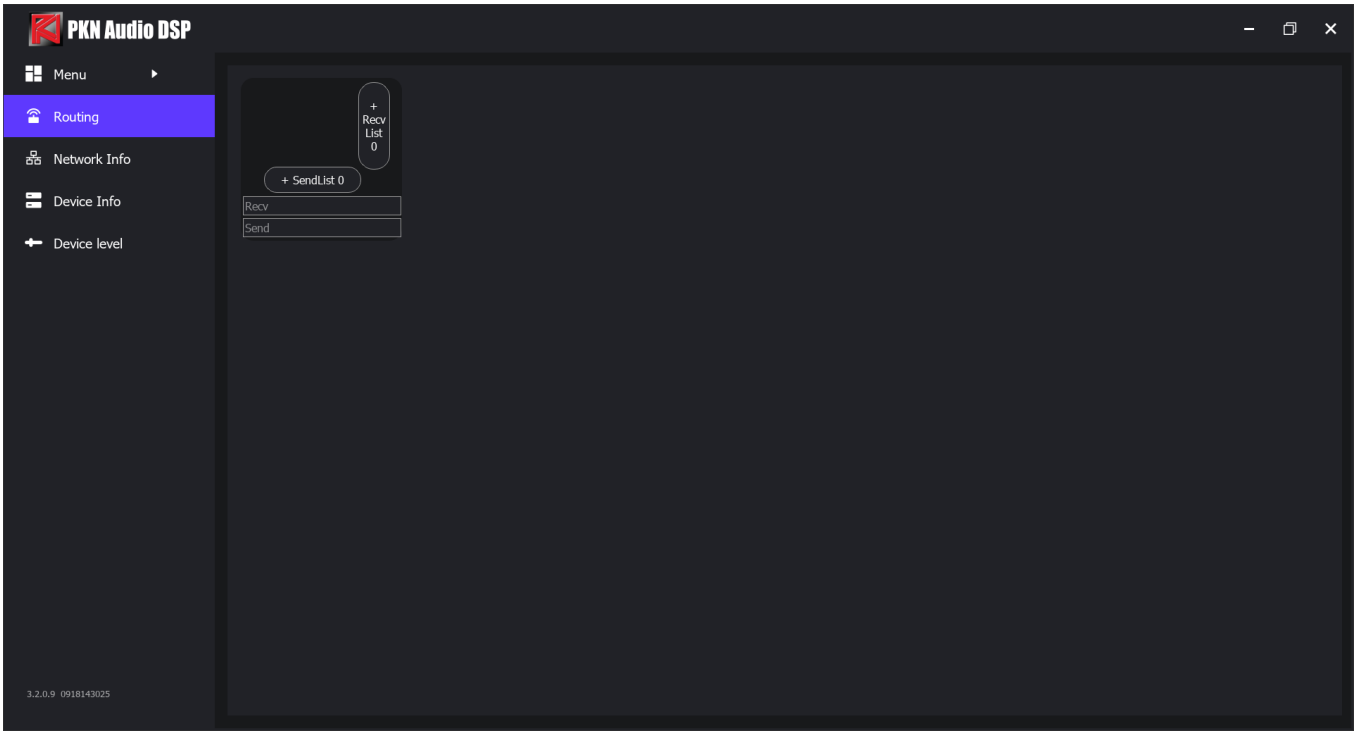
PKN Audio DSP GUI Instruction Manual



The **PKN Audio DSP** software is a comprehensive platform, that covers all Digital Signal Processing and Network Routing functions from the simplest to the most complex audio systems.

The system is capable of routing and distributing both analog and digital audio signals, perform high quality Digital Signal Processing, and controlling, monitoring of all devices in the local area network (LAN), while maintaining lossless audio signal quality and ultra-low latency in accordance with the AES67 standards.

Apart from our current hardware, the XE-DSP series amplifiers, we also support software solutions for digital audio streaming via an AES67 enabled virtual sound card (VSC). (Optional)

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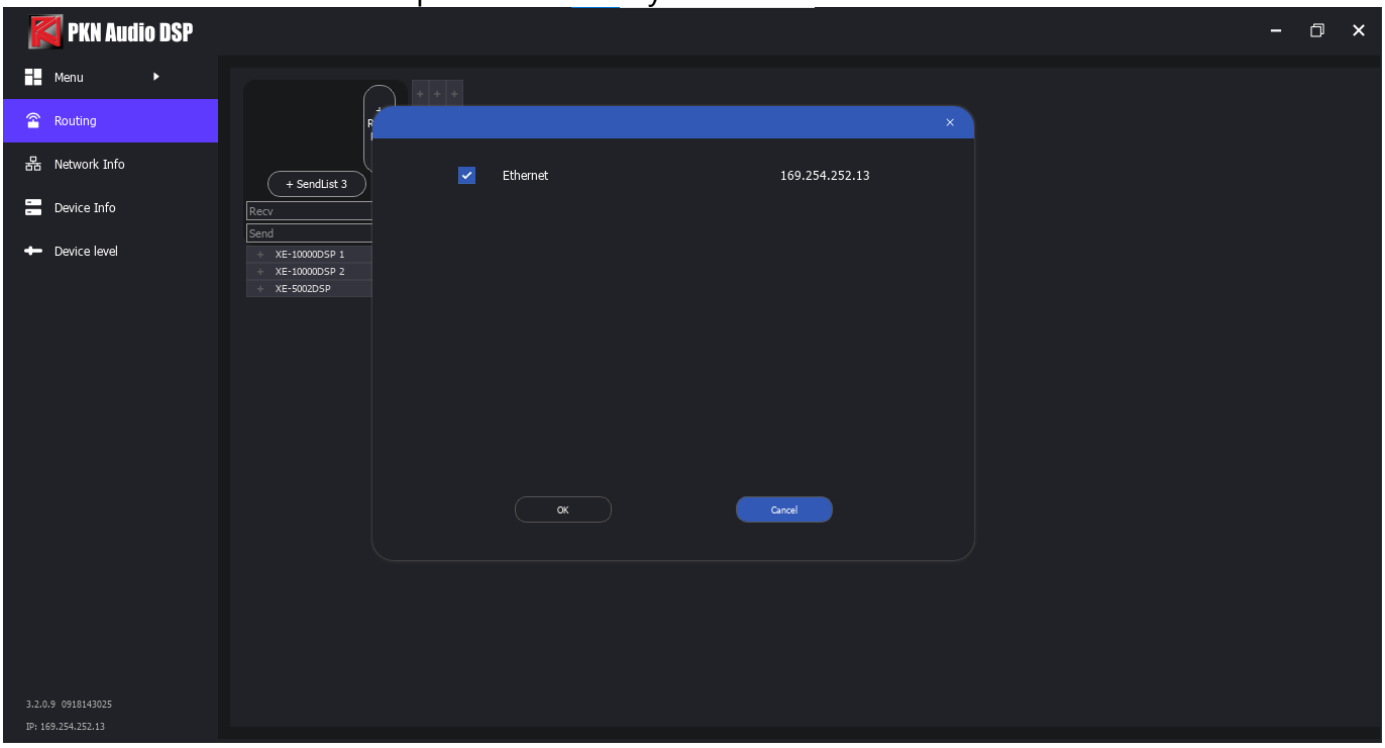
1. PKN Audio DSP Software installation

Make sure you have downloaded our latest software from:
http://www.pknaudio.com/XE-DSP/PKNA_DSP-Controller.zip

- Double-click the software installation package to install.
- Choose the install location, then click `Next`.
- Choose if you need a desktop shortcut, and/or quick launch icon. After selection, click `Next.`
- Confirm if your choices are correct. If so, click `Install`.
- Wait for the installation to be completed.
- Choose whether to launch the application, or exit the installer once you click `Finish`.
- Make sure to allow the software through the firewall when its prompted, or you can experience abnormalities and issues with device detection and/or correct controlling!

2. Discover Devices

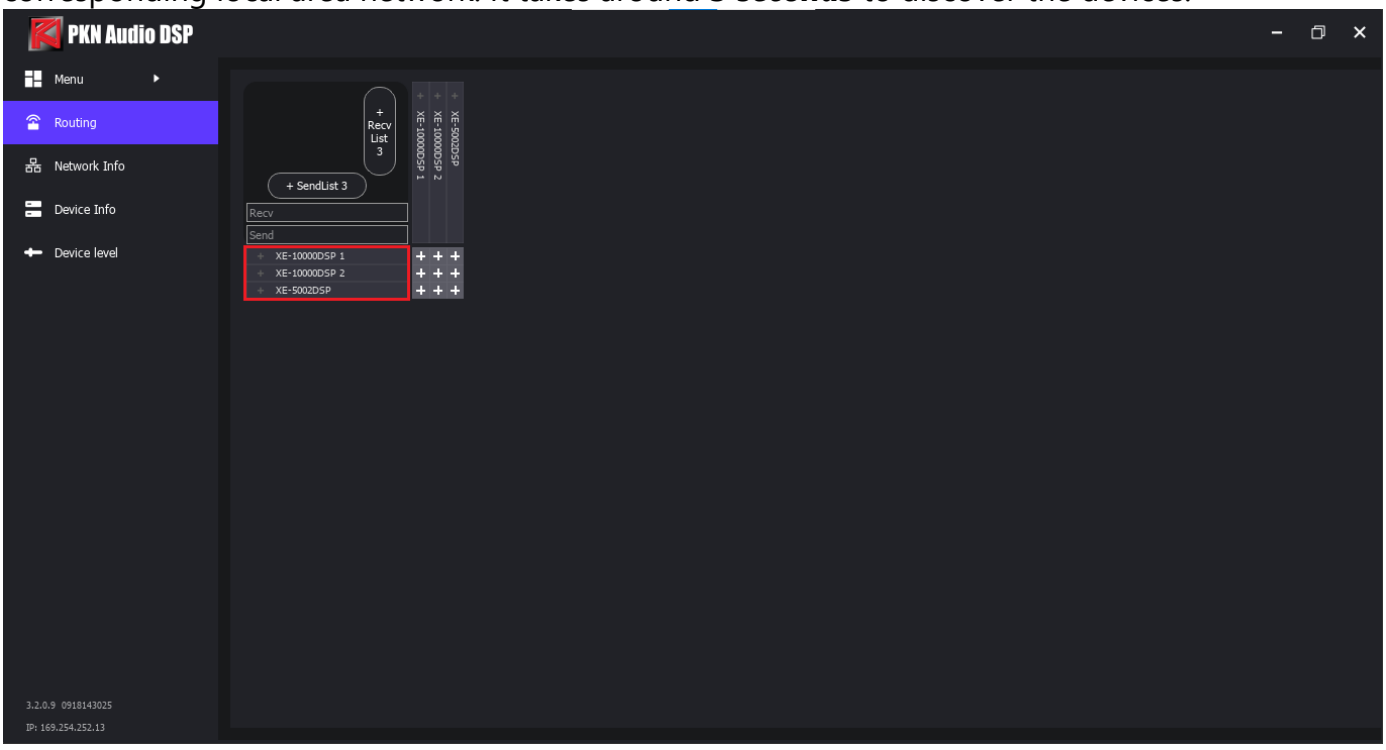
The software discovers and controls devices through LAN (local area network).
When opening the software for the first time, it is necessary to specify which network card of the computer is used (*different network cards may correspond to different local area networks*). If there is only one, the software will select it by default, but if there are multiple network cards, the correct one needs to be specified manually.



If the network cable is unplugged and plugged back in, or there is any network change, the corresponding network card needs to be re-selected.

Click the *Menu* and select it in the drop-down window `Set Network Card`:

After selecting the network card, the software will automatically discover the devices in the corresponding local area network. It takes around ***5 seconds*** to discover the devices:

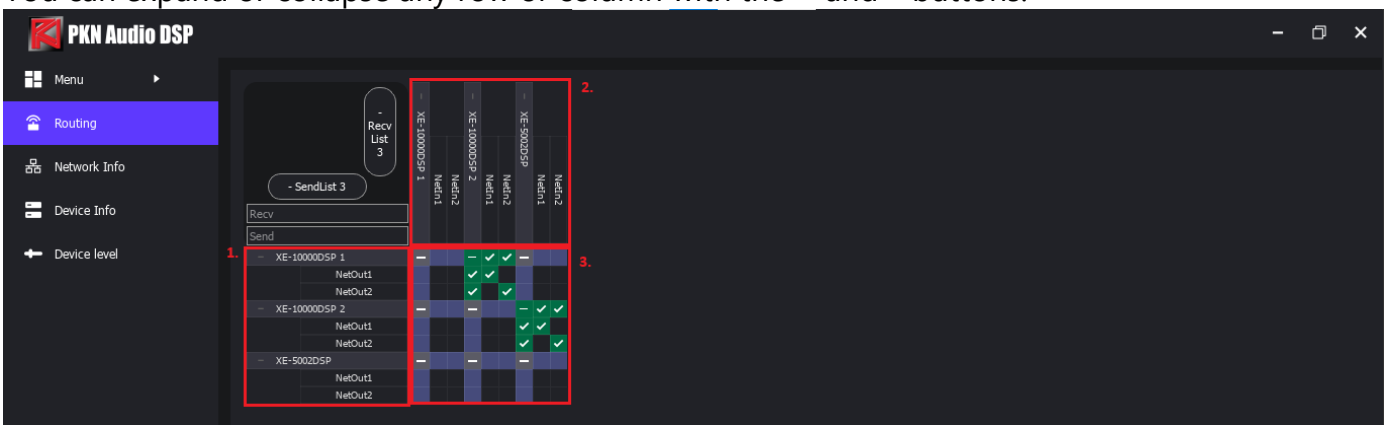


You can also refresh the device list by `Menu → Refresh` manually.

