



# *4-Channel Audio Power Amplifier Configuration Guide*

NQ-A4060, NQ-A4120, NQ-A4300

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# Contents

<b>Contents</b> .....	<b>ii</b>
<b>List of Figures</b> .....	<b>iii</b>
<b>List of Tables</b> .....	<b>iv</b>
 <b>Configuring the Nyquist 4-Channel Audio Power Amplifiers</b> .....	 <b>1</b>
Using the Dashboard .....	2
Standalone Operation .....	4
Updating Firmware .....	4
Network Settings Tab Parameters .....	6
Configuration Settings Tab Parameters .....	9
Standalone Operation Configuration Settings .....	12
Accessing Log Files .....	16
Setting DSP Parameters .....	18
Setting the Channel Level .....	22
Adjusting Volume Levels .....	22
Knob Adjustments .....	22
Signal Indicators .....	23
Muting a Channel .....	23
Compressor .....	25
Delay .....	28
Graphic EQ .....	29
High/Low Pass .....	30
Limiter .....	33
Noise Gate .....	35
Parametric EQ .....	37
Peak Limiter .....	38
Presets .....	40
RMS Limiter .....	43
Router .....	45
Settings .....	46
Signal Present .....	48
Standby .....	49
Status .....	51

# List of Figures

Figure 1.	Nyquist Appliance Login.....	2
Figure 2.	4-Channel Power Amplifier Dashboard.....	2
Figure 3.	Firmware Update Page.....	5
Figure 4.	Network Settings.....	7
Figure 5.	Appliance Configuration Settings (Standalone disabled).....	10
Figure 6.	Appliance Configuration Settings (Standalone enabled).....	12
Figure 7.	Logs.....	17
Figure 8.	DSP Page.....	19
Figure 9.	Amplifier Mute Settings.....	24
Figure 10.	Compressor Settings.....	25
Figure 11.	Delay Settings.....	28
Figure 12.	Graphic EQ Settings.....	29
Figure 13.	High/Low Pass Parameters.....	31
Figure 14.	Limiter Settings.....	34
Figure 15.	Noise Gate Settings.....	36
Figure 16.	Parametric Equalizer Settings.....	37
Figure 17.	Peak Limiter Settings.....	39
Figure 18.	Presets Settings.....	41
Figure 19.	RMS Limiter Settings.....	43
Figure 20.	Router.....	45
Figure 21.	Settings Parameters for 4-Channel Mono.....	47
Figure 22.	Signal Present Parameters.....	48
Figure 23.	Standby Settings.....	50
Figure 24.	Status for 2-Channel.....	52
Figure 25.	Status When All Channels Are Bridged.....	53

# List of Tables

Table 1.	Appliance Dashboard Fields.....	2
Table 2.	Appliance Dashboard Buttons.....	3
Table 3.	Firmware Update settings.....	6
Table 4.	Network Settings.....	7
Table 5.	Configuration Settings (Standalone disabled).....	10
Table 6.	Configuration Settings (Standalone enabled).....	13
Table 7.	Logs.....	17
Table 8.	DSP Page.....	20
Table 9.	DSP Features.....	21
Table 10.	Amplifier Mute Settings.....	24
Table 11.	Compressor Settings.....	26
Table 12.	Delay Settings.....	29
Table 13.	High/Low Pass Parameters.....	32
Table 14.	Limiter Settings.....	35
Table 15.	Noise Gate Settings.....	36
Table 16.	Peak Limiter Settings.....	40
Table 17.	Preset Settings.....	42
Table 18.	RMS Limiter Settings.....	44
Table 19.	Signal Present Parameters.....	49
Table 20.	Standby Settings.....	51
Table 21.	Status.....	54

# Configuring the Nyquist 4-Channel Audio Power Amplifiers

Bogen's Nyquist-based networked four-channel audio power amplifiers (NQ-A4060, NQ-A4120, NQ-A4300) support small, medium, and large Nyquist intercom solutions in schools and in commercial paging and public address solutions.

Available in 240-, 480-, and 1200-watt models, the audio power amplifiers provide flexibility and versatility without the need for add-on modules. Each model offers state-of-the-art, built-in Digital Signal Processing (DSP) software—including factory loudspeaker presets—that turns the amplifier into a complete audio solution.

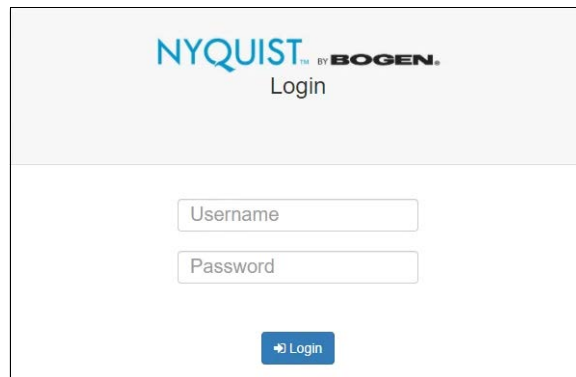
A short press of the appliance's **Reset** button reboots the device. If you press the **Reset** button for 10 seconds, the appliance returns to the factory default configuration settings. Returning to the default configuration settings does not change the appliance's firmware.

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.



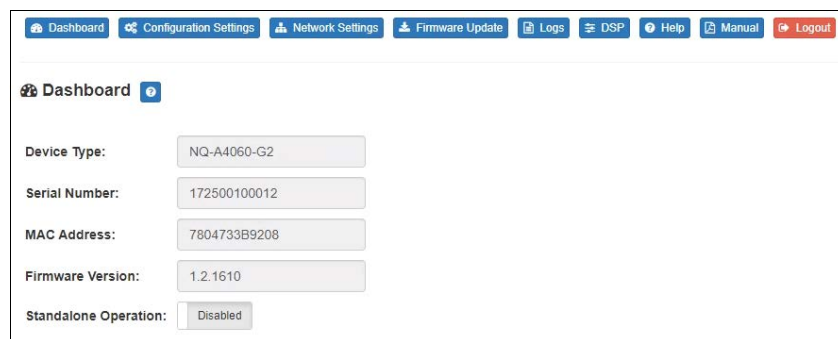
The login page features the 'NYQUIST BY BOGEN' logo at the top. Below the logo, there are two input fields: 'Username' and 'Password'. At the bottom of the form is a blue 'Login' button with a right-pointing arrow icon.

