Hewlett Packard
Enterprise

Hardware Guide

AF20, AF20Q, AF40, AF60, AF80, AFS3

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Email: *mailto:support@nimblestorage.com*

For all other general support contact information, go to *https://www.hpe.com/us/en/services/nimble-storage.html*.

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Install the HPE Nimble Storage Array

There are several steps to install the HPE Nimble Storage array, such as providing a suitable operating environment, installing the array into your rack, and making network connections appropriate to your current and anticipated topologies. After the array has been configured, you can perform maintenance and upgrade tasks as needed.

Network Considerations

In preparation for installing your HPE Nimble Storage array, information in this section will help you:

- Determine your *network topology*
- Plan for the configuration of *IP Addresses*
- Identify options for *subnets*, including (for iSCSI):
  - Discovery IP addressing
  - IP address zones
  - Traffic assignments
- Understand data connections to your iSCSI or Fibre Channel array through *Interface Pairs*

Use the *Installation Checklist* to note all information required before installing your array. For more information, refer to the *GUI Administration Guide* or the *CLI Administration Guide*.

Network Topology

When you initially configure the arrays, you are prompted to choose a network topology. The selection that you make enables the setup wizard to assist in making the optimal networking choices:

- One shared network
- Two dedicated networks
- Advanced network configuration
- Dual Fabric Fibre Channel

Important The following diagrams are conceptual examples of the network connections you might use for each topology. These diagrams are not intended to show a complete set of connections.

One Shared Network

In this configuration, the management and data traffic share the same physical network interfaces. If more than one switch is used in this configuration, the switches must be connected to each other by an inter-switch link or trunk port, or they must be configured in a single switch stack if supported by the switch manufacturer. You may want to consider this configuration if you have only one network or if your data traffic is low enough that adding management traffic does not affect the LAN.

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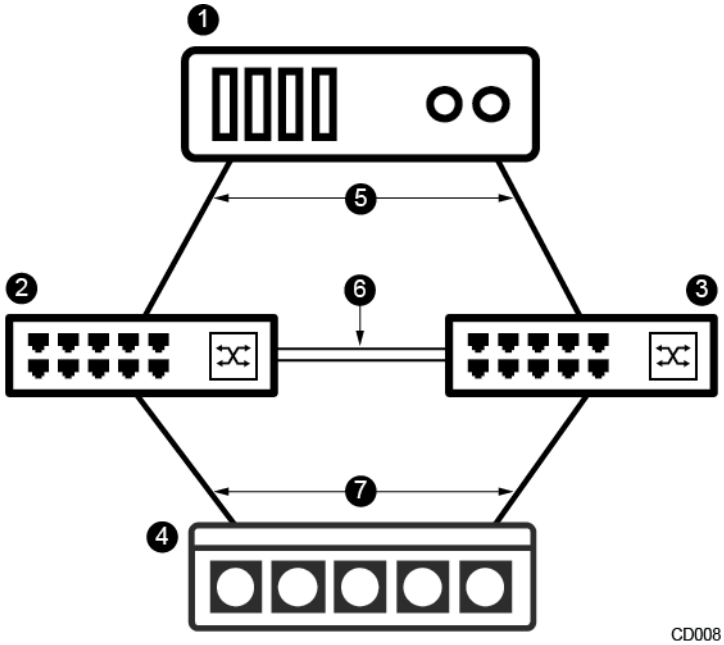
Figure 1: Topology diagram - network connections for one shared network



1 Host/server
2 Ethernet switch 1
3 Ethernet switch 2
4 Array
5 Host data/management connections
6 Inter-switch link
7 Array data/management connections

Two Dedicated Networks

In this configuration, management traffic and data traffic are separated into two subnets. Management traffic uses the ports assigned to the management subnet. All other subnets are designated as data only. Two switches for the management traffic and two switches for the data traffic are recommended for redundancy and high availability. Multiple switches carrying a particular subnet must be connected with an inter-switch link, trunk port, or switch stacking modules. If that subnet is assigned to a particular VLAN, the inter-switch link or trunk port must allow that VLAN.

This configuration option is probably best in cases where security is an issue, where network administrators do not need access to data traffic, where the amount of data traffic is such that it has a dedicated network, or where the network for data traffic is completely separate from the management network.

Choose this option:

- To limit iSCSI traffic to 10Gb interfaces
- To isolate the subnets for network security
- If you want a dedicated broadcast domain reserved for iSCSI traffic

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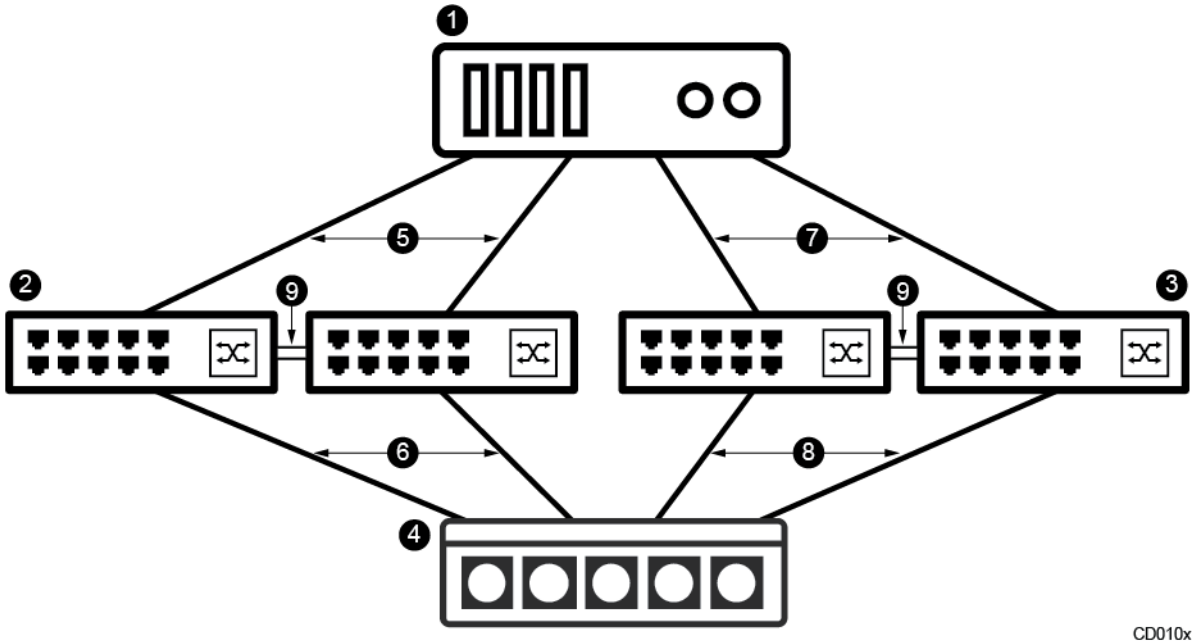
Figure 2: Topology diagram - network connection for two dedicated networks



1 Host/server
2 Ethernet switch (management)
3 Ethernet switch (data)
4 Array
5 Host management connections
6 Array management connections
7 Host data connections
8 Array data connections
9 Inter-switch link

Advanced Network Configuration

From the **Advanced and advanced multipath requirements** selection of the setup wizard, you can define a configuration for a dedicated management port or define any number of ports to handle the desired I/O flow. The advanced network configuration allows the greatest flexibility to suit your network traffic and advanced multipath requirements.

This particular example shows the management and data paths on different networks. Data ports are connected to subnets that carry iSCSI traffic, and you can add more data connections to additional ports as needed. Note that the subnet addresses in the illustration are just examples. This arrangement enables the maximum data throughput by isolating management traffic from the data.

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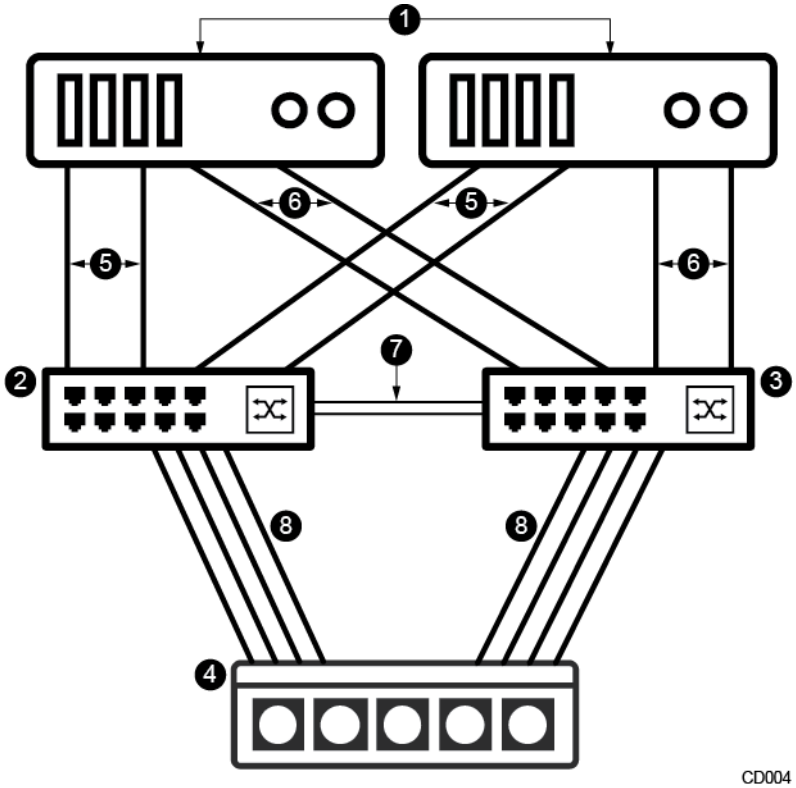
Figure 3: Topology diagram - advanced network configuration, data connections



1 Host/server
2 Ethernet switch 1, subnet 10.10.30.x/24
3 Ethernet switch 2, subnet 10.10.20.x/24
4 Array
5 Host data connections, switch 1
6 Host data connections, switch 2
7 Inter-switch link
8 Array data connections

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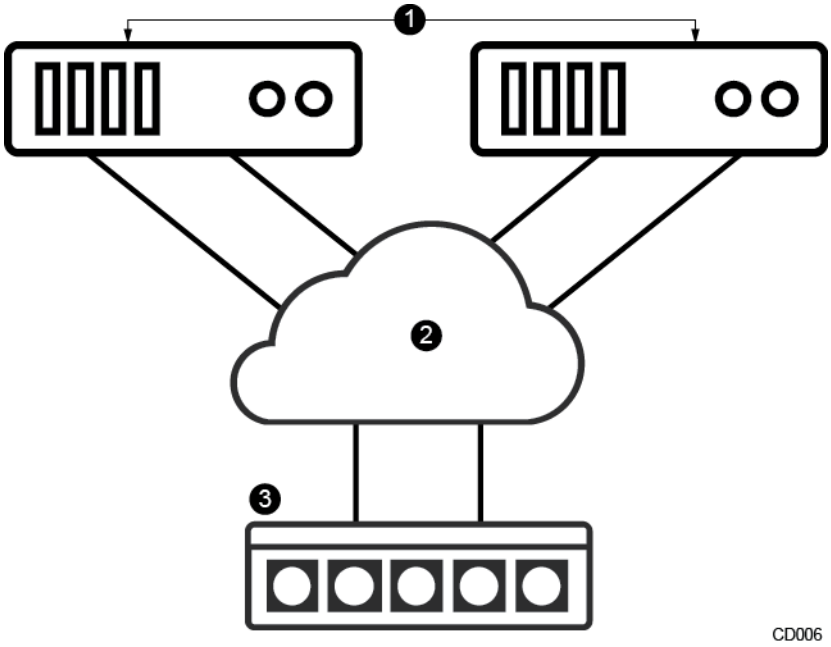
Figure 4: Topology diagram - advanced network configuration, management connections



1 Host/server
2 Management network
3 Array

Dual Fabric Fibre Channel

In this configuration, two Fibre Channel ports on a host HBA are connected to two separate Fibre Channel switches, with each Fibre Channel switch connected to both controllers on the array. The host management port and the controller management ports are connected through an Ethernet switch.

This configuration provides redundant paths for Fibre Channel traffic. If one of the host Fibre Channel ports fails, or one of the Fibre Channel switches fails, the host remains connected to both controllers through the remaining host Fibre Channel port or Fibre Channel switch, and Fibre Channel traffic continues uninterrupted.

Note that only one data connection is shown. You can add more connections and use different ports as needed.

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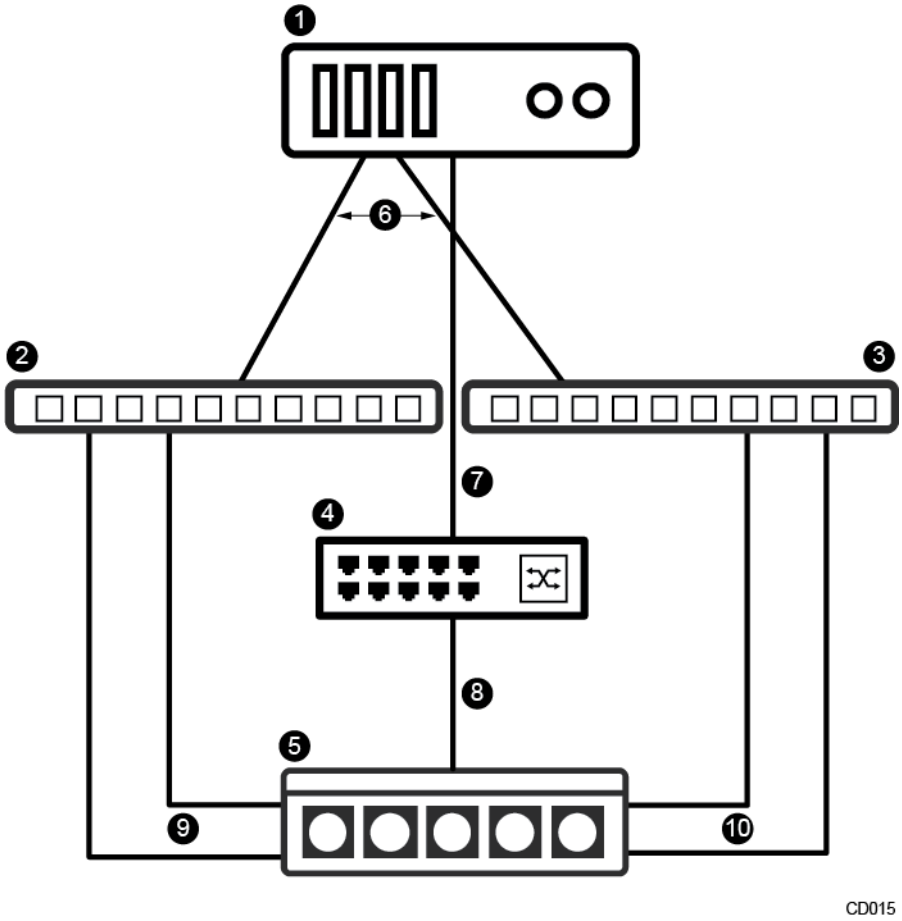
Figure 5: Topology diagram - network connections for dual fabric Fibre Channel



1 Host/server
2 Fibre Channel switch 1
3 Fibre Channel switch 2
4 Ethernet switch
5 Fibre Channel array
6 Host data connections
7 Host management connections
8 Array management connections
9 Data fabric 1 connections
10 Data fabric 2 connections

IP Addresses

An IP address is a 32-bit identifier for devices on a TCP/IP network. IP addresses allow devices on a network, such as servers, switches, and arrays, to communicate with each other. HPE Nimble Storage arrays use IP addresses for the following purposes:

Table 1: Types of IP addresses

IP Address	Purpose
Management	Typically defined on eth1 or on eth1 and eth2 interface, the management IP address provides access to the NimbleOS management interface (GUI, CLI, or API) for the array group. It is also used for volume replication. It resides on the group management subnet and floats across all management only (Mgmt only) and management + data (Mgmt + Data) interfaces.

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IP Address	Purpose
Discovery	For iSCSI arrays, each subnet has its own discovery IP address. It enables the iSCSI initiator to discover iSCSI targets for the volumes on the array. You can use this IP address for data as well as management in a single shared network. **Note** Discovery IP addresses are not required for Fibre Channel arrays.
Data	One or more IP addresses can be configured to carry data traffic. One data IP address can be configured for each interface pair (corresponding interfaces on the two controllers). Both controllers use the same IP address but never at the same time because only one controller is active at a time. Other data IP addresses can be configured on different subnets. **Note** In a dedicated network topology, the data IP addresses cannot be the same as the management/iSCSI discovery IP addresses.
Support	Each controller on an array must have a dedicated support IP address, which can be used for troubleshooting and technical support purposes in the event that a controller is not reachable through the management IP address. The support IP addresses must be placed on the group management subnet.

Subnets

A subnet is logical subdivision of a network. It is defined by the first IP address in the network and a netmask that specifies a contiguous range of IP addresses within that network. A subnet can be assigned to one or more network interfaces.

The maximum Transmission Unit (MTU) can be set for a subnet so that it uses either a standard, jumbo, or custom frame size. If you choose to use a custom frame size, you must specify the size in bytes.

Specifying a VLAN ID on a subnet allows more than one subnet to be assigned to an interface using IEEE 802.1Q tagged frames. Subnets without a VLAN ID can only have untagged assignments. Switch port configurations must match the VLAN IDs configured on the subnets for tagged assignments. For more information, refer to the procedure to Configure VLAN Tagging in the *GUI Administration Guide* or *CLI Administration Guide*.

Subnet Traffic Types

Traffic types are used to segregate network traffic into different subnets. A subnet can carry one of the following traffic types.

Table 2: Traffic Types

Traffic Type	Description
Management (Mgmt only)	The subnet carries only management traffic.
Data (Data only)	The subnet carries only data traffic.
Management and Data (Mgmt + Data)	The subnet carries both management and data traffic.

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Subnet Traffic Assignments

Traffic assignments determine what type of iSCSI traffic a data subnet carries. You can assign a data subnet on an iSCSI array to carry one of the following kinds of traffic.

Note Traffic assignments are not required for Fibre Channel arrays.

Table 3: Traffic Assignments

Traffic Assignment	Description
iSCSI + Group	The subnet carries both iSCSI data traffic and intra-group communication (traffic between arrays in a group).
iSCSI only	The subnet carries only iSCSI data traffic.
Group only	The subnet carries intra-group communication traffic.

IP Address Zones in Subnets

An IP address zone is a group of host IP addresses and array data IP addresses in a subnet. When using two switches for iSCSI traffic, hosts can achieve better performance by establishing iSCSI connections with data IP addresses inside the same zone, as opposed to establishing iSCSI connections with data IP addresses in a different zone.

Note IP address zones are not required for Fibre Channel arrays.

The IP addresses within a subnet can be divided into IP address zone types.

Table 4: IP Address Zone Types

Zone Type	Description
None	Used for non-iSCSI enabled subnets.
Single	All IP addresses are in one zone. This is the default zoning setting. With two network switches, iSCSI connections can be routed over the inter-switch link.
Bisect	One zone includes the IP addresses from the top half of the subnet; for example, 192.168.1.128 to 192.168.1.254. The other zone takes the IP addresses from the bottom half of the subnet; for example, 192.168.1.1 to 192.168.1.127
Even/Odd	The IP addresses are grouped by their last bit. One zone includes the even-numbered IP addresses, such as 192.168.1.2, 192.168.1.4, 192.168.1.6, and so on. The other zone includes the odd-numbered IP addresses, such as 192.168.1.1, 192.168.1.3, 192.168.1.5, and so on.

IP address zones are useful for configurations that use two switches, where you want to establish connections that avoid the Inter-Switch Link. For IP address zones to work, the host and the array must have their data IP addresses configured with half of their IP addresses from one zone connected to one switch and the other half of its IP addresses from the other zone connected to the other switch. For example, assume that:

- There is a single subnet, 192.168.1.0/24.
- There are two zones, defined as Red and Blue.
- Red zone consists of:
  - Host IP 192.168.1.1
  - Array Data IP 192.168.1.3
  - Array Data IP 192.168.1.5
- Blue zone consists of:

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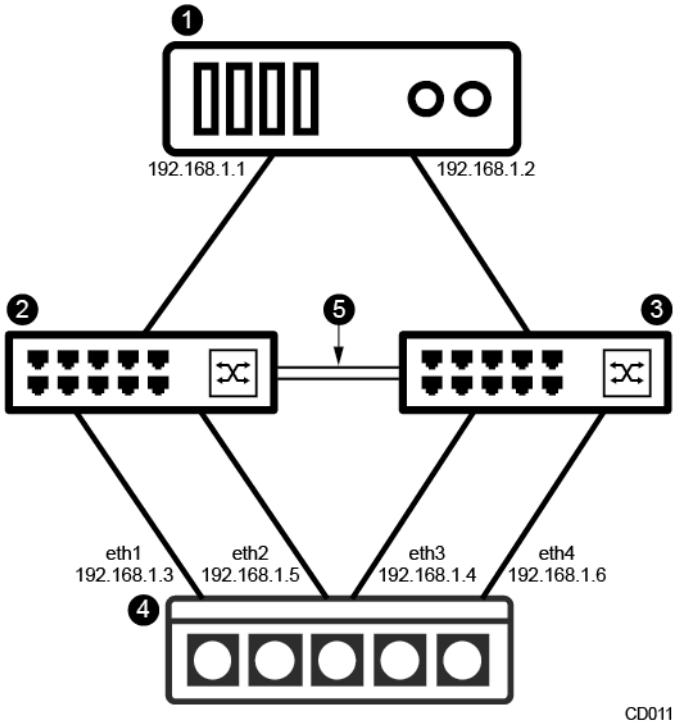
- Host IP 192.168.1.2
- Array Data IP 192.168.1.4
- Array Data IP 192.168.1.6

In the IP Address Zone, the host IP addresses in the Red zone only establish connections with the data IP addresses in the Red zone. And the host IP addresses in the Blue zone only establish connections with the data IP addresses in the Blue zone. In this way, iSCSI connections do not use inter-switch link and thereby maximize I/O performance.

Figure 6: IP Address Zones



1 Host
2 Switch 1
3 Switch 2
4 Array
5 Inter-switch link

Interface Pairs

Nimble uses the term *interface* to identify specific ports on the controller. For iSCSI, an interface is an Ethernet port connection that can be used for data, management, or both; for Fibre Channel, an interface is a Fibre Channel port connection that can be used for data only.

The purpose of interface pairs is to ensure *high availability* and *redundancy* in the event of a controller or network switch failure. In the event of a controller failover, proper network connections ensure minimal data service interruption.

To minimize single points of failure, connect as many interface port pairs as possible.

iSCSI Interface Pairs

An iSCSI *interface pair* refers to a set of two data or management Ethernet connections, one from each controller, to the network switch. The cables for an interface pair connect to the same data or management port on each controller. See *Interface Numbering* on page 16.

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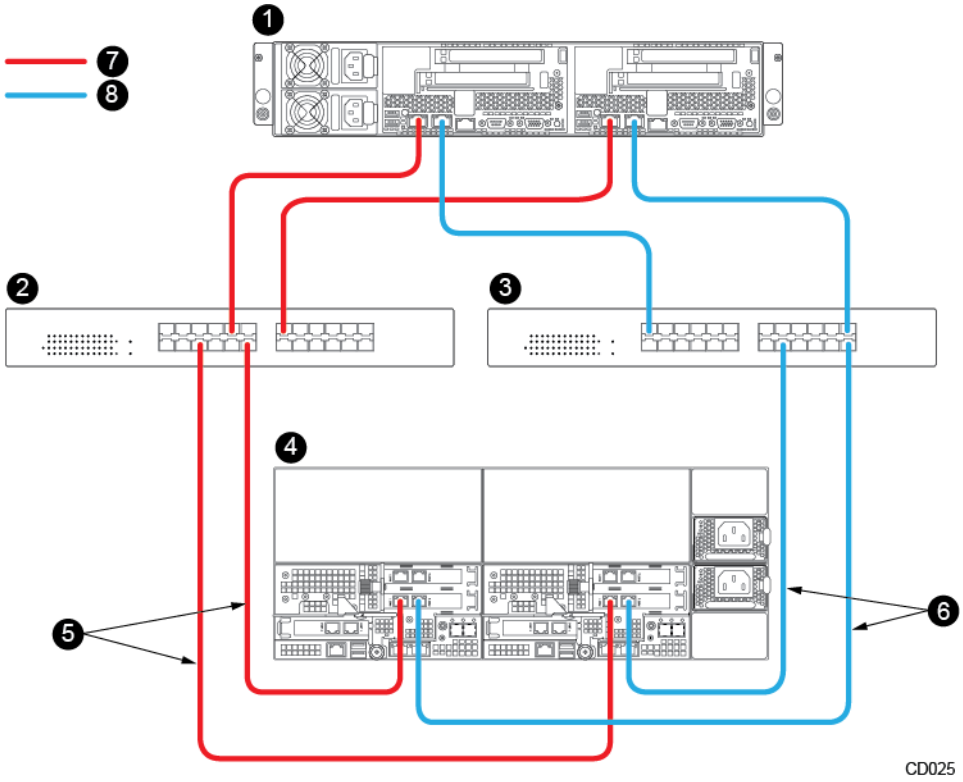
Figure 7: An example of Ethernet connections using interface pairs



1 Host/server
2 Switch 1/subnet 1
3 Switch 2/subnet 2
4 Array
5 Interface pair from data ports eth2a
6 Interface pair from data ports eth2b
7 Data interface pair 1
8 Data interface pair 2

An interface pair is the combination of the same data port on both controllers. In the preceding diagram:

- Data ports eth2a form one interface pair (red)
- Data ports eth2b form another interface pair (blue)

Make sure that each interface pair connects to the SAME network or subnet. In this example, the red interface pair connects to subnet 1 and the blue connects to subnet 2.

Fibre Channel Interface Pairs

A Fibre Channel *interface pair* refers to a set of two Fibre Channel data connections, one from each controller, to the Fibre Channel switch. The cables for an interface pair connect to the same data port on each controller. See *Interface Numbering* on page 16.

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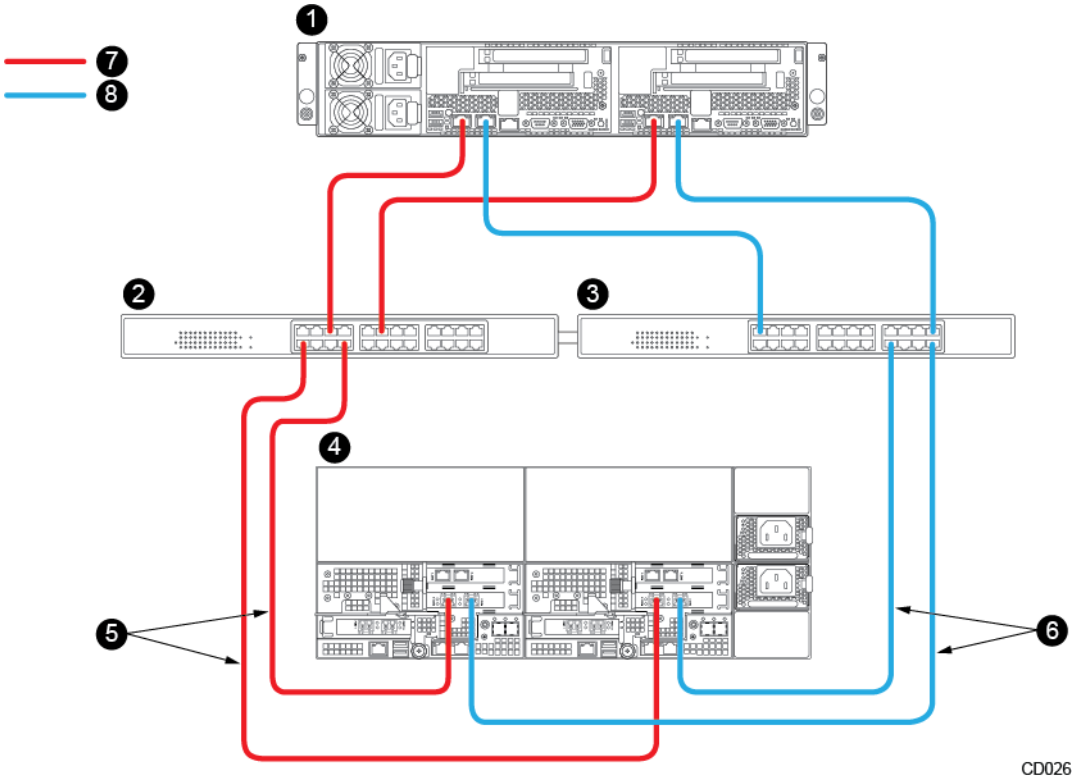
Figure 8: An example of Fibre Channel connections using interface pairs



1	Host/server	**5**	Interface pair from data ports fc2a
2	Fibre Channel switch 1	**6**	Interface pair from data ports fc2b
3	Fibre Channel switch 2	**7**	Data interface pair 1
4	Array	**8**	Data interface pair 2

An interface pair is the combination of the same data port on both controllers. In the preceding diagram:

- Data ports fc2a form one interface pair (red)
- Data ports fc2b form another interface pair (blue)

Interface Numbering

All array models have two onboard 10GBaseT ports. Adding additional NICs can support up to six 10GBaseT, SFP, or GbE ports, for a total of up to eight ports.

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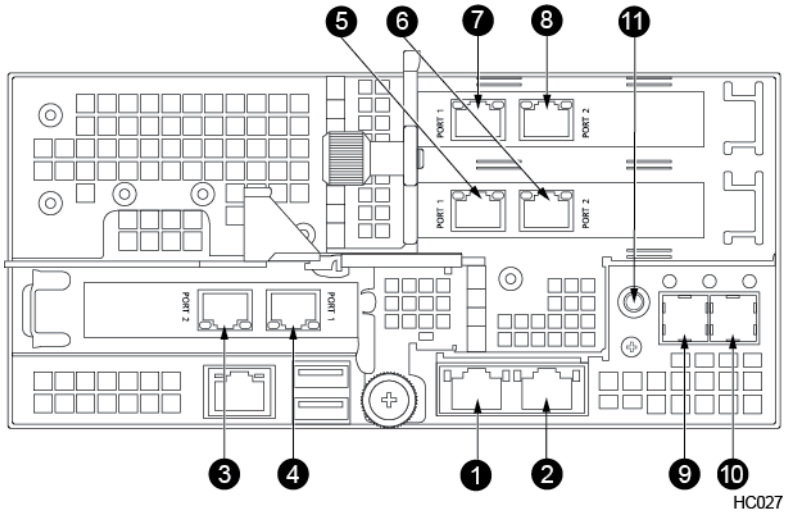
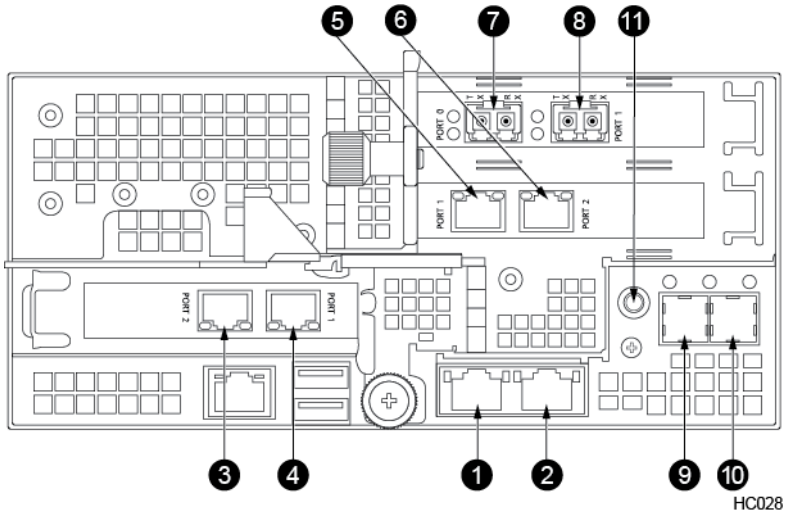
Figure 9: Array interface example (Ethernet ports)



1 eth0a
2 eth0b
3 eth1b
4 eth1a
5 eth2a
6 eth2b
7 eth3a
8 eth3b
9 SAS Out
10 SAS Out
11 Serial port

Figure 10: Array interface example (Ethernet and Fibre Channel ports)



1 eth0a
2 eth0b
3 eth1b
4 eth1a
5 eth2a
6 eth2b
7 fc3a
8 fc3b
9 SAS Out
10 SAS Out
11 Serial port

For more information on SFPs and connecting 10GbE ports to your array, see *SFP Specifications* on page 136.