3. Main View: Digital Audio Routing, Network & Device info

3.1 Routing

This view represents all connected device's digital audio in -and outputs' network routing.
You can expand or collapse any row or column with the + and – buttons.

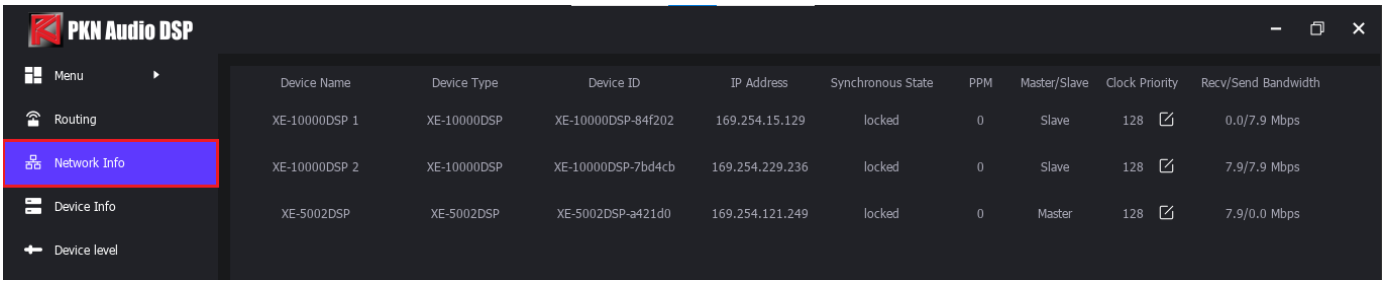


1. This is the **sending** device list. After expanding it, you can see the network sending channels of each device.
2. This is the **receiving** device list. After expanding it, you can see the network receiving channels of each device.
3. Here you can set up the digital audio routing. The checked state means that the network sending channel signal of the device corresponding to area 1 is sent to the network receiving channel of the device corresponding to area 2.

   Note that there is also an internal routing of each device's digital (and analog) audio in/outputs as well.
   (For more details see → *4.3.3 Matrix*)

3.2 Network Info

On the left panel, click `Network Info`, to see various network related information about the connected devices.



- `Device Name:` A modifiable display name of each device on the interface.
  You can modify it in the **`Device Details`** → `Device Configuration` menu:
  Double-click the device you wish to modify. The **`Device Details`** menu pops up in a new window and under Device Information, you can change the name to your liking.
  (For more info about the Device Details menu and editing the display name see → 4.1 Device Config)

- `Device Type:` Used to distinguish device types. Different types correspond to different products and functions. This is set by the manufacturer, and cannot be changed.

- `Device ID:` Used to uniquely identify a device. (It represents the embedded DSP modules' unique ID, not the devices' serial number. Also not modifiable.)

- `IP Address:` Currently used, unique IP address allocated to the corresponding device. This can be set to either Manual or Automatic (DHCP) acquisition.
  Important to note, that if your computer's IP acquisition is set to manual, make sure that the connected devices are also set to manual, otherwise you can experience issues with correct controlling of your device!
  (For more details see → 4.1 Device Config)

- `Synchronous State:` Status of device synchronization. After any device is connected to the network, they will automatically synchronize with the Master device. The process can take up to 1 minute, the status is refreshed every 5-10 seconds.

- `PPM`: Description parameter for clock alignment of master and slave devices. Generally, it is within ±30.

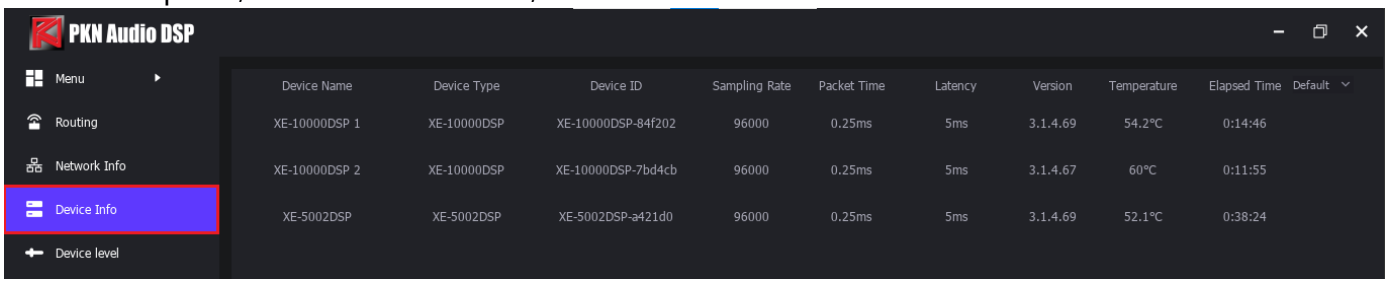
- `Master/Slave`: Shows whether it is a master or a slave device. There is only one master device in a local area network. If there are other non-PKN Audio devices in the network using PTP clocks, they will also participate in the selection of master and slave devices together.
  (Meaning, if there is a non-PKN Audio device in the same local area network, and its clock priority is higher, all shown devices on the software may act as slaves.)

- `Clock Priority`: A modifiable parameter used to select master and slave devices. The range is 0-255 with the default value of 128. You can modify it with the `Edit` button next to the value.
  The system will automatically select the device with the highest priority (smallest value) in the network as the master device. You can manually specify a certain device to be the master (higher priority).
  (Virtual Sound Cards (VSC) cannot be masters. The clock priority cannot be modified, and is displayed as NA.)

- `Recv/Send Bandwidth:` Current network data transfer rate between devices (Received/Sent) shown in Mbps.

3.3 Device Information

On the left panel, click `Device Info`, to see technical information of the connected devices:



- `Device Name, Device Type, Device ID`: All the same as above.
  *(You can open the **`Device Details`** pop-up window of any device, from any view by double-clicking the device's name or row you wish to configure.)*

- `Sampling Rate:` The audio sample rate of the device. The XE-DSP series currently only support 96kHz.

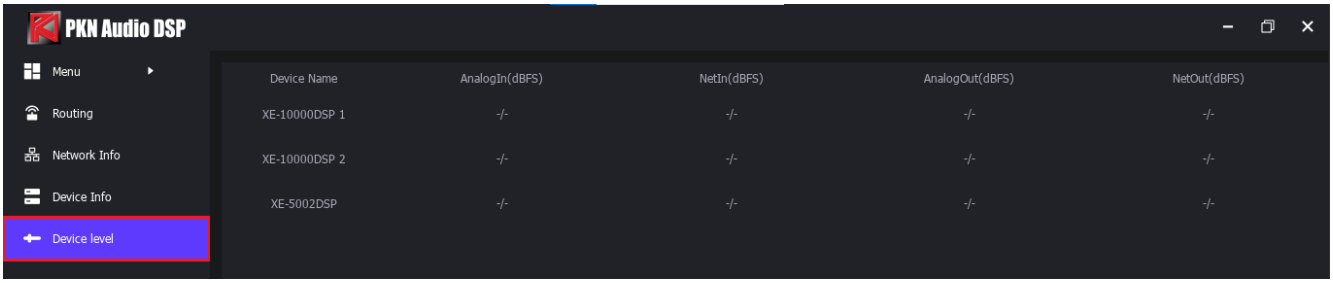
- `Packet Time:` A setting parameter for network audio data packets.
  (Can be modified. For more details see → 4.1 Device Config)

- `Latency:` A setting parameter for network audio transmission latency.
  (Can be modified. For more details see → 4.1 Device Config)

- `Version:` Displays the firmware version of the embedded DSP module of the device. *(The version of the Virtual Sound Card (VSC) is displayed in the VSC software. This option shows NA.)*
- `Temperature:` The embedded DSP module's core processor's current temperature. **During normal use, the temperature should be below 70°C and should not exceed 80°C.**
- `Elapsed time:` The continuous running time of the device since last startup.

3.4 Device Level

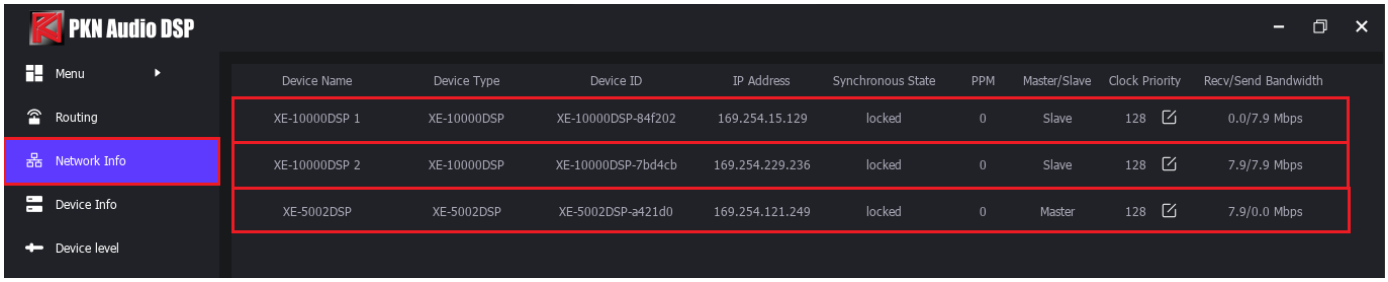
On the left panel, click `Device level` to quickly see the signal levels (in dBFS) of every connected device:



Each row contains the corresponding input and output levels of each connected device's respective channels divided by a "/". If there is no input/output "-/-" can be seen.

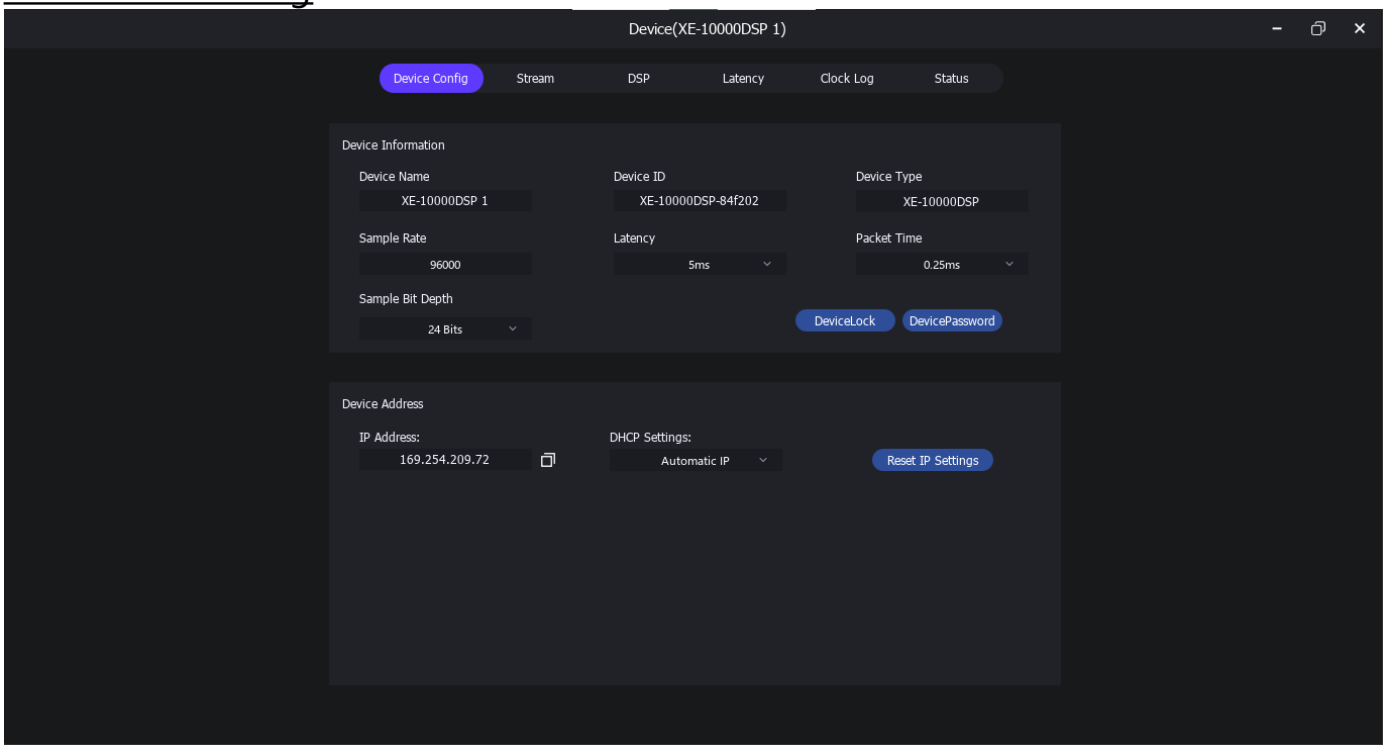
4. Device Details

On any `Routing, Network Info, Device Info,` or `Device Level` menu double-click the name or row of the device you wish to configure:



This will pop up the **`Device Details`** in a new window, by default on `Device Config` view.

