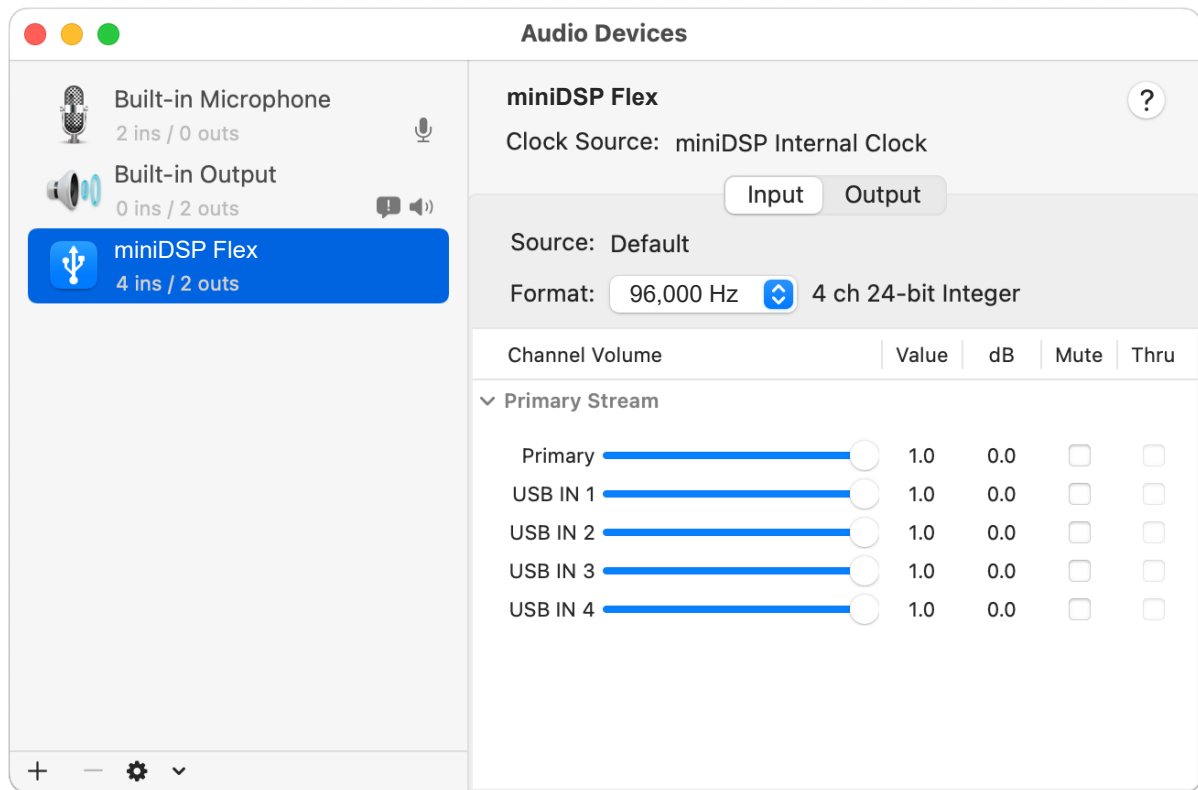
To set the miniDSP Flex as the default audio output device, right-click and select "Use this device for sound output":



Note that individual audio playback apps may allow the miniDSP Flex to be selected for audio output independently of the system default. They may also control sample rate automatically.

## USB Audio from Flex to computer

The miniDSP Flex sends its four output channels to the computer over USB. Click on the **Input** button in Audio MIDI Setup to see them. These can be used to monitor or record the output channels of the miniDSP Flex:



For an example application using this feature, see the app note [Analog recording with miniDSP and ocaudio](https://www.minidsp.com/applications/advanced-tools/analog-recording-with-minidsp-adc) (<https://www.minidsp.com/applications/advanced-tools/analog-recording-with-minidsp-adc>) on our website.

### Tip

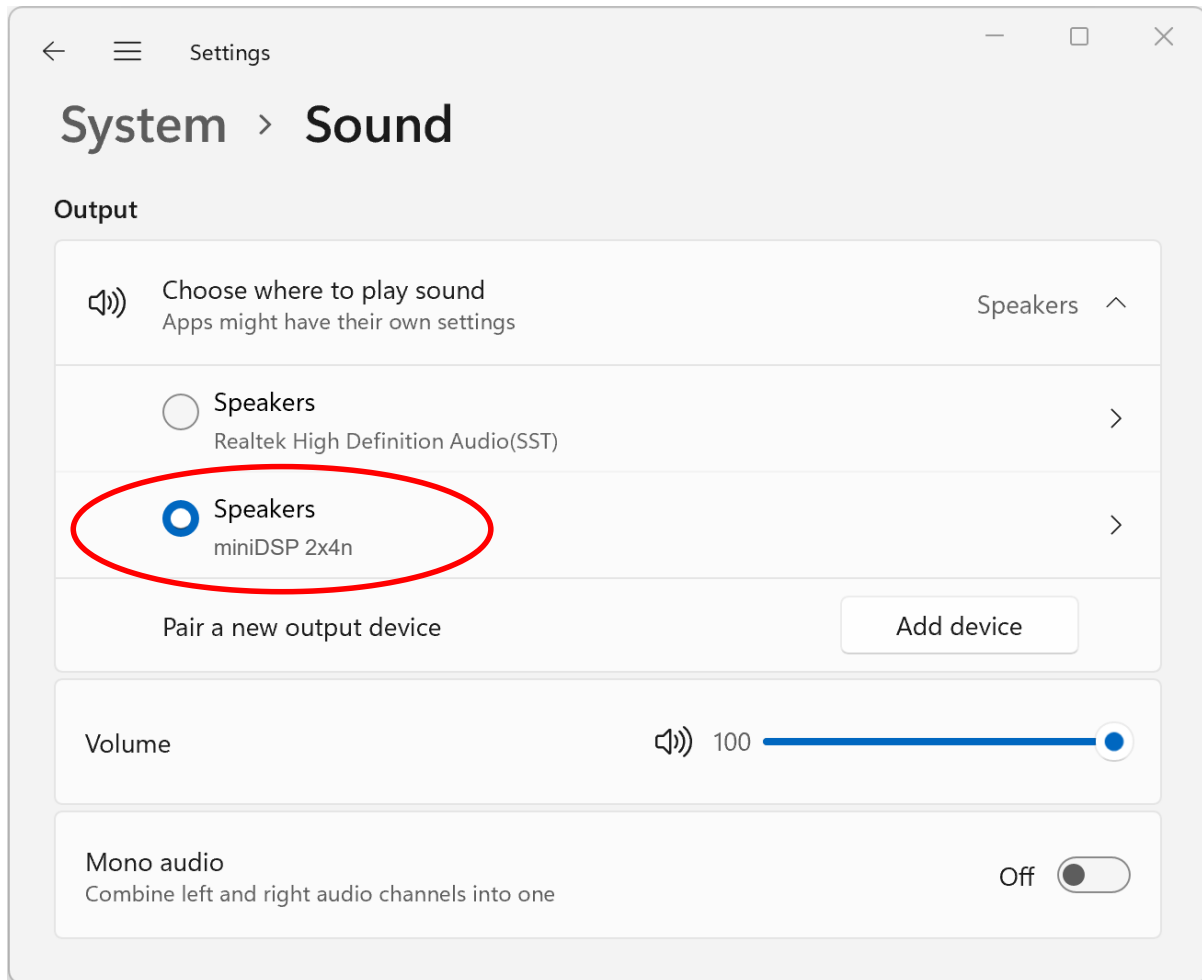
To avoid having macOS resample the outputs from the Flex, set the sample rate here to the DSP's internal sample rate: **96 kHz**.

## Windows 11

Note: to play USB audio from Windows, the miniDSP UAC2 driver package must be installed first.

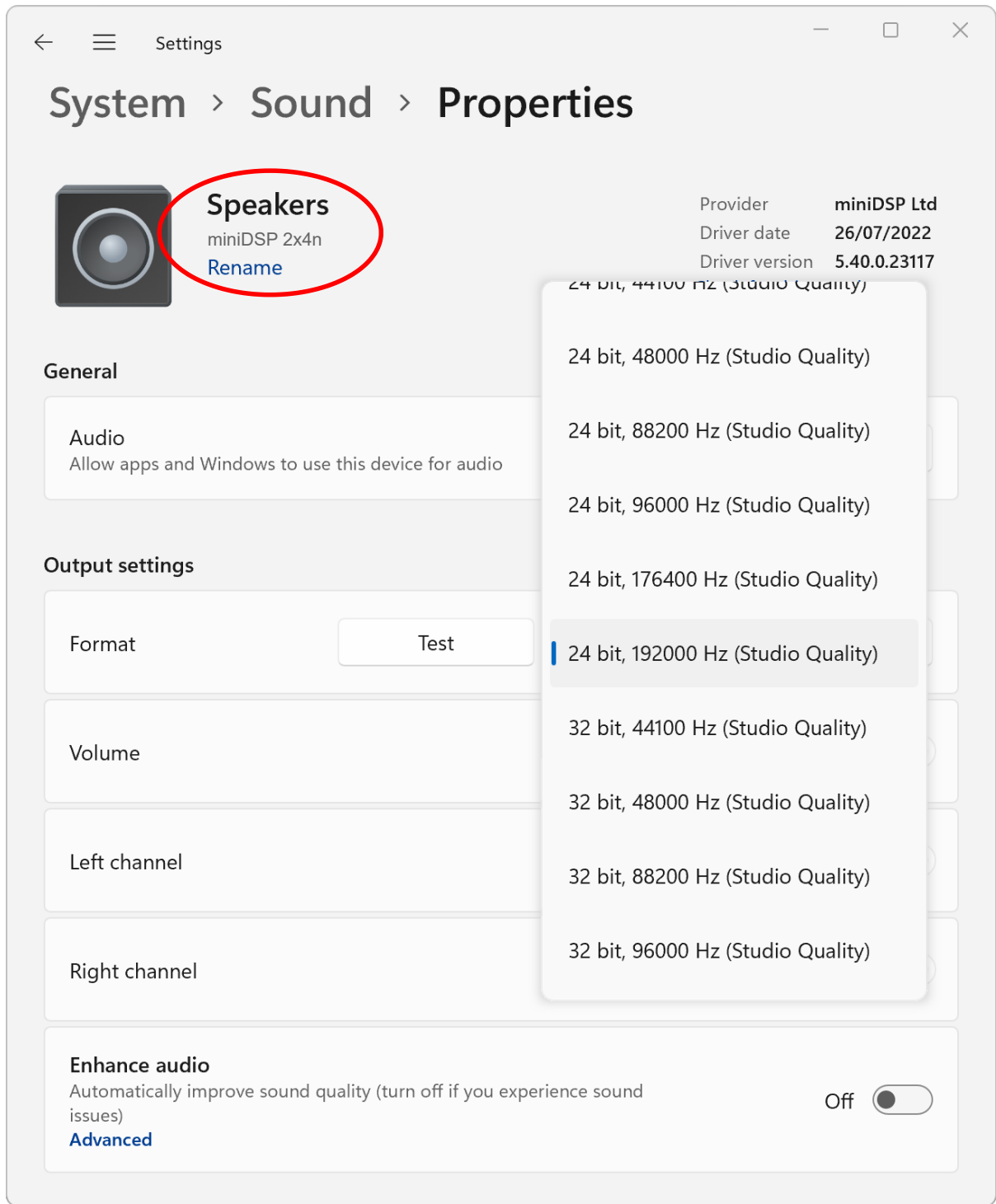
### Default audio device

To set the miniDSP Flex as the default audio output device, open the Settings app and navigate to the System -> Sound page. Select the Flex with the radio button:



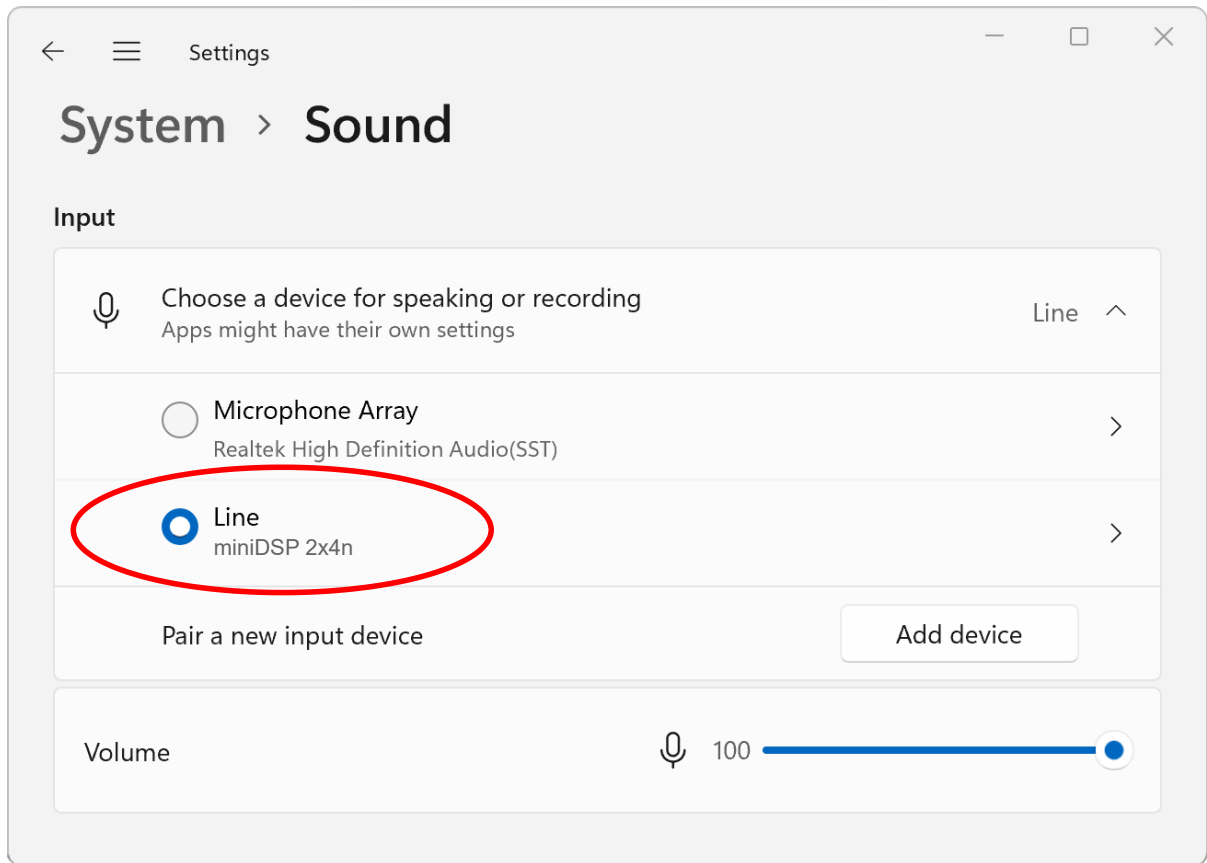
### Set sample rate

To change the bit depth and sample rate, click on the rightward angle symbol >. Click the selector next to **Format** to pop up the sample rate menu. Sample rates up to 192 kHz can be selected:



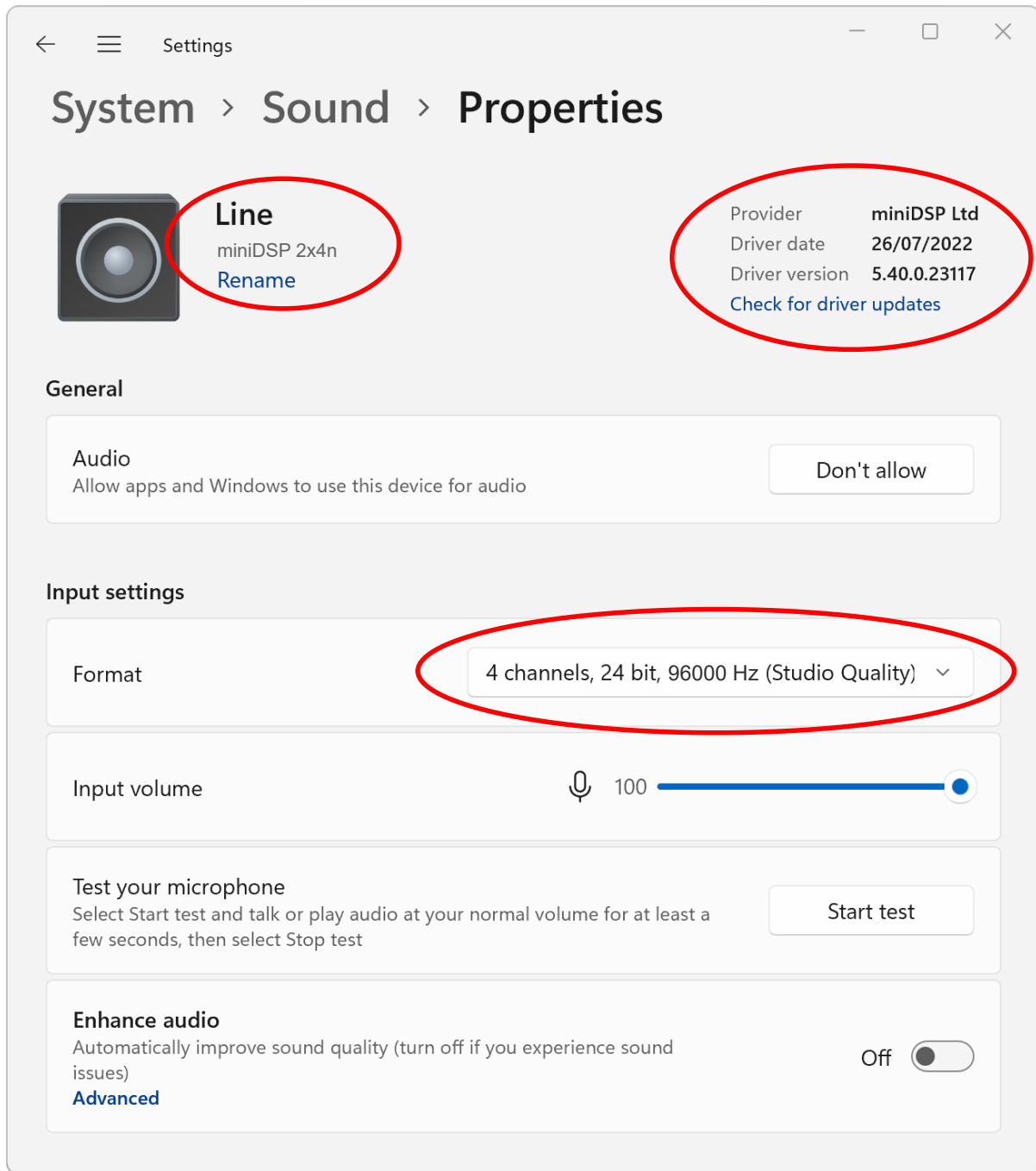
### USB Audio from Flex to computer

The miniDSP Flex sends its four output channels to the computer over USB. These can be used to monitor or record the output channels after DSP processing:



To avoid Windows resampling the outputs from the Flex, set the sample rate here to the DSP's internal sample rate: **96 kHz**.

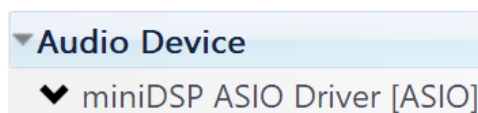




For an example application using this feature, see the app note [Analog recording with miniDSP and ocenaudio](https://www.minidsp.com/applications/advanced-tools/analog-recording-with-minidsp-adc) (<https://www.minidsp.com/applications/advanced-tools/analog-recording-with-minidsp-adc>) on our website.

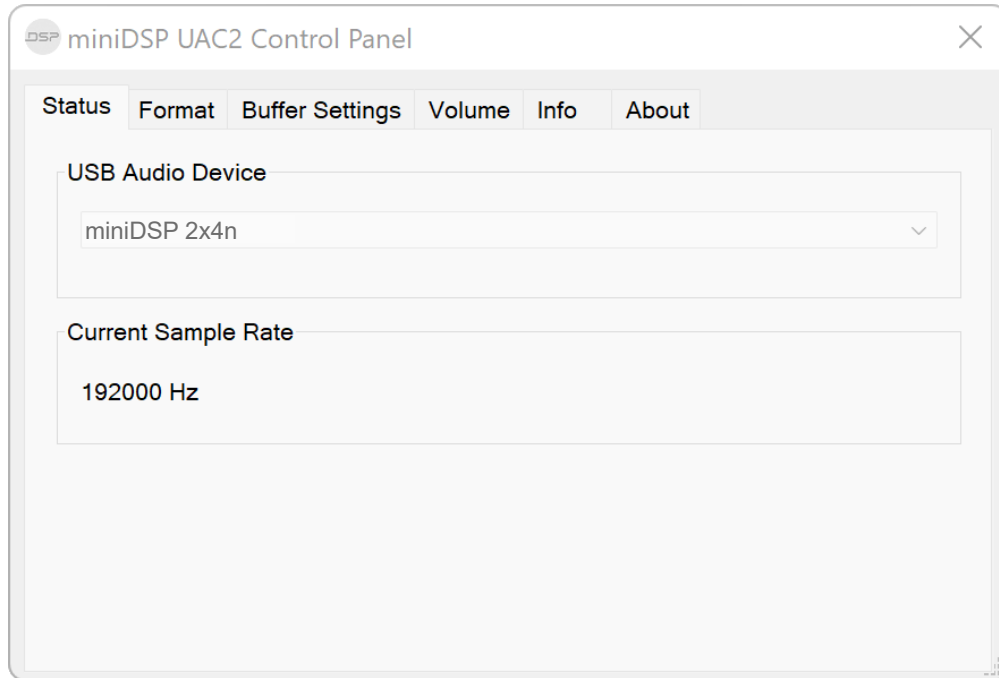
## ASIO

If your audio application supports ASIO® audio drivers, we recommend selecting the miniDSP ASIO Driver in its settings. This typically allows the application to automatically change sample rate. For example, in JRiver Media Center:

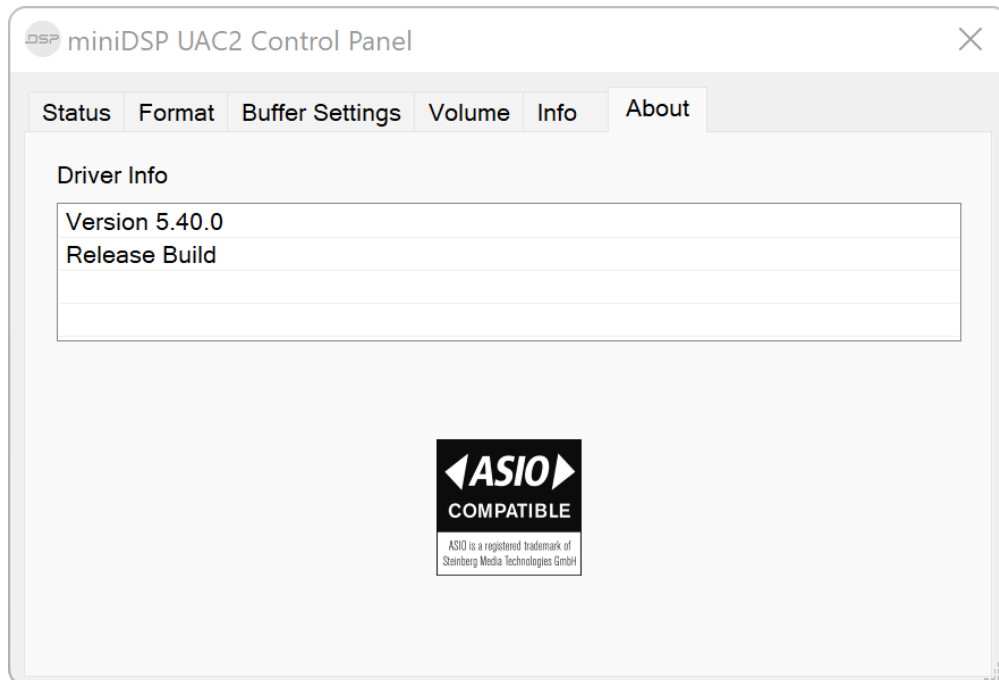


## miniDSP UAC2 control panel

The current settings of the miniDSP Flex can be viewed by opening the **miniDSP UAC2 Control Panel** from the Windows Start menu (under the **miniDSP Ltd** folder). This control panel allows you to view current settings. In addition, it can be used to set buffer size, although we recommend that you leave this setting at the default. If you are having an issue with inadequate output volume over USB playback, check the Volume tab.



To see the installed version of the UAC2 driver, use the About tab:



# Remote control

The miniDSP Flex has several options for remote control of key runtime functions.

The miniDSP Flex has several options for remote control of key runtime functions.

## Using the miniDSP remote

The infrared remote control provided with the miniDSP Flex controls all key runtime functions.



### Standby

Put the miniDSP Flex into standby and take it out again.



### Mute

Mute and unmute audio output.



### Volume

Reduce or increase the volume. Each press changes the volume by 0.5 dB. Holding down a button will accelerate volume change to 3 dB steps.



### Media control

Have no effect with the Flex.



### Dirac Live

Enable or disable Dirac Live filtering. Has an effect only if the miniDSP Flex is upgraded with Dirac Live.



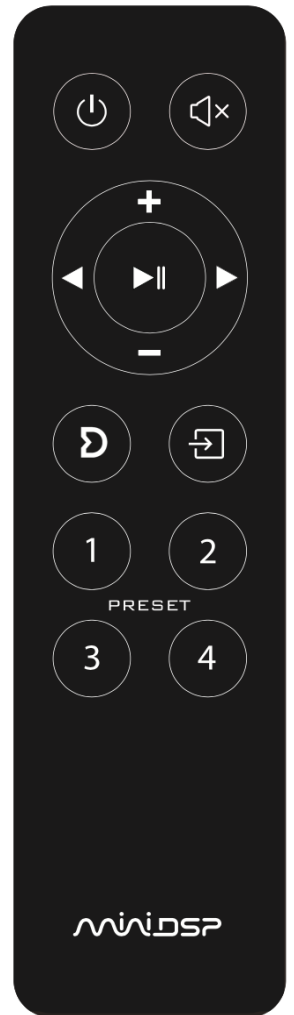
### Source selection

Cycle through the available input sources in order: TOSLINK, SPDIF (coax), USB, Bluetooth, Analog.



### Preset (1 through 4)

Switch to the selected preset. It will take a few seconds for the preset selection to complete while the processor loads the new filters from its flash memory into the DSP.



## Using a third-party programmable remote

A third-party programmable remote can be used with the miniDSP Flex. Use the remote codes listed below.

<b>Code</b>	<b>Function</b>
35 CA 0E F1	Next Input Source
35 CA 01 FE	Preset 1
35 CA 02 FD	Preset 2
35 CA 05 FA	Preset 3
35 CA 00 FF	Preset 4
35 CA 0A F5	Volume Up
35 CA 09 F6	Volume Down
35 CA 0C F3	Mute/Unmute
35 CA 06 F9	Filter On/Off
35 CA 22 DD	ANALOG
35 CA 23 DC	TOSLINK
35 CA 24 DB	SPDIF
35 CA 25 DA	USB
35 CA 26 D9	BT
35 CA 41 BE	Rewind (BT Only)
35 CA 42 BD	Fast-forward (BT Only)
35 CA 43 BC	Play (BT Only)
35 CA 40 BF	Standby

## Programming a Logitech Harmony remote

The miniDSP Flex can be used with a Logitech® Harmony® remote. The same functions as the stock remote are programmed into the Harmony database. In addition, you can set up buttons for direct input source selection (instead of cycling through input sources).

The procedure is as described in the application note linked below, except that you should select "minidsp flex" as the device instead of "shd".



