

# *Nyquist Server Installation and Setup Guide*

E7000 Release 9.0  
C4000 Release 6.0



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# Nyquist Server Installation Options

Two options are available for installing and deploying Nyquist Server:

- 1 Using a Nyquist System Controller (NQ-SYSCTRL), which already has the operating system and Nyquist server application software installed on it.
- 2 Using your own server platform and installing the Debian OS and Nyquist server application software. While option 1 is the quickest and easiest approach, option 2 may be better suited for situations where high-availability server features like Redundant Array of Independent Disks (RAID) or hot-swappable power supplies are desired.

This manual describes the installation steps for option 2.

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*Note:* This manual provides the Nyquist Server installation process when using your own server. If you are using the Nyquist System Controller (NQ-SYSCTRL), refer to the *Nyquist System Controller Setup Guide*.

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Before installing Nyquist, ensure that:

- Required services are enabled on your network. An example of a required service includes TFTP.
- Required multicast IP addresses and ports are known and available.
- Required IP addresses are known and available.
- Required port numbers are open.

Ensure your server meets system requirements before beginning the Debian OS installation.

If you are updating an existing Nyquist system, read *“Best Practices” on page 50* and then refer to the update procedure in the *Nyquist E7000 System Administrator Manual*.

## Understanding System Requirements

The Nyquist controller web-based UI requires a secure Hypertext Transfer Protocol Secure (https) network connection to the Nyquist controller. Users can log in to the Nyquist controller using the Google Chrome or Microsoft Edge web browser from a computer or tablet running either the Windows 10 (or later) or Mac OS X 10.12.x (or later) operating system (OS), or using the Safari browser from an iPhone or iPad device running iOS 14 (or later). The UI can also be accessed via a Chrome or Edge browser-enabled Android-based tablet or mobile device.

To access the server, type your server's IP address (for example, 10.10.20.12) in your browser's address bar.

## Whitelisted Web Addresses

The Nyquist controller requires access to specific Uniform Resource Locators (URLs), commonly referred to as web addresses. Access to many of these web addresses is required during installation; access to other web addresses, such as the address for the Network Time Server (NTS) are required during runtime. The Information Technology (IT) department for the site must whitelist the web addresses so that they can be easily accessed as needed.

Nyquist controller access to these URLs can be checked via the **Check Internet Site Access** feature on the **System Parameters** page or by pressing the **Check Internet Site Access** button on the **Network Wizard** page during product activation.

The following table lists the URLs that must be whitelisted.

**Table 1. Whitelisted Web Sites**

URL	Description
http://hostedactivation.com (specifically, http://hostedactivation.com/bogen)	Required for Nyquist controller License support
http://downloads.digium.com	Required for downloads from Digium Phone Module for Asterisk (DPMA)
http://downloads.asterisk.org/ (specifically, http://downloads.asterisk.org/pub/telephony/sounds/releases)	Required for sounds download
http://www.pjsip.org/	Required for PJSIP download
http://ftp.us.debian.org (specifically: http://ftp.us.debian.org/debian/)	Required during Linux package installation
http://deb.debian.org/debian/	
https://deb.debian.org/debian/	
http://security.debian.org (specifically: http://security.debian.org/)	Required during Linux package installation
stun01.sipphone.com	Required for STUN based IP address resolution (This is used by the Nyquist controller Web UI and should be enabled on the computer that runs the web UI.)
stun:stun01.sipphone.com	

**Table 1. Whitelisted Web Sites (Continued)**

<b>URL</b>	<b>Description</b>
<a href="https://raw.githubusercontent.com/">https://raw.githubusercontent.com/</a>	Serves unprocessed versions of files stored in the GitHub repositories.
<a href="http://2431612419.airable.io">http://2431612419.airable.io</a> <a href="https://2431612419.airable.io">https://2431612419.airable.io</a>	The <i>airable</i> URL for Internet-based-radio Audio Distributions
<a href="http://api.sound-machine.com">http://api.sound-machine.com</a> <a href="https://api.sound-machine.com">https://api.sound-machine.com</a>	The SoundMachine URL for Internet-based-radio Audio Distributions
<a href="http://api.bogenedu.com/api/customers">http://api.bogenedu.com/api/customers</a>	Required for Nyquist controller warranty support
<a href="http://bogen-ssu.bogen.com/">http://bogen-ssu.bogen.com/</a>	Bogen System Software Update server. Required for automatic Nyquist server software and Nyquist firmware software update notifications and downloads.
<a href="https://www.weather.gov/alerts">https://www.weather.gov/alerts</a> <a href="https://ipapi.co">https://ipapi.co</a>	Required for displaying weather alerts. Required for automatically finding county code for alerts.
<a href="https://api.weather.gov">https://api.weather.gov</a>	Required for obtaining alerts from the National Weather Service.
<a href="http://openweathermap.org">http://openweathermap.org</a> <a href="http://api.openweathermap.org">http://api.openweathermap.org</a>	Required for obtaining current weather conditions.
<a href="https://ns1.google.com">ns1.google.com</a> <a href="https://resolver1.opendns.com">resolver1.opendns.com</a>	Required for obtaining the Nyquist server's public IP address for Audio Distribution streams and for automatically finding the county code for alerts.
<a href="https://dl-ssl.google.com">dl-ssl.google.com</a>	Required for Nyquist installation and updates to download and install Google Chrome browser.

URLs that are entered on the Nyquist controller **System Parameters** page are used during runtime and include the URLs for the NTS, the Session Traversal Utilities for Network Address Translation (NAT) (STUN) server, and the Traversal Using Relays around NAT (TURN) server.

The default URLs for the STUN and TURN servers are not set. The default URL for NTS is [pool.ntp.org](http://pool.ntp.org).

## Nyquist System Server Requirements

The following are the minimum requirements for the Nyquist controller if you elect not to use the Nyquist System Controller (NQ-SYSCTRL):

**Table 2. Nyquist System Server Minimum Requirements**

<b>OS</b>	<p>Debian Linux OS (AMD 64-bit version) release 11.7 or a higher minor revision of release 11.</p> <p><i>Note:</i> Refer to the most up to date Release Notes on the <a href="http://www.bogen.com">www.bogen.com</a> web site for details about which Linux OS versions have been tested for use with the Nyquist controller.</p>
<b>CPU</b>	<p>Quad-core Intel-based processor running at 3.0 GHz or higher</p>
<b>Memory</b>	<p>8 GB</p> <p>Error Correcting Code (ECC) RAM is recommended for increased performance and reliability.</p>
<b>Disk Storage</b>	<p>One 250 GB disk drive</p> <p>Some form of hardware-based Redundant Array of Independent Disks (RAID) is recommended for redundancy and high availability.</p> <p>Consider using a larger drive if large amounts of audio (for example, voice mail, announcements, recordings, and music) are being stored on the system. Note that music, tones, and announcements created or stored as .wav files will be larger than if created or stored as MP3 files. Other factors that should be considered are:</p> <ul style="list-style-type: none"><li>• How often will backups be performed?</li><li>• Will the system be backed up locally or remotely on a detachable drive, Storage Area Network (SAN)/Network Attached Storage (NAS), or Network File System (NFS)?</li><li>• How many users will have voicemail ability?</li><li>• How long will voicemail messages be stored?</li><li>• Will voicemail messages be part of the local system backups?</li></ul>
<b>Network Interface Card (NIC)</b>	<p>Minimum 1000 MB Ethernet port</p>

**Table 2. Nyquist System Server Minimum Requirements (Continued)**

<b>PCI Expansion Slots</b>	One or more Peripheral Component Interconnect (PCI)/PCI Express (PCIe) slot if telephony network connectivity other than, or in addition to, SIP trunking is required; contact your Bogen Dealer for assistance in determining these telephony hardware needs.
<b>Telephony Interfaces</b>	One or more PCI/PCIe type third-party telephony interface cards (for example, Foreign Exchange Office [FXO], Foreign Exchange Subscriber [FXS], etc.) if telephony network connectivity other than, or in addition to, SIP trunking is required; contact your Bogen Dealer for assistance in determining these telephony hardware needs.

## **Network Application Services**

Required application services will be installed automatically on the Nyquist controller as part of the Nyquist software installation. All other network services must be already pres-

ent or installed manually on the associated network. The following table lists the services and their locations:

**Table 3. Network Application Services**

<b>Service</b>	<b>Description</b>	<b>Required</b>	<b>Location</b>
Apache	Used as the web server to drive the Nyquist controller web interface.	Mandatory	Nyquist controller
DHCP	Supplies dynamic IP addresses to the Nyquist controller system server and associated devices. (DHCP is the acronym for Dynamic Host Configuration Protocol.) It also supplies the Trivial File Transfer Protocol (TFTP) server IP address or host name to devices on the network via option_66.	Optional	Network and/or Nyquist controller
DNS	Resolves host names to IP addresses. DNS is an acronym for Domain Name System, a hierarchical naming system for computers, servers, or other resources connected to either the Internet or to a private network.	Mandatory <sup>a</sup>	Network
ICE STUN TURN	Resolves IP addresses behind Network Address Translation (NAT)/ firewall. <ul style="list-style-type: none"> <li>• Interactive Connectivity Establishment</li> <li>• Session Traversal Utilities for NAT</li> <li>• Traversal Using Relays around NAT</li> </ul>	Optional	Nyquist controller Network
LDAP	LDAP is used by the Nyquist controller to import users into the Nyquist system.	Optional	Network
NTP	Provides date/time synchronization for the Nyquist controller and the associated devices (IP Phones, appliances). (NTP is an acronym for Network Time Protocol.)	Mandatory	Network



**Table 3. Network Application Services (Continued)**

<b>Service</b>	<b>Description</b>	<b>Required</b>	<b>Location</b>
SNMP	Provides the Nyquist controller Linux server statistics via Simple Network Management Protocol (SNMP) v1 through Port 161.	Optional	Nyquist controller
TFTP	<p>TFTP is used by IP phone and Nyquist controller device provisioning. A TFTP server runs on the Nyquist controller on port 69 (the standard TFTP port #).</p> <p>Device provisioning files are stored on the Nyquist controller in directory: <code>/srv/tftp</code>.</p> <p>This is the only directory exposed by the TFTP server.</p>	Mandatory	Nyquist controller

- a. Required for Nyquist software upgrades, updating license keys, adding new feature license keys, using Internet-based features, e.g., Internet Radio service, weather alerts, weather conditions, Routines API, Routine Webhook-Post action.

# Installing Debian

You must install the Debian 11.7 (or newer) AMD 64 operating system on the Nyquist system server before you can install the Nyquist application software.

To install Debian 11.7.x AMD 64 bit:

- 1 Insert a bootable media into the computer. The bootable media can be a DVD, CD, or flash drive.

The initial **Debian GNU/Linux installer menu** install screen appears.



