



AoIP Gateway Configuration Guide

NQ-GA400P

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Configuring the Nyquist AoIP Gateway

The Nyquist GA400P AoIP (Audio over IP) Gateway provides the ability to receive an analog signal, convert it to a digital signal, and send it to a partner device across a network. It can also receive a digital signal over a network, convert it to an analog signal, and play it back through a speaker.

Used in conjunction with other AoIP Gateway devices—or other systems offering similar SIP-related capabilities—this highly flexible device provides the critical function of converting analog signals (like voice or music) to and from digital signals. For example, with the use of such additional components as speakers and microphones, this gateway device allows you to:

- Enable music to a remote device on the network.
- Send and receive announcements over the network.

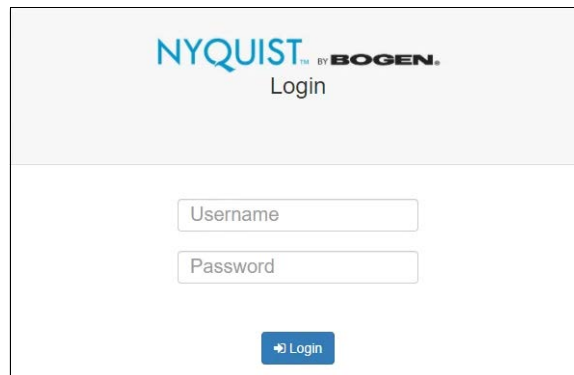
A short press of the appliance's **Reset** button reboots the device. If you press the **Reset** button for 10 seconds, the appliance returns to the factory default configuration settings. Returning to the default configuration settings does not change the appliance's firmware.

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 appropriate *Nyquist System Administrator Guide*.

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

To access the appliance's user interface (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** or **Appliance Status**, navigate to the device that you want to configure, and then select the **Link** icon.

The image shows the login page for the Nyquist Appliance. At the top, the logo reads "NYQUIST™ BY BOGEN." followed by the word "Login". Below the logo, there are two input fields: "Username" and "Password". At the bottom of the form is a blue button with a right-pointing arrow and the text "Login".

NYQUIST™ BY BOGEN.
Login

Username

Password

Login

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.

The image shows the dashboard for the NQ-GA400P-AoIP Gateway. The title is "NQ-GA400P-AoIP Gateway (GA400P Work)". Below the title is a navigation bar with buttons: Dashboard, Configuration Settings, Network Settings, Firmware Update, Logs, DSP, Help, Manual, and Logout. The main content area is titled "Dashboard" and contains the following fields:

Device Type: NQ-GA400p

Serial Number: 172500100012

MAC Address: C4F31269CFC9

Firmware Version:

Standalone Operation: Disabled

Figure 2. NQ-GA400P 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 device.
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 this appliance's configuration guide.
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 firmware version the appliance is using and if an update is available. You can also load a firmware release, install the loaded firmware, restore the configuration to factory defaults, and 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 different from 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 view or update the firmware version.
- 2 If the device is in Standalone mode, selecting the **Check for Updates** button checks the Bogen website for the latest firmware version available. If a version newer than the one currently installed is found, it is downloaded to the appliance.
- 3 If you already have a firmware file you would like to install to the appliance, select **Upload Firmware** to upload the firmware file from your computer to the appliance. 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**.
- 4 The page displays the uploaded firmware version ("New Nyquist Version") and an **Update Firmware** button appears. Select this button if you want to update the appliance's firmware to the uploaded version.
- 5 If you want to return your appliance to its original factory configuration, select **Restore Factory Settings**.
- 6 Select **Reboot Appliance** to restart your appliance.

Table 3. Firmware Update settings

Current Nyquist Version	Shows the version of the appliance's currently installed firmware.
New Nyquist Version	Shows the version of the firmware that has been loaded, though not installed, onto the appliance.
Update Firmware	<p>Available only when a new firmware version has been loaded onto the appliance (as specified in New Nyquist Version).</p> <p>Installs the loaded firmware. A reboot may be required after installation.</p>
Upload Firmware	<p>Prompts the user to specify a firmware file, which will then be loaded (though not installed) onto the appliance.</p> <p><i>Note:</i> To obtain the firmware file for a specific version, please contact Bogen Customer Service.</p>
Check for Updates	<p>Available only when the appliance is configured for Standalone mode.</p> <p>Checks the Bogen website for the latest firmware version available and, if it finds a version newer than what is currently installed, downloads it to the appliance.</p>
Restore Factory Settings	<p>Returns the appliance to its original factory configuration.</p> <p><i>Note:</i> This does not install the original appliance firmware. The firmware will not be changed.</p>
Reboot Appliance	Restarts the 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**.