- Using a Harmony Remote with the miniDSP SHD (<https://www.minidsp.com/applications/audio-streaming/shd-with-harmony-remote>)

### Info

**Logitech** and **Harmony** are registered trademarks of Logitech.

## Android/iOS control app

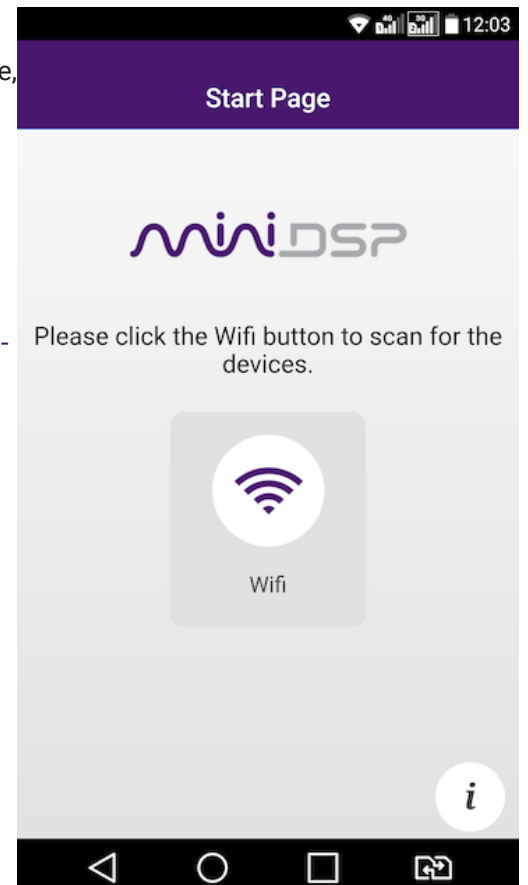
With the addition of a miniDSP Wi-DG (<https://www.minidsp.com/products/accessories/wi-dg>) Wi-Fi to USB bridge, the miniDSP Flex can be remote-controlled from a phone or tablet running Android or iOS (iPhone/iPad).

For more information, see this application note:

- Using Android / iOS app to control your miniDSP (<https://www.minidsp.com/applications/advanced-tools/android-ios-app-control>)

If you're keen to just get started, here are the direct links to the app:

- Android version on Google Play store (<https://play.google.com/store/apps/details?id=com.dsp4you.minidsp&hl=en>)
- iOS version on iTunes store (<https://itunes.apple.com/us/app/minidsp-control-app/id945240204?mt=8>)



Note that currently the miniDSP Control App cannot be used over the Bluetooth connection. It will work only if a Wi-DG is connected to the USB port of the miniDSP Flex.

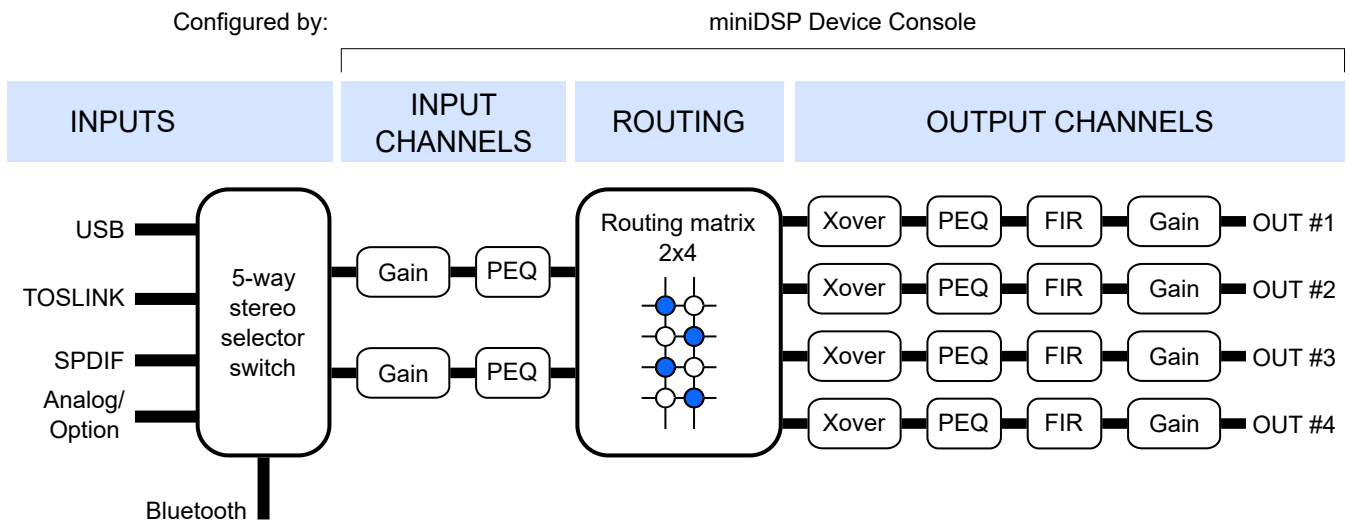
 **Warning**

If the USB port is being used for iOS/Android app control via the Wi-DG, it cannot be used for USB Audio streaming.

# Signal Flow

# Signal flow

The diagram below is a simplified representation of the signal flow through the miniDSP Flex (without Dirac Live):



Signal flow of the miniDSP Flex (without Dirac Live)

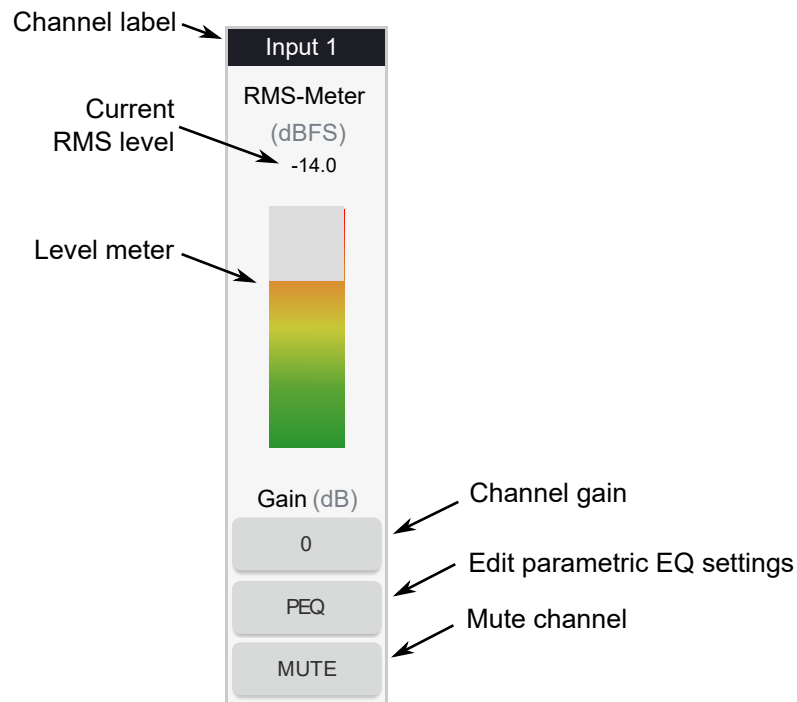
The audio signal flows from left to right in the above diagram:

1. One of the five stereo input sources is selected by the user.
2. The selected stereo signal is passed through the input channel processing blocks: level metering, input gain, and parametric EQ.
3. The processed input channels are fed into a 2-in 4-out routing matrix that routes/mixes the two processed input channels to the four output channels.
4. Each output channel runs a comprehensive set of DSP functions: parametric EQ, crossovers, FIR filtering, level metering, delay, output gain and compressor.

The combination of the routing matrix and the crossover blocks on the output channels is what gives the miniDSP Flex the ability to be used in many different system configurations.



# Input Channels



## Channel label

Each input channel has a customizable label displayed 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 12 characters), and press the Enter key.

## Current RMS level, Level meter

Displays the current signal level in real time. (The device must be connected and online to display signal levels.)

## Channel gain

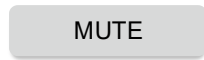
The gain of each input channel can be set to a value between -72 dB and +12 dB. (0 dB, the default, is unity gain or no change in level.) To set the gain, click on the Gain value of that channel. The gain can be entered by moving the slider or it can be entered numerically. The up and down arrows can be used to change the gain in 0.1 dB increments.

## PEQ

Click on this button to open the parametric EQ settings window for that input channel. There are ten parametric EQ filters on each input channel. See [Parametric EQ](#).

## Mute

Press this button to mute that input channel. The button color and label changes to show that the channel is muted:



Channel is not muted

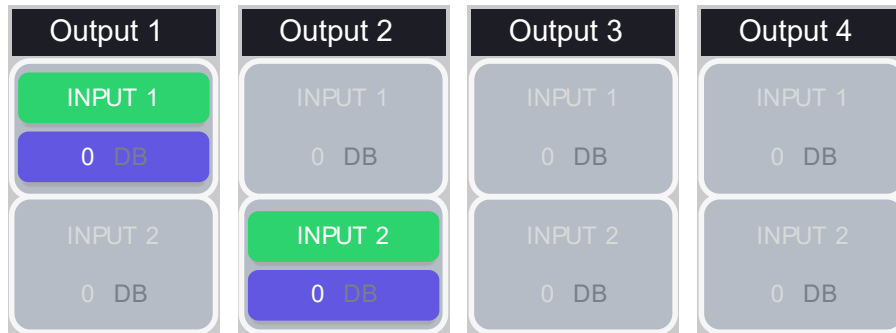


Channel is muted

# Signal routing

## Overview

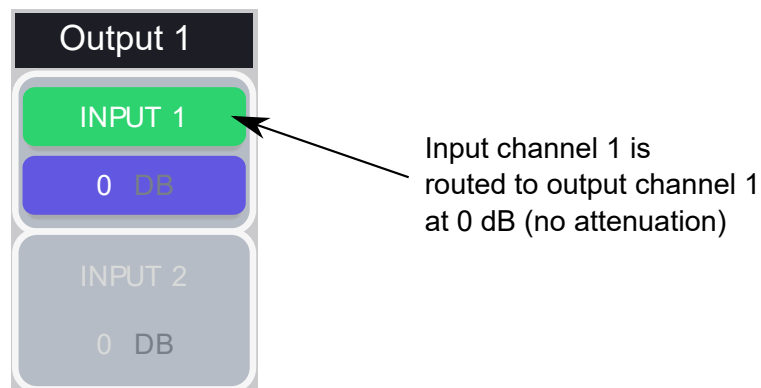
Each input channel can be sent, or *routed*, to any number of output channels. This is accomplished with the routing buttons at the top of the output channel strips:



In addition to routing, the miniDSP Flex supports mixing, where input channels can be mixed at different levels to a single output channel. The complete set of routing controls along the top of the output channel strips is therefore also called the "matrix mixer."

## Basic routing

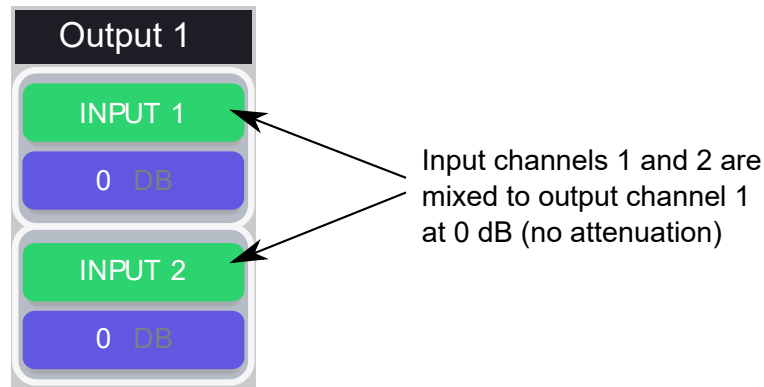
To route an input channel to an output channel, click on the input channel's name. When routed, the button is green:



Note: if the input channel has been renamed, it's name will appear instead of e.g. "Input 1".

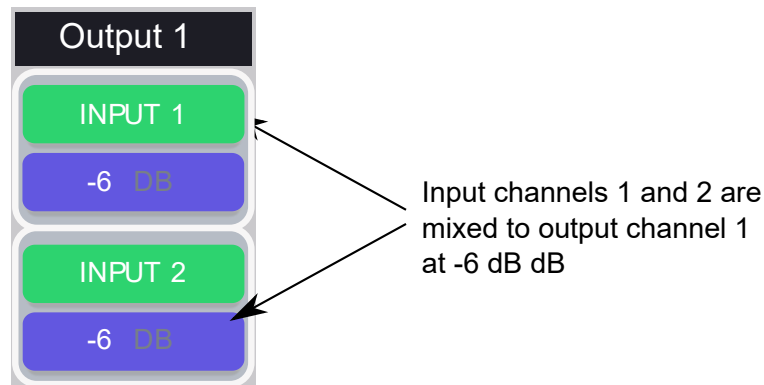
## Mixing

To mix both input channels to an output, select both of them:



By default, each input channel is mixed at "full strength" – that is, without any attenuation, as indicated by the "0 dB" label. To mix at different levels, click on the level button and either use the slider or enter the desired value directly. The gain of the signal being mixed can be set to a value between -72 and +12 dB.

In this example, both channels are mixed at half level (-6 dB):



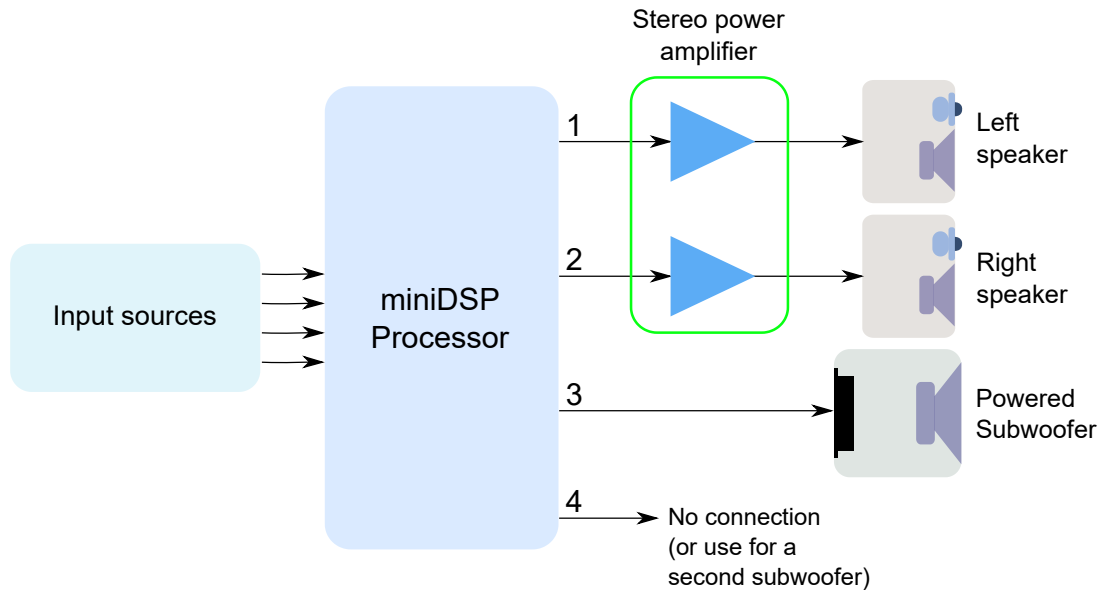
## Routing examples

This section illustrates a few examples of signal routing. The input and output channels have been renamed by typing in the labels at the top of the channel strips. We recommend you do the same to help avoid errors.