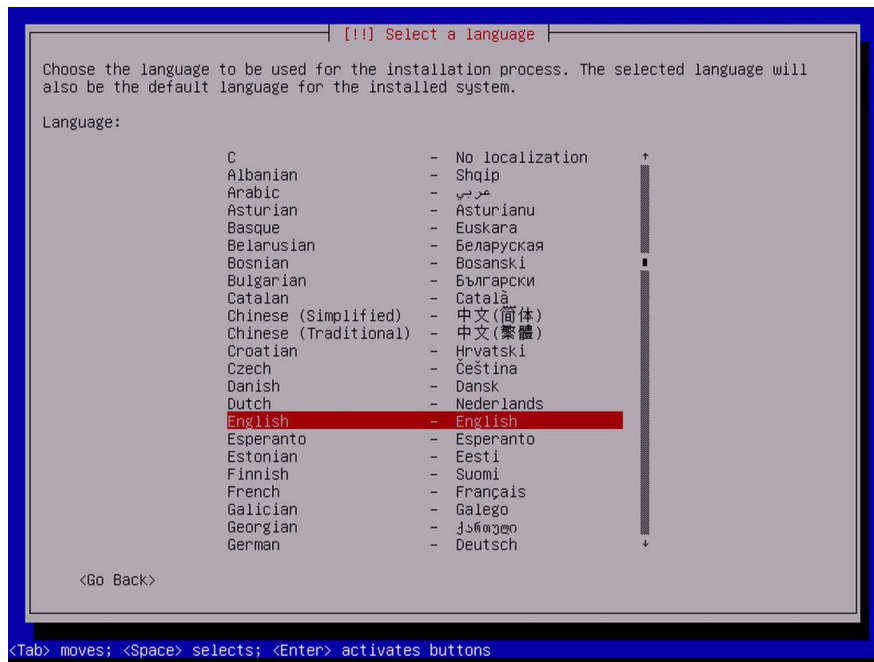
Select **Install** and then press **Enter**.

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*Note:* This document describes the process for the **Install** option, but the **Graphical install** option, which is very similar, can also be used.

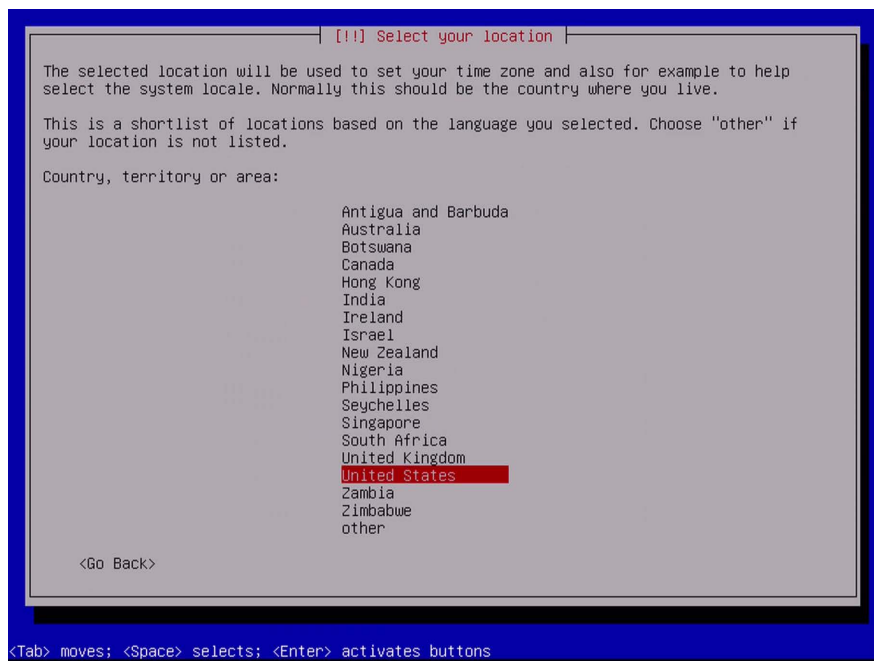
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- 2 You will be prompted to select localization options that will be used for both the installation and for the installed system. These localization options include language and location. The default language is **English**.



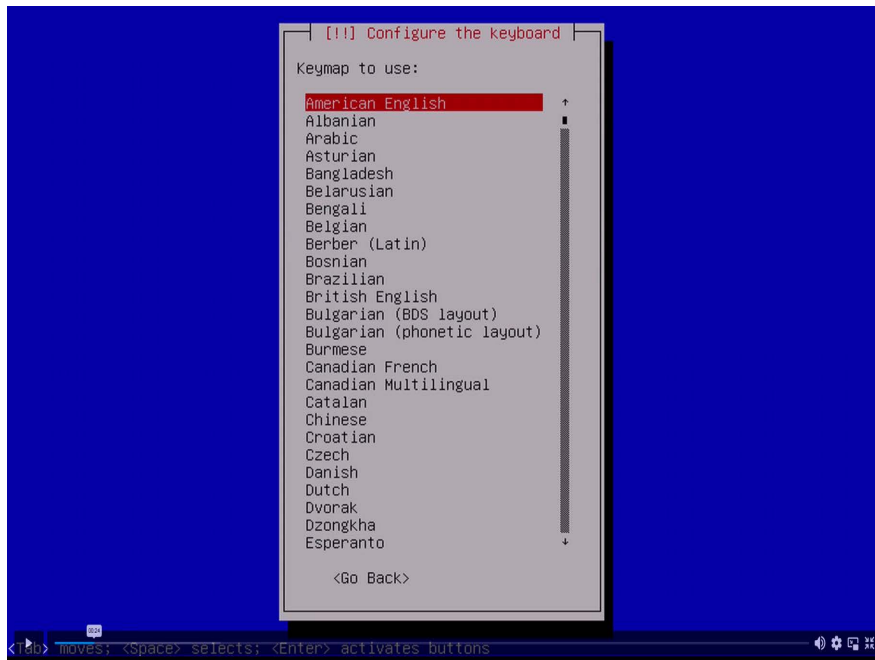
Select a language and then press **Enter**.

- 3 Your location is used to set your time zone.

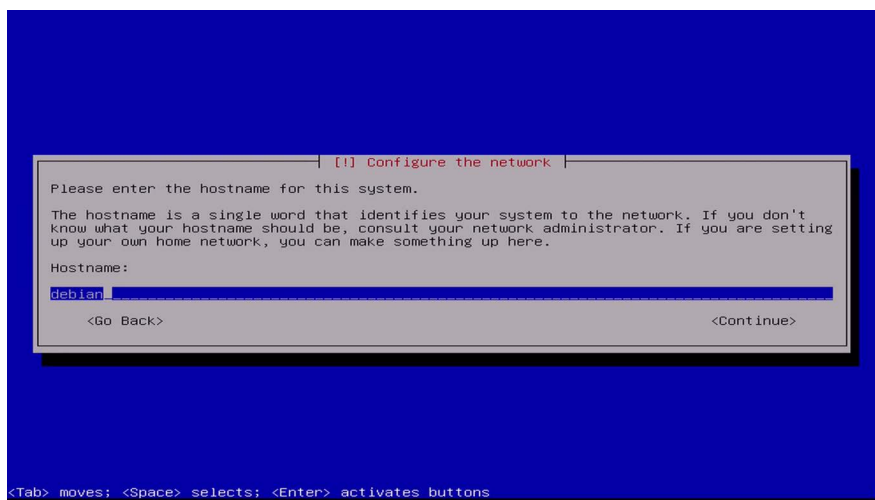


Select your location and then press **Enter**.

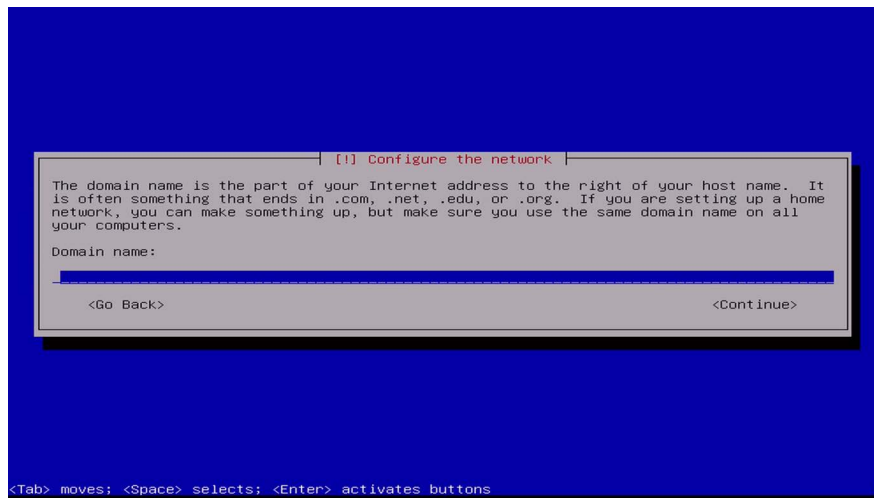
- 4 Select the keyboard that you want to use and then press **Enter**.



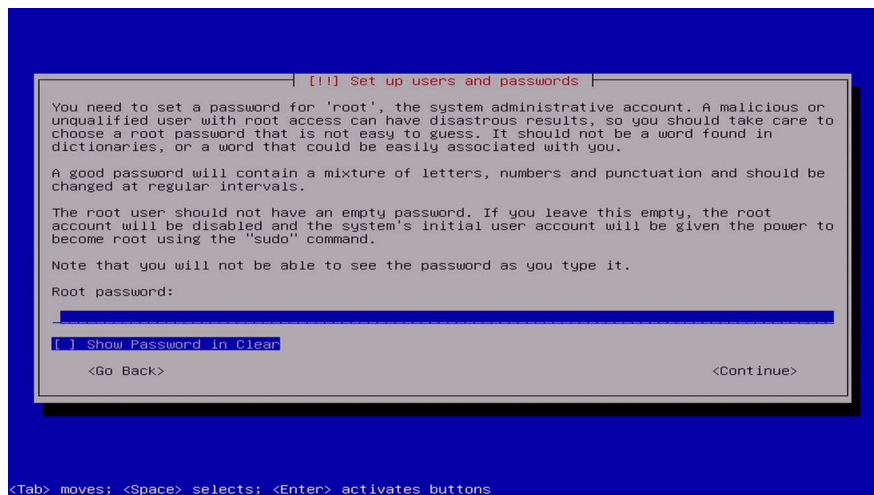
- 5 When prompted for the hostname, type **debian**, select **Continue**, and press **Enter**.



- 6 Type the domain name or leave this field blank if you are using an IP address. Then, select **Continue** and press **Enter**.

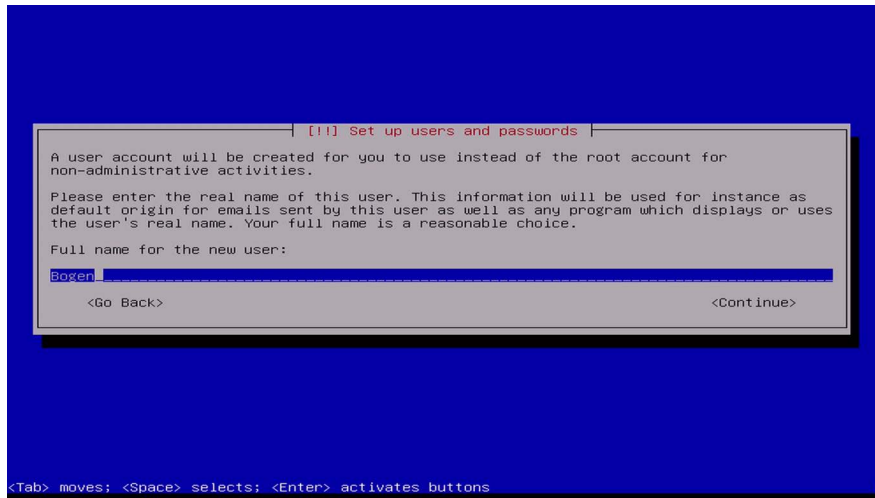


- 7 Specify a password for the root (system administrative) account. Note that this password should contain a mixture of letters, numbers, and special characters and that you should record this password as you will need it when installing Nyquist.