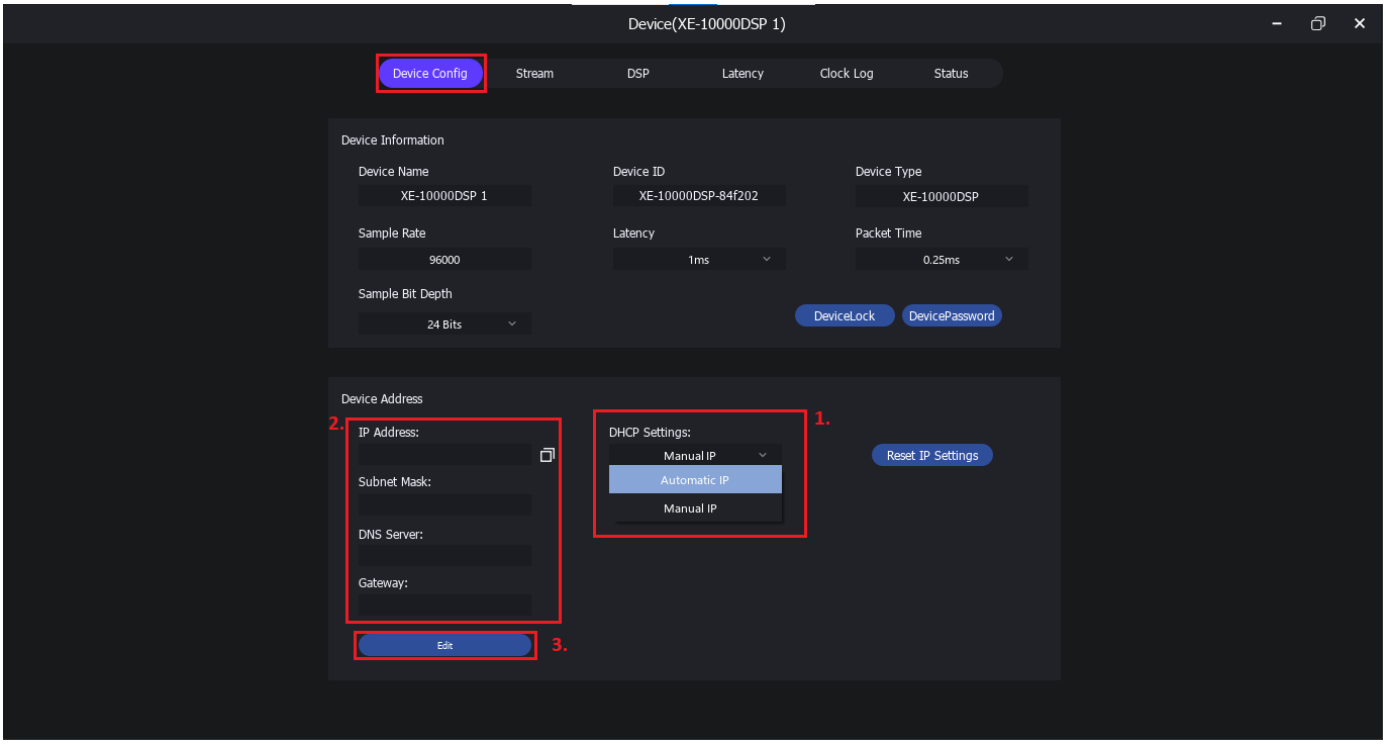
4.1 Device Config



- `Device Name`: By default, it is the amplifier's name.
  You can rename it by clicking in the text box. The name cannot exceed 32 characters. Once done just hit enter to apply.
- `Device ID`: The unique ID for identifying the device (cannot be modified).
- `Device Type`: Used to distinguish the device series (cannot be modified).
- `Sample Rate`: Currently set audio sampling rate.
- `Latency`: Network latency parameter set in ms. The smaller the value, the lower the latency.
- `Packet Time`: A parameter for the network data packets' transfer rate. The network latency can not be less than 4 times the packet time.
  (Meaning, if the packet time is set to 0.25ms, the network latency can be set to a minimum of 1ms. If the packet time is set to 1ms, the network latency can be set to a minimum of 5ms. If you want to set the network latency to 1ms, you must first change the packet time to 0.25ms. Changing the packet time requires rebooting of the DSP)

  It is important to note, that the lower the latency, the more resources are required from external network devices (switches, routers, cables etc.) as well. It is recommended to leave it on the default settings, for a more stable experience.
- `IP Address`: Displays the current IP address of the device.
- `Reset IP Settings`: If the IP address is in manual setting mode, and incorrect parameters are set, it could cause the software being unable to obtain/view device information. In this case, the IP setting can be reset to the default automatic acquisition with this button.

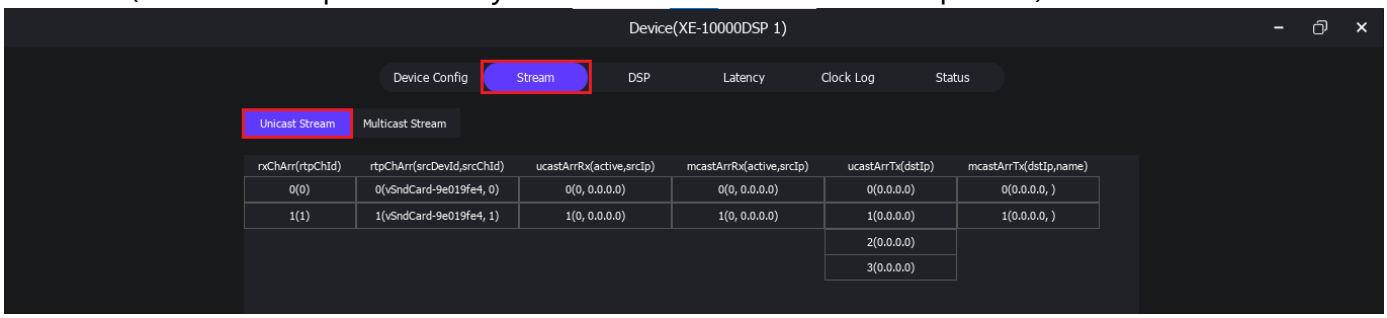
- `DHCP Settings`: Automatic or Manual acquisition method selection of device IP addresses. For manual setting, select `Manual IP` ***(1.)***, then click `Edit` ***(2.)***, then enter the specified value in the corresponding input boxes ***(3.)*** and click Save. When setting manually, ensure that the IP address, subnet mask, DNS server address and gateway values are correct, otherwise, it may not be possible to view/obtain device information correctly.



4.2 Stream

4.2.1 Unicast Stream

This page displays the unicast receiving, sending and routing stream records, and status of the devices. (This data is updated every time a **`Device Details`** is opened.)



- *`rxChArr(rtpChId)`*: The routing records of the receiving channels. The first number represents the channel ID (0 represents channel 1). The content in parentheses represents the subscript of rtpChArr, corresponding to the index of the rtcChArr(srcDevId, srcChId) list. -1 means there is no routing.

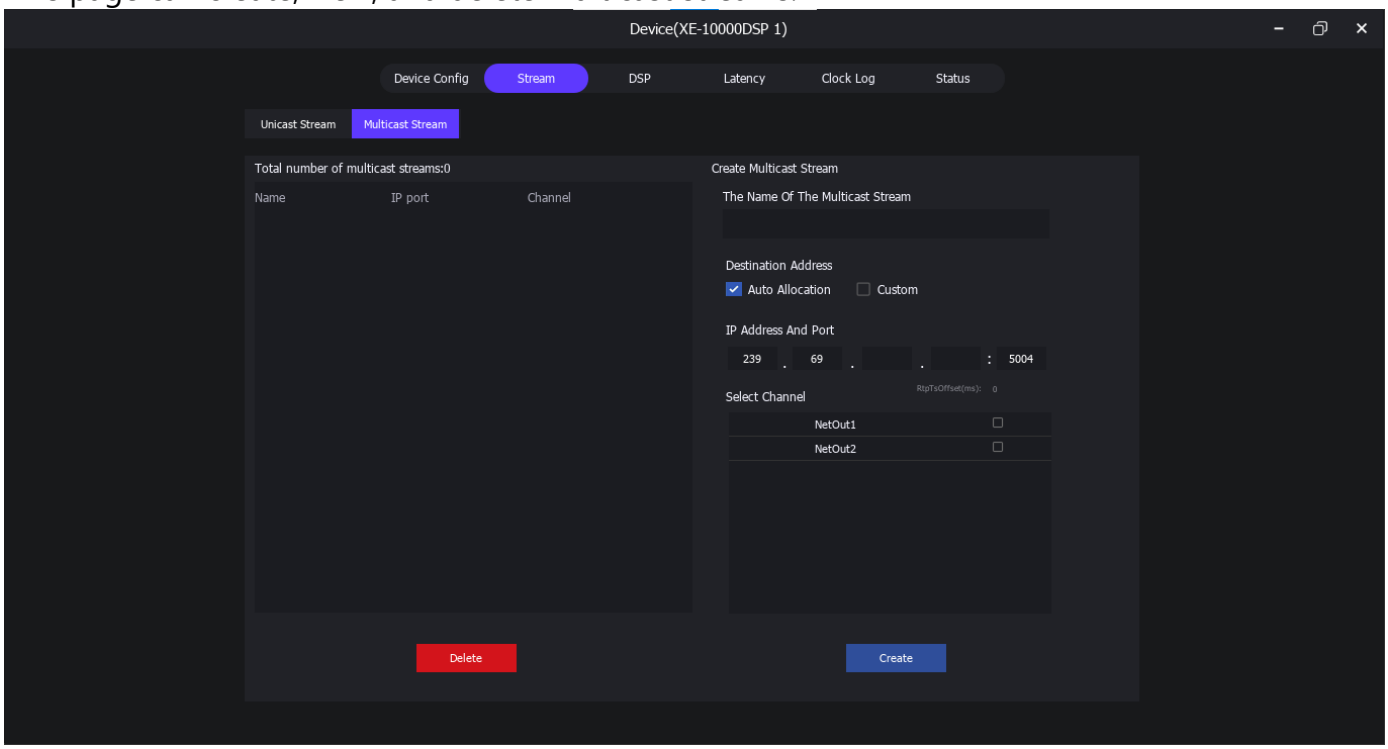
- `rtpChArr(srcDevId, srcChId)`: srcDevId corresponds to the ID of the sending device. srcChId corresponds to the channel index of the sending device. (0 represents channel 1)

- `ucastArrRx(active, srcIp)`: It represents the array of unicast received data streams. 0 means inactive, and 1 means active. Only in the active state can audio streams be transmitted. "`srcIp`" represents the IP address of the sending device.

- `mcastArrRx(active, srcIp)`: Represents the array of multicast received data streams. 0 means inactive, and 1 means active. Only in the active state can audio streams be transmitted. "`srcIp`" represents the IP address of the sending device.
- `ucastArrTx(dstIp)`: Represents the array of sending channels that have currently established connections (the array index has nothing to do with the channel). "`dstIp`" represents the IP address of the receiving device.
- `mcastArrTx(dstIp, name)`: The array of multicast sending streams that have been created. "`dstIp`" represents the multicast stream address. "name" represents the multicast stream name.

4.2.2 Multicast Stream

This page can create, view, and delete multicast streams.



`The Name Of The Multicast Stream`: The name displayed after creation. It should not exceed 32 characters.

`Destination Address`: The address of the multicast stream. If there are no special requirements, automatic allocation can be selected. You can also customize the address.

`Select Channel`: Selection of channels that can be sent out using the multicast stream.

`Create`: Create a multicast stream with the parameters you set above.

`Delete`: You can delete a previously created multicast stream.

4.3 DSP

This page is dedicated to all digital signal processing features on every analog and digital channel of the device.