**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.



The dashboard has a top navigation bar with buttons for Dashboard, Configuration Settings, Network Settings, Firmware Update, Logs, DSP, Help, Manual, and Logout. The main content area is titled 'Dashboard' and displays the following fields:

Device Type:	NQ-A4060-G2
Serial Number:	172500100012
MAC Address:	7804733B9208
Firmware Version:	1.2.1610
Standalone Operation:	Disabled

**Figure 2. 4-Channel Power Amplifier Dashboard**

## Using the Dashboard

The dashboard displays the following fields:

**Table 1. Appliance Dashboard Fields**

<b>Device Type</b>	Identifies the model of this device.
<b>Serial Number</b>	Identifies the serial number for the device.

**Table 1. Appliance Dashboard Fields**

<b>MAC Address</b>	Specifies the Media Access Control (MAC) address, which is a unique identifier assigned to network interfaces for communications on the physical network segment.
<b>Firmware Version</b>	Provides the firmware version installed on the station.
<b>Standalone Operation</b>	Enables or disables Standalone mode.

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

**Table 2. Appliance Dashboard Buttons**

<b>Dashboard</b>	Displays the dashboard.
<b>Configuration Settings</b>	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.
<b>Network Settings</b>	Accesses the Network Settings page where you can view and set network settings, such as the static IP address.
<b>Firmware Update</b>	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.
<b>Logs</b>	Accesses log files, which record either events or messages that occur when software runs and are used when troubleshooting the appliance.
<b>DSP</b>	Accesses the DSP page where you can view and set parameters for Digital Signal Processing (DSP).
<b>Help</b>	Accesses the appliance's online help.
<b>Manual</b>	Displays the appliance's configuration manual.
<b>Logout</b>	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**

<b>Current Nyquist Version</b>	Shows the version of the appliance's currently installed firmware.
<b>New Nyquist Version</b>	Shows the version of the firmware that has been loaded, though not installed, onto the appliance.
<b>Update Firmware</b>	<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>
<b>Upload Firmware</b>	<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>
<b>Check for Updates</b>	<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>
<b>Restore Factory Settings</b>	<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>
<b>Reboot Appliance</b>	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

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

**Table 4. Network Settings (Continued)**

<b>NTP Server</b>	<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>
<b>TFTP Server</b>	<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 <b>Configuration</b> settings via the <b>Get Configuration from Server</b> button.</p> <p>If <b>TFTP Server from DHCP</b> (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 <b>TFTP Server from DHCP</b> 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 <b>TFTP Server from DHCP</b> 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>
<b>TFTP Server from DHCP</b>	<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)**

<b>DHCP Enabled</b>	Indicates if the device is enabled to use DHCP to retrieve its IP configuration.
<b>Reboot Appliance</b>	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 12).

*To view or modify 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 12 for Standalone Operation configuration.
- 3 If changes were made (Standalone Operation only), click the **Save Configuration Settings** 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="239.1.36.1"/>	<input type="text" value="6000"/>	<input type="text" value="-23"/>	<input type="text" value="1,2,3,4"/>
All-Call:	<input type="text" value="239.1.36.2"/>	<input type="text" value="6004"/>	<input type="text" value="-23"/>	<input type="text" value="1,2,3,4"/>
Audio Distribution:	<input type="text" value="239.1.36.3"/>	<input type="text" value="6008"/>	<input type="text" value="-23"/>	<input type="text" value="1,2,3,4"/>

**Device Stations**

Port Number	Port Type	Account Id	Local Port	Username
<input type="text" value="1"/>	<input type="text" value="Paging-Audio Amp"/>	<input type="text" value="sip:0208@192.168.1.199"/>	<input type="text" value="5060"/>	<input type="text" value="0208"/>
<input type="text" value="2"/>	<input type="text" value="Paging-Audio Amp"/>	<input type="text" value="sip:0209@192.168.1.199"/>	<input type="text" value="5060"/>	<input type="text" value="0209"/>
<input type="text" value="3"/>	<input type="text" value="Paging-Audio Amp"/>	<input type="text" value="sip:0210@192.168.1.199"/>	<input type="text" value="5060"/>	<input type="text" value="0210"/>
<input type="text" value="4"/>	<input type="text" value="Paging-Audio Amp"/>	<input type="text" value="sip:0211@192.168.1.199"/>	<input type="text" value="5060"/>	<input type="text" value="0211"/>

**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)**

<b>Get Configuration from Server</b>	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).
<b>Web Username</b>	Displays the username of the current user.
<b>Emergency-All-Call</b>	Identifies the IP address, port number, cut level (volume), and station list used for emergency all-call pages.
<b>All-Call</b>	Identifies the IP address, port number, cut level (volume), and station list used for all-call pages.

**Table 5. Configuration Settings (Standalone disabled)**

<b>Audio Distribution</b>	Identifies the IP address, port number, cut level (volume), and station list used for audio distribution.
<b>Multicast #</b>	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 following information for each **Device Station** attached to the amplifier:

<b>Port Number</b>	Shows the output port of the amplifier, where 1 = A, 2 = B, 3 = C, and 4 = D.
<b>Port Type</b>	Shows the device type to which the port connects.
<b>Account ID</b>	Shows the SIP account (IP address) associated with the device preceded by the extension of the device associated with this port.
<b>Local Port</b>	Shows the port used for SIP.
<b>Username</b>	Shows the username or extension for the station associated with the port.