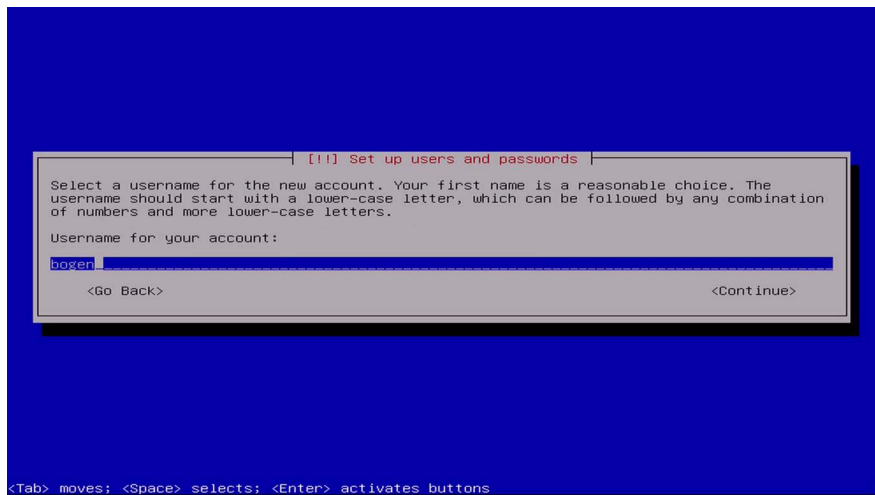
- 8 When prompted, re-enter the password and press **Continue**.

- 9 Specify the full name of a user who will perform non-administrative activities on the server.



Select **Continue**.

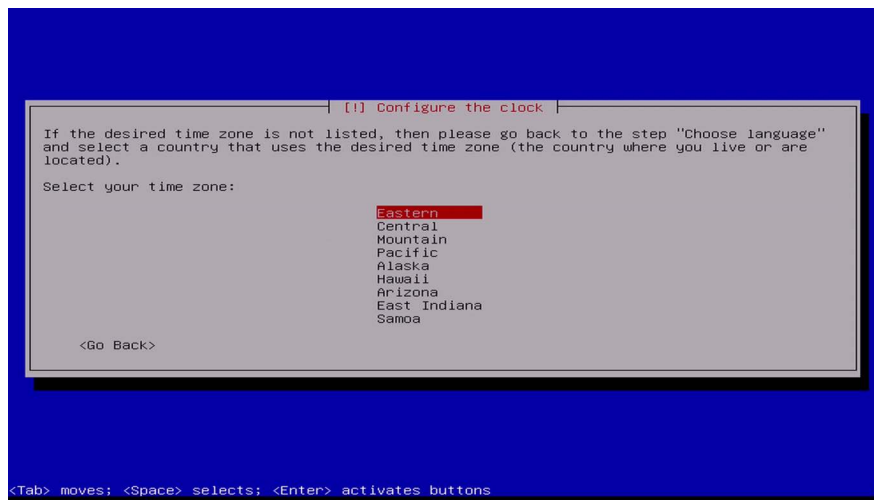
- 10 Type a user name for the new account and select **Continue**.



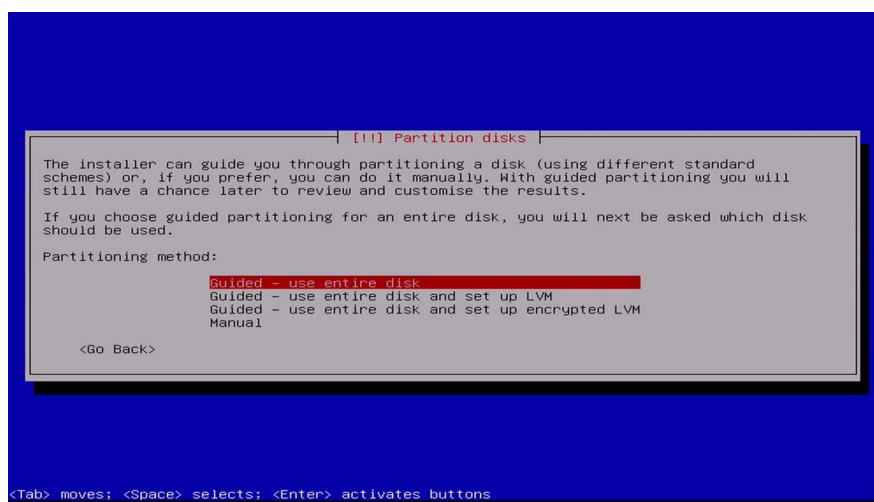
- 11 When prompted, enter a password for this user and select **Continue**.

- 12 When prompted, re-enter the password and select **Continue**.

13 Select your time zone and then press **Enter**.



14 Select **Guided - use entire disk** and press **Enter** to begin partitioning the disk.

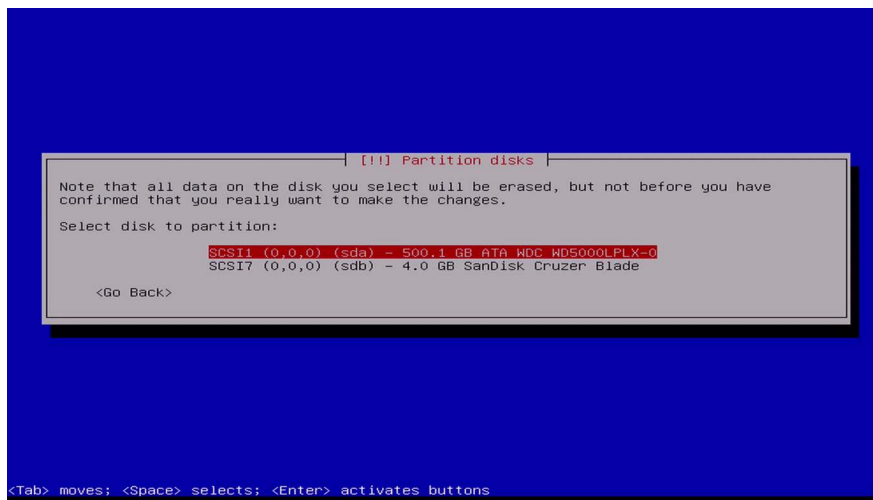


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*Note:* Though you can select a different partitioning scheme or to manually partition the disk, the next few steps use the **Guide - use entire disk** option. You can later review and customize the results.

---

15 Select the disk that you want to partition and press **Enter**.

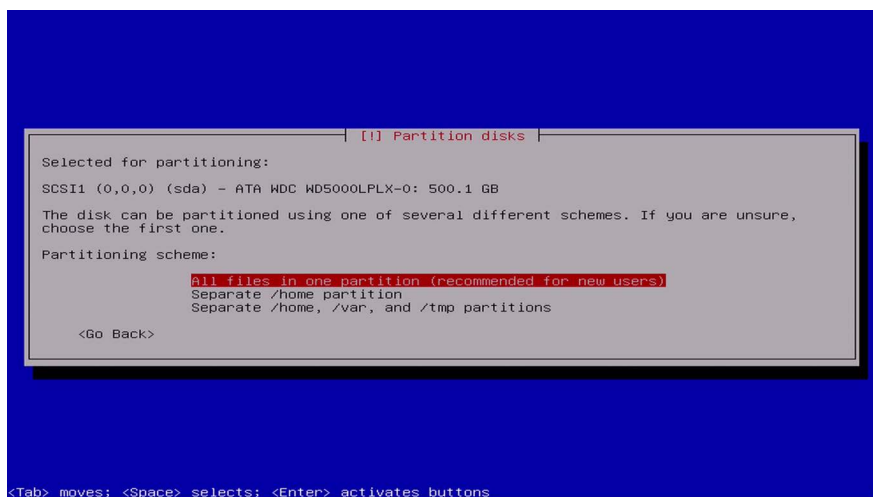


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**Warning** All data on the selected disk will be erased.

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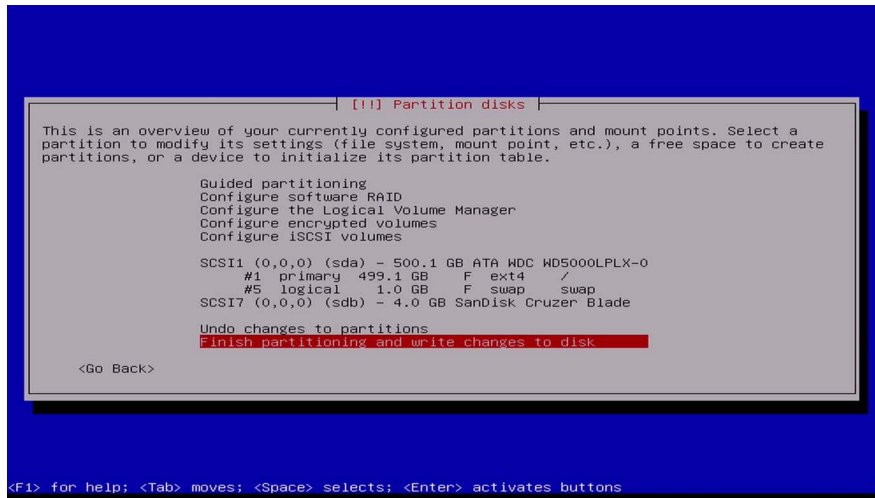
16 Select the partitioning scheme that you want to use. If you are uncertain as to which scheme would be best, select **All files in one partition (recommended for new users)**.



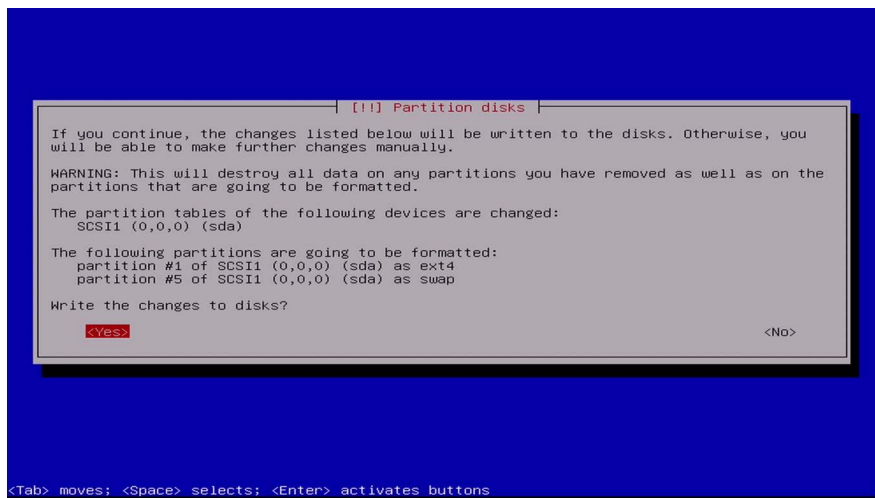
Press **Enter**.