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Installation Checklist

Note The following list outlines the information that you need to have to complete the setup of NimbleOS. You type this information the first time that you access the NimbleOS to configure the array.

All network settings represent IPv4 values.

The latest version of this list can be found at http://infosight.hpe.com/welcomecenter.

Item	Description	Value
Array Access		
Array name	Pick any name you want to assign your array. This will be in addition to the serial number that comes with the array.	
Group name	Pick a name that fits with your infrastructure. This name could match the location or organization that is using the storage to help you identify the storage as you manage it.	
Management IP address	Computers need an IP address so they can communicate with each other. These IP addresses need to be routable to the internet but should be behind a firewall. When your laptop communicates with the array to make changes, what IP address should it use?	
Management subnet mask	The netmask for the management subnet (ie. 255.255.248.0 for a /21 network)	
Administrator password	The password for the default administrator account (username: admin)	
Data Subnet Configuration (iSCSI Only)	A subnet is logical subdivision of a network. It is defined by the first IP address in the network and a netmask that specifies a contiguous range of IP addresses within that network. A subnet can be assigned to one or more network interfaces. It is recommended to have at least two data subnets but you may have four or more.	
Data subnet name	A label for this subnet to identify it in the NimbleOS UI	Up to 4
Network Address	An IP address for the data network	Up to 4
Network address subnet	The netmask for the management subnet (ie. 255.255.224.0 for a /19 network)	Up to 4
Discovery IP address – For iSCSI arrays only	An IP address used for iSCSI discovery	Up to 4
Interface Assignment		
Controller A diagnostic IP address	The IP address that HPE Nimble Support should use to help resolve issues. You need two IP addresses, one for each controller.	
Controller B diagnostic IP address	See description for Controller A diagnostic IP address.	

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Item	Description	Value
Domain		
Management network domain name	Enter the domain name the array will be joining and the DNS servers responsible for the domain.	
DNS server IP addresses, up to three	The domain name server (DNS) server IP address is used to communicate with other computers in your domain.	
Time		
NTP server IP address	NTP (Network Time Protocol) sets the time on your system correctly.	
Time zone	Set the time zone by region and Country/State/City.	
Support		
Sender (from) email address		
SMTP server IP addressRecipient email addresses	If there are any problems with the array, the array sends you an email. To do so, we need to be connected to your email (or SMTP) server.	
HTTP proxy server IP address	If you use a proxy to the internet as part of your firewall setup, tell us about it.	(optional)
HTTP proxy server port		(optional)
HTTP proxy server user name	Optional user name for the proxy	(optional)
HTTP proxy server password	Optional user name for the proxy	(optional)

Rack Mount Safety Precautions

Observe these safety precautions when you install the HPE Nimble Storage array or expansion shelf in a rack.

Table 5: Rack Mount Safety Precautions

Consideration	Precaution
Operating Ambient Temperature	If the array or expansion shelf is installed in a closed or multi-unit rack assembly, the operating temperature might be greater than the ambient (room) temperature. Provide adequate cooling so the rack environment does not exceed 35°C (95°F) as specified by the rack manufacturer.
Air Flow	Install the equipment in the rack such that each item has ample air flow required for proper cooling. Cold air comes into the front of the array (drive side) and is exhausted out the back of the array (controller side) by the fans. Install the array with the front facing the cold aisle and the back facing the hot aisle in your environment.
Mechanical Loading	Mount the equipment so that the mechanical loads on the rack are even top-to-bottom, front-to-back, and side-to-side.

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Consideration	Precaution
Circuit Overloading	Be sure there is adequate power service to prevent overloading the circuits. Check the ratings of each item of equipment on each circuit. **Note** The power supplies are 220VAC or 110VAC auto-detecting.
Reliable Grounding	You must provide reliable grounding (earthing) of rack-mounted equipment. In addition, pay attention to supply connections from the branch circuit, such as power strips.

Install the Array

Use this procedure to install the following HPE Nimble Storage array models: AF20, AF20Q, AF40, AF60, and AF80.

Before you begin

Attention

If you are installing more than one HPE Nimble Storage array, refer to the *Hardware Guide* available on HPE InfoSight for information about your model.

https://infosight.hpe.com/tenant/Nimble.Tenant.0018000000ovsdmAAA/resources/nimble/docs?Document+Type=Hardware+Guide

What you need for each array:

- 19-inch four-post rack. The provided rails fit both round-hole and square-hole racks.

  Racks with a depth of 1200 mm best accommodate the length of the HPE Nimble Storage chassis, providing ample space for cabling and ease of service. Racks with a depth of 1075 mm can be used but may provide limited space for cables and component access.

- 4U space available in the 19-inch rack
- At least two Ethernet cables for management, one cable per controller
- At least two cables, Ethernet or Fibre Channel, for data
- One or two switches, depending on your array and network topology. Two 10GbE or Fibre Channel switches are recommended for high availability and redundancy.
- Two power outlets on separate circuits

  1200 W power supply with C14 connector:

  - Steady state current: 2.5A @ 240V; 5A @120V
  - Startup current: 3A @ 240V; 6A @ 120V

  3000 W power supply with C20 connector:

  - AF60 steady state current: 4.5A @ 240V; 9A @ 120V
  - AF60 startup current: 5.5A @ 240V; 11A @ 120V
  - AF80 (240V only): steady state 6A; startup 7A

Before beginning, download and read the Release Notes, available on HPE InfoSight (*https://infosight.hpe.com/*). HPE InfoSight is a password-protected web portal, so you must have an account to access Release Notes and documentation. If you do not have an HPE InfoSight account, click **Create Account** and provide the required information. If you already have an account, type your email address and password, then click **Login**.

Visit the Welcome Center (*https://infosight.hpe.com/welcomecenter*) for help setting up your HPE Nimble Storage array.

Note

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- Install this product in restricted-access locations only, such as a dedicated equipment room or an electrical closet.
- Position the rack in a location with at least 800 mm rear clearance and 1000 mm front clearance for maintenance access.
- Cold air comes into the front of the array (drive side) and is exhausted out the back of the array (controller side) by the fans. Install the array with the front facing the cold aisle and the back facing the hot aisle in your environment.

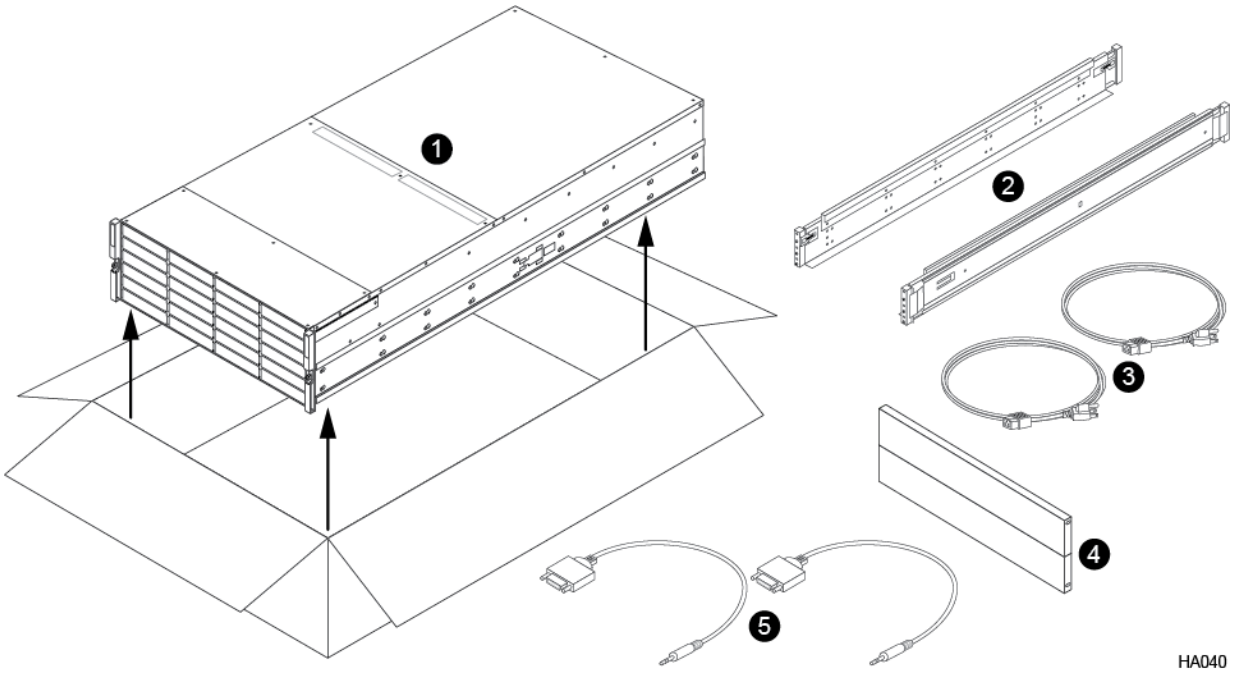
Caution

The chassis weighs over 52 kg (115 lb). Always use at least two people or a server lift when lifting the chassis.

Procedure

1 Unpack and inspect the hardware.

Save the original packaging.



1 Array
2 Outer rails
3 Power cords
4 Bezel
5 Serial console cables

2 Install the outer rail assemblies onto the rack.

Note To ensure that the array thumbscrews align correctly, align the rail assembly in exactly 4U of rack space. The bottom stud on the rail assembly inserts into the bottom hole of the bottom unit of the 4U rack space allotted for the array.

a) Align the bottom stud of the rail at the position you want.

Note the orientations embossed on the outer rail.

b) Press the keeper latch and position the front studs in the rack. When the studs are engaged, release the keeper latch to secure the front of the rail in the rack.

c) Align the back of the rail at the same rack position as the front.

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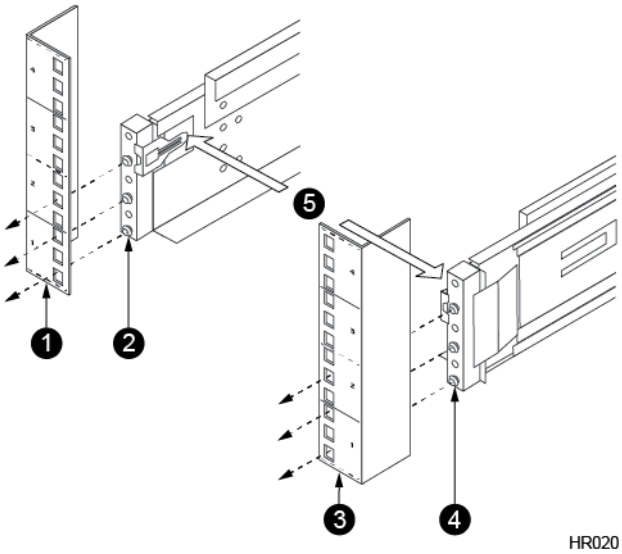
d) Position the back studs in the rack and press the keeper latch. When the studs are engaged, release the keeper latch to secure the back of the rail in the rack.
e) Repeat steps a through d on the other side.

The following diagram shows where the rail assemblies should be correctly installed in a rack.



1 Left front rack post
2 Left rail assembly
3 Right front rack post
4 Right rail assembly
5 Keeper latch

3 Slide the chassis into the rack.

Caution

The chassis weighs over 52 kg (115 lb). Always use at least two people or a server lift when lifting the chassis.

a) Insert the chassis into the rack, back side first. Be sure the inner rails insert into the outer rails.
b) Gently slide the chassis into position.

When you hear a click, the inner rails have locked into the rail assembly.

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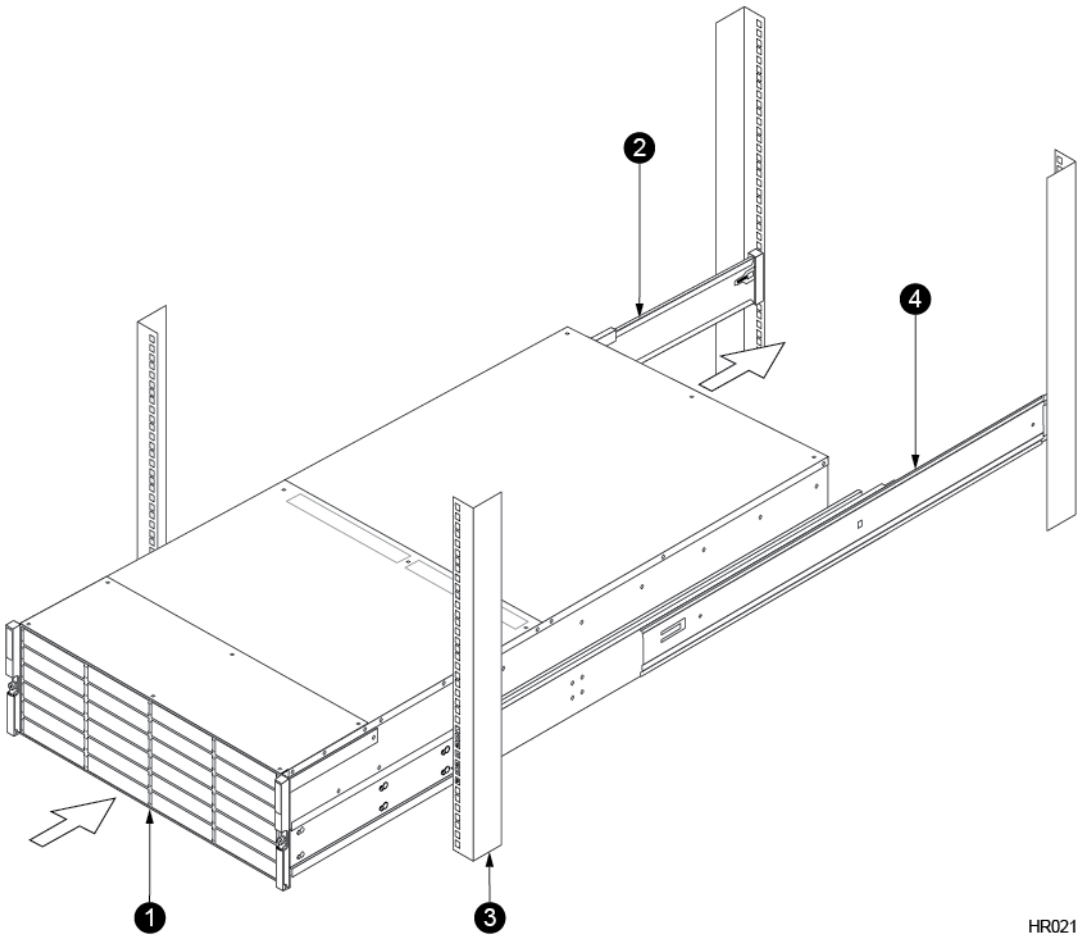
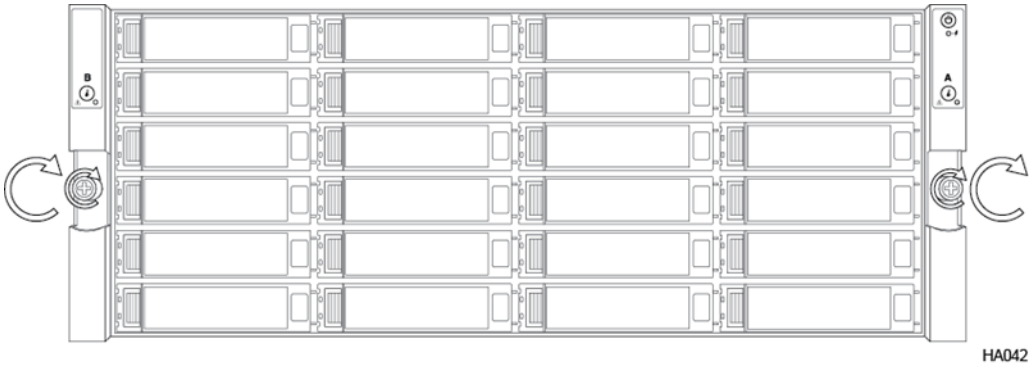


1 Chassis
2 Left rail assembly
3 Right front rack post
4 Right rail assembly

4 Secure the chassis to the rack.

The chassis has two handles. Each handle has a screw that holds the chassis to the rails so it does not slide out of the rack. Tighten the screw in each handle until secure.



5 Secure the bezel to the front of the chassis.

a) Align the four retention pins on the bezel with the four mounting holes on the front of the chassis.
b) Press gently but firmly until the bezel snaps into place.

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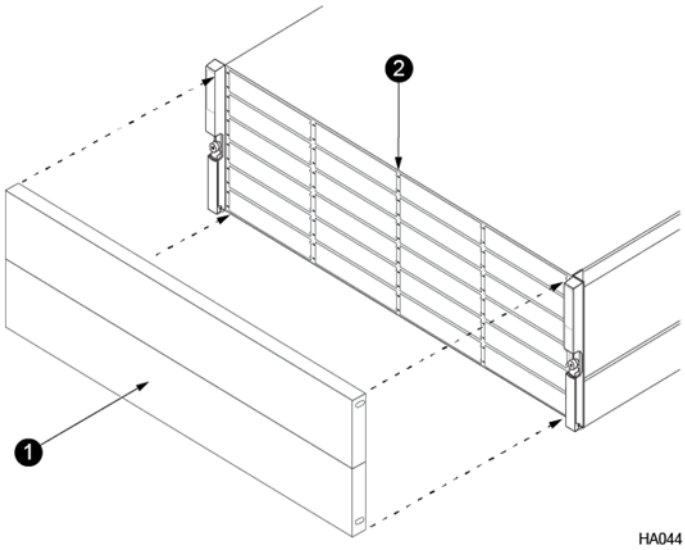

1 Bezel **2** Chassis

6 Cable the array for your desired network topology.

a) Connect ports for management (commonly the onboard ports eth0a and eth0b).

b) Connect ports for data according to your network topology and protocol (eth or fc).

- For Ethernet, cable the same port on each controller to the same network switch and subnet. The two ports form an interface par, and iSCSI initiators have a network path to both controllers. If your switches have multiple VLANs configured, make sure that each interface pair is connected to switch ports on the same VLAN.
- For Fibre Channel, cable the same port on each controller to the same FC switch.

See the *Hardware Guide* on HPE InfoSight for detailed network configuration examples.

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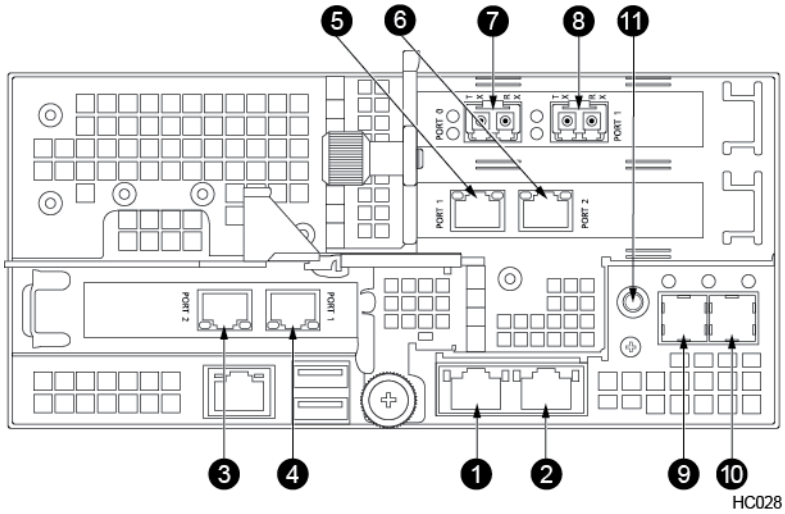
Figure 11: Array interface example (Ethernet and Fibre Channel ports)



1 eth0a
2 eth0b
3 eth1b
4 eth1a
5 eth2a
6 eth2b
7 fc3a
8 fc3b
9 SAS Out
10 SAS Out
11 Serial port

Network Connections

Depending on your desired *Network Topology*, the following network configuration examples show how to make the physical network connections to support that topology.

Note Later, be sure to make the appropriate port settings that correspond to these network connections.

One Shared Network

In this configuration:

- Management and data paths share the same subnet or network
- Any traffic can use any type of port

In the following example, the eth0a port on each controller provides the management path (red cables). The eth2b port on each controller provides the data path (blue cables).

The management and data ports connect to the same network switch. The host also connects to the switch. This is a very simple network, but it still has redundant controllers to provide high availability.

Note that only one management connection and one data connection are shown. You can add more connections and use different ports as needed.

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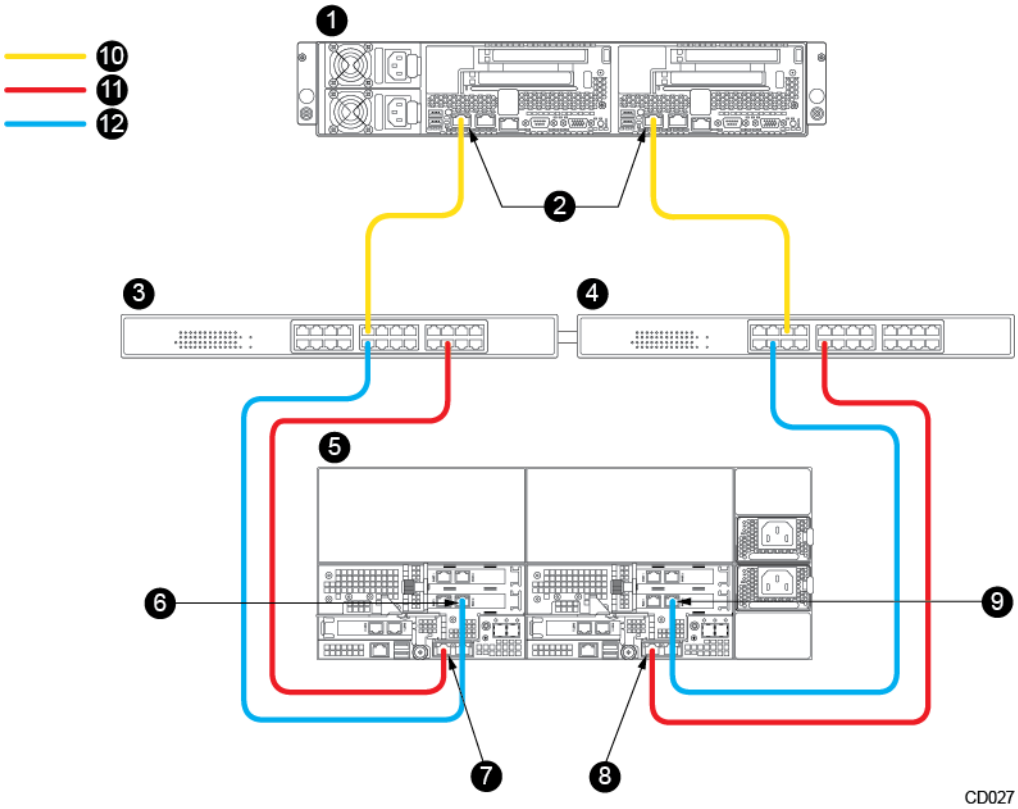
Figure 12: An example of network connections for one shared network



1 Host/server
2 Network Interface Cards (NICs)
3 Ethernet switch 1
4 Ethernet switch 2
5 Array
6 Data port eth2b on controller A
7 Management port eth0a on controller A
8 Management port eth0a on controller B
9 Data port eth2b on controller B
10 Host network connection
11 Management interface pair
12 Data interface pair

Two Dedicated Networks

In this configuration:

- Management and data paths are on different subnets or networks
- Port eth0a and eth0b handle management traffic
- Ports in slot 1 (eth1 ports) through slot 3 (eth3 ports) handle data traffic

In the following example, the eth0a port on each controller provides the management path (red cables). The eth2b port on each controller provides the data path (blue cables). The management and data ports connect to different network switches. The host also connects to both switches. The separated management and data paths on this network provide higher performance and high availability.

Note that only one management connection and one data connection are shown. You can add more connections and use different ports as needed.

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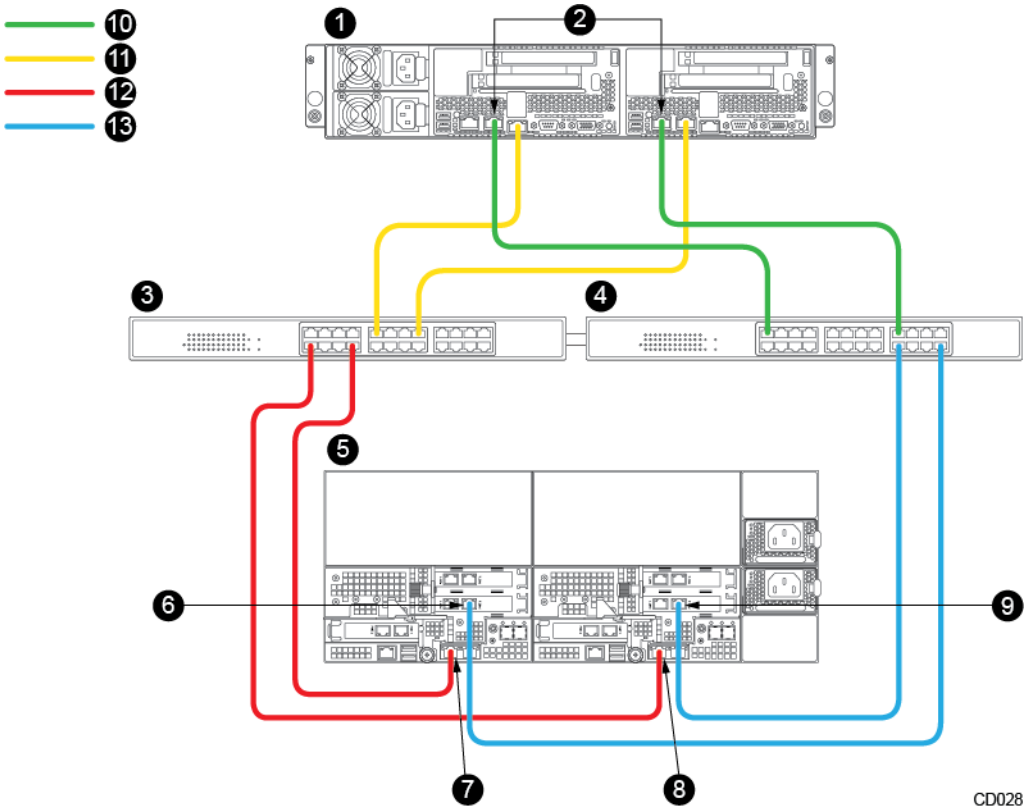
Figure 13: An example of network connections for two dedicated networks



1 Host/server
2 Network Interface Cards (NICs)
3 Ethernet switch 1
4 Ethernet switch 2
5 Array
6 Data port eth2b on controller A
7 Management port eth0a on controller A
8 Management port eth0a on controller B
9 Data port eth2b on controller B
10 Data port connections
11 Management port connections
12 Management interface pair
13 Data interface pair

Advanced Configuration

In this configuration:

- Management and data paths are on different subnets or networks
- Port eth0 handles management traffic
- Ports eth1 through eth3 handle data traffic

The following example shows one possible way to connect the cabling for an advanced configuration. The data and management paths are shown separately. Note that the subnet addresses in the data path illustration are just examples. Your settings will differ. The advanced configuration uses the maximum number of data connections on the iSCSI network to obtain the best availability and throughput.

In more advanced configurations, you can define your own network configuration to handle the desired I/O flow.