# Standalone Operation Configuration Settings

Configuration Settings

Device Type:

NQ-A4XXX-G2-Amplifier

Device Name:

NQ-A4XXX-G2

Web Username:

admin

Web Password:

Web Confirm Password:

Time Zone:

Select a time zone

Prioritize Line Input:

No

Channel A Load Impedance:

Low

Channel A Ouput Power:

0

Channel B Load Impedance:

Low

Channel B Ouput Power:

0

Channel C Load Impedance:

Low

Channel C Ouput Power:

0

Channel D Load Impedance:

Low

Channel D Ouput Power:

0

Enable SIP Calls:

Yes

SIP Server Address:

SIP Network Port:

SIP Codecs:

G722ulawalaw

SIP Extension (Channel A):

501

SIP User Name (Channel A):

501

SIP Password (Channel A):

bogen

Cut Level (Channel A): 0 dB

SIP Extension (Channel B):

502

SIP User Name (Channel B):

502

SIP Password (Channel B):

bogen

Cut Level (Channel B): 0 dB

SIP Extension (Channel C):

503

SIP User Name (Channel C):

503

SIP Password (Channel C):

bogen

Cut Level (Channel C): 0 dB

SIP Extension (Channel D):

504

SIP User Name (Channel D):

504

SIP Password (Channel D):

bogen

Cut Level (Channel D): 0 dB

Save Configuration Settings

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	Channel A	-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)**

<b>Device Type</b>	Displays the type of this device.
<b>Device Name</b>	Provide a name for this device.
<b>Web Username</b>	Provide a web username for this appliance.
<b>Web Password</b>	Provide a web password for logging into the appliance.
<b>Web Confirm Password</b>	Re-enter the password used to log into the appliance.
<b>Time Zone</b>	Select the time zone in which the device resides.
<b>Prioritize Line Input</b>	<p>If a channel simultaneously receives input signals from both a network input and a line input, "Yes" means line input is used, "No" means network input is used.</p> <p>Yes or No</p>
<b>Channel A/B/C/D Load Impedance</b>	<p>Specify the impedance load of the connected speaker(s).</p> <p>Low (typically 4-16 ohms) or High (typically 1000+ ohms)</p>
<b>Channel A/B/C/D Output Power</b>	<p>Controls the output power to the speaker.</p> <p>This can be a value from -6 to +6 dB.</p>
<b>Enable SIP Calls</b>	<p>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.</p> <p>Yes or No</p>
<b>SIP Server Address<sup>a</sup></b>	Specify the IP address of the SIP Registration Server with which the device will register.
<b>SIP Network Port<sup>a</sup></b>	Specify the IP port on which to communicate with the SIP Registration Server (typically 5060).
<b>SIP Codecs<sup>a</sup></b>	Displays a read-only list of codecs allowed on SIP sessions.
<b>SIP Extension<sup>a</sup> (Channel A/B/C/D)</b>	<p>Specify the SIP extension corresponding to Channel A, B, C, or D.</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:&lt;extension&gt;@&lt;local_ip_address&gt;</p>
<b>SIP Username<sup>a</sup> (Channel A/B/C/D)</b>	Specify the SIP username used to register Channel A, B, C, or D with the SIP server.

**Table 6. Configuration Settings (Standalone enabled)**

<b>SIP Password<sup>a</sup></b> <b>(Channel A/B/C/D)</b>	Specify the SIP registration password used to register Channel A, B, C, or D with the SIP server.
<b>Cut Level<sup>a</sup></b> <b>(Channel A/B/C/D)</b>	<p>Specify the intercom volume to be used for SIP calls over Channel A, B, C, or D.</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 each Multicast Address configured for this device.

<b>Multicast IP Address</b>	Specifies the multicast IP address on which to receive audio streams.
<b>Multicast Port Number</b>	Specifies the multicast port on which to receive audio streams.

## Codec

Specifies the codec to be used when decoding audio. Select one of the following values:

- G711 u-law
  - Intercom 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
  - Intercom 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
  - Tone and paging quality
  - A wideband audio codec operating at 48, 56, and 64 kbps.
- OPUS
  - 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 output.

One or more of the following values:

- Channel A
- Channel B
- Channel C
- Channel D

## 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:* To fine tune the level per channel, adjust the levels on the DSP mixing board interface.

*Note:* A maximum of 24 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 using the 4-way arrow symbols to drag entries up and down 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.
btmtp	Contains information about failed login attempts.
daemon.log	Contains information logged by the various back-ground daemons that run on the system.
debug	Contains errors and debug information.

**Table 7. Logs (Continued)**

<b>Log</b>	<b>Description</b>
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 various DSP operations on digital channels A, B, C, and D.

*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 (A, B, C, or D) 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 router's Analog Input Gain control (see "*Router*" on page 45), after which the analog signal is converted to a digital signal. The digital signal can then be routed to one or more of the mixer's four output channels (A, B, C, and D) via the DSP Router, where it is processed by the mixing board interface.

Digital VoIP audio streams received over the network—whether as SIP-initiated phone calls or as multicast audio (see SIP and Multicast configuration settings in *"Configuration Settings Tab Parameters"* on page 9)—are also controlled by the mixer's output channels (A, B, C, and D).

*Tip:* Be aware that the output levels of digital audio streams received over the network are controlled by the same sliders that control analog line input signals. You can use the DSP Router to adjust an analog signal level relative to a digital signal level on the same channel.

The digital signal, regardless of the source, is then conditioned, filtered, and enhanced via the DSP processors, and its level adjusted via the mixing board's slider controls. The digital outputs of all channels are converted to analog signals and sent to the channel's electrical output connectors. If this device is being used as an Audio Distribution source, the signals can be distributed as digital audio over the network using a Nyquist server's Audio Distribution feature.

*Note:* Audio Distribution functionality is not supported in Standalone Operation mode.



**Figure 8. DSP Page**

From the DSP page, you can view and control the signal levels for each channel. Selecting the DSP Features button for a channel displays a list of DSP features which can be applied


to that channel (though some DSP features are channel-independent, such as Router and Status), such as compressor, noise gate, filters, equalizers, and limiters, as well as features for monitoring the signal and the amplifier status. You can even load groups of pre-defined DSP settings, known as *DSP presets*, and assign them to the channel connected to that speaker.

*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.

*Note:* If two output connectors are configured for Bridge mode (A/B or C/D), the output channel that corresponds to the second connector (B or D) will not appear on the mixing board interface.

DSP features and controls are described in the following table.

**Table 8. DSP Page**

<b>Save Settings to Server</b>	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.
<b>Mute</b>	Silences the audio for the selected channel.
<b>DSP Features button</b> 	Presents a menu of DSP features that can be applied to the corresponding channel.
<b>Level Slider</b>	Adjusts the channel volume level in 1-dB increments.
<b>NET-IN LED</b>	Illuminates when a signal is being received from the Network stream input.
<b>LINE-IN LED</b>	Illuminates when a signal is being received from the analog Line input.
<b>Clip LED</b>	Illuminates when a signal has exceeded the maximum threshold, indicating that the signal is “clipping.”
<b>IN VU meter</b>	Indicates the strength of the input signal.
<b>OUT VU meter</b>	Indicates the strength of the output signal.