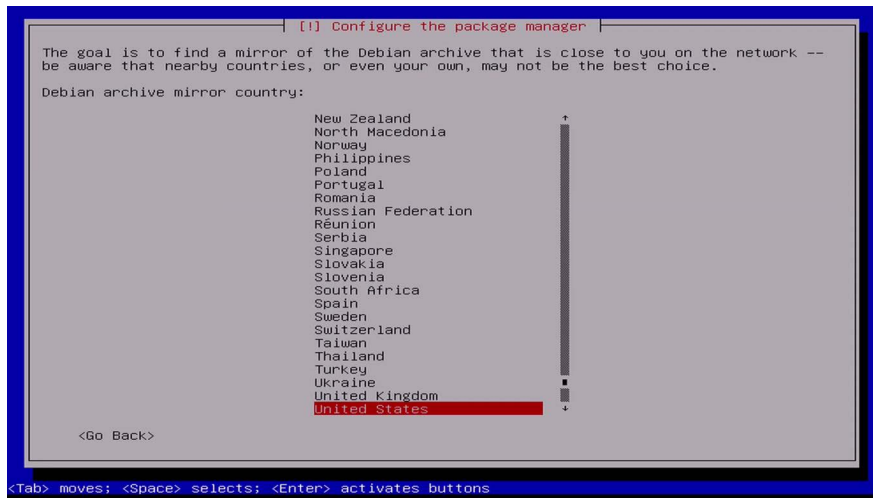
- 17 When prompted, select **Finish partition and write changes to disk** and then press **Enter**.



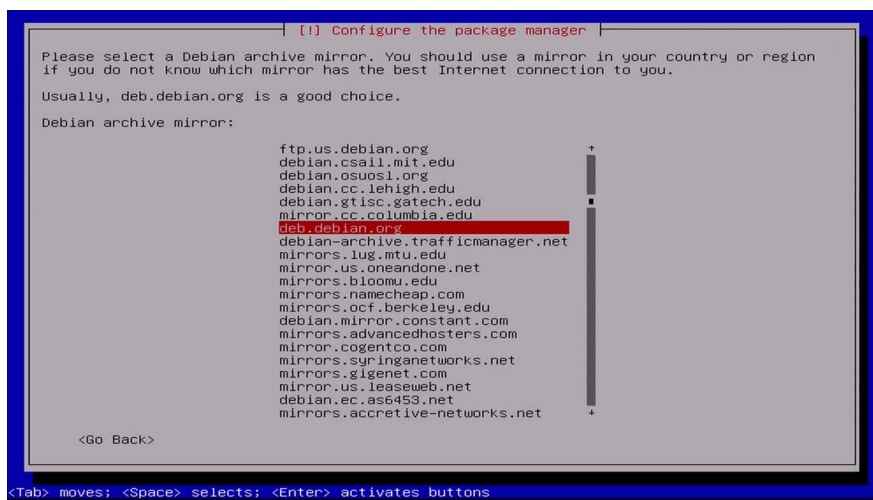
- 18 Select **Yes** to write changes to the disks and then press **Enter**.



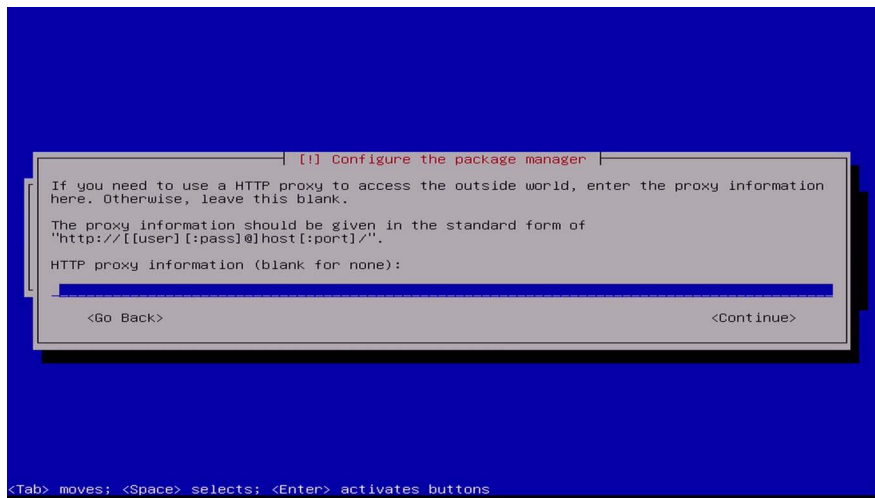
19 When prompted, select a Debian archive mirror country and then press **Enter**.



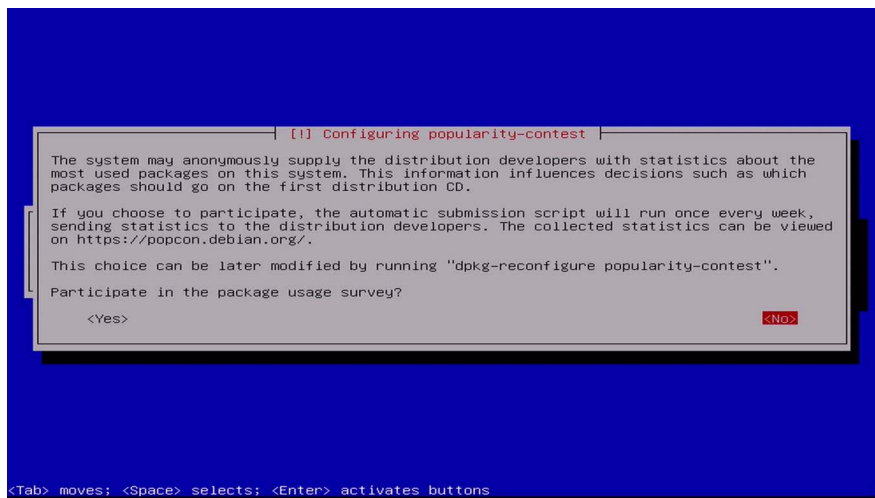
20 Select a Debian archive mirror and then press **Enter**.



- 21 When prompted to configure the package manager, leave the proxy field blank and press **Enter**.



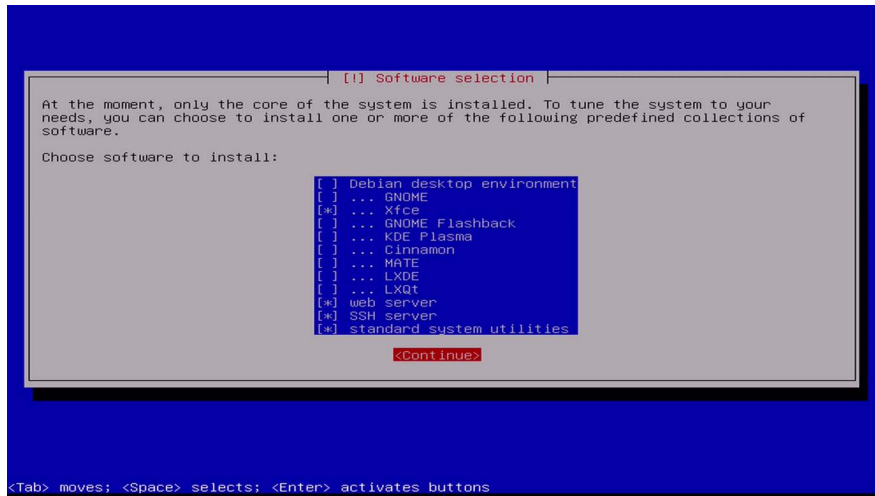
- 22 When prompted to participate in the popularity-contest survey, select either **Yes** or **No** and press **Enter**.



- 23 Select the software that you want to install.

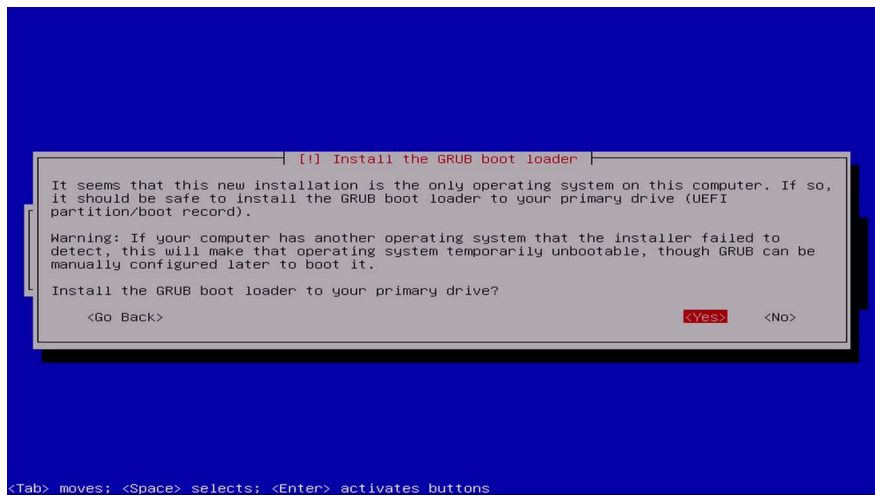
At a minimum, select:

- **Xfce,**
- **Web Server,**
- **SSH Server,** and
- **Standard System Utilities.**



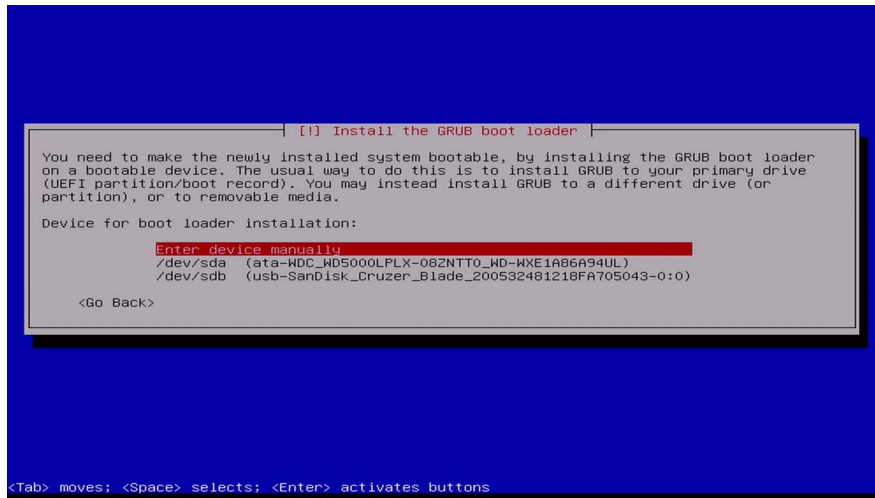
Select **Continue** and press **Enter**.

- 24 When prompted to install the GRUB boot loader on a hard disk, select **Yes** and then press **Enter**.

