Nyquist Matrix Mixer Pre-Amp Configuration Guide

NQ-P0100

BOGEN COMMUNICATIONS, INC.

740-00022F
210419

Contents

List of Figures

List of Tables

Configuring the Nyquist Matrix Mixer Pre-Amp

The Nyquist Matrix Mixer Pre-Amp (NQ-P0100) is a mixer preamplifier that allows microphone, AES3 digital, and line-level source inputs to be integrated into a Nyquist system. These input sources can then be routed to any endpoint or group of endpoints on the network for paging or audio distribution.

You can let the Nyquist server automatically discover and configure the Matrix Mixer Pre-Amp, or you can manually configure it through the Matrix Mixer Pre-Amp's web-based user interface (web UI).

A short press of the appliance's **Reset** button reboots the device. If you press the **Reset** button for 10 seconds, the appliance returns to the factory default configuration settings. Returning to the default configuration settings does not change the appliance's firmware.

The following sections describe settings and configurations that can be applied to this device which are not controlled by the Nyquist server. For information about using Nyquist's automatic configuration process, refer to the *Nyquist System Administrator Guide*.

Note: Do not use third-party Chrome browser extensions with the Nyquist user interface.

To access the appliance's UI:

1. Access the appliance's web UI by doing one of the following:
   a) On your web browser, enter the IP address for the appliance as the URL.
   b) From the Nyquist web UI navigation bar, select **Stations**, select **Stations Status**, navigate to the device that you want to configure, and then select the **Link** icon.

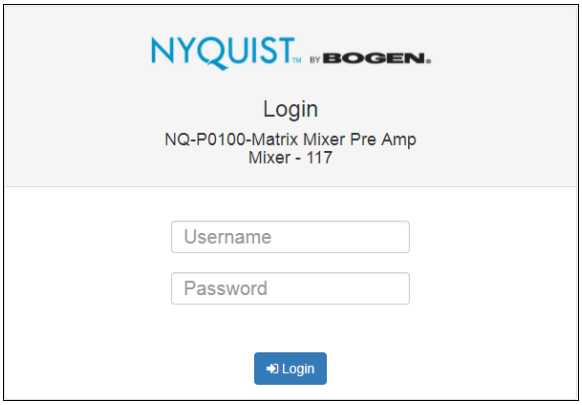

Figure 1. Nyquist Appliance Login

2 At the Nyquist Appliance Login page, enter username and password, and then select **Login**.

The default username is **admin**; the default password is **bogen**.

The dashboard for the selected appliance appears.

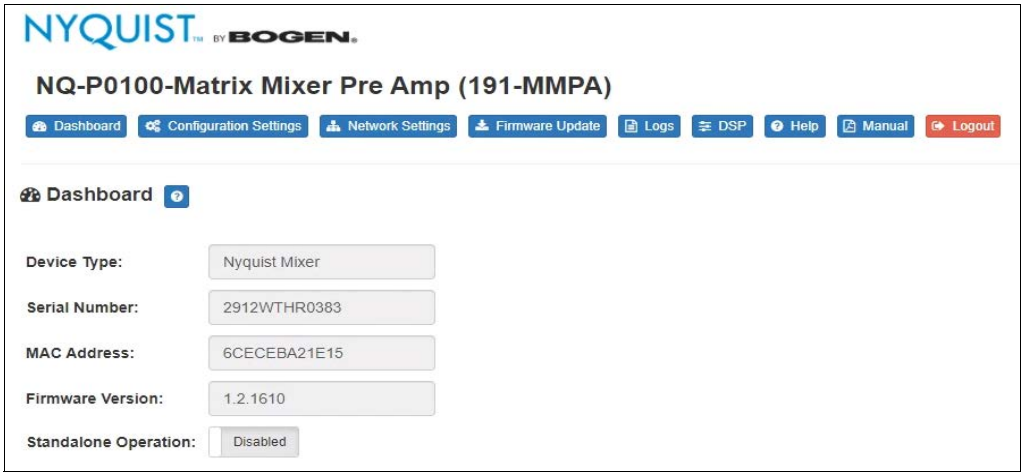

Figure 2. Matrix Mixer Pre-Amp Dashboard

Using the Dashboard

The dashboard displays the following fields:

Table 1. Appliance Dashboard Fields

Device Type	Identifies the model of this device.
Serial Number	Identifies the serial number for the device.
MAC Address	Specifies the Media Access Control (MAC) address, which is a unique identifier assigned to network interfaces for communications on the physical network segment.
Firmware Version	Provides the firmware version installed on the station.
Standalone Operation	Enables or disables Standalone mode.

The following buttons are available at the top of all pages in the application.

Table 2. Appliance Dashboard Buttons

Dashboard	Displays the dashboard.
Configuration Settings	Accesses the Configuration Settings page, where you can view and set various options. If Standalone Operation is not enabled, you can also receive configuration settings from a Nyquist server.
Network Settings	Accesses the Network Settings page where you can view and set network settings, such as the static IP address.
Firmware Update	Accesses the Firmware Update page where you can view the current Nyquist version, update firmware to a new version, restore the configuration to factory defaults, and reboot the appliance.
Logs	Accesses log files, which record either events or messages that occur when software runs and are used when troubleshooting the appliance.
DSP	Accesses the DSP page where you can view and set parameters for Digital Signal Processing (DSP).
Help	Accesses the appliance's online help.
Manual	Displays the Nyquist Matrix Mixer Pre-Amp Configuration Manual.
Logout	Logs out of the appliance's dashboard.

Standalone Operation

This device can run in Standalone Operation mode, where it will not interact with a Nyquist server (e.g., E7000 or C4000). This means the device will not:

- Fetch device configuration from Nyquist server
- Register with Nyquist server (via SIP)
- Store backup information to Nyquist server
- Allow access to Nyquist server-based NTP

Standalone Operation mode is ideal for scenarios that do not require the full functionality provided by an integrated system, such as the Bogen C4000 or E7000 Series, but has the

ability to provide paging, multi-channel audio processing, and a SIP endpoint for a PBX/ VoIP phone system. It can be used to play music, audio, paging, and related functions.

Updating Firmware

When you select **Firmware Update** from the appliance's web UI, the Firmware Update page appears. From this page you can determine which Nyquist version the appliance is using and if an update is required. You can also use this page to restore the configuration to factory defaults and to reboot the appliance.

Note: A Nyquist appliance connected to the Nyquist network receives a configuration file from the Nyquist server that includes the latest firmware available from the server. If the firmware is later than the one installed on the appliance, an automatic firmware update occurs unless the **Firmware** parameter for the station is left blank. Refer to the *Nyquist System Administrator Guide* for more information.

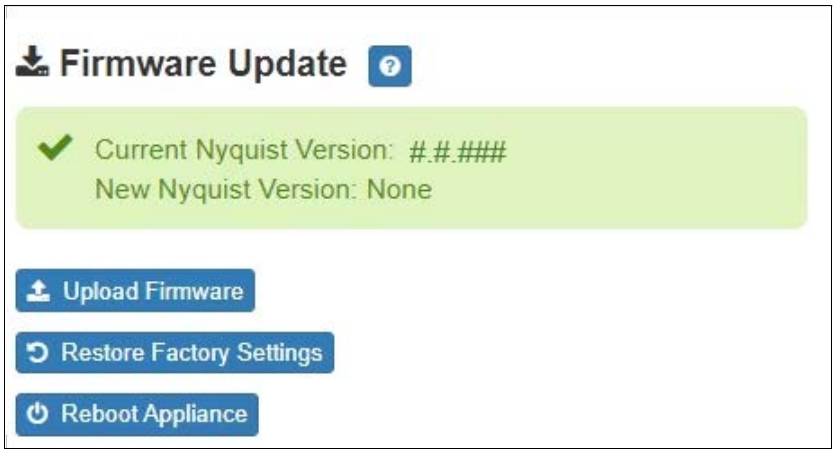

Figure 3. Firmware Update Page

To use the Firmware Update page:

1. On the appliance web UI's main page, select **Firmware Update** to ensure you have the latest firmware version.
2. Select **Upload Firmware** to upload a firmware file from your computer to the appliance.

   If you select this option, a popup screen appears that allows you to select the file that you want to upload. You can navigate to the file's location. After you select the file,

select **Upload**. The page displays the uploaded firmware version and an **Update Firmware** button appears. Select this button if you want to update the appliance's firmware to the uploaded version.

3. If you want to return your appliance to its original configuration, select **Restore Factory Settings**.
4. Select **Reboot Appliance** to restart your appliance.

Network Settings Tab Parameters

Network settings can be configured dynamically by the Nyquist server or manually by using the appliance's web UI.