**Table 8. DSP Page**


<b>Pink Noise</b>	When set to ON, a pink noise signal will be sent to the output channel.
<b>Phase Invert</b>	When set to ON, the signal for this channel is inverted, usually to prevent two similar but out-of-phase signals from canceling each other out.

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**

<b>Compressor</b>	Lessens the dynamic range between the loudest and quietest parts of an audio signal.
<b>Delay</b>	Delays the signal by a specified number of milliseconds.
<b>Graphic EQ</b>	Uses fixed frequencies to tailor the frequency content of an audio signal.
<b>High/Low Pass</b>	Filters out frequencies in the input signal that are above and below specified high and low cutoff frequencies.
<b>Limiter</b>	Prevents a signal from exceeding an adjustable maximum level.
<b>Noise Gate</b>	Eliminates low-level hiss, noise, or leakage, particularly when there is a high level of ambient noise.
<b>Parametric EQ</b>	Uses a center/primary frequency to allow tailoring of the frequency content of an audio signal.
<b>Peak Limiter</b>	Limits the signal to a specified threshold based on the signal's instantaneous levels.
<b>Presets</b>	Provides predefined configurations of DSP features, tailored for specific speakers models.
<b>RMS Limiter</b>	Limits the signal to a specified threshold based on the signal's average levels over time.
<b>Router</b>	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.
<b>Settings</b>	Allows you to provide names and colors for the input and output channels.

**Table 9, DSP Features**

<b>Signal Present</b>	Allows you to specify the signal level at which the signal LED will be lit, as well as how long it will remain lit.
<b>Standby</b>	Allows the amplifier to automatically put itself in a low power standby mode when there is little or no signal.
<b>Status</b>	Provides real-time status for the amplifier, including for which mode (2-channel or single-channel bridge mode) the outputs are configured, channel output limits, and more.
<b>Reset button</b> 	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 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 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.

- 

The Amplifier Mute feature disables the output signal when the input signal registers below a specified threshold. It operates at the hardware level, and as such, can minimize or eliminate noise that is generated by the device itself, such as the popping sound that can occur when the amplifier is turned on or off. However, it does not provide the sophisticated control of the signal that the Noise Gate DSP effect provides, such as customizable attack, decay, and hold settings.



**Figure 9. Amplifier Mute Settings**

*To adjust the Amplifier Mute 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 **Amplifier Mute**.

*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 10. Amplifier Mute Settings**

<b>Enable</b>	Enables or disables the amplifier mute effect for this channel.
---------------	---

**Table 10. Amplifier Mute Settings**

<b>Threshold</b>	Sets the minimum threshold level that the signal must reach to allow the signal to be sent to the output channel.  Threshold range is -135 to +21 dB.
<b>Status</b>	Indicates if channels A/B and C/D are in Amplifier Mute mode (On) or not (Off).

## Compressor

A compressor reduces the dynamic range of a signal. This effect is perceived as quieting loud sounds and boosting quiet 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 11, "Compressor Settings," on page 26.

*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 11. Compressor Settings**

<b>Enable</b>	Enables or disables the compressor DSP effect for this channel.
<b>Threshold</b>	<p>Sets the threshold level, which is the point where the signal activates the compressor circuit.</p> <p>The range is -135 to +21 dB.</p>
<b>Attack</b>	<p>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.</p> <p>The range is 1 to 500 ms.</p>
<b>Hold</b>	<p>Sets how long compression will be applied after the signal has fallen below the threshold.</p> <p>The range is 1 to 500 ms.</p>
<b>Decay</b>	<p>Sets how quickly or slowly compression will be removed from the signal after the signal has dropped below the threshold <i>and</i> 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.</p> <p>The range is 0 to 2000 ms.</p>
<b>Knee</b>	<p>Sets how far below the threshold compression will begin to be <i>gradually</i> applied to the signal. A very low value, known as a <i>hard knee</i>, immediately applies full compression once the threshold is reached. A high value, known as a <i>soft knee</i>, 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.</p> <p>The range is 1 to 100 dB.</p>

**Table 11. Compressor Settings**

<b>Ratio</b>	<p>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.</p> <p>The range is 1 to 100.</p>
<b>Input meter</b>	<p>Shows the strength of the input signal.</p>
<b>Output meter</b>	<p>Shows the strength of the output signal, providing a visual indicator of the effect of the compressor on the output signal.</p>
<b>Comp LED</b>	<p>Illuminates when compression is being applied to the signal.</p>

## Delay

A delay effect causes the signal to be delayed by a configurable time interval from 0 to 30 milliseconds. This can be useful for synchronizing playback between different channels which, for various reasons, may be playing out-of-sync.



**Figure 11. Delay Settings**

*To adjust the Delay 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 **Delay**.

*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 *Table 12, "Delay Settings,"* on page 29.

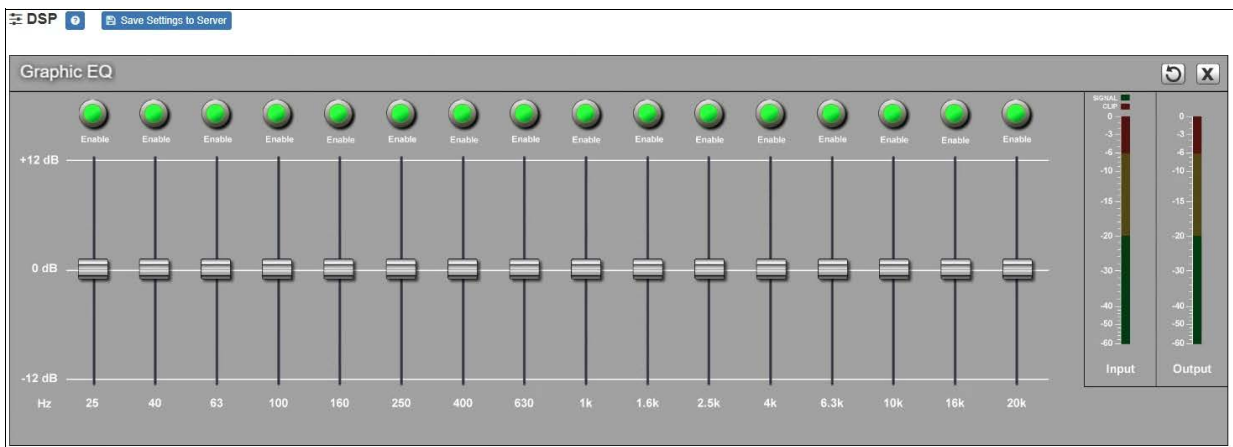
**Table 12. Delay Settings**

<b>Delay (ms)</b>	Sets the number of milliseconds by which the input signal will be delayed before sending it to the output channel.
<b>Signal LED</b>	Illuminates when the input signal is present.
<b>Clip LED</b>	Illuminates when the input signal is clipping.
<b>Input meter</b>	Indicates the strength of the input signal.