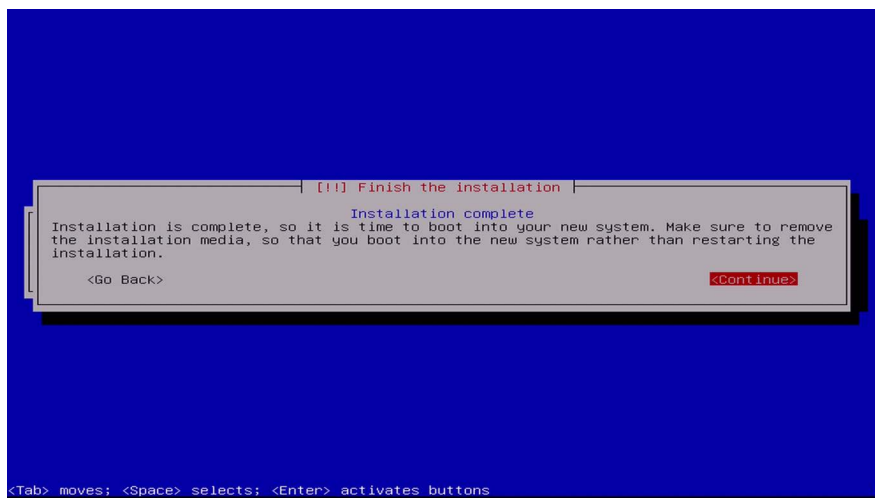


The boot loader allows your server to launch the Debian OS when powered on.

- 25 When prompted to select the hard disk where the bootable software is to reside, **Enter device manually** and then press **Enter**.



- 26 When prompted that the installation is complete, make sure to remove the installation media, select **Continue**, and press **Enter**.



The server boots into the new system and displays the GUI.

You can now install the Nyquist software application (see *"Installing the Nyquist System Server"* on page 20).

# Installing the Nyquist System Server

The Nyquist system server install involves the following tasks:

- Set up a static or reserved IP address for the Nyquist server.
- Copy and extract the `nyquist-e7000-xx.xx.xx.xxxx.tar.gz` or `nyquist-c4000-xx.xx.xx.xxxx.tar.gz` file.
- Install the Nyquist application software.
- Use the Setup Wizards to begin configuring the Nyquist server.

Before installing Nyquist server, you must install the Debian OS (see “Installing Debian” on page 8).

## Set Up Static IP Address

Configure the IP address of the Nyquist system server with a static address or a reserved DHCP-assigned address. Once configured, verify that the IP address has been correctly assigned (e.g., via the `ip` command or via the Network Setting UI) and that the Internet is accessible.

## Download and Extract the .tar File

---

*Note:* The Nyquist server must have access to the Internet in order to complete this procedure.

---

The `<nyquist-e7000-x.x.x.xxx.tar.gz>` or `<nyquist-c4000-x.x.x.xxx.tar.gz>` file is a compressed archive file that must be copied to the server and then extracted.

---

*Note:* The `x.x.x.xxx` will indicate the version of the Nyquist server.

---

To download and extract the `<nyquist-e7000-x.x.x.xxx.tar.gz>` or `<nyquist-c4000-x.x.x.xxx.tar.gz>` file:

- 1 Download the appropriate `tar.gz` file from the following Bogen URL to the `/tmp` directory. (Replace `<nyquist_model>` with E7000 or C4000.)

[https://www.bogen.com/<nyquist\\_model>-software-update-subscriptions](https://www.bogen.com/<nyquist_model>-software-update-subscriptions)

- 2 Begin a terminal session.
- 3 Type `su` at the command prompt, press **Enter**, and then type the root password.
- 4 Type `cd /tmp` to switch to the `tmp` directory, then enter the tar extraction command, as shown below:

```
cd /tmp
tar xPvf nyquist-<nyquist_model>-<x.x.x.xxx>.tar.gz
```

The file will be extracted to the `/opt/bogen` directory.

```
root@debian:/home/nyquist# cd /tmp
root@debian:/tmp# tar xPvf nyquist-<nyquist_model>-<x.x.x.xxx>.tar.gz
```

## Install the Nyquist Software

After copying and extracting the `nyquist-e7000-x.x.x.xxx.tar.gz` or `nyquist-c4000-x.x.x.xxx.tar.gz` file, you can install the Nyquist application software. This installation process takes approximately 1 hour and 45 minutes.

*To install Nyquist:*

- 1 Type the following command at the command prompt:

```
root@debian:/tmp# /opt/bogen/install_nyquist █
```

Press **Enter**.

- 2 Enter your License Activation Key and press **Enter** to start the package installation.

```
root@debian:/tmp# /opt/bogen/install_nyquist
Enter License Activation Key (XXXX-XXXX-XXXX-XXXX): █
```

- 3 When prompted, enter your country code. For the United States, type `01` and press **Enter**.

- 4 Press **Enter** to read the End User License Agreement (EULA).

```
Please read the Nyquist End User License Agreement (EULA):
Press enter key to display the Nyquist EULA █
```

Press the **Space bar** to continue reading the EULA.

```
Do you accept the Nyquist EULA (Enter Yes or No)? █
```

Type **Yes** to accept the EULA.

- 5 When prompted to select option (C)reate (E)nter, (I)mport or (S)kip, type **C**, and then press **Enter**.

```
Select option: (C)reate, (E)nter, (I)mport or (S)kip? C
Select option: (I)P Address or (D)omain Name? I █
```

When prompted to select option (I)P Address or (D)omain name, type **I**.

Type the server's IP address, and then press **Enter**.

If the Nyquist application software had been previously installed, the following prompt appears:

```
It looks like you already have a Nyquist system installed: #.#.#:###
Please choose from one of the following options to proceed:
-----
Install - Use this option to fresh-install release: #.#.#:###
-----
* Nyquist software will be fresh-installed, user data deleted.
* All Configuration data will be deleted.
* Uploaded tones/alarms/announcements will be deleted.
* Uploaded songs and playlists will be deleted.
* Recordings will be deleted.
* Voicemail recordings will be deleted.
* Call Detail Records (CDRs) will be deleted.
* System Backups will be preserved and available after installation.
-----
Update - Use this option to re-install the software to release: #.#.#:###
-----
* Nyquist software will be re-installed, while preserving user data.
* All Configuration data will be preserved.
* Uploaded tones/alarms/announcements will be preserved.
* Uploaded songs and playlists will be preserved.
* Recordings will be preserved.
* Voicemail recordings will be preserved.
* Call Detail Records (CDRs) will be preserved.
* System Backups will be preserved and available after installation.
Please enter your choice (Enter: Install or Update)?
```

If you enter **Update**, the new Nyquist version updates your existing system and keeps all of your already configured data (for example, schedules or station). If you enter **Install**, the new Nyquist version overwrites your existing version and all of your current configuration data is deleted.



## Using the Setup Wizards

- 1 Before you can log in to the Nyquist server, you must first install the Bogen Certificate Authority (CA) on your local machine, which will allow your browser to recognize the Nyquist server as a trusted server.

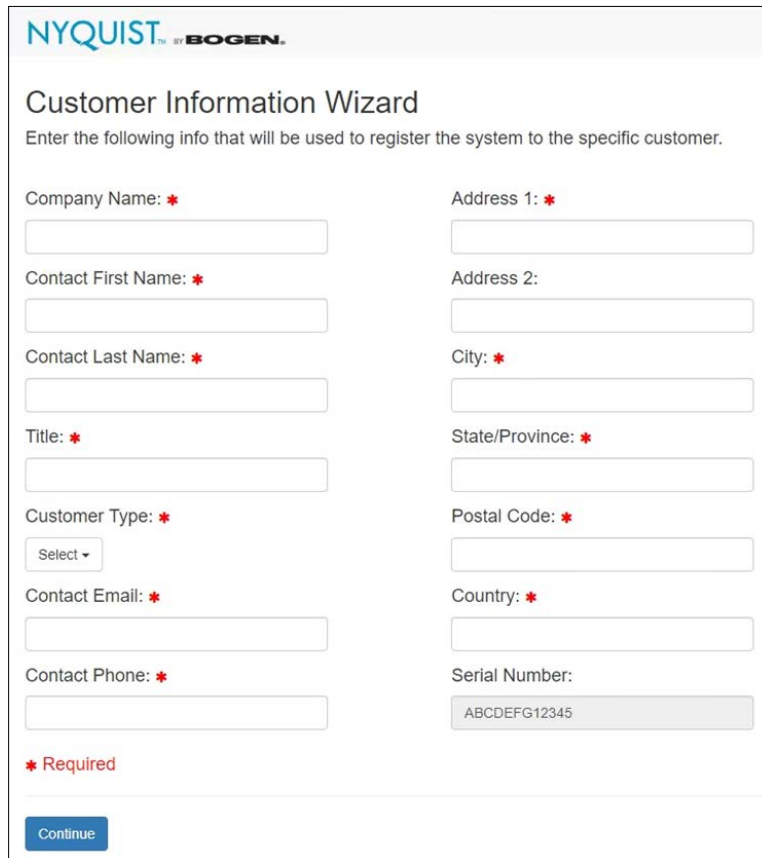
For details on how to install the Bogen CA, see *"Installing the Bogen Digital Certification Authority"* on page 43.

Once the Bogen CA has been installed, navigate to:

<https://<server>>

## Customer Information Wizard

- 1 The *Customer Information Wizard* screen launches to collect product registration information for warranty purposes and to activate the system's Software Update Subscription (SUS). (See *Figure 1, "Customer Information Wizard,"* on page 24.)



The screenshot shows the 'Customer Information Wizard' interface. At the top, it features the 'NYQUIST by BOGEN' logo. Below the logo, the title 'Customer Information Wizard' is displayed, followed by the instruction: 'Enter the following info that will be used to register the system to the specific customer.' The form is organized into two columns of input fields. The left column includes fields for 'Company Name', 'Contact First Name', 'Contact Last Name', 'Title', 'Customer Type' (a dropdown menu with 'Select' as the current selection), 'Contact Email', and 'Contact Phone'. The right column includes fields for 'Address 1', 'Address 2', 'City', 'State/Province', 'Postal Code', and 'Country'. A 'Serial Number' field is located at the bottom right, containing the text 'ABCDEFG12345'. A legend at the bottom left indicates that a red asterisk (\*) denotes a required field. A blue 'Continue' button is positioned at the bottom left of the form area.

**Figure 1. Customer Information Wizard**

Complete the form and click **Continue**.

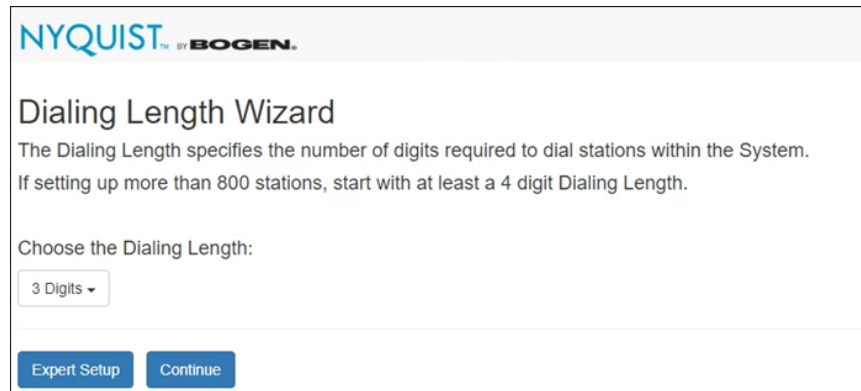
## Dialing Length Wizard

If you already know how to configure a Nyquist system and want to skip the wizards, click **Expert Setup**, which takes you directly to the Nyquist system's Login screen and will not redirect you back to any of the wizards.