4.3.1 Diagram

On this page, you can easily enable, bypass or modify the functions of the DSP input and output signal chain.

1. Channels that are grouped together are displayed here. You can right-click the names of any channel and choose which groups to allocate them to. Also by left-clicking the channel names, you can modify them.
   (Currently this feature is only implemented within one device, meaning you cannot group channels from different devices together yet.)

2. A basic signal indicator, where green means there is signal on that channel, gray means there's none, or it's below -60dB.

3. You can link channels with this button together. This way if you enable/disable, or modify a parameter on a DSP function, it will automatically change on the linked channel as well. This is only possible if the DSP functions are the same on both channels, above and below this icon. Green (on the right) means linked, gray (left) means unlinked.

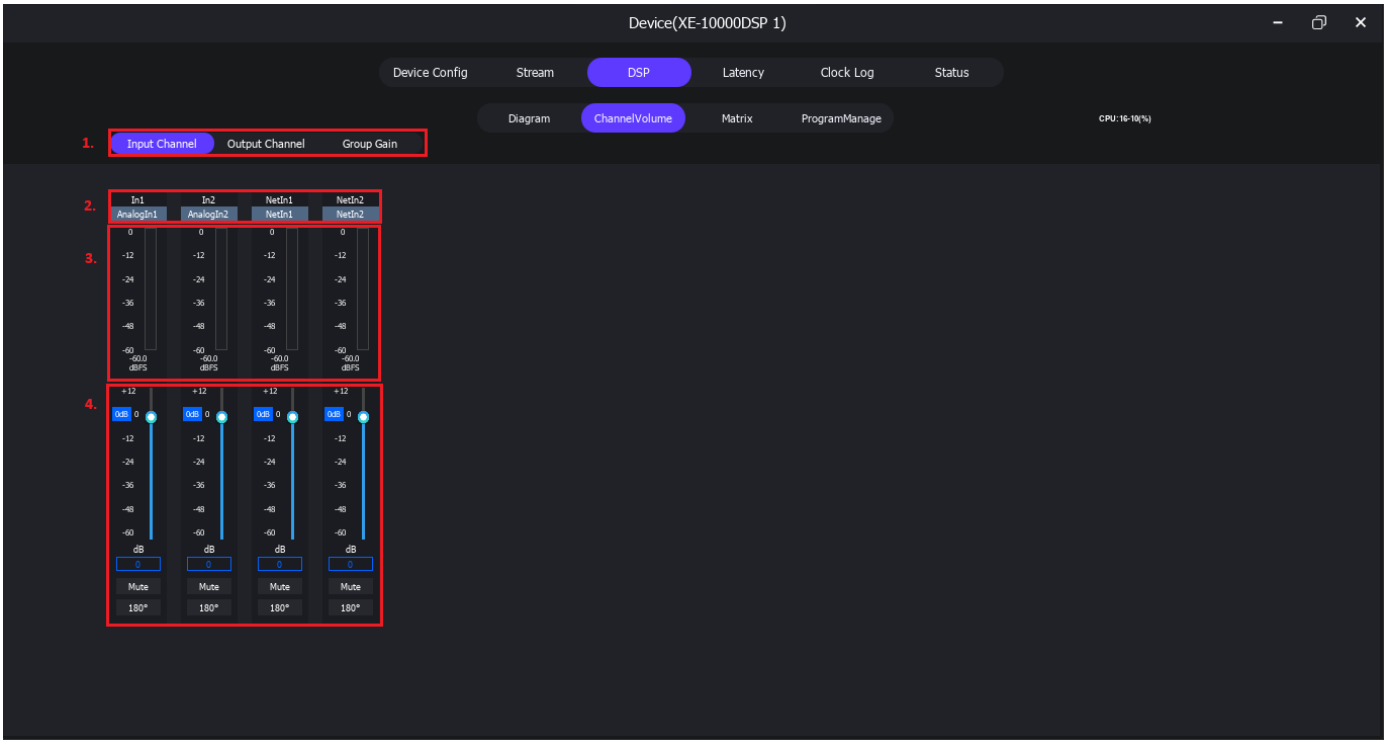
4. This area represents what DSP functions are present on a channel.
   Bright color indicates that the function is enabled (not bypassed), and gray indicates that the function is disabled (bypassed).
   You can quick-toggle between enabled and disabled by right-clicking and selecting `Set/Cancel Bypass` on the corresponding function box. Also, on the right-click context menu, you can copy and paste function parameters between the same type of DSP functions.
   Double-clicking a function box will pop up the detailed parameter settings page.
   The DSP functions of different channels may be different.
   (For each module's Detailed view see → 5.3 Detailed Explanation of DSP Functions)
   (Multiple detailed parameter setting pages can be opened at the same time, and they stay opened only between the DSP menus (`Diagram`, `Channel Volume`, `Matrix` and `ProgramManage`). You can also freely move the windows around, or enable/disable the functions, with the `Bypass` buttons.)

5. The `MUTE`, `180°` (Invert Phase), and `GAIN` functions are fixed for every channel and are always on the end of the chain.
   Clicking mute and 180° toggles the feature, clicking the gain box shows its adjustment view.

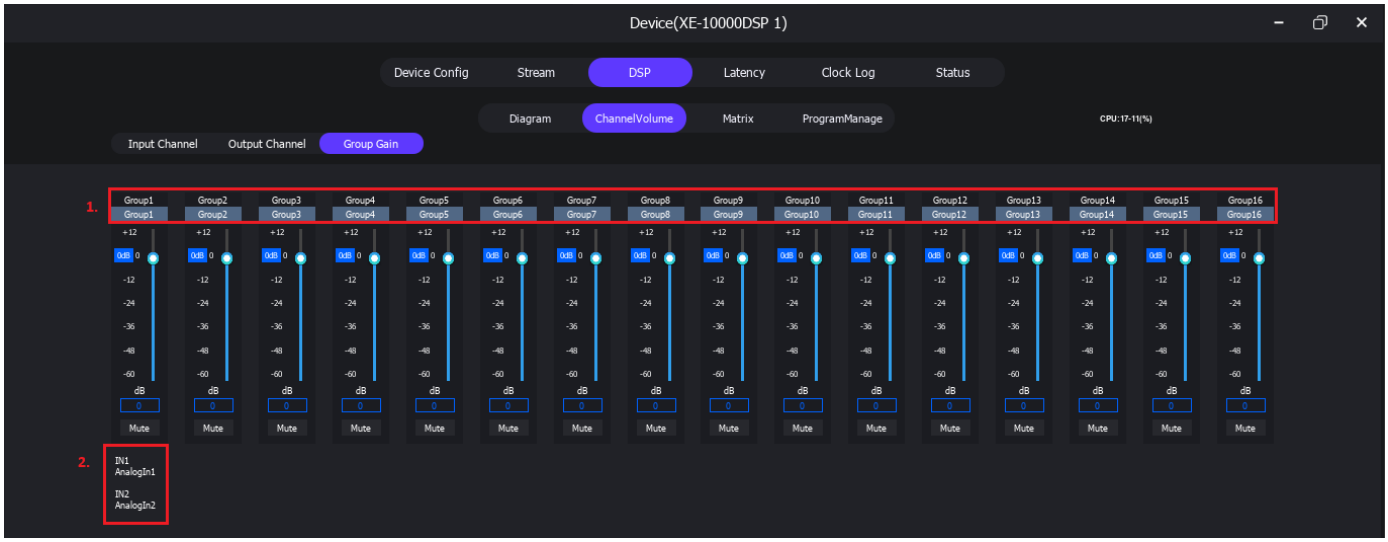
6. You can modify the DSP Feature chain with the `Editor` button.
   (For more details see → 5. Advanced DSP Features)

7. Current CPU usage is shown here. Some DSP functions use more resources then others, but generally using more features on more channels, means higher CPU usage and higher temperatures. Please make sure CPU usage does not exceed 85% for stable use.

4.3.2 ChannelVolume

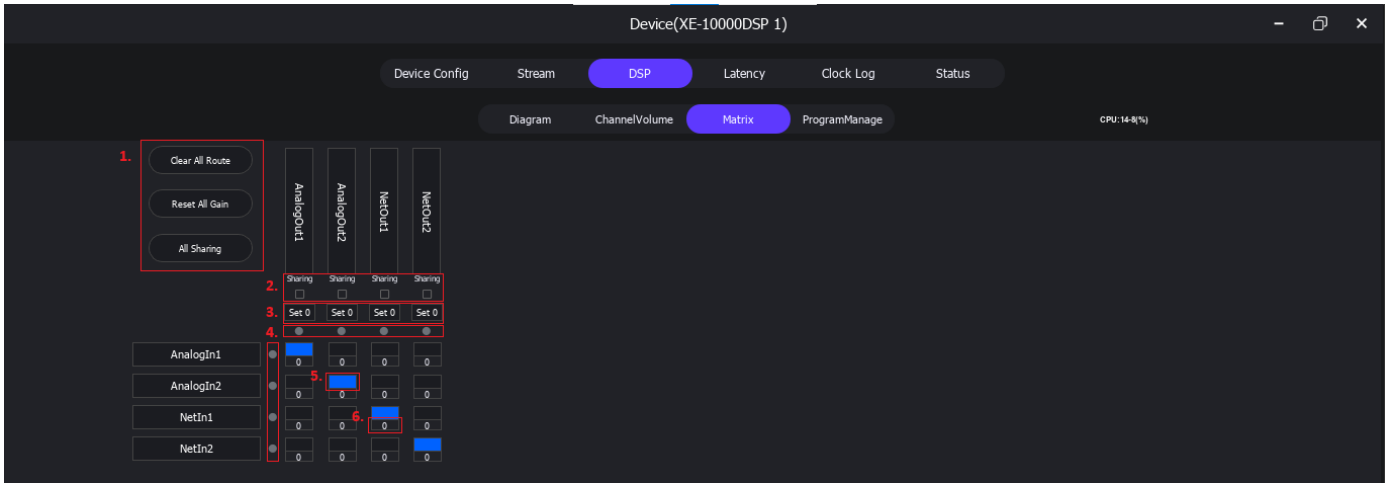


1. Here you can switch between the input, output, and group views.
2. This area represents each channel's name.
3. Here you can see each channel's level in real time.
4. The area represents channel gain, mute, and phase inverse. You can reset the levels to 0dB with the blue button.



1. This area represents each group's name.
2. This area indicates which channels are assigned under the corresponding group.

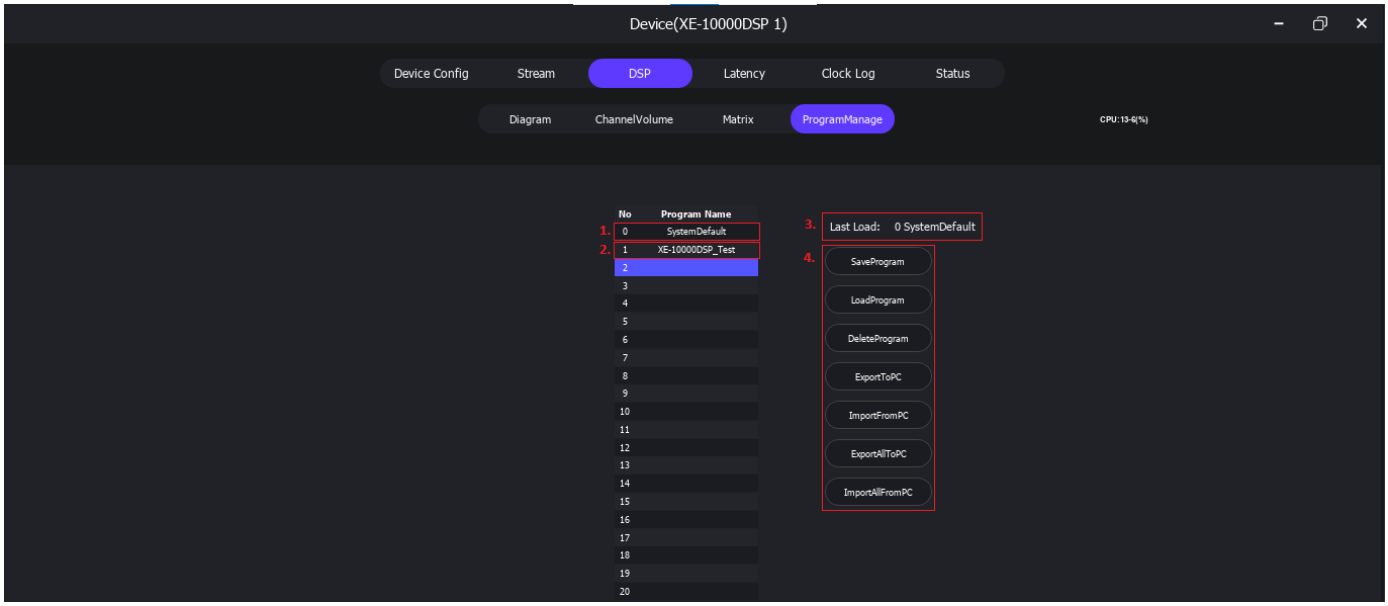
4.3.3 Matrix



1. Shortcut functions for setting parameters in bulk, for all channels.
2. If the *`Sharing`* box is checked, the gain sharing method will be used when multiple input channels are mixed to a single output channel.
3. Gain reset button, that sets the gain of all input channels for the corresponding output channel to 0dB.
4. Level meter display, which makes it easy to check if there's signal present on the input and output channels.
5. Indicating if the corresponding input channel is mixed to the corresponding output channel. (in this case, and by default AnalogIn1 is mixed to AnalogOut1, AnalogIn2 to AnalogOut2 etc.)
6. Shows the gain of the corresponding input channel mixed to the corresponding output channel. You can click it to open an adjustment window.

