



2-Channel Audio Power Amplifier Configuration Guide

NQ-A2060, NQ-A2120, NQ-A2300



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Configuring the Nyquist 2-Channel Audio Power Amplifiers

Bogen's Nyquist-based networked two-channel audio power amplifiers (NQ-A2060, NQ-A2120, NQ-A2300) support small, medium, and large Nyquist intercom solutions in schools and in commercial paging and public address solutions.

Available in 120-, 240-, and 600-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 two-second 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 the process for manual configuration. For information about using Nyquist's automatic configuration process, refer to the appropriate *Nyquist System Administrator Guide*.

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

To access the appliance's Web-based user interface (UI):

- 1 Before accessing the web UI for the first time, the Bogen Certification Authority (CA) digital certificate must be installed on the client. This certificate can be downloaded from any Nyquist appliance and enables your browser to recognize the Nyquist web application as a trusted site.

For details on how to download and install the certificate to your client computers, see *"Bogen Digital Certification Authority" on page 58*.

- 2 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 server's 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.
 - c) From the Nyquist server's **Appliance Discovery Wizard**, select the **Link** icon for the device that you want to configure.

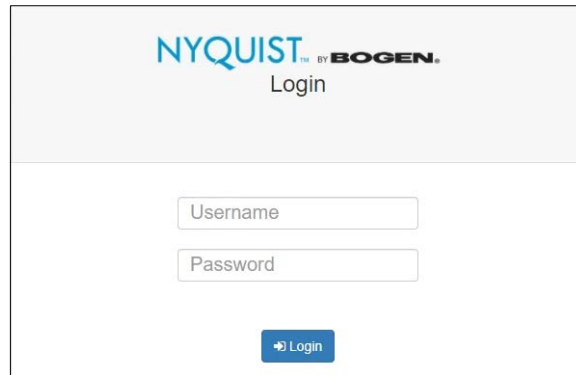
The image shows the login page for the Nyquist Appliance. At the top, the logo "NYQUIST BY BOGEN" is displayed in blue and black text, with "Login" centered below it. The main area contains two input fields: "Username" and "Password", both with light gray borders. Below these fields is a blue button with a white right-pointing arrow and the text "Login".

Figure 1. Nyquist Appliance Login

- 3 At the Nyquist appliance's Login page, enter username and password, then press enter or click on the **Login** button.

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

Note: After a successful login, a warning will be displayed if the default password is still in use. We strongly encourage changing the default password as soon as possible.

When you have logged in successfully, you will be presented with the dashboard for the appliance.

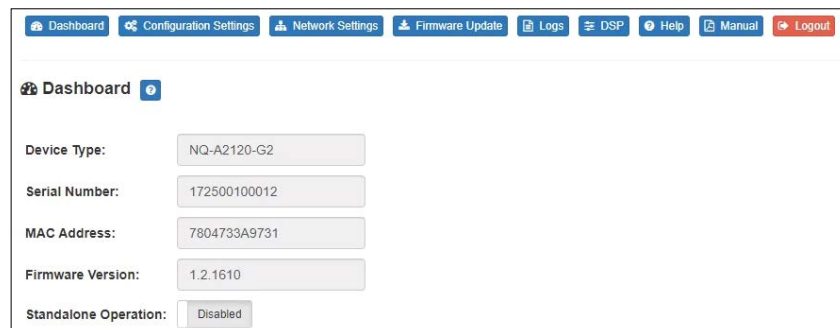
The image shows the dashboard of a 2-Channel Power Amplifier. At the top is a navigation bar with buttons: "Dashboard" (active), "Configuration Settings", "Network Settings", "Firmware Update", "Logs", "DSP", "Help", "Manual", and "Logout". Below the navigation bar is the "Dashboard" section, which includes a "Device Type" field with the value "NQ-A2120-G2", a "Serial Number" field with "172500100012", a "MAC Address" field with "7804733A9731", a "Firmware Version" field with "1.2.1610", and a "Standalone Operation" field with a "Disabled" button.

Figure 2. 2-Channel Power Amplifier Dashboard

Using the Dashboard

The dashboard displays the following fields:

Table 1. Appliance Dashboard Fields

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

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

Table 2. Appliance Dashboard Buttons

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

Standalone Operation

This device can also 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 allows this device to be used without a Nyquist server as a generic SIP endpoint when integrated with a 3rd-party VoIP telephone system or other SIP server-based solutions, such as a unified communications (UC) platform. In a non-SIP environment, these devices are capable of receiving audio through one or more prioritized multicast channels.

Important: Appliances maintain a distinct web username and password for Standalone Operation. It may be helpful to record this standalone-mode username and password or set them to the default or well-known values before switching to non-standalone mode. This username and password will be needed to log in when and if the appliance is subsequently returned to standalone mode. The standalone-mode username and password will be set to the default values if the appliance is reset to the factory default configuration.

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.



Note: Some buttons only appear on this page when applicable.

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.
 - If the device is in Standalone mode, the **Check for Updates** button will be shown. Selecting it 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 and the **Update Firmware** button will be shown.
 - 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**.

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.
 - If you want to return your appliance to its original factory configuration, select **Restore Factory Settings**.
 - 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	Available only when a new firmware version has been loaded onto the appliance (as specified in New Nyquist Version). Installs the loaded firmware. A reboot may be required after installation.
Upload Firmware	Prompts the user to specify a firmware file, which will then be loaded (though not installed) onto the appliance. <i>Note:</i> To obtain the firmware file for a specific version, please contact Bogen Technical Support.
Check for Updates	Available only when the appliance is configured for Standalone mode. 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. <i>Note:</i> Ensure your Nyquist appliance has network access to <code>bogen-ssu.bogen.com</code>, port 22.
Restore Factory Settings	Returns the appliance to its original factory configuration. <i>Note:</i> This does not install the original appliance firmware. The firmware will not be changed.
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** 

 Network Traffic Capture

IP Address:

192.168.90.18

Netmask:

255.255.255.0

Gateway:

192.168.90.1

VLAN ID:

VLAN Priority:

0 - Best Effort ▾

NTP Server:

192.168.90.10

TFTP Server:

192.168.90.10

TFTP Server from DHCP:

Yes ▾

DHCP Enabled:

Yes ▾

Reboot Appliance:

No ▾

 Save

Figure 4. Network Settings

 **Network Settings** 

IP Address:

192.168.90.18

Netmask:

255.255.255.0

Gateway:

192.168.90.1

DNS:

192.168.90.1

VLAN ID:

VLAN Priority:

0 - Best Effort ▾

NTP Server:

192.168.90.10

DHCP Enabled:

Yes ▾

Reboot Appliance:

No ▾

 Save

Figure 5. Network Settings (Standalone)

Network settings are described in the following table:

Table 4. Network Settings

Network Traffic Capture	Captures network traffic on this appliance and saves it to a PCAP file that can be downloaded to the user’s computer. For details, see <i>Network Traffic Capture</i> in the Nyquist System Administrator Guide.
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.