Network Settings

IP Address:

172.31.19.220

Netmask:

255.255.255.0

Gateway:

172.31.19.254

VLAN ID:

9

VLAN Priority:

0 - Best Effort

NTP Server:

172.31.19.203

TFTP Server:

172.31.19.203

TFTP Server from DHCP

No

DHCP Enabled:

Yes

Reboot Appliance:

No

Save

Figure 4. Network Settings

Network settings are described in the following table:

Table 4. Network Settings

IP Address	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 4. Network Settings (Continued)

NTP Server	<p>Identifies the IP address or the domain name of the Network Time Protocol (NTP) Server.</p> <p><i>Note:</i> This field is only editable when Standalone Operation is enabled.</p>
TFTP Server	<p>Identifies the host name or IP address of the Trivial File Transfer Protocol (TFTP) server.</p> <p>The specified TFTP server can be used to automatically set this device's Configuration settings via the Get Configuration from Server button.</p> <p>If TFTP Server from DHCP (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.</p> <p><i>Note:</i> 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.</p> <p><i>Note:</i> If this value is unspecified, the TFTP Server from DHCP 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 TFTP Server from DHCP setting must be set to No, which makes the field editable.</p> <p><i>Note:</i> This setting is not available when Standalone Operation is enabled.</p>
TFTP Server from DHCP	<p>"Yes" means the device will use the DHCP option 66 value to retrieve an address for the TFTP Server from DHCP.</p> <p>"No" means the device will ignore the DHCP option 66 value and use the manually configured value of the TFTP Server (see above).</p> <p><i>Note:</i> This setting is not available when Standalone Operation is enabled.</p>

Table 4. 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 view or manually configure the Nyquist appliance configuration:

- 1 On the appliance Web UI's main page, select **Configuration Settings**.
- 2 View the settings as described in Table 5 on page 10 for normal configuration, or modify the settings as described in "*Standalone Operation Configuration Settings*" on page 11 for Standalone Operation configuration.
- 3 If changes were made (Standalone Operation only), click the **Save Configuration Settings**, **Save Multicast Addresses (Audio Cast)**, and/or **Save Multicast Addresses** buttons to save your changes.

Configuration Settings

Get Configuration From Server

Web Username:

	IP Address	Port Number	Cut Level	Station List
Emergency-All-Call:	<input type="text" value="239.1.1.1"/>	<input type="text" value="6000"/>	<input type="text" value="0"/>	<input type="text" value="1,2"/>
All-Call:	<input type="text" value="239.1.1.2"/>	<input type="text" value="6004"/>	<input type="text" value="-3"/>	<input type="text" value="1,2"/>
Audio Distribution:	<input type="text" value="239.1.1.3"/>	<input type="text" value="6008"/>	<input type="text" value="-24"/>	<input type="text" value="1,2"/>

Device Stations

Port Number	Port Type	Account Id	Local Port	Username
<input type="text" value="1"/>	<input type="text" value="Audio Gateway"/>	<input type="text" value="sip:0204@10.10.5.1"/>	<input type="text" value="5060"/>	<input type="text" value="0204"/>
<input type="text" value="2"/>	<input type="text" value="Audio Gateway"/>	<input type="text" value="sip:0205@10.10.5.1"/>	<input type="text" value="5060"/>	<input type="text" value="0205"/>

Figure 5. Appliance Configuration Settings (Standalone disabled)

The following table describes the **Configuration Settings** tab settings when Standalone Operation is *not* enabled for this device:

Table 5. 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 " <i>Network Settings Tab Parameters</i> " on page 6).
Web Username	Identifies the username of the current user.
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 device:

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

Configuring this device consists of specifying one or more of the following:

- The SIP server addresses, ports, and SIP extensions at which to register for incoming SIP pages and announcements.
- The output multicast (Audio Cast) addresses (and ports) to which the device will send one or more digitized line input signals.
- The input multicast addresses (and ports) from which the device will receive digital signals, which will then be converted to analog and played to one or more line outputs.

To use this device to make announcements or SIP calls, connect a microphone to one of the Line Input ports (possibly through a preamp device, which would convert the mic-level signal to a line-level signal). For the **Multicast Addresses (Audio Cast)** entry whose channel matches the line input port, specify a codec, cut level, and multicast address and port to which the signal will be streamed. That stream can be consumed by one or more devices to receive announcements or SIP calls.

