



# *20W PoE+ Integrated Power Amplifier Configuration Guide*

NQ-GA20P2

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# Configuring the Nyquist Integrated Power Amplifier

The NQ-GA20P2 is a plenum-rated Nyquist 20W integrated power amplifier. It works as a page zone extender to facilitate voice access to a single zone of one-way paging over the Nyquist network.

It also works in background music applications, leveraging the exhaustive audio management and distribution capabilities of Bogen's Nyquist platform.

The NQ-GA20P2 appliance uses the latest in Class D amplifier technology and provides unparalleled sonic quality, exceptional reliability, and reduced power consumption to permit standalone PoE+ operation over the local network.

The Nyquist server or System Controller can automatically discover and configure the NQ-GA20P2, but you can also manage the device, and manually configure some settings, through the appliance's web-based user interface (web UI). It can also operate in Stand-alone mode, allowing it to be used without a Nyquist server.

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*.

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

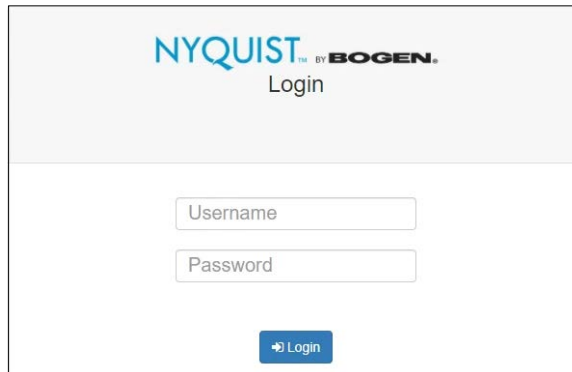
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*To access the appliance's Web-based user interface (UI):*

- 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 *"Installing the Bogen Digital Certification Authority" on page 38*.

- 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.

The image shows the login page for the Nyquist Appliance. At the top, there is a header with the text "NYQUIST™ BY BOGEN®" in blue and black, and "Login" in black below it. Below the header, there are two input fields: "Username" and "Password". 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.

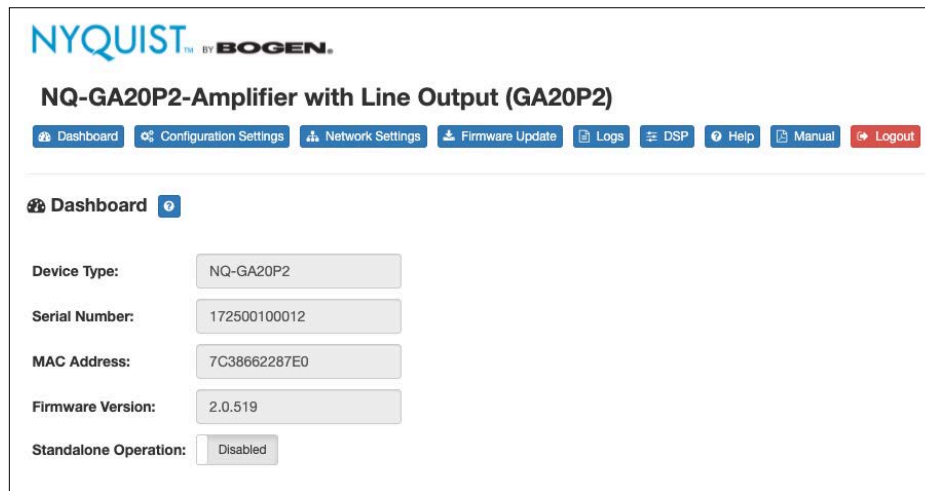
The default username is **admin**; the default password is **bogen**.

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*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.

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



**Figure 2. NQ-GA20P2 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.
<b>MAC Address</b>	Identifies 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>	Identifies the firmware version installed on the device.
<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 this appliance's configuration guide.
<b>Logout</b>	Logs out of the appliance's web UI.

## 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 3<sup>rd</sup>-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.

## 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.

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*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.