To manually configure network settings:

1. On the appliance web UI's main page, select **Network Settings**.
2. Select your desired network settings.
3. Select **Save**.

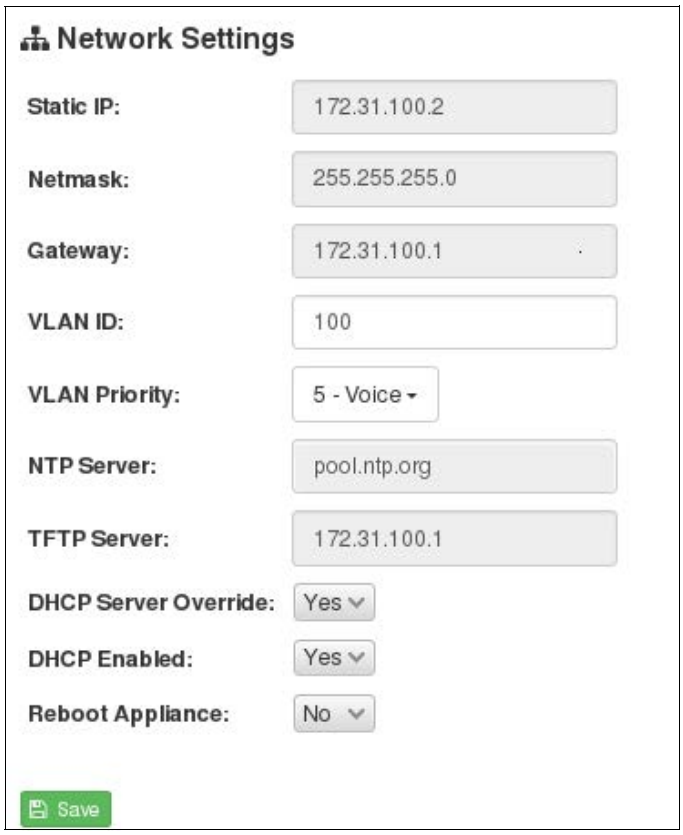

Figure 4, Network Settings

Network settings are described in the following table:

Table 3, Network Settings

Static IP	Identifies the IP address assigned to the appliance.
Netmask	Identifies the subnetwork subdivision of an IP network.
Gateway	Identifies the address, or route, for the default gateway.
VLAN ID	Identifies the Virtual Local Area Network (VLAN) for this appliance. Values range from 0 to 4094.
VLAN Priority	Identifies the priority of the network traffic on the VLAN. Priority can range from 0 through 7.

Table 3, Network Settings (Continued)

NTP Server	Identifies the IP address or the domain name of the Network Time Protocol (NTP) Server. *Note:* This field is only editable when Standalone Operation is enabled.
TFTP Server	Identifies the host name or IP address of the Trivial File Transfer Protocol (TFTP) server. The specified TFTP server can be used to automatically set this device's **Configuration** settings via the **Get Configuration from Server** button. If **DHCP Server Override** (see below) is set to "Yes", this value will be auto-configured via DHCP option 66, assuming the DHCP server has been configured to provide option 66. For details, see the documentation for your DHCP server. *Note:* A TFTP server runs on the Nyquist server on port 69 (the standard TFTP port) and the optional Nyquist DHCP service automatically provides this TFTP address via option 66. *Note:* If this value is unspecified, the **DHCP Server Override** will automatically be set to "Yes", this field will become read-only, and DHCP will be used to configure this setting. To change this value, the **DHCP Server Override** setting must be set to No, which makes the field editable. *Note:* This setting is not available when Standalone Operation is enabled.
DHCP Server Override	"Yes" means the device will use the DHCP option 66 value to retrieve an address for the TFTP Server from DHCP. "No" means the device will ignore the DHCP option 66 value and use the manually configured value of the TFTP Server (see above). *Note:* This setting is not available when Standalone Operation is enabled.

Table 3, Network Settings (Continued)

DHCP Enabled	Indicates if the device is enabled to use DHCP to retrieve its IP configuration.
Reboot Appliance	Indicates that this appliance should reboot when the Save button is clicked.

Configuration Settings Tab Parameters

The easiest way to configure Nyquist appliances is to obtain configuration settings from the Nyquist server by selecting **Get Configuration From Server**. However, you can manually configure an appliance through the appliance's Web UI when Standalone Operation is enabled (see *"Standalone Operation Configuration Settings" on page 11*).

To manually configure your Nyquist appliance:

1. On the appliance Web UI's main page, select **Configuration Settings**.
2. Select or view the settings as described in Table 4 on page 10 for normal configuration, or Table 5 on page 12 for Standalone Operation configuration.
3. Select **Save**.

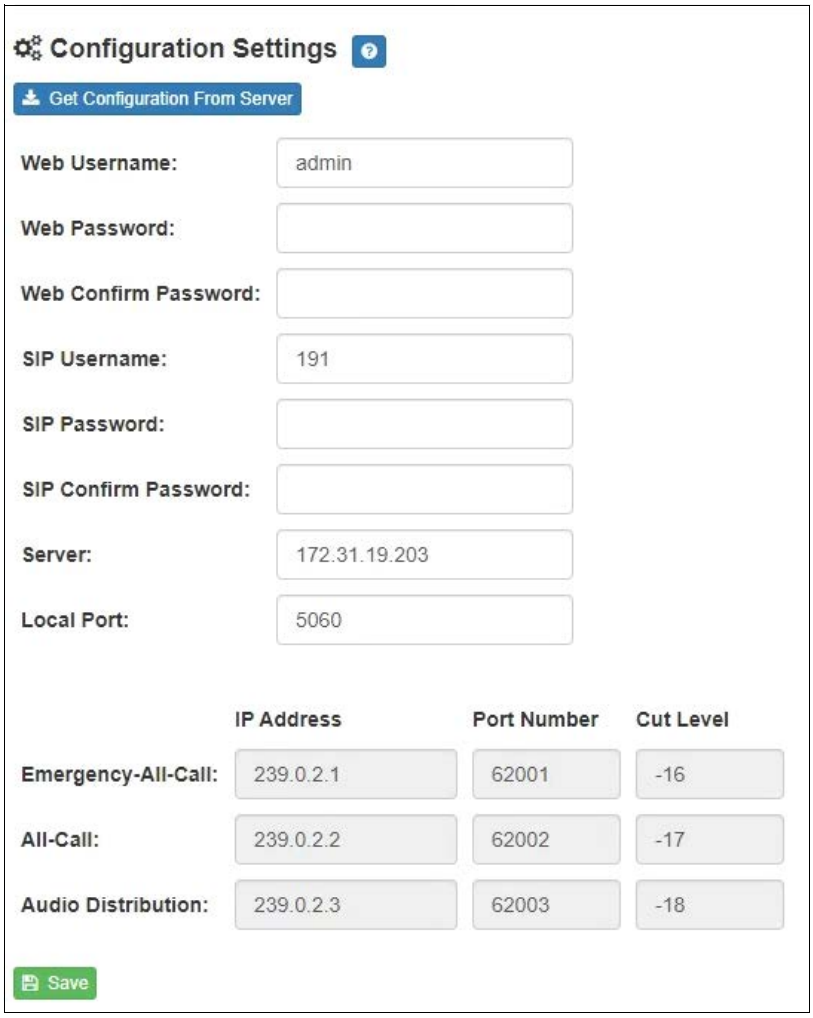

Figure 5. Appliance Configuration Settings (Standalone disabled)

The following table describes the **Configuration Settings** tab settings:

Table 4. Configuration Settings (Standalone disabled)

Get Configuration from Server	Retrieves configuration settings (i.e., web username, server, and local port) from the TFTP server specified in the Network Settings (see Table 1 on page 1).
Web Username	Provide a web username for this appliance.
Web Password	Provide a web password for logging into the appliance.
Web Confirm Password	Re-enter the web password for logging into the appliance.
SIP Username	Provide the username used for Session Initiation Protocol (SIP) device registration.
SIP Password	Provide the password used for SIP device registration.
SIP Confirm Password	Re-enter the password used for SIP device registration.
Server	Identifies the IP address of the Nyquist server.
Local Port	Identifies the local port to be used for SIP communications.
Emergency-All-Call	Identifies the IP address, port number, cut level (volume), and station list used for emergency all-call pages.
All-Call	Identifies the IP address, port number, cut level (volume), and station list used for all-call pages.
Audio Distribution	Identifies the IP address, port number, cut level (volume), and station list used for audio distribution.
Multicast #	Identifies the IP address, port number, cut level (volume), and station list used for the multicast audio stream of one (or more) zones.