Table 4. Network Settings (Continued)

DNS	Identifies one or more space-delimited DNS server IP addresses. <i>Note:</i> If DHCP option 6 (DNS) is provided by a DHCP server, the DHCP-provided DNS configuration and this field will be ignored. <i>Note:</i> This field is only available when Standalone Operation is enabled.
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.
NTP Server	Identifies the IP address or the domain name of the Network Time Protocol (NTP) Server. <i>Note:</i> This field is only editable when Standalone Operation is enabled.
TFTP Server	Identifies the host name or IP address of the Trivial File Transfer Protocol (TFTP) server. The specified TFTP server can be used to automatically set this device's Configuration settings via the Get Configuration from Server button. If 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. <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. <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. <i>Note:</i> This setting is not available when Standalone Operation is enabled.

Table 4. Network Settings (Continued)

TFTP Server from DHCP	Yes means the device will use the DHCP option 66 value to retrieve an address for the TFTP Server from DHCP. No means the device will ignore the DHCP option 66 value and use the manually configured value of the TFTP Server (see above). <i>Note:</i> This setting is not available when Standalone Operation is enabled.
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 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 11 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: admin

	IP Address	Port Number	Cut Level	Station List
Emergency-All-Call:	239.0.1.1	6000	-21	1,2
All-Call:	239.0.1.2	6004	-21	1,2
Audio Distribution:	239.0.1.3	6008	-24	1,2
Multicast 1:	239.0.1.166	6100	-32	1,2

Nyquist Control Password

Save Password

Device Stations

Port Number	Port Type	Account Id	Local Port	Username
1	Paging-Audio Amp	sip:0201@172.31.19.202	5060	0201
2	Paging-Audio Amp	sip:0202@172.31.19.202	5060	0202

Figure 6. 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	Displays 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 a specific zone. If this device belongs to more than one zone, then multiple Multicast # entries will be displayed.
Nyquist Control Password	Specifies a password used to secure Nyquist control messages between this device and the Nyquist server. This value must match the password specified on the Nyquist server to support certain Nyquist features, such as sound masking, amp protection mode, and station check-in. The specified password must be exactly 20 characters long and include uppercase, lowercase, and numeric characters. <i>Note:</i> This password cannot be set unless the Web Password has been changed from the default value.

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

Port Number	Shows the output port of the amplifier, where 1 = A and 2 = B.
Port Type	Shows the station 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.

Note: When the amplifier is used for Sound Masking, Account ID, Local Port, and Username will be blank.

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 calls.
- The input multicast (Receive) addresses (and ports) from which the device will receive encoded signals, which will then be converted to analog and played to the outputs.

To receive networked audio, configure one or more **Multicast Addresses (Receive)** entries with the multicast addresses and ports from which to receive the encoded streams. Specify a codec, output channel (i.e., Channels A/B), and cut level on which to play the received (and decoded) audio signal.

Configuration Settings

Device Type:

NQ-A2120-G2-Amplifier

Device Name:

NQ-A2120-G2

Web Username:

admin

Web Password:

Web Confirm Password:

Time Zone:

New York

Prioritize Line Input:

No

Channel A Load Impedance:

Low

Channel A Output Power:

0

Channel B Load Impedance:

Low

Channel B Output Power:

0

Enable SIP Calls:

Yes

SIP Server Address:

SIP Network Port:

SIP Codecs:

G722 ulaw alaw

SIP Extension (Channel A):

SIP Username (Channel A):

SIP Password (Channel A):

Cut Level (Channel A): 0 dB

SIP Extension (Channel B):

SIP Username (Channel B):

SIP Password (Channel B):

Cut Level (Channel B): 0 dB

Save Configuration Settings

Multicast Addresses (Receive)

Sorting:

Disabled

		Multicast IP Address	Multicast Port Number	Codec	Channels	Cut Level (dB)	Description
		239.1.1.1	6000	G711 u-law	Channel A	-20	Empty
		239.1.1.1	6002	OPUS	Channel B	-20	Empty

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

Save Multicast Addresses

Figure 7. 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	Provide a name for this device.
Web Username	Provide a web username for this appliance.
Web Password	Provide a web password for logging into the appliance.
Web Confirm Password	Re-enter the password used to log into the appliance.
Time Zone	Select the time zone in which the device resides.
Prioritize Line Input	If a channel simultaneously receives input signals from both a network input and a line input, "Yes" means the line input is used, "No" means the network input is used. Yes or No
Channel A/B Load Impedance	Specify the impedance load of the connected speaker(s). Low (typically 4–16 ohms) or High (typically 1000+ ohms)
Channel A/B Output Power	Controls the output power to the speaker. This can be a value from -6 to +6 dB.
Enable SIP Calls	Enables this device to receive one-way SIP calls, wherein only the caller can be heard (such as announcements). If enabled, a number of SIP-related configuration settings are displayed. Yes or No
SIP Server Address^a	Specify the IP address of the SIP Registration Server with which the device will register.
SIP Network Port^a	Specify 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 (Channel A/B)	Specify the SIP extension corresponding to Channel A or B. The extension, along with the IP address, is used to specify the URI used to place a SIP call to this extension: sip:<extension>@<local_ip_address>
SIP Username^a (Channel A/B)	Specify the SIP username used to register Channel A or B with the SIP server.

Table 6. Configuration Settings (Standalone enabled)

SIP Password^a (Channel A/B)	Specify the SIP registration password used to register Channel A or B with the SIP server.
Cut Level^a (Channel A/B)	Specify the intercom volume to be used for SIP calls over Channel A or B. This can be a value from -42 and 0 dB. The default value is -20 dB. <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.