4.3.4 ProgramManage

This view shows every program that is saved in the device's internal memory.

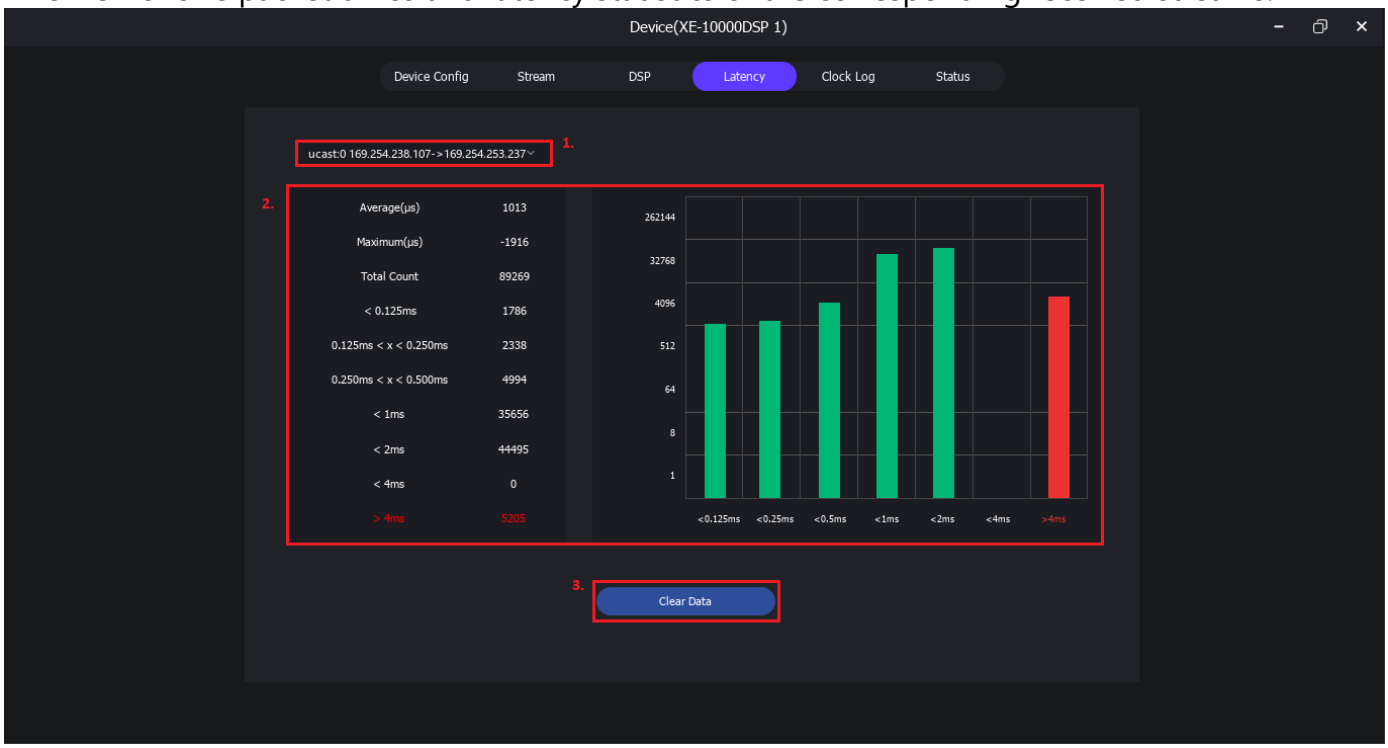


(*Note that after loading a preset and manually adjusting any parameters, the changes are kept, even after a reboot, but are NOT saved automatically to the last loaded program.*
Meaning, if program A is manually loaded and any parameters are modified, the device is shutdown and restarted, the modified parameters will still be in effect, but if program A is loaded again, the modified parameters will be lost.
If you want to save the modified parameters to a program, be sure to manually click `SaveProgram` *and overwrite it to save your changes that can be loaded again!)*

1. The No. 0 Program contains the system default parameters. This program cannot be modified, overwritten, or deleted.
2. From No. 1 to 20 are the user customizable preset slots.
3. This message shows the last loaded preset.
4. This is the management function area. Here you can:
    - `SaveProgram`: Select the corresponding row in the list to save current parameters to a program.
    - `LoadProgram`: Select the corresponding program from the list to load its saved parameters to the device.
    - `DeleteProgram`: Select the corresponding program in the list to delete the program from memory.
    - `ExportToPC`: Select the corresponding program in the list to export the program to a file, stored on your PC.
    - `ImportFromPC`: Select the corresponding row in the list to import a previously exported file into the device. If you select an already existing slot, the software will ask if you would like to overwrite it with the imported settings.
    - `ExportAllToPC`: Bulk export all custom programs to a file, stored on your PC.
    - `ImportAllFromPC`: Bulk import all custom programs from a previously exported file into the device. **Note that this will overwrite every program that is present in device memory, after confirmation!**

4.4 Latency

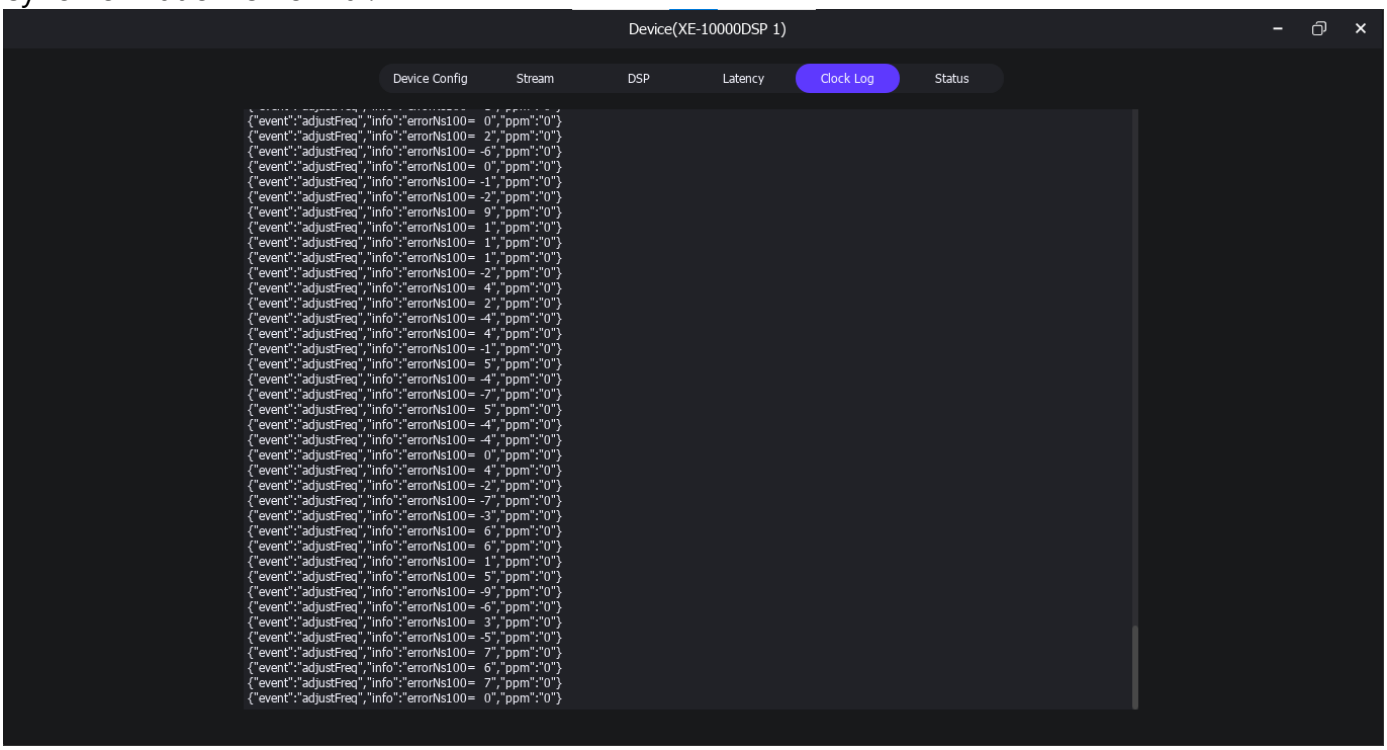
This view shows packet times and latency statistics of the corresponding received streams.



1. Here you can select the stream you wish to monitor, if data is received from multiple devices. If there is only one, that will be selected by default.
2. This area represents statistical data. Before the device is powered on and synchronized, the received data will appear as >4ms, and a red bar. This is normal behavior.
   Right after powering-on, the clock is not yet synchronized. After the power-on state is complete, and the clocks are synchronized, the red bar will no longer increase.
3. This button can clear all currently logged data, so you can perform statistics measurement again from zero.
   Generally, if there are occasional over 4ms late data packets, and the red bar appears, it is due to fluctuations in the network environment, and does not affect sound transmission.
   If there is a continuous increase in red data at intervals, or audible errors in the sound transmission, it indicates abnormal network or device data transmission, and troubleshooting is required. It's recommended to check or modify the `Packet Time` and `Latency` values in 4.1 Device Config.

4.5 Clock Log

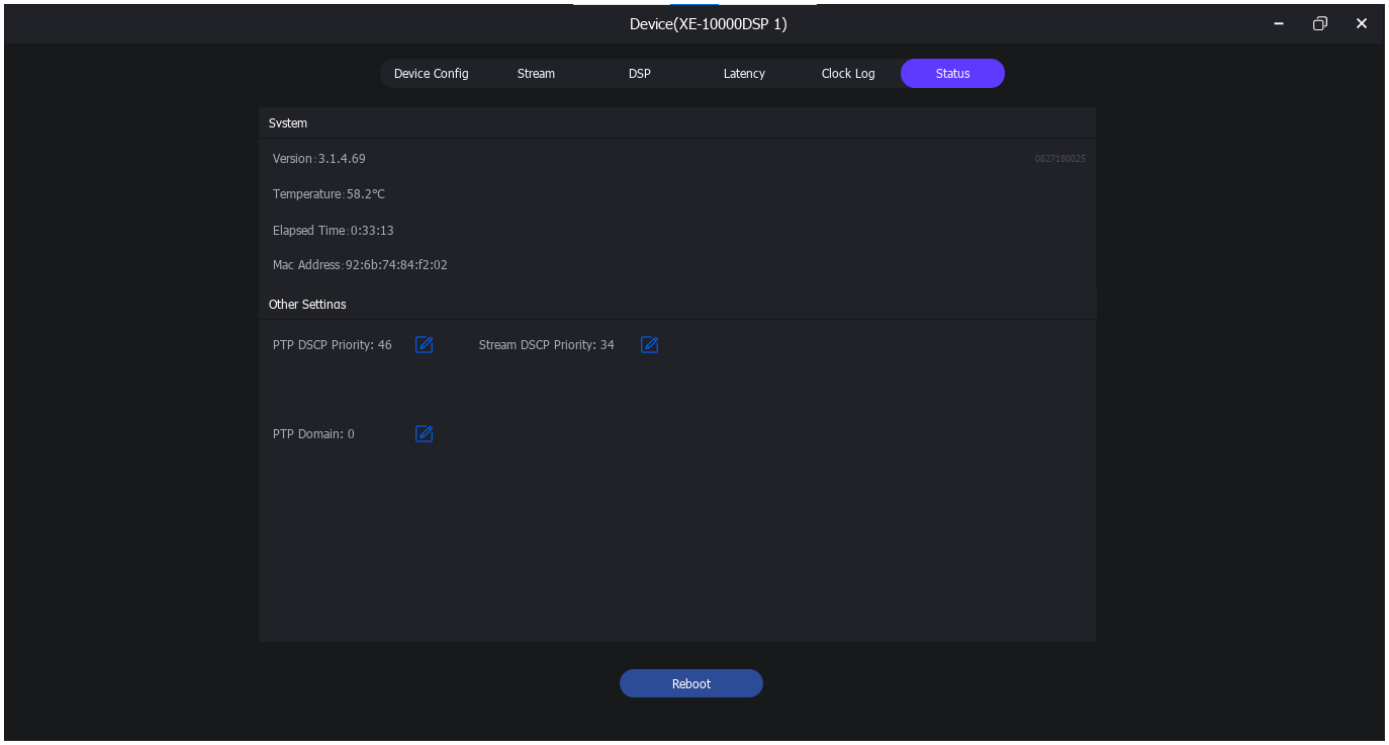
This information is used for device debugging and can be used to check if the clock synchronization is normal.