## Graphic EQ

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.

## 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 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 13. 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.

<b>Frequency</b>	<p>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.</p> <p>The high-pass filter attenuates content below this frequency and lets frequencies above this cutoff frequency pass through the filter.</p>
<b>Type</b>	<p>Available filter types are:</p> <ul style="list-style-type: none"><li>• Linkwitz-Riley (12, 24, 36, and 48 dB per octave)</li><li>• Butterworth (6, 12, 18, 24, 30, 36, 42, and 48 dB per octave)</li><li>• Bessel (12, 18, and 24 dB per octave)</li></ul> <p><i>Note:</i> 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.</p>

**Table 13. High/Low Pass Parameters**

### ***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.

<b>Frequency</b>	<p>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.</p> <p>The low-pass filter attenuates content above this frequency and lets frequencies below this cutoff frequency pass through the filter.</p>
<b>Type</b>	<p>Available filter types are:</p> <ul style="list-style-type: none"><li>• Linkwitz-Riley (12, 24, 36, and 48 dB per octave)</li><li>• Butterworth (6, 12, 18, 24, 30, 36, 42, and 48 dB per octave)</li><li>• Bessel (12, 18, and 24 dB per octave)</li></ul> <p><i>Note:</i> 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.</p>

## **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 14. Limiter Settings**

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

## Noise Gate

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 15. Noise Gate Settings**

<b>Enable</b>	Enables or disables the noise gate DSP effect for this channel.
<b>Threshold</b>	<p>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.</p> <p>Threshold range is -135 to +21 dB.</p>

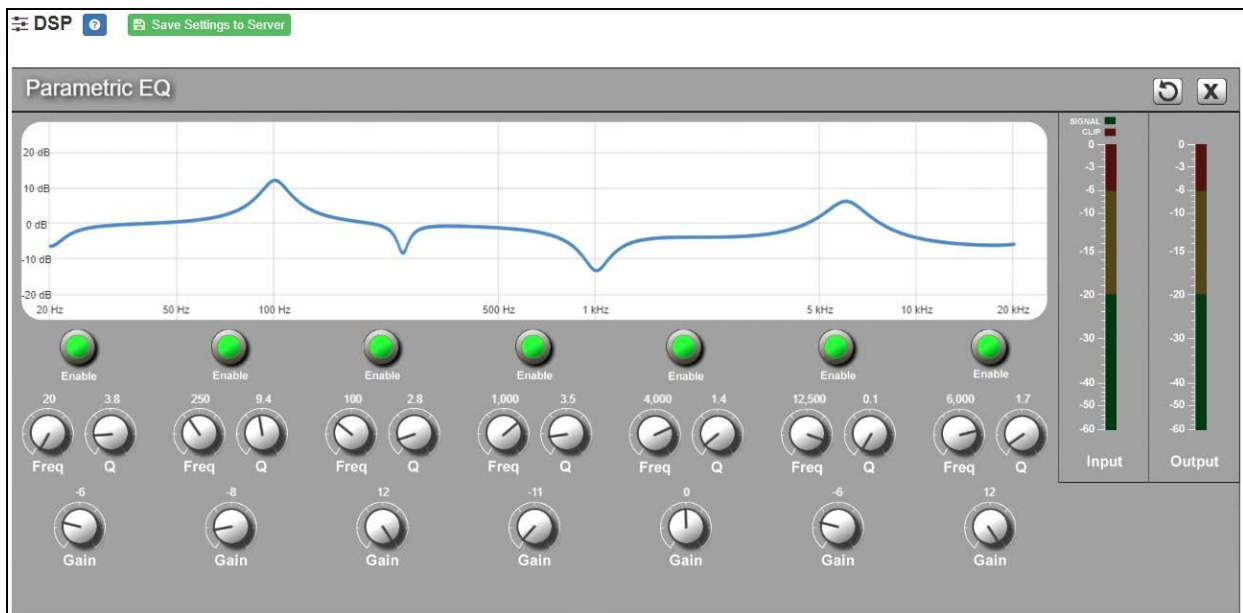


**Table 15. Noise Gate Settings**

<b>Attack</b>	Sets how long it takes for the gate to open once the signal reaches the threshold level.  Attack range is 1 to 500 ms.
<b>Hold</b>	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.
<b>Decay</b>	Sets hows quickly or slowly the gate will close once the signal has dropped below the threshold level <i>and</i> the Hold interval has expired.  Decay range is 0 to 2000 ms.

## 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 16. Parametric Equalizer Settings**

The parametric 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**.

## Peak Limiter

The primary purpose of the **Peak Limiter** is to eliminate very high signals, which can not only create unpleasantly loud sound, but potentially cause mechanical damage to the speaker. Any signal that exceeds the threshold will be compressed, thereby reducing the signal.

This type of limiter is triggered by the peak, or loudest part, of a signal, not the overall strength or volume. This means it can be triggered any time the signal exceeds the specified threshold, however briefly. This is in contrast to the **RMS Limiter**, which is triggered by a signal whose level exceeds the threshold over a period of time.

The primary purpose of the **Peak Limiter** is not typically to shape or enhance the audio signal, but to limit any (hopefully uncommon) signals that exceed the mechanical tolerance levels of the speakers.

*Tip:* The Presets feature contains predefined Peak Limiter settings for a number of specific speakers.



**Figure 17. Peak Limiter Settings**

*To adjust the Peak Limiter 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 **Peak Limiter**.

*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 Table 16, "Peak Limiter Settings," on page 40.
- 5 Select **Enable** to apply the settings to the selected channel.