To receive announcements or SIP calls, configure one or more **Multicast Addresses** entries with the multicast addresses and ports from which to receive the input streams. Specify a codec, cut level, and output channel (i.e., Line Output port) on which to play the received (and decoded) audio signal.

Configuration Settings

Device Type:

NQ-GA400P-AoIP Gateway

Device Name:

NQ-GA400p

Web Username:

admin

Web Password:

Web Confirm Password:

Time Zone:

Select a time zone

Enable SIP Calls:

Yes

External Relay Trigger 1:

Disabled

External Relay Trigger 2:

Disabled

SIP Server Address:

SIP Network Port:

SIP Codecs:

G722 ulaw alaw

SIP Extension (Line Output 1):

SIP Username (Line Output 1):

SIP Password (Line Output 1):

Cut Level (Line Output 1): 0 dB

SIP Extension (Line Output 2):

SIP Username (Line Output 2):

SIP Password (Line Output 2):

Cut Level (Line Output 2): 0 dB

Save Configuration Settings

Multicast Addresses (Audio Cast)

Enabled	Multicast IP Address	Multicast Port Number	Codec	Channels	Cut Level (dB)
No	Empty	Empty	OPUS	1	-20
No	Empty	Empty	OPUS	2	-20

Save Multicast Addresses (Audio Cast)

Multicast Addresses

Sorting: Disabled

	Multicast IP Address	Multicast Port Number	Codec	Channels	Cut Level (dB)
<div><div></div><div></div></div>	239.1.1.1	6000	G711 u-law	1	-20

Note: The following codecs are supported for multicast: G711 u-law, G711 a-law, G722, and OPUS.

Save Multicast Addresses

Figure 6. Appliance Configuration Settings (Standalone enabled)

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

Table 6. Configuration Settings (Standalone enabled)

Device Type	Displays the type of this device.
Device Name	Provides a name for this device.
Web Username	Specifies a web username for this appliance.

Table 6. Configuration Settings (Standalone enabled)

Web Password	Specifies a web password for logging into the appliance.
Web Confirm Password	Re-enter the password used to log into the appliance.
Time Zone	Specifies the time zone in which the device resides.
External Relay Trigger 1/2	Enables this device to apply a trigger signal to the external relay output to notify an external device that an output signal is being sent to Line Output 1 or 2.
Enable SIP Calls	<p>Enables this device to receive one-way SIP calls, wherein only the caller can be heard (such as announcements).</p> <p><i>Note:</i> If enabled, other SIP-related configuration settings are displayed.</p>
SIP Server Address^a	Specifies the IP address of the SIP Registration Server with which the device will register.
SIP Network Port^a	Specifies the IP port on which to communicate with the SIP Registration Server (typically 5060).
SIP Codecs^a	Displays a read-only list of codecs allowed on SIP sessions.
SIP Extension^a (Line Output 1/2)	<p>Specifies the SIP extension for Line Output 1 or 2.</p> <p>The extension, along with the IP address, is used to specify the URI used to place a SIP call to this extension:</p> <p style="text-align: center;">sip:<extension>@<local_ip_address></p>
SIP Username^a (Line Output 1/2)	Specifies the SIP username used to register Line Output 1 or 2 with the SIP server.
SIP Password^a (Line Output 1/2)	Specifies the SIP registration password used to register Line Output 1 or 2 with the SIP server.
Cut Level^a (Line Output 1/2)	<p>Specifies the intercom cut volume to be used for SIP calls over Line Output 1 or 2.</p> <p>This can be a value from -42 and 0 dB.</p> <p>The default value is -20 dB.</p> <p><i>Note:</i> To modify, click on the value, adjust the slider on the popup using the cursor keys or mouse, and click the check box button.</p>

- a. Available only when Enable SIP Calls has a value of Yes.

The following parameters appear for the two **Multicast Addresses (Audio Cast)** (i.e., outgoing streams) and for each of the **Multicast Addresses** (i.e., incoming streams) configured for this device.

Enabled (audio cast only)	Enables audio signals from the Line Input ports to be sent to the specified multicast addresses and ports.
Multicast IP Address	Specifies the multicast IP address on which to send or receive audio streams.
Multicast Port Number	Specifies the multicast port on which to send or receive audio streams.
Codec	<p>Specifies the codec to be used when encoding or decoding audio. Select one of the following values:</p> <ul style="list-style-type: none">• G711 u-law<ul style="list-style-type: none">• Intercom call quality• 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<ul style="list-style-type: none">• Intercom call quality• 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<ul style="list-style-type: none">• Tone and paging quality• A wideband audio codec operating at 48, 56, and 64 kbps.• OPUS<ul style="list-style-type: none">• Music quality• An audio codec format designed for speech and general audio, supporting low latency, constant and variable bitrate encoding (6 to 510 kbps), and five sampling rates (from 8 to 48 kHz).