### Subwoofer integration

The diagram below shows the connections for a stereo pair of speakers plus a single subwoofer. This is the simplest type of active system, so is a good introduction to the advanced features of the miniDSP Flex. It is also known as a "2.1" system.

The stereo amplifier is connected to outputs 1 and 2, and the subwoofer is connected to output 3. In the diagram, it's a powered subwoofer. (Never connect an output of the Flex directly to a subwoofer driver or speaker.)



Typical connections for subwoofer integration with the miniDSP Flex

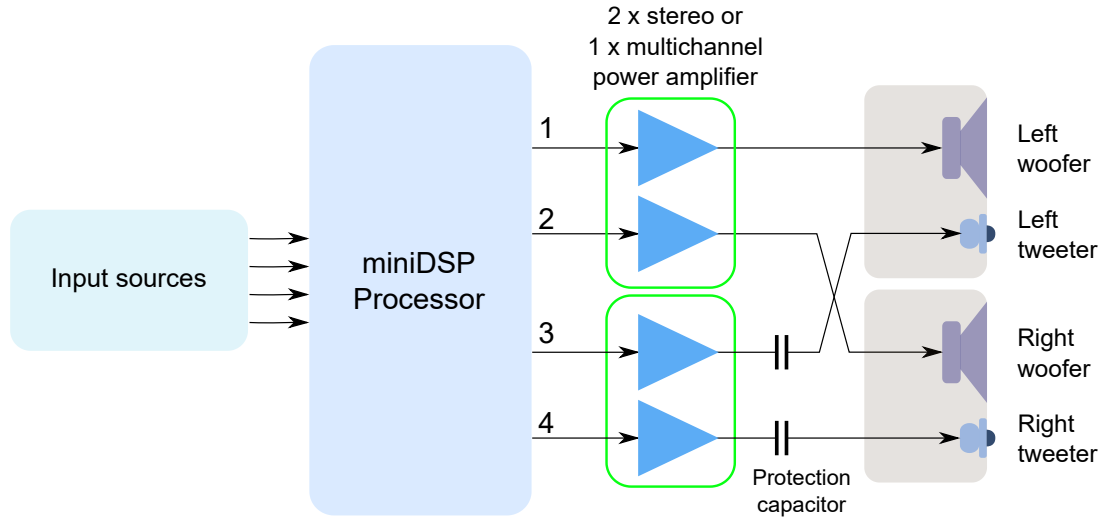
The routing for this system is:



The left and right inputs are sent to outputs 1 and 2. Both inputs are summed and sent to output 3. Outputs 1 and 2 will usually have a high pass crossover filter to remove the sub frequencies, and output 3 will have a low pass crossover filter.

### Two-way active speaker

The diagram below shows the connections for a two-way active speaker. Amplification can be either a multichannel amplifier, or a pair of stereo amplifiers.



Typical connections for a two-way active speaker using the miniDSP Flex

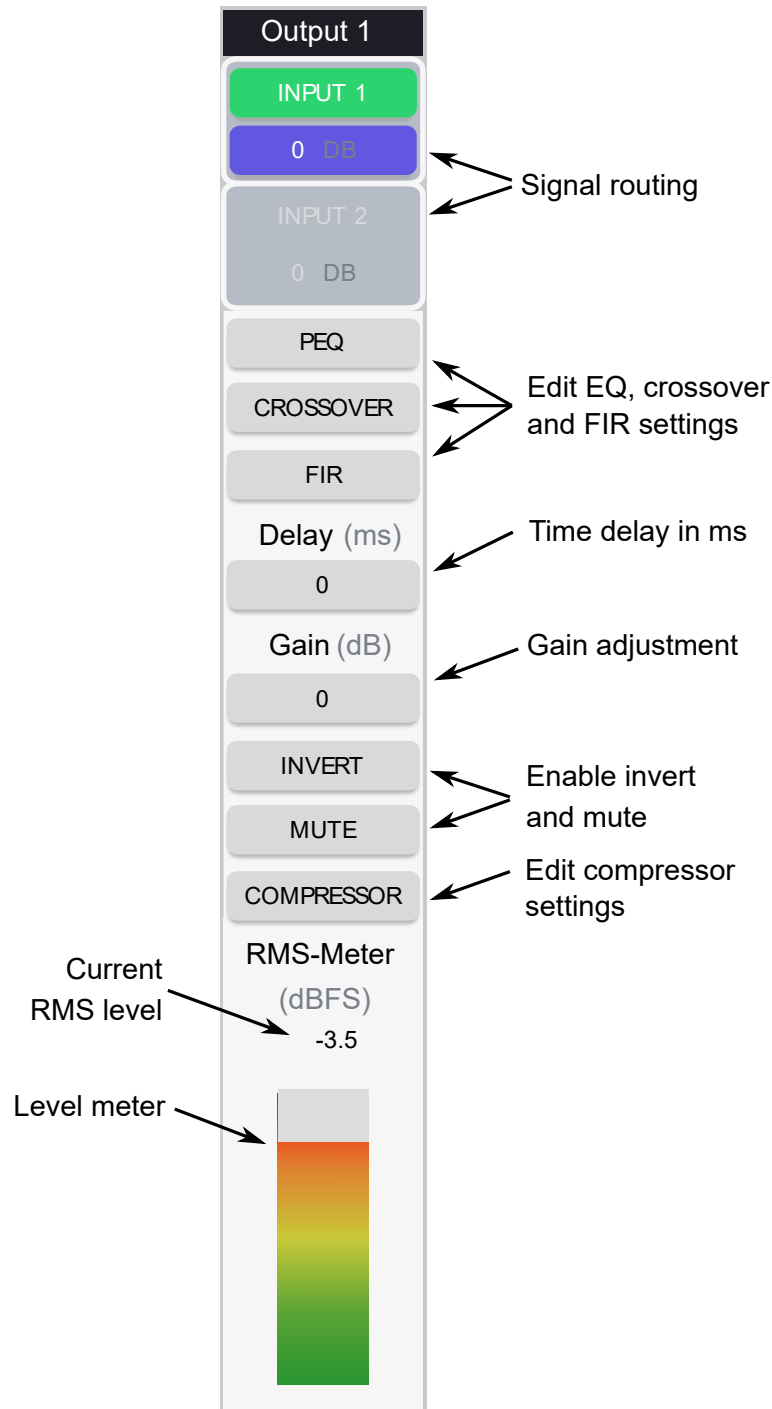
The routing for this system is:



The left input is routed to outputs 1 and 3, and the right input is routed to outputs 2 and 4. Each output channel will need a low pass filter for the woofers or a high pass filter for the tweeter.

# Output Channels

Each of the four output channels has a complete "strip" of controls:



## Channel label

Each output channel has a customizable label displayed 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 12 characters), and press the Enter key.

## Signal routing

Sets the routing from input channels to output channels. See [Signal routing](#).

## PEQ

Click on this button to open the parametric EQ settings window for that output channel. There are 10 parametric EQ filters on each input channel. See [Parametric EQ](#).

## CROSSOVER

Click on this button to open the crossover settings window for that output channel. See [Crossover](#).

## FIR

Click on this button to open the FIR filtering window for that output channel. A total of 4096 can be computed. See [FIR filtering](#).

## Time delay

A delay of up to **80 ms** can be applied to each output channel. To set the delay, click on the delay button for a channel. The delay value can be entered by moving the slider or it can be entered numerically. The up and down arrows can be used to change the delay in 0.01 ms increments.

## Gain adjustment

The gain of each output channel can be set to a value between -72 dB and +12 dB. (0 dB, the default, is unity gain or no change in level.) To set the gain, click on the Gain value of that channel. The gain can be entered by moving the slider or it can be entered numerically. The up and down arrows can be used to change the gain in 0.1 dB increments.

## Invert

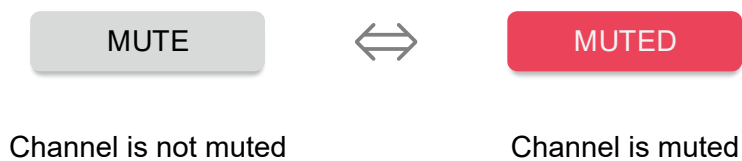
Each output channel can be inverted in polarity. To invert, press the Invert button. The status is indicated by a change in color and label:



## Mute



Each output channel can be individually muted. To mute it, press the Mute button. The status is indicated by a change in color and label:



## Current RMS level, level meter

Displays the current signal level in real time. (The device must be connected and online to display signal levels.)

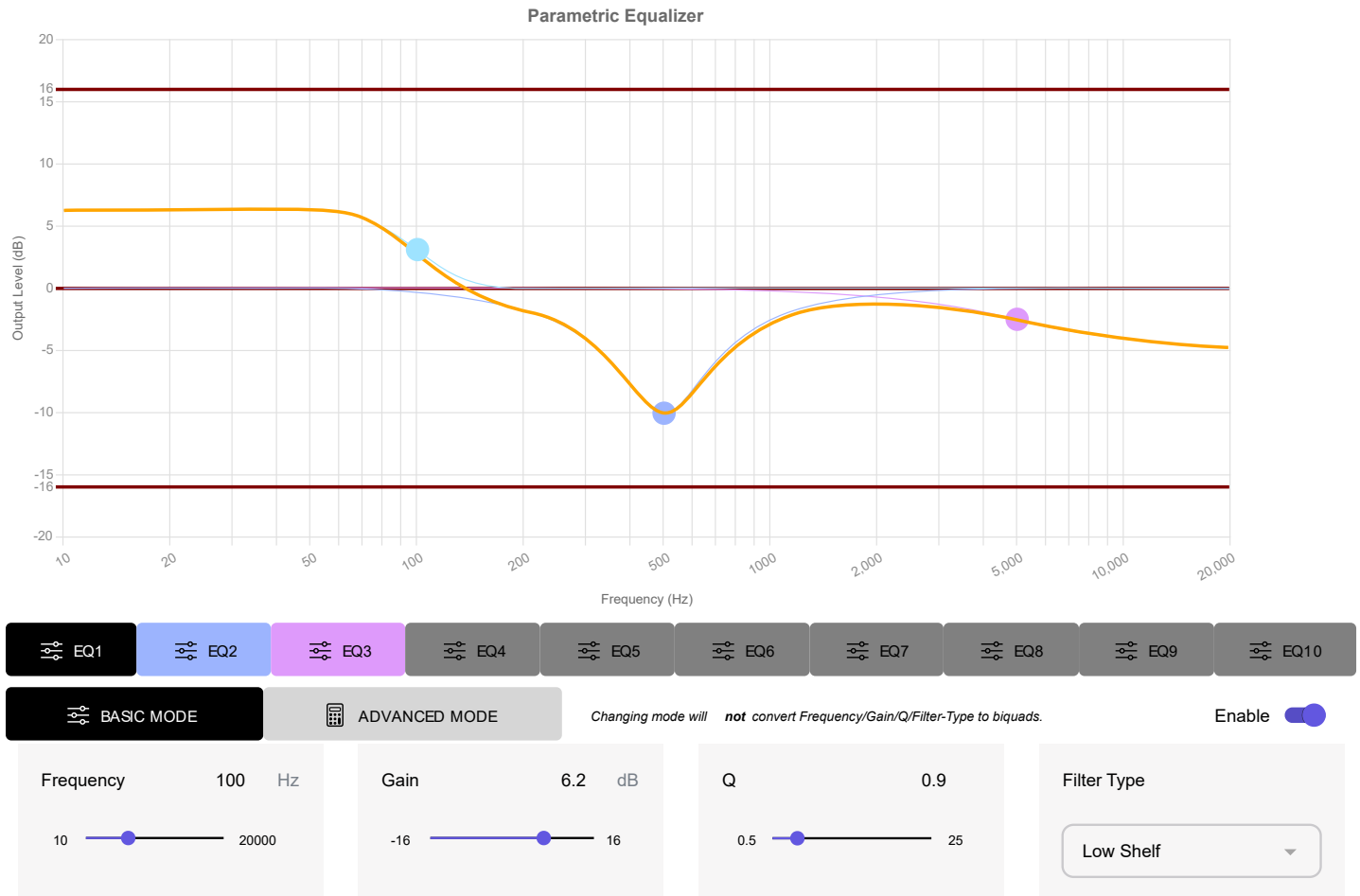
# DSP Reference

# 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.

## Overview

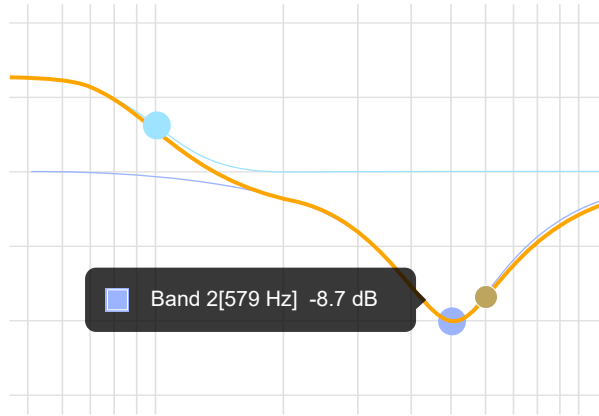
Click on the PEQ button to open the parametric equalizer settings window:



The miniDSP Flex has 10 parametric EQ filters on each input and output channel. The graph displays the response of each filter in a light color and the combined response of all enabled filters as a heavy line. For example, the curve shown above has a low-shelf boost at 100 Hz, a dip at 500 Hz, and a high-shelf cut at 5000 Hz.

## Editing filters

Change the frequency and gain of each filter by clicking and dragging on the drag-points (colored circles) on the graph. The full set of parameters can be edited as described below. Hovering the mouse over any curve brings up an overlay showing the frequency and the gain at that frequency.



## Disabling individual filters

All 10 filters are enabled by default. To disable a filter, select it with the row of buttons. Click on the Enable button to turn it off.



Filter is enabled

Filter is disabled

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.

## Filter mode

The parametric EQ filters can be set in either basic mode or advanced mode. Basic mode allows each filter to be specified simply by providing four parameters, while advanced mode requires the use of a separate design program.