*Note:* If you select **Expert Setup** and have not set a new password, you will need to enter the default username, **admin**, and the default password, **bogen**, to log into the system. Login credentials are case sensitive.

After completing Expert Setup, you must manually complete system configuration using the Admin Web UI (see the *Nyquist System Administrator Guide*).

- 2 On the *Dialing Length Wizard* screen, set the dialing length (number of digits) used by stations in your system.

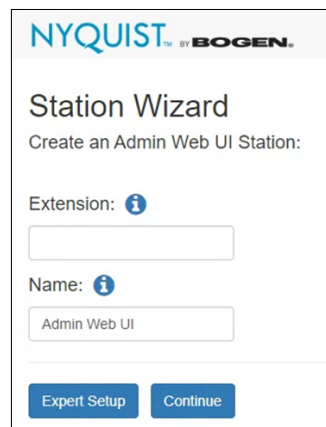


**Figure 2. Dialing Length Wizard**

Click **Continue** to advance to the next wizard.

## Station Wizard

- 3 On the *Station Wizard* screen, create the Admin Web UI station by entering the Extension and Name for this station. You can enter any value that does not start with a nine (9).



**Figure 3. Station Wizard**

Click **Continue** to advance to the next wizard.

## User Wizard

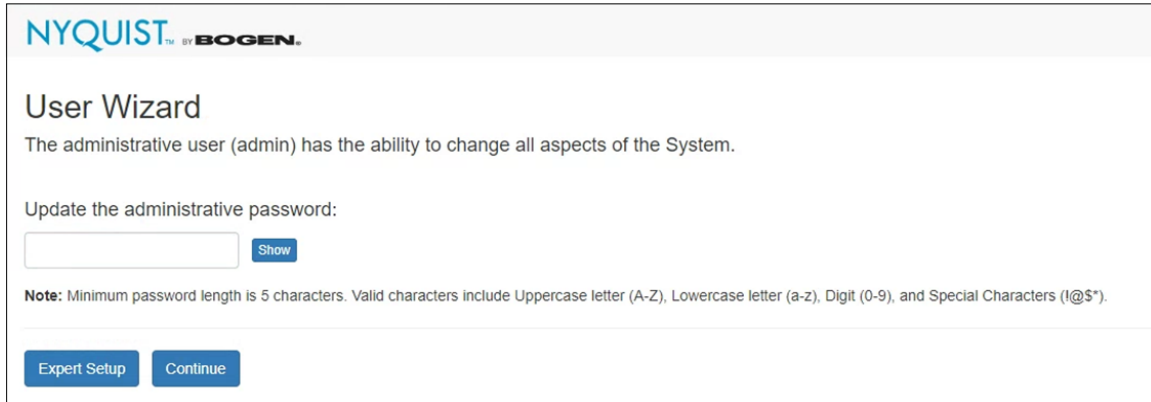
---

**Important:** The User Wizard specifies the administrative password for the System Controller. We recommend that you create a strong password, click **Show** to

verify the entered password, and store the password in a secure location (e.g., a trusted password manager application).

---

- 4 On the *User Wizard* screen, type an updated password for the Admin Web user.

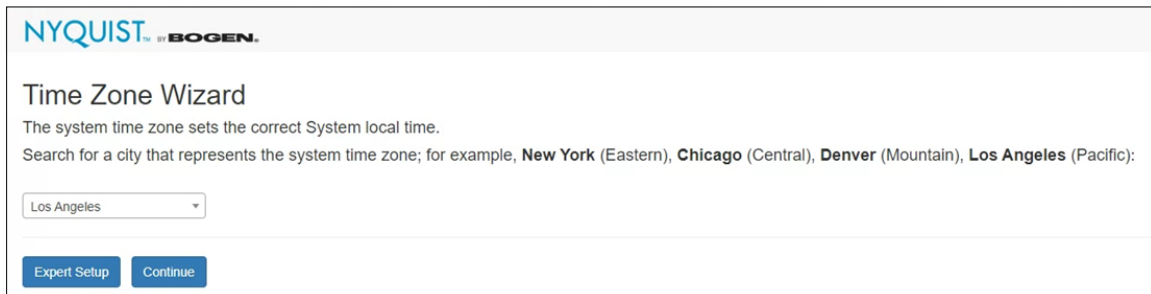


**Figure 4. User Wizard**

Click **Continue** to advance to the next wizard.

## Time Zone Wizard

- 5 On the *Time Zone Wizard* screen, set the time zone to be used by your system.

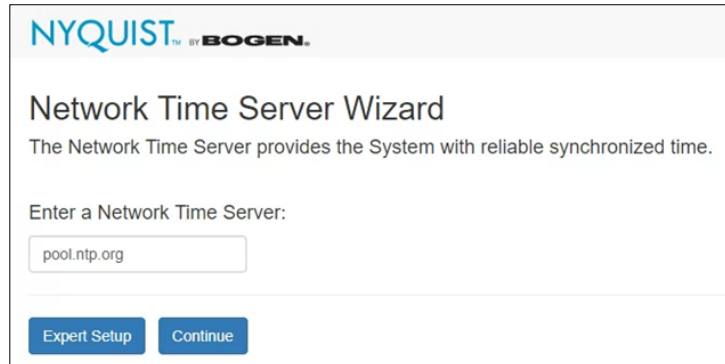


**Figure 5. Time Zone Wizard**

Click **Continue** to advance to the next wizard.

## Network Time Server Wizard

- 6 On the *Network Time Server Wizard* screen, specify the Network Time Server—also known as a Network Time Protocol (NTP) server—to be used by the Nyquist server.



**Figure 6. Network Time Server Wizard**

Click **Continue** to advance to the next wizard.

---

*Note:* Keep in mind that your Nyquist server must be able to reach the Network Time Server that you specify. If you specify an Internet-based server (e.g., pool.ntp.org, time.google.com), you may need to update your network routers' whitelist tables to allow the network traffic.

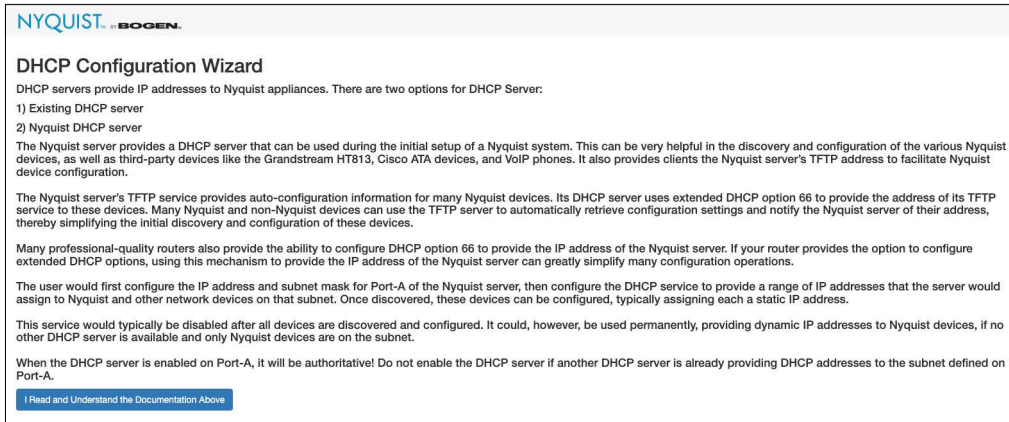
If you are not keeping your Nyquist system connected to the Internet, you should attempt to use a Network Time Server that is available on your private network; your network router may provide a Network Time Service. Consult your local Information Technology (IT) team for advice.

---

## DHCP Wizard

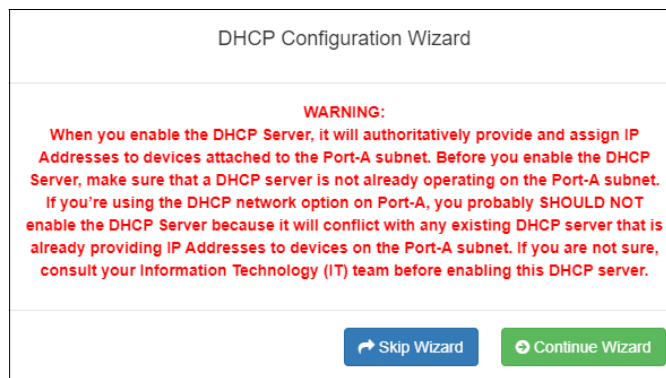
- 7 The first page of the *DHCP Configuration Wizard* screen describes how to best use DHCP, DHCP option 66, and the Nyquist TFTP server for discovery and configuration of Nyquist appliances. It also explains that the Nyquist server's DHCP service should

not be used if there is already an existing DHCP server on the Nyquist server's Port-A subnet.



Click **I Read and Understand the Documentation Above** to continue.

- 8 A warning message will be displayed explaining the risks of enabling the Nyquist DHCP Server when there is another DHCP server operating on the local subnet.



If you do *not* already have a DHCP server on your subnet and would like to use the Nyquist DHCP feature, select **Continue Wizard** and proceed to configure Nyquist's DHCP server. If you already have a DHCP server, select **Skip Wizard** and advance to the next wizard.

---

*Tip:* The Nyquist server's TFTP service provides autoconfiguration information for many Nyquist devices. Many Nyquist and non-Nyquist devices can use the TFTP service to automatically retrieve configuration settings and notify the Nyquist controller of their address, thereby simplifying the initial discovery and configuration of these devices.

If you choose to use a different DHCP server during the device discovery process, many professional-grade routers allow you to configure extended DHCP option 66 to provide the IP address of the Nyquist server. This mechanism can greatly simplify many configuration operations.

---

---

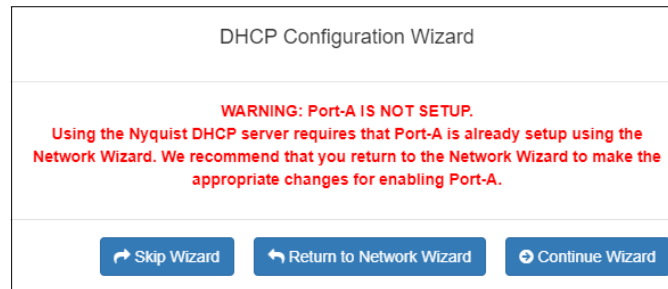
---

**Caution** Configuring any address *other* than the Nyquist server for DHCP option 66 will cause problems with device discovery and autoconfiguration.

---

---

If Port-A has not been properly setup, you will be warned and asked whether you want to skip the *DHCP Configuration Wizard*, continue it, or return to the *Network Wizard* to configure Port-A. If you skip the DHCP wizard, DHCP will *not* be activated on the Nyquist server.



---

---

**Caution** Only execute the *Network Wizard* if your system is using the Nyquist System Controller (NQ-SYSCTRL) device. Executing it on a custom server can result in unpredictable behavior.

---

---

- 9 On the *DHCP Configuration Wizard* screen, configure the Nyquist DHCP server settings, as described in Table 1, “*DHCP Wizard settings*,” on page 30.