Channels

Channel(s) on which the audio streams will be input or output.

One or more of the following values:

- Line 1
- Line 2

Tip: If multiple output channels are selected, they will all use the same cut level. Fine tuning of cut levels per output channel can be adjusted using DSP settings.

Cut Level (dB)

Specifies the cut level for the audio stream.

This can be a value from -70 to 0 dB.

The default value is -20 dB.

Note: To modify, click on the value, adjust the slider on the popup using the cursor keys or mouse, and click the check box button.

Tip: If multiple output channels are selected, they will all use the same cut level. Fine tuning of cut levels per output channel can be adjusted using DSP settings.

Note: A maximum of 24 received multicast entries is supported.

Note: Multicast Addresses should be ordered by priority, highest priority first. If multiple streams are active on the same channel simultaneously, the one with the highest priority will be played. Set the **Sorting** switch to Enabled and drag entries up and down using the 4-way arrow symbols to rearrange the priorities.

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 7. 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.
btmpt	Contains information about failed login attempts.
daemon.log	Contains information logged by the various background daemons that run on the system.

Table 7. Logs (Continued)

Log	Description
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 signals 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.



Figure 8. DSP Page

Note: The terms *analog input* and *analog output* will be used to refer to the electrical signals on the physical analog ports (e.g., from a microphone and to an amplifier) while *network send* and *network receive* will refer to the digital streams that are sent and received over the network.

The DSP page displays a mixing board console containing two input strips and two output strips. The input strips accept the *analog inputs* from the line input connectors and—after gain adjustments, analog-to-digital conversion, and DSP enhancements—send the digital *network send* over the network. The output strips accept the digital *network receive* from the network and—after DSP enhancements, digital-to-analog conversion, and gain adjustments—send the *analog output* to the line output connectors.

Each strip controls the audio signal for a given channel, providing muting, gain adjustments, signal processing, and more. Signal processing includes traditional audio processing, such as hi/low-pass filters (output), limiters (input), and parametric EQs (output).

This console can be used to do the following:

- View **Signal** indicators for each channel.
- Adjust the **Input Gain** level for each *analog input* signal.
- Adjust the **Input 1/2** level for each *network send* signal.
- Adjust the **Output 1/2** level for each *analog output* signal.
- Apply DSP effects to the digital signals of both the input and output channels.

Selecting the DSP Features menu 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 8. 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.
	<i>Note:</i> 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 present.
IN VU meter	Indicates the strength of the <i>analog input</i> signal.

Table 8. DSP Page

OUT VU meter	Indicates the strength of the <i>network send</i> signal.
Input Gain	Adjusts the strength of the <i>analog input</i> signal.

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

Table 9. DSP Features

High/Low Pass (Output only)	Filters out frequencies in the input signal that are above and below specified high and low cutoff frequencies.
Limiter (Input only)	Prevents a signal from exceeding a certain preset maximum level.
Parametric EQ (Output only)	Uses a center/primary frequency to all tailoring of the frequency content of an audio signal.
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.

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 to 12 dB. If you place the mouse over the slider, the numerical value of the level appears.

Adjusting Volume Levels

The vertical slider control can be used to adjust the channel's output level in 1-dB increments between -60 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 and 0 dB.

Tip: For best results, use the vertical slider to adjust the input level until you have a strong signal (i.e., within the green and yellow areas on the meter), then adjust the final output levels using the DSP Outputs controls.

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.

Knob Adjustments

Many DSP controls use knobs to adjust one or more settings. The value of a knob can be adjusted in one of two ways:

- 1 Click the knob control, hold the mouse button down, and drag the mouse up or down to increase or decrease the value.
- 2 Double-click the knob, type a value into the resulting popup, and click the Save button.

Signal Indicators

Each input channel has signal indicators and two vertical volume unit (VU) meters, labeled "IN" and "OUT".

The green input signal LED(s) automatically illuminates when a signal is being received.

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 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 Input Gain

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 clipping and distortion have been eliminated.

Also, make sure that the **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.

Note: Some microphones produce very low output. It may not be possible to completely compensate for the low level, but it should be possible 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.

High/Low Pass

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 9. 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 10. High/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 handheld microphones are used.

Frequency

Set the cutoff frequency. You can adjust the frequency 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)

Note: The term "dB per octave" describes how steeply frequencies below the selected cutoff frequency are attenuated. For example, if the cutoff frequency is 100 Hz and the filter type specifies 12 dB per octave, a 50-Hz signal (i.e., one octave lower) will be attenuated by 12 dB and a 25-Hz signal (i.e., two octaves lower) will be attenuated by an additional 12 dB.