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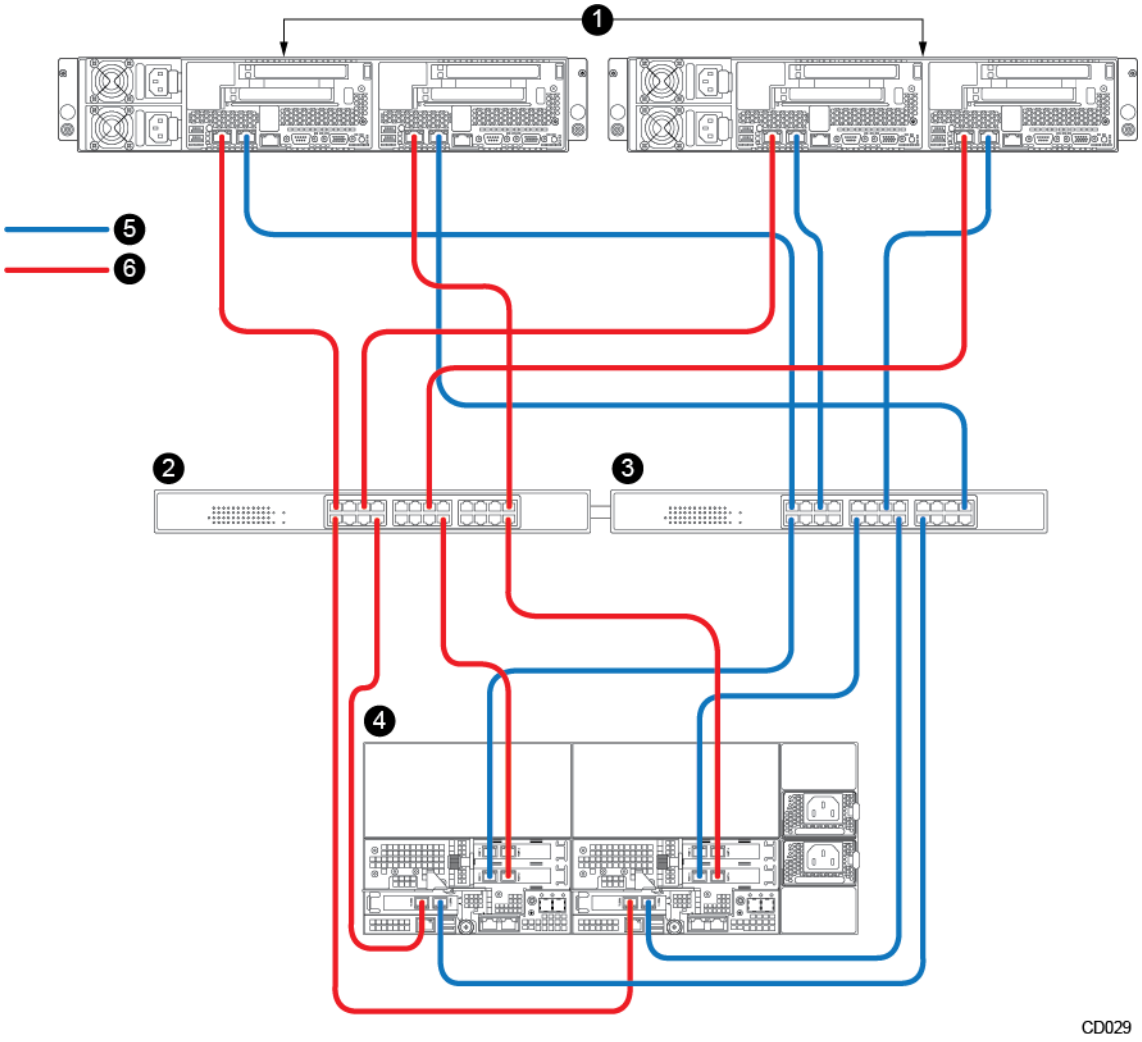
Figure 14: An example of advanced network configuration: data connections



1 Host/server
2 Ethernet switch 1, subnet 10.10.30.x/24
3 Ethernet switch 2, subnet 10.10.20.x/24
4 Array
5 Even numbered data ports to switch 1
6 Odd numbered data ports to switch 2

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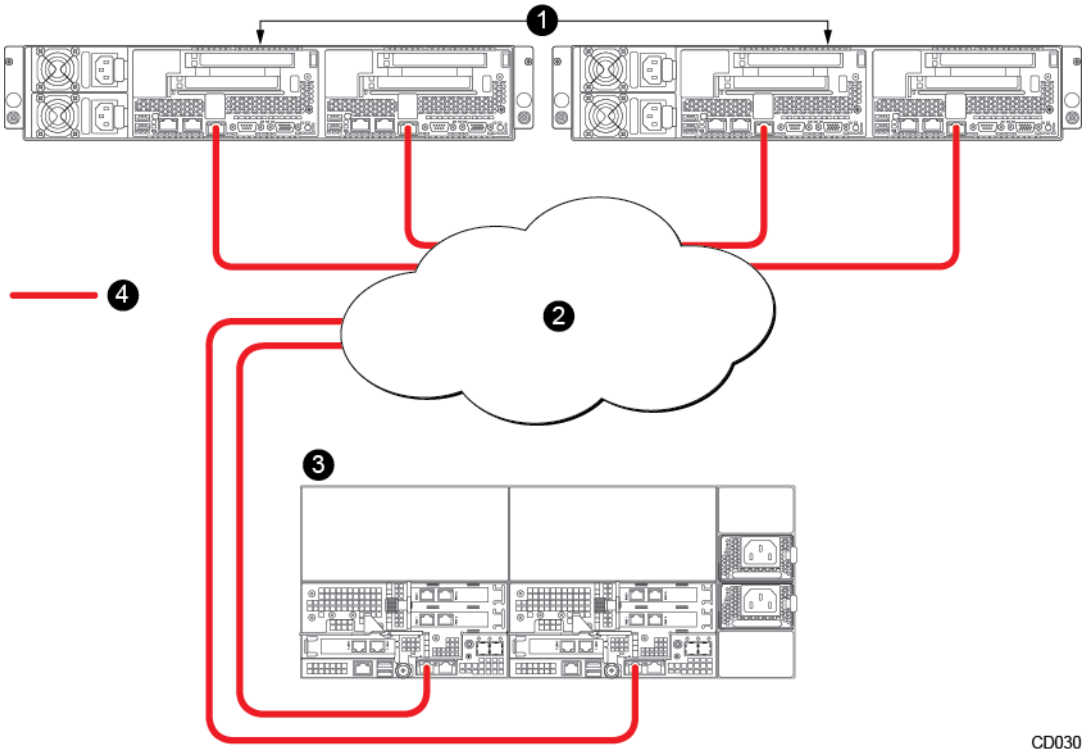
Figure 15: An example of advanced network configuration: management connections



1 Host/server
2 Management network
3 Array
4 Management port connections

Group Configuration

In this configuration:

- Management paths for all arrays are on the same subnet
- Data paths for all arrays are on the same subnet or subnets
- The group of arrays is assembled and managed through the NimbleOS software

The next example shows network connections for arrays that are managed as a *group*. This example started with a two-dedicated-network configuration, and then added a second array. It does not matter what the management and data connections are, as long as all management paths are on the same subnet and all data paths are on the same subnet. If you have multiple data subnets, be sure that each array has access to all of the data subnets.

Note that you must create the group using the NimbleOS software. You can have up to four arrays in a group.

For instructions on how to create groups, refer to the *GUI Administration Guide* or the *CLI Administration Guide*.

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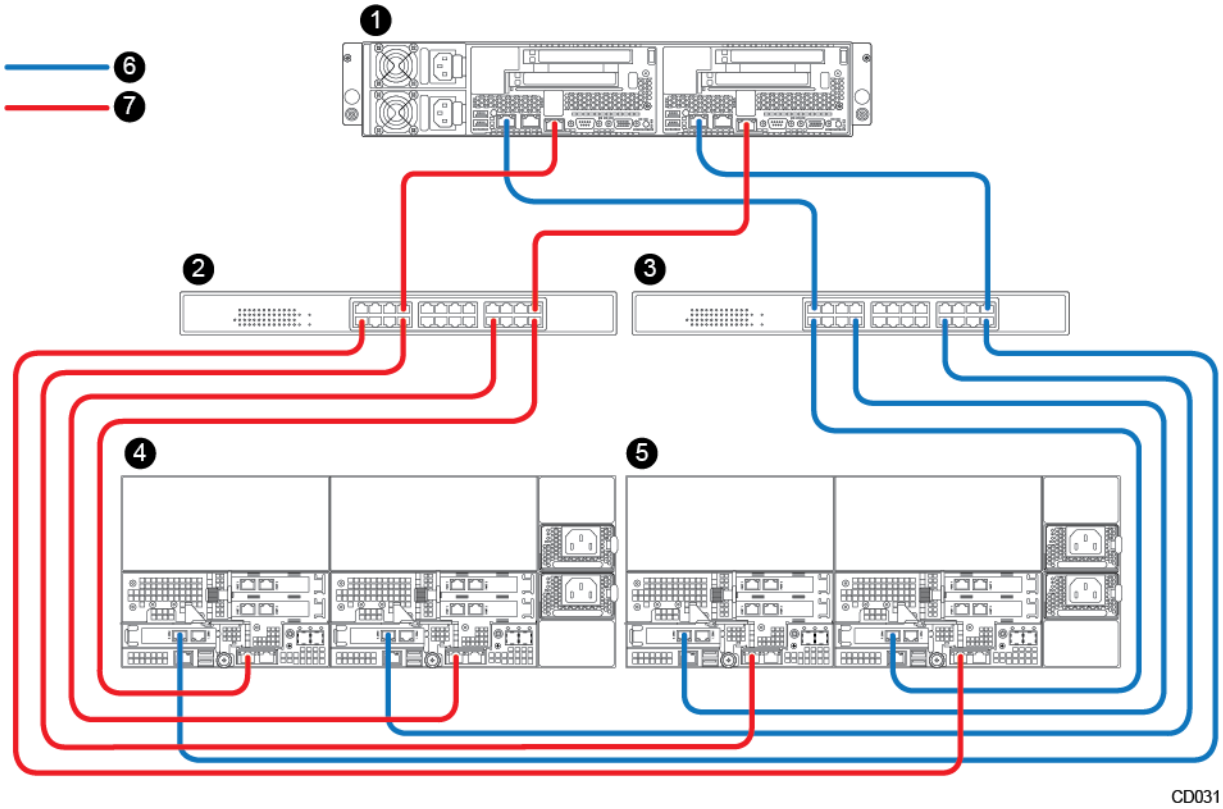
Figure 16: An example of network connections for a group



1 Host/server
2 Switch 1 management
3 Switch 2 data
4 Array 1
5 Array 2
6 Data port connections
7 Management port connections

Dual Fabric Fibre Channel

In this configuration:

- Management traffic uses an Ethernet switch
- Data traffic uses Fibre Channel switches
- Port eth0 handles management traffic
- Ports fc1a and fc1b handle Fibre Channel data traffic
- The active controller (A or B) receives data traffic from both Fibre Channel switches (dual fabric)

In the following example, the eth0a port on each controller provides the management path (red cables). The fc1b port on both controllers provides the data path from Fibre Channel Switch 1 (green cables). The fc1a port on both controllers provides the data path from Fibre Channel Switch 2 (blue cables). The management ports connect to an Ethernet switch. The host also connects to both Fibre Channel switches. The separated data paths on this network provide higher performance and high availability.

Note that only one management connection and one data connection are shown. You can add more connections and use different ports as needed.

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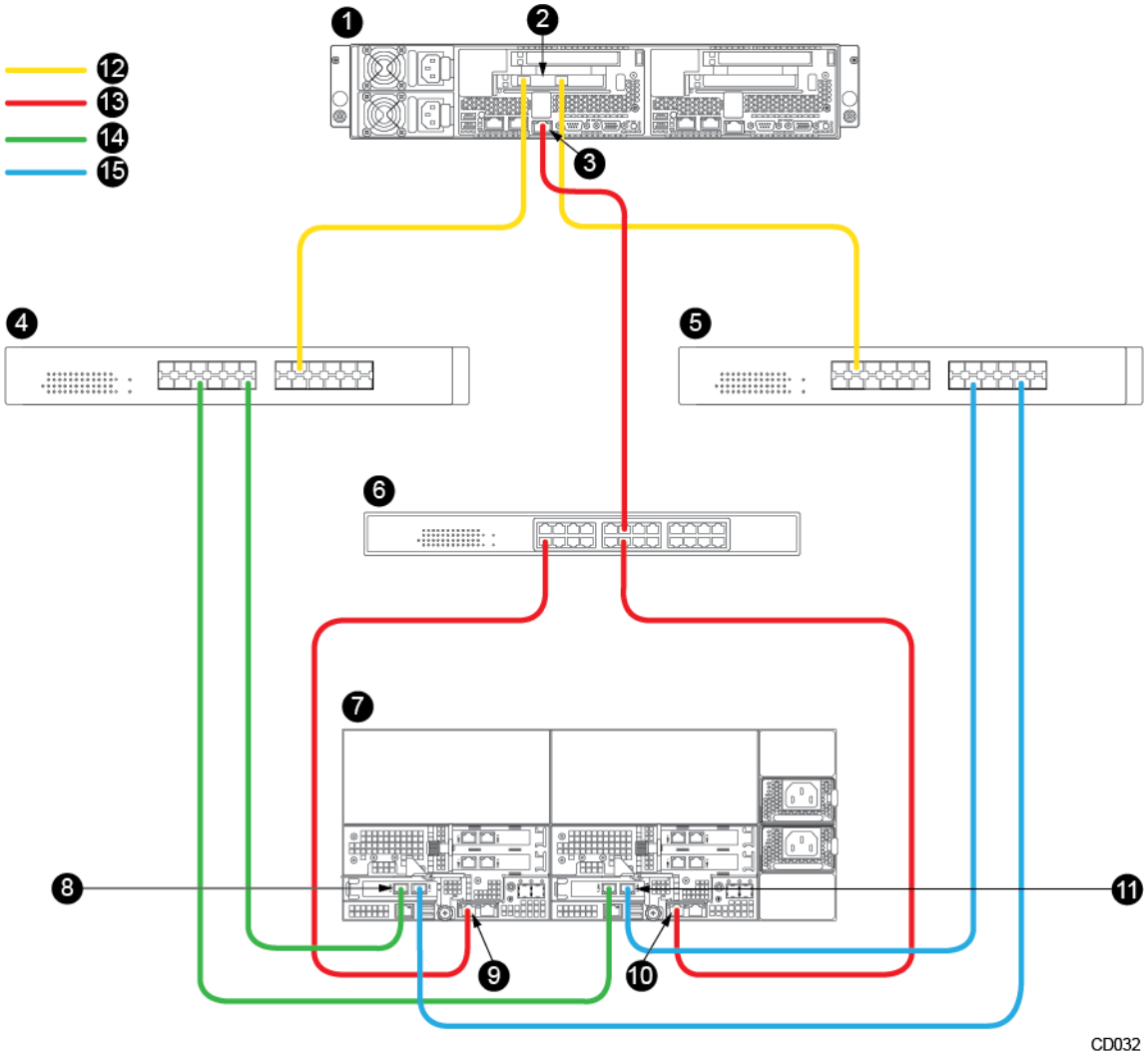
Figure 17: An example of network connections for dual fabric Fibre Channel



1 Host/server
2 Fibre Channel HBA
3 Management port
4 Fibre Channel switch 1
5 Fibre Channel switch 2
6 Ethernet switch
7 Fibre Channel array
8 Data port fc1b on controller A
9 Management port eth0a on controller A
10 Management port eth0a on controller B
11 Data port fc1a on controller B
12 Host data port connections
13 Management port connections
14 Data fabric 1 connections
15 Data fabric 2 connections

Connect the Power to the Array

Before you begin

The HPE Nimble Storage array must be installed in a rack or enclosure and the array must be connected to a network.

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Procedure

1. Plug the power cables into both power supplies.
2. Verify that the connection is secure.
3. Plug the other end of the power cables into the power circuit.

   To minimize the risk of both power supplies losing power simultaneously, connect each power cable to a different circuit.

   If the array does not come online automatically, press the power button on the front of the chassis.

Initial Setup Using the Nimble Setup Manager

After your array has been installed in the rack and connected to your network, you must complete the initial setup of the array by configuring some basic settings to get the array running on the network.

This chapter describes using the HPE Nimble Storage Setup Manager (NSM), which has been installed on a Windows host as part of the HPE Nimble Storage Windows Toolkit, to complete the initial setup. The NSM has a graphical user interface (GUI) that allows you to easily complete the initial setup.

Note If you do not have a Windows host from which to complete the initial setup, you must use the NimbleOS CLI. For more information, see *Initial Setup Using the CLI* on page 37.

After the initial setup is complete, refer to the *GUI Administration Guide* or the *CLI Administration Guide* for group and volume configuration, and additional optional configuration tasks.

Download the Windows Toolkit

Download the latest version of the HPE Nimble Storage Windows Toolkit (NWT) to install on your Windows host or Windows VM.

Important Make sure that the version of NWT is compatible with the version of NimbleOS on your array. For compatibility information, see the Validated Configuration Matrix tool, which is available on HPE InfoSight (*https://infosight.hpe.com/tenant/Nimble.Tenant.0018000000ovsdmAAA/resources/nimble/validated-configuration-matrix*).

Before you begin

To download the NWT, you must have an Internet connection from the Windows host or client to HPE InfoSight.

Important HPE Nimble Storage Setup Manager (NSM) is only required for array setup.

What you need on a Windows server:

- Internet connection to HPE InfoSight
- .NET Framework 4.5.2

What you need on a Windows client:

- Internet connection to HPE InfoSight
- Windows OS 7 or later
- .NET Framework 4.5.2

Procedure

1. In your Internet browser, go to *https://infosight.hpe.com/*, type your email address and password, and click **Log In**.

   If you do not have a password, click **New user? Enroll now.**
2. Click **Resources** > **Software Downloads**.
3. In the Integration Kits pane, click **HPE Nimble Storage Windows Toolkit**.

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4 From the HPE Nimble Storage Windows Toolkit (NWT) page, click **Software (64 bit)**.

Note The Windows host used to initially configure the array must be connected to the same physical subnet as the array.

5 Save the NWT installation package to your Windows host.

The installation package has a name similar to `Setup-NimbleNWT-x64.x.x.x.x.exe`, where `x64` is the supported microprocessor and `x.x.x.x` is the NWT version number.

6 Download the latest *Nimble Windows Toolkit Release Notes*.

Review the list of Windows Server hotfixes.

Note If you are installing NSM alone, then no hotfixes are needed. However, .NET framework requirements still apply. Hotfix requirements are mandatory for any Windows host in which the NCM is used to connect to Nimble volumes.

Install the Windows Toolkit on a Client

You have the option of installing HPE Nimble Windows Toolkig (NWT) on a Windows client.

Before you begin

Download the HPE Nimble Storage Windows Toolkit (NWT) from HPE InfoSight (*https://infosight.hpe.com*).

See *Download the Windows Toolkit* on page 32.

The client machine must be running Windows OS 7 or later to install the NWT.

Important If you plan to install NWT in a Remote Desktop session or on a virtual machine, open the Command Prompt and enter:

mstsc /console

Procedure

1 Open the `Setup-NimbleNWT-x64.x.x.x.x.zip` file and extract the `Setup-NimbleNWT-x64.x.x.x.x.exe` installer file.
2 On the Windows client, right-click the installer file and choose **Run as administrator**.
3 In the Welcome to the InstallShield Wizard for the NWT dialog, click **Next**.
4 In the License Agreement dialog, choose **I accept the terms of the license agreement** and click **Next**.

Important You must accept the End User License Agreement (EULA) to install the NWT.

5 In the Nimble Logs Directory dialog box, take of the following actions::

- Click **Next** to accept the default log location.
- Click **Change**, browse to the desired directory, click **OK**, and click **Next**.

In the Custom Setup dialog, **Nimble Setup Manager** (NSM) is selected by default. The NSM enables first-time setup of the HPE Nimble Storage array.

6 In NWT 7.0.0 and later, provide the Group Management IP address and the username/password credentials for the HPE Nimble Storage array. You must register at least one group. The array user should have Power User or above credentials.

If you do not do this when you set up NWT, you can use NWT PowerShell cmdlet **Set-NWTConfiguration** to specify the array credentials.

You must register the host with the array group to enable application-synchronized snapshot creation.

7 Click **Install**.

You can modify this option after clicking **OK** by clicking **Back** to return to the Custom Setup dialog.

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If you deselected Nimble Setup Manager, a message is displayed informing you that you need to explicitly select it if iSCSI management is required.

8 Click **OK** to acknowledge the message.

9 In the InstallShield completed dialog, click **Finish**.
The NWT software installs itself onto the Windows host. This process might take a few minutes. The installer log is saved to the `C:\NWT_Install.log` file.

Complete the Initial Setup Using the Nimble Setup Manager

The HPE Nimble Storage Setup Manager (NSM) enables you to create a new group from an uninitialized array. The array is the only member of the group.

The configuration options provided by the array web GUI depend on the network protocol being used. If it detects that an array is using iSCSI, it provides a set of configuration options specific to iSCSI; if it detects that Fibre Channel is being used, it provides a set of configuration options specific to Fibre Channel.

Note A newly plugged-in array might not appear immediately on the array details page of the GUI. It might take up to five (5) minutes to update the page. Refresh the browser to see the array on the page immediately after you plug it in.

Before you begin

The Windows host that you use to initially configure the array must be connected to the same physical subnet as the array management port and have direct (non-routed) access to the array management port.

The Windows host must have the following software installed:

- .NET Framework 4.5.2 or above
- Nimble Windows Toolkit

Before you start, complete the *Installation Checklist* on page 18. You need the information from the checklist to perform the initial GUI setup.

Caution If you have multiple unconfigured arrays and you plan to add them to the same group, configure only one array now. Later, add the remaining arrays to the group. For information about how to add an array to a group, refer to the *GUI Administration Guide* or the *CLI Administration Guide*.

Note Subnet and VLAN configuration are separate actions. VLANs are not supported during setup.

Procedure

1 In the Windows Start menu, click **Nimble Storage** > **Nimble Setup Manager**.

2 Select one of the uninitialized arrays from the Nimble Setup Manager list and click **Next**.

Note If the array is not visible in Nimble Setup Manager, verify that the array is on the same subnet as the Windows host.

3 In the Information dialog, click **OK**.

Clicking OK closes the Nimble Setup Manager, and continues the setup on the array through your web browser.

4 You might see a warning similar to *There is a problem with this website's security certificate.* You can safely ignore this warning and click **Continue**.

If prompted, you can also download and accept the security certificate. Or create your own security certificate. Refer to the **cert** command in the *Command Reference*.

Note If Internet Explorer 11 displays a blank page, clear the browser's cache. The page should be visible after refreshing the browser.

5 In the HPE Nimble Storage License Agreement, read the agreement, scroll to the bottom, check the acknowledgment box, and then click **Proceed**.

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6 In the Array Setup, choose the appropriate group option and click **Next**.

- Set up this array but do not join a group. Continue to the next step.
- Add this array to an existing group. Enter the IP address of the group.

  If you chose to join an existing group, your browser redirects to the login screen of the group leader array. Refer to the *GUI Administration Guide* or the *CLI Administration Guide* for steps on how to add an unconfigured array to a group, and complete the configuration.

7 Provide or change the following initial management settings and click **Finish**:

- Array name
- Group name
- Management IP address and subnet mask for the eth1 interface
- Default gateway IP address
- Domain name
- (Optional) Administrator password

8 After a successful setup, click **Continue**.
Your browser automatically redirects to the Management IP address of the array.

Note If the array does not initialize, check the cabling to the network switch and check the subnet mask.

9 In the login screen, type the password you set and click **Log In**.
From this point forward, you are in the NimbleOS GUI.

10 Provide the Subnet Configuration information for the following sections and click **Next**:

a) Management IP:

- IP address
- Network
- Subnet mask

Note The Management IP is used for the GUI, CLI, and replication. It resides on the management subnet and floats across all "Mgmt only" and "Mgmt + Data" interfaces on that subnet.

b) Subnet:

- Subnet label
- Network
- Netmask
- Traffic Type – Data only
- Traffic Assignment (This field is hidden if you are running a Fibre Channel array)
- Discovery IP (This field is hidden if you are running a Fibre Channel array)
- IP Address Zone – Single, Bisect, or Even/Odd (This field is hidden if you are running a Fibre Channel array)
- Maximum Transmission Unit (MTU) – Standard, Jumbo, or Custom
- Frame size in bytes – User specified value

  Ensure that your network switches support the selected frame size.

  Note If Jumbo frames are selected, ensure that they are configured end to end. To confirm that Jumbo frames are supported, perform an end-to-end ping with the jumbo frame size and without fragmentation; for example: `ping <hostname> -f -l 8972`

  The data port IP addresses are assigned to interface pairs, such as eth5 on controller A and eth5 on controller B. If one controller fails, the corresponding port on the remaining controller still has data access. At least one interface pair must be configured. However, a minimum of two is recommended.

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Note To add a data subnet, click **Add Data Subnet**, provide the required information.

11 Provide Interface Assignment information for the following sections and click **Next**:

a) Interface Assignment:

For each IP interface, assign a subnet and a Data IP address within the specified network. For inactive interfaces, assign the "None" subnet.

b) FC Interface (Fibre Channel arrays only):

This section displays the link status for all Fibre Channel ports. No configuration is required.

c) Diagnostic IP:

- Controller A diagnostic IP address within the specified network
- Controller B diagnostic IP address within the specified network

12 Provide the following Domain information and click **Next**:

a) Domain Name

b) IP address of your DNS Servers

You can list up to five DNS servers.

13 Provide the following Time information and click **Next**:

a) Time (NTP) Server

Type the hostname or IP address of your NTP server.

b) Time Zone

Choose the time zone the array is located in.

14 Provide Support information for the following sections and click **Finish**.

a) Email Alerts

- From Address

  This is the email address used by the array when sending email alerts. It does not need to be a real email address, but it must be in the proper address format. Include the group or array name for easy identification.

- Send to Addresses

  Nimble recommends that you check the *Send event data to Nimble Storage Support* check box.

- Simple Mail Transfer Protocol (SMTP) server hostname or IP address

b) Diagnostic Analysis

Checking the Send Diagnostic Analysis data to Nimble Storage Support check box enables HPE Nimble Storage Support to monitor your array, notify you of problems, and provide solutions.

c) HTTP Proxy

Diagnostic Analysis and software updates require an HTTPS connection to the Internet, either directly or through a proxy server. If a proxy server is required, check the **Use HTTP Proxy** and provide the following information to configure the proxy server details:

- HTTP proxy server hostname or IP address
- HTTP proxy server port
- Proxy server user name
- Proxy server password

Note The system does not test the validity of the SMTP server connection or the email addresses that you provide.

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15 Click **Finish**.
A pop-up window appears with status updates and then the Setup Complete window appears.

16 Click **Continue**.
The NimbleOS home screen appears.

What to do next

Make sure that the Management IP address and the Controller Diagnostic IP addresses are added to your mail server's relay list.

Firewalls should not allow inbound communications from untrusted networks or any internet addresses.

Firewalls should allow outbound communications, from the Management IP address and both Controller Diagnostic IP addresses, to the following TCP ports and host addresses:

- SSH: 2222 hogan.nimblestorage.com – For a Secure Tunnel connection to Nimble Storage Support
- HTTPS: 443 nsdiag.nimblestorage.com – For Diagnostic Analysis and heartbeat
- HTTPS: 443 update.nimblestorage.com – For software updates
- HTTPS: 443 nsstats.nimblestorage.com – For relay of per-VM statistics (used in InfoSight VMvision)

Next, see *After Installation and Initial Setup* on page 39.

Initial Setup Using the CLI

After your array has been installed in the rack and connected to your network, you must complete the initial setup of the array by configuring some basic settings to get the array running on the network.

This section describes using the CLI to complete the initial setup. To use the CLI, you must first establish a connection to the active controller on the array.

Note If you have a Windows host, and you cannot establish a serial connection to the active controller on the array, you must use the HPE Nimble Storage Windows Setup Manager to complete the initial setup. For more information, see *Initial Setup Using the Nimble Setup Manager* on page 32.

After the initial setup is complete, refer to the *GUI Administration Guide* or the *CLI Administration Guide* for group and volume configuration, plus additional optional configuration tasks.

Set up a Serial Connection

The CLI requires a serial connection for the initial setup of the array. After setup, the CLI can also use an SSH connection over the network.

Before you begin

Obtain these items:

- Serial console cables that came with your array. The jacks arrive affixed to the power supply handle.
- Laptop computer or workstation
- Null-modem cable with DB9-female connector at one end and the appropriate connector on the other to mate with the serial interface on the laptop computer or workstation

Procedure

1 Connect the serial port on your laptop computer or workstation to the serial port on the controller.

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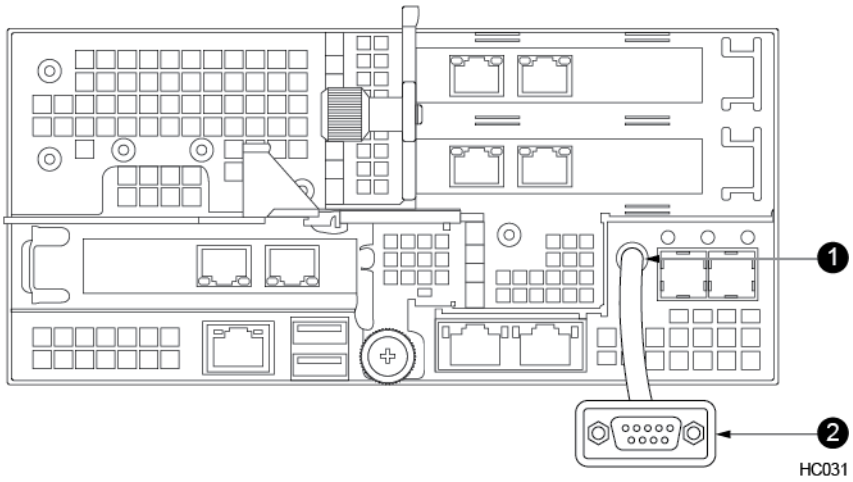

1 Serial port **2** Serial connector

2 Run the serial console software with the following settings:

Data bits	8
Parity	None
Stop bits	1
Speed	115.2Kbps
Flow control	None

3 Log in as user `admin` with the password `admin`.

Note You can only log into the active controller. If you cannot log in, move the laptop computer or workstation connection to the other controller and try to log in again.

After you have logged in, the CLI is ready to accept commands.

What to do next

Type **?** to see a list of commands.

Type the command followed by **--help** to see the usage information for that command.

Complete the Initial Setup Using the NimbleOS CLI

Before you begin

The CLI requires a serial connection with the array. See *Set up a Serial Connection* on page 37.

Before you start, fill out the *Installation Checklist* on page 18. You need the information from the checklist to perform the initial CLI setup.

Note Subnet and VLAN configuration is a separate action.

Procedure

1 After you are logged into the active controller, type:

setup

The Terms and Conditions are displayed.

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2 Click **Enter** to read the Terms and Conditions, then type **yes** to accept them.
3 Type the following information as requested. Example values are shown here.

Important If you accept an incorrect entry, you must start the setup process again.

1 Enter array name: **greyhound**
2 Enter group name: **storehouse**
3 Enter management IP address: **10.12.128.79**
4 Enter management netmask: **255.255.0.0**
5 Enter default gateway IP address: **10.12.255.254**
6 Enter domain name: **admin.storage.com**
7 Do you want to continue setup in the GUI? Enter yes or no: **no**

Note Use your own values for each item in the preceding sample.

4 Specify whether you want to continue the setup in the GUI.

1 If you type **yes**, the array opens the GUI to complete the configuration as described in *Initial Setup Using the Nimble Setup Manager* on page 32.
2 If you type **no**, continue to Step 5 to complete the configuration.

5 Type the following information as requested. Example values are shown here.

1 Enter comma-separated list of DNS server(s): **10.64.0.13,10**.
2 Enter NTP server name: **time.ntpserver.com**
3 Enter time zone: **America/Los_Angeles**
4 Enter subnet label for NIC eth1: **management**
5 Enter subnet for NIC eth1 (use slash notation, for example, 10.11.0.0/16): **10.12.0.0/16**
6 Enter comma-separated list of subnet types for the subnet on NIC eth1 [management,data]: **management**
7 Enter MTU for the subnet on NIC eth1 [standard | jumbo | <integer>]: **standard**
8 Enter subnet label for NIC eth:
9 Enter support IP address for controller A: **10.64.33.10**
10 Enter support IP address for controller B: **10.64.33.11**

Note Use your own values for each item in the preceding sample.

6 After the setup is complete, disconnect the Serial-USB-VGA adapter (dongle) and serial cable.

What to do next

Open an SSH session to the management IP address of the array and log in with the user name **admin** and the password **admin**.

If you need to change the admin password, type `useradmin --passwd`, press **Enter**, and follow the prompts.