## Basic mode

**BASIC MODE**    **ADVANCED MODE**    Changing mode will **not** convert Frequency/Gain/Q/Filter-Type to biquads.

Frequency: 100 Hz Slider: 10 to 20000	Gain: 6.2 dB Slider: -16 to 16	Q: 0.9 Slider: 0.5 to 25	Filter Type: Low Shelf
--	-----------------------------------	-----------------------------	------------------------

The shape of the parametric EQ filters is set with a small set of intuitive parameters.

## Frequency

For PEAK filters, this is the center frequency of the peak or dip. For HIGH\_SHELF and LOW\_SHELF filters, this is the frequency at which the gain is half of the set value. For ALL\_PASS filters, this is the center frequency of the phase shift.

## Gain

For PEAK filters, this is the gain in dB at the center frequency. For HIGH\_SHELF and LOW\_SHELF filters, 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. This item is not present for the ALL\_PASS filter type.

## Q

Q controls the "sharpness" of the filter. For PEAK filters, lower Q gives a broader peak or dip, while higher Q gives a narrower peak or dip. For HIGH\_SHELF and LOW\_SHELF filters, Q controls how quickly the filter transitions from no gain to maximum gain. For ALL\_PASS filters, higher Q gives a steeper phase transition.

## 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

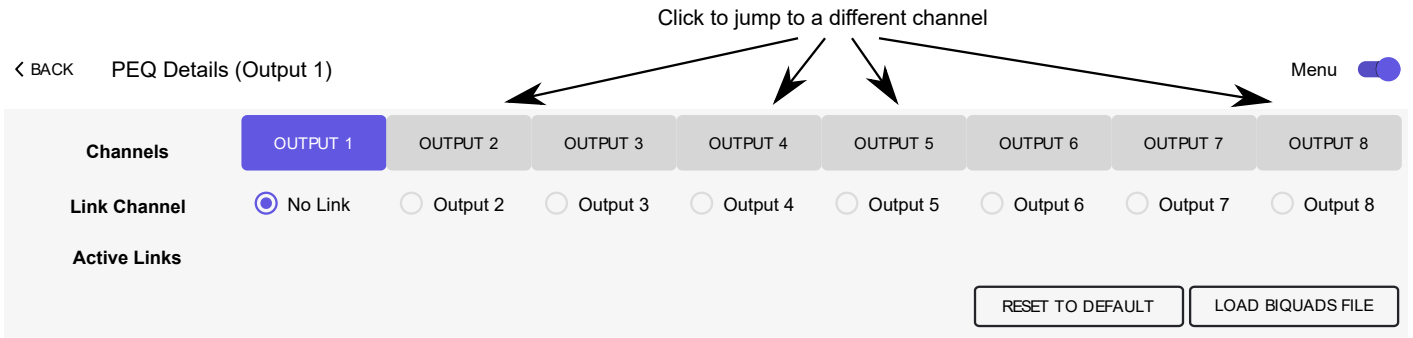
Reduce or increase part of the frequency spectrum *above* a given frequency.

### ALL\_PASS

Create a phase shift across the frequency band. This can be useful for correcting phase issues and for simulating analog crossovers.

## Jumping between channels

To jump quickly between the parametric EQ window of different channels, enable the Menu switch at the top right. Jump to a different channel by clicking on the row of buttons:

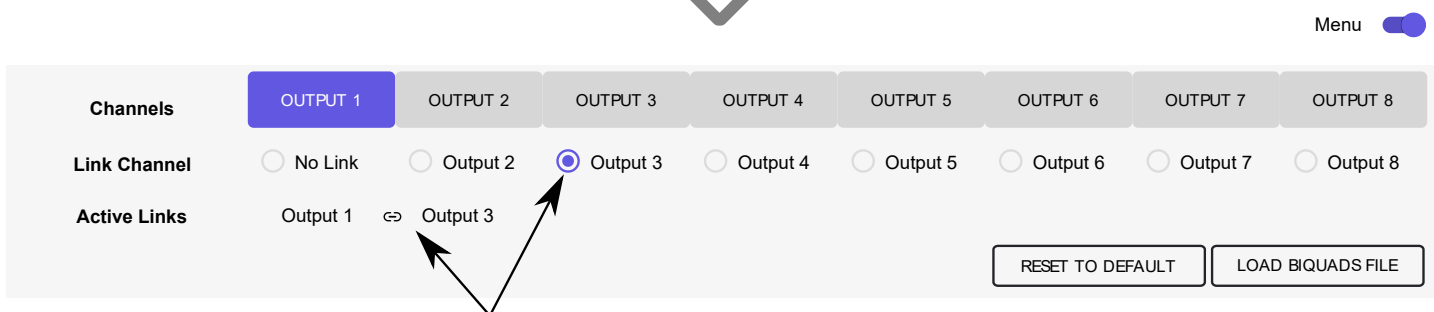
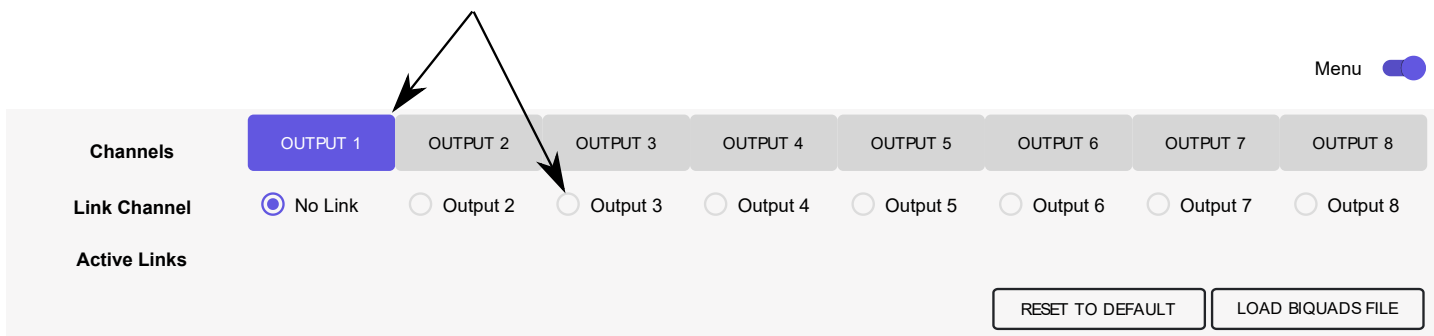


## Linking channels

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, enable the Menu switch at the top right. Click on the channel that you want to link the current channel to. After confirming, an indicator appears to show the new link:

While viewing channel 1, click on channel 3's Link Channel selector



The indicators change to show linked status

### Info

A channel can be linked to only one other channel. That is, you cannot link three or more channels.

## Reset to default

To reset all parametric EQ bands of the current channel to the default settings, enable the Menu switch at the top right and click the RESET TO DEFAULT button:

Menu

Channels	OUTPUT 1	OUTPUT 2	OUTPUT 3	OUTPUT 4	OUTPUT 5	OUTPUT 6	OUTPUT 7	OUTPUT 8
Link Channel	<input checked="" type="radio"/> No Link	<input type="radio"/> Output 2	<input type="radio"/> Output 3	<input type="radio"/> Output 4	<input type="radio"/> Output 5	<input type="radio"/> Output 6	<input type="radio"/> Output 7	<input type="radio"/> Output 8
Active Links	<input type="button" value="RESET TO DEFAULT"/> <input type="button" value="LOAD BIQUADS FILE"/>							

### Warning

This operation is not reversible, so be sure you mean to reset all bands! Save your settings to a file first if you need to keep any.

## Advanced mode

Advanced mode enables custom biquad programming for almost infinite flexibility in filter implementation. In this mode, each individual filter to be specified by its *biquad coefficients*. The coefficients must be generated by a design program such as Room EQ Wizard (REW). The design program must be set for a **96 kHz** sample rate.

### Programming a single biquad

Each parametric EQ filter can be individually switched to advanced mode. Paste in the coefficients in the format shown and click on the **PROCESS AND APPLY** button for them to take effect. Click the **RESET** button to set the coefficients back to their default values.

**Biquad Programming**

```

biquad1,
b0=0.998191200483864,
b1=-1.9950521500467384,
b2=0.996920046761057,
a1=1.9950521500467384,
a2=-0.9951112472449212

```

### Info


Switching between basic and advanced mode does not convert between Frequency/Gain/Q and biquad parameters. The basic parameters and advanced biquad coefficients for each filter are stored independently and the selected set is used for processing.