The **Configuration Settings** tab also displays the following information for each **Device Station** attached to the amplifier:

Port Number	Shows the output port/channel number of the appliance.
Port Type	Shows the device type to which the port connects.

Account ID	Shows the SIP account (IP address) associated with the device preceded by the extension of the device associated with this port.
Local Port	Shows the port used for SIP.
Username	Shows the username or extension for the station associated with the port.

Standalone Operation Configuration Settings

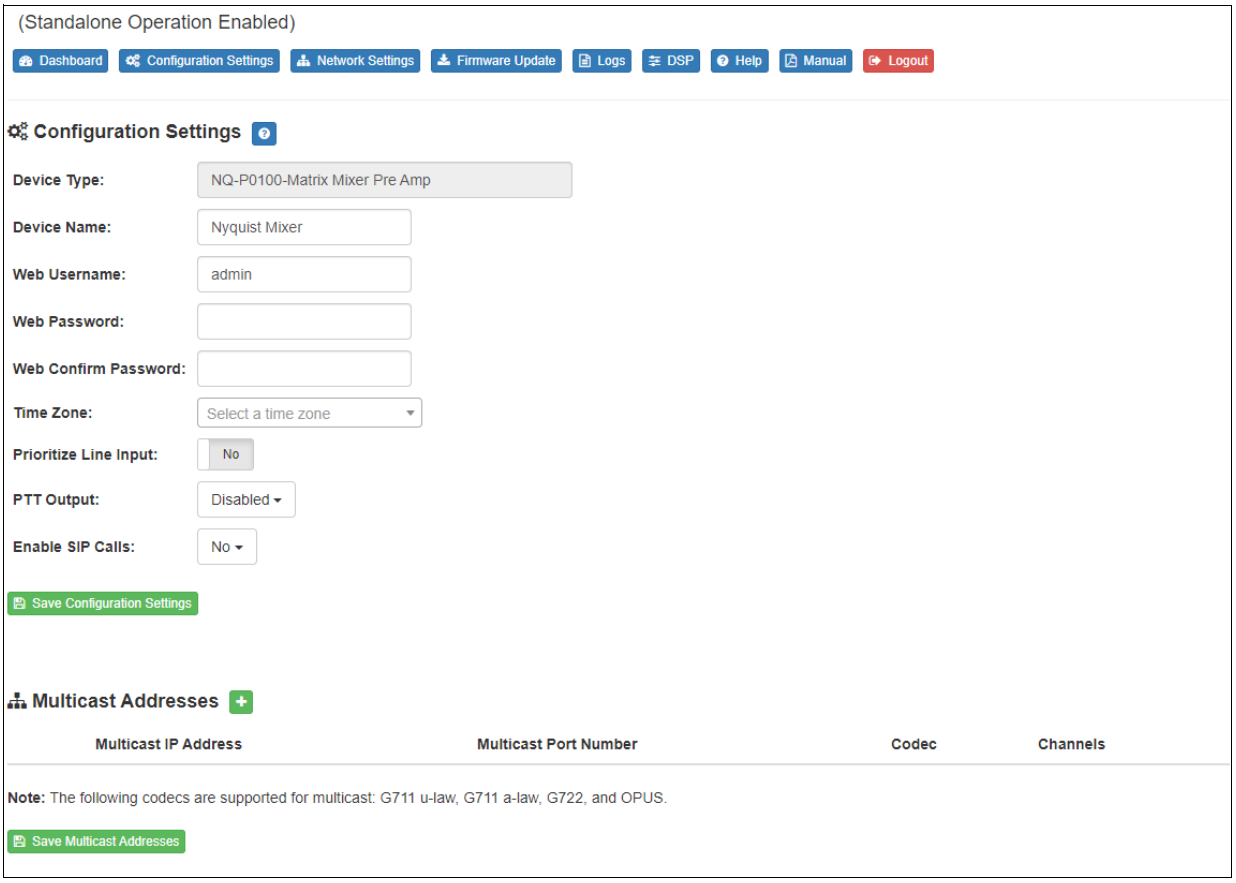

Figure 6. Appliance Configuration Settings (Standalone enabled)

The following table describes the Configuration tab settings when Standalone Operation is enabled for this device:

Table 5. Configuration Settings (Standalone enabled)

Device Type	Displays the type of this device.
Device Name	Provide a name for this device.
Web Username	Provide a web username for this appliance.
Web Password	Provide a web password for logging into the appliance.
Web Confirm Password	Re-enter the password used to log into the appliance.
Time Zone	Select the time zone in which the device resides.
Prioritize Line Input	Yes or No If a channel simultaneously receives input signals from both a network input and a line input, "Yes" means the line input is used, "No" means the network input is used.
PTT Type	Specifies whether the output from a connected Push-to-Talk (PTT) microphone is controlled by the DSP Router configuration or by the **PTT Output** configuration (below). Select one of the following values: • None • DSP Controlled
PTT Output	Specify the output port to which the PTT microphone signal (from line input 4) will be sent. Select one of the following values: • None • Line Out
Enable SIP Calls	Enables this device to receive one-way SIP calls, wherein only the caller can be heard (such as announcements). If enabled, a number of SIP-related configuration settings are displayed.
SIP Server Address	Specify the IP address of the SIP Registration Server with which the device will register.
SIP Codecs	Displays a read-only list of codecs allowed on SIP sessions.

Table 5. Configuration Settings (Standalone enabled)

SIP Extension	Specify the SIP extension corresponding to the Line Out channel. The extension, along with the IP address, is used to specify the URI used to place a SIP call to this extension: sip:<extension>@<local_ip_address>
SIP Network Port	Specify the IP port on which the Line Out channel will communicate (typically 5060).
SIP User Name	Specify the SIP user name used to register the Line Out channel with the SIP server.
SIP Password	Specify the SIP registration password used to register the Line Out channel with the SIP server.

The following parameters appear for each Multicast Address configured for this device.

Multicast IP Address	The multicast IP address on which to receive audio streams.
Multicast Port Number	The multicast port on which to receive audio streams.

Codec	The codec to be used when decoding audio. Select one of the following values:
	• G711 u-law
	  • A narrowband audio codec that provides toll-quality audio at 64 kbps. The u-law version is primarily used in North America and Japan.
	• G711 a-law
	  • A narrowband audio codec that provides toll-quality audio at 64 kbps. The a-law version is primarily used in most countries outside of North America and Japan.
	• G722
	  • A wideband audio codec operating at 48, 56, and 64 kbps.
	• OPUS
	  • An audio codec format designed for speech and general audio, supporting low latency, constant and variable bitrate encoding (6 kbps to 510 kbps), and five sampling rates (from 8 kHz to 48 kHz).

Channels	Specifies to which channel(s) the multicast audio will be output. Only one option is available for this device: • Line out

Note: Multicast Addresses should be ordered by priority, highest priority first. If multiple streams are active simultaneously, the one with the highest priority will be played.

Note: A maximum of 24 multicast entries is supported.

Accessing Log Files

A log file records events and messages that occur when software runs, to be used when troubleshooting the appliance. From the appliance's web-based UI, log files can be viewed directly or exported via download to your PC, Mac, or Android device, where they can be copied to removable media or attached to an email for technical support.

To view a log file:

1. On the appliance Web UI's main page, select **Logs**.
2. From the drop-down menu, select the log that you want to view.
   Multiple versions of the same log, and zipped copies of the log, may be available.
3. To export the file, select **Export**.
   A link to a .txt file appears in the browser's lower left corner.