Next, see *After Installation and Initial Setup* on page 39.

After Installation and Initial Setup

Software Updates, Host Connection, Groups, Volumes (iSCSI and FC)

Continue your configuration by following instructions in the *GUI Administration Guide* or *CLI Administration Guide* to create performance policies, set up connections, and complete setup in the HPE Nimble Storage Setup Manager (NSM). HPE Nimble Storage arrays support both iSCSI and Fibre Channel protocols, and provides information for your specific host connection method to create initiator groups and volumes. Additional configuration options include creating and managing storage pools, volume collections, snapshots, replication strategies, security policies, and performance monitoring.

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Learn about these post-installation configuration tasks in the *GUI Administration Guide* or the *CLI Administration Guide*.

Windows Environments

The HPE Nimble Storage Windows Toolkit (NWT), mentioned briefly in this guide, includes features that go beyond setting up the array. The Nimble VSS requester and the Nimble VSS hardware provider enable you to take application-consistent snapshots on a Nimble array. The HPE Nimble Storage Connection Manager (NCM) sets up the optimum number of data connections, and finds the best data connection to use under MPIO. The Windows Toolkit includes a Nimble DSM kernel driver that claims and aggregates data paths for the Nimble array.

See the *Windows Integration Guide* for more information.

VMware Environments

HPE Nimble Storage integration with VMware consists of features preinstalled in the NimbleOS and features installed separately. The vStorage APIs for Array Integration (VAAI) enable the WRITE SAME, UNMAP, ATS, Copy Offload, and XCOPY APIs. The HPE Nimble Storage vCenter plugin creates and manages datastores on the Nimble array. NimbleOS also includes a VASA Provider for vVol support. VMware Synchronized Snapshots enable application consistent snapshots within VMware environments. SRA for SRM lets you set up disaster recovery plans. NCM installs on the ESXi host. NCM consists of two components:

- HPE Nimble Storage Connection Service – CIM provider. Optimized connection management.
- HPE Nimble Storage Path Selection Plugin – Optimized path management.

See the *VMware Integration Guide* for more information.

Linux Environments

The HPE Nimble Storage array fits well into a generic Linux environment. For help setting up MPIO in a Linux environment, see the *Linux Integration Guide*.

Using the NimbleOS

The NimbleOS has a multitude of features only touched upon in this document. Over time, you might need to update your network settings, performance policies, or replication partners, as well as create new volumes and groups and make administrative changes to your HPE Nimble Storage array.

Anytime you have a question, in the GUI, click **Help** at the top right of the NimbleOS screen.

In the CLI type `?` to see a list of commands.

Also refer to the *GUI Administration Guide*, the *CLI Administration Guide*, or the *Command Reference*.

Updates and Upgrades

When the time comes to update the NimbleOS on your array, refer to the *GUI Administration Guide* or the *CLI Administration Guide* for information on how to update the NimbleOS using the GUI or CLI.

The *Command Reference* also covers updates.

Depending on which model array you have, there are upgrade paths for the controllers and cache drives. When you are ready to upgrade, contact HPE Nimble Storage Support first.

See the quick start guide that ships with the upgrade component. The *Hardware Guide* also covers upgrades.

Maintenance and Repair

The HPE Nimble Storage array is a proven and reliable product. But on occasion, you may need to replace a controller, power supply, drive, or other component.

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Refer to the *Hardware Guide* for more information.

How Do I Obtain these Guides?

The guides discussed here are available for free download from the HPE InfoSight portal at *https://infosight.hpe.com/*.

Questions?

HPE Nimble Storage Support offers troubleshooting and other guidance by phone and by email.

All documentation and knowledge base articles are available on the HPE InfoSight portal at *https://infosight.hpe.com/*. To register on HPE InfoSight, click the *Enroll Now* link on the main page.

Email: *support@nimblestorage.com*

For all other general support contact information, go to *https://www.nimblestorage.com/customer-support/*.

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Array Components

Each array has the following components:

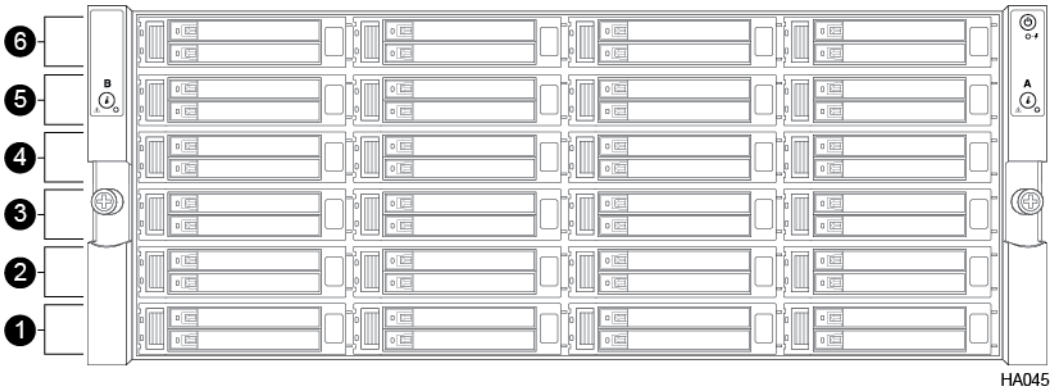
- A chassis
- Two storage controllers
- One power supply for each controller
- One NIC on each controller
- 24 SSDs
- Two HD SAS expansion ports
- Support for dual/quad 1G, 10G BaseT, SFP+

Check HPE InfoSight for the latest updated configurations and specifications for your specific array model.

Array Front Panel

The front bezel snaps on and off, exposing or hiding the drives within the array chassis. During normal operations, the bezel should remain in place.

The following figure show the slot designations for the current array model.



1 Slots 1-4
2 Slots 5-8
3 Slots 9-12
4 Slots 13-16
5 Slots 17-20
6 Slots 21-24

Array Rear Panel

The rear of the array includes two controllers and two power supplies. Management, data, and power cabling is done at the rear of the array. The basic components are the same regardless of the model.

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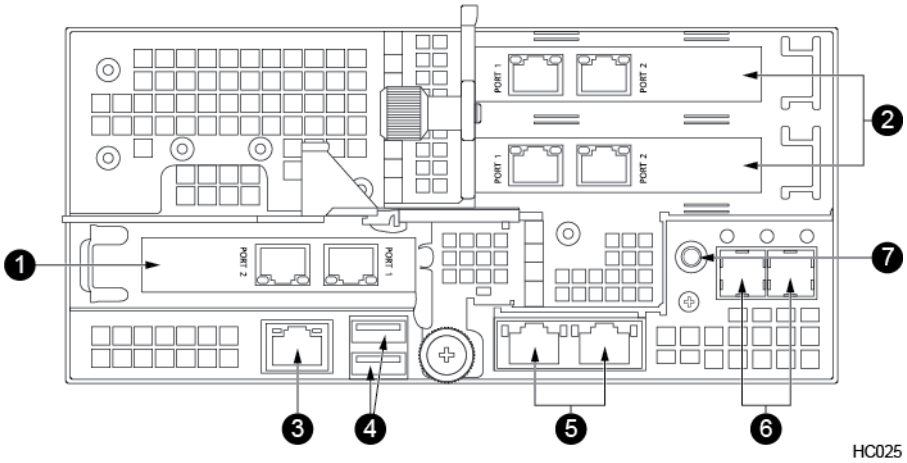
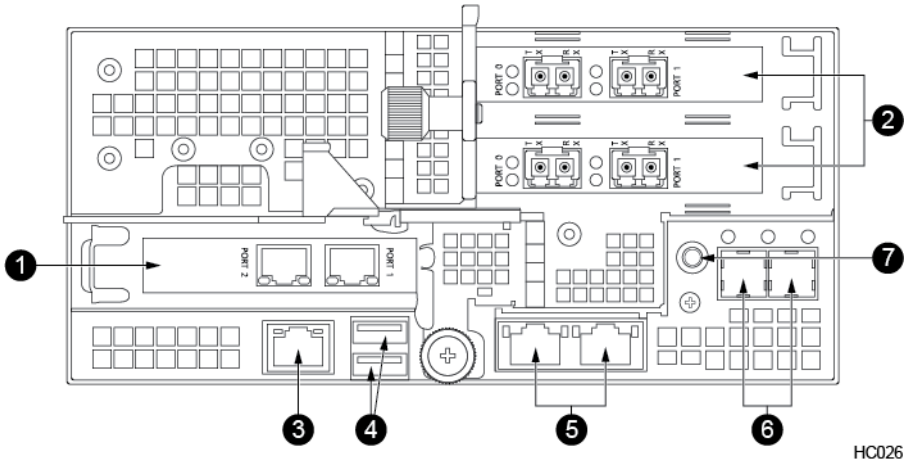
Figure 18: Array rear view - Ethernet only



1 10GBaseT Ethernet ports
2 10GBaseT Ethernet ports
3 BMC port (not used)
4 USB ports (not used)
5 10GBaseT Ethernet ports
6 HD SAS3 expansion ports
7 Serial port

Figure 19: Array rear view - with Fibre Channel ports



1 10GBaseT Ethernet ports
2 16Gb/s Fibre Channel HBAs
3 BMC port (not used)
4 USB ports (not used)
5 10GBaseT Ethernet ports
6 HD SAS3 expansion ports
7 Serial port

Controller States and Status

A controller status of Active/Standby is the normal operating status. This insures that the array is running in a optimal state for full redundancy in the event that a controller takeover is required. (If controllers are not in this state, contact Nimble Storage Support for further diagnoses.)

Controller States:

Active

The controller is actively responding to read/write operations from the host or hosts.

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Standby

The controller is powered on, synchronizing mirrored data to the active controller, and available for controller takeover, should it be required.

Solo

The controller is powered on, responding to reads/writes but there is no standby controller to takeover if a controller takeover is required. If this controller fails, the array will be non-operational. (A controller will be in Solo mode if the 2nd controller is in one of the following states: Unknown, Stale.)

Unknown

The controller is not powered up or is in the process of rebooting. During this time the active controller can not communicate to the controller therefore it does not know which state it is in.

Stale

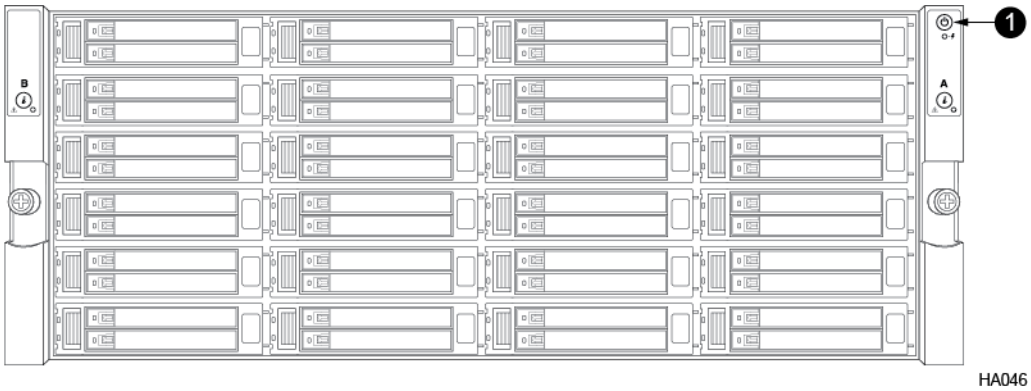
The controller has completed the bootup process but is not actively synchronizing or mirroring data with the active controller.

Start the Array

This action starts the array.

Procedure

To start the array after a shutdown, press the Power button.



1 Power button

Shut Down the Array Using the GUI

This action shuts down the array and any expansion shelves managed by the array.

For most hardware changes you do not need to shut down (power off) the array because the components are redundant and hot swappable.

Caution When you shut down the array, all volumes go offline.

Procedure

1. In the main menu, choose **Administration > Shutdown**.
2. Click **Shut Down Array**.

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Shut Down the Array Using the CLI

This action shuts down the array and any expansion shelves managed by the array.

For most hardware changes you do not need to shut down (power off) the array because the components are redundant and hot swappable.

Caution When you shut down the array, all volumes go offline.

Procedure

1. Determine the name of the array.
   array --list
   The name of the array appears in the list.
2. Halt the array.
   halt --array *array_name*

Example

```
Nimble OS $ halt --array datamaster-a
```

Restart the Array

You rarely need to restart an array.

You must use the CLI to restart the array. Any expansion shelves managed by the array also restart.

Caution When you restart the array, all volumes temporarily go offline.

Procedure

1. Determine the name of the array.
   array --list
   The name of the array appears in the list.
2. Reboot the array.
   reboot --array *array name*

Example

```
reboot --array datamaster-a
```

Array LEDs

The array front LEDs are located on both handles. The power button and power supply status LED are only on the right handle.

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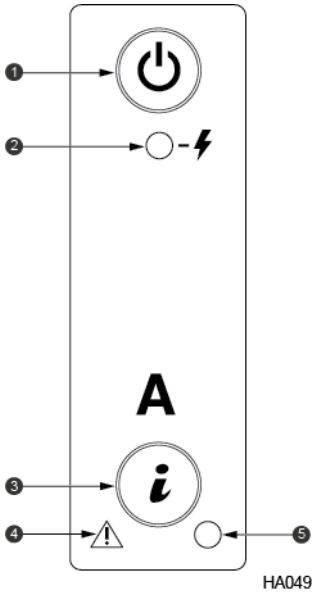
Figure 20: Front LEDs



1 Power button
2 Power supply status
3 Controller ID button
4 Controller status
5 Controller power

The following table describes the front LEDs.

LED	Status
Power button	Solid green indicates that the power is on
Power supply status	• Solid green indicates that input from the installed power supplies is within range • Amber indicates that power is out of range
Controller ID button	Blue LED inside the ID button changes state when the button is pushed or when an ID command is received
Controller status	• Solid green indicates the controller is running and system status is healthy • Blinking green indicates the system is operating in a degraded state, such as loss of redundant power supply or fan • Blinking amber indicates an impending failure, although the system is still operating • Solid amber indicates that the system is halted or has failed
Controller power	• Solid green indicates the controller is powered on • Off indicates the controller is powered off

Drive LEDs

The following shows the drive and LED indicator lights and describes their functions.

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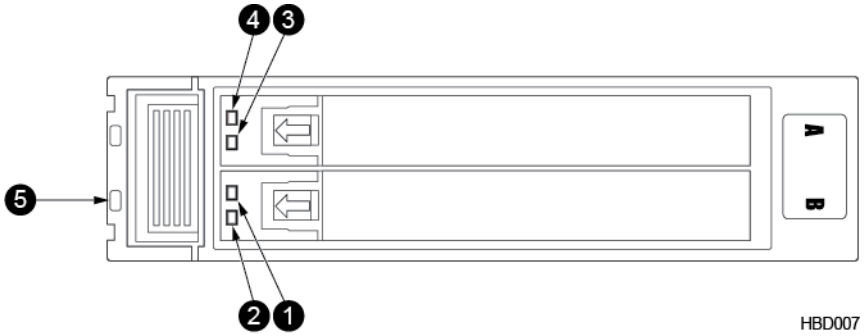
Figure 21: SSD drive and carrier LEDs



1 Drive B fault
2 Drive B operation
3 Drive A operation
4 Drive A fault
5 Drive carrier fault

In an SSD drive carrier, there are two individual drive slots, each with two LEDs. The following table describes the dual flash carrier LEDs.

Table 6: SSD Drive Carrier LEDs

LED	Status
Drive carrier fault (far left)	Solid red indicates that the drive carrier itself has failed. Contact HPE Nimble Storage Support to send a replacement drive carrier. The replacement drive carrier will come preinstalled with a new interposer and slots.
Drive fault (top LED)	Solid red indicates that a drive (A or B) has failed or been removed
Drive operation (bottom LED)	• Solid green indicates that the drive (A or B) is on-line and ready • Blinking green twice per second indicates that the drive is being initialized • Blinking green five times per second indicates read/write activity on the drive

Controller LEDs

The HPE Nimble Storage array has several LEDs to indicate various functions and the operating state of its components. Depending on the model and configuration, the node component displays certain LEDs to indicate its operating state, including network link/connection, heartbeat, and power supply.

Controller LED Tables

The following tables describe the LED indicators for array controllers.

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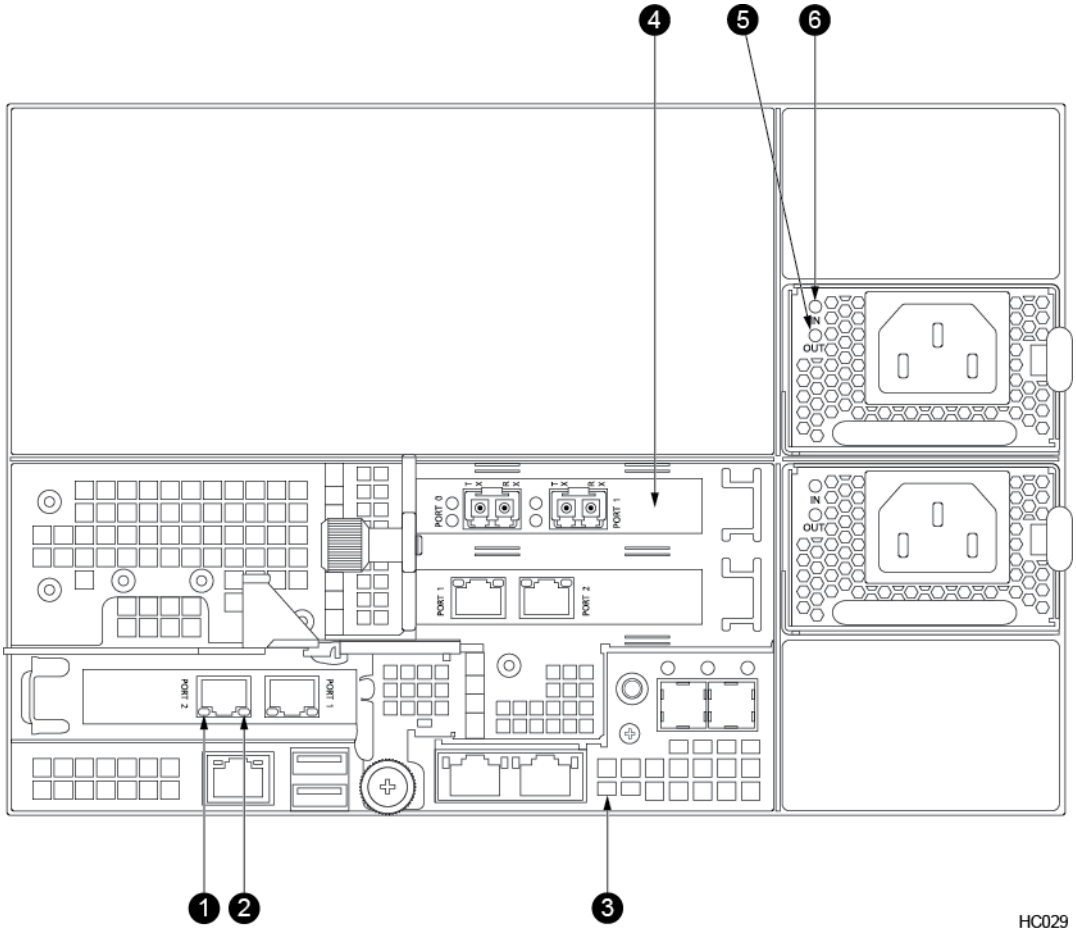
Figure 22: Array controller LEDs (Ethernet and Fibre Channel shown)



1 10GBaseT Ethernet speed
2 10GBaseT Ethernet link
3 Controller status
4 16Gb/s Fibre Channel HBAs
5 Out LED
6 In LED

Table 7: Controller LEDs

LED	Status
Ethernet link	Flashing indicates network activity
Ethernet speed	• Green: 10Gb/s • Amber: 1Gb/s • Off (Dark): 10/100Mb/s, no connection

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LED	Status
Controller status	• Solid green indicates the controller is running and system status is healthy • Blinking green indicates the system is operating in a degraded state, such as loss of redundant power supply or fan • Blinking amber indicates an impending failure, although the system is still operating • Solid amber indicates that the system is halted or has failed
Power supply	In LED: Solid green indicates PSU is working. Off indicates PSU has failed. Out LED: Blinking amber indicates power supply is not turned on.

The following table describes the *additional* controller LEDs in Fibre Channel (FC) arrays.

Table 8: Fibre Channel Controller LEDs

LED	Status		
16 Gb/s Fibre Channel HBA	Green and Amber: FC Card OK, link status:		
	Green LED: • On • On • On • Slow blink	Amber LED: • 2 fast blinks • 3 fast blinks • 4 fast blinks • Off	Status: • OK, link up 4Gb • OK, link up to 8Gb • OK, link up at 16 Gb • OK, link down
	Green and Amber: FC Card failure, boot, or no power:		
	Green LED: • On • On • Off • Off • Off • Off	Amber LED: • Off • On • Flashing • Slow blink • Off • On	Status: • Failure in FW • Failure in FW • Card booting • Failure after POST • No power or bad card • POST failure, possible bad card

Find the Serial Number of an Array Using the GUI

Procedure

1. In the NimbleOS GUI, choose **Hardware.**
2. Click the link of the array you want.
3. Look in the Properties section for the serial number.

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Find the Serial Number of an Array Using the CLI

Procedure

1 Find the serial number of an array.
shelf --array *array name* **--list**

2 Look for the serial number in the list of information.

Example

```
Nimble OS $ shelf --array rackarray3 --list
```

Check Array Model Number, NimbleOS Version, and Operating State Using the GUI

Obtain information about your array before performing general maintenance, software updates, or hardware upgrades.

Before you begin

Before performing any upgrades, replacements, or general maintenance on your HPE Nimble Storage hardware, use the following steps to check the model number, NimbleOS version running on your array, and the operating state.

Procedure

1 In the NimbleOS GUI, choose **Hardware**
2 Click the link for the array.

Look in the Properties section for the model number and OS version.

See also *Find the Serial Number of an Array Using the GUI* on page 49

3 Note the status of Controller A and Controller B.

Important

One controller should be Active and the other in Standby. If any other state is shown, contact HPE Nimble Storage Support.

Check Array Model Number, NimbleOS Version, and Operating State Using the CLI

Obtain information about your array before performing general maintenance, software updates, or hardware upgrades.

Before you begin

Before performing any upgrades, replacements, or general maintenance on your Nimble hardware, use the following steps to check the model number, NimbleOS version running on your array, and the operating state.

Procedure

1 Check the model number and NimbleOS version of the array.

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array --info *array name*

Note the Model and Version number.

2 Check the operating state of the controllers.

ctrlr --list

Important One controller should be Active and the other in Standby. If any other state is shown, contact HPE Nimble Storage Support.

Example

```
Nimble OS $ array --info
Nimble OS $ ctrlr --list
```

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Install the Expansion Shelf

Use this procedure to install and activate up to two AFS3 expansion shelves, depending on the model of your HPE Nimble Storage array.

Caution

- When you activate the expansion shelf, there is a momentary pause in data service from the array. You might need to activate the expansion shelf during a maintenance window.
- The chassis weighs over 43 kg (95 lb). Always use at least two people or a server lift when lifting the chassis.

Before you begin

What you need for each expansion shelf:

- 19-inch four-post rack. The provided rails fit both round-hole and square-hole racks.

  Racks with a depth of 1200 mm best accommodate the length of the HPE Nimble Storage chassis, providing ample space for cabling and ease of service. Racks with a depth of 1075 mm can be used but may provide limited space for cables and component access.
- Four rack units (4U) of space available in the 19-inch rack
- At least two dual SAS cables, 1 m or 3 m (two 1 m cables are included)

Caution Start-up current draw may exceed 6A. When attaching multiple shelves, attach and activate the shelves one at a time.

- Before beginning, download and read the Release Notes, available on HPE InfoSight (*https://infosight.hpe.com/*). HPE InfoSight is a password-protected web portal, so you must have an account to access Release Notes and documentation. If you do not have an HPE InfoSight account, click **Create Account** and provide the required information. If you already have an account, type your email address and password, then click **Login**.
- The power supplies are 220V AC or 110V AC auto-detecting.
- This product is intended for installation in restricted-access locations only, such as a dedicated equipment room or an electrical closet.

Procedure

1 Unpack and inspect the hardware.

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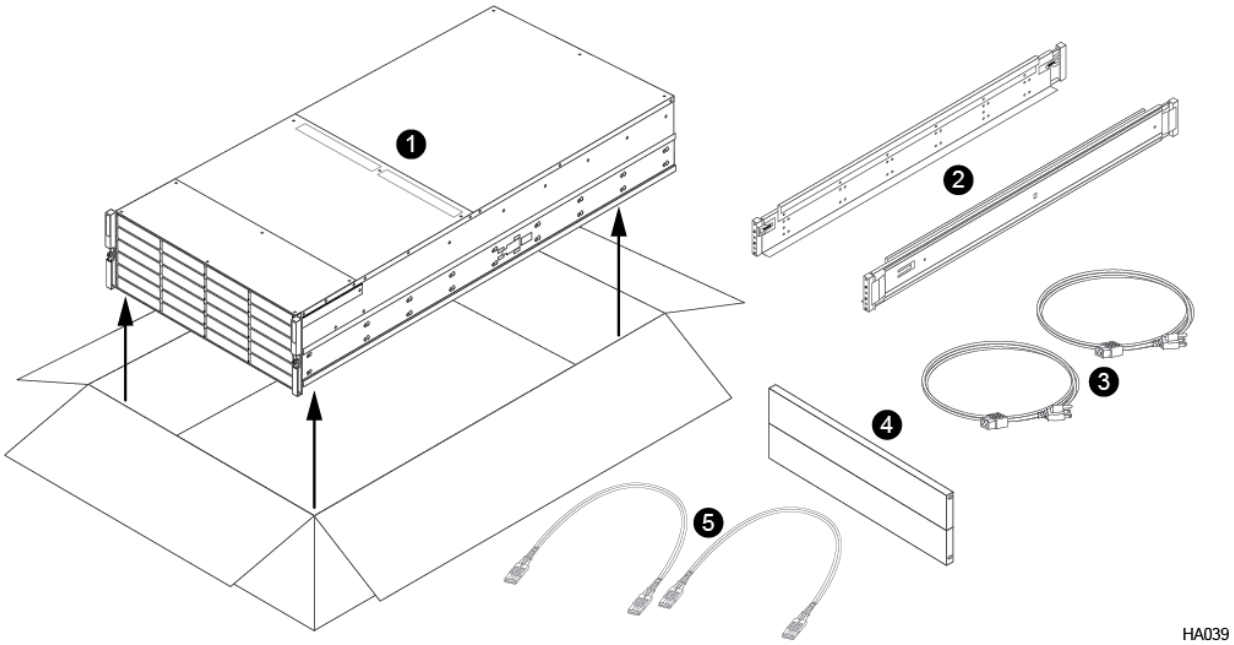

1 Array
2 Outer rails
3 Power cords
4 Bezel
5 Dual SAS cables

Save the original packaging.

2 Install the rail assemblies into the rack.

Note To ensure that the array thumbscrews align correctly, install the rail assembly in exactly 4U of rack space. You should insert the bottom stud on the rail kit into the bottom hole of the bottom unit of the allotted 4U of rack space.

a) Align the bottom stud of the rail at the position you want.
b) Press the keeper latch and position the front studs in the rack. When the studs are engaged, release the keeper latch to secure the front of the rail in the rack.
c) Align the back of the rail at the same rack position as the front.
d) Position the back studs in the rack and press the keeper latch. When the studs are engaged, release the keeper latch to secure the back of the rail in the rack.
e) Repeat steps a through d on the other side.

The following diagram shows where the rail assemblies should be correctly installed in a rack.

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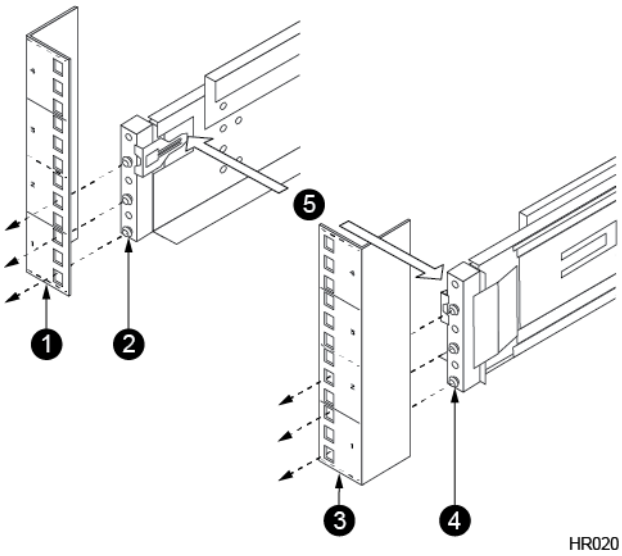

1 Left front rack post
2 Left rail assembly
3 Right front rack post
4 Right rail assembly
5 Keeper latch

3 Slide the chassis into the rack.

Caution

The chassis weighs over 43 kg (95 lb). Always use at least two people or a server lift when lifting the chassis.

a) Insert the chassis into the rack, back side first. Be sure the inner rails insert into the outer rails.
b) Gently slide the chassis into position.
When you hear a click, the inner rails have locked into the rail assembly.