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*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**

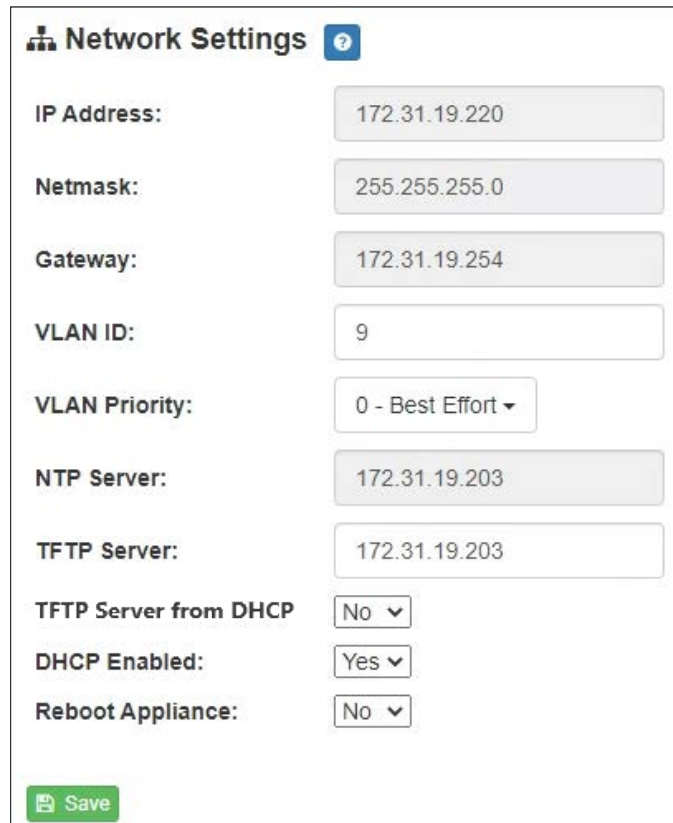
<b>Current Nyquist Version</b>	Shows the version of the appliance's currently installed firmware.
<b>New Nyquist Version</b>	Shows the version of the firmware that has been loaded, though not installed, onto the appliance.
<b>Update Firmware</b>	<p>Available only when a new firmware version has been 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 Technical Support.</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> <p><i>Note:</i> Ensure your Nyquist appliance has network access to <a href="http://bogen-ssu.bogen.com">bogen-ssu.bogen.com</a>, port 22.</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**.



The screenshot shows a web form titled "Network Settings" with a help icon. The form contains the following fields and controls:

Field Label	Value / Selection
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 ▼

At the bottom left of the form is a green "Save" button with a floppy disk icon.

**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.
<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>

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

<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>
<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 13).

*To view 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 12 for normal configuration, or modify the settings as described in "*Standalone Operation Configuration Settings*" on page 13 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="239.0.2.1"/>	<input type="text" value="62001"/>	<input type="text" value="-16"/>	<input type="text" value="1"/>
All-Call:	<input type="text" value="239.0.2.2"/>	<input type="text" value="62002"/>	<input type="text" value="-17"/>	<input type="text" value="1"/>
Audio Distribution:	<input type="text" value="239.0.2.3"/>	<input type="text" value="62003"/>	<input type="text" value="-28"/>	<input type="text" value="1"/>
Multicast 1:	<input type="text" value="239.0.2.10"/>	<input type="text" value="62010"/>	<input type="text" value="-21"/>	<input type="text" value="1"/>

Nyquist Control Password  
  
 Save Password

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:200@172.31.19.203"/>	<input type="text" value="5060"/>	<input type="text" value="200"/>

**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>	Identifies the web username for this appliance.
<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.
<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.
<b>Nyquist Control Password</b>	<p>Specifies a password used to secure Nyquist control messages between this device and the Nyquist controller. This value must match the password specified on the Nyquist controller to support certain Nyquist features, such as sound masking, amp protection mode, and station check-in.</p> <p>The specified password must be exactly 20 characters long and include uppercase, lowercase, and numeric characters.</p> <p><i>Note:</i> This password cannot be set unless the Web Password has been changed from the default value.</p>

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

<b>Port Number</b>	Shows the port number of the appliance.
<b>Port Type</b>	Shows the station 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

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 both line and speaker outputs.