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

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

Multicast IP Address	Specifies the multicast IP address on which to receive audio streams.
Multicast Port Number	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 both of the following values:

- Channel A
- Channel B

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.

Description

User-specified description of this multicast address.

This setting can contain a maximum of 30 characters and should not contain any of the following: [] {} <> , | :

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.

Note: The maximum number of multicast entries supported is 24.

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 and zipped copies of a log may be available.

- 3 To export the file, select **Export**.
The log file will be downloaded to your browser.

View Logs

sw_versions.log

/var/log/sw_versions.log

Export

Debian 8.6 - Linux kernel version:

4.9.0-rc7-bone3 #5 Fri Dec 2 09:26:11 EST 2016 armv7l GNU/Linux

Software Components:

Log Settings

Logging Level:

ERROR

Logging Categories

Log Registration:

No

Log Intercom:

No

Log Check-In:

No

Log Multicast:

No

Log PTT:

No

Log Sound Masking:

No

Save

Status Reporting Settings

Enable Status Reporting:

No

Network IP Address:

Network Port:

0

Status Reporting Categories

Intercom:

No

Paging:

No

Save

Figure 8. Logs

Available logs are described in the following table.

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.
daemon.log	Contains information logged by the various background daemons that run on the system.
debug	Contains errors and debug information.
dmesg	Contains information about hardware, device driver initialization, and kernel module messages that take place during system startup.
dpkg.log	Contains information that is logged when a package is installed or removed using dpkg command.

Table 7. Logs (Continued)

Log	Description
kern.log	Contains information logged by the kernel and recent login information for all users.
messages	Contains messages generated by Nyquist.
sw_versions.log	Contains the names and version numbers of key software components used by the Nyquist appliance.
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.

Log Settings

Log Settings provides the ability to specify the level of detail to be logged at run time (in the *syslog* and *daemon.log* files) for each of several categories.

Note: These settings do not filter the display of events that have already occurred; they indicate which subsequent events will be logged.

Table 8. Log Settings

Logging Level	Indicates the level of detail to be logged at runtime. Valid values are: NONE: No Nyquist logging will be performed. ERROR: Only error conditions will be logged. These are conditions that prevent the appliance from operating correctly. WARNING: Warning and error conditions will be logged. INFO: All information will be logged, including informational, warning, and error conditions. The default value is ERROR.
Logging Categories	Indicates which event categories will be logged for this device. Any number of categories can be enabled. By default, all categories are disabled.
Log Registration	Log detailed information related to station registration.
Log Intercom	Log detailed information related to intercom calls to and from the appliance, as well as talkback parameters.
Log Check-In	Log detailed information related to station check-ins.
Log Multicast	Log detailed information related to incoming multicast pages or audio distribution.
Log PTT	Log detailed information related to Push-to-Talk features.
Log Sound Masking	Log detailed information related to amplifier sound masking, such as spectrum preset applied, slow and fast ramping, and scheduled ramping.

Status Reporting Settings

The **Status Reporting Settings** section provides the ability to configure network-based status reporting for this device.

When an event of any of the specified **Status Reporting Categories** occurs, a JSON packet will be sent to the specified IP address and UDP port containing the event infor-

mation. The JSON will be formatted in the following format (the fields are described in the following table):

```
{"device":"<string>","port":<int>,"event":"<string>","state":"<string>"}
```

Table 9. Status Event JSON elements

JSON key	Value Description
device	MAC address of the reporting station, with hexadecimal bytes separated by colons (:).
port	The port on the Nyquist appliance to which the reporting station is connected. Valid integer values range from 1 (for most appliances) to 24.
event	The type of event that occurred. Valid values are: • INTERCOM • PAGE
state	The status of the event. Valid values are: • PENDING • IN_PROGRESS • TERMINATED

To configure the Status Reporting for this appliance, set **Enable Status Reporting** to **Yes**, configure the **Network IP Address** and **Network Port** (a UDP port) to which status

events will be sent, and specify which **Status Reporting Categories** to send, as described in the following table.

Table 10. Status Reporting Settings

Enable Status Reporting	Enables network-based status reporting whenever a call changes state on a given port. PENDING: Call setup in progress, but not yet connected. IN_PROGRESS: Call or page established. TERMINATED: Call or page ended. This setting is disabled by default.
Network IP Address	The network IP address to which status messages will be sent.
Network Port	The network UDP port to which status messages will be sent.
Status Reporting Categories	Status event types to be sent to the event logging server.
Intercom	Report intercom-related events.
Paging	Report paging-related events.

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 and B.

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

Note: When the amplifier is being used for Sound Masking, the DSP controls should *not* be used to make changes. When Sound Masking is enabled, using any DSP control feature may interfere with the Sound Masking feature and have unintended results.

The signal for a channel (A or B) 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 48*), 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 two output channels (A and B) via the DSP Router, where it can be conditioned using 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 10*)—are also controlled by the mixer's output channels (A and B).

Tip: 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 channel fader 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 or when the amplifier is being used for Sound Masking.

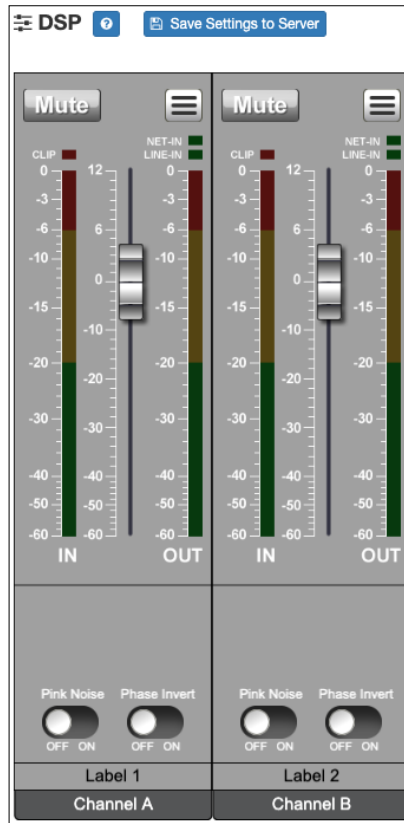


Figure 9. DSP Page

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), the output channel that corresponds to the second connector (B) will not appear on the mixing board interface.