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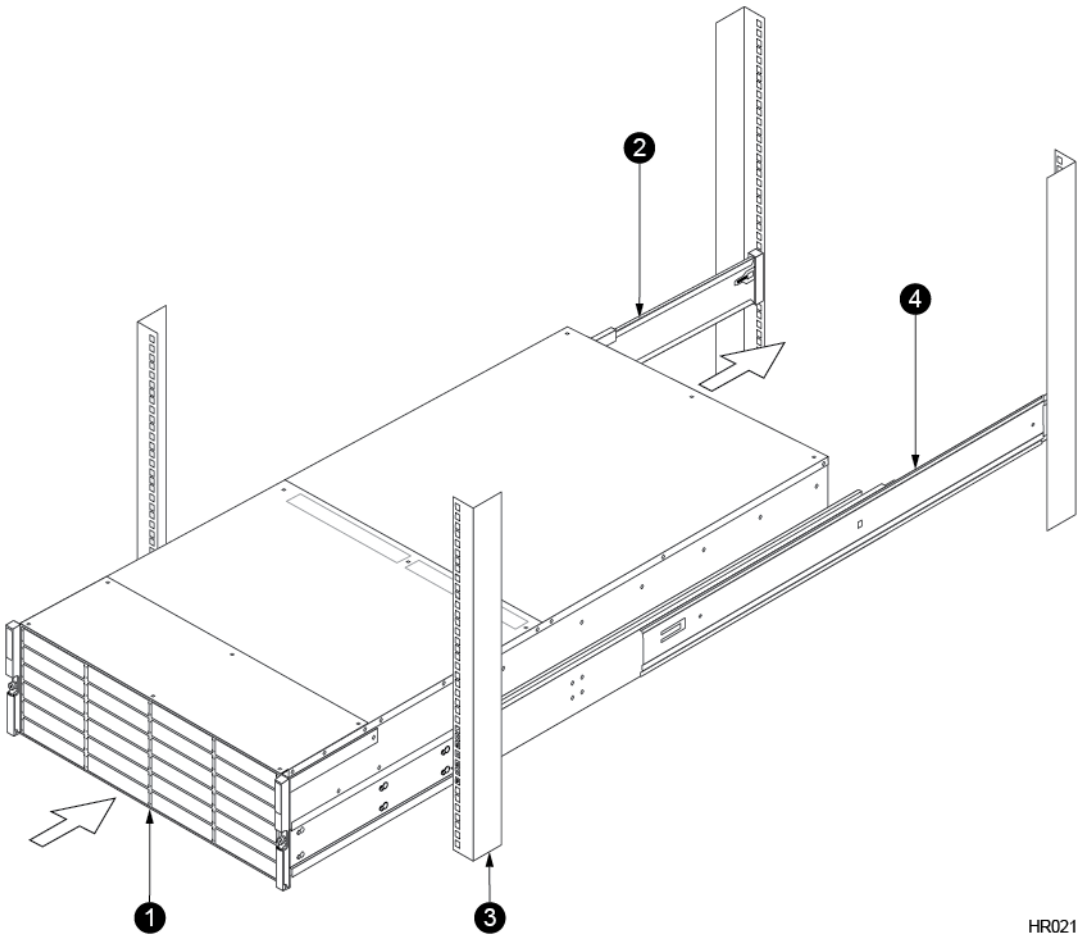
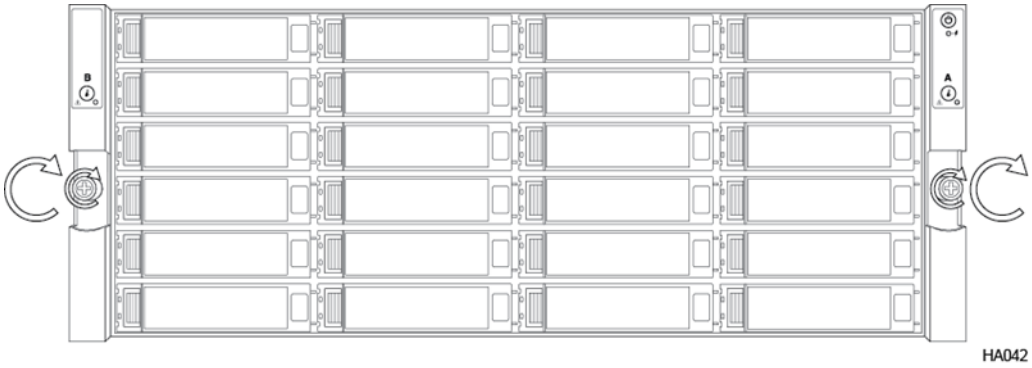


1 Chassis
2 Left rail assembly
3 Right front rack post
4 Right rail assembly

4 Secure the chassis to the rack.

The chassis has two handles. Each handle has a screw that holds the chassis to the rails so it does not slide out of the rack. Tighten the screw in each handle until secure.



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Connect the Power to the Expansion Shelf

Before you begin

Before you perform this task, you must have already installed the HPE Nimble Storage expansion shelf in a rack or enclosure.

Procedure

1. Plug the power cables into both power supplies on the back of the expansion shelf.
2. Plug the other end of the power cables into the power circuit.

   To minimize the risk of both power supplies losing power simultaneously, connect each power cable to a different circuit.
3. Verify that the SAS LEDs are green after connecting the power cables.
4. If the expansion shelf does not come online automatically, press the power button on the front of the chassis.

   If the expansion shelf still does not turn on, contact HPE Nimble Storage Support.

Connect and Activate the Expansion Shelf

Note Do not shut down the array while turning on and connecting the expansion shelf. Arrays must be running NimbleOS 5.0.5 or later. Fully configure the array before you connect the expansion shelf to it.

Procedure

1. Verify that the SSDs are installed and fully plugged in.

   Some slots might be empty.

   a) Apply power to the expansion shelf.

      Expansion shelf power must be on before connecting the SAS cables.

   b) Verify that the power is on before you start cabling.
2. Cable the expansion shelf to the SAS expansion ports on the array.

   Use the provided dual cable to cable the array to the expansion shelf.

   Make sure not to cross the cables:

   - Cable P1 on the array to P1 on the expansion shelf and P2 on the array to P2 on the expansion shelf
   - Install the cables into the ports with the retention tabs down

   a) Connect the SAS Out ports of controller A on the array to the SAS In ports of expander A on the expansion shelf.

   b) Connect the SAS Out ports of controller B on the array to the SAS In ports of expander B on the expansion shelf.

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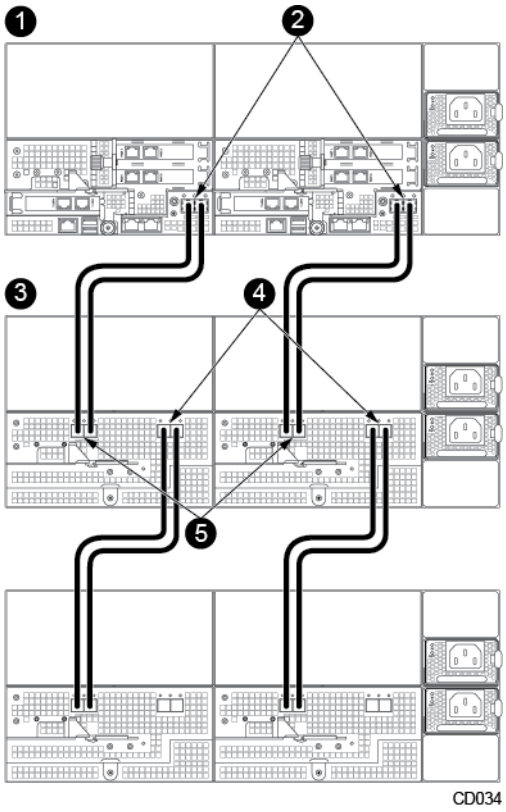

1 Array
2 SAS expansion ports
3 Expansion shelf
4 SAS Out
5 SAS In

3 (Optional) Cable another expansion shelf to the array:

You can connect up to two expansion shelves.

a) Connect the SAS Out ports from Controller A to the SAS In ports of Expander A on the expansion shelf.
b) Connect the SAS Out ports from Controller B to the SAS In ports of Expander B on the expansion shelf.

Note Wait at least 3 (three) minutes between each additional expansion shelf connection to ensure the firmware update is complete.

4 Activate the expansion shelf.

Note Ensure that all drives are detected and all drive LEDs are green before activating the expansion shelf. Activation will fail if any drives are missing or have failed.

a) In the NimbleOS GUI, click **Hardware**, then select the array that contains the new drives.
b) In the array list, click the array that manages the expansion shelf.
c) On the expansion shelf graphic, click **Activate**.

When the activation completes, the expansion shelf appears on the Array Management page.

Caution

When you activate the expansion shelf, there is a momentary pause in data service from the array. You might need to activate the expansion shelf during a maintenance window.

5 Snap the bezel to the front of expansion shelf.

The bezel is the front plate that attaches to the front of the array to control airflow. The bezel includes power connection pins on both sides.

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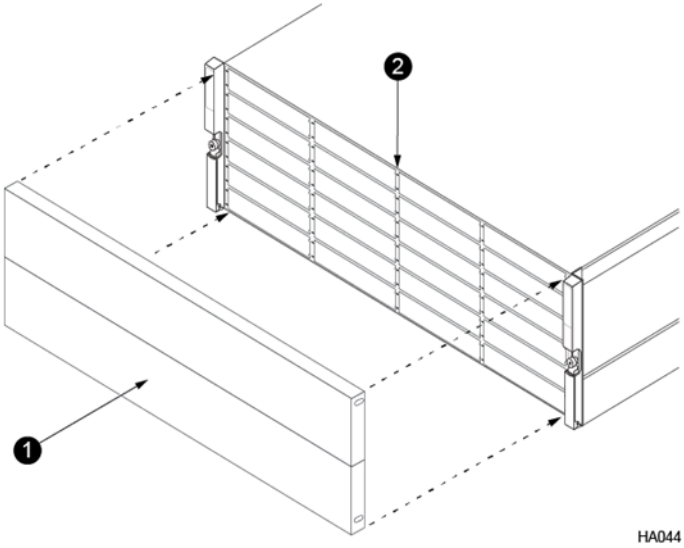
a) Align the four black connection pins on the bezel with the four holes inside both sides of the front of the expansion shelf.
b) Press gently but firmly until the bezel snaps into place.



1 Bezel **2** Chassis

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Expansion Shelf Components

An expansion shelf increases the storage available to an array. HPE Nimble Storage AFxx model All Flash Arrays support the AFS3 expansion shelf. The AFS3 includes the chassis, two controllers, two I/O units with cooling fans, two power supplies, and SSDs.

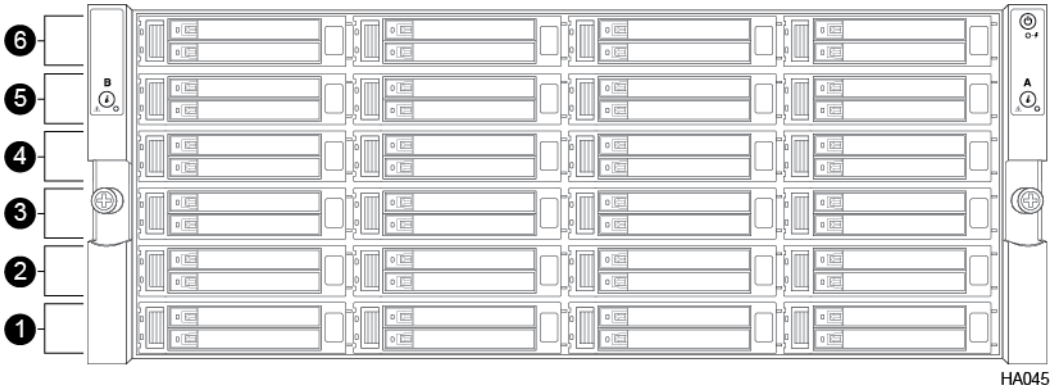
The All Flash Array supports either one or two AFS3 expansion shelves (depending on the array model). Each AFS3 has two I/O units on the back called *expanders*. Like the controllers in an All Flash Array, expanders are replacable in the field.

AFS3 Front Panel

The front bezel snaps on and off, exposing or hiding the drives within the expansion shelf chassis. During normal operations, the bezel should remain in place.

The following figure shows the slot designations for the AFS3 expansion shelf. Each Dual Flash Carrier (DFC) has two slots, one for drive A and one for drive B.

Figure 23: AFS3 expansion shelf - front view



1 Slots 1-4
2 Slots 5-8
3 Slots 9-12
4 Slots 13-16
5 Slots 17-20
6 Slots 21-24

The SSDs in the AFS3 are numbered sequentially and should be populated in all bank A slots first. Therefore, the drives in the first 24-pack of SSDs are installed in bank A, from slot 1-24 in order, and the drives in the second 24-pack of SSDs are installed in bank B, slots 1-24, in the same order.

AFS3 Rear Panel

The rear of the AFS3 expansion shelf includes the expanders and power supplies. Data and power cabling are done at the rear of the AFS3. The array manages the AFS3 through the SAS expansion cables. There are no network connectors on an AFS3. The rear components are the same regardless of the model.

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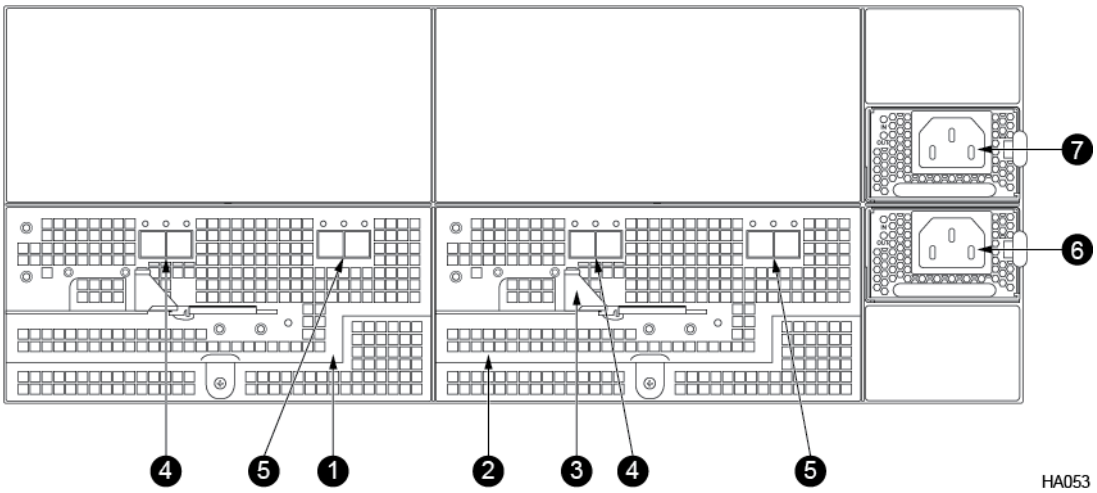
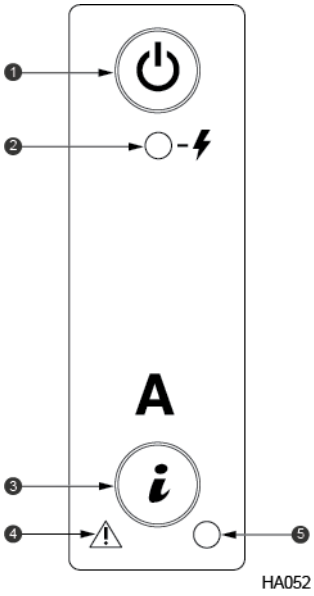


1 Expander A
2 Expander B
3 Expander release lever
4 SAS In
5 SAS Out
6 Power supply 1
7 Power supply 2

Expansion Shelf LEDs



1 Power button
2 Power supply status
3 Expander ID
4 Expander status
5 Expander power

The expansion shelf front LEDs are located on both handles. The power button on the right handle turns the expanders on and off. The following table describes the front LEDs.

LED	Status
Power button	Solid green indicates that the power is on

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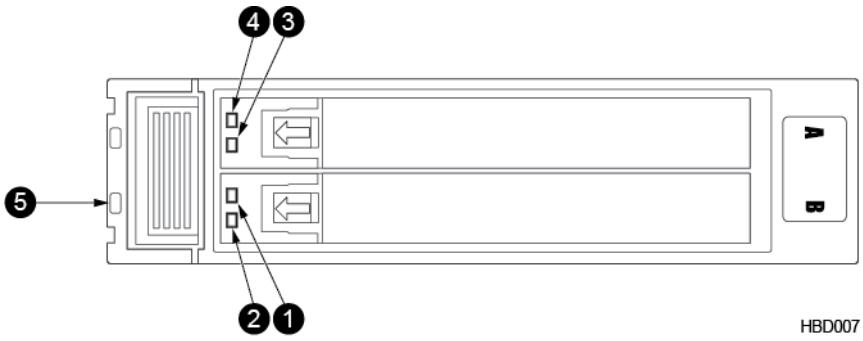
LED	Status
Power supply status	• Solid green indicates that input from the installed power supplies is within range • Amber indicates that power is out of range
Expander ID	Blue LED inside the Expander ID changes state when an ID command is received
Expander status	• Solid green indicates the expander is running and system status is healthy • Blinking green indicates the system is operating in a degraded state, such as loss of redundant power supply or fan • Blinking amber indicates an impending failure, although the system is still operating • Solid amber indicates that the system is halted or has failed
Expander power	• Solid green indicates the shelf is powered on • Off indicates the shelf is powered off

Drive LEDs

The following shows the drive and LED indicator lights and describes their functions.

Figure 24: SSD drive and carrier LEDs



1 Drive B fault
2 Drive B operation
3 Drive A operation
4 Drive A fault
5 Drive carrier fault

In an SSD drive carrier, there are two individual drive slots, each with two LEDs. The following table describes the dual flash carrier LEDs.

Table 9: SSD Drive Carrier LEDs

LED	Status
Drive carrier fault (far left)	Solid red indicates that the drive carrier itself has failed. Contact HPE Nimble Storage Support to send a replacement drive carrier. The replacement drive carrier will come preinstalled with a new interposer and slots.

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LED	Status
Drive fault (top LED)	Solid red indicates that a drive (A or B) has failed or been removed
Drive operation (bottom LED)	• Solid green indicates that the drive (A or B) is on-line and ready • Blinking green twice per second indicates that the drive is being initialized • Blinking green five times per second indicates read/write activity on the drive

Shut Down an Expansion Shelf

For most hardware changes you do not need to shut down (power off) the expansion shelf because the components are redundant and hot swappable.

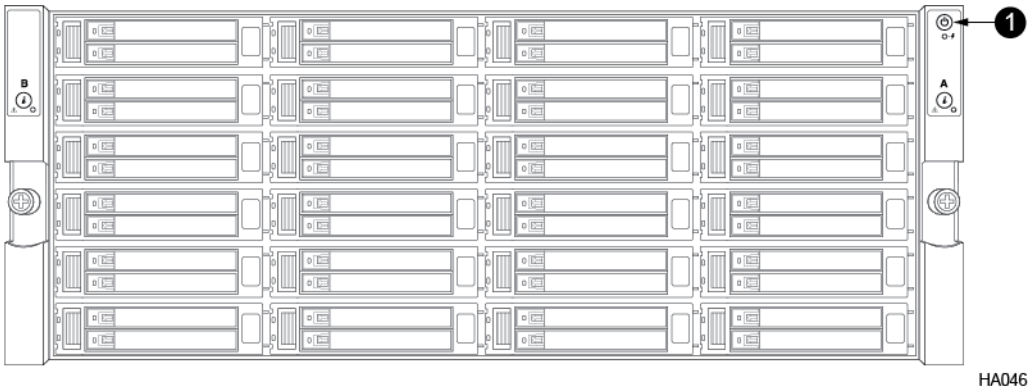
Before you begin

Caution

To prevent your volumes from going offline, shut down the array that manages the expansion shelf first. Then shut down the expansion shelf. See *Shut Down the Array Using the GUI* on page 44.

Procedure

To shut down the expansion shelf, press and hold the Power button on the shelf for 4 seconds.



1 Power button

Restart an Expansion Shelf

You rarely need to restart an expansion shelf. To restart a shelf, you must use the CLI to restart the array that is connected to the expansion shelf.

Caution When you restart the array, all volumes temporarily go offline.

Procedure

1. Determine the name of the array that manages the expansion shelf.
   array --list

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The name of the array appears in the list.

2 Restart the array.
reboot --array *array name*

Example

```
Nimble OS $ array --list
Nimble OS $ reboot --array datamaster-a
```

Find the Serial Number of an Expansion Shelf Using the GUI

Procedure

1 In the NimbleOS GUI, choose **Hardware.**
2 Click the link of the expansion shelf you want.
3 Look in the Properties section for the serial number.

Find the Serial Number of an Expansion Shelf Using the CLI

Procedure

1 Find the serial number of an array.
shelf --array *array name* **--list**
2 Look for *Serial #* in the list of information.

Example

```
Nimble OS $ shelf --array rackarray3 --list
```

Find the Serial Number of an Expansion Shelf on the Enclosure

Procedure

1 Go to the back of the enclosure.
2 Look for the serial number above Expander A.

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Maintenance Procedures

The following topics describe maintenance procedures for the HPE Nimble Storage array.

Drive Maintenance

The procedures for maintaining drives are the same for the following:

- Solid State Drives (SSDs)
- Arrays
- Expansion Shelves

How HPE Nimble Storage Arrays Handle a Failed Drive

The HPE Nimble Storage array is designed to be highly available, with redundant components. In some cases, more than one drive could fail. If this occurs, Nimble arrays will use Integrated Spare to rebuild data on one drive, even before the failed drive is replaced. This ensures that the array restores maximum data redundancy in a timely manner.

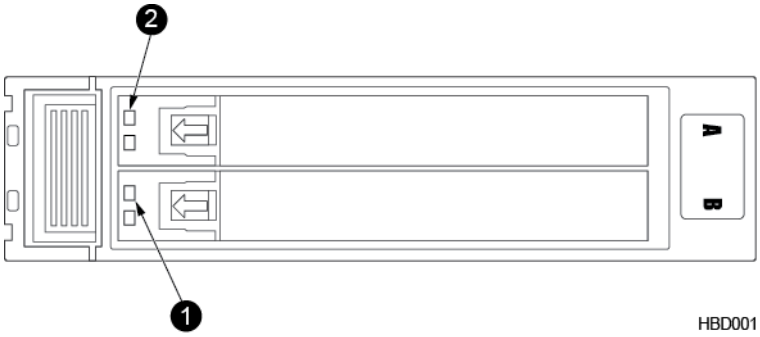
When a drive fails, a rebuild process starts automatically on spare distributed space (not to a dedicated spare drive). If the failed drive is inserted back to the array and is determined to be usable, a quick rebuild reinstates the drive. Even if a rebuild has already begun on integrated spare space, the quick rebuild takes priority, and the full rebuild is halted.

When a new replacement drive is inserted, if data has already finished repopulating to the integrated spare space, data is copied back to the new drive. If a second drive fails, and no drives have yet been replaced, there will be no second rebuild, since the array can only rebuild the amount of data on one drive of integrated spare.

How to Tell that a Drive has Failed

Any of the following events can indicate that a solid state drive (SSD) has failed:

- LEDs are solid red or off
- Event appears in the Events list
- Receipt of an alert email from the array.



1 Drive B (empty) **2** Drive A operation (populated)

Replace a Failed Drive (SSD)

Use this procedure to replace SSDs in your HPE Nimble Storage array or expansion shelf.

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Time required:	5 to 10 minutes
Parts required:	Replacement drive ordered from HPE Nimble Storage
Information required:	• RMA (Return Material Authorization) work order • Case number • Array serial number
Tools required:	• ESD (electrostatic discharge) strap or appropriate grounding device
Support contact:	See *Support*.

HPE Nimble Storage recommends using the Maintenance Window functionality within the HPE InfoSight portal to inform HPE Nimble Storage Support of upcoming maintenance windows.

Refer to *https://infosight.hpe.com/dashboards/nimble/wellness/maintenance-windows* for more information.

You can disable automated support case generation during planned maintenance from the Manage Maintenance Windows page. After a maintenance window is set, no further communication with HPE Nimble Storage Support is required.

The replacement drive ships as a stand-alone part, preinstalled in its sled.

Before you attempt to replace the drive:

- Do not remove the failed drive until you are ready to install the replacement.
- Determine which drive (A or B) in the drive carrier to replace before making the replacement.
- To identify a failed drive:
  - LEDs are solid red or off
  - Event appears in the Events list
  - Receipt of an email from the array
- Verify that the replacement drive matches the part shown on the RMA work order.
- Use the same type and size replacement drive as the old drive (SSD dual flash carrier). The drive sled label may vary in appearance or be upside down when the new drive carrier is properly oriented.

Procedure

1 Gently pull the front bezel away from the array chassis.

The bezel includes power connection pins on both sides.

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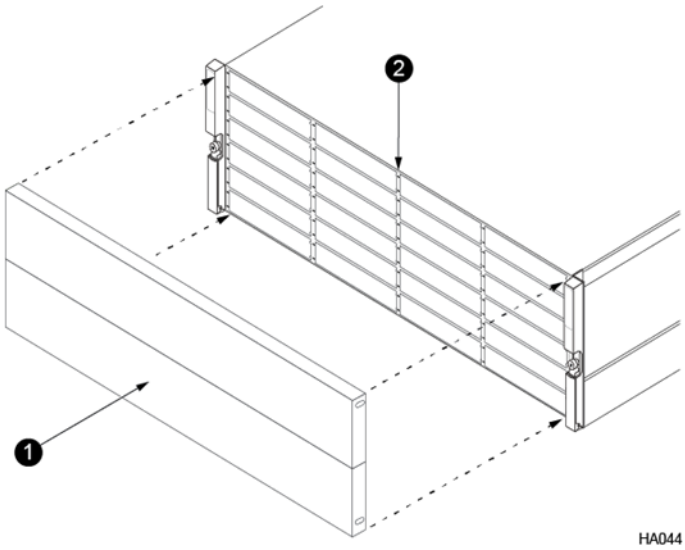
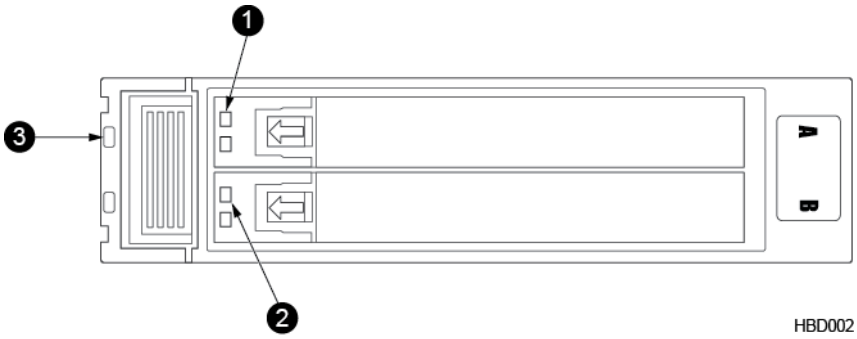


1 Bezel **2** Chassis

2 Identify the failed drive.

A failed drive has a red drive fault LED for that drive (B or A). Do not replace a drive with a dark drive fault LED.



1 Drive A fault **3** Drive carrier fault
2 Drive B fault

3 Release and remove the appropriate drive sled (B or A) from the drive carrier.

a) To release the handle, slide the green tab in the direction of the arrow. The sled handle springs open.
b) Pull the sled handle to remove the drive from the drive carrier. (Use firm, steady pressure.)

Important Do not press the lever for the drive carrier itself. Only open the individual sled (B or A) containing the drive to be replaced.

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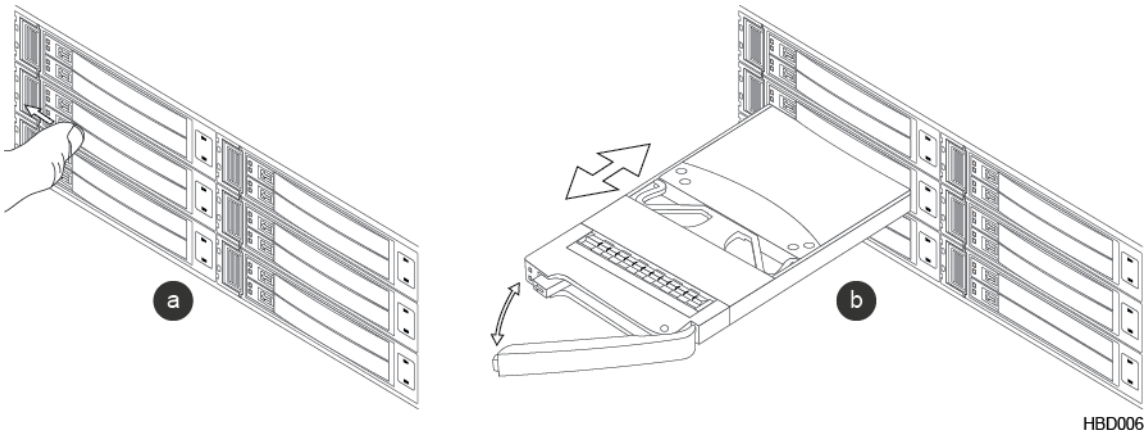


4 Insert the replacement drive into the drive carrier.

5 Close the sled handle.

Push the handle until it fully engages with the release tab.

6 After no more than two minutes, make sure that the drive (B or A) is green.

If the LED does not light, remove and reinsert the drive. If unsuccessful, contact HPE Nimble Storage Support.

7 Replace the bezel.

Hold the bezel in place and then firmly press the bezel until you feel the keepers lock.

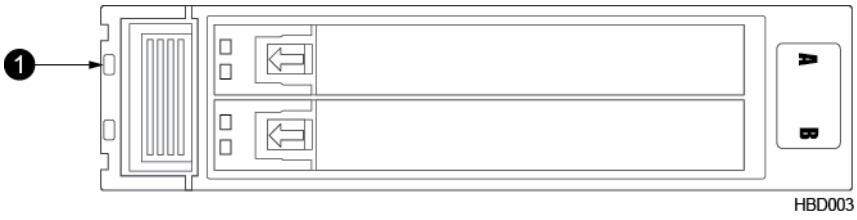
8 Return the failed drive as directed on the RMA work order.

How to Tell that the Drive Carrier has Failed

It is important to be able to distinguish whether the SSD drive carrier (the unit holding two drives), or the drive (A or B) itself has failed.

First determine the failed component (a drive or the drive carrier).

Figure 25: Fault LED on the drive carrier



1 Drive carrier fault

If the carrier fault LED is lit, but the drive fault LED (the red LED on drive A or B) is not lit, then the carrier has failed and must be replaced. See *Replace a Failed Dual Flash Drive Carrier* on page 68

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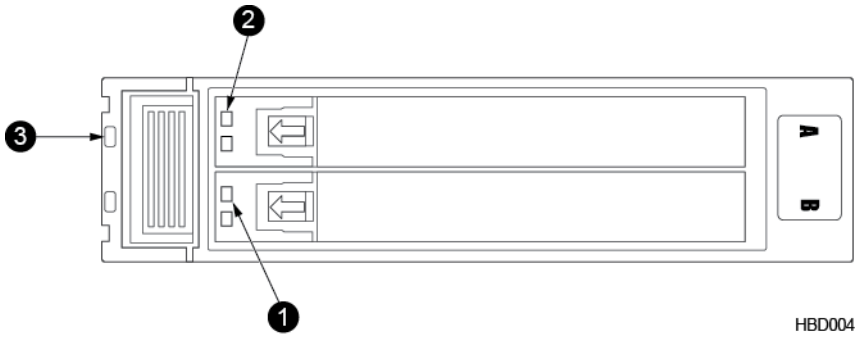

1 Drive B fault
2 Drive A fault
3 Drive carrier fault

If both the drive and the carrier fault LEDs are lit, try replacing the failed drive first. If the carrier fault LED persists, then replace the carrier. Contact HPE Nimble Storage Support.

Replace a Failed Dual Flash Drive Carrier

Use this procedure to replace the entire failed Dual Flash drive carrier in your HPE Nimble Storage array.

Time required:	5 to 10 minutes
Parts required:	Replacement drive carrier ordered from HPE Nimble Storage
Information required:	• RMA (Return Material Authorization) work order • Case number • Array serial number
Tools required:	• ESD (electrostatic discharge) strap or appropriate grounding device
Support contact:	See *Support*

HPE Nimble Storage recommends using the Maintenance Window functionality within the HPE InfoSight portal to inform HPE Nimble Storage Support of upcoming maintenance windows.

Refer to *https://infosight.hpe.com/dashboards/nimble/wellness/maintenance-windows* for more information.