**Table 16. Peak Limiter Settings**

<b>Enable</b>	Enables or disables the Peak Limiter DSP effect for this channel.
<b>Threshold</b>	<p>Sets the threshold level, which is the point where the signal activates the compressor circuit.</p> <p>The range is -135 to +21 dB.</p>
<b>Attack</b>	<p>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.</p> <p>The range is 1 to 500 ms.</p>
<b>Hold</b>	<p>Sets how long compression will be applied after the signal has fallen below the threshold.</p> <p>The range is 1 to 500 ms.</p>
<b>Decay</b>	<p>Sets how quickly or slowly compression will be removed from the signal after the signal has dropped below the threshold <i>and</i> 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.</p> <p>The range is 0 to 2000 ms.</p>
<b>Input meter</b>	Shows the strength of the input signal.
<b>Output meter</b>	Shows the strength of the output signal, providing a visual indicator of the effect of the compressor on the output signal.
<b>Limiting LED</b>	Illuminates when compression is being applied to the signal.

## Presets

The DSP configuration settings for a channel can be stored as a *DSP preset*. A DSP preset stores the settings for the *DSP preset effects*: **Hi/Low Pass Filter**, **Peak Limiter**, **RMS Lim-**

**iter**, and **Parametric EQ**. When a DSP preset is applied to a channel, the settings of the DSP preset effects are replaced with the settings in the preset. Presets can also be exported or imported to or from (JSON-encoded) files, which allows them to be backed up or shared between devices.

Bogen has provided a number of predefined DSP presets. These configurations are defined and optimized for specific speakers.

DSP presets can be selected and applied to each individual channel. Selecting a preset will apply the predefined settings for that channel, potentially overwriting any existing settings. If any of those settings are later modified by the user, the existing preset will be unselected, but all other settings from the preset will remain. To completely remove the preset configuration from a channel, click the **Clear** button, which returns the DSP preset effect settings to their default values for the selected channel.

*Note:* To completely remove an uploaded preset from the list, the **Firmware Update** view has a **Restore Factory Settings** option, which will clear out all custom presets along with *all other* configuration settings. Use this feature with caution.

The screenshot displays the 'Presets' settings interface. At the top, there's a 'DSP' header with an information icon and a 'Save Settings to Server' button. Below this is a 'Presets' modal window with a close button (X) in the top right corner. The modal contains four channels, each with a dropdown menu for selecting a preset and four buttons: 'Details', 'Generate', 'Download', and 'Clear'. At the bottom of the modal, there is an 'Upload Presets' button on the left and an 'Apply' button on the right.

**Figure 18. Presets Settings**

*To adjust the Presets 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 **Presets**.
- 4 Make desired adjustments using the controls described in *Table 17, "Preset Settings,"* on page 42.

**Table 17. Preset Settings**

<b>Ch A/Ch B/Ch C/Ch D</b>	<p>Select a predefined DSP preset configuration from the list of options for Channels A, B, C, and D. These configurations will be applied when the <b>Apply</b> button is clicked.</p> <p><i>Note:</i> This field will be blank if no preset has been selected for this channel. To deselect an existing preset, click <b>Clear</b>. Selecting the blank entry has no effect.</p>
<b>Details</b>	Displays the name and description of the preset, as well as an optional link to a web page related to the preset (if available).
<b>Generate</b>	<p>Prompts the user to specify a new name and stores the current settings of the DSP preset effects (<b>Hi/Low Pass Filter</b>, <b>Peak Limiter</b>, <b>RMS Limiter</b>, and <b>Parametric EQ</b>) under that name.</p> <p>Valid characters: A–Z, a–z, 0–9, - (hyphen), and _ (underscore).</p>
<b>Download</b>	Downloads the selected preset configuration (as a JSON file) to the user's local computer.
<b>Clear</b>	Deselects the currently selected preset configuration and returns the DSP preset effect settings for the channel to their default values. Note that these changes take effect immediately, without having to click <b>Apply</b> .
<b>Upload Presets</b>	Prompts the user to select one or more preset configuration files from the local computer. These files must contain JSON-encoded DSP preset configurations that were previously downloaded or provided by Bogen technical support. Once uploaded, the new DSP preset configurations will be available for use.
<b>Apply</b>	Applies the selected preset configurations to the DSP channels.

## RMS Limiter

The primary purpose of the **RMS Limiter** is to protect the speakers from the thermal damage that can be caused by extended periods of excessive power usage. Any signal whose RMS level exceeds the threshold will be compressed, thereby reducing the signal.

The **RMS Limiter** uses the RMS (root mean square) level, which is proportional to the average amount of energy over a short period of time, to determine when a signal has met the threshold. Because the RMS level is more closely related to the perceived volume of a signal than the peak level, this type of limiter is less sensitive to extremely short signal peaks, and more sensitive to the overall volume of a signal. This is opposed to the **Peak Limiter**, which is triggered by any signal that exceeds the threshold, however briefly.



Figure 19. RMS Limiter Settings

To adjust the RMS Limiter 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 **RMS Limiter**.

*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 *Table 18, "RMS Limiter Settings,"* on page 44.
- 5 Select **Enable** to apply the settings to the selected channel.

**Table 18. RMS Limiter Settings**

<b>Enable</b>	Enables or disables the RMS Limiter DSP effect for this channel.
<b>Threshold</b>	Sets the threshold level, which is the RMS level above which the signal will activate the compressor circuit.  The range is -135 to +21 dB.
<b>Attack</b>	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.
<b>Hold</b>	Sets how long compression will be applied after the signal has fallen below the threshold.  The range is 1 to 500 ms.
<b>Decay</b>	Sets how quickly or slowly compression will be removed from the signal after the signal has dropped below the threshold <i>and</i> 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.
<b>Input meter</b>	Shows the strength of the input signal.
<b>Output meter</b>	Shows the strength of the output signal, providing a visual indicator of the effect of the compressor on the output signal.
<b>Limiting LED</b>	Illuminates when compression is being applied to the signal.



## Router

Router settings allow you to specify where to output a line input signal and how much to adjust its level. For each input, you can:

- Adjust the **Analog Input Gain**. This adjusts the electronic gain for the input signal.
- Enable or disable the input.
- Adjust the **Input Gain**. This adjusts the digital gain for the input.
- Route the input to one or more output channels.
- Adjust the gain per output channel.

For each output channel, you can:

- Enable or disable the output channel.
- Adjust the overall output gain, which includes all of the input signals that are routed to that output channel.