DSP features and controls are described in the following table.

Table 11. 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.
Channel Fader	Adjusts the channel volume level in 1–dB increments.
NET-IN LED	Illuminates when a signal is being received from the Network stream input. <i>Note:</i> When Sound Masking is enabled, NET-IN LED is illuminated.
LINE-IN LED	Illuminates when a signal is being received from the analog Line input.
Clip LED	Illuminates when a signal has exceeded the maximum threshold, indicating that the signal is “clipping.” <i>Note:</i> When Sound Masking is enabled, Clip LED is illuminated.
IN VU meter	Indicates the strength of the input signal.
OUT VU meter	Indicates the strength of the output signal.
Pink Noise	When set to ON, a pink noise signal will be sent to the output channel.
Phase Invert	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 12. DSP Features

Compressor	Lessens the dynamic range between the loudest and quietest parts of an audio signal.
Delay	Delays the signal by a specified number of milliseconds.
Graphic EQ	Uses fixed frequencies to tailor the frequency content of an audio signal.

Table 12. DSP Features

High/Low Pass	Filters out frequencies in the input signal that are above and below specified high and low cutoff frequencies.
Limiter	Prevents a signal from exceeding an adjustable maximum level.
Noise Gate	Eliminates low-level hiss, noise, or leakage, particularly when there is a high level of ambient noise.
Parametric EQ	Uses a center/primary frequency to allow tailoring of the frequency content of an audio signal.
Peak Limiter	Limits the signal to a specified threshold based on the signal's instantaneous levels.
Presets	Provides predefined configurations of DSP features, tailored for specific speakers models.
RMS Limiter	Limits the signal to a specified threshold based on the signal's average levels over time.
Router	Routes the audio signals from each input channel to zero or more output channels, as well as adjusting the level of each input signal per selected output channel.
Settings	Allows you to provide names and colors for the input and output channels.
Signal Present	Allows you to specify the signal level at which the signal LED will be lit, as well as how long it will remain lit.
Standby	Allows the amplifier to automatically put itself in a low power standby mode when there is little or no signal.
Status	Provides real-time status for the amplifier, including which mode (2-channel or single channel bridge mode) the output is configured, channel output limits, and more.
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 *channel fader*, which 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 fader, the numerical value of the level appears.

Adjusting Volume Levels

The channel fader 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, adjust input signal levels 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 fader 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.

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 13, "Compressor Settings," on page 29.

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 13. Compressor Settings

Enable	Enables or disables the compressor DSP effect for this channel.
Threshold	Sets the threshold level, which is the point where the signal activates the compressor circuit. The range is –135 to +21 dB.

Table 13. Compressor Settings

Attack	Sets how quickly or slowly compression will be applied to the signal once the audio signal goes above the threshold level. It specifies the length of time over which the compression ratio will gradually increase from no compression to full compression. The range is 1 to 500 ms.
Hold	Sets how long compression will be applied after the signal has fallen below the threshold. The range is 1 to 500 ms.
Decay	Sets how quickly or slowly compression will be removed from the signal after the signal has dropped below the threshold <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.
Knee	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. The range is 1 to 100 dB.
Ratio	Sets the compression ratio to be applied to the signal. For example, if the ratio is set for 6 (6:1), the input signal must increase by 6 dB for the output level to increase by 1 dB. The range is 1 to 100.
Input meter	Shows the strength of the input signal.

Table 13. Compressor Settings

Output meter	Shows the strength of the output signal, providing a visual indicator of the effect of the compressor on the output signal.
Comp LED	Illuminates when compression is being applied to the signal.

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.

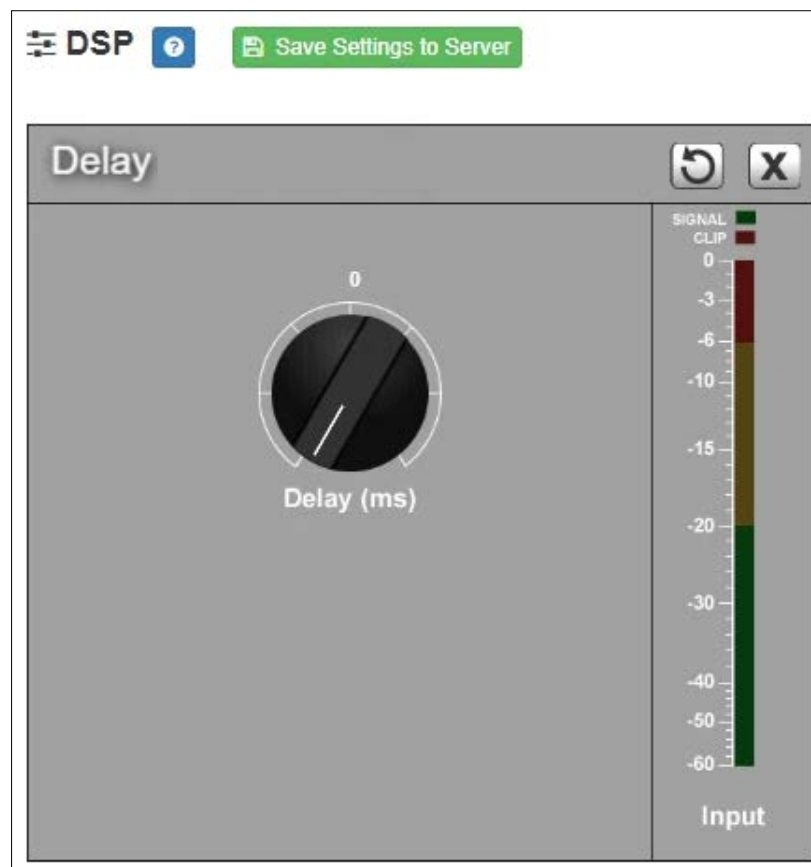


Figure 11. Delay Settings

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 14, "Delay Settings,"* on page 32.

Table 14. Delay Settings	
Delay (ms)	Sets the number of milliseconds by which the input signal will be delayed before sending it to the output channel.
Signal LED	Illuminates when the input signal is present.
Clip LED	Illuminates when the input signal is clipping.
Input meter	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.