You can disable automated support case generation during planned maintenance from the Manage Maintenance Windows page. After a maintenance window is set, no further communication with HPE Nimble Storage Support is required.

Caution

Before you attempt to replace the failed drive carrier:

- Do not remove the drive carrier or individual SSD slots from the drive carrier until you are ready to install the replacement.
- Determine that the drive carrier has failed before making the replacement.

  To identify a failed drive carrier:

  - LED on the carrier itself is solid red
  - Event appears in the Events list
  - Receipt of an alert email from the array

- Verify that the replacement drive carrier matches the part shown on the RMA work order.

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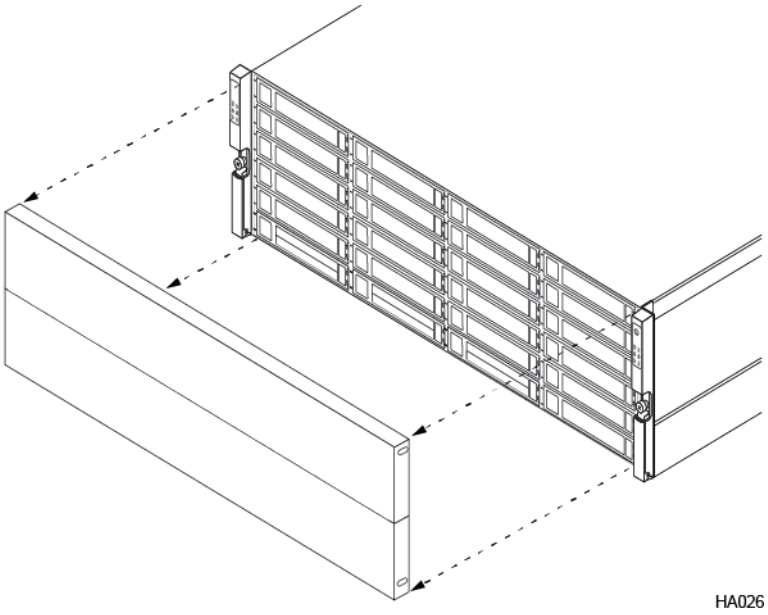
- Use the same type and size replacement drive carrier as the old drive carrier (SSD dual flash carrier).

  The A and B drive sled label may vary in appearance or be upside down when the new drive carrier is properly oriented.

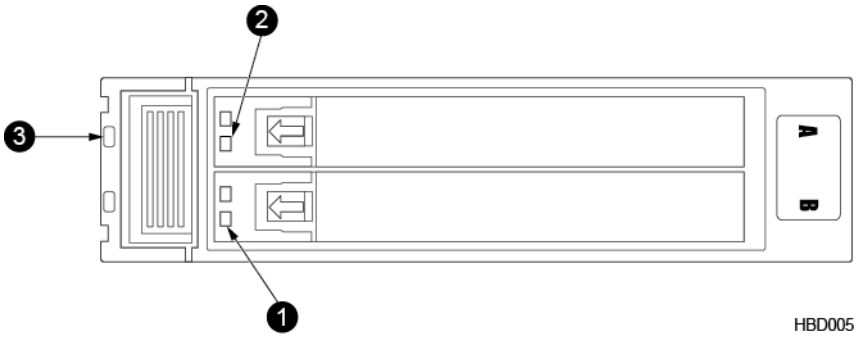
Procedure

1 Gently pull the front bezel away from the array chassis.



2 Identify the failed drive carrier.

A failed drive carrier has a red fault LED on the left side of the carrier, to the left of the drive LEDs. (Do not replace a drive carrier with a dark carrier fault LED.)



1 Drive B operation
2 Drive A operation
3 Drive carrier fault

3 Release and remove both drive sleds (A and B) from the failed drive carrier.

a) To release the handle, slide the small green tab to the left on the sled of the drive (B, bottom). The sled handle springs open.
b) Pull the sled handle to remove the drive from the drive carrier. (Use firm, steady pressure.)
c) Repeat steps a) and b) to remove the second drive from the drive carrier (A, top).

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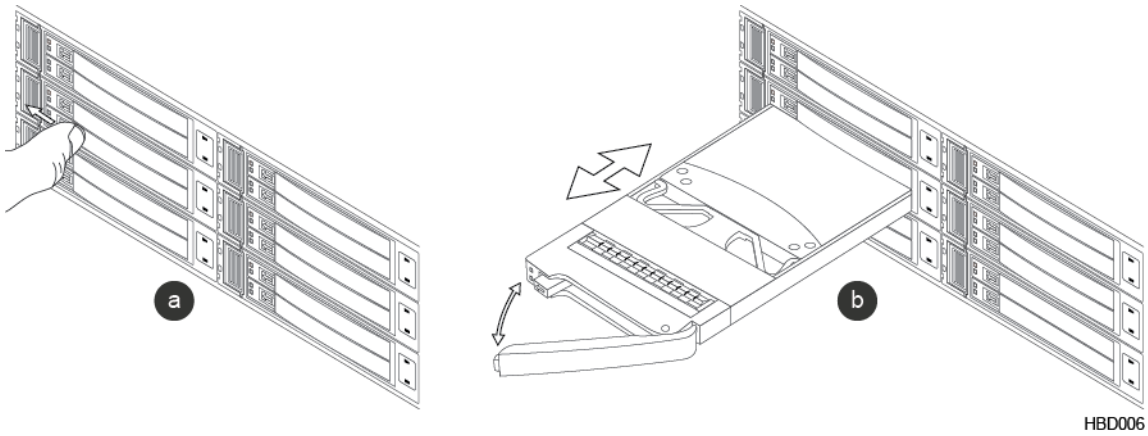
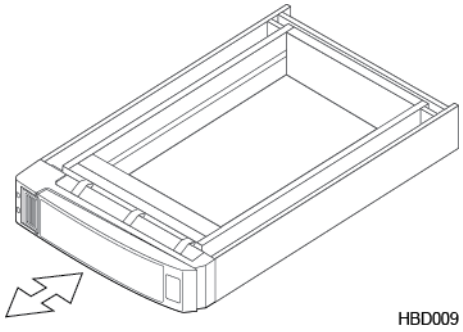


4 Remove the drive carrier:
   a) Remove the black retention clip that is directly next to the release latch by firmly grasping it and pulling straight out.
   b) Press the release latch and remove the drive carrier from the chassis bay. (Use firm, steady pressure.)
5 Prepare and insert the replacement drive carrier:
   a) In the replacement drive carrier, first remove the black retention clip that is directly to the right of the release latch. Then remove and discard the two empty SSD drive sleds.



   b) With the carrier handle open, carefully slide the replacement carrier into the empty chassis bay and close the carrier handle to lock the carrier in place.
6 Insert the SSD drives (A and B), one at a time, into the replacement drive carrier.
   a) With the sled handle open, carefully slide the first SSD drive sled (B, bottom) into the bottom drive bay (B) of the new drive carrier, and close the sled handle.
   b) Repeat step a) for the second SSD drive sled (A, top) to insert it into the top drive bay (A).
7 Secure the bezel to the front of the chassis.

   Hold the bezel in place and then firmly press the bezel until you feel the keepers lock.
8 Return the failed drive carrier as directed on the RMA work order.

Controller Maintenance

You can replace the following components on a controller:

- Network interface card (NIC)

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- Fibre Channel (FC) host bus adapter (HBA)

Note If any non-replaceable component on a controller fails, replace the entire controller.

Replace a Controller

Before you begin

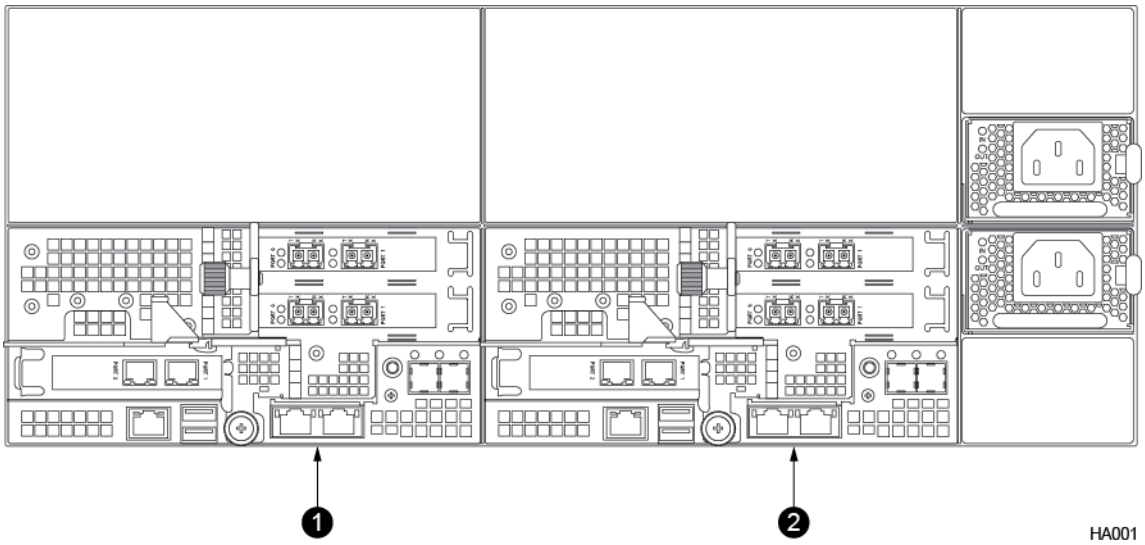
Use this procedure to replace the controller in your HPE Nimble Storage array.

Time required:	45 minutes per controller
Parts required:	Replacement controller(s) ordered from HPE Nimble Storage
Information required:	• RMA (Return Materials Authorization) work order • Case number • Array name or serial number The array serial number can be found on the back of Controller A.
Support contact:	See *Support*.

HPE Nimble Storage recommends using the Maintenance Window functionality within the HPE InfoSight portal to inform HPE Nimble Storage Support of upcoming maintenance windows.

Refer to *https://infosight.hpe.com/dashboards/nimble/wellness/maintenance-windows* for more information.

You can disable automated support case generation during planned maintenance from the Manage Maintenance Windows page. After a maintenance window is set, no further communication with HPE Nimble Storage Support is required.



1 Controller A **2** Controller B

Note

- If one controller fails, the other controller takes over. The array can function with one healthy controller while the replacement is installed.
- Replace the array controller if any of its components, such as the NVDIMM, have failed.

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- Replacement controllers are shipped without the PCIe cage installed. Before installing the replacement controller, you must remove the PCIe cage from the failed controller and install it into the replacement controller.

Caution

Before you attempt to replace the controller:

- Do not remove the failed controller until you are ready to install the replacement.
- Verify that the replacement controller matches the part shown on the RMA work order.
- Determine the state of the controllers.

  See *Check Array Model Number, NimbleOS Version, and Operating State Using the GUI*.

Procedure

1. Prepare the failed controller for replacement.
   a) Log in to the array using the CLI.
   b) Determine whether the failed controller is in Standby mode.
      ctrlr --list --array *array_name* y
   c) If the failed controller is in Active mode, perform a manual failover.
      failover --array *array_name*
   d) Verify that the manual failover placed the failed controller in Standby mode.
      ctrlr --list
   e) Halt the standby controller.
      halt --array *array_name* **--controller** {*A* | *B*}

      Example

      ```
      NimbleOS $ halt --array array123 --controller A
      ```

2. Remove the failed controller.
   a) Label all cables to ensure proper recabling later, then remove them from the controller.
   b) Pinch the controller release lever catch to release the controller release lever.

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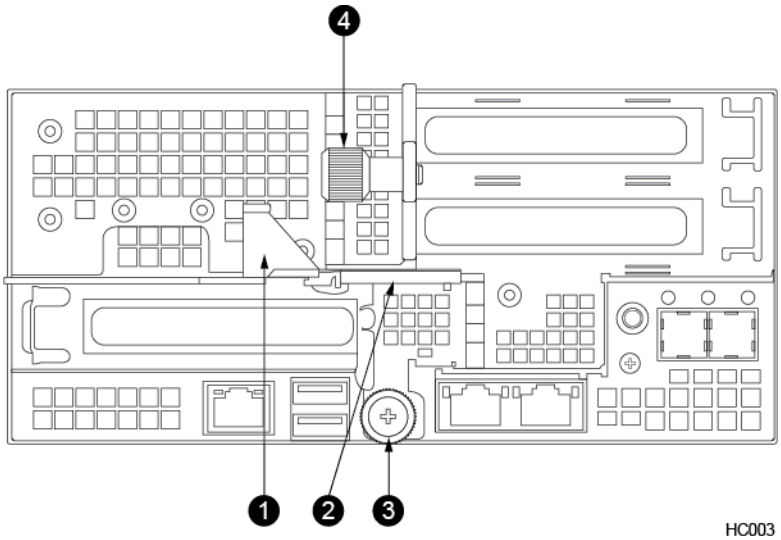


1 Controller release lever
2 Controller release lever catch
3 Thumbscrew - PCIe cage release
4 Thumbscrew - PCIe card release

c) Firmly pull the controller release lever until the controller slides out of the chassis. Then place the controller on a flat surface.

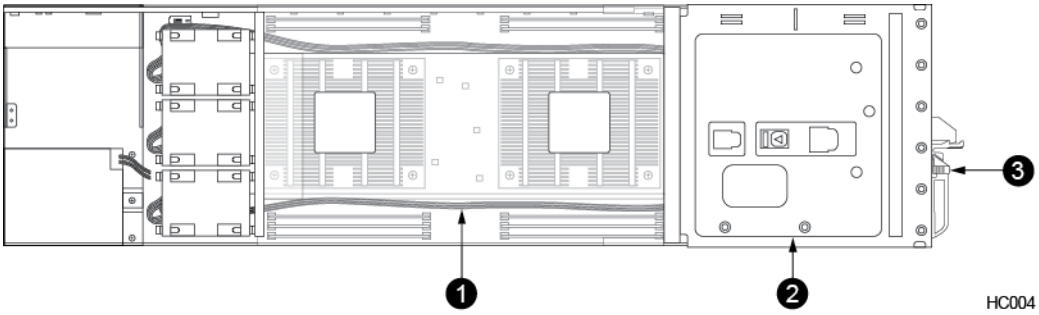
Important

To avoid electrostatic damage, place array components on a grounded anti-static mat. Use an ESD wrist strap during removal and replacement.

3 Remove the PCIe cage from the failed controller.

a) Loosen the bottom thumbscrew on the PCIe cage (item #3 in the figure in Step 2, above).

Important For AF20 and HF20 models you must also remove the transparent controller shroud from the controller.



1 Controller shroud
2 PCIe cage
3 Controller release lever

b) **For AF20 and HF20 models:** Grasp both sides of the PCIe cage and lift the cage out of the controller, making sure that the cage clears the guide pins and that both riser cards and the bridge board connector are properly unseated.

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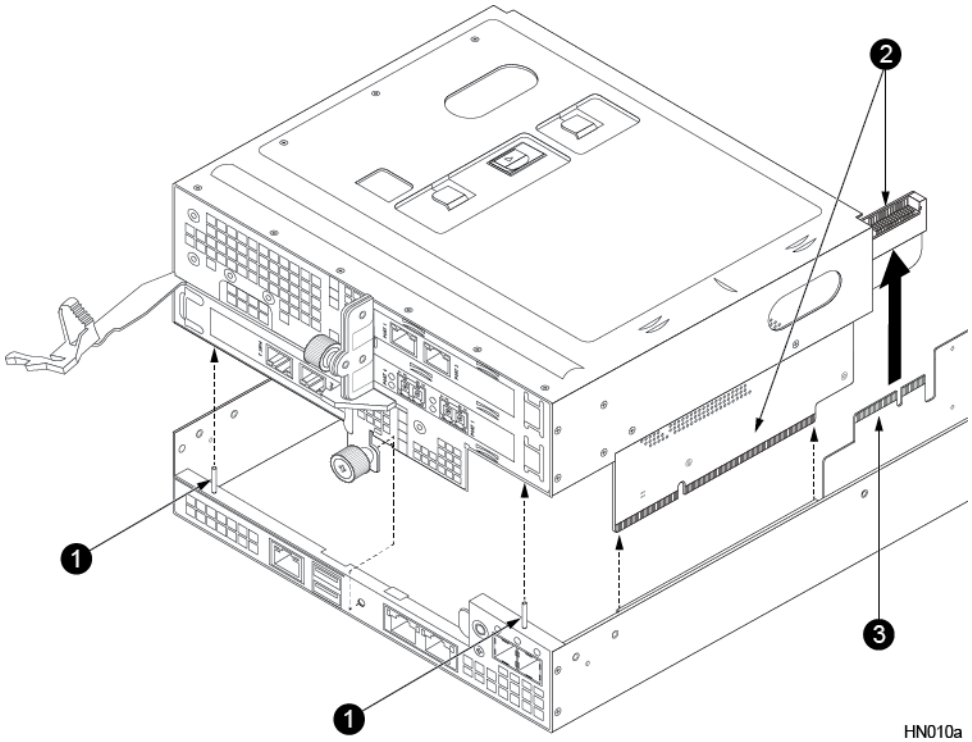

1 Guide pins
2 Riser card
3 Bridge board

c) **For all other models**: Grasp both sides of the PCIe cage and lift the cage out of the controller making sure the cage clears the guide pins and that the underlying riser cards are properly unseated from their connectors.

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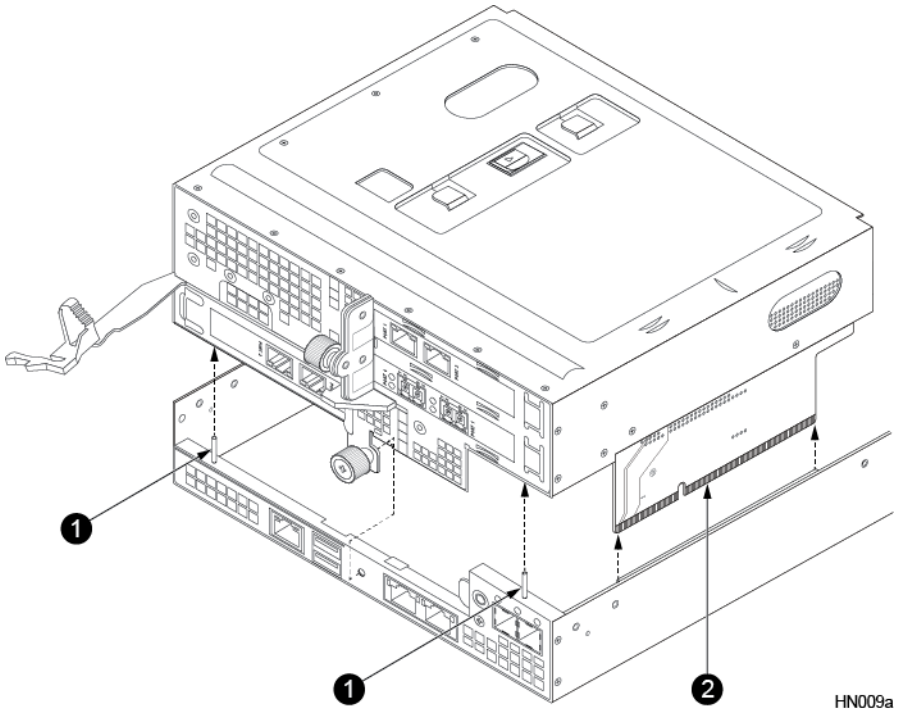

1 Guide pins **2** Riser card

4 Insert the PCIe cage into the controller.

a) **For AF20 and HF20 models:** Lower the PCIe cage back into the controller, making sure that the PCIe cage aligns with the guide pins, and that the riser card with the bridge board connector aligns with the bridge board. Press down on the top of the PCIe cage ensuring that both riser cards and the bridge board connector are properly seated. Then replace the controller shroud.

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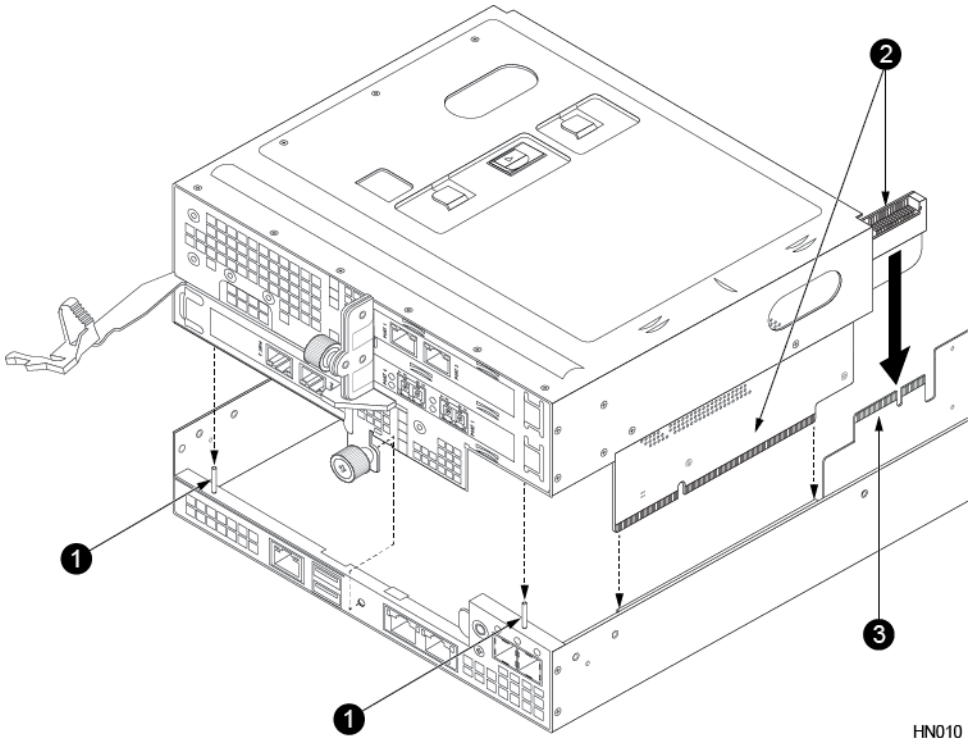

1 Guide pins
2 Riser card
3 Bridge board

b) **For all other models**: Lower the PCIe cage back into the controller, making sure that the PCIe cage aligns with the guide pins. Press down on the top of the PCIe cage ensuring that both riser cards are properly seated in the connectors. Also make sure that the NIC cards clear the controller shroud during installation.

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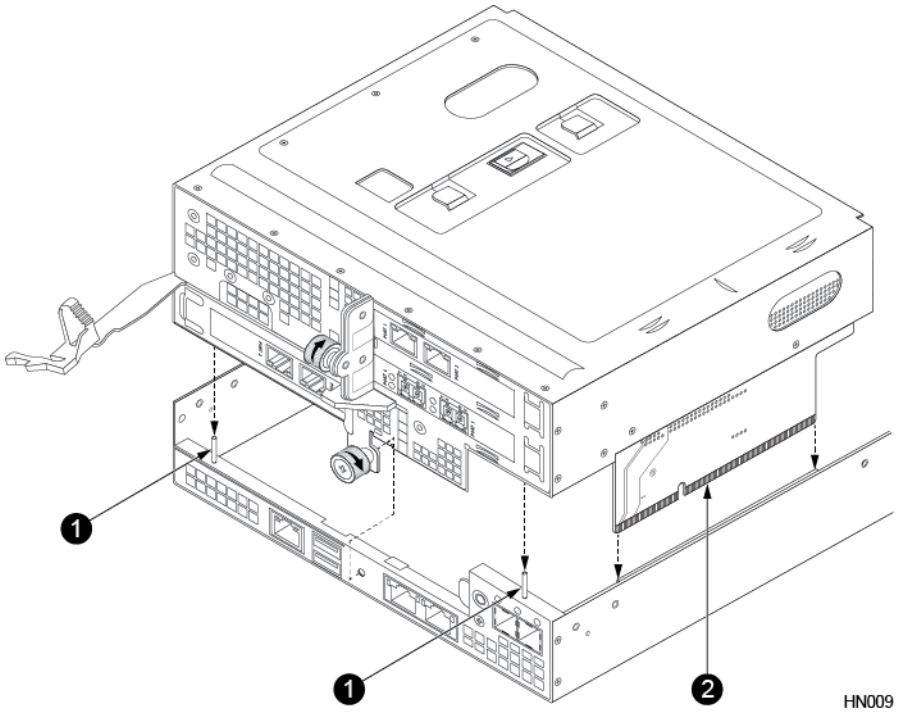

1 Guide pins **2** Riser card

c) Tighten the bottom thumbscrew.

5 Return the controller shroud into place if you removed it to access the PCIe cage.
   a) Align the notches in the shroud (marked by arrows) with the pegs on the controller.
   b) Lower the shroud into place. Make sure the tabs on the shroud seat properly in the controller.

6 Install the replacement controller.
   a) Make sure the controller release lever is fully extended.
   b) Slide the replacement controller into the chassis bay. Do not force the controller. If it does not slide in easily, remove it and retry.
   c) After the new controller is in place, return the controller release lever to its original closed position until the catch clicks, and then tighten the thumbscrew.
   d) Reconnect all the cables to the new controller (as labeled from step 2).

7 Verify that the new controller is powered on.

   Once installed, the replacement controller powers on automatically. The controller LEDs on both the left and right side of the array remain on. If the controller does not power on automatically, contact HPE Nimble Storage Support.

   Note If firmware updates are required, the new controller can take from 15 to 45 minutes to appear in the UI. If the controller takes longer than 45 minutes to report an Active/Standby state, contact HPE Nimble Storage Support for assistance.

8 Return the failed controller as directed on the RMA work order.

Replace a PCIe Card

Use this procedure to replace existing network interface cards (NICs), host bus adapters (HBAs), or storage class memory (SCM) on your HPE Nimble Storage array.

Note SCM is available for AF60 and AF80 model arrays.

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Before you begin

Time required:	15 minutes per controller
Parts required:	Replacement NIC, HBA, or SCM ordered from HPE Nimble Storage
Information required:	• RMA (Return Material Authorization) work order • Case number • Array serial number
Tools required:	• ESD (electrostatic discharge) strap or appropriate grounding device
Support contact:	See *Support*.

HPE Nimble Storage recommends using the Maintenance Window functionality within the HPE InfoSight portal to inform HPE Nimble Storage Support of upcoming maintenance windows.

Refer to *https://infosight.hpe.com/dashboards/nimble/wellness/maintenance-windows* for more information.

Important

Controllers may only be serviced in Standby mode. Never remove a controller running in Active mode. You do not have to shut down the array or expansion shelf to replace or add a PCIe card. An HPE Nimble Storage array can function with one active controller while the PCIe card is added on the standby controller.

Procedure

1. Identify and halt the controller that is in Standby mode.
   a) Log in to the array using the CLI.
   b) Determine which controller is in Standby or Unknown mode.
      ctrlr --list --array *array_name*
   c) Halt the standby controller.
      halt --array *array_name* **--controller** {*A* | *B*}
2. Physically remove the standby controller.
   a) Label all cables to ensure proper recabling later, then remove them from the controller.
   b) Pinch the controller release lever catch to release the controller release lever.
   c) Firmly pull the controller release lever until the controller slides out of the chassis. Then place the controller on a flat surface.

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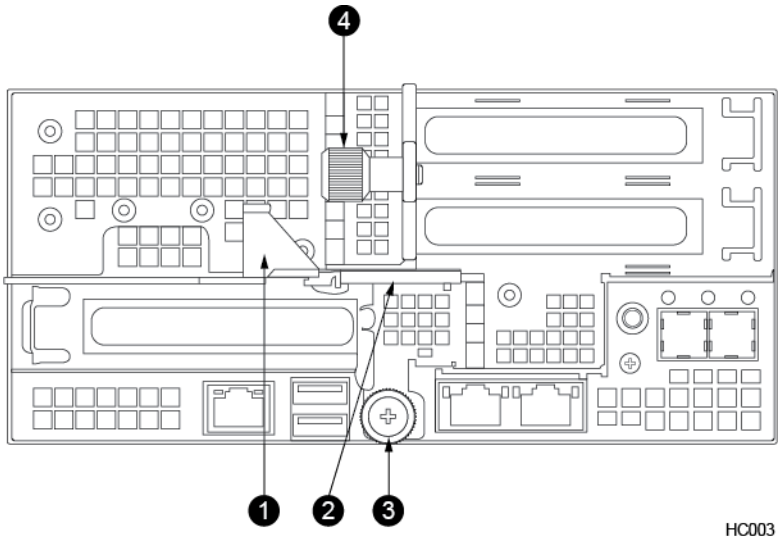


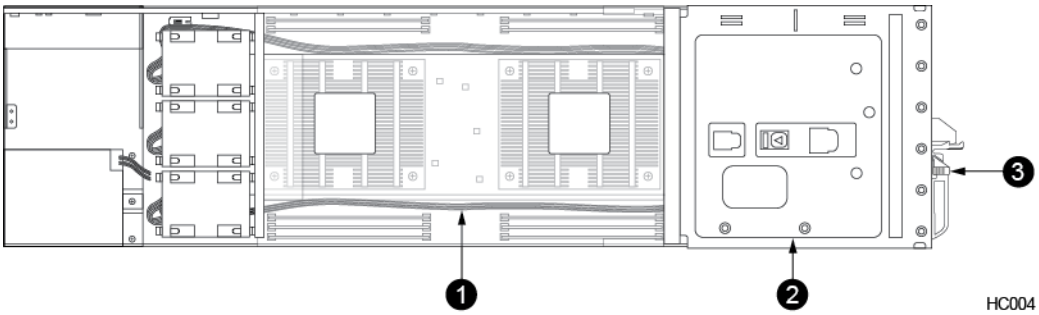
1 Controller release lever
2 Controller release lever catch
3 Thumbscrew - PCIe cage release
4 Thumbscrew - PCIe card release

3 Remove the PCIe cage.

a) Loosen the bottom thumbscrew on the PCIe cage.

Important

For AF20 and HF20 models you must also remove the transparent controller shroud from the controller.



1 Controller shroud
2 PCIe cage
3 Controller release lever

b) **For AF20 and HF20 models:** Grasp both sides of the PCIe cage and lift the cage out of the controller, making sure that the cage clears the guide pins and that both riser cards and the bridge board connector are properly unseated.