## Loading a biquad file

Multiple biquads can be set at once by loading a file containing biquad coefficients. 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,
b2=0.9985489719847982,
a1=1.9981670485581222,
a2=-0.9981891119334211,
biquad3,
..
biquad4,
..
biquad10,
b0=1.0010192374642126,
b1=-1.9950555192569264,
b2=0.9940580112181501,
a1=1.995060938714333,
a2=-0.9950718292249559
```

To load the file, select the Menu switch at the top right and click the **LOAD BIQUADS FILE** button. The filters are set to advanced mode starting at EQ1.



The screenshot shows the top right corner of the miniDSP Flex interface. A 'Menu' switch is turned on. Below it, a row of buttons labeled 'OUTPUT 1' through 'OUTPUT 8' is visible. Underneath, a 'Link Channel' section contains radio buttons for 'No Link' (selected) and 'Output 2' through 'Output 8'. At the bottom right, there are two buttons: 'RESET TO DEFAULT' and 'LOAD BIQUADS FILE', with the latter being circled in red.

If the loaded file contains fewer than 10 biquads, then only that number of EQ filters will be set to Advanced mode. For example, if loading a file with six biquads, EQ1 to EQ6 will be set to Advanced mode, and EQ7 to EQ10 will not be changed. This can be used to good effect in cases where manually-set parametric EQ (in Basic mode) is required in addition to parametric EQ developed with a design program.



If the loaded file contains more than 10 biquads, then only the first 10 will be loaded.

## Biquad design software

Following are programs that can be used to design your biquad coefficients. The design program must be set for a **96 kHz** sample rate.

### 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):

- Download zipped spreadsheet from miniDSP.com  
([https://www.minidsp.com/images/fbfiles/files/All\\_digital\\_coefs\\_v1-20101026.zip](https://www.minidsp.com/images/fbfiles/files/All_digital_coefs_v1-20101026.zip))

### 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 using the Device Console. Room EQ Wizard can be downloaded from:

- Room EQ Wizard downloads (<https://www.roomeqwizard.com/#downloads>)

For guidance on using this feature, refer to the app note Auto EQ with Room EQ Wizard (<https://www.minidsp.com/applications/rew/rew-autoeq-step-by-step>) .

# Crossover

Crossovers "split" the frequency band to send to different drivers. In a two-way loudspeaker, for example, 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.

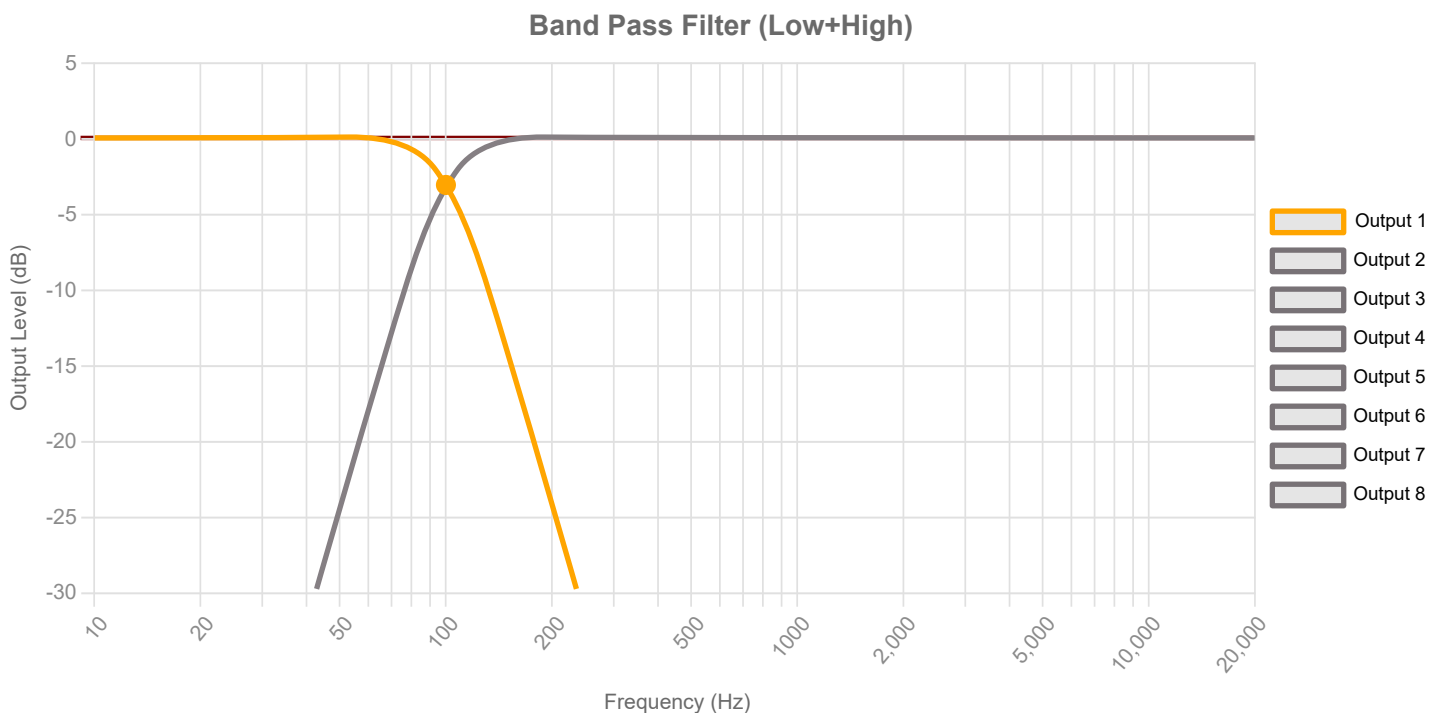
When integrating a subwoofer, high pass filters are used on the speakers and a low pass filter on the subwoofer.

Crossover filters can also be used to limit low frequency content delivered to a speaker or subwoofer, to help protect it from over-excursion.

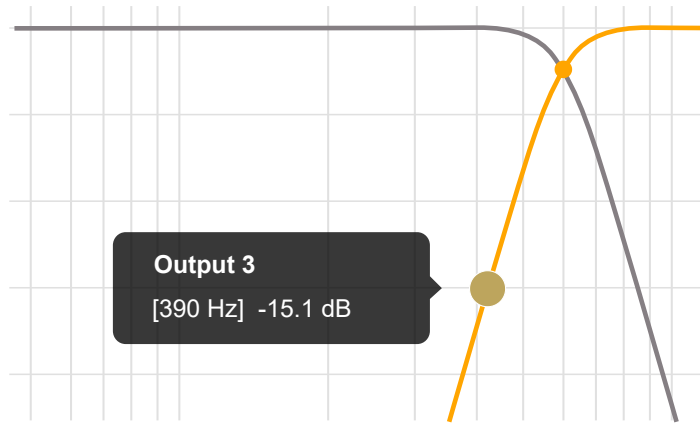
Unlike conventional analog crossovers, the flexibility of DSP allows a completely arbitrary mix of different filter slopes and types. Filters can be set at any frequency or disabled completely. This allows maximum flexibility in matching your crossover to the acoustic characteristics of the loudspeaker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

## Overview

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



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.



## Crossover mode

The crossovers on each output channel can be set in either basic mode or advanced mode. Basic mode allows each crossover filter to be specified simply by providing two parameters, while advanced mode requires the use of a separate design program.



## Basic mode

In basic mode, there are two crossover filters on each output channel: high pass (removes low frequencies) and low pass (removes high frequencies). In basic mode, these two filters are completely independent and each has its own settings.

BASIC MODE      ADVANCED MODE     *Changing mode will **not** convert Frequency/Filter-Type to biquads.*

<p>HIGH-PASS FILTER     Enable <input type="checkbox"/></p> <p>Cut-off Frequency     100 Hz</p> <p>10 <input type="range" value="100"/> 20000</p> <p>Filter Type</p> <p>Butterworth 24 dB/Octave ▼</p>	<p>LOW-PASS FILTER     Enable <input checked="" type="checkbox"/></p> <p>Cut-off Frequency     100 Hz</p> <p>10 <input type="range" value="100"/> 20000</p> <p>Filter Type</p> <p>Butterworth 24 dB/Octave ▼</p>
--	--

## Enable

The crossover filters are disabled by default. To enable a crossover filter, click on the Enable switch.



Crossover filter is disabled



Crossover filter is enabled

## Cut-off 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)

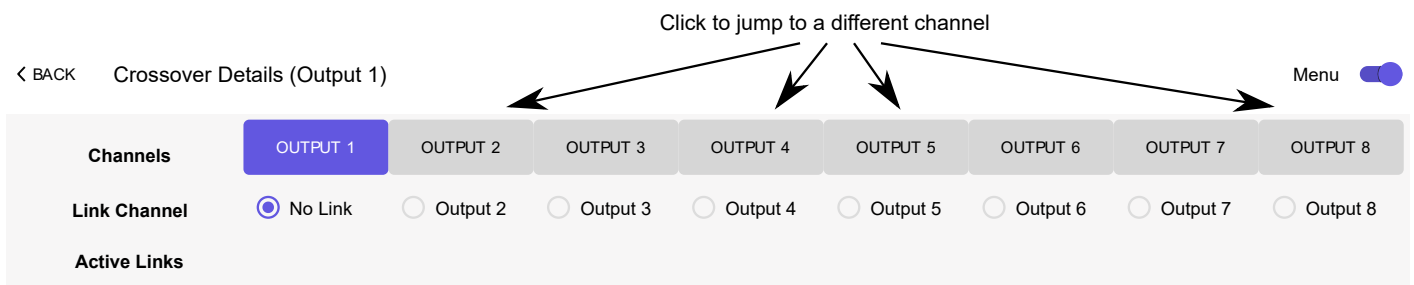
Available in 12, 24, and 48 dB/octave, Linkwitz-Riley crossover filters are 6 dB down at the cutoff frequency.

### Bessel

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

## Jumping between channels

To jump quickly between the crossover window of different channels, enable the Menu switch at the top right. Jump to a different channel by clicking on the row of buttons:



## Linking channels

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, enable the Menu switch at the top right. Click on the channel that you want to link the current channel to. After confirming, an indicator appears to show the new link:

While viewing channel 1, click on channel 3's Link Channel selector

Channels	OUTPUT 1	OUTPUT 2	OUTPUT 3	OUTPUT 4	OUTPUT 5	OUTPUT 6	OUTPUT 7	OUTPUT 8
Link Channel	<input checked="" type="radio"/> No Link	<input type="radio"/> Output 2	<input type="radio"/> Output 3	<input type="radio"/> Output 4	<input type="radio"/> Output 5	<input type="radio"/> Output 6	<input type="radio"/> Output 7	<input type="radio"/> Output 8
Active Links								



Channels	OUTPUT 1	OUTPUT 2	OUTPUT 3	OUTPUT 4	OUTPUT 5	OUTPUT 6	OUTPUT 7	OUTPUT 8
Link Channel	<input type="radio"/> No Link	<input type="radio"/> Output 2	<input checked="" type="radio"/> Output 3	<input type="radio"/> Output 4	<input type="radio"/> Output 5	<input type="radio"/> Output 6	<input type="radio"/> Output 7	<input type="radio"/> Output 8
Active Links	Output 1 ↔ Output 3							

The indicators change to show linked status

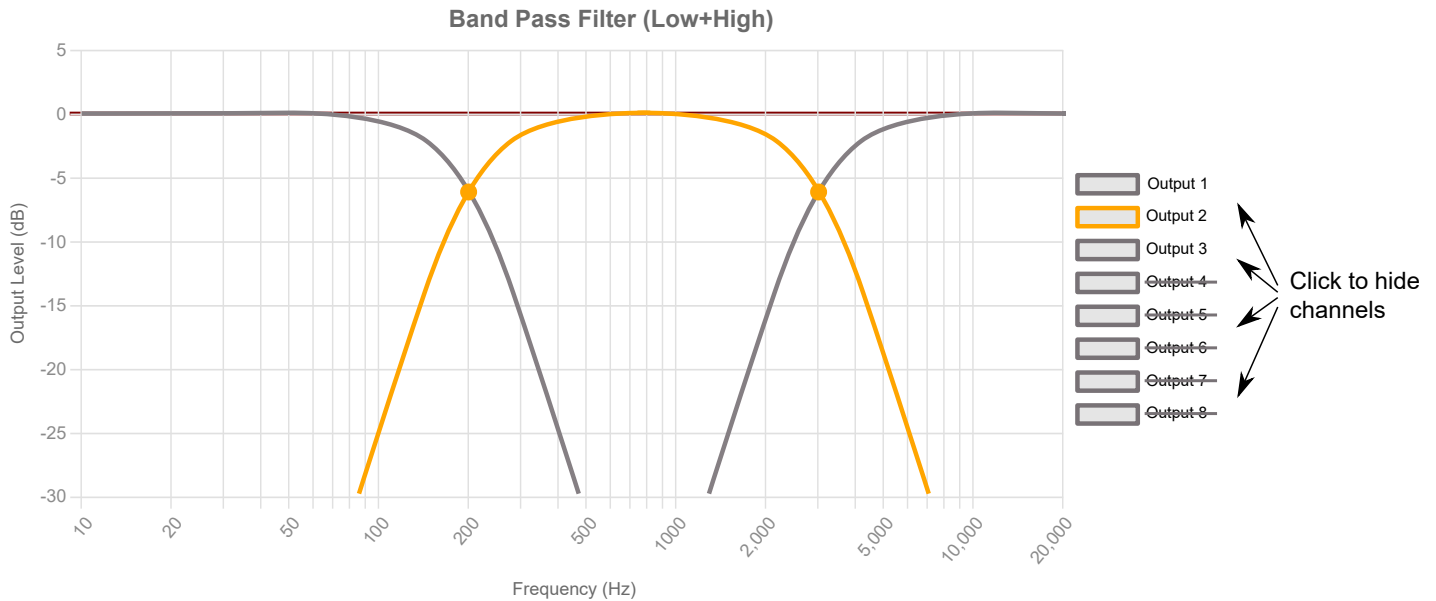
### **i** Info

A channel can be linked to only one other channel. That is, you cannot link three or more channels.

## Hiding channels

By default, the crossover graph shows the crossovers of all four output channels. The current channel is displayed in orange and the others in black.

If you wish to view only a subset of channels, use the switches to the right of the graph to select channels to hide. In this example, channel 2 is the current channel. Channels 1 to 3 are visible, while channels 4 to 8 are hidden:



The crossover settings of channels 1, 2 and 3 can be changed by using the channel selection buttons at the top of the window to jump between them. As long as you stay on these channels, the set of hidden channels stays the same. However, if you switch to a hidden channel, that channel then becomes visible. (For example, if you switch to channel 6, then channels 1, 2, 3 and 6 will be visible.)

## Advanced mode

The crossover block on each output channel has eight biquads. In Basic mode, four are allocated to the high pass filter and four to the low pass filter. In Advanced mode, however, the eight biquads are all specified by their coefficients, in the following format:

```


biquad1,
b0=0.998191200483864,
b1=-1.9950521500467384,
b2=0.996920046761057,
a1=1.9950521500467384,
a2=-0.9951112472449212,
biquad2,
b0=0.999640139948623,
b1=-1.9981670485581222,
b2=0.9985489719847982,
a1=1.9981670485581222,
a2=-0.9981891119334211,
biquad3,
..
biquad4,
..
biquad8,
b0=1.0010192374642126,
b1=-1.9950555192569264,
b2=0.9940580112181501,
a1=1.995060938714333,
a2=-0.9950718292249559


```

These biquads can be used for almost infinite flexibility (within the limits of eight biquads). For example, you could use two biquads for a fourth-order high pass filter, and the remaining six for parametric EQ.

## Setting biquads for the crossover block

Paste the coefficients into the text box, then click on the **PROCESS AND APPLY** button for them to take effect.

 BASIC MODE

 ADVANCED MODE

**Biquad Programming**

```

biquad1,
b0=0.998191200483864,
b1=-1.9950521500467384,
b2=0.996920046761057,
a1=1.9950521500467384,
a2=-0.9951112472449212,
biquad2,
b0=0.999640139948623,
```

PROCESS AND APPLY

### i Info

Switching between basic and advanced mode does not convert between Frequency/Filter type and biquad parameters. The basic parameters and advanced biquad coefficients for each filter are stored independently and the selected set is used for processing.

## Biquad design software

Following are programs that can be used to design your biquad coefficients. The design program must be set for a **96 kHz** sample rate.

### 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):

- Download zipped spreadsheet from miniDSP.com ([https://www.minidsp.com/images/fbfiles/files/All\\_digital\\_coefs\\_v1-20101026.zip](https://www.minidsp.com/images/fbfiles/files/All_digital_coefs_v1-20101026.zip))

### 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 using the Device Console. Room EQ Wizard can be downloaded from:

- Room EQ Wizard downloads (<https://www.roomeqwizard.com/#downloads>)

For guidance on using this feature, refer to the app note [Auto EQ with Room EQ Wizard](https://www.minidsp.com/applications/rew/rew-autoeq-step-by-step) (<https://www.minidsp.com/applications/rew/rew-autoeq-step-by-step>).

# FIR Filtering

FIR filtering is a powerful and advanced feature . It allows construction of complex arbitrary equalization and crossover filters with independent control of amplitude and phase.

## FIR filtering overview

FIR ("finite impulse response") filtering differs from the IIR ("infinite impulse response") filters used in the PEQ and crossover blocks. Technically speaking, IIR filters are *recursive*, meaning that each output value is partially calculated from earlier output values as well as from input values. While an IIR filter requires only a fairly small of values to be specified, an FIR filter is specified by a large array of numbers.

FIR filtering allows very complex filters to be constructed, with the aid of suitable design software. These filters can correct for amplitude only ("linear phase filters"), phase only, or a combination or both.

These numbers are conventionally referred to as "taps." The miniDSP Flex can compute a total of 4096 taps.

## The FIR filter pane

Each **output** channel has an FIR filter bank with a variable number of taps. Click on the **FIR** button to open the FIR filter settings window:

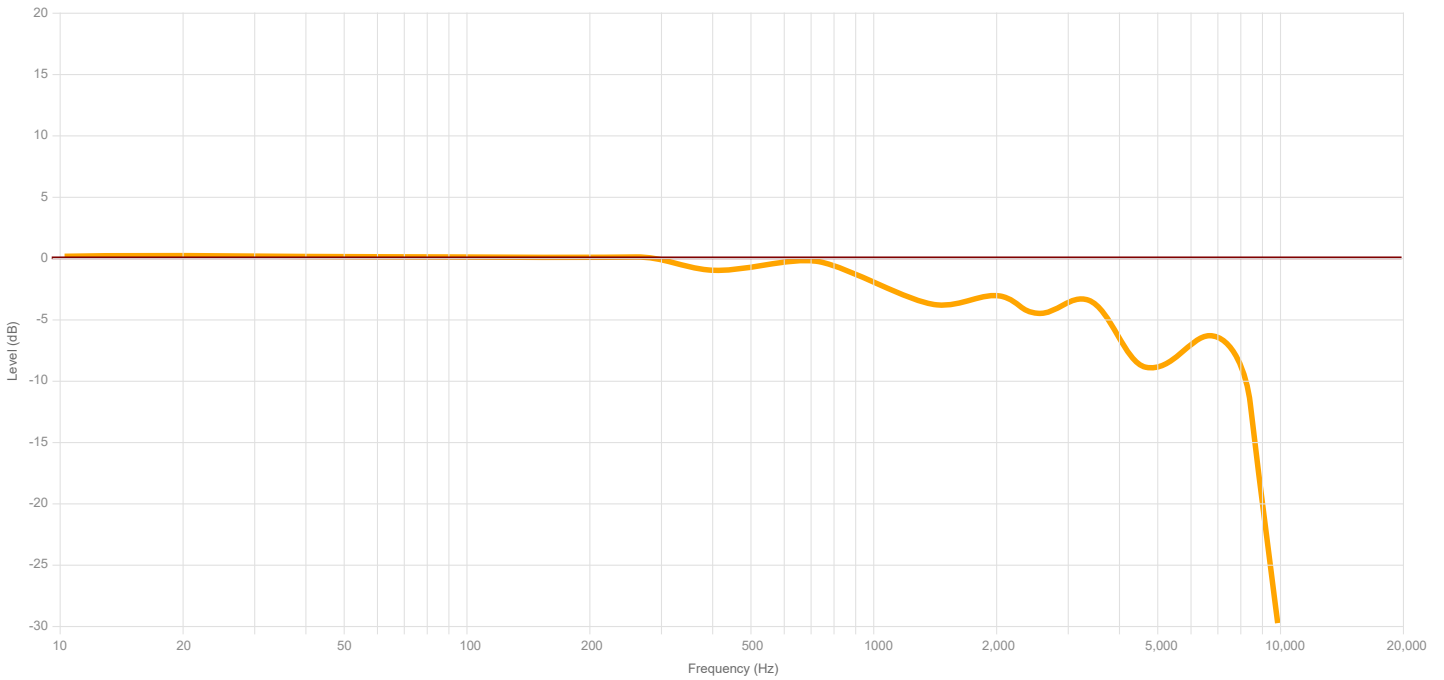


Channels

INPUT 1

INPUT 2

FIR - Frequency Response



FILE MODE

Aa MANUAL MODE

Taps Input Area