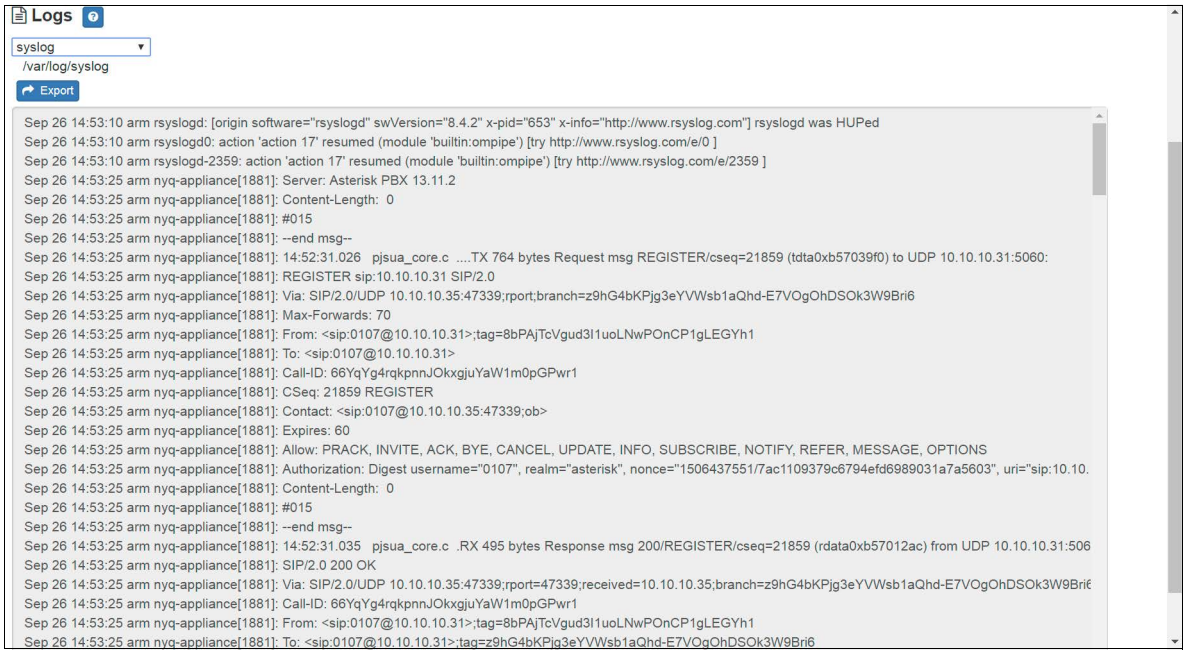

Figure 7, Logs

Available logs are described in the following table. If a log file is empty, however, it will not appear in the drop-down list of available logs.

Table 6, Logs

Log	Description
ampws.log	Contains information about protection status and logs protection events with temperature information at the time of event.
auth.log	Contains system authorization information, including user logins and authentication methods that were used.
btmp	Contains information about failed login attempts.
daemon.log	Contains information logged by the various background daemons that run on the system.
debug	Contains errors and debug information.
dpkg.log	Contains information that is logged when a package is installed or removed using dpkg command.
faillog	Contains user failed login attempts.
kern.log	Contains information logged by the kernel and recent login information for all users.
lastlog	Contains information on the last login of each user.
messages	Contains messages generated by Nyquist.
php5-fpm.log	Contains errors generated by the PHP script.
syslog	Contains list of errors that occur when the server is running and server start and stop records
user.log	Contains information about all user level logs.
wtmp	Contains historical record of users logins at which terminals, logouts, system events, and current status of the system, and system boot time.

Setting DSP Parameters

When you select **DSP** (Digital Signal Processing) from the appliance's web UI, the DSP page appears. This page presents a mixing board interface, allowing you to monitor, control, and perform DSP operations on the signal of the input and output channels.

Note: Digital Signal Processing (DSP) refers to the digital operations that are performed to modify or control the digital signal.

The signal for a channel can come from either of two sources:

1. An analog line input signal
2. A digital VoIP audio stream or multicast audio

The level of an analog line input signal can be adjusted via the mixer's Input Gain control. The analog signal is then converted to a digital signal, after which its level is then controlled using the slider control.

Digital VoIP audio streams received over the network, either as SIP-initiated phone calls or as multicast audio (see SIP and Multicast configuration settings in *"Configuration Settings Tab Parameters" on page 8*), are controlled by the mixer's Network input channel (Input 5).

> *Note:* The network channel, Input 5, controls the levels and DSP processing for the received network audio streams, while the Output channel controls the output levels and final DSP processing of the output signal. Keep in mind that the output channel may include other signals that have been sent via the DSP Router to those output channels, such as the signals from Inputs 1 through 4 (though network audio streams take precedence over the analog signals from Inputs 1 through 4).

Each digital signal, regardless of the source, is conditioned, filtered, and enhanced via the DSP processors, and its level adjusted via the mixing board's slider controls. The processed signal from each channel is then routed to the Output channel according to the DSP Router configuration (see *"Adjusting Router Settings" on page 38*).

The digital output of all channels that are routed to the Output channel are digitally merged, processed according to the output channel's DSP settings, and ultimately converted to an analog signal and sent to the output connectors. Signals that are routed to the Network output channels via the DSP Router can be sent as digital audio to the network using a Nyquist server's Audio Distribution feature.

Note: Audio Distribution functionality requires a Nyquist server and is not supported in Standalone Operation mode.

Figure 8. DSP Page

The DSP page displays a mixing board console containing five input strips and one output strip. Each strip controls the audio signal for a given channel, providing muting, input/output levels, signal processing, and more. Signal processing includes traditional audio processing, such as compressors, noise gates, equalizers, and more. There are some differences between the controls available for different channel types (e.g., output channels do not have input gain controls), but they otherwise operate very similarly.

This console can be used to do the following:

- View **Signal** and **Clip** indicators for each channel.
- Set the channel level for input and output channels.
    - The Input 1, 2, 3, and 4 sliders control the output levels at which the digitized signal from the four analog input channels will be sent to the network devices, Line Out, and Speaker Out channels (subject to Router settings).
    - The Input 5 slider controls the output level at which the signal from the network input channel will be sent to the Output channel.
    - The Output slider controls the overall level of the Output channel.
- Apply DSP features to the signal of each input and output channel individually.
- Specify whether each analog input channel uses **Line** or **Mic** input. For Input 1, **AES** is also a digital input option. (See *"Selecting Input Type, Input Gain, and Phantom Power" on page 22*.)

- Adjust **Input Gain** level for each analog input channel. (See "*Selecting Input Type, Input Gain, and Phantom Power" on page 22*.)
- Control **Phantom Power** for any channel using **Mic** as the input. (See "*Selecting Input Type, Input Gain, and Phantom Power" on page 22*.)

Selecting the DSP Features button at the top-right corner of a channel displays a menu of DSP features for that channel. Each channel, both input and output, has its own associated menu, and the corresponding DSP features will be applied to the signal for that particular channel.

The various mixer controls, as well as the DSP features available via the DSP Features menu, are briefly described in the following table and will be discussed in more detail in subsequent sections.

Note: The DSP page (including the mixing board and other DSP pages) can only be used by one browser session at a time. If another session is already connected and using this DSP page, the mixing board displayed will be disabled.

Table 7. DSP Page

Save Settings to Server	Backs up the DSP settings to the server. If this device is later replaced or reset to factory defaults, these DSP settings can be restored when the new device is "swapped" for the old on the Nyquist server. *Note:* This button appears on each DSP feature page.
Mute	Silences the audio for the selected channel.
DSP Features button 	Presents a menu of DSP features that can be applied to the corresponding channel.
Level Slider	Adjusts the channel volume level in 1 dB increments.
Signal LED	Illuminates when a signal is being received.
Clip LED	Illuminates when a signal has exceeded the maximum threshold, indicating that the signal is "clipping."
IN VU meter	Indicates the strength of the input signal.
OUT VU meter	Indicates the strength of the output signal.
Input Gain	Adjusts the strength of the input signal.

Table 7. DSP Page

Line/AES/Mic	Determines whether the input signal coming from the channel's input jack is at line or microphone level, or if it is encoded as a digital AES signal.
Phantom Power	Determines if phantom power is being provided to the input microphone.

The DSP features that can be applied to a channel, accessible through the DSP Features menu, are described in *Table 8*.

Table 8, DSP Features

Compressor	Lessens the dynamic range between the loudest and quietest parts of an audio signal.
Ducker	Lowers, or ducks, the output of a channel when another signal is encountered.
Graphic EQ	Uses fixed frequencies to tailor the frequency content of an audio signal.
High/Low Pass	Filters out frequencies in the input signal that are above and below specified high and low cutoff frequencies.
Limiter	Prevents a signal from exceeding an adjustable maximum level.
Noise Gate	Eliminates low-level hiss, noise, or leakage, particularly when there is a high level of ambient noise.
Parametric EQ	Uses a center/primary frequency to allow tailoring of the frequency content of an audio signal.
Router	Routes the audio signals from each input channel to zero or more output channels, as well as adjusting the level of each input signal per selected output channel.
Settings	Allows you to provide names and colors for the input and output channels.
Signal Present	Allows you to configure the threshold level and duration that a signal must reach before the Signal LED will be activated for this channel.
Reset button 	Present on almost all DSP screens other than the main mixer, this button will reset the DSP settings to the displayed feature's default setting.

You can set **Limiter** and **Signal Present** parameters for the output signal or set global **Ducker**, **Router**, and **Settings** options by selecting the option you want from the drop-down menu available for the output.