To receive networked audio, configure one or more **Multicast Addresses (Receive)** entries with the multicast addresses, ports, and codecs from which to receive the encoded streams. Specify the cut level for the signal sent to the output channel, which plays to both the line and speaker outputs.

**Configuration Settings**

**Device Type:** NQ-GA20P2-Amplifier with Line Output

**Device Name:** NQ-GA20P2

**Web Username:** admin

**Web Password:**

**Web Confirm Password:**

**Time Zone:** Select a time zone

**Output Power (Watts):** 1/2

**Enable SIP Calls:** Yes

**SIP Server Address:**

**SIP Network Port:**

**SIP Codecs:** G722 ulaw alaw

**SIP Extension:**

**SIP Username:**

**SIP Password:**

**Cut Level: -6 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	1	-20	Empty

**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>	Provides a name for this device.
<b>Web Username</b>	Specifies a web username for this appliance.
<b>Web Password</b>	Specifies a web password for logging into the appliance.
<b>Web Confirm Password</b>	Reenter the password used to log into the appliance.
<b>Time Zone</b>	Specifies the time zone in which the device resides.
<b>Output Power (Watts)<sup>a</sup></b>	Specifies the output power for the amplifier in Watts. Valid values are: 1/8, 1/4, 1/2, 1, 2, 4, 8, and 16.
<b>Enable SIP Calls</b>	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.
<b>SIP Server Address<sup>a</sup></b>	Specifies the IP address of the SIP Registration Server with which the device will register.
<b>SIP Network Port<sup>a</sup></b>	Specifies 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></b>	Specifies the SIP extension for this device.  The extension, along with the IP address, is used to specify the URI used to place a SIP call to this extension:  <code>sip:&lt;extension&gt;@&lt;local_ip_address&gt;</code>
<b>SIP Username<sup>a</sup></b>	Specifies the SIP user name used to register with the SIP server.
<b>SIP Password<sup>a</sup></b>	Specifies the SIP registration password used to register with the SIP server.
<b>Cut Level<sup>a</sup></b>	Cut level for intercom calls.  This can be a value from -42 to 0 dB.

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.
<b>Codec</b>	<p>Specifies the codec to be used when decoding audio. Select one of the following values:</p> <ul style="list-style-type: none"> <li>• G711 u-law <ul style="list-style-type: none"> <li>• Intercom call quality</li> <li>• A narrowband audio codec that provides toll-quality audio at 64 kbps. The u-law version is primarily used in North America and Japan.</li> </ul> </li> <li>• G711 a-law <ul style="list-style-type: none"> <li>• Intercom call quality</li> <li>• 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.</li> </ul> </li> <li>• G722 <ul style="list-style-type: none"> <li>• Tone and paging quality</li> <li>• A wideband audio codec operating at 48, 56, and 64 kbps.</li> </ul> </li> <li>• OPUS <ul style="list-style-type: none"> <li>• Music quality</li> <li>• 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).</li> </ul> </li> </ul>
<b>Channels</b>	Channel(s) on which the audio streams will be output. Fine tuning of levels per output channel can be adjusted using DSP settings.

### Cut Level (dB)

Specifies the cut level for the audio stream.

This can be a value from –70 to 0 dB.

The default value is –20 dB.

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

---

*Tip:* To fine tune the cut level per channel, adjust the gain settings on the DSP Router.