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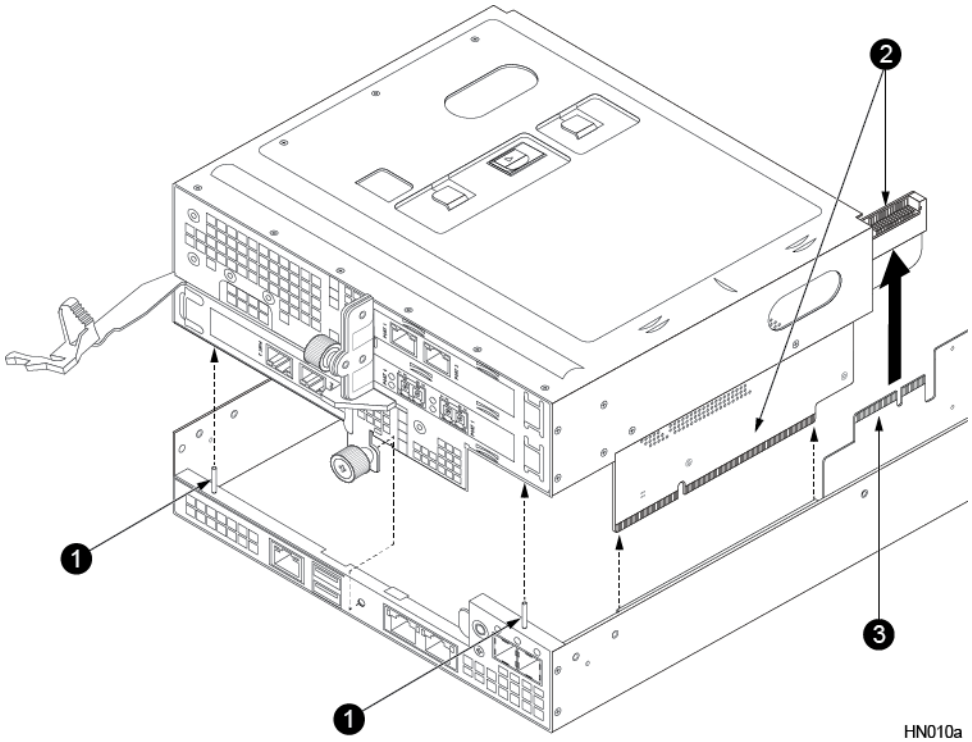

1 Guide pins
2 Riser card
3 Bridge board

c) **For all other models**: Grasp both sides of the PCIe cage and lift the cage out of the controller making sure the cage clears the guide pins and that the underlying riser cards are properly unseated from their connectors.

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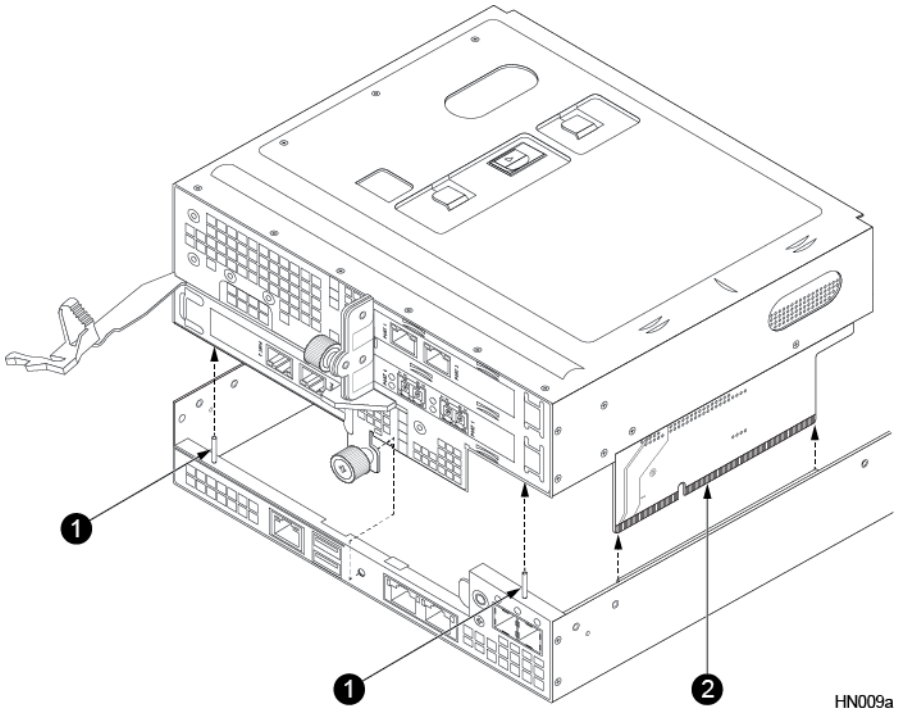
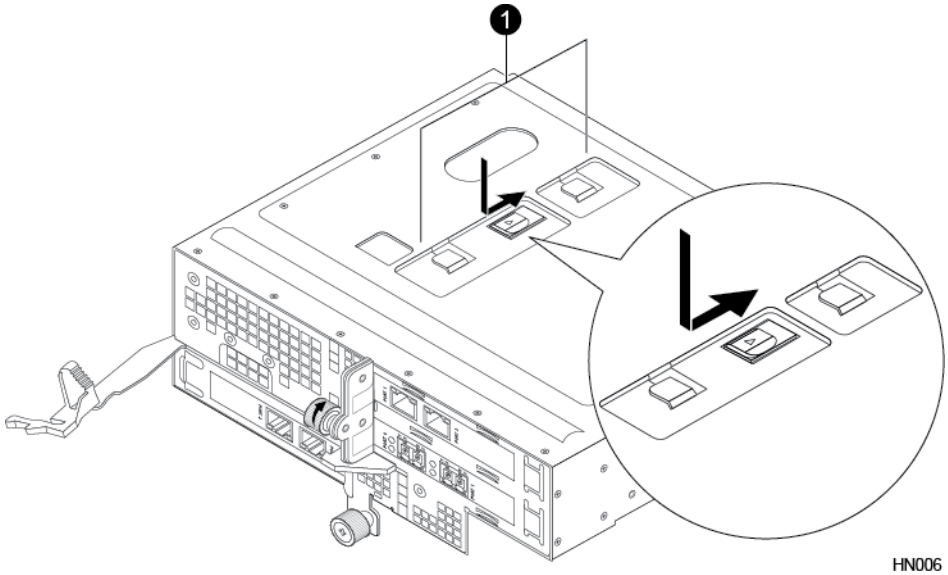


1 Guide pins **2** Riser card

4 Loosen the PCIe card holder.

a) The PCIe card holder protrudes through the top of the PCIe cage in three sections. Push down on the center section and slide the PCIe card holder in the direction of the arrow to loosen it from the cage.



1 PCIe card holder release

5 Remove the PCIe card holder.

a) Turn the PCIe cage upside down and place on a flat surface.

b) Remove the loosened PCIe card holder by sliding it away from the PCIe cards.

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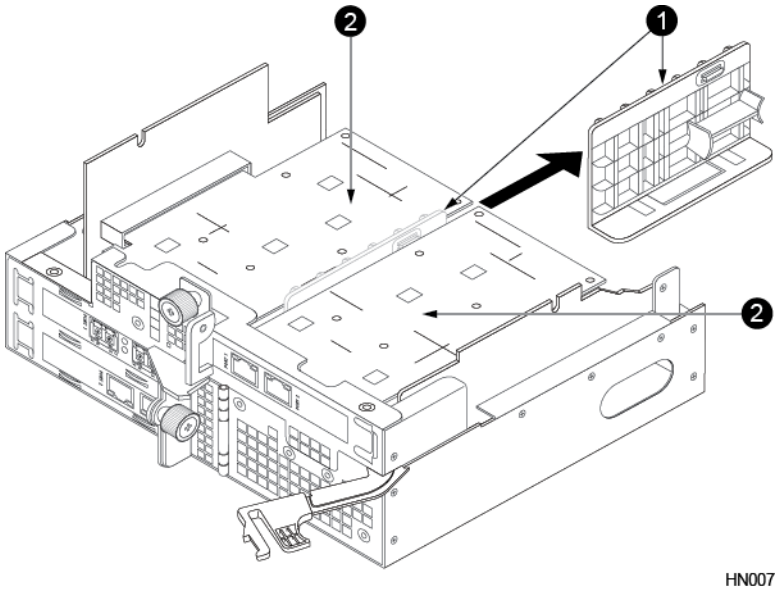

1 PCIe card holder **2** PCIe card

Important

Note the card holder orientation relative to the PCIe card when you remove it as you will reinstall the card holder in a later step.

6 Remove a PCIe card.

a) Loosen and then swing the thumbscrew next to the PCIe card into the open position.
b) Pull the PCIe card out of the card slot.

Note If you are installing a quad port 10Gb SFP+ NIC card, you must remove the transceivers from the ports before attempting to the install the card.

7 Insert the new PCIe card.

a) Insert the new PCIe card into the card slot.
b) Swing the thumbscrew next to the card into the closed position and tighten.

Tip You can temporarily remove the SFPs and the rubber port covers on the new PCIe card to make it easier to angle the card into the slot.

Note After the card is successfully installed, reinsert the transceiver into the port if you removed it.

8 Reinsert the PCIe card holder.

a) Rotate the card holder 45 degrees clockwise and line up the top most PCIe card with the plastic tabs.
b) Insert the card holder in the direction of the arrow until it hits the rear stop.

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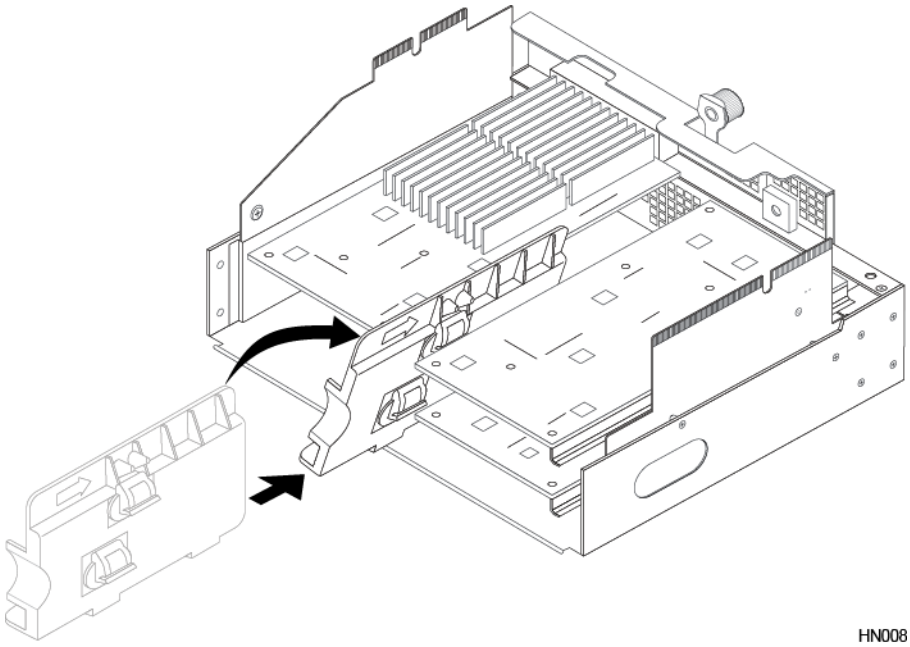
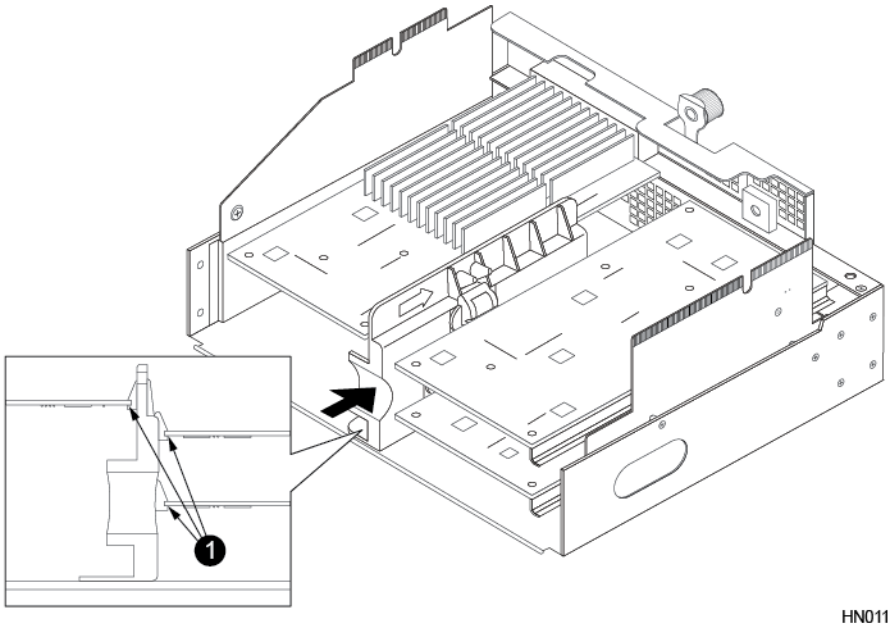


c) Twist the card holder into place ensuring the rubber tabs engage all PCIe cards properly.



1 Rubber tabs

d) Continue to slide the card holder into the PCIe cage until it locks into place.

9 Insert the PCIe cage into the controller.

a) Turn the PCIe cage right side up.

b) **For AF20 and HF20 models:** Lower the PCIe cage back into the controller, making sure that the PCIe cage aligns with the guide pins, and that the riser card with the bridge board connector aligns with the bridge board. Press down on the top of the PCIe cage ensuring that both riser cards and the bridge board connector are properly seated. Then replace the controller shroud.

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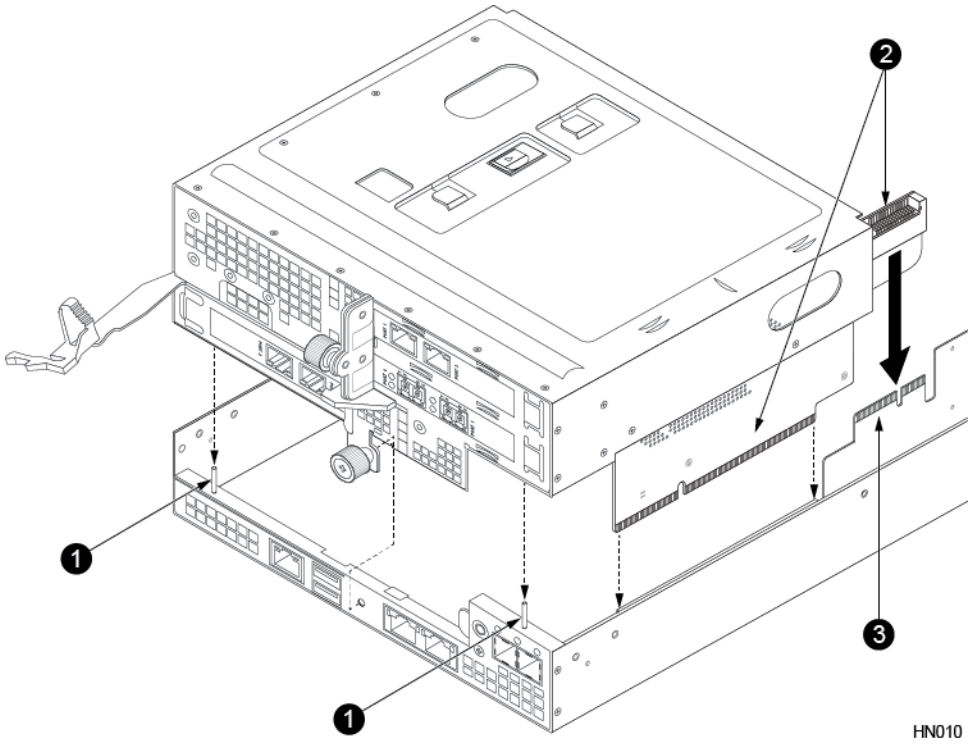

1 Guide pins
2 Riser card
3 Bridge board

To replace the controller shroud:

1. Align the notches in the shroud (marked by arrows) with the pegs on the controller.
2. Lower the shroud into place, making sure the tabs on the shroud seat properly in the controller.

c) **For all other models**: Lower the PCIe cage back into the controller, making sure that the PCIe cage aligns with the guide pins. Press down on the top of the PCIe cage ensuring that both riser cards are properly seated in the connectors. Also make sure that the PCIe cards clear the controller shroud during installation.

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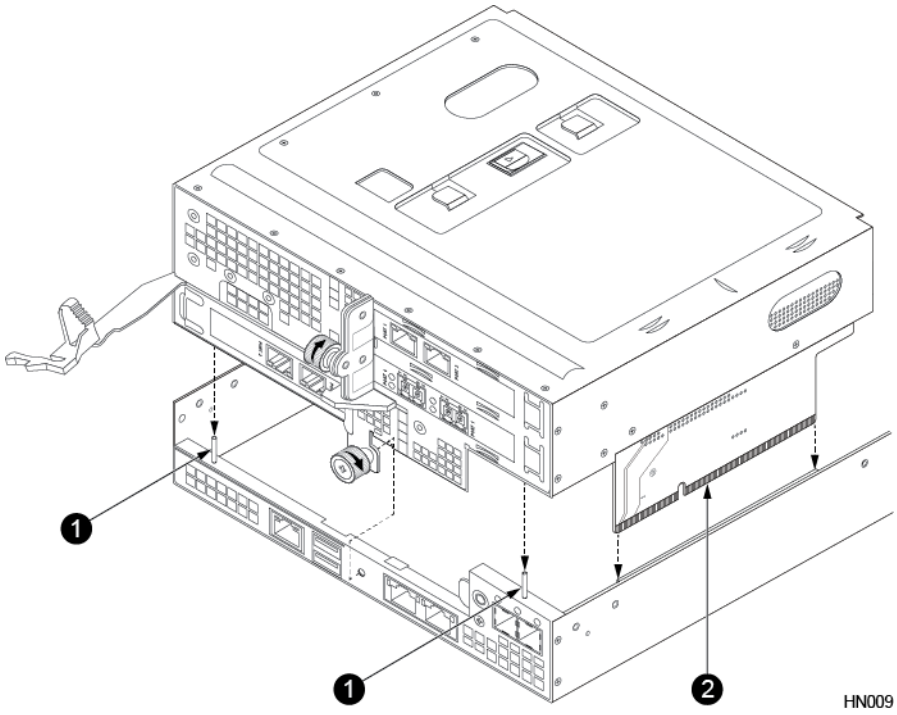

1 Guide pins **2** Riser card

d) Tighten the bottom thumbscrew.

10 Insert the controller into the chassis.

a) Make sure the controller release lever is fully extended.

b) Insert the controller into the chassis and push the controller all the way in until the controller release lever locks into the release lever catch.

The controller will automatically start.

11 Verify configuration of new PCIe cards.

a) In the GUI, click **Hardware**.

b) Verify that the controllers are in Active and Standby modes. For NICs or HBAs, verify that the ports are connected (green). For SCM, verify that the icon is blue.

Note Ports that are not configured for management traffic (NIC ports only) or data traffic (NIC or HBA ports) will have an unconfigured (gray) status. HBA ports cannot be configured for management traffic.

Fail Over a Controller Using the GUI

A failover switches management of the array from the active controller to the standby controller.

Before you begin

Failover requires one controller to be in Active mode and the other controller to be in Standby mode.

Procedure

1 In the NimbleOS GUI, choose **Hardware**.

2 From the list of arrays, click the array you want to fail over.

3 In the Array view, note which controller is Active and which is Standby.

4 Click **Make Active** on the Standby controller.

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5 In the confirmation dialog box, click **Yes**.
During the failover operation, the standby controller first goes into Solo mode, and then into Active mode. The active controller goes into Unknown mode, then into Stale mode, and finally into Standby mode.

Fail Over a Controller Using the CLI

A failover switches management of the array from the active controller to the standby controller.

Before you begin
Failover requires one controller to be in Active mode and the other controller to be in Standby mode.

Procedure

1 Determine the name of the array.
array --list
The name of the array appears in the list.
2 Perform the failover.
failover --array *array_name*
During the failover operation, the standby controller first goes into Solo mode, and then into Active mode. The active controller goes into Unknown mode, then into Stale mode, and finally into Standby mode.

Example

```
Nimble OS $ failover --array datamaster-a
```

Determine the Operating State of the Controllers Using the GUI

Procedure

1 In the NimbleOS GUI, choose **Hardware**.
2 Click the link of the array you want.
3 Look for *Controller A* or *Controller B*.
4 Check the operating state of each controller.
One controller should be in Active mode and the other in Standby mode.

Determine the Operating State of the Controllers Using the CLI

Procedure

List the controllers.
ctrlr --list
A list of controllers appears with information including their operating states.
One controller should be in Active mode and the other in Standby mode.

Expander Maintenance

If an expander fails, or any component on an expander fails, such as the fans, replace the entire expander.

Replace an Expander

Use this procedure to replace existing expanders in your expansion shelf.

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Before you begin

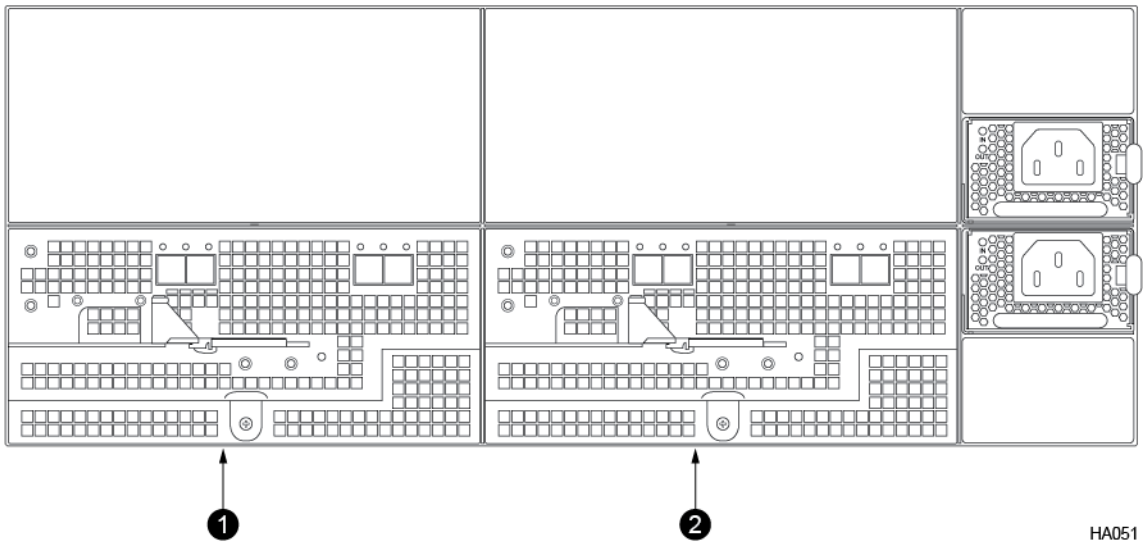
Time required:	15 minutes per expander (Do not exceed 15 minutes to avoid overheating.)
Parts required:	Replacement expander ordered from HPE Nimble Storage
Information required:	• RMA (Return Material Authorization) work order • Case number • Expansion shelf serial number The expansion shelf serial number can be found on the back of Controller A.
Tools required:	• ESD (electrostatic discharge) strap or appropriate grounding device
Support contact:	See *Support*.

HPE Nimble Storage recommends using the Maintenance Window functionality within the HPE InfoSight portal to inform HPE Nimble Storage Support of upcoming maintenance windows.

Refer to *https://infosight.hpe.com/dashboards/nimble/wellness/maintenance-windows* for more information.

You can disable automated support case generation during planned maintenance from the Manage Maintenance Windows page. After a maintenance window is set, no further communication with HPE Nimble Storage Support is required.

The expansion shelf serial number label is located above Expander A.



1 Expander A **2** Expander B

Note

- Be sure to identify the correct expansion shelf by its serial number.
- Be sure to identify the correct expander (A or B) as the one that has failed.
- If the incorrect expander is removed, an unplanned failover occurs.

Procedure

1 Prepare the array for expander replacement.

a) Log in to the array using the CLI.

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Type **ctrlr --list --array** *array_name* to determine which controller is in Active mode (A or B).

b) If the controller in Active mode is in the same path as the failed expander, perform a manual failover:

Type **failover** *array_name*

ctrlr --list --array *array_name* to verify that the manual failover placed the controller in Standby mode.

2 Remove the failed expander.

a) Label all cables to ensure proper recabling later, then remove the cables from the expander.

b) Pinch the controller handle release clip to unlatch the controller handle.

c) Grasp the failed expander by the handle and use a firm, steady pressure to pull the expander out of the chassis bay. Use two hands to support the expander during removal, but keep the expander tray level, with one hand supporting the expander platform from underneath to prevent it from falling forward.

Important

To avoid electrostatic damage, place array components on a grounded anti-static mat. Use an ESD wrist strap during removal and replacement.

3 Install the replacement expander.

a) Slide the replacement expander into the chassis bay until the handle latches into place.

Do not force the expander. If it does not slide in easily, remove it and try again.

b) Reattach the cables (use the labeling from step 2a as a guide).

4 Verify that the new expander is powered on.

After it is installed, the replacement expander powers on automatically. The expander LEDs on both the left and right side of the expansion shelf remain on. If the expander does not power on automatically, contact HPE Nimble Storage Support.

Note The new expander might take up to 15 minutes to appear in the user interface. If the expander takes longer than 15 minutes to report an Active/Standby state, contact HPE Nimble Storage Support for assistance.

5 Return the failed expander as directed on the RMA work order.

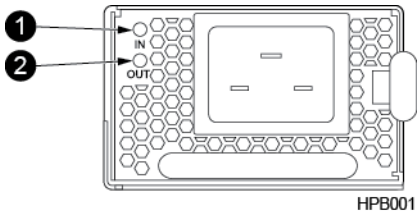
Power Supply Maintenance

The procedures for maintaining power supplies is the same for all HPE Nimble Storage arrays and expansion shelves.

How to Tell that a Power Supply has Failed

Any of the following events can indicate that a power supply has failed:

- LED (In) on the power supply is dark.
- Event appears in the Events list in the hardware category.
- Receipt of an alert email from the array.



1 Power supply LED (In) **2** Power supply LED (Out)

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Replace an AC Power Supply

Use this procedure to replace a failed AC power supply unit (PSU) on your HPE Nimble Storage array or expansion shelf.

Before you begin

Time required:	5 to 10 minutes
Parts required:	Replacement AC power supply ordered from HPE Nimble Storage
Information required: Support contact:	• RMA (Return Material Authorization) work order • Case number • Array serial number See *Support*

HPE Nimble Storage recommends using the Maintenance Window functionality within the HPE InfoSight portal to inform HPE Nimble Storage Support of upcoming maintenance windows.

Refer to *https://infosight.hpe.com/dashboards/nimble/wellness/maintenance-windows* for more information.

You can disable automated support case generation during planned maintenance from the Manage Maintenance Windows page. After a maintenance window is set, no further communication with HPE Nimble Storage Support is required.

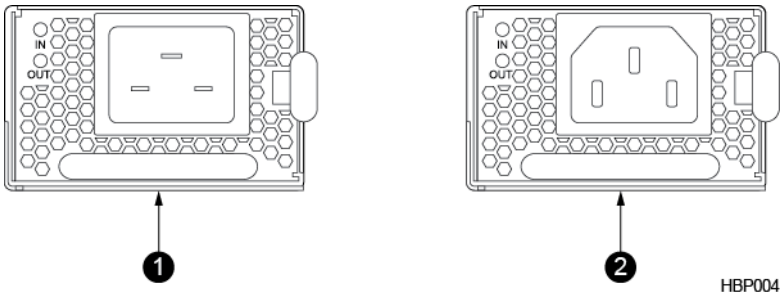
Note

Before you attempt to replace a power supply:

- Do not remove the PSU until you are ready to install the replacement
- Never unplug or unseat both PSUs at the same time
- Use only UL-approved power cords

Procedure

1. Identify the power supply to replace. In the NimbleOS software, the lower power supply is PSU1, and the upper power supply is PSU2.



1 3000W Power Supply **2** 1200W Power Supply

2. Remove the power cord from the PSU by pulling back on the sliding tabs on the sides of the cord and then pulling the cord out of the socket.
3. Push the power supply release lever to the left, grasp the handle, and pull out the PSU.

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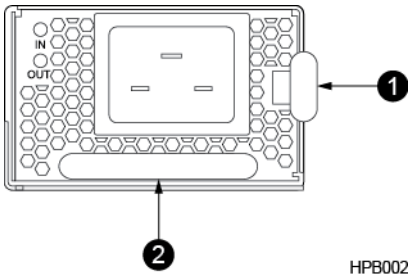

1 Power supply release lever **2** Power supply handle

4. Insert the new PSU. Push in gently until you hear a click.
5. Plug in the power cord.

   Power is automatically restored to the PSU as soon as the cord is plugged in.

Replace a DC Power Supply

Use this procedure to replace a failed DC power supply unit (PSU) on your HPE Nimble Storage array or expansion shelf.

One PSU can adequately power the array while the other PSU is being replaced.

Before you begin

Time required:	10 to 15 minutes
Parts required:	Replacement DC power supply ordered from HPE Nimble Storage
Information required:	• RMA (Return Material Authorization) work order • Case number • Array serial number
Tools required:	• ESD (electrostatic discharge) strap or appropriate grounding device • Phillips screwdriver
Support contact:	See *Support*.

HPE Nimble Storage recommends using the Maintenance Window functionality within the HPE InfoSight portal to inform HPE Nimble Storage Support of upcoming maintenance windows.

Refer to *https://infosight.hpe.com/dashboards/nimble/wellness/maintenance-windows* for more information.

You can disable automated support case generation during planned maintenance from the Manage Maintenance Windows page. After a maintenance window is set, no further communication with HPE Nimble Storage Support is required.

A PSU with an amber LED may have a fault. But an amber LED also indicates:

- The external power is switched off with the DC power connected
- The power supply is not properly seated in its slot
- The array is powered off
- A power supply internal fault has occurred

Verify that the power cord is plugged in, then check for and correct these conditions before you assume that the PSU in your HPE Nimble Storage array needs to be replaced.

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Caution

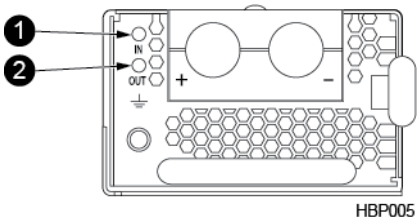
Before you attempt to replace a power supply:

- Do not remove the PSU until you are ready to install the replacement
- Never unplug or unseat both PSUs at the same time
- Use only UL-approved power cords

Procedure

1 Identify the failed PSU.

The LED on a failed PSU is amber or dark.

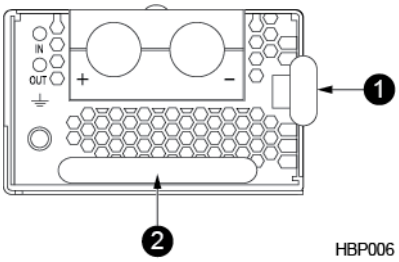


1 In LED **2** Out LED

2 Remove the power connections.

Caution Before proceeding, verify that the DC power source is turned off at the circuit breaker.

a) Push the power supply release lever to the left, grasp the handle, and pull the power supply out several inches to access the connector cover.



1 Power supply release lever **2** Power supply handle

b) Remove the connector cover from the PSU.
c) Unscrew the two wire connections labeled **+** (RTN) and **-** (-48V) from the PSU and pull the wires out.
d) Remove the PSU.

3 Insert the new PSU. Push in gently until you hear a click.

Do not force the power supply. If it fails to install properly, contact HPE Nimble Storage Support.