**Figure 7. DHCP Wizard**

**Table 1. DHCP Wizard settings**

<b>Default Lease Time</b>	Length in seconds that will be assigned to a lease if the client does not request a specific expiration time. Decrease this value if you are only using the DHCP server to stage Nyquist devices.
<b>Max Lease Time</b>	Maximum length in seconds that will be assigned to a lease. Decrease this value if you are only using the DHCP server to stage Nyquist devices.
<b>IP Range Start</b>	Start of the IP address range from which to allocate addresses to devices on the Port-A subnet. After performing Auto Configure, you can increase this value to reserve a range of IP addresses on the subnet for fixed address assignments.
<b>IP Range End</b>	End of the IP address range from which to allocate addresses to devices on the Port-A subnet. After performing Auto Configure, you can decrease this value to reserve a range of IP addresses on the subnet for fixed address assignments.



**Table 1. DHCP Wizard settings (Continued)**

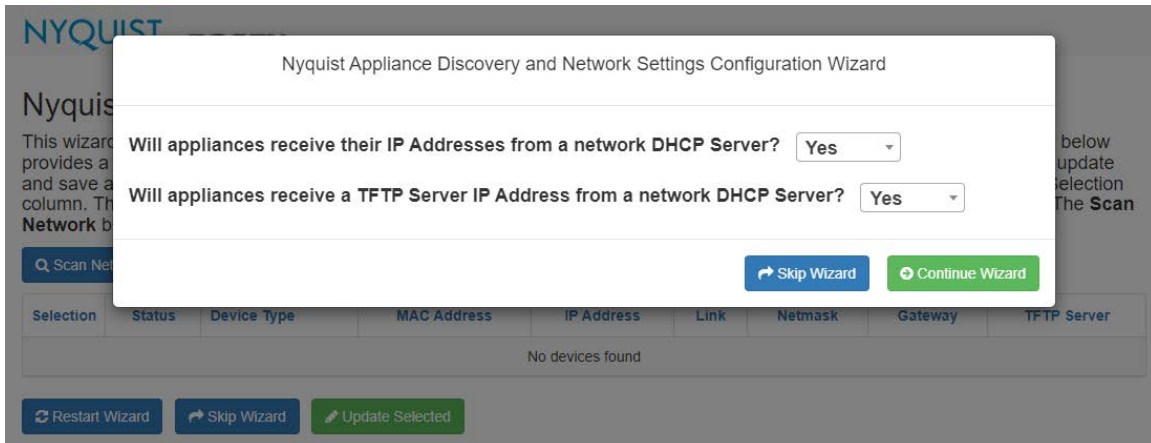
<b>Gateway</b>	<p>Gateway address sent to DHCP clients used for routing packets outside of the Port-A subnet. Auto Configure will set this value based on the current Port-A setup; you can still change it if needed.</p> <p><i>Note:</i> If you are setting up the Nyquist DHCP server to provide IP Addresses and TFTP Server IP Address to Nyquist appliances, the Gateway IP address must be set to the Nyquist server's IP address; if you leave it blank, paging and audio distribution will not function. If you're using the Automatic Failover feature, the Gateway address must be set to the Master IP Address.</p>
<b>Domain Name</b>	<p>Domain name for devices operating on the subnet, excluding hostname. Leave this parameter blank if the Port-A subnet is private and not included in DNS managed domain. If the server has a domain name set, Auto Configure will use the server value. This is typically left blank.</p>
<b>DNS Servers</b>	<p>Comma-delimited list of DNS servers that devices on the subnet can use to resolve hostnames. Auto Configure will set this value; you can change it if needed.</p>
<b>Skip Wizard</b>	<p>Skip the DHCP Wizard and do not active the Nyquist DHCP service.</p>
<b>Activate DHCP Server</b>	<p>Saves the specified DHCP configuration and activate the Nyquist DHCP server.</p>
<b>Auto Configure</b>	<p>This button selects appropriate DHCP configuration values based on the existing server configuration. These values can be modified by the user before saving the settings.</p> <p><i>Note:</i> These values will not be saved until the user clicks the <b>Activate DHCP Server</b> button.</p>

- 10 Select **Auto Configure** to generate appropriate DHCP configuration values, then customize the generated values as needed.
- 11 After all DHCP settings have been configured, select **Activate DHCP Server** to activate the DHCP service and advance to the *Zone Wizard*.

## Appliance Discovery Wizard

- 12 The Nyquist Appliance Discovery and Network Settings Configuration Wizard first displays a popup that asks if discovered Nyquist appliances will receive their IP

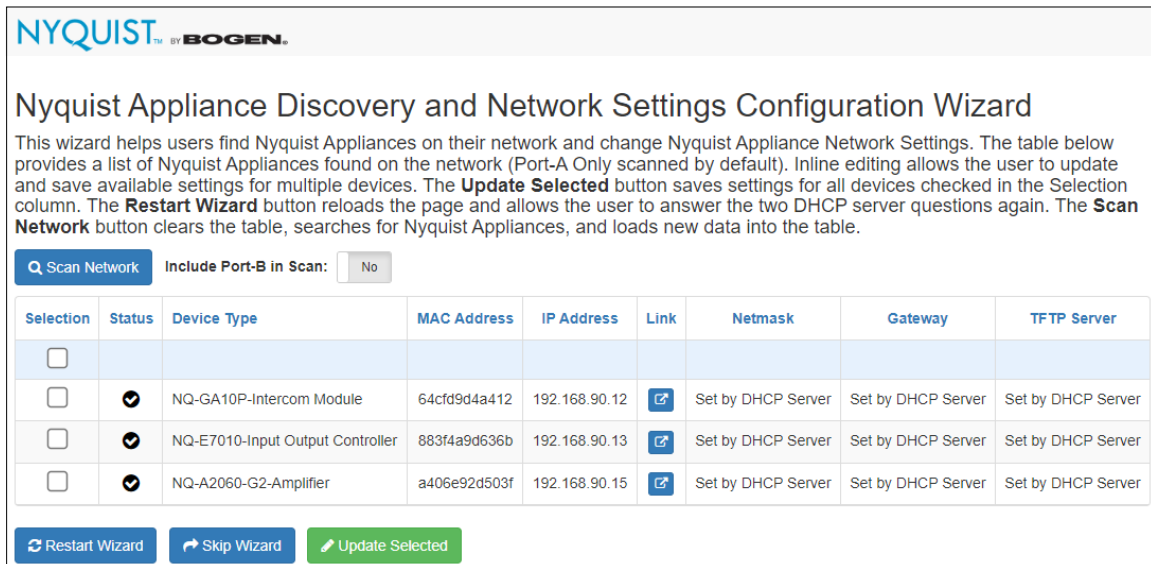
addresses from a network DHCP server, whether from this System Controller or a network DHCP server.



**Figure 8. Network Appliance Discovery and Network Settings Configuration Wizard (start)**

If so, select **Yes** and indicate if they will also receive the TFTP server address from the DHCP server, otherwise select **No**. Select **Yes** if the DHCP server will publish the System Controller’s IP address via DHCP option 66, otherwise select **No**.

- 13 The Nyquist Appliance Discovery and Network Settings Configuration Wizard page automatically scans the Port-A network and displays all Nyquist appliances discovered.



**Figure 9. Network Appliance Discovery and Network Settings Configuration Wizard (appliances)**

- 14 If you would like to search the Port-B network in addition to the Port-A network, set **Include Port-B in Scan** to **Yes** and select **Scan Network** to reinitiate the network scan. All Nyquist appliances found will be displayed.
- 15 If you would like to login to an appliance’s web interface, select the **Link** button for that appliance.

**16** Select any appliances to be reconfigured and select **Update Selected**.

---

*Note:* Updating an appliance changes its network configuration; it does not add a corresponding station for the appliance. If available, a **Create** button will be displayed next to the appliance's **Device Type** which opens the **Add Station** screen for the appliance.

---

**17** When ready, select **Skip Wizard** to continue to the next wizard.

---

*Tip:* The Appliance Discovery Wizard can be initiated at any time to discover and configure new appliances by browsing to:

<https://<server>/setup/discovery>

---

## Zone Wizard

The number of zones that you can create for a C4000 depends upon your product license. Regardless of what size system license was purchased, however, the Zone Wizard will only assist in creating a maximum of 20 zones. (Additional zones, if desired and licensed, can

be added via the Admin Web UI after the initial setup is complete.) If you have purchased 20 or fewer zones, the system will automatically generate the zones.

Remove	Zone Number	Name	Type	Cut Level (dB)	Audio Distribution Cut Level (dB)	Pre-Announce Tone	Multicast IP Address	Multicast Port
	1	Zone1	Paging+Time+Audio	-6	-24	1-Second	239.1.1.10	6100
	2	Zone2	Paging+Time+Audio	-6	-24	1-Second	239.1.1.11	6104
	3	Zone3	Paging+Time+Audio	-6	-24	1-Second	239.1.1.12	6108
	4	Zone4	Paging+Time+Audio	-6	-24	1-Second	239.1.1.13	6112
	5	Zone5	Paging+Time+Audio	-6	-24	1-Second	239.1.1.14	6116
	6	Zone6	Paging+Time+Audio	-6	-24	1-Second	239.1.1.15	6120
	7	Zone7	Paging+Time+Audio	-6	-24	1-Second	239.1.1.16	6124
	8	Zone8	Paging+Time+Audio	-6	-24	1-Second	239.1.1.17	6128
	9	Zone9	Paging+Time+Audio	-6	-24	1-Second	239.1.1.18	6132
	10	Zone10	Paging+Time+Audio	-6	-24	1-Second	239.1.1.19	6136
	11	Zone11	Paging+Time+Audio	-6	-24	1-Second	239.1.1.20	6140
	12	Zone12	Paging+Time+Audio	-6	-24	1-Second	239.1.1.21	6144
	13	Zone13	Paging+Time+Audio	-6	-24	1-Second	239.1.1.22	6148
	14	Zone14	Paging+Time+Audio	-6	-24	1-Second	239.1.1.23	6152
	15	Zone15	Paging+Time+Audio	-6	-24	1-Second	239.1.1.24	6156
	16	Zone16	Paging+Time+Audio	-6	-24	1-Second	239.1.1.25	6160
	17	Zone17	Paging+Time+Audio	-6	-24	1-Second	239.1.1.26	6164
	18	Zone18	Paging+Time+Audio	-6	-24	1-Second	239.1.1.27	6168
	19	Zone19	Paging+Time+Audio	-6	-24	1-Second	239.1.1.28	6172
	20	Zone20	Paging+Time+Audio	-6	-24	1-Second	239.1.1.29	6176

The current license allows the creation of more than 20 zones. This wizard only allows the creation of 20 zones initially. You can create more zones after the setup is complete.

**Figure 10. Zone Wizard**

**18** You can delete an automatically generated zone by selecting the red X next to the zone you want to delete.

You can make edits to a zone by selecting the hyperlink of any zone parameter (except for the Zone Number).

**Table 2. Zone Wizard settings**

<b>Name</b>	Identifies the zone by the user-created name. The name can be alphanumeric (such as "Bldg 1") and contain up to 30 characters.
<b>Type</b>	Identifies the zone as being able to receive paging, time, audio, or a combination of paging, time, or audio.
<b>Cut Level (dB)</b>	Sets the volume cut level for announcements. The volume cut level can range from 0 to -42 dB. The default level is -6 dB.