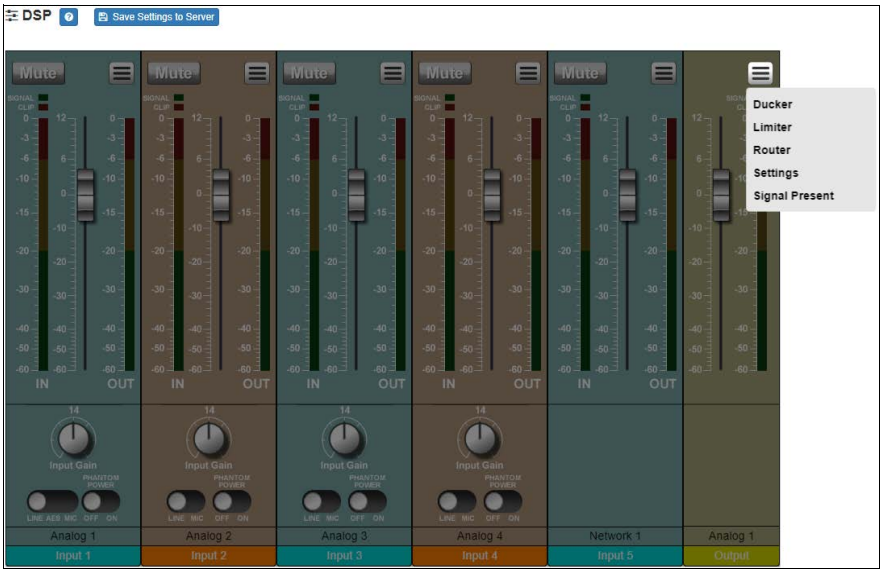

Figure 9. DSP Output Options

Setting the Channel Level

The Channel Level control is a vertical slider that is adjusted in 1 dB increments and controls the output level for the channel. The Channel Levels can range from -60 dB to 12 dB. If you place the mouse over the slider, the numerical value of the level appears.

Signal LED, Clip LED, and VU Meters

Each input channel has one or more input signal LEDs, Clip LED, and two vertical volume unit (VU) meters, labeled “IN” and “OUT”.

The green input signal LEDs automatically illuminate when a signal is being received. The red **Clip** LED automatically illuminates when the signal is clipping (i.e., exceeding a predefined threshold). Clipping can result in distortion and, for output signals, can even damage speakers. Note that the specific level and duration that a signal must reach in order to trigger the input signal LED can be configured via the **Signal Present** settings.

The “IN” VU meter indicates the strength of the channel’s input signal (after gain adjustments), while the “OUT” VU meter indicates the strength of the channel’s output signal. The VU meter not only illuminates green, yellow, or red (depending on the signal level), but also has a scale ranging from -60 dB to 0 dB to indicate the actual signal level.

Muting a Channel

You can mute a channel to cut off an audio signal and stop the input signal from being sent to the output channel. Note the input signal will still be visible on the IN meter, but the OUT meter will show that nothing is being forwarded to the output channel.

To mute a channel:

1. On the appliance Web UI's main page, select **DSP**.
2. Click the **Mute** button for the channel that you want to silence.

   The **Mute** button will illuminate red. You can click the **Mute** button again to unmute the channel.

Adjusting Volume Levels

The vertical slider control can be used to adjust the channel's output level in 1 dB increments between -60 dB and +12 dB. The overall adjusted output level of the channel signal can be viewed on the "OUT" VU meter, marked in 2 dB increments between -60 dB and 0 db.

To adjust the channel volume level:

1. On the appliance Web UI's main page, select **DSP**.
2. Use the channel's slider to adjust the volume level.

Selecting Input Type, Input Gain, and Phantom Power

Just above the labels for the input channels is a switch that allows you to select either **Line** or **Mic** as the input, indicating the type of input signal being used. A line level signal is typically at least 50 dB greater than a mic level signal.

Input channel 1- has the option to select **AES** as a digital input type. Input channels 1–3 accept either XLR or Phoenix (also known as Euroblock) connectors, while channel 4 only accepts a Phoenix connector.

Note: AES stands for Audio Engineering Society 3, a standard for the exchange of digital audio signals between professional audio devices.

If you select **Mic** as the input, you can specify whether or not the microphone will use phantom power. Phantom power is electrical power that is sent to a condenser mic through its mic cable.

Note: Phantom power is only used by devices that contain active electronics, such as condenser microphones and many direct boxes. It uses a balanced signal, which renders it effectively invisible to balanced microphones that do not use it. When enabled, +15V of balanced phantom power is available on pins 2 and 3 of the XLR connector or the +/- terminals of the Phoenix connector.

Caution **Phantom powering can cause equipment malfunction, or even damage, if used with cables or adapters that connect one side of the input to ground, or if certain equipment other than microphones is connected to it.**

Because input signal levels can vary greatly based on the attached device, you will want to adjust the **Input Gain** for a channel to ensure the input signal level is high enough to use, but not so high that it sounds distorted. The input signal level can be viewed on the "IN" VU meter and adjusted using the **Input Gain** knob.

Tip: Typically, a good input signal will vary between the high green and low yellow areas of the VU meter, but your ears should be the ultimate judge of a good signal. Remember, the purpose of the Input Gain is to adjust the strength of the input signal, *not* the volume of the final output signal.

Troubleshooting Gain Structure

Channel Sliders should be set to 0 dB (unity gain) during the channel level setup procedure.

The range for optimal **Input Gain** control operation is from about 9 o'clock to 2 o'clock.

If Channel Clipping Occurs

If the signal is clipping or producing audible distortion, the gain is too high. Reduce the **Input Gain** by turning the knob counterclockwise until the **Clip** LED does not illuminate. If the signal cannot be reduced below clipping with the Input level control at minimum and the input source is not a microphone, change the Input setting to **Line** to pad the signal to a lower level.

Also, make sure that the new **Input Gain** setting offers a usable control range between the 0 and -20 dB positions on the channel slider volume control.

If Channel Volume Is Too Low

If the channel slider volume control must be set above the +6 dB position to provide adequate volume, the **Input Gain** setting is too low. Set the channel level slider to **0**, turn the **Input Gain** knob to the 1 o'clock position, and increase the **Input Gain** by turning knob clockwise until clipping occurs or the VU meter's signal level is between -10 dB and -3 dB. Then, adjust the **Input Gain** to a setting just below the clipping level.

If the signal cannot be increased with the **Input Gain** knob at 2–3 o'clock, make sure the input is not set to **Line**.

> *Note:* Some microphones are very low output. The mixer will not be able to completely compensate for the low level but will be able to provide a usable output signal. A decent dynamic microphone output level is approximately -55 dB. Check your microphone's specifications.

If Channel Volume Is Too High

If a channel is not clipping but the channel slider level control must be set below the -20 dB position to achieve the proper volume level, the **Input Gain** control setting is too high. Set the channel slider control knob to the 0 dB position and adjust the **Input Gain** control until the desired volume level is achieved. Reduce the **Input Gain** by turning the knob counterclockwise.

If the signal cannot be reduced below clipping with the Input level control at minimum (and the input source is not a microphone), change the Input to **Line** to pad the signal to a lower level, set the channel slider control knob to the 0 dB position and adjust the **Input Gain** control until the desired volume level is achieved.

Adjusting Compression Settings

A compressor reduces the dynamic range of a signal. This effect is perceived as quieting loud sounds.

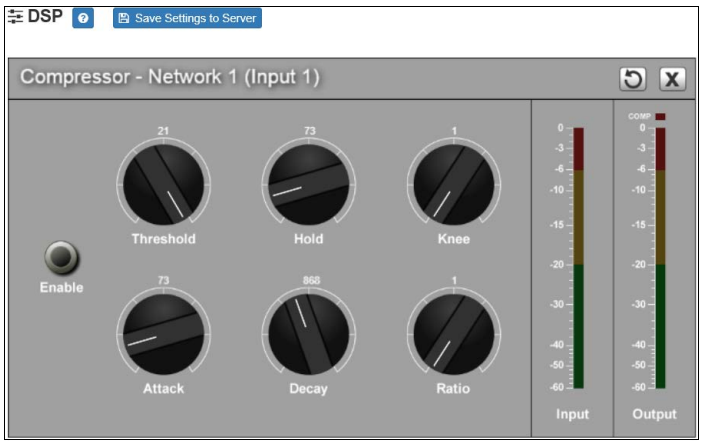

Figure 10. Compressor Settings

To adjust the compressor settings for a channel:

1. On the appliance Web UI's main page, select **DSP**.
2. Select the **Menu** button for the channel.
3. From the drop-down menu, select **Compressor**.
4. Make desired adjustments using the controls described in *Table 9, "Compressor Settings," on page 25*.

> *Note:* If you want to return to the factory settings, select the **Reset** icon that appears in the right corner.