4.6 Status

This page displays the DSP core's firmware version information, temperature, running time, and MAC address.

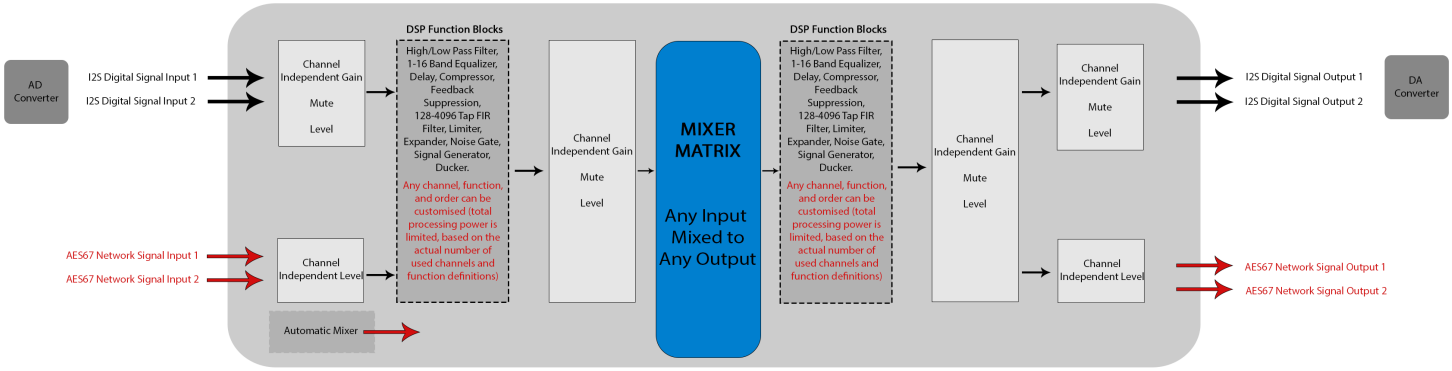
Here you can also set the PTP DSCP priority Stream DSCP Priority and the PTP Domain values with the edit button. Also you can reboot the DSP module, without powering the device.



5. Advanced DSP Features

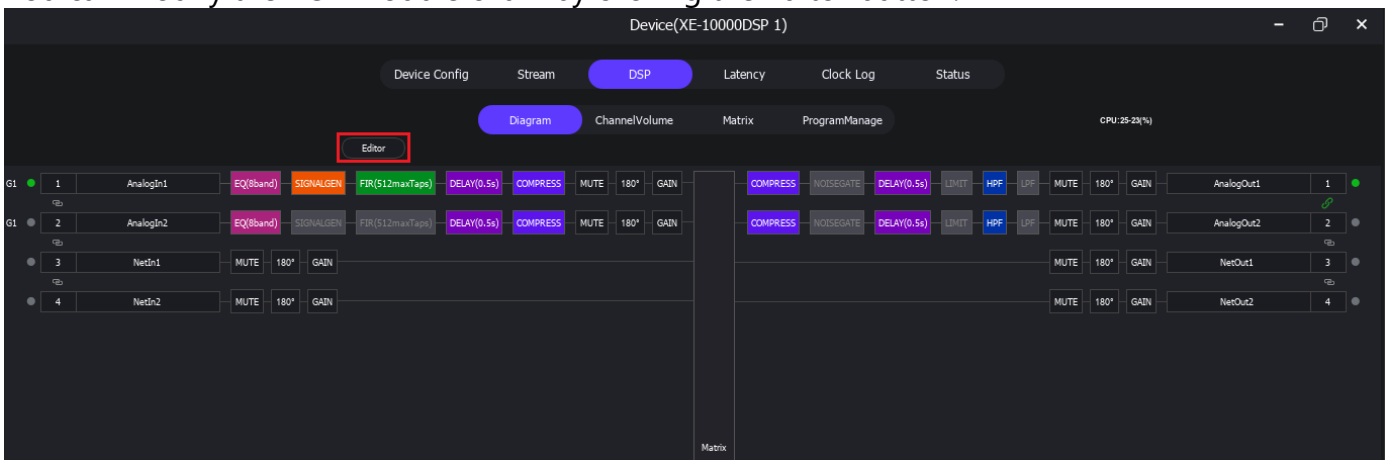
Be sure to read 4.3 DSP before continuing!

5.1 Signal Flow Chart of DSP Module Equipped Devices

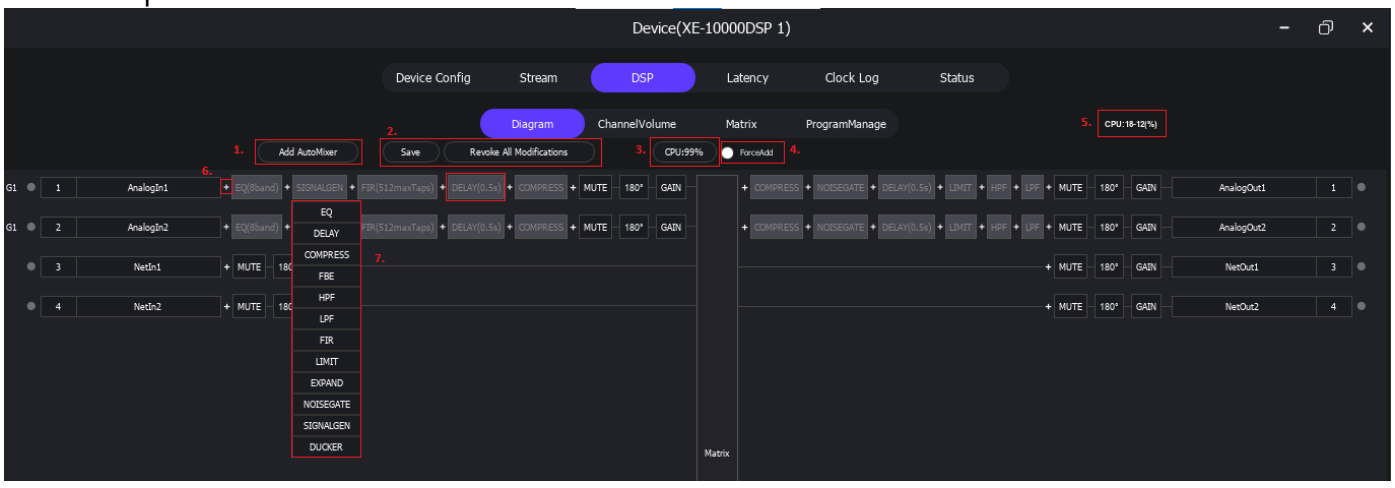


5.2 DSP Editor View

You can modify the DSP module chain by clicking the Editor button:



This will open the chain modification view:



1. You can add an extra Auto Mixer channel to the input channels with this button.
2. Here you can save or cancel your changes made since you clicked the Editor.
3. This shows the predicted maximum CPU usage assessment. The combination of DSP functions should not exceed the maximum CPU occupancy rate.

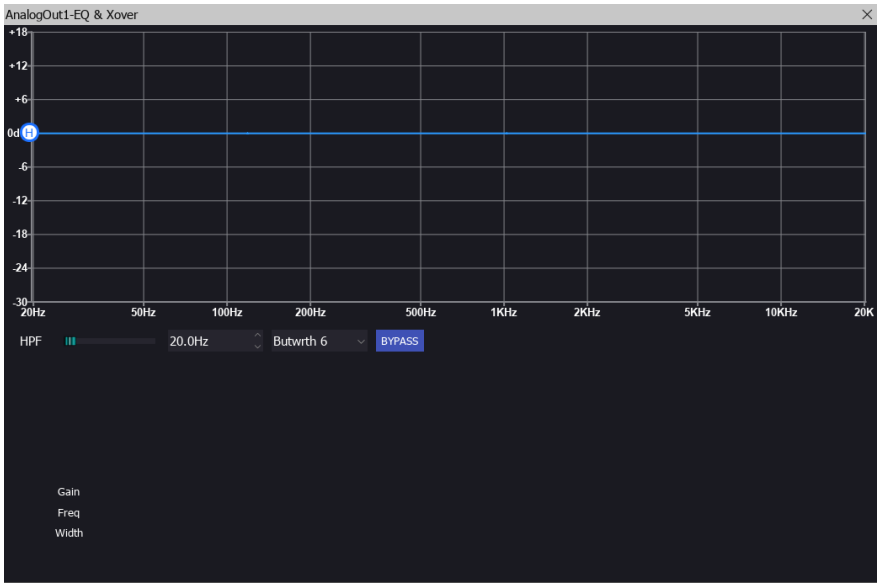
4. However, you can disable the max CPU rate limitation with the `ForceAdd` checkbox. If it's absolutely necessary, you can try adding more than the recommended amount of features to the signal chain, but this requires constant monitoring of the current CPU usage (5.) and temperature levels (under Status or Device Info).(CPU usage should not exceed 85%, and DSP core temperature should not be above 80°C)

   WE DO NOT TAKE ANY RESPONSIBILITY IF THERE IS ANY DAMAGE OR THE DEVICE BECOMES FAULTY DUE TO OVERLOADING THE CPU!
5. Current CPU usage.
6. Click the + button to add a DSP function to the corresponding place in the chain. You can choose any from the list (7.) with limitations for equalization, high pass, and low pass. From these only one can be set for each channel, and they share the same edit window.
   Also for the delay function, all channels share a delay upper limit, depending on your latency settings.
7. The list of DSP Functions that can be added to the chain.

5.3 Detailed Explanation of DSP Functions

These are the modules you can add to any "+" marked places of the signal chain from the Editor menu:

5.3.1 ***HPF*** *– High Pass Filter*

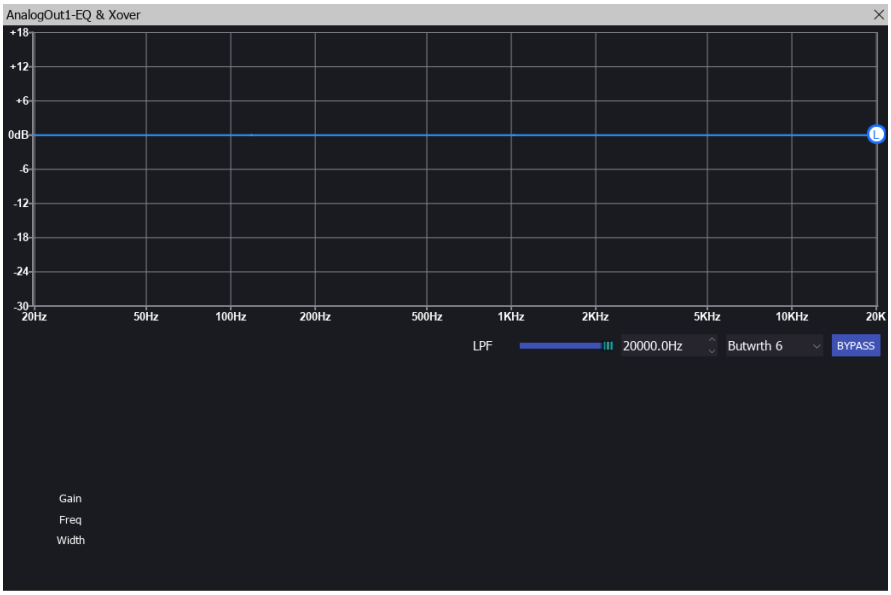


`BYPASS:` Toggle Bypass / Enable of the function.

`HPF:` You can adjust the cutting frequency of the high pass filter with the **`slider`** between 20-19900Hz or typing the value manually between 19.7-20200Hz up to one decimal accuracy.
You can also drag the Ⓗ to adjust the frequency.