Figure 20. Router

*Note:* The number of output channels that appear on the Router screen depends on whether the output channels are configured for Bridged or 2-Channel mode. For example, if Channels A and B are in Bridged mode, then three output channels appear: A, C, and D. If Channels C and D are also in Bridged mode, then only two output channels would appear on the Router screen: A and C.

*To adjust the router settings:*

- 1 On the appliance Web UI's main page, select **DSP**.
- 2 Select the **Menu** button for any channel.
- 3 From the drop-down menu, select **Router**.
- 4 Enable the desired Inputs (green).

- 5 Enable the desired Outputs (blue).
- 6 Enable the output channels to which each input is to be routed (gray).
- 7 Adjust the **Analog Input Gain** for each desired channel to ensure a strong input signal is being received.

*Tip:* You may have to switch between the Router and mixing board views of the DSP page to view the input VU meters, Line-In LEDs, and Clip LEDs while adjusting the input gains.

- 8 Adjust the digital input, output, and routed channel gains as desired.

## Settings

You can specify custom names and colors for each of the mixing board channels. Note that the number of channels that appear can range from two to four, depending on whether channels are configured for mono or single channel bridge mode.

	Name	Color
Ch A:	<input type="text" value="Label 1"/>	Grey ▾
Ch B:	<input type="text" value="Label 2"/>	Grey ▾
Ch C:	<input type="text" value="Label 3"/>	Grey ▾
Ch D:	<input type="text" value="Label 4"/>	Grey ▾

Save

**Figure 21. Settings Parameters for 4-Channel Mono**

For example, if channels A and B and channels C and D have been placed in Single Channel Bridged Mode, then only two channels appear.

*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**.
- 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.

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

- 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 22. 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.

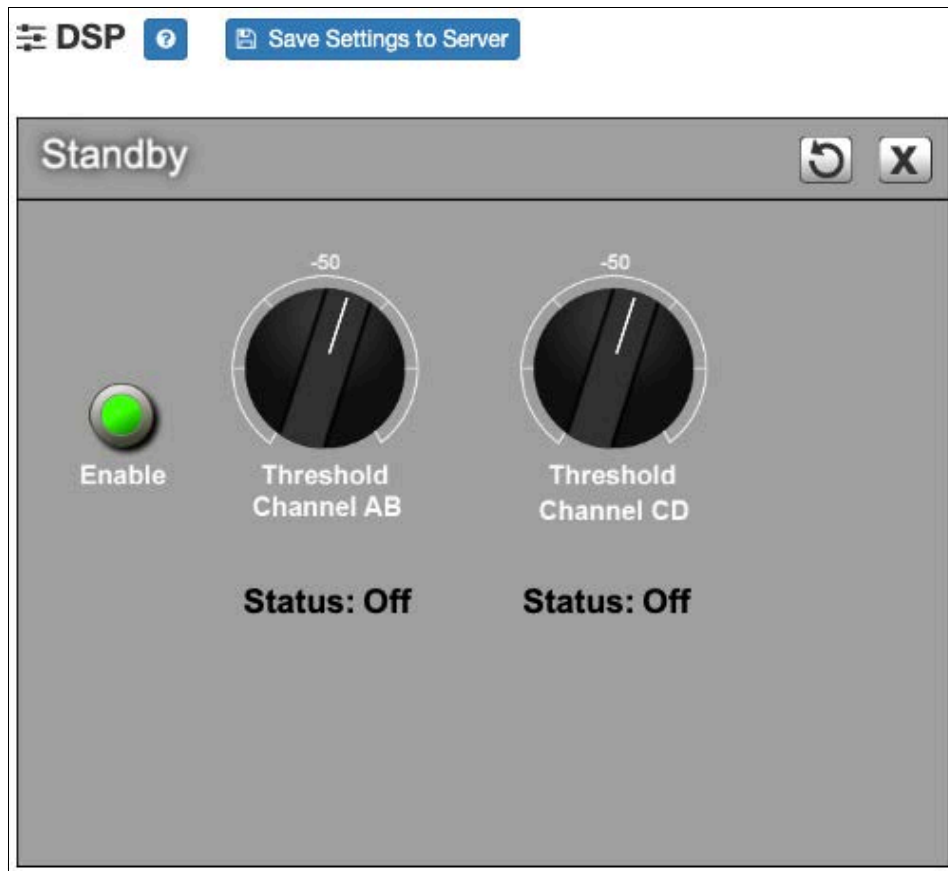
**Table 19. Signal Present Parameters**

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

## Standby

The amplifier can automatically be put into a low-power Standby mode if the signal falls below a specified threshold level for 200 seconds or longer. This can be enabled and the threshold level set via the Standby settings. When a signal is received that exceeds the specified threshold, the amplifier will automatically recover from standby mode.

**Caution** There may be up to a one second latency for the amplifier to recover from standby mode, which could cause the beginning of the audio signal to be lost. For this reason, it may be a good idea to include a second or more of “comfort noise” at the beginning of the signal to mitigate this effect, or if necessary, to disable this feature.



**Figure 23. Standby Settings**

*To adjust the Standby 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 **Standby**.

*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 *Table 20, "Standby Settings," on page 51*.
- 5 Select **Enable** to apply the settings to the selected channel.

**Table 20. Standby Settings**

<b>Enable</b>	Enables or disables the standby feature for the amplifier.
<b>Threshold Channel AB and Threshold Channel CD</b>	<p>Sets the threshold level for channels A/B and for channels C/D.</p> <p>If the signal level remains below this level for 200 seconds or longer, the amplifier is put into low power Standby mode. Normal operation will resume (within one second) once a signal is received that exceeds this level.</p> <p>The range is -144 to +24 dB.</p>
<b>Status</b>	Indicates if channels A/B and C/D are in Standby mode (On) or not (Off).

## Status

The **Status** selection for the power amplifier provides real-time status, such as whether the amplifier is operating in 2-channel mono or single-channel bridged mode, LEDs for thermal protection and clipping, a real-time reading of the appliance's temperature, and indicators of the amplifier's standby and mute status. Note that the number of channels that appear depends on whether the amplifier is operating in 2-channel mono or single-channel bridged mode.