---

### 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:* A maximum of 24 multicast entries is supported.

---

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**

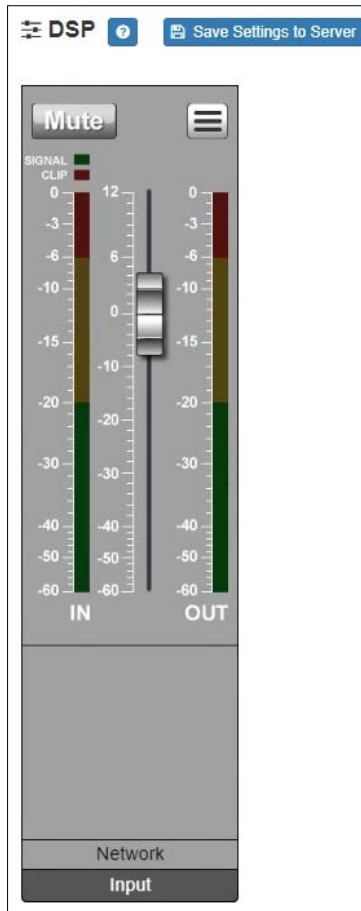
Available logs are described in the following table. If a log file is empty, however, it will not appear in the drop-down list of available logs.

**Table 7. Logs**

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

## Setting DSP Parameters

When you select **DSP** from the appliances web UI, the DSP page appears.



**Figure 8. DSP Page with Channel Drop-Down Menu**


From this page, you can adjust settings in the DSP. The appliance uses traditional processors (for example, Compressor, Limiter) for audio signals in the digital domain.

The DSP page shows **Mute** and **Level** selections for the input channel and allows you to adjust the channel input level.

Selecting the **Menu** button displays other parameters. DSP parameters and the Mute and Level buttons 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.
<b>DSP Features button</b> 	Presents a menu of DSP features that can be applied to the corresponding channel.
<b>Channel Fader</b>	Adjusts the channel volume level in 1-dB increments.
<b>Signal LED</b>	Illuminates when a signal is present.
<b>IN VU meter</b>	Indicates the strength of the network input signal.
<b>OUT VU meter</b>	Indicates the strength of the channel output signal for both Line Output and Speaker Output.

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>High/Low Pass</b>	Sets the band of frequencies that will pass through the high pass and low pass filters and selects the type of filter that is used.
<b>Limiter</b>	Prevents a signal from exceeding an adjustable maximum level.
<b>Outputs</b>	Allows you to enable speaker or line outputs and to adjust the volume level for each output.
<b>Parametric EQ</b>	Uses a center/primary frequency to allow tailoring of the frequency content of an audio signal.
<b>Settings</b>	Allows you to provide names and colors for the input channel.
<b>Signal Present</b>	Illuminates green when audio is present in the channel input.
<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 *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.

## Adjusting Compression Settings

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



**Figure 9. 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 10, "Compressor Settings,"* on page 25.

---

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

---

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

**Table 10. 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 10. Compressor Settings**

<b>Ratio</b>	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.
<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>Comp LED</b>	Illuminates when compression is being applied to the signal.

## Setting High Pass/Low Pass Parameters

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

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



**Figure 10. High/Low Pass Parameters**

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

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

---

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

---

- 4 Set the parameters described in the following table:

**Table 11. High/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>Enable</b>	Enables or disables the High-Pass filter.
---------------	---

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

<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>

### ***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>Enable</b>	Enables or disables the Low-Pass filter.
---------------	--



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

<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>

## Adjusting the Limiter

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

Limiter parameters are set per channel.