`Butwrth 6:` Here you can select the characteristics of the cutting frequency.
The types of filters are the following:
Butterworth (Butwrth): 6/12/24/36/48 dB/oct
Bessel: 12/24/36/48 dB/oct
Linkwitz-Riley (Lnk-Ril): 12/24/36/48 dB/oct

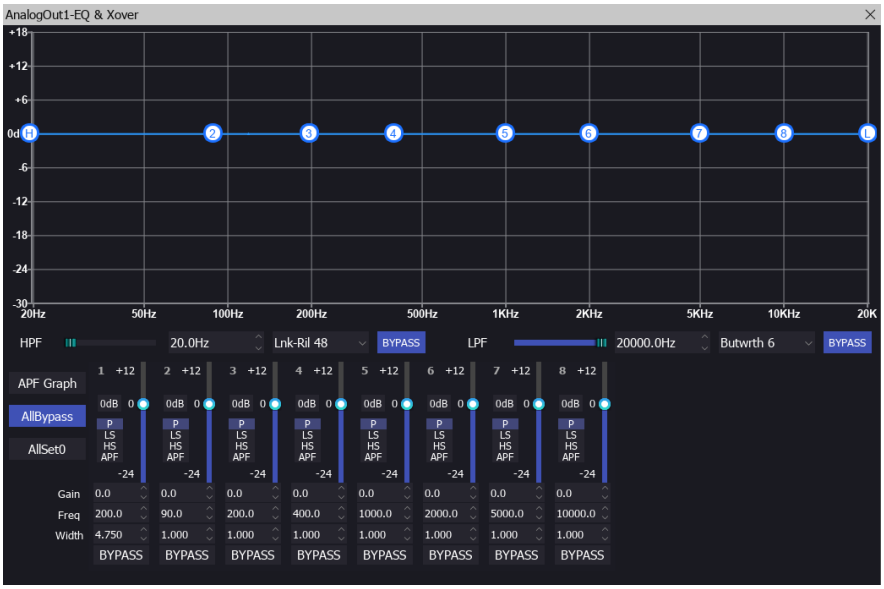
*5.3.2 **LPF** - Low Pass Filter*



Every parameter is modifiable in the same manner as the High Pass Filter.

Note that if both High and Low Pass Filter is present on a channel, they share the same view, along with the Equalizer. Also you can't add more than one LPF, HPF, or EQ to each channel.

*5.3.3 **EQ** - Parametric Equalizer*

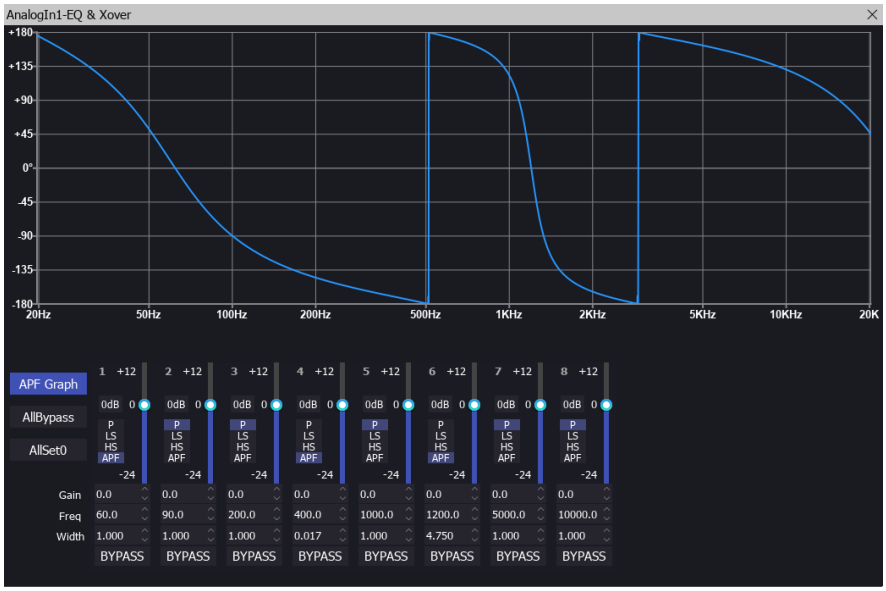


You can enable or disable the EQ with the **`AllBypass`** button. While the EQ is enabled, using a band's **`BYPASS`** button, you can toggle them on or off. This can be useful for an instant, audible, live feedback, of the changes you make.

`EQ Types:` Parametric (**`P`**), Low Shelf (**`LS`**) and High Shelf (**`HS`**)

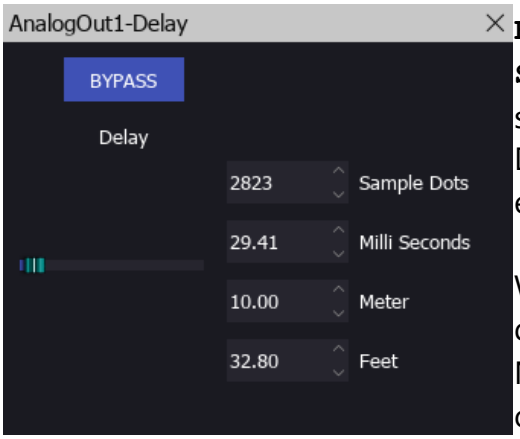
`Gain:` Set the gain of the corresponding channel between -24 and +12 dB
`Freq:` Set the desired frequency in Hz. (Same range as HPF/LPF: 19.7-20200Hz)
`Width:` Set the desired bandwidth for the band. This value can range from 0.017 to 4.75.

To use a band as an All Pass Filter, select the **APF** from the EQ types, then toggle the **APF Graph** view:



Here, only the **Width** and **Freq** parameters are usable, to shift the phase of the chosen frequencies, as the APF Graph shows, between -180 and +180 degrees.

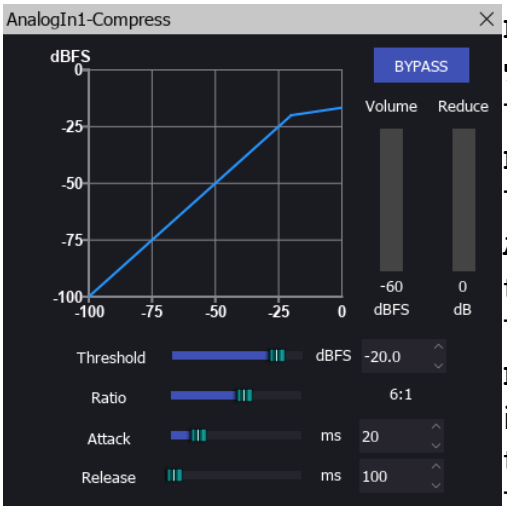
5.3.4 ***DELAY***



BYPASS: Toggle Bypass / Enable of the function.
Sample Dots, **Milliseconds**, **Meter** or **Feet:** You can set the delay time with either of these parameters. Defining a value in any box will automatically calculate every other parameter.

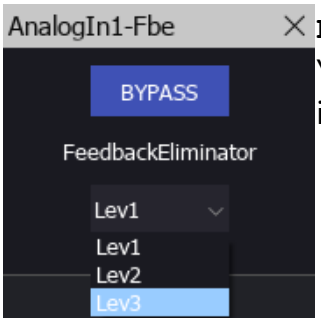
When selecting a delay function, you can set the maximum delay value from **0.1s**, **0.5s**, **1s** or **2s**.
Note, that all channels share a delay upper limit, depending on your latency settings. By default that is 2s.
(For example you can set 4 channels with 0.5s max delay each, but cannot set 2x 0.5s and add 2x 1s, because adding the last would exceed the 2s total.)

5.3.5 ***COMPRESS*** *- Compressor*



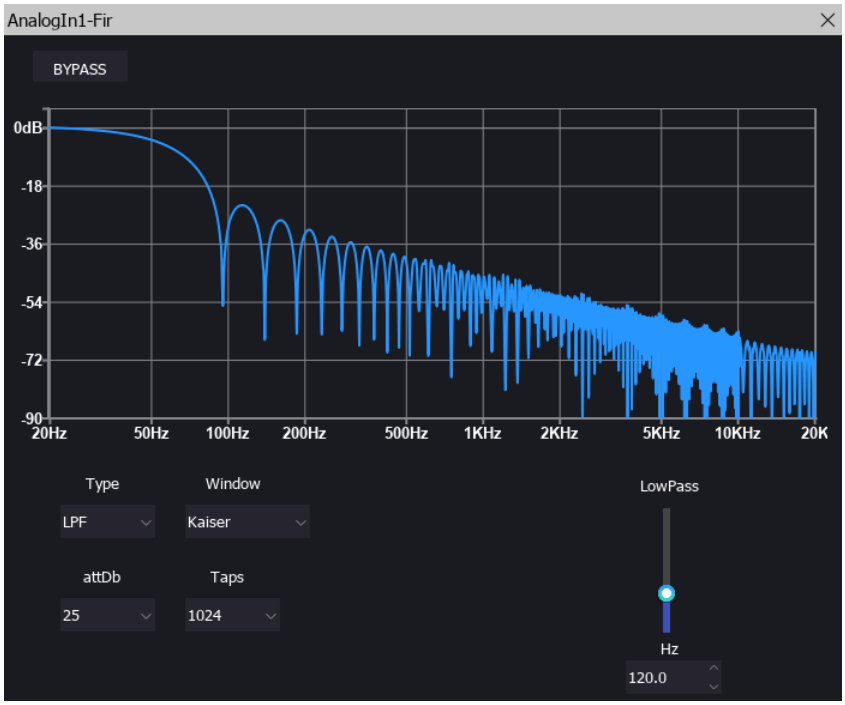
BYPASS: Toggle Bypass / Enable of the function.
Threshold: Set where should the compression take effect.
The value can range between -100 and 0 dBFS
Ratio: Set the compression ratio (slope of the knee).
The value can range between 1.2:1 and 128:1 ratio.
Attack: Set the time, how soon should the compression take effect once the signal is above the given threshold.
The value can range between 1 and 100ms.
Release: Set, how much time has to pass after the signal is below the given threshold, for the compression to return to normal.
The value can range between 100 and 6000ms.

*5.3.6 **FBE** - Feedback Eliminator*



`BYPASS:` Toggle Bypass / Enable of the function.
You can choose between 3 levels. The higher you choose, the more it impacts the signal.

*5.3.7 **FIR** - Finite Impulse Response Filter*

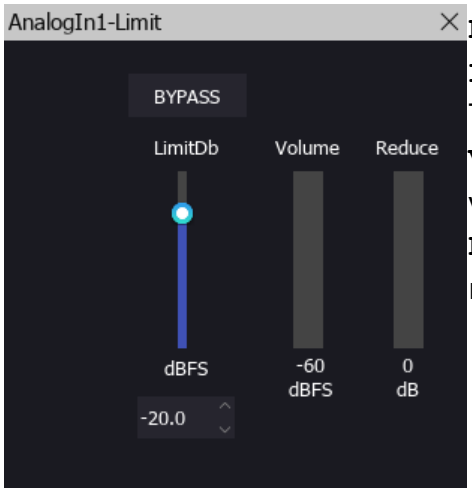


`BYPASS:` Toggle Bypass / Enable of the function.
`Type:` You can select Low Pass Filter (**`LPF`**), High Pass Filter (**`HPF`**), **`Band`** or **`Custom`**
`Window:` If you didn't select a Custom IR, you can set a window for the selected type of filter
The options are: **`Rectangle`**, **`Hanning`**, **`Hamming`**, **`Blackman`** and **`Kaiser`**.
`Taps:` Even though you selected a maximum number of taps when choosing the FIR from the drop down list, here you can still change the resolution of the taps, up to the max value.

IMPORTANT NOTE: Higher number of taps can be tolling on the CPU. Always make sure to monitor the CPU usage when you add any high resolution FIR filters!
(For 4 channels we recommend 512 taps each)

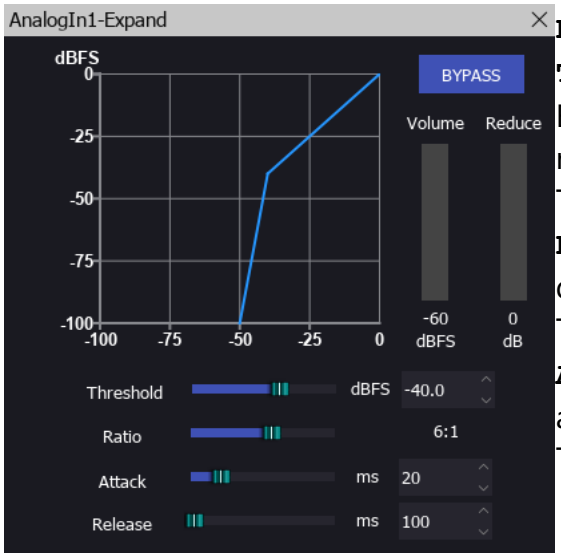
`attDb:` This function is exclusive to the **`Kaiser`** window, as only that has means to modify the attenuation.
The values range from 21 to 120 dB.
`Slider(s):` If the selected type is not Custom, the respective low and/or high frequencies can be set with the sliders, or by typing the values manually.
The values can range: HPF: 20-19999.9Hz | LPF: 20.1-20000Hz | Band: Both HPF and LPF

*5.3.8 **LIMIT** – Peak Limiter*



`BYPASS:` Toggle Bypass / Enable of the function.
`LimitDb:` Set the ceiling for the limiter to take effect from. The values range from 0 to -100dB.
`Volume:` Here you can monitor the current incoming signal volume that the limiter receives (in dBFS).
`Reduce:` This shows how many decibels of volume is being reduced from the signal that is exceeding the limit (in dB).