```

b0=1
b1=0
b2=0
b3=0
b4=0
b5=0
b6=0
b7=0

```

PROCESS INPUTS CLEAR TAPS

APPLY

Usage by Channel

Input 1	1024
Input 2	1024
Available	2048
Total	4096

Note: There must be at least 6 taps, and no more than 2048 Taps.

## Enabling and disabling the filter

The FIR filter blocks are disabled by default. To enable an FIR filter block, click on the Enable FIR switch.

Enable FIR



Enable FIR

FIR filter is disabled

FIR filter is enabled

When the FIR filter is enabled, the graph is a solid colored line. When disabled, the graph is a dashed grey line.

## Allocating taps

Taps are allocated to each block according to the number of loaded taps. The miniDSP Flex can compute a total of 4096 taps. These can be distributed as you wish across the four output channels, with the limitation that each channel must have 6 or more taps and can have no more than 2048 taps.

The decision on how many taps to allocate to each channel is up to you and should be determined after working with an FIR filter design program.

## Loading filters

### File mode

In File Mode, a filter coefficient file generated by an FIR filter design program is loaded. The coefficient file must use IEEE 754 single-precision binary floating-point format ([https://en.wikipedia.org/wiki/Single-precision\\_floating-point\\_format#IEEE\\_754\\_single-precision\\_binary\\_floating-point\\_format:\\_binary32](https://en.wikipedia.org/wiki/Single-precision_floating-point_format#IEEE_754_single-precision_binary_floating-point_format:_binary32)) .

FILE MODE
Aa MANUAL MODE

No file chosen. Please click Browse button to begin.

BROWSE

Usage by Channel

Input 1	1024
Input 2	1024
Available	2048
Total	4096

Note: There must be at least 6 taps, and no more than 2048 Taps.

To load coefficients, click Browse, navigate to the file containing the filter coefficients, and open it. The first few coefficients will be displayed and the buttons will change:

FILE MODE
Aa MANUAL MODE

woofer-impulse-2048.bin

```
b0 = -8.680318615006399e-7
b1 = -8.120589995996852e-7
b2 = -7.801536980878154e-7
b3 = -7.81908681801724e-7
b4 = -8.072910304690595e-7
b5 = -8.364621066903055e-7
b6 = -8.545673040316615e-7
b7 = -8.593909797127708e-7
```

BROWSE
UNLOAD FIR
APPLY

Usage by Channel

Input 1	2048
Input 2	1024
Available	1024
Total	4096

Note: There must be at least 6 taps, and no more than 2048 Taps.

The displayed graph will also change to reflect the response of the loaded file.

- To accept the loaded filter, click APPLY.

- To cancel the operation, click UNLOAD FIR.

## Manual mode

In Manual Mode, the FIR filter coefficients are pasted directly into the entry box in plain text, as shown below.

FILE MODE

Aa MANUAL MODE

### Taps Input Area