5. Select **Enable** to apply the settings to the selected channel.

Table 9. Compressor Settings

Enable	Enables or disables the compressor DSP effect for this channel.
Threshold	Sets the threshold level, which is the point where the signal activates the compressor circuit. The range is -135 to +21 dB.
Attack	Sets how quickly or slowly compression will be applied to the signal once the audio signal goes above the threshold level. It specifies the length of time over which the compression ratio will gradually increase from no compression to full compression. The range is 1 to 500 ms.
Hold	Sets how long compression will be applied after the signal has fallen below the threshold. The range is 1 to 500 ms.
Decay	Sets how quickly or slowly compression will be removed from the signal after the signal has dropped below the threshold *and* the Hold interval has expired. It specifies the length of time over which the compression ratio will gradually decrease from full compression to no compression. The range is 0 to 2000 ms.

Table 9. Compressor Settings

Knee	Sets how far below the threshold compression will begin to be *gradually* applied to the signal. A very low value, known as a *hard knee*, immediately applies full compression once the threshold is reached. A high value, known as a *soft knee*, will gradually start applying compression before the signal reaches the threshold, not reaching the full effect until the threshold is reached, thereby "rounding off" the compression effect. Increasing the knee level decreases the obvious transition from the uncompressed to the compressed sound. The range is 1 to 100 dB.
Ratio	Sets the compression ratio to be applied to the signal. For example, if the ratio is set for 6 (6:1), the input signal must increase by 6 dB for the output level to increase by 1 dB. The range is 1 to 100.
Input meter	Shows the strength of the input signal.
Output meter	Shows the strength of the output signal, providing a visual indicator of the effect of the compressor on the output signal.
Comp LED	Illuminates when compression is being applied to the signal.

Adjusting Ducking Settings

Ducking is an audio effect in which the level of one audio signal is reduced by the presence of another signal. For example, if background music is playing when a page is made, the ducker will sense the presence of audio from a paging microphone and trigger a

reduction in the output of the music signal for the duration of the page. The ducker restores the original level for the background music once the page is over.

Figure 11. Ducker Parameters

To adjust the ducker settings for a channel:

1. On the appliance Web UI's main page, select **DSP**.
2. Select the **Menu** button for the channel or select the **Menu** button for the **Output**.
3. From the drop-down menu, select **Ducker**.

> *Note:* If you want to return to the factory settings, select the **Reset** icon that appears in the right corner.

4. Make desired adjustments using the controls described in the following table:

Table 10. Ducker Parameters

Threshold	Sets the threshold level, or how loud the signal has to be, before ducking is enabled. The range is -135 to +20 dB.
Hold	Sets how long the master continues to duck the signal after the signal is below the threshold. The range is 1 to 500ms.

Table 10. Ducker Parameters

Master	Select the channel that serves as the master, or unducked, channel. The audio on this channel has priority; audio for all other channels is ducked.
Ducked	Select the channel or channels that will be ducked when the threshold is reached on the master channel.

Adjusting the Graphic Equalizer

The graphic equalizer allows you to tailor the audio signal to optimize the frequency response of the sound system.

The graphic equalizer parameters are set per channel.

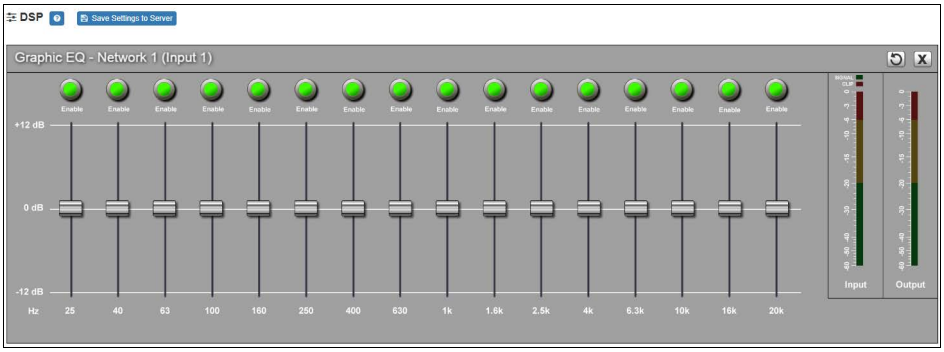

Figure 12. Graphic EQ Settings

To adjust the graphic equalizer settings for a channel:

1. On the appliance Web UI's main page, select **DSP**.
2. Select the **Menu** button for the channel.
3. From the drop-down menu, select **Graphic EQ**.

   The Graphic EQ provides 16 slider knobs that can be moved between +12 dB and -12 dB. The frequency of each slider is different and range from 25 Hz to 20,000 (20k) Hz.

By default, each knob is set at 0 dB, which means that no frequencies are being boosted or cut.

Note: For the best results, frequencies should be cut only. Boosting frequencies to compensate for room dimensions or speaker response deficiencies usually results in a loss of headroom in the signal chain.

4 Adjust frequencies as desired, ensuring the **Enable** LEDs are green for the selected frequencies.

Note: If you want to return to the factory settings, select the **Reset** icon that appears in the right corner.

Setting High Pass/Low Pass Parameters

High pass filters allow signals that are higher than the specified frequency and attenuate signals that are lower. Low pass filters allow signals that are lower than the specified frequency and attenuate signals that are higher. When combined, they are known as a *band pass filter*. Band pass filters can be used to tailor the frequency response of a microphone exclusively for vocals, which can be very useful in a noisy environment to filter out the higher and lower frequencies that could mask the human vocal range during announcements.

You can specify the range of frequencies that will pass through the high pass and low pass filters and select the type of filter that is used through the channel's **High/Low Pass** drop-down menu option.

Figure 13. High/Low Pass Parameters

To adjust the high/low pass parameters for a channel:

1. On the appliance Web UI's main page, select **DSP**.
2. Select the **Menu** button for the channel.
3. From the drop-down menu, select **High/Low Pass**.

> *Note:* If you want to return to the factory settings, select the **Reset** icon that appears in the right corner.

4. Set the parameters described in the following table:

Table 11. High Pass/Low Pass Parameters

High Pass (Low Cut)	
This feature helps eliminate low frequency noise (signals of 100 Hz and below, such as background rumble from ventilation systems, etc.) and is used primarily with microphone level input. It is particularly effective when hand held microphones are used.	
Frequency	Set the cutoff frequency. You can adjust the frequencies by moving the knob (click and move up or down) or by double-clicking the knob and typing the frequency. When typing the frequency, only numeric values from 20 Hz to 20,000 Hz can be entered. The high pass filter attenuates content below this frequency and lets frequencies above this cutoff frequency pass through the filter.
Type	Available filter types are: • Linkwitz-Riley (12, 24, 36, and 48 dB per octave) • Butterworth (6, 12, 18, 24, 30, 36, 42, and 48 dB per octave) • Bessel (12, 18, and 24 dB per octave) The dB per octave refers to how steep the roll off of the filter is below the selected cutoff frequency.

Table 11. High Pass/Low Pass Parameters (Continued)

Low Pass (High Cut)	
This feature helps eliminate high frequency noise (signals of 8000 Hz and above) such as background hiss and sibilance (excessive "S" in vocals, etc.) and is used primarily with microphone level input. It is particularly effective when handheld microphones are used.	
Frequency	Set the cutoff frequency. You can adjust the frequencies by moving the knob (click and move up or down) or by double-clicking the knob and typing the frequency. When typing the frequency, only numeric values from 20 Hz to 20,000 Hz can be entered. The low pass filter attenuates content above this frequency and lets frequencies below this cutoff frequency pass through the filter.
Type	Available filter types are: • Linkwitz-Riley (12, 24, 36, and 48 dB per octave) • Butterworth (6, 12, 18, 24, 30, 36, 42, and 48 dB per octave) • Bessel (12, 18, and 24 dB per octave) The dB per octave refers to how steep the roll off of the filter is above the selected cutoff frequency.

Adjusting the Limiter

A limiter is a compressor with a high slope (i.e., attack) that is used to prevent a signal from exceeding a set decibel level. Limiters are used as safeguards against signal clipping.

Limiter parameters are set per channel.

Figure 14. Limiter Settings

To adjust the limiter settings for a channel:

5 On the appliance Web UI's main page, select **DSP**.

6 Select the **Menu** button for the channel or select the **Menu** button for the **Output**.

7 From the drop-down menu, select **Limiter**.

Note: If you want to return to the factory settings, select the **Reset** icon that appears in the right corner.

8 Adjust the following settings as needed:

Table 12. Limiter Settings

Threshold	Sets the signal level at which the limiter is triggered. Any signal exceeding this threshold will be compressed to this level. The range is -24 to +24 dB.
Decay	Sets the rate for turn off of the limiter after the signal is below the threshold. Decay range is 5 to 2300 milliseconds.
RMSTC **(Root Mean Square Time Constant)**	Sets how fast the limiter reacts to a signal that has exceeded the threshold. RMSTC range is 50 to 10000 dB/sec.