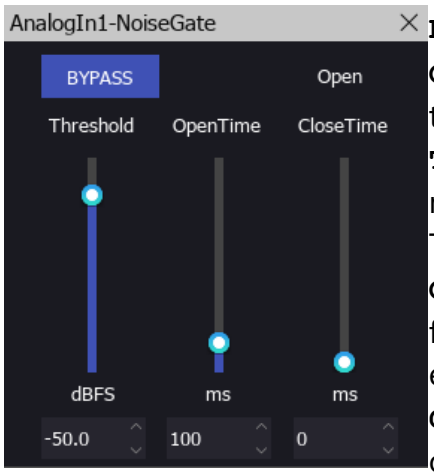
*5.3.9 **EXPAND** - Expander*



`BYPASS:` Toggle Bypass / Enable of the function.
`Threshold:` Set the value from which below the Expander should further lower the volume of the received signal.
The value can range between -100 and 0 dBFS
`Ratio:` Set how much the signal is reduced for every dB it is below the threshold.
The value can range between 1.2:1 and 128:1 ratio.
`Attack:` Set the time how quickly the gain reduction is applied after the signal drops below the threshold.
The value can range between 1 and 100ms.

`Release:` Set the time how long it takes for the signal's gain to return to normal after it goes back above the threshold.
The value can range between 100 and 6000ms.

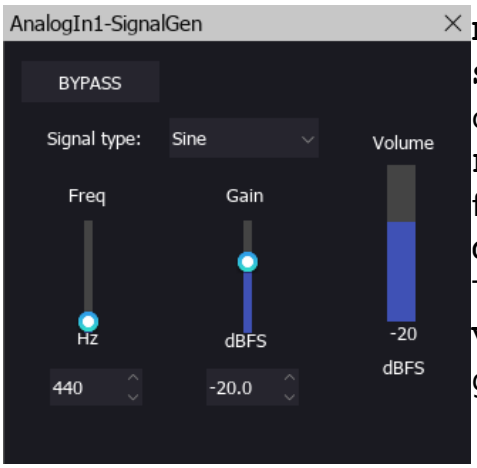
*5.3.10 **NOISEGATE** - Noise Gate*



`BYPASS:` Toggle Bypass / Enable of the function.
`Open/Close:` On the top right, you can see the current state of the Noise Gate.
`Threshold:` Set the value from which below, the signal is muted.
The value can range between -42 and -100dBFS.
`OpenTime` (aka Attack): Set the time it takes for the gate to go from completely closed to fully open after the input signal exceeds the given threshold.
`CloseTime` (aka Release): Set the duration the gate remains fully open after the signal falls below the threshold.

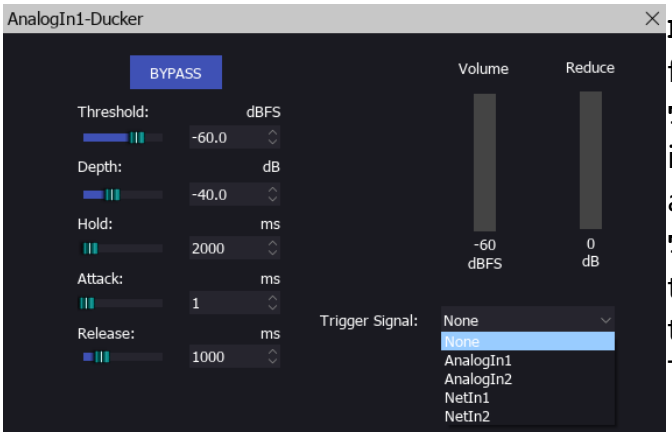
Both Open and CloseTime values can range between 0 and 1000ms.

5.3.11 ***SIGNALGEN*** *- Signal Generator*



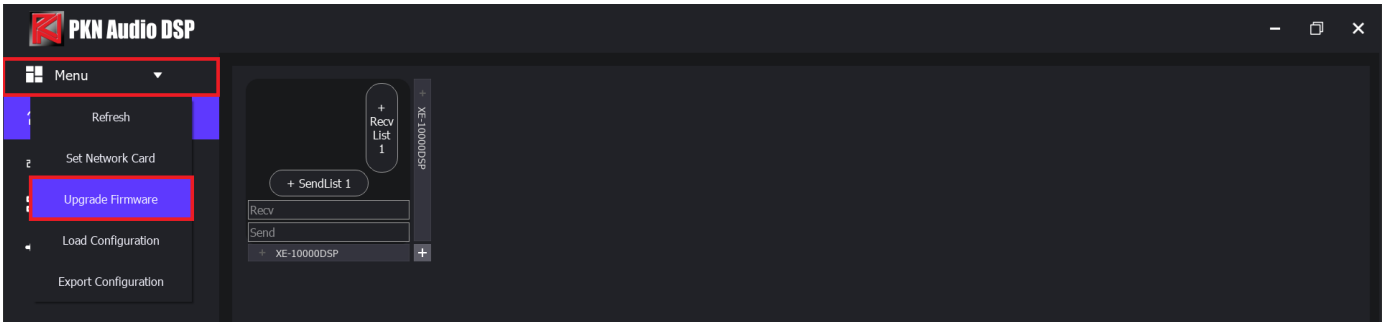
`BYPASS:` Toggle Bypass / Enable of the function.
`Signal Type:` Choose from 3 options: **`Sine`**, **`White Noise`** or **`Pink Noise`**
`Freq:` When **`Sine`** is selected, you can manually change the frequency of the wave from 20 to 20000 Hz.
`Gain:` Set the volume of the selected signal type.
The value can range between 0 and -60dB.
`Volume:` Monitor the current volume on the signal generator's output.

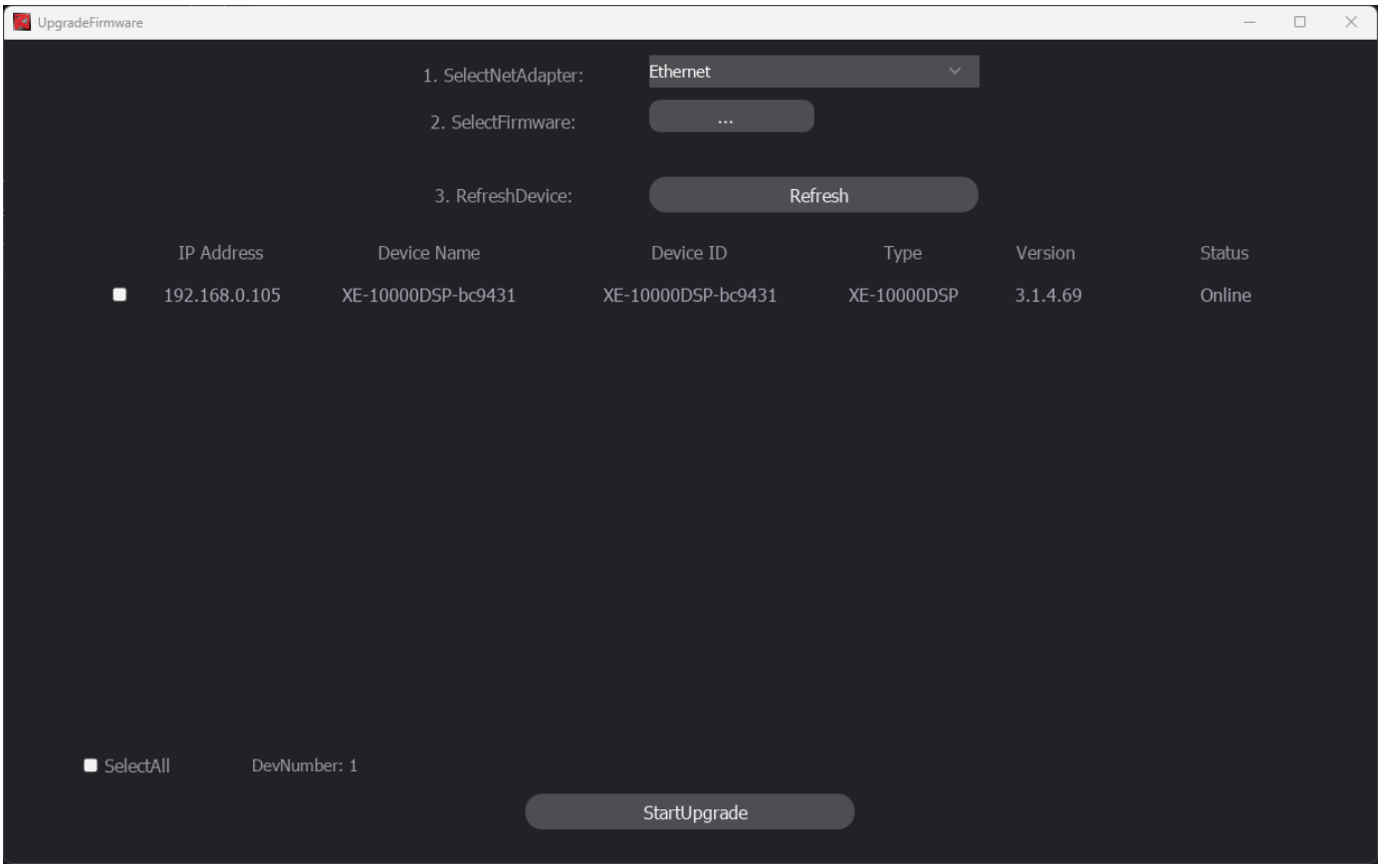
5.3.12 ***DUCKER*** *- Sidechain Attenuation*



`BYPASS:` Toggle Bypass / Enable of the function.
`Trigger Signal:` Choose the sidechain input signal, which will determine the attenuation of the current channel.
`Threshold:` Set the volume that the selected trigger signal source should reach, to activate the attenuation.
The value can range between -80 and -50 dBFS.
`Depth:` Set the value where the volume should be reduced to, once the trigger signal source reaches the given threshold.
The value can range between -60 and 0 dB.
`Hold:` Set how long the signal remains at its attenuated level before the release.
The value can range between 1 and 50000ms.
`Attack:` Set how quickly should the ducker lower the signal volume once the trigger meets the threshold.
The value can range between 1 and 1000ms.
`Release:` The time it takes for the signal to return to its original level, after **`Hold`** time passes.
The value can range between 1 and 5000ms.

6. Firmware Update





Click `Menu → Upgrade Firmware`, to open the firmware upgrade interface:

- `SelectNetAdapter`: For a computer with only one network card, the default selection is correct. If you have multiple network cards, make sure to select the network card corresponding to the upgradable device's local area network, or the device might not show up.
- `SelectFirmware`: Select the firmware upgrade package used for machine upgrade. You can check for updates on our website: http://www.pknaudio.com/XE-DSP/PKNA_DSP_Latest_Firmware.zip
- `RefreshDevice`: If there are no devices listed, use this button to refresh the list.

From the checkbox select which devices you would like to upgrade with the selected package, then click StartUpgrade and wait until the process is finished.
The device will automatically restart after the upgrade is completed.

7. Troubleshooting

- *When the software starts, it prompts that the xxx.dll library is missing!*

The prompt for the lack of most .dll files indicates that the operating system lacks Microsoft runtime libraries. Downloading `Microsoft VC++ runtime library collection` and installing it can solve the problem.

- *The software cannot detect the device!*

-Check if the network card selection is correct, make sure to select the network card in the same local area network as the device.
-Check if the firewall has blocked the software from connection. Be sure you allowed it the first time you started the program.
-Through the firmware upgrade program, check whether the device can be searched. If the firmware upgrade program can search but the software cannot detect it, first check the above two items.
-Check whether the network port LED of the device is flashing. If it's not, be sure to check the hardware.

- *The software can detect the device, but cannot control it!*

-Check whether the network card selection is correct.
-Check whether the IP address of the computer and the IP address of the device are in the same local area network and domain.
-Check whether the computer is set to a fixed IP, resulting in the computer and the device not being in the same local area network.
-Check whether the network is normal with other devices.
-Check the "`Device Info`" menu, to see if the running time can be obtained. If the running time cannot be obtained, check the computer network and switch status (you can check for packet loss with a "ping" command from CMD towards the device's IP).
-Sometimes, when a USB network port adapter is used, there could be problems with poor network connectivity.

- *Firmware upgrade fails!*

-Check whether the network card selection is correct.
-Be sure to select the network card in the same local area network as the device.
-Check whether the firewall has blocked the software.
-If the firewall is enabled, the following programs need to be allowed for network access:

- ***PKNAudioDSP.exe***
- ***AES67Update.exe***
- ***gohttpserver.exe***