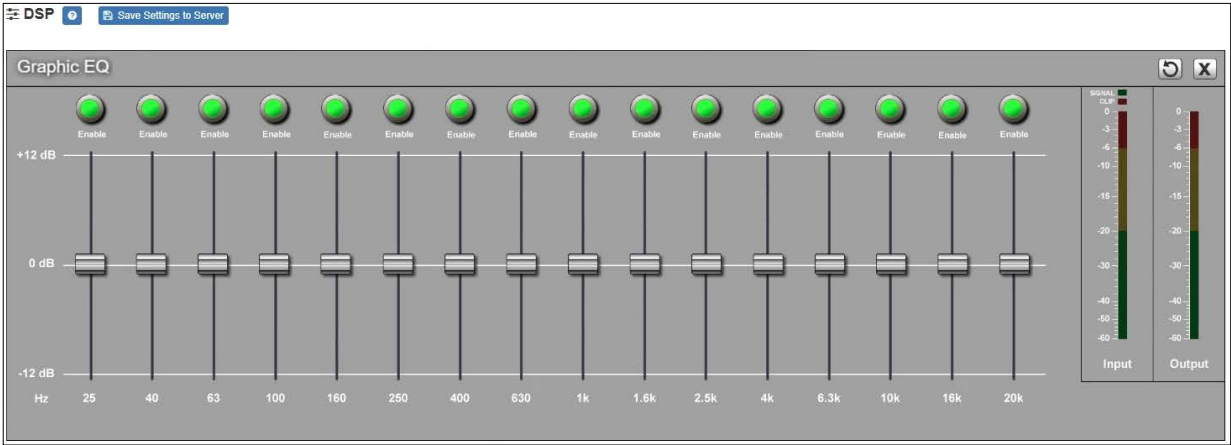


Figure 12. Graphic EQ Settings

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 15. 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.

Enable Enables or disables the High-Pass filter.

Table 15. High/Low Pass Parameters (Continued)

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) <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.
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.	
Enable	Enables or disables the Low-Pass filter.

Table 15. High/Low Pass Parameters (Continued)

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) <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.

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:

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

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 16. Limiter Settings

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

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 17. Noise Gate Settings

Enable	Enables or disables the noise gate DSP effect for this channel.
Threshold	Sets the minimum threshold level that the signal must reach for the noise gate to "open," allowing the signal to be sent to the output channel. Threshold range is -135 to +21 dB.

Table 17. Noise Gate Settings

Attack	Sets how long it takes for the gate to open once the signal reaches the threshold level. Attack range is 1 to 500 ms.
Hold	Sets the length of time the gate will stay fully open after the signal reaches the threshold level. Hold range is 1 to 500 ms.
Decay	Sets hows quickly or slowly the gate will close once the signal has dropped below the threshold level <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.

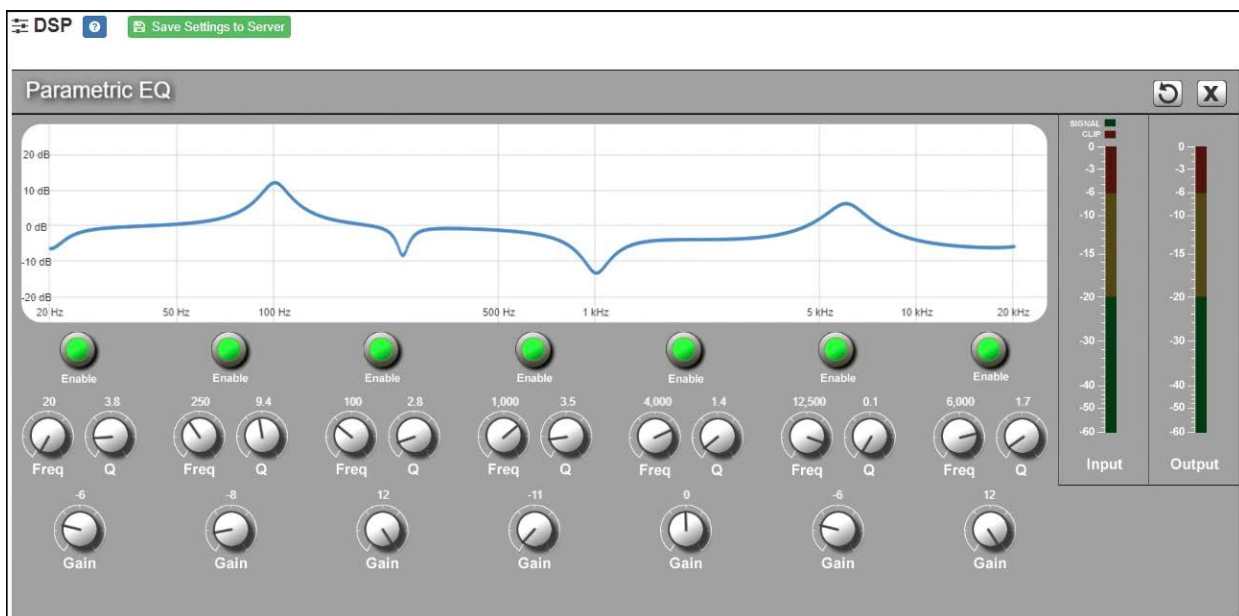


Figure 16. Parametric Equalizer Settings

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 18, "Peak Limiter Settings," on page 43.
- 5 Select **Enable** to apply the settings to the selected channel.

Table 18. Peak Limiter Settings

Enable	Enables or disables the Peak Limiter DSP effect for this channel.
Threshold	Sets the threshold level, which is the point where the signal activates the compressor circuit. The range is -135 to +21 dB.
Attack	Sets how quickly or slowly compression will be applied to the signal once the audio signal goes above the threshold level. It specifies the length of time over which the compression ratio will gradually increase from no compression to full compression. The range is 1 to 500 ms.
Hold	Sets how long compression will be applied after the signal has fallen below the threshold. The range is 1 to 500 ms.
Decay	Sets how quickly or slowly compression will be removed from the signal after the signal has dropped below the threshold <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.
Input meter	Shows the strength of the input signal.
Output meter	Shows the strength of the output signal, providing a visual indicator of the effect of the compressor on the output signal.
Limiting LED	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 Limiter**, 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.