Adjusting Noise Gate Settings

A noise gate controls the volume of an audio signal by attenuating the signal when it registers below the threshold. This is typically used to eliminate or minimize background noise.

Figure 15. Noise Gate Settings

To adjust the noise gate settings for a channel:

1. On the appliance Web UI's main page, select **DSP**.
2. Select the **Menu** button for the channel.
3. From the drop-down menu, select **Noise Gate**.

> *Note:* If you want to return to the factory settings, select the **Reset** icon that appears in the right corner.

4. Adjust the following settings as needed:

Table 13. Noise Gate Settings

Enable	Enables or disables the noise gate DSP effect for this channel.
Threshold	Sets the minimum threshold level that the signal must reach for the noise gate to “open”, allowing the signal to be sent to the output channel. Threshold range is -135 to +21 db.
Attack	Sets how long it takes for the gate to open once the signal reaches the threshold level. Attack range is 1 to 500 ms.
Hold	Sets the length of time the gate will stay fully open after the signal reaches the threshold level. Hold range is 1 to 500 ms.
Decay	Sets hows quickly or slowly the gate will close once the signal has dropped below the threshold level *and* the Hold interval has expired. Decay range is 0 to 2000 ms.

Adjusting Parametric Equalizer Settings

A parametric equalizer is a multi-band variable equalizer that allows control of frequency amplitude (boost/cut), center frequency, and frequency bandwidth, or Q.

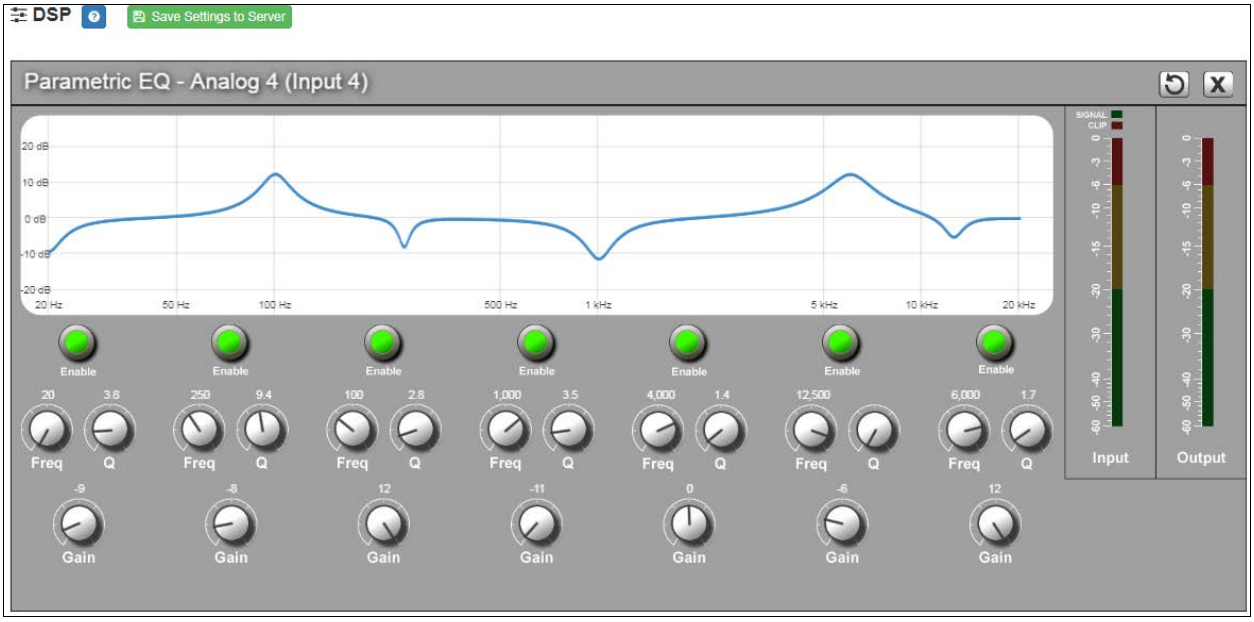

Figure 16. Parametric Equalizer Settings

The parameter equalizer settings for your device allows you to adjust the Q and gain for seven separate frequencies, which then become plot points on the screen's graph.

To adjust the parametric equalizer settings for a channel:

1. On the appliance Web UI's main page, select **DSP**.
2. Select the **Menu** button for the channel.
3. From the drop-down menu, select **Parametric EQ**.

> *Note:* If you want to return to the factory settings, select the **Reset** icon that appears in the right corner.

4. Adjust frequencies as desired, ensuring the **Enable** LEDs are green for each selected frequency. You can adjust the frequencies by moving the **Freq** knob or by double-clicking the knob and typing the frequency. When typing the frequency, only numeric values from 20 to 20,000 can be entered.
5. Make desired **Q** adjustments by adjusting knob (or double-clicking and typing the desired adjustment). Q can be from 0.1 to 20 and sets how wide to either side of the selected frequency the adjacent frequencies are affected.

Q is the Quality or Quality Factor, which refers to the bandwidth of one band of a parametric equalizer. Q is calculated by dividing the center frequency in Hz by the width of the boost or cut zone, +3 dB or -3 dB above or below 0 dB.

6 For each frequency, use the **Gain** knob or double-click the knob and type the gain to either boost (turn up) or cut (turn down).

Gain knobs can be moved between +12 or -12 dB. By default, each knob is set at 0 dB, which means that no frequencies are being boosted or cut.

7 Select **Save Settings to Server**.

Adjusting Router Settings

The Router allows you to specify which analog input signal(s) will be sent to which output channel(s). In addition, you can adjust the level of each individual input signal on each output channel to which it is routed. You can access the Router page from the drop-down menus of each channel, but only one router exists for the appliance.

In essence, you need to enable the input signals that you want to use (green areas), enable the output channels that you want to use (blue areas), and enable the mapping (gray areas) to indicate which inputs will be mixed into which outputs. You can also use the volume knobs to customize the overall volume of an input signal (green areas), the overall volume for an output channel (blue areas), and the volume of a specific input signal on a given output channel (gray areas).

The input channels and output levels for all network signals can *only* be controlled via the Router. For each analog input signal to be sent over the network, activate the Enable button and adjust the relative level knobs (“A#→N#”) for one or more Network channels. Finally, adjust the overall output level knob (“Network #”) of the final network signal.

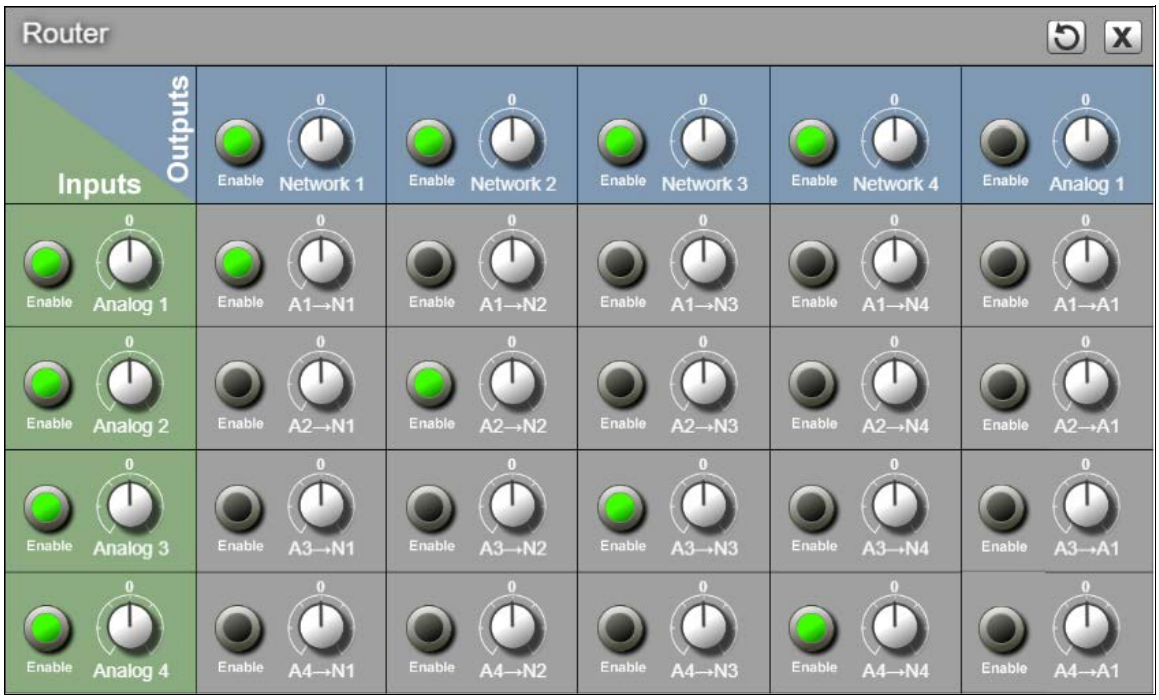

Figure 17. Router Settings

To adjust the router settings:

1. On the appliance Web UI's main page, select **DSP**.
2. Select the **Menu** button for the channel or select the **Menu** button for the **Output**.
3. From the drop-down menu, select **Router**.