4 Attach the power connections.

a) Push the power supply release lever to the left, grasp the handle, and pull the power supply out several inches to access the connector cover.
b) Remove the connector cover from the PSU.
c) Using the screws provided in the PSU replacement kit, screw in the two wires from your DC power source to the connections labeled **+** (RTN) and **-** (-48V).
d) Return the connector cover to its position and tighten the cover screw. Maximum torque is 4.3 in-lbs (0.49 N-m).

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e) Return the power supply to its position.

Power is automatically restored to the PSU as soon as the connection is made and the DC power source is turned on.

5 After no more than two minutes, verify that the LED on the PSU is lit and appears solid green.

If the LED does not stop blinking and go solid green, check the connection to the power source. If that does not work, contact HPE Nimble Storage Support.

6 Return the failed PSU as directed on the RMA work order.

Replace AC Power Supplies with DC Power Supplies

Use this procedure to replace the AC power supply units (PSUs) on your HPE Nimble Storage array with DC PSUs.

One PSU can adequately power the array while the other PSU is being replaced.

Warning You can only replace the AC Power supply with a DC Power supply on a chassis that has grounding lugs.

Note During PSU replacement, the array will run properly while powered with AC and DC power sources at the same time.

Before you begin

Time required:	10 to 15 minutes
Parts required:	Replacement DC power supplies ordered from HPE Nimble Storage
Information required:	• Case number • Array serial number
Tools required:	• ESD (electrostatic discharge) strap or appropriate grounding device • 7/16-inch (11 mm) torque wrench • Phillips screwdriver
Support contact:	See *Support*.

HPE Nimble Storage recommends using the Maintenance Window functionality within the HPE InfoSight portal to inform HPE Nimble Storage Support of upcoming maintenance windows.

Refer to *https://infosight.hpe.com/dashboards/nimble/wellness/maintenance-windows* for more information.

You can disable automated support case generation during planned maintenance from the Manage Maintenance Windows page. After a maintenance window is set, no further communication with HPE Nimble Storage Support is required.

Procedure

1 Install the provided ground cable.

The power supply replacement kit includes a 72 inch 4-gauge ground cable.

a) Connect the ground cable to both grounding lugs on the rear of the array chassis. Using a 7/16-inch (11 mm) torque wrench, apply between 41 in-lbs (4.63 N-m) and 57 in-lbs (6.44 N-m) of torque to each nut.

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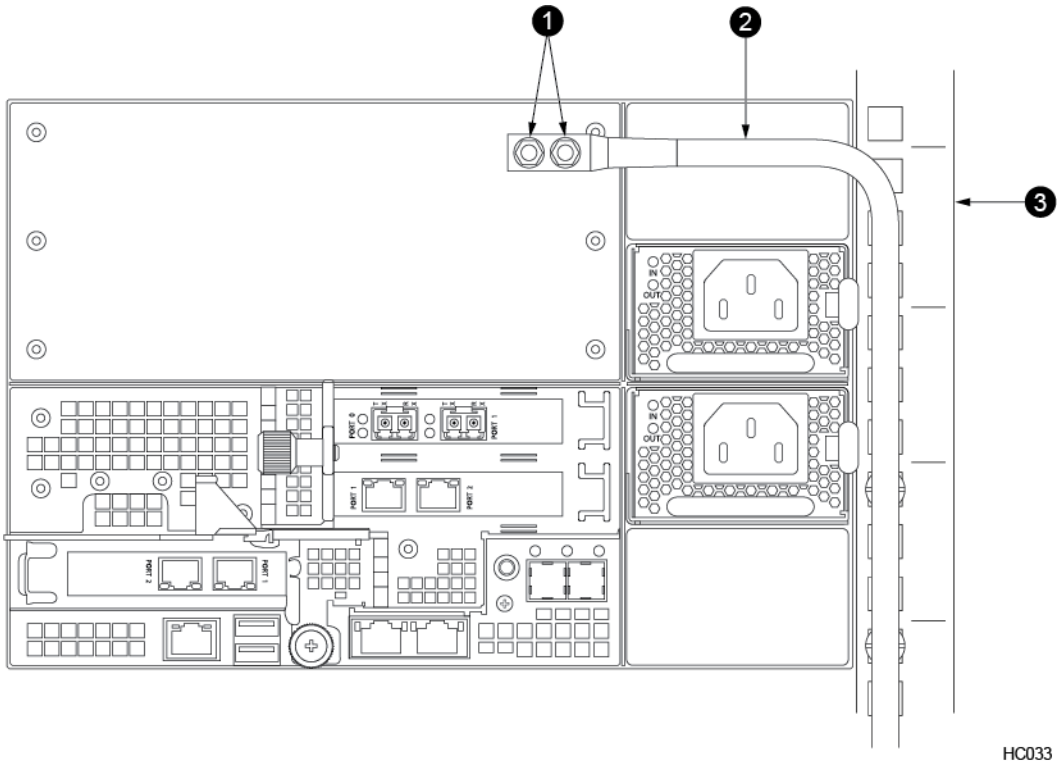
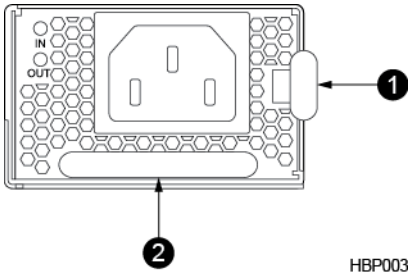


1 Grounding lugs
2 Ground cable
3 Left back rack post

b) Connect the other end of the ground cable to an approved grounding point in your environment, such as a grounding plate on the rack.

2 Remove the power cord from one of the AC PSUs.

3 Push the power supply release lever to the left, grasp the handle, and pull out the PSU.



1 Power supply release lever **2** Power supply handle

4 Insert the new PSU. Push in gently until you hear a click.

Do not force the power supply. If it does not slide in properly, remove it and try again.

The DC PSU has an internal fuse for overload protection. In the installation environment:

- A 50A circuit breaker is required at the DC power source
- To disconnect the array from DC power, turn off both branch circuit breakers that supply power to the array PSUs

5 Attach the power connections.

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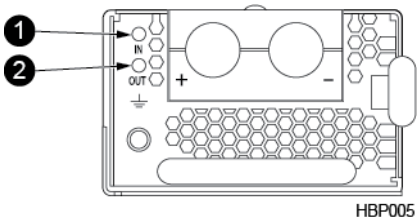
a) Push the power supply release lever to the left, grasp the handle, and pull the power supply out several inches to access the connector cover.
b) Remove the connector cover from the PSU.
c) Using the screws provided in the PSU replacement kit, screw in the two wires from your DC power source to the connections labeled **+** (RTN) and **-** (-48V).

   Use 6-gauge wire or larger and UL-certified connectors, such as Panduit LCD6-14A-L.

d) Return the connector cover to its position and tighten the cover screw. Maximum torque is 4.3 in-lbs (0.49 N-m).
e) Return the power supply to its position.

Power is automatically restored to the PSU as soon as the connection is made and the DC power source is turned on.

6 After no more than two minutes, verify that the LED on the PSU is lit and appears solid green.



1 In LED **2** Out LED

If the LED does not stop blinking and go solid green, check the connection to the power source. If that does not work, contact HPE Nimble Storage Support.

7 Repeat steps 2 through 6 for the second PSU.

Chassis Maintenance

If your existing chassis needs to be replaced, you can move your array components (drives, power supply, and controllers) with all network cabling to a new chassis ordered from HPE Nimble Storage.

Replace the Chassis

Use this procedure to replace the chassis of your HPE Nimble Storage array.

HPE Nimble Storage recommends using the Maintenance Window functionality within the HPE InfoSight portal to inform HPE Nimble Storage Support of upcoming maintenance windows.

Refer to *https://infosight.hpe.com/dashboards/nimble/wellness/maintenance-windows* for more information.

You can disable automated support case generation during planned maintenance from the Manage Maintenance Windows page. After a maintenance window is set, no further communication with HPE Nimble Storage Support is required.

Before you begin

Time required:	1 hour.
Parts required:	Replacement chassis ordered from HPE Nimble Storage
Information required:	• RMA (Return Material Authorization) work order • Case number

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	• Array serial number
Tools required:	• ESD (electrostatic discharge) strap or appropriate grounding device
Support contact:	See *Support*.

A replacement chassis comes without drives, controllers, or power supplies. Those components come from your existing array.

Caution

Before you attempt to replace the chassis:

- Plan how you want to install the new chassis into the rack. Does the existing array have to be removed first? Do you have a jack, or other lifting device, or a second person to help you lift the array into place?
- Schedule for adequate downtime during hours of minimal array use.
- Disconnect the array from your VMware host.
- Unmount the array from your host.

Procedure

1. Shut down the existing array using one of the following methods.
   - In the GUI, go to **Administration > Shutdown** and click **Shut Down Array**.
   - In the CLI, type **halt --array** *array_name*.
2. Label the cables for all connections so that you can easily reconnect them to the correct ports during installation.
3. Unplug the power cords, network cables, and SAS cables from the array, and remove the front bezel.
4. Remove the existing array from the rack.
5. Install the new chassis into the rack.
6. Move the drive carriers from the existing array to the new chassis.

   Do not remove a drive from its drive carrier.

   a) Slide the black release tab toward the carrier LED. The handle springs open.

      For Dual Flash drive carriers, you must remove the small retention clip that is directly next to the release tab by firmly grasping it and pulling straight out.

   b) Pull the drive carrier handle to remove the drive in slot 1 from the existing array. Use firm, steady pressure.

      For Dual Flash drive carriers, press the release tab and pull the drive carrier from the chassis bay.

   c) Slide the drive into the drive bay of slot 1 on the new chassis. Do not force the drive. If it does not slide in smoothly, remove it and start again.

   d) Close the drive carrier handle.

      Push the handle until it fully engages with the release tab.

   e) Repeat this action with the other drive carriers.

      Important

      Always install each drive into the same slot number on the new chassis as on the existing array.

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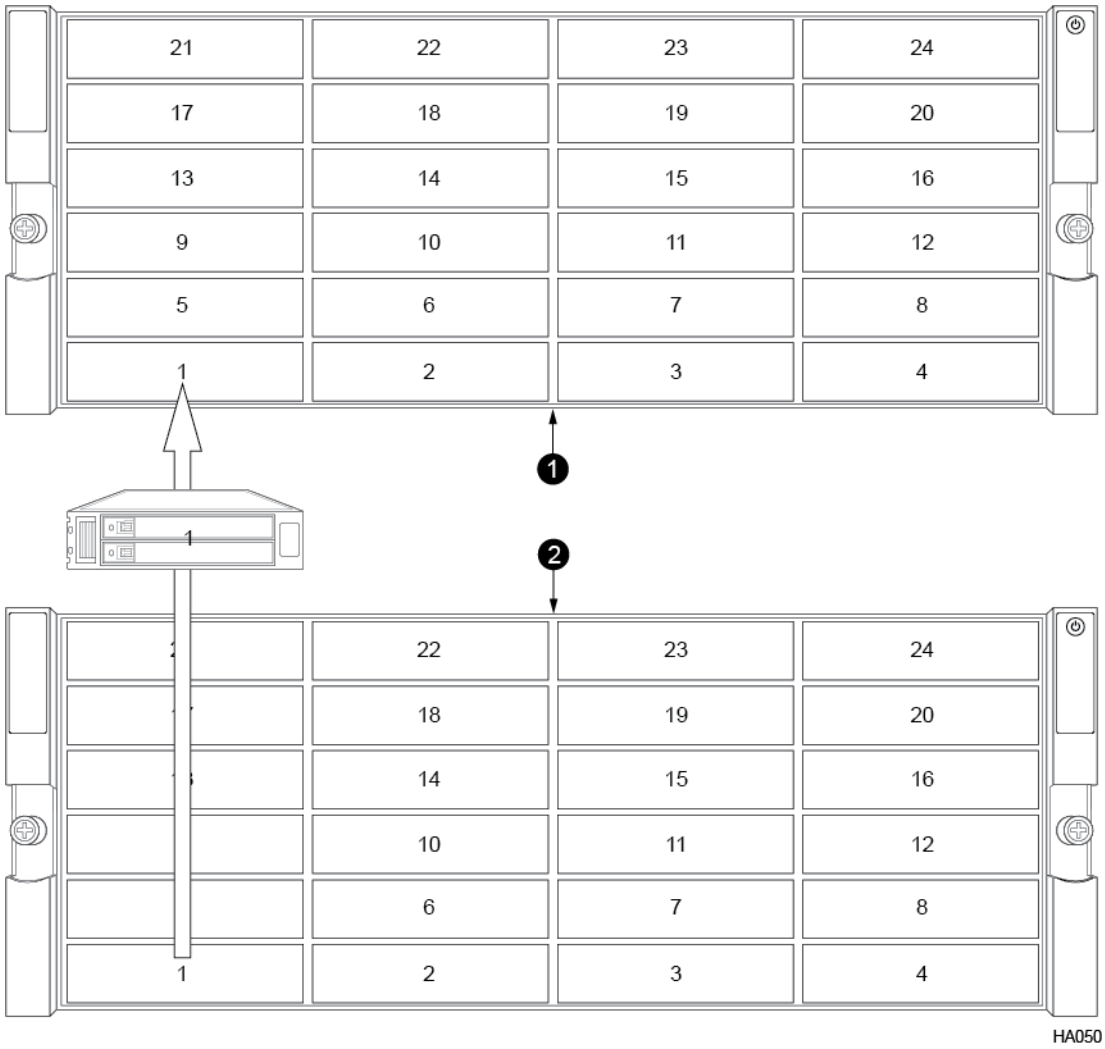

1 New array **2** Existing array

7 Move the controllers from the existing array to the new chassis.

a) Pinch the controller release lever catch to release the controller release lever.
b) Firmly pull the controller release lever until the controller slides out of the chassis.
c) Slide the controller into the same bay on the new chassis, in the same controller slot.

Note Do not force the controller. If it does not slide in easily, remove it and try again.

d) Return the release lever to its original closed position.
e) Repeat this action with the other controller. Each controller must be installed in the same bay of the new chassis.

8 Move the power supplies from the existing array to the new chassis.

a) Push the power supply release lever to the left, grasp the handle, and pull the power supply out of the chassis bay.
b) Slide the power supply into a bay of the new chassis until you hear a click. Do not force the power supply.

Note If it does not slide in easily, remove it and try again.

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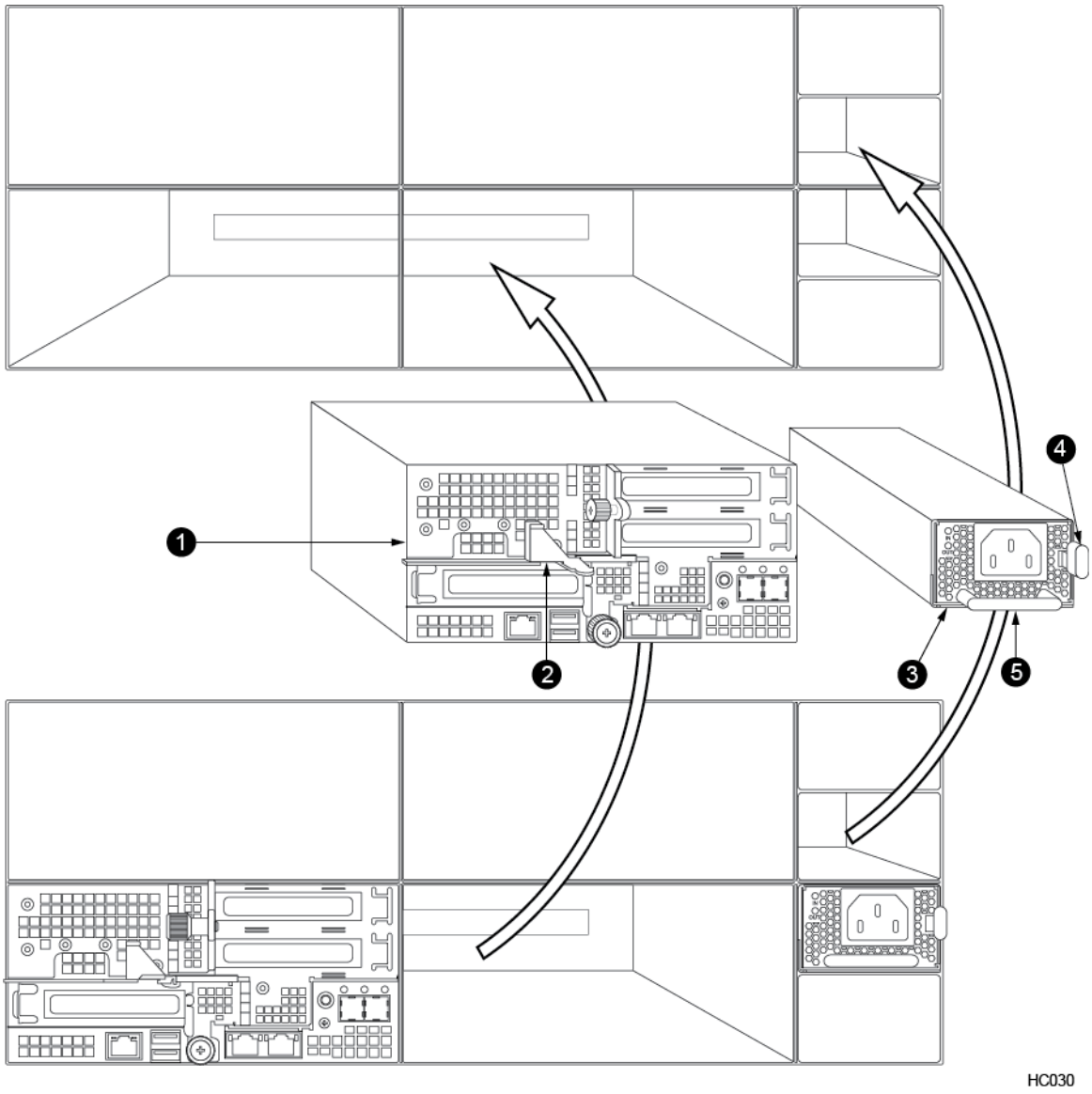
c) Repeat this action with the other power supply. A power supply can be installed in either bay of the new chassis.



1 Controller
2 Controller handle
3 Power supply
4 Power supply release lever
5 Power supply handle

When all components from the array are installed in the new chassis, the new chassis becomes the new array.

9 Plug in the network cables first, then SAS cables, followed by the power cords into the new array, and replace the front bezel.

10 Verify that the array is powered on.

The array powers up automatically when the power cables are connected. If the array did not power on, contact HPE Nimble Storage Support.

11 Contact HPE Nimble Storage Support to complete the configuration of the chassis.

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Support will provide guidance for the follow-up tasks that must be performed after the chassis has been physically exchanged.

It is critical that you complete these tasks as part of the same maintenance window. You must engage Support to perform the tasks before you reconnect the host environment to volumes. As part of this process, Support will also verify the correct operation of the array.

Note If you are performing an ES3 or AFS3 chassis replacement, these additional steps are not required.

12 Return the old chassis as directed on the RMA work order.

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Upgrade Procedures

Your HPE Nimble Storage array can be upgraded to add more SSDs (in an empty drive sled of a carrier) to increase capacity, as well as by installing new NICs or FC HBAs and cabling additional expansion shelves.

To check supported upgrades for your array, refer to the *Array Configuration Matrix* available on InfoSight at: *https://infosight.nimblestorage.com*.

Upgrade SSDs

Use these procedures to add new SSDs to your HPE Nimble Storage array or expansion shelf.

- *Upgrade SSDs (AFxx, AFS3)* on page 99
- *Upgrade SSDs (AF20Q)* on page 101

Upgrade SSDs (AFxx, AFS3)

Use this procedure to add new SSDs to your HPE Nimble Storage array or expansion shelf.

Time required:	Up to 30 minutes
Parts required:	New 24-pack of SSDs ordered from HPE Nimble Storage
Tools required:	• ESD (electrostatic discharge) strap or appropriate grounding device
Support contact:	See *Support*.

HPE Nimble Storage recommends using the Maintenance Window functionality within the HPE InfoSight portal to inform HPE Nimble Storage Support of upcoming maintenance windows.

Refer to *https://infosight.hpe.com/dashboards/nimble/wellness/maintenance-windows* for more information.

You can disable automated support case generation during planned maintenance from the Manage Maintenance Windows page. After a maintenance window is set, no further communication with HPE Nimble Storage Support is required.

Note You do not have to shut down the array to upgrade drives.

Caution

Before you install the new drives:

- All Drive A sleds must be fully populated before installing SSDs in Drive B sleds.
- The pack of SSDs must all be the same capacity.

  Note The SSDs in Drive B can be different capacities than the SSDs already installed in Drive A.

- AFxx arrays must be running NimbleOS 5.0.5 or later. AFxxxx arrays and AFS2 expansion shelves must be running 3.4.x or later.
- If you are replacing a drive that has failed, see *Replace a Failed Drive (SSD)* on page 64
- After installation, the new drives must be activated before they are fully functional.

  Note The drives in bank B will not report as installed in the GUI or CLI until all drives in the bank are populated.

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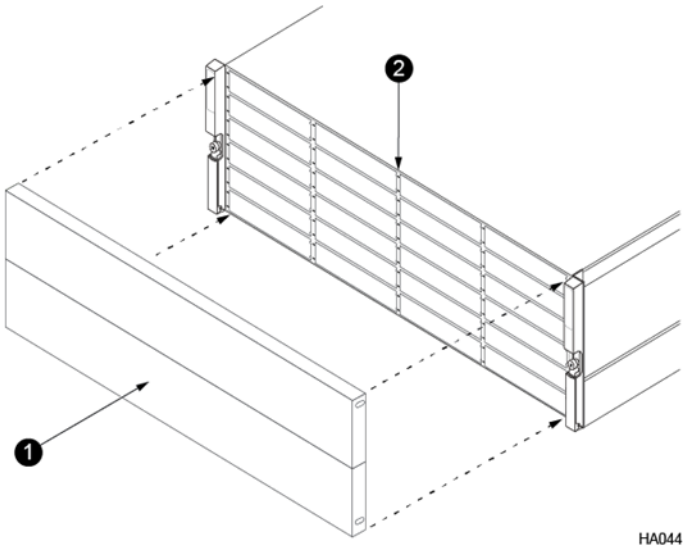
Procedure

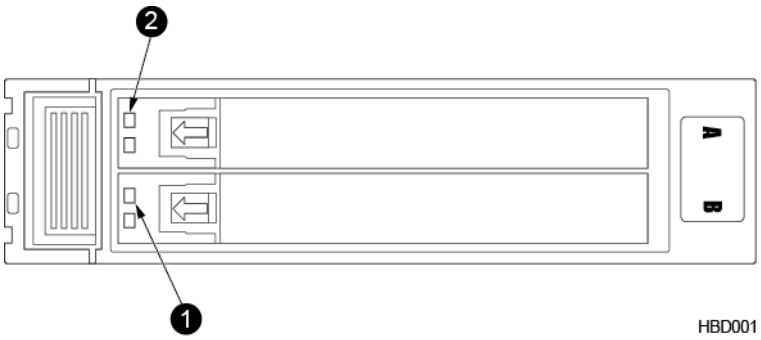
1 Gently pull the front bezel away from the array chassis.

The bezel includes power connection pins on both sides.



1 Bezel **2** Chassis

2 Identify the empty drive.



1 Drive B (empty) **2** Drive A operation (populated)

The empty drive sled in an SSD drive carrier should be for Drive B (bottom) with Drive A (top) already populated. (Do not remove the sled for Drive A or the drive carrier.)

3 Release and remove the empty drive sled B from the drive carrier.

a) To release the handle, press the release tab toward the carrier LEDs.

b) Pull the sled handle to remove the empty sled from the drive carrier. Use firm, steady pressure.

Important Do not press the lever for the drive carrier itself. Only open the individual sled (B or A) containing the drive to be replaced.

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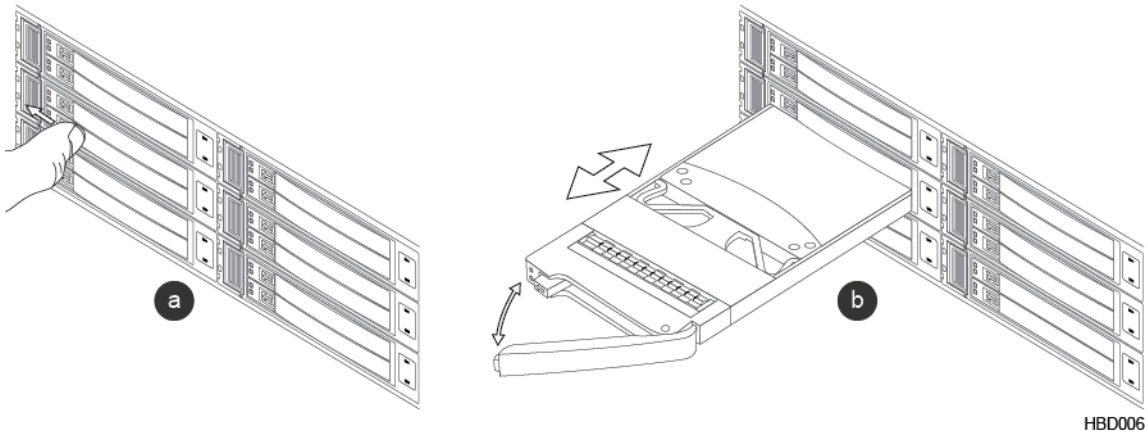

4 Insert the new drive sled (with drive) into drive bay (B) of the drive carrier.
5 Close the sled handle.

   Push the handle until it fully engages with the release tab.

6 Repeat steps 2-5 for each additional drive to install.
7 Activate the new drives and verify operation.

   The drive operation LED for each drive blinks red and then goes solid green when the new drive is detected.

   Important Activate the drives only after all drives are properly installed and the LEDs for every drive B turn green. If the LED does not light, remove and reinsert the drive. If unsuccessful, contact HPE Nimble Storage Support.

   Use either the array GUI or CLI to activate the new drives.

   a) In the GUI, do one of the following:

      - For version 3.x or earlier, choose **Manage > Arrays**, then select the array that contains the new drives.
      - For version 4.x or later, click **Hardware**, then select the array that contains the new drives.

      An alert message appears when inactive drives are detected.

   b) Either click the Activate Now link in the message, or click **Activate**.

      The graphic display of the drives shows orange for all B drives, and green for all A drives.

      In the CLI:

      - Activate all drives in drive set 1 for drive B (B=1) in the selected array.

        shelf --activate *array_serial_number* **--array** *array_name* **--driveset 1**

8 Replace the bezel.

   Hold the bezel in place and then firmly press the bezel until you feel the keepers lock.

Upgrade SSDs (AF20Q)

Use this procedure to add new SSDs to your HPE Nimble Storage model AF20Q array

Time required:	Up to 30 minutes

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Parts required:	New 12-pack of SSDs ordered from HPE Nimble Storage
Tools required:	• ESD (electrostatic discharge) strap or appropriate grounding device
Support contact:	See *Support*.

HPE Nimble Storage recommends using the Maintenance Window functionality within the HPE InfoSight portal to inform HPE Nimble Storage Support of upcoming maintenance windows.

Refer to *https://infosight.hpe.com/dashboards/nimble/wellness/maintenance-windows* for more information.

You can disable automated support case generation during planned maintenance from the Manage Maintenance Windows page. After a maintenance window is set, no further communication with HPE Nimble Storage Support is required.

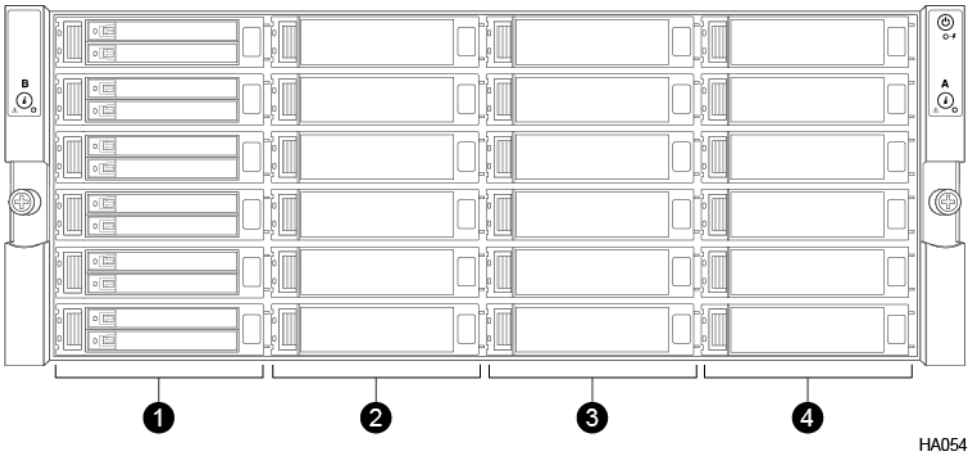
Note You do not have to shut down the array to upgrade drives.

- The pack of SSDs must all be the same capacity.
- The array must be running NimbleOS 5.0.5 or later.
- You must add new SSDs to drive sets in order from left to right.
- If you are replacing a drive that has failed, see *Replace a Failed Drive (SSD)* on page 64
- After installation, the new drives must be activated before they are fully functional.

  Note The drives in bank B will not report as installed in the GUI or CLI until all drives in the bank are populated.

The 12-pack of new SSDs arrives with the SSDs already installed in dual flash carriers. Replace the blank drive carriers of the next empty drive set with the six pre-populated dual flash drive carriers.

The following figure shows the drive set designations for the AF20Q array.



1 Drive set 1
2 Drive set 2
3 Drive set 3
4 Drive set 4

Procedure

1 Gently pull the front bezel away from the array chassis.

The bezel includes power connection pins on both sides.

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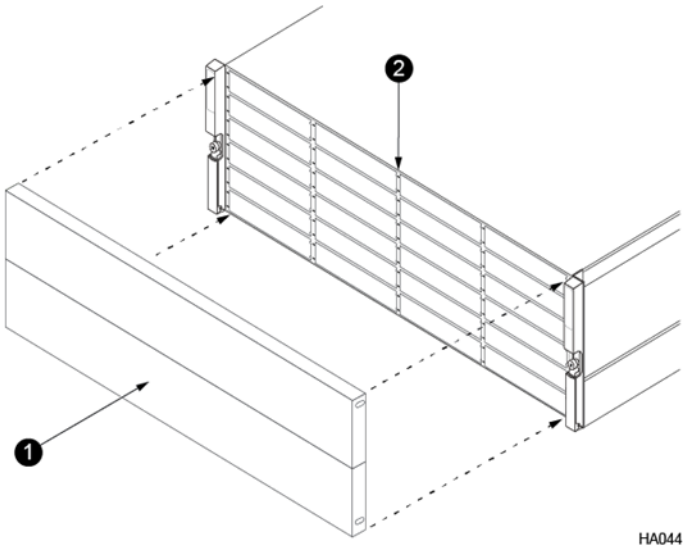