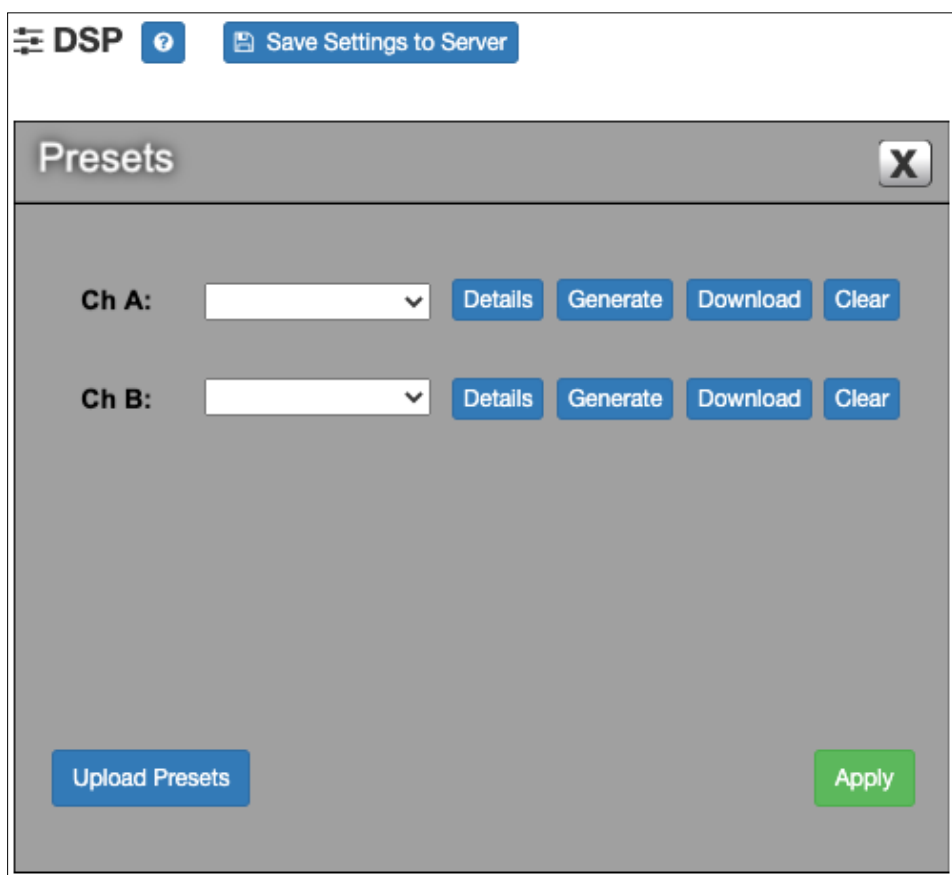


Figure 18. Presets Settings

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 19, "Preset Settings,"* on page 46.

Table 19. Preset Settings

Ch A/Ch B	Select a predefined DSP preset configuration from the list of options for Channels A and B. These configurations will be applied when the Apply button is clicked. <i>Note:</i> This field will be blank if no preset has been selected for this channel. To deselect an existing preset, click Clear. Selecting the blank entry has no effect.
Details	Displays the name and description of the preset, as well as an optional link to a web page related to the preset (if available).
Generate	Prompts the user to specify a new name and stores the current settings of the DSP preset effects (Hi/Low Pass Filter, Peak Limiter, RMS Limiter, and Parametric EQ) under that name. Valid characters: A–Z, a–z, 0–9, - (hyphen), and _ (underscore).
Download	Downloads the selected preset configuration (as a JSON file) to the user's local computer.
Clear	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 Apply.
Upload Presets	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.
Apply	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 20, "RMS Limiter Settings,"* on page 48.
- 5** Select **Enable** to apply the settings to the selected channel.

Table 20. RMS Limiter Settings

Enable	Enables or disables the RMS Limiter DSP effect for this channel.
Threshold	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.
Attack	Sets how quickly or slowly compression will be applied to the signal once the audio signal goes above the threshold level. It specifies the length of time over which the compression ratio will gradually increase from no compression to full compression. The range is 1 to 500 ms.
Hold	Sets how long compression will be applied after the signal has fallen below the threshold. The range is 1 to 500 ms.
Decay	Sets how quickly or slowly compression will be removed from the signal after the signal has dropped below the threshold <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.
Input meter	Shows the strength of the input signal.
Output meter	Shows the strength of the output signal, providing a visual indicator of the effect of the compressor on the output signal.
Limiting LED	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.

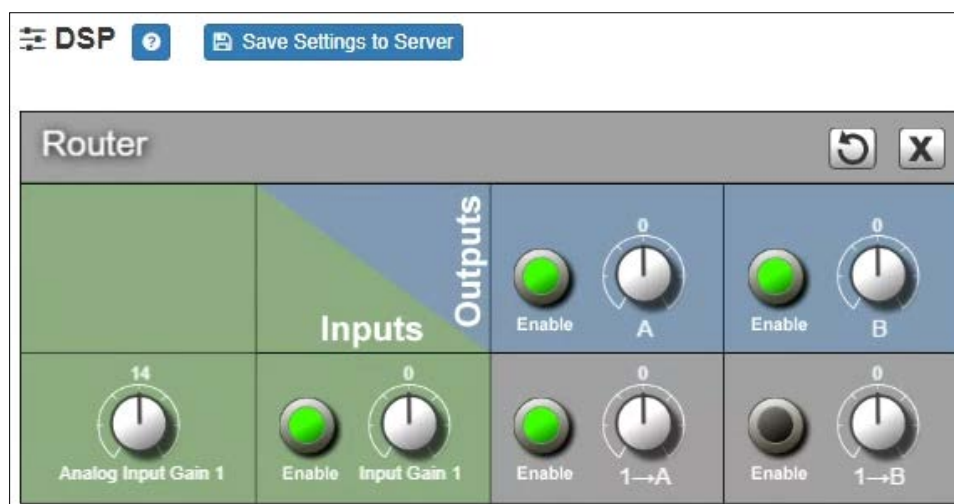


Figure 20. Router

Note: If your appliance is configured for Bridge mode (as opposed to Mono), only output channel A appears on the Router screen.