**Figure 11. 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.

---

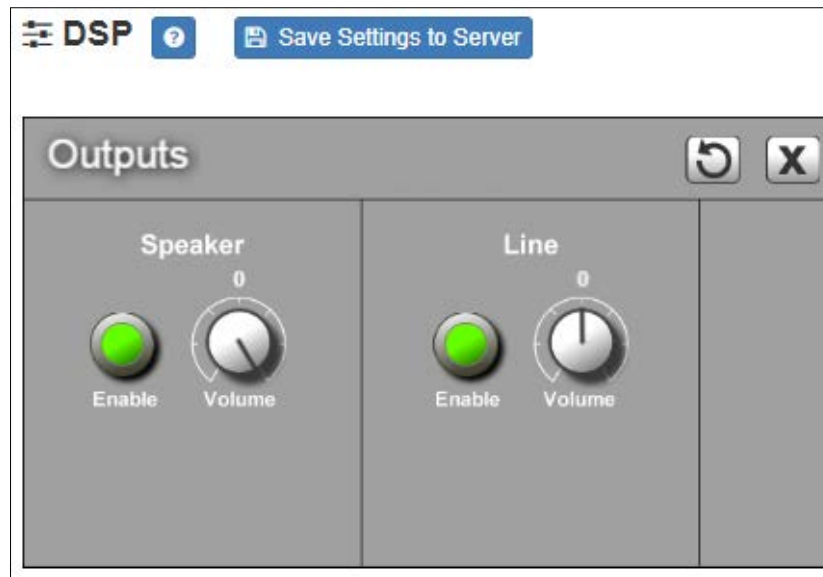
- 4 Adjust the following settings as needed:

**Table 12. Limiter Settings**

<b>Threshold</b>	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.
<b>Decay</b>	Sets the rate for turn off of the limiter after the signal is below the threshold.  Decay range is 5 to 2300 milliseconds.
<b>RMSTC</b> <b>(Root Mean Square</b> <b>Time Constant)</b>	Sets how fast the limiter reacts to a signal that has exceeded the threshold.  RMSTC range is 50 to 10000 dB/sec.

## Adjusting Outputs

Selecting **Outputs** allows you to enable and adjust the volume levels for speaker and line outputs.



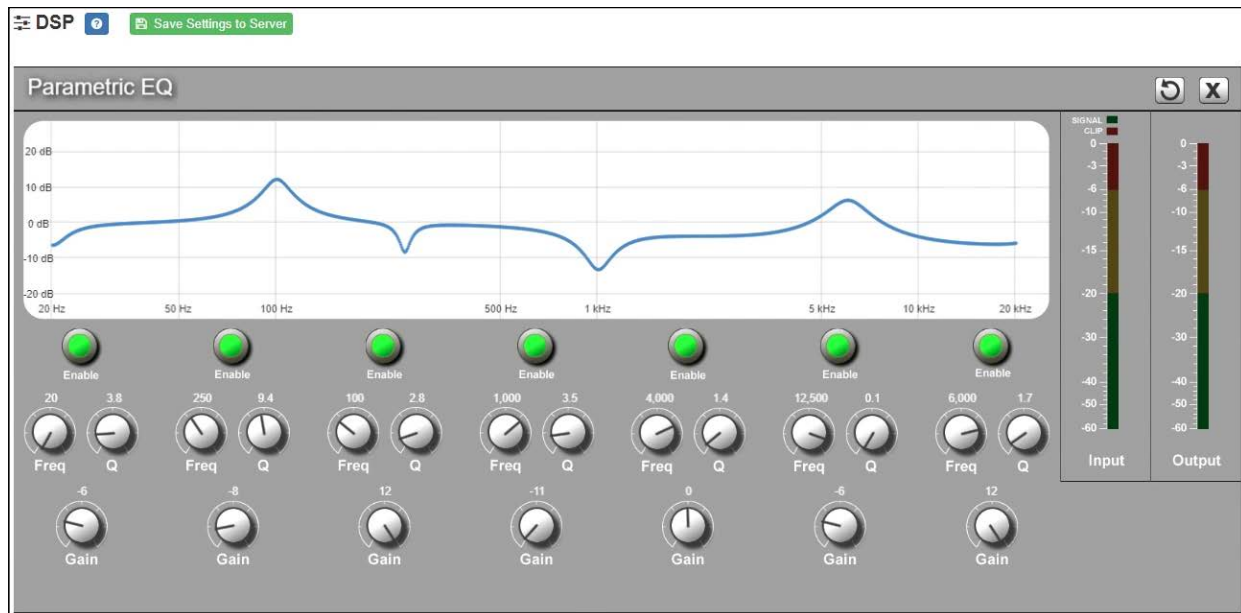
**Figure 12. Outputs**

*To adjust outputs for speaker or line:*

- 1 On the appliance Web UI's main page, select **DSP**.
- 2 Select the **Menu** button.
- 3 From the drop-down menu, select **Outputs**.
- 4 To enable outputs for a speaker or line, select **Enable** for the corresponding output.
- 5 Make desired Volume adjustments by adjusting the knob. Volume levels range from 0 to 15 dB for the Speaker Output and -15 to 15 dB for the Line Output.