Table 10. High/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)

Note: The term "dB per octave" describes how steeply frequencies above the selected cutoff frequency are attenuated. For example, if the cutoff frequency is 8,000 Hz and the filter type specifies 12 dB per octave, a 16,000-Hz signal (i.e., one octave higher) will be attenuated by 12 dB and a 32,000-Hz signal (i.e., two octaves higher) will be attenuated by an additional 12 dB.

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 10. 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 11. 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

Sets how fast the limiter reacts to a signal that has exceeded the threshold.

**(Root Mean Square
Time Constant)**

RMSTC range is 50 to 10000 dB/sec.

Parametric EQ

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

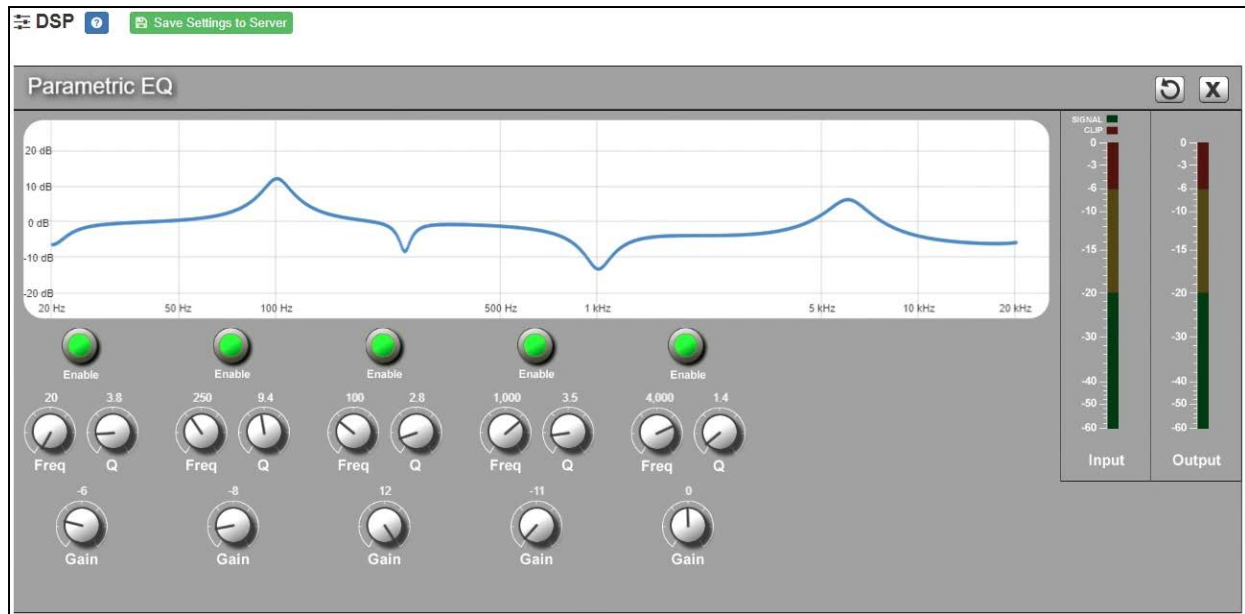


Figure 11. Parametric Equalizer Settings

The parametric equalizer settings for your device allows you to adjust the Q and gain for five 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**.

Settings

You can specify custom names and colors for each of the input and output channels. This allows you to customize the appearance of the mixer board.

The screenshot shows a 'Settings' window with a title bar containing a refresh icon and a close button. The window has a table with two columns: 'Name' and 'Color'. There are four rows of settings: 'Input 1' with 'In 1' and 'Grey', 'Input 2' with 'In 2' and 'Grey', 'Output 1' with 'Out 1' and 'Grey', and 'Output 2' with 'Out 2' and 'Grey'. A green 'Save' button is located in the bottom right corner.

	Name	Color
Input 1:	In 1	Grey
Input 2:	In 2	Grey
Output 1:	Out 1	Grey
Output 2:	Out 2	Grey

Save

Figure 12. 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 channel.



Figure 13. 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 12. Signal Present Parameters

Threshold	<p>Sets the minimum level the signal must reach before the signal LED is illuminated.</p> <p>Threshold range is -144 to +24 dB.</p>
Hold	<p>Sets the minimum number of milliseconds that the signal LED will remain illuminated.</p> <p>Hold range is 2 to 200 milliseconds.</p>