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 input, output, and routed channel gains (green, blue, and gray).

Settings

You can specify custom names and colors for each of the mixing board channels. Note that if your appliance is configured for single channel bridge mode, only one channel appears.

The screenshot shows a web interface for configuring DSP settings. At the top, there is a header bar with a menu icon, the text "DSP", an information icon, and a "Save Settings to Server" button. Below this is a "Settings" window with a title bar containing a refresh icon and a close icon. The main content area of the window is a table with two columns: "Name" and "Color". There are two rows of settings, labeled "Ch A:" and "Ch B:". For "Ch A:", the "Name" field contains "Label 1" and the "Color" dropdown menu is set to "Grey". For "Ch B:", the "Name" field contains "Label 2" and the "Color" dropdown menu is also set to "Grey". A green "Save" button is located at the bottom right of the settings area.

	Name	Color
Ch A:	Label 1	Grey
Ch B:	Label 2	Grey

Figure 21. Settings Parameters for 2 Channel Mono

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 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 21. Signal Present Parameters

Threshold	Sets the minimum level the signal must reach before the signal LED is illuminated. Threshold range is –144 to +24 dB.
Hold	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 22, "Standby Settings,"* on page 55.
- 5 Select **Enable** to use the Standby feature with the defined levels.

Table 22. Standby Settings

Enable	Enables or disables the standby feature for the amplifier.
Threshold Channel AB	Sets the threshold level for channels A/B. 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. The range is -144 to +24 dB.
Status	Indicates if channels A/B 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 for 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.

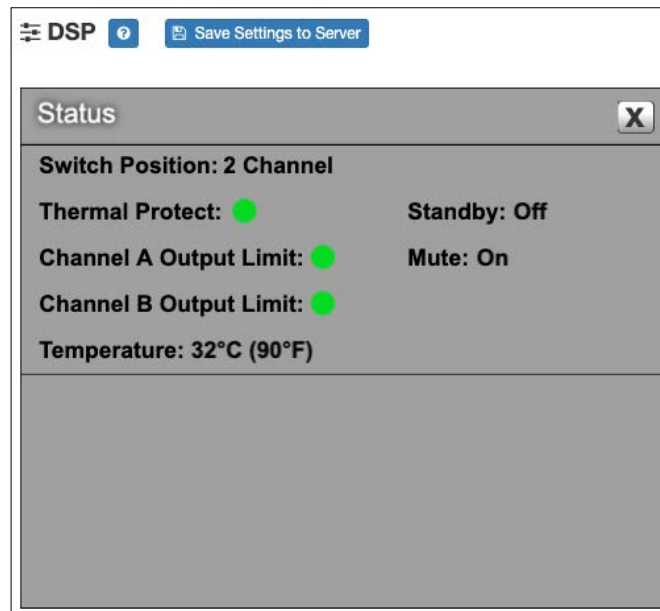


Figure 24. Status for 2-Channel

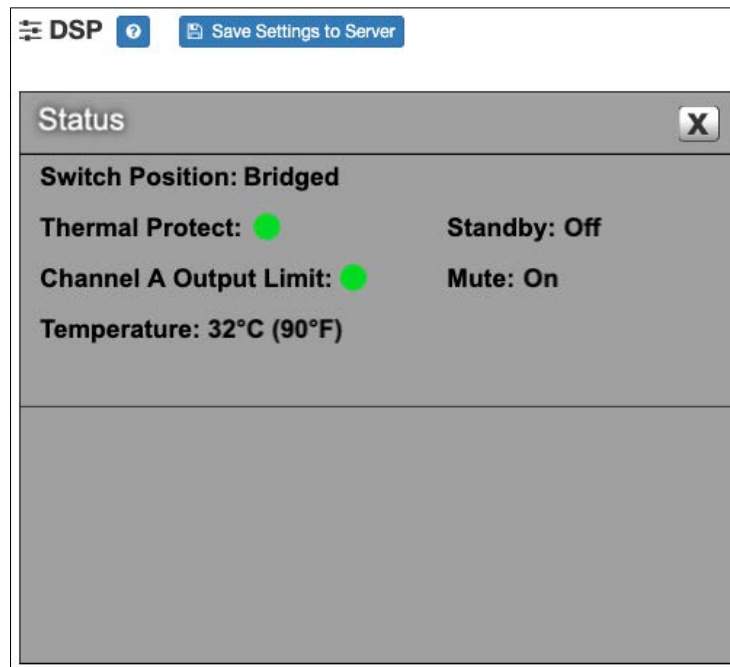


Figure 25. Status for Bridged Channel

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 23. Status

Switch Position	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.
Thermal Protect	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.
Channel A/B Output Limit	Appears red if the output signal is too high and is being clipped or distorted. Otherwise, the LED is green.
Temperature	Provides the real-time temperature of the appliance in both Celsius and Fahrenheit. The amplifier enters protection mode if the temperature exceeds 85 °C.
Standby	Indicates if channels A/B are in Standby mode (On) or not (Off).
Mute	Indicates if channels A/B are in Mute mode (On) or not (Off).

Appendix A: Bogen Digital Certification Authority

When a client (e.g., a web browser) connects to the Bogen device's web application, the device's digital certificate is sent to the client to authenticate the identity of the device's web application. The client uses the Bogen Certification Authority (CA) certificate to authenticate the device's digital certificate, which verifies that the client is connecting to a valid server. If the Bogen CA certificate is not installed on the client, the browser will display a warning that it was unable to authenticate the server, displaying a red *Not secure* warning immediately to the left of the browser's address bar (or a similar warning, depending on the browser) after it attempts to access the Bogen device.

The following sections provide instructions for downloading and installing the Bogen CA in various environments.

Tip: The Bogen CA can be downloaded using the cURL command instead of via the browser. If you prefer that method, issue the following command in lieu of step 1 of the subsequent installation instructions:

```
curl.exe --insecure https://<device>/ssl/bogenCA.crt > bogenCA.crt
```

Tip: Some browsers do not recognize newly installed CAs until after the browser has restarted. Browse to <chrome://restart> in a Chromium-based browser or <edge://restart> in the Edge browser to restart all open browser windows.