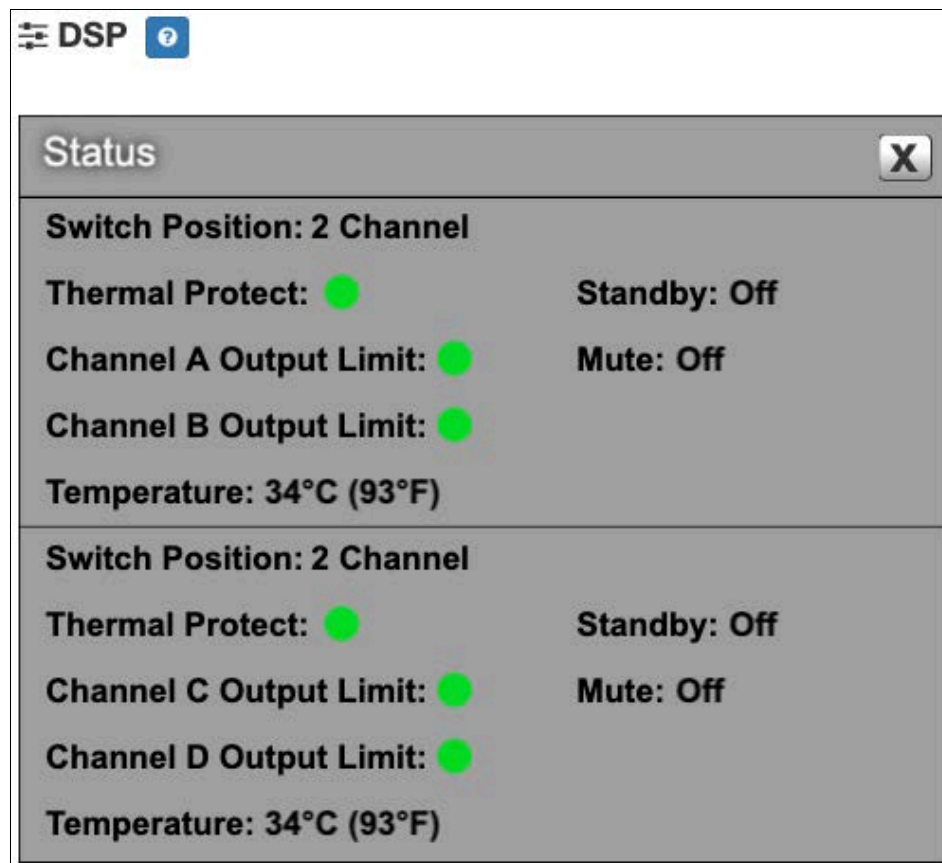
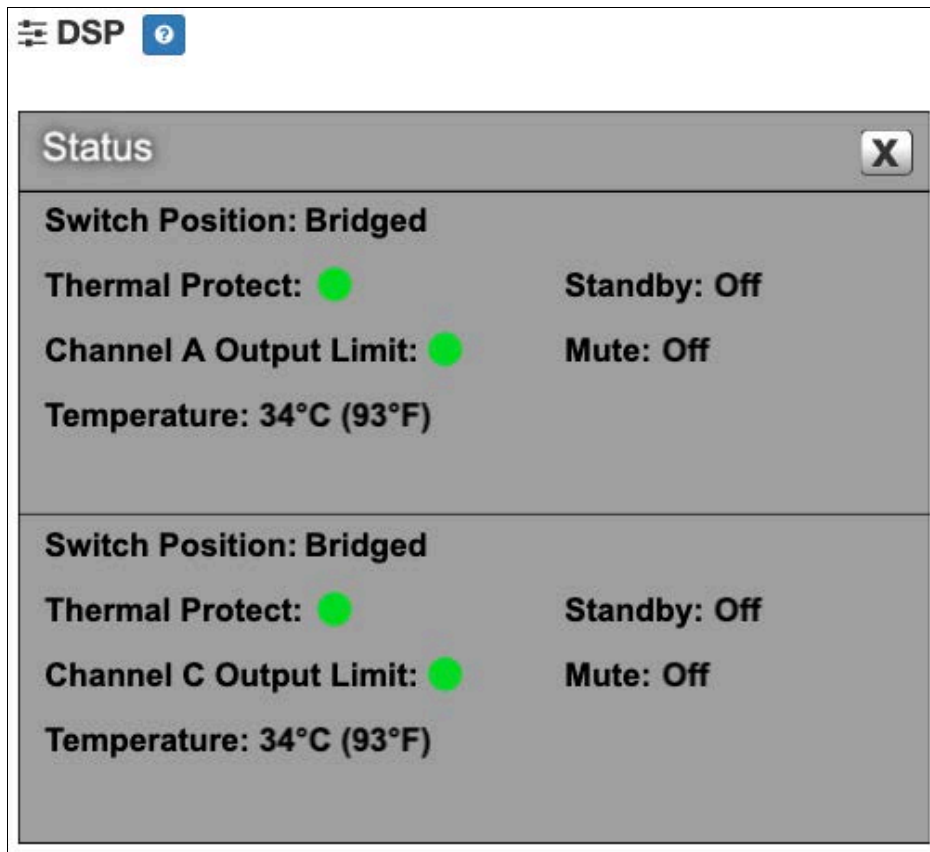


Figure 24. Status for 2-Channel





**Figure 25. Status When All Channels Are Bridged**

*To view status for the power amplifier:*

- 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 **Status**.

The view-only information that appears is described in the following table:

**Table 21. Status**

<b>Switch Position</b>	Indicates the position of the Amplifier Mode switch located on the rear of the appliance. Bridged mode is typically used when higher-power, single-channel operation with a high-impedance loudspeaker load is needed. For information about setting the Amplifier Mode, refer to the installation manual for the appliance.
<b>Thermal Protect</b>	Appears red if the output channel is being overloaded or there is an external short and the amplifier has placed itself into protection mode to prevent permanent damage. Otherwise, the LED is green.
<b>Channel A/B/C/D Output Limit</b>	Appears red if the output signal is too high and is being clipped or distorted. Otherwise, the LED is green.
<b>Temperature</b>	Provides the real-time temperature of the appliance in both Celsius and Fahrenheit. The amplifier enters protection mode if the temperature exceeds 85 °C.
<b>Standby</b>	Indicates if channels A/B and C/D are in Standby mode (On) or not (Off).
<b>Mute</b>	Indicates if channels A/B and C/D are in Mute mode (On) or not (Off).