## Adjusting Parametric Equalizer Settings

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



**Figure 13. 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.

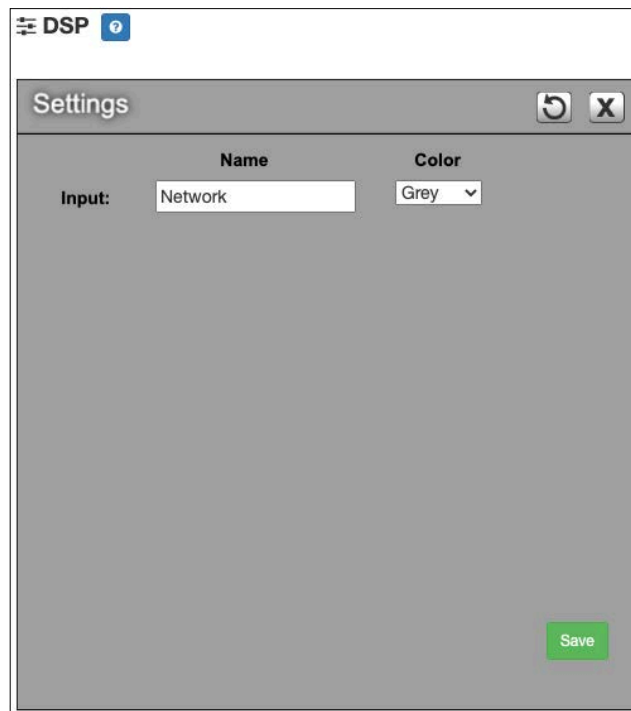
- 6 For each frequency, use the **Gain** knob or double-click the knob and type the gain to either boost (turn up) or cut (turn down).

**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**.

## Settings

You can set select a name and a color for the input channel.

The image shows a web-based settings interface for a DSP. At the top, there's a header bar with 'DSP' and a blue circular icon. Below this is a 'Settings' window with a title bar containing a refresh icon and a close 'X' icon. The main area of the window is divided into two columns: 'Name' and 'Color'. Under 'Name', there's a text input field with 'Network' entered. Under 'Color', there's a dropdown menu currently showing 'Grey'. A green 'Save' button is located in the bottom right corner of the settings panel.

**Figure 14. Settings Parameters**

To adjust the settings for the 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 Type the name that you want to display for the channel.
- 5 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 15. 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 13. 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.

# Appendix A: Bogen Digital Certification Authority

## Installing the Bogen Digital Certification Authority

When your 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 you do not install the Bogen CA certificate, 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 when you attempt to access the Bogen device.

### 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.

You can also 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
```

If you wish to validate the certificate before importing it, execute the following command after retrieving the CRT file:

```
(New-Object -TypeName Security.Cryptography.X509Certificates.X509Certificate2 -ArgumentList "$env:temp\bogenCA.crt").GetCertHashString()
```

The output will be the hash value (i.e., thumbprint) of the downloaded certificate, which should match the following (as of the current release):

```
0A8248F69D970F8DD855D0E0592972DA64B1A845
```

To install the certificate for the current user, execute the following command:

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

That command installs the CA certificate into the CurrentUser certificate store, which only applies to the current user. 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 also be executed remotely using PowerShell Remoting, which may be helpful if the certificate needs to be installed on many client machines.

## Installing Certification Authority on Mac System

*To download and install the Certification Authority on a Mac:*

- 1 From your Chrome or Edge 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