Installing Certification Authority on Windows System

To download and install the Certification Authority on a Windows device:

- 1 From your Chrome or Edge browser, type `http://<device>/ssl/bogenCA.crt` in the address bar, where `<device>` is the Nyquist device's IP address or DNS name (for example, `http://192.168.1.0/ssl/bogenCA.crt`).
- 2 Select the downloaded file and select **Open**.
- 3 Select **Open** when prompted with "Do you want to open this file?"
- 4 Select the **Install Certificate...** button. The Certificate Import Wizard starts.
- 5 Select **Current User**, and then select **Next**.

Note: To allow *all* users on this Windows client to access the Nyquist device, select **Local Machine** instead of **Current User**. You may be prompted for administrator credentials.

- 6 Select "Place all certificates in the following store", then select **Browse**.
- 7 Select **Trusted Root Certification Authorities**, and then select **OK**.
- 8 Select **Next**.

9 Select **Finish**.

10 Restart the browser and log in to the device's web application.

Install Certificate Authority using PowerShell (optional)

You can optionally download and install the Certification Authority using a PowerShell command prompt or script, which involves fewer steps.

To download the certificate to a CRT file, execute the following PowerShell command, replacing <device> with the IP address or DNS name of the Nyquist device:

```
Invoke-WebRequest -Uri http://<device>/ssl/bogenCA.crt -OutFile $env:TEMP\bogenCA.crt
```

To optionally validate the certificate before importing it, execute the following command:

```
[Security.Cryptography.X509Certificates.X509Certificate2]::new(  
    "$env:TEMP\bogenCA.crt").GetCertHashString() -eq '0A8248F69D970F8DD855D0E0592972DA64B1A845'
```

If the command returns True, the certificate is valid.

To install the CA certificate into the CurrentUser certificate store, which only applies to the current user, execute the following command:

```
Import-Certificate -CertStoreLocation cert:\CurrentUser\Root -FilePath $env:TEMP\bogenCA.crt
```

To install the certificate for all users on this machine, which requires administrator privileges to execute, execute the following command:

```
Import-Certificate -CertStoreLocation cert:\LocalMachine\Root -FilePath $env:TEMP\bogenCA.crt
```

Note: These commands can be executed remotely using PowerShell Remoting, which may be helpful if the certificate needs to be installed on multiple client machines.

Installing Certification Authority on Mac System

To download and install the Certification Authority on a Mac:

- 1 From your Safari browser, type `http://<device>/ssl/bogenCA.crt` in the address bar, where <device> is the Nyquist system device's IP address or DNS name (for example, `http://192.168.1.0/ssl/bogenCA.crt`).
- 2 Save the downloaded `bogenCA.crt` file to the desktop.
- 3 Double-click the certificate file on the desktop.
The Keychain Access App opens.
- 4 Double-click the certificate to reveal the trust settings.
- 5 Change the top trust setting to **Always Trust**.
- 6 Close the Trust Setting window and enter the computer administrative password to save.
- 7 Restart the browser and log in to the Nyquist web application.

Installing Certification Authority on an Android Device

Note: The Android device WiFi must be connected to the same network as the Nyquist Server.

To download and install the Certification Authority on an Android device:

- 1 From your Chrome or Edge browser, type `http://<device>/ssl/bogenCA.crt` in the address bar, where `<device>` is the Nyquist device's IP address or DNS name (for example, `http://192.168.1.0/ssl/bogenCA.crt`).
- 2 If prompted, verify your identity (e.g., enter your PIN or fingerprint).
- 3 Type a certificate name (e.g., "Bogen CA"), specify "VPN and apps" under "Used for", and select **OK** to install the certificate.

Installing Certification Authority on an iOS Device

Note: The iOS device WiFi must be connected to the same network as the Nyquist Server.

To download and install the Certification Authority on an iPhone Operating System (iOS) device:

- 1 From your Safari browser, type `http://<device>/ssl/bogenCA.crt` in the address bar, where `<device>` is the Nyquist device's IP address (for example, `http://192.168.1.0/ssl/bogenCA.crt`).
- 2 Select **Go**.
- 3 Select **Allow** when prompted to allow the download.
- 4 Select **Close** after the notification that a profile was downloaded.
- 5 Select **Settings > General > VPN & Device Management**.
- 6 Select the **Bogen CA** certificate under **DOWNLOADED PROFILE**.
- 7 Select **Install**.
- 8 If prompted, enter your passcode.
- 9 On the **Warning** page, select **Install**.
- 10 Select **Done**.
- 11 Select **Settings > General > About > Certificate Trust Settings**.
- 12 Under **ENABLE FULL TRUST FOR ROOT CERTIFICATES**, enable the switch next to **Bogen CA**.

Viewing the Certificate

The following steps outline how to view and verify the TLS/SSL certificate that was provided by the Nyquist device.

Important: The user interfaces for browsers change not infrequently, so the exact details may vary from what is described in the following instructions. Some security packages can also affect the information available, such as antivirus software that injects its own CA certificate in lieu of the website's actual certificate, which has the effect of hiding the actual certificate from the user.

- 1 Browse to the Bogen device's web application in your browser (using Safari on iOS, Chrome or Edge on all other platforms).
- 2 Select the lock icon on the address bar of the browser (to the left of the URL).
- 3 Display the CA certificate by following one of the following steps:
 - a) On the Chrome or Edge browser, select **Connection is secure**, then select either **Certificate is valid**, the certificate icon, or **Certificate information** to display the Certificate Viewer dialog. Select the Details tab, then Bogen CA in the Certificate Hierarchy section.
 - b) On the Safari browser *[MacOS or iOS only]*, select **Show Certificate** in the window that appears.
 - c) As an alternative on Android devices, select the Android system's **Settings > Biometrics and security > Other security settings > View security certificates**, select the **USER** tab, and select the Bogen certificate.
- 4 Verify that the Bogen CA certificate is selected and not the server certificate (the server certificate's name will be an IP address). To verify that the certificate is valid, verify that the displayed fingerprint values match the following:

SHA-1: 0A 82 48 F6 9D 97 0F 8D D8 55 D0 E0 59 29 72 DA 64 B1 A8 45

SHA-256: 6B D0 D5 8D C8 F7 E8 03 9E A3 F1 52 32 1D 9C 5C 58 8B 4E FA DF 03 43 64 34 C2 6C 63 C5 4A AC 46