```
b0=1
b1=0
b2=0
b3=0
b4=0
b5=0
b6=0
b7=0
```

PROCESS INPUTS

CLEAR TAPS

APPLY

### Usage by Channel

Input 1	1024
Input 2	1024
Available	2048
Total	4096

Note: There must be at least 6 taps, and no more than 2048 Taps.

The pasted coefficients must be plain text in this format:

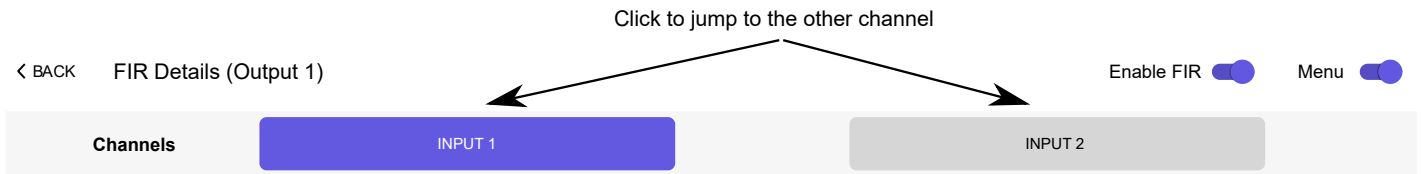
```
b0 = 1
b1 = -1
b2 = 0.5
b3 = -0.5
b4 = 0.2
b5 = 1
```

To set coefficients:

- Cut and paste the coefficients from the text output of the design program.
- Press the PROCESS INPUTS button.
- Confirm that the frequency response graph is as you expect.
- Press APPLY. This will write the coefficients into the processor's memory.
- To clear the filter coefficients, click CLEAR TAPS and then APPLY.

## Jumping between channels

To jump quickly between the FIR filter window of different channels, enable the Menu switch at the top right. Jump to a different channel by clicking on the channel buttons:



## FIR filter design software

The filter coefficients must be created with the aid of filter design software. miniDSP does not provide any such software, instead referring you to the many software packages available for this purpose (both freeware and commercial). Please see the [FIR filter tools \(https://www.minidsp.com/applications/advanced-tools/fir-filter-tools\)](https://www.minidsp.com/applications/advanced-tools/fir-filter-tools) page on our website. The design program must be set for a **96 kHz** sample rate.

## Tips

### Tip

If, after selecting a filter file or setting coefficients, the frequency response graph does not change as expected, make sure that the Enable FIR switch is turned on.

### Tip

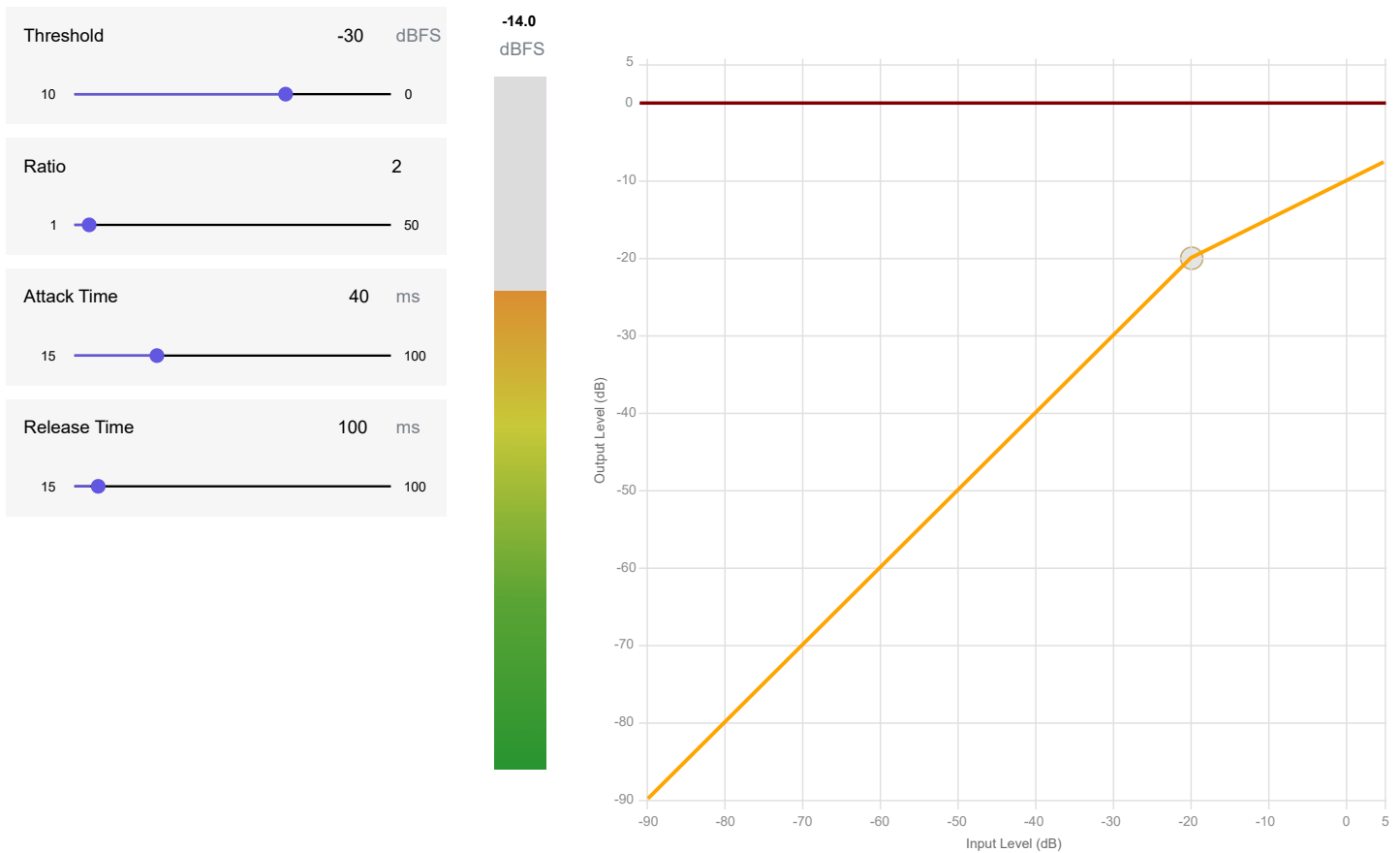
If you zero *all*\* filter taps, make sure that you also disable the the filter, otherwise there will be no audio through that channel.

# Compressor

The compressor reduces the gain of an output channel when the audio signal reaches the level 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.

## Overview

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 \(https://en.wikipedia.org/wiki/Dynamic\\_range\\_compression\)](https://en.wikipedia.org/wiki/Dynamic_range_compression).

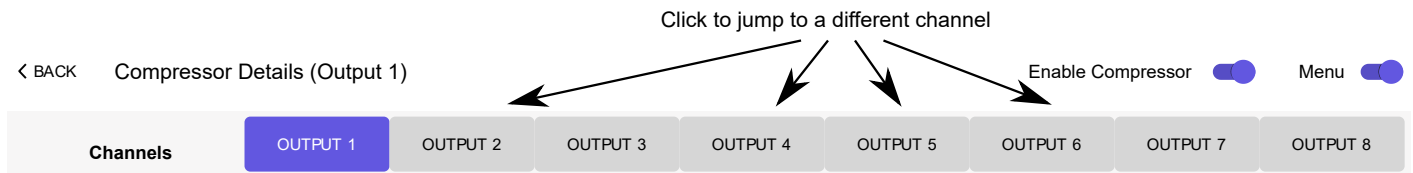
## Enable

The compressor block is disabled by default. To enable it, click on the Enable Compressor switch. The graph will change from a dashed grey line (disabled) to a solid colored line (enabled).



## Jumping between channels

To jump quickly between the compressor window of different channels, enable the Menu switch at the top right. Jump to a different channel by clicking on the row of buttons:




# Additional Information

# Migrating to DC

If you have used the older "plugin" software with your miniDSP Flex, you will need to perform a one-time migration procedure to use it with miniDSP Device Console.

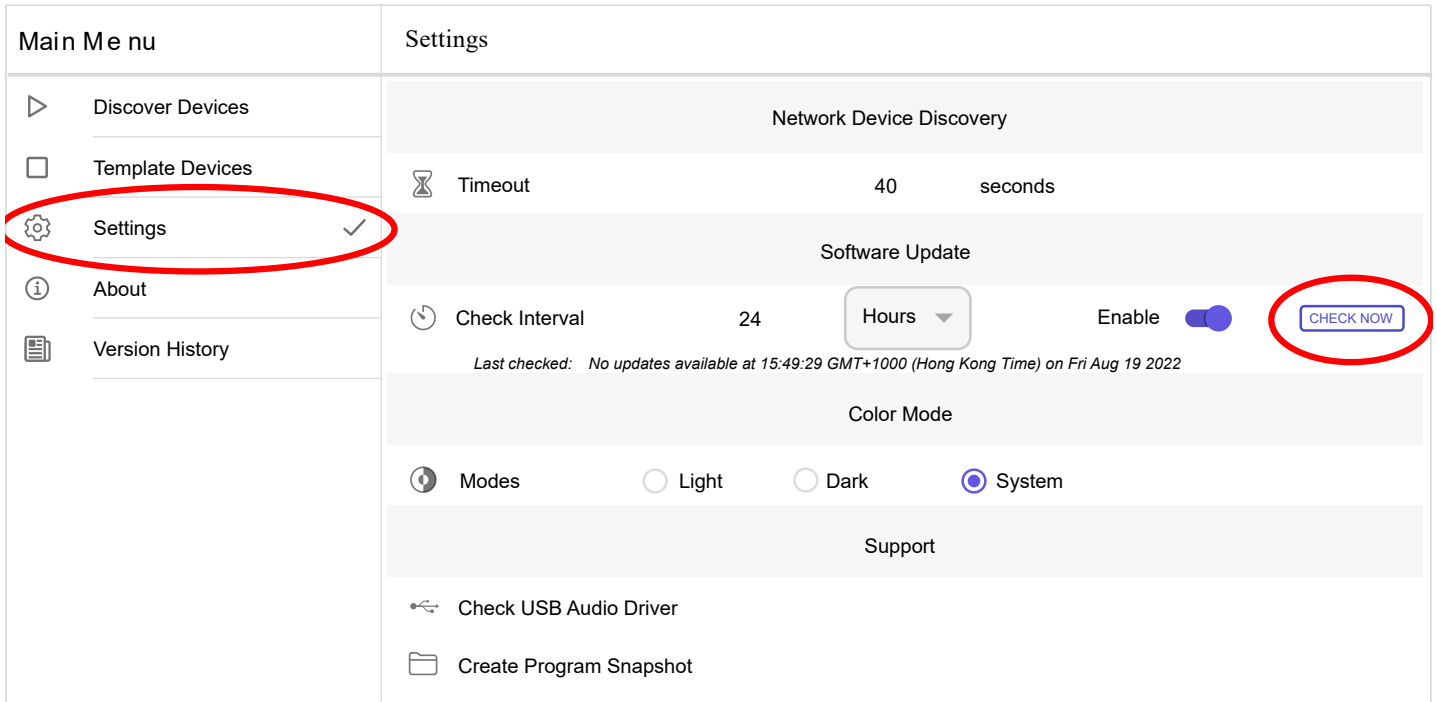
Follow the procedure described below. Please be sure to perform all steps in order.










 **Tip**

If you are having trouble using your device with Device Console, we recommend that you start again from step 1 and make sure that every step is done in order.

## 1. Check that you have the latest version of Device Console

Start miniDSP Device Console. Go to the Settings page and click on **CHECK NOW**:



Main Me nu	Settings
 Discover Devices	<b>Network Device Discovery</b>
<input type="checkbox"/> Template Devices	 Timeout 40 seconds
 <b>Settings</b> ✓	<b>Software Update</b>
 About	 Check Interval 24 <input type="text" value="Hours"/> Enable <input checked="" type="checkbox"/> <b>CHECK NOW</b>
 Version History	<i>Last checked: No updates available at 15:49:29 GMT+1000 (Hong Kong Time) on Fri Aug 19 2022</i>
	<b>Color Mode</b>
	 Modes <input type="radio"/> Light <input type="radio"/> Dark <input checked="" type="radio"/> System
	<b>Support</b>
	 Check USB Audio Driver
	 Create Program Snapshot

If a newer version of Device Console is available, you will see a popup offering to download and update to the latest version. Click **YES**.

## 2. (Windows only) Check that you have the latest USB driver

In the Settings page of Device Console, click on **Check USB Audio Driver**:



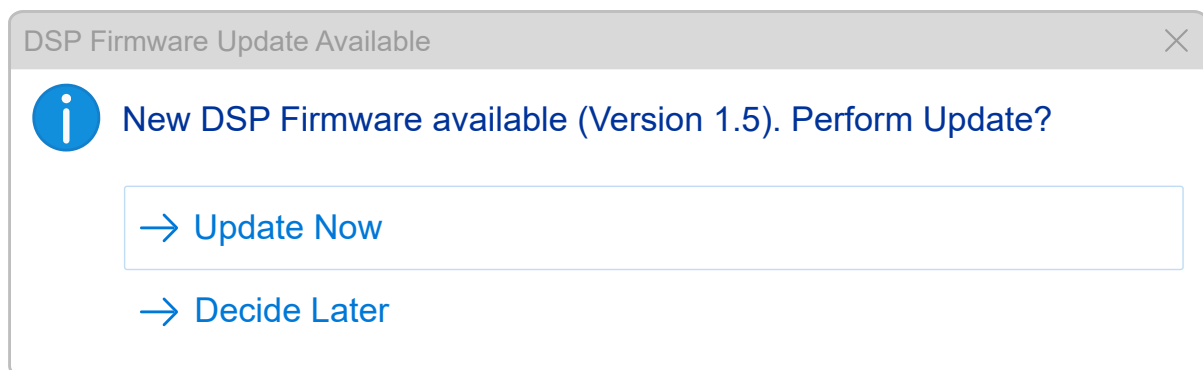
Main Me nu	Settings
<ul style="list-style-type: none"> <li>Discover Devices</li> <li>Template Devices</li> <li><b>Settings</b> ✓</li> <li>About</li> <li>Version History</li> </ul>	<p>Network Device Discovery</p> <p>Timeout 40 seconds</p> <p>Software Update</p> <p>Check Interval 24 Hours Enable <input checked="" type="checkbox"/> <a href="#">CHECK NOW</a></p> <p><i>Last checked: No updates available at 15:49:29 GMT+1000 (Hong Kong Time) on Fri Aug 19 2022</i></p> <p>Color Mode</p> <p>Modes <input checked="" type="radio"/> Light <input type="radio"/> Dark <input checked="" type="radio"/> System</p> <p>Support</p> <p><b>Check USB Audio Driver</b></p> <p>Create Program Snapshot</p>

If the miniDSP USB Audio driver is not up to date (or has not been installed), DC will offer to install the latest version. In that case, click on the **PROCEED** button and proceed through the installation.

### 3. Update DSP Firmware

Connect your Flex to your computer and power it on. It will appear on the **Discover Devices** page of Device Console. Click on it.

If the Flex needs a DSP Firmware update, this window will appear:



If this message appears, click on **Update Now**. (If it does not appear, you do not need a firmware upgrade and can jump straight to the next step.)

After the firmware update completes, the Flex will restart.


 **Tip**

In some cases, the Flex will not restart properly. If you experience odd symptoms, such as Device Console not returning to the **Discover Devices** page, the Flex not appearing on the **Discover Devices** page, or the DSP Firmware update screen appearing again, power cycle the Flex and restart Device Console.

## 4. Download the Migration Pack

Locate your Flex on the **Discover Devices** page. Click on it. You will see a message like this:

XMOS Firmware version not supported ✕

 **Device running a XMOS firmware version 1.25 that is too old to update with Device Console.**

Please upgrade to version 1.50 or above with the DFU Tool provided by the DC-Migration-Package. Click the 'Download' button to retrieve from miniDSP User Downloads.

[→ Decide Later](#)

[→ Download](#)

(If you do not see this message, you do not need to upgrade the firmware and you can skip ahead to the next step.)

Click on the **Download** button to download the Migration pack containing all necessary files. Alternatively, you can download it at any time by clicking on this link:

- [Download the Migration Pack for miniDSP Flex \(https://phpstack-793508-3229840.cloudwaysapps.com/deviceconsole/migration-packages/Flex-DC%20Migration.zip\)](https://phpstack-793508-3229840.cloudwaysapps.com/deviceconsole/migration-packages/Flex-DC%20Migration.zip)

After downloading, if your browser did not automatically unzip the downloaded file, unzip it manually by double-clicking on it (macOS) or right-click on it and select "Extract All" (Windows).

## 5. Upgrade the firmware in your Flex

The firmware in your Flex must be upgraded for it to work properly with Device Console. This is a one-time operation that must be performed with the firmware upgrade utility contained in the Migration Pack.

1. Check that the Flex is connected to your computer via USB and that it is powered on.
2. Start the firmware upgrade program.

For Windows, navigate to:

XMOS Firmware > Firmware\_Upgrade\_Tools > Windows > miniDSPUAC2Dfu

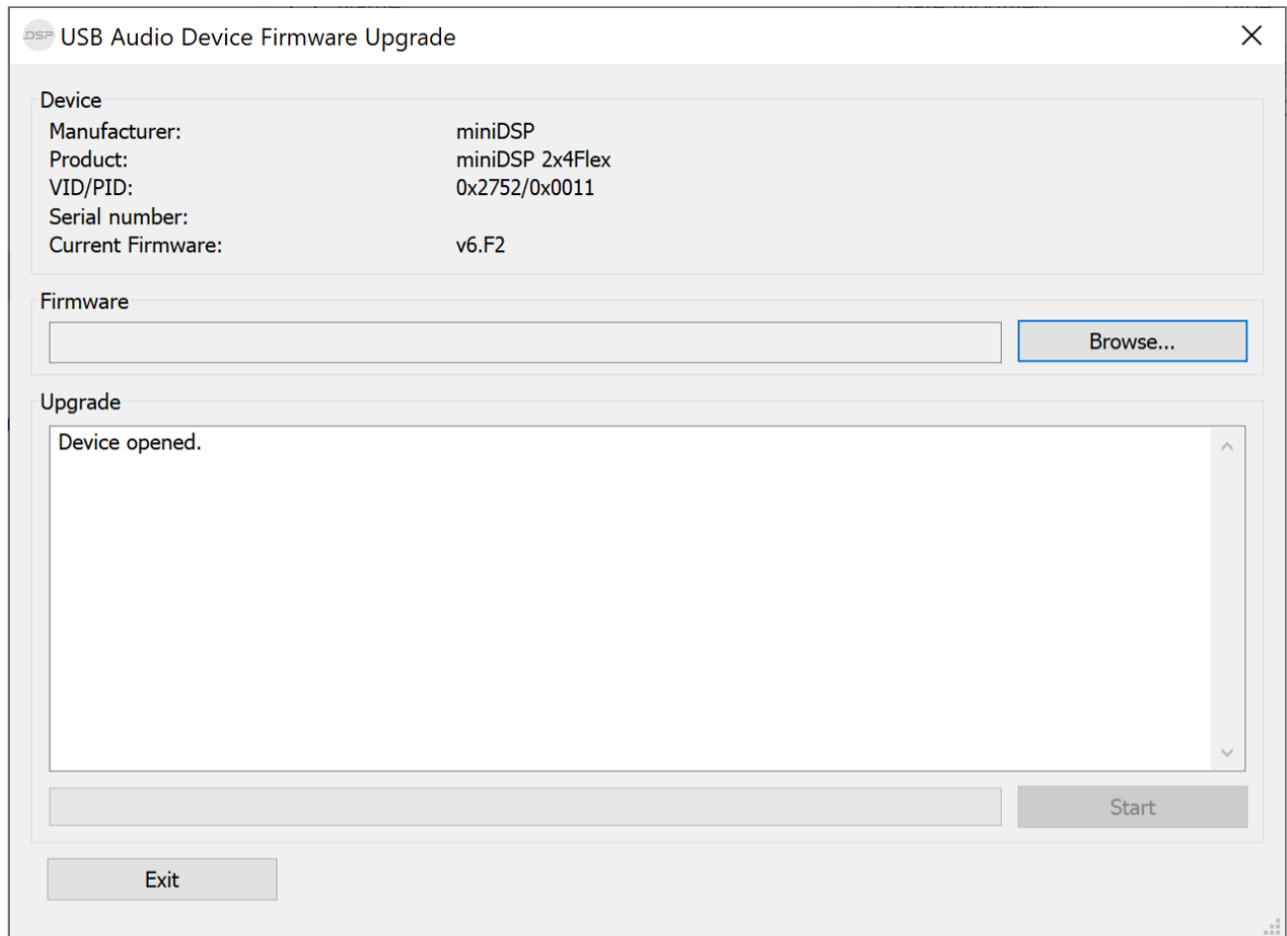
Double-click on the **miniDSPUAC2Dfu.exe** program to run it.

For macOS, navigate to:

XMOS Firmware › Firmware\_Upgrade\_Tools › Mac

Double-click on the **miniDSP USB DFU.app** program to run it.

3. The firmware update utility will start:



4. Click on **Browse** and select the firmware file from the **XMOS\_Firmware** folder of the migration pack. It will have a name like "miniDSP\_Flex\_XMOS\_v1.59\_up.bin." (The version number embedded in the file name may change.)

#### Warning

Do not proceed if you cannot locate the correct firmware file. The name of the firmware file **must** begin with "miniDSP\_Flex\_XMOS" or you could damage your Flex.

5. Click on the **Start** button. You will see a progress bar as the upgrade proceeds.

#### Warning

DO NOT DISCONNECT THE USB CABLE OR POWER FROM THE Flex WHILE FIRMWARE UPGRADE IS IN PROGRESS. DOING SO MAY "BRICK" YOUR Flex.

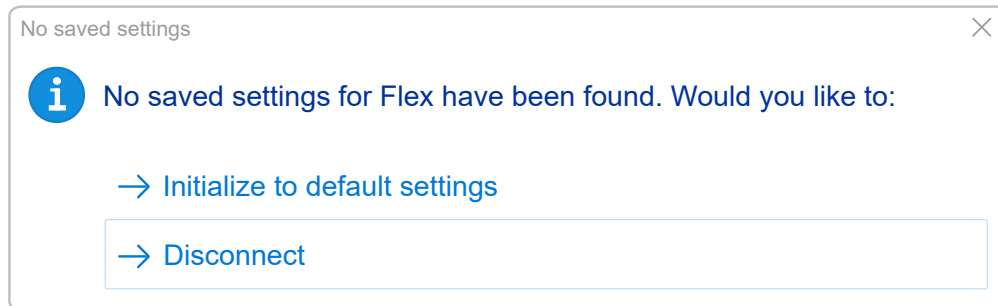
6. Once the firmware upgrade completes, you will see a message that the upgrade completed successfully. Click on **Exit**.

Now that your Flex firmware has been updated to a version that is compatible with Device Console, future firmware upgrades can be done directly from within Device Console.

## 6. Migrate your configuration presets

Presets that were previously loaded into the Flex using the miniDSP 2x4 plugin will automatically be imported into Device Console.

If no existing presets are found, you will be prompted to initialize the presets to defaults when you connect to the Flex. In that case, click on **Initialize to default settings**.



# Troubleshooting and support

## Trouble-shooting audio issues

### No sound during playback

If you get no sound while playing music, double-check the following items. Depending on the specific processor, you may be able to do this with the aid of the level meters in the miniDSP Device Console.

1. Check which input source you have selected.
2. Check the connection and cabling between the source(s) and the processor.
3. Check the master volume setting.
4. Check that the processor is not muted.
5. Check your Routing and make sure that you are routing inputs through to outputs.
6. If your processor has crossovers, check your crossover settings. (In particular, some processors have a default high pass filter set at 1 kHz on some channels as a safety measure for 2-way active speakers. If using these channels for subwoofers, the high pass filters must be bypassed.)
7. Check that output cabling is connected to the correct connectors on the rear panel and to the correct inputs on downstream equipment (e.g. amplifiers).
8. 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 left and right speakers. 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, double-check all connections on the rear panel.

# Obtaining support

If you are experiencing issues with your miniDSP Flex that are not resolved by this manual and by following the troubleshooting steps above:

1. Check the [miniDSP forums \(https://www.minidsp.com/forum/index\)](https://www.minidsp.com/forum/index) to see if this issue has already been raised and a solution provided.
2. Contact miniDSP via the support portal at [support.minidsp.com \(https://support.minidsp.com/\)](https://support.minidsp.com/) with:
  - a. The firmware versions obtained from the Display Versions button in miniDSP Device Console.
  - b. A clear explanation of the symptoms you are seeing.
  - c. A description of troubleshooting performed and your results.
  - d. (Recommended) For quickest resolution of your issue, include the current program snapshot. This can be obtained from the [Device Console Settings](#) screen.