**Table 2. Zone Wizard settings**

<b>Audio Distribution Cut Level (dB)</b>	Sets the volume cut level for audio distribution playing to stations in the zone. The cut level can range from 0 to -42 dB. The default value is -24 dB.
<b>Pre-Announce Tone</b>	Identifies what, if any, tone should play before an announcement.
<b>Multicast IP Address</b>	Identifies the IP address for multicast calls to the zone.
<b>Multicast Port Number</b>	Identifies the port number for multicast calls to the zone.

For some parameters (Type and Pre-Announce Tone), you can select from the drop-down menu that appears; for others, select the value, enter a new value, and select the check box when done.

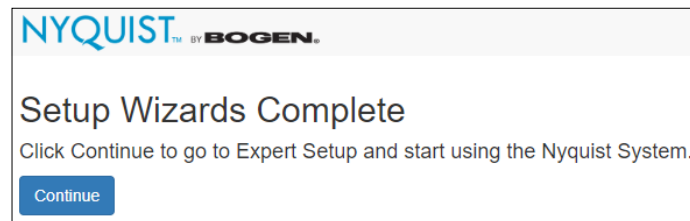


Or, you can select **Skip Wizard** and create your zones later through the Admin Web UI.

- 19 After all zones are created, click **Save** to advance to the *Setup Wizards Complete* screen.

## Setup Wizards Complete

- 20 With all setup wizards completed, click **Continue** to go to the *Nyquist Login* screen.



**Figure 11. Setup Wizards Complete**

## Adjusting Final Network Configuration Settings

To modify the Nyquist DHCP settings, open the DHCP Configuration Wizard by entering the following URL in the browser's address bar:

<http://<server>/setup/dhcp>

---

*Note:* You may need to re-enter a new IP address into your browser’s address bar to reconnect to the Nyquist server once the settings have been applied.

---

The Appliance Discovery Wizard can be initiated at any time to discover and configure new appliances by browsing to:

<https://<server>/setup/discovery>

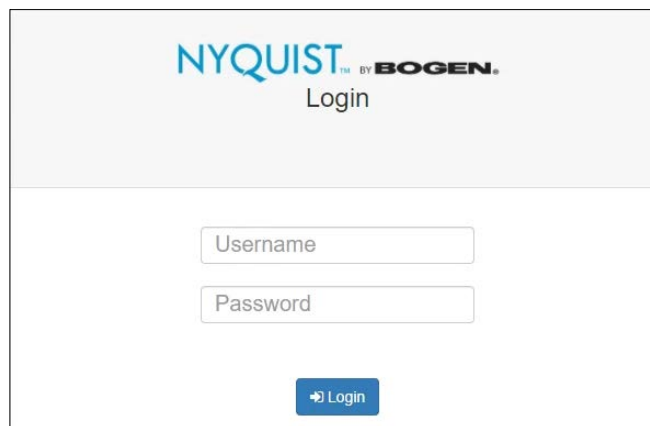
## Logging into the Nyquist Server

Before you can log into the Nyquist server, you must first install the Bogen Certificate Authority (CA), which will allow your browser to recognize the Nyquist server as a trusted server.

For details on how to install the Bogen CA, see *“Installing the Bogen Digital Certification Authority”* on page 43.

Once the Bogen CA has been installed, navigate to:

<https://<server>>



**Figure 12. Nyquist System Controller Login**

The first time you log in to the server, enter a username of `admin` and the administrative password specified in the User Wizard. If you skipped the User Wizard, the default password is `bogen`.

## Update Server Software

Although not required, it is strongly recommended to check for software updates for the Nyquist server.

To check the current version number of the Nyquist server, select **About** from the hamburger menu in the top-right corner of the admin page. The version will be shown at the top of the page.

For detailed instructions on how to update the Nyquist server software, see *"Updating Nyquist Software"* on page 50.

---

*Note:* Updating Nyquist server software will also install the latest firmware for the Nyquist appliances.

---

# Best Practices

This section details recommendations and best practices to use when:

- Updating the Nyquist system server software to a new software release
- Reinstalling a previous Nyquist software release
- Reinstalling the same Nyquist software release
- Updating Nyquist appliance firmware (software stored on the appliance)
- Using System Backups

---

*Tip:* Whenever configuration changes are made, we recommend performing a System Backup and using Export to save a copy of the backup on your local computer.

---

---

*Note:* Before configuring or using any Nyquist appliances, you must ensure that the appliance firmware is updated to the latest release. The latest Nyquist firmware release can also be downloaded directly (as a .tar.gz file) from the appropriate Bogen website:

**E7000:** <https://www.bogen.com/dealers>

**C4000:** <https://www.bogen.com/c4000-resources>

---

## Updating Nyquist Software

---

*Note:* Before beginning the install process, make sure that your Nyquist system server can access the required URLs or web sites (see “*Whitelisted Web Addresses*” on page 1) from a supported browser.

---

New Nyquist server software may include patches to address known issues or new releases that provide additional features.

When updating to a new Nyquist server software release, use the Admin Web UI to perform a system update unless directed by technical support. Performing a system update ensures that all configuration data, call detail records, recordings, voice mail, and all upload announcements, alarms, tones, and songs are retained and are available after the system software update.

To check the current version number of the Nyquist server, select **About** from the hamburger menu in the top-right corner of the admin page. The version will be shown at the top of the page.



To perform a system update:

- 1 On the navigation bar, select **System Backup/Restore**.
- 2 Select **Create Backup** to perform a **System** backup and use the **Export** feature to save a copy of the system backup to your local computer. You may also want to create backups of **Recordings** and **Voicemail** and export them.
- 3 From the navigation bar, select **System Parameters**.
- 4 From the **System Parameters** page, select **System Update**.
- 5 If the System Controller is connected to the Internet, click the **Check for System Updates** button to search for and download the latest system update. (This may take some time, depending on your internet connection speed.)

Some Nyquist system updates are only available by downloading them directly from a Bogen website:

**E7000:** <https://www.bogen.com/dealers>

**C4000:** <https://www.bogen.com/c4000-resources>.

The system update file will typically be named `nyquist-c4000-<version>.tar.gz` or `nyquist-e7000-<version>.tar.gz`. After downloading the file to your local computer via a browser, the file can be uploaded to the Nyquist server via the **Upload** button of the **System Update** page.

- 6 It is *very important* to read the Release Notes, which can be displayed by clicking the blue button. They often contain critical information regarding the upgrade process.

---

*Tip:* Copying the notes to a word processor allows you to view the notes during the installation process and may be easier to read.

---

- 7 Install the latest version available for the Nyquist server, carefully following relevant instructions from the Release Notes.

---

**Warning** Be aware that a system update can sometimes take several minutes, during which time the device should *never* be powered down or interrupted.

---

- 8 Once the update has completed, we recommend regenerating the System Controller's server certificate. From the **System Parameters** page, select the **Edit** button, then select the **Generate Server Certificate** button.

For a more detailed explanation, see *Performing a System Update* in the *Nyquist System Administrator Guide*.

Perform the server system update process before updating Nyquist appliance software.

## Assigning Permissions for New Features

After you have finished updating the Nyquist software, permissions for features introduced by this new release must be set for the roles that will use these features.

*To assign permissions for these new features:*

- 1 On the navigation bar, select **Roles**.
- 2 On the **Roles** page, select the **Permissions** icon next to the role for which you want to edit permissions.
- 3 On the **Edit Permissions** page, make desired changes.
- 4 Select **Save**.

For more information, refer to the *Nyquist System Administrator Guide*.

## Reinstalling an Earlier Software Release

---

*Note:* Before beginning the install process, make sure that your Nyquist system server can access the required URLs or web sites (see “*Whitelisted Web Addresses*” on page 1) from a supported browser.

---

If you want to reinstall an earlier software release, you should first do a fresh install of the Debian software. Then, install Nyquist using the `install_nyquist` command (see “Installing the Nyquist Software” on page 39).

After the installation completes, you can restore user configuration data from a system backup provided the system backup was created from the same release that is now installed.

Nyquist appliance software may also need to be reinstalled to a previous release to maintain compatibility with the Nyquist system server.

## Reinstalling the Same Software Release

---

*Note:* Before beginning the install process, make sure that your Nyquist system server can access the required URLs or web sites (see “*Whitelisted Web Addresses*” on page 1) from a supported browser.

---

If you need to re-install the same software release, you should first perform a system backup. (Refer to the Nyquist System Administrator Manual.)

Next, install Nyquist using the `install_nyquist` command (see “Installing the Nyquist Software” on page 39).

---

*Note:* When using a system backup to restore configuration data, the system backup to be used must have been created by the same Nyquist server software release that is currently running or an older release (i.e., not from a newer release than is currently running).

---

After completing the software installation, restore user configuration data from the system backup.

You can use Recordings and Voicemail backups to restore recordings and voicemail on any Nyquist software release. These type of backups are not dependent on any specific release version (unless otherwise stated by Bogen on specific software releases).

## Updating Appliance Firmware

---

*Note:* Before beginning the install process, make sure that your Nyquist system server can access the required URLs or web sites (see “*Whitelisted Web Addresses*” on page 1) using the Nyquist Admin Web UI.

---

The firmware for all devices used with the Nyquist system must be compatible with the software installed on the Nyquist System Controller, and all Nyquist appliances in a given installation should be configured to run the same firmware version.

The latest Nyquist appliance firmware release can also be downloaded directly (as a `.tar.gz` file) from the appropriate Bogen website:

**E7000:** <https://www.bogen.com/dealers>

**C4000:** <https://www.bogen.com/c4000-resources>.

The Nyquist appliance firmware will be named `NyqUpdate-<version>.tar.gz`.

Firmware can be updated for Nyquist appliances and Analog Station Bridge (ASB) devices through the Admin Web UI or through the appliance's web UI. For information about the appliance's web UI, refer to the device's configuration guide.

Using the Nyquist Admin Web UI via the **Firmware** page, you can upload a firmware file to the Nyquist system server, download firmware to an appliance or ASB, view a list of appliances and stations and ASBs that are linked to a firmware name, set default firmware for any stations and bridge devices to be added, and delete firmware entries.

*To perform an appliance firmware update:*

- 1 On the navigation bar, select **Firmware**.
- 2 Click the Check for Updates button to search for and download the latest device firmware update.

Some Nyquist firmware updates are only available by downloading them directly from a Bogen website:

**E7000:** <https://www.bogen.com/dealers>

**C4000:** <https://www.bogen.com/c4000-resources>.

The firmware update file will typically be named `NyqUpdate-<version>.tar.gz`. After downloading the file to your local computer via a browser, the file can be uploaded to the Nyquist server via the **Upload** button of the **Firmware** page.

- 3 It is *very important* to read the Release Notes, which can be displayed by clicking the blue button. They often contain critical information regarding the upgrade process.

---

*Tip:* Copying the notes to a word processor allows you to view the notes during the installation process and may be easier to read.

---

- 4 To define this update as the default for all Nyquist appliances, select the **Set as Default Firmware** button for this update.
- 5 To add or edit a custom note for this update, select the **Edit** button for this update, modify the Notes field, and click **Save**.
- 6 To apply the update to one or more appliances, select the **Device Selection** button, select one or more devices, and select the **Update** button.

---

**Warning** Be aware that a firmware update can sometimes take several minutes, during which time the device should *never* be powered down or interrupted.

---

For a more detailed explanation, see *Configuring Appliance Firmware* in the *Nyquist System Administrator Guide*.

# 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

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

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*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

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

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*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.

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*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.

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- 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