> *Note:* If you want to return to the factory settings, select the **Reset** icon that appears in the right corner.

4. Adjust the input, output, and cross gain settings as desired.
5. To route a signal to a specific output, select the Input's Enable button so that it changes from gray to green.

   This signal can be sent to Network 1, 2, 3, or 4, to the Line Out, or to any combination of these.

   Network outputs are signals that can be used as an audio stream source, to be sent by a Nyquist server to other stations or appliances.

   The **Line Out** output is sent to the corresponding balanced connector on the rear panel of the appliance.

Signals from input channels Analog 1 to 4 can be mixed to each output as desired. Multiple input signals can be mixed to multiple outputs or to a single output. Likewise, outputs are enabled by selecting the Enable button for the selected outputs (turning the button from gray to green).

Settings

You can specify custom names and colors for each of the four input channels, the network input channel, and the output channel.

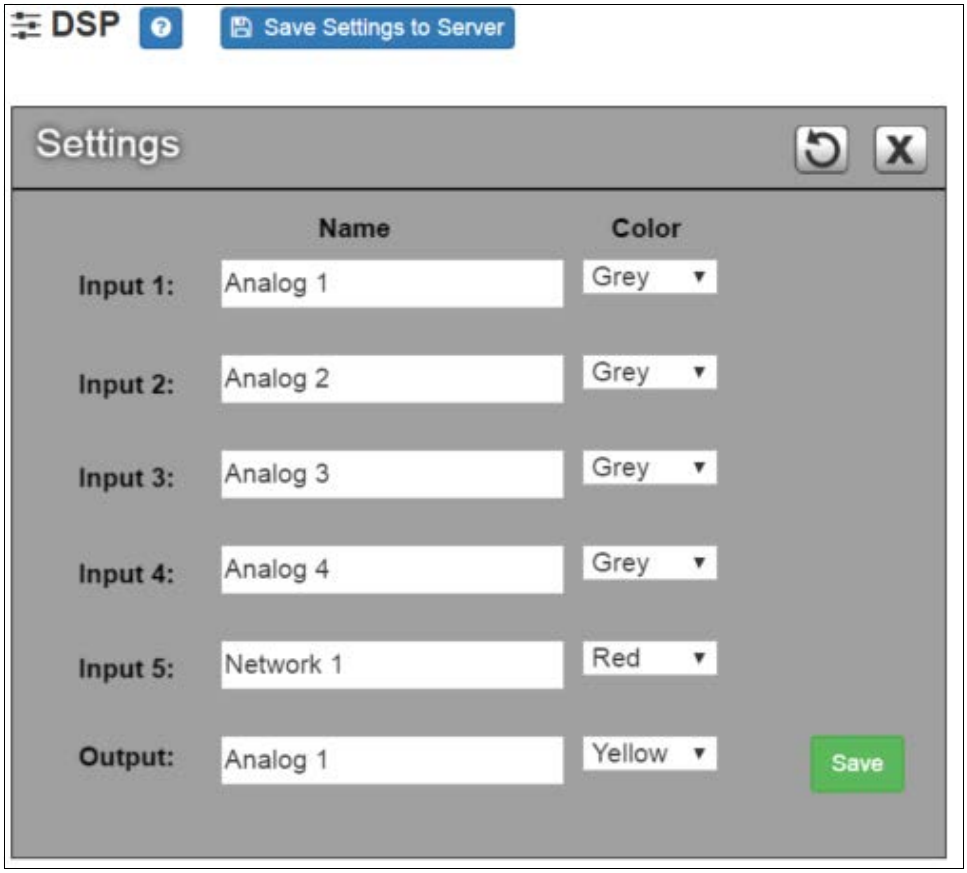

Figure 18. Settings Parameters

To adjust the settings for a channel:

1. On the appliance Web UI's main page, select **DSP**.
2. Select the **Menu** button for the channel.

3 From the drop-down menu, select **Settings**.

Note: If you want to return to the factory settings, select the **Reset** icon that appears in the right corner.

4 For each channel, type the name that you want to display for the channel.

5 For each channel, select a color that will be used to highlight the channel.

6 Select **Save**.

Signal Present

You can configure the threshold level that a signal must reach before the **Signal** LED is lit, as well as how long the LED will remain lit. You can configure this for each input channel and for the output channel.

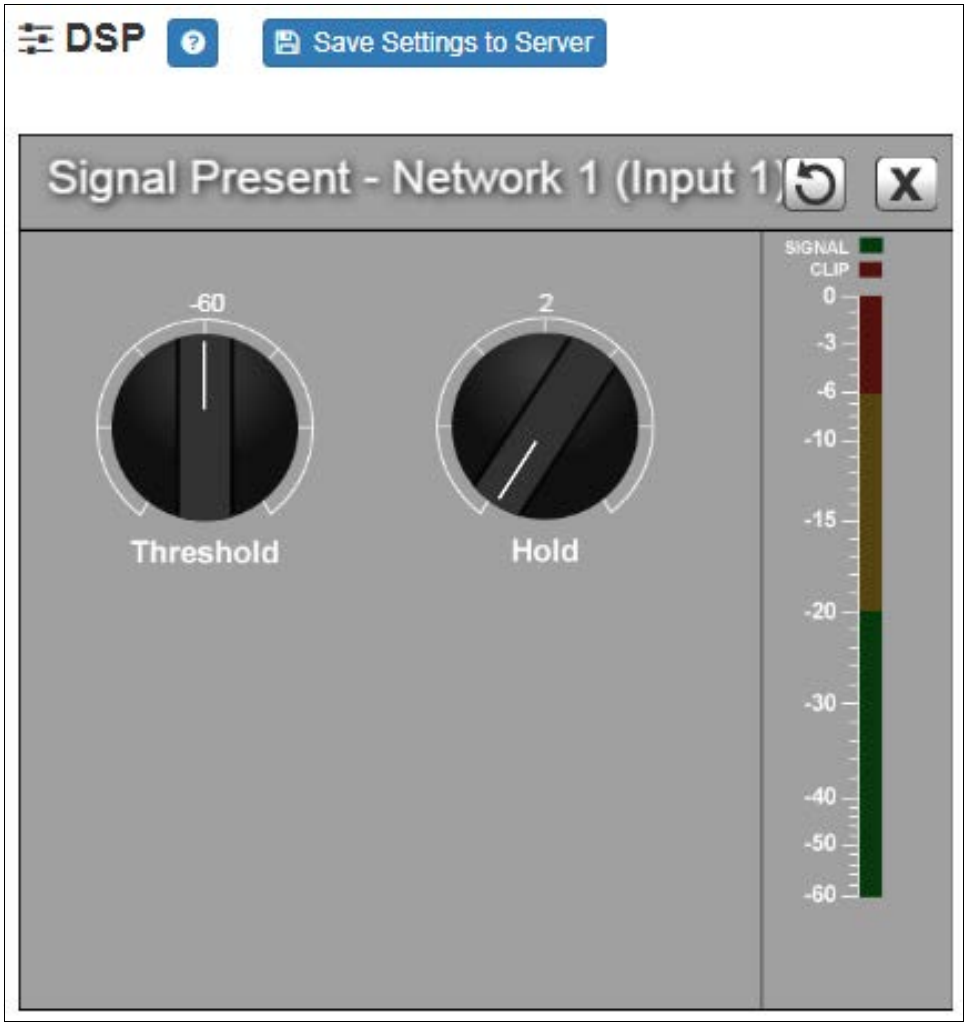

Figure 19. Signal Present Parameters

To adjust the Signal Present settings for a channel:

1. On the appliance Web UI's main page, select **DSP**.
2. Select the **Menu** button for the channel.
3. From the drop-down menu, select **Signal Present**.

Note: If you want to return to the factory settings, select the **Reset** icon that appears in the right corner.

4 Adjust the following settings as needed.

Table 14. Signal Present Parameters

Threshold	Sets the minimum level the signal must reach before the **Signal** LED is illuminated.
Hold	Sets the minimum number of milliseconds that the Signal LED will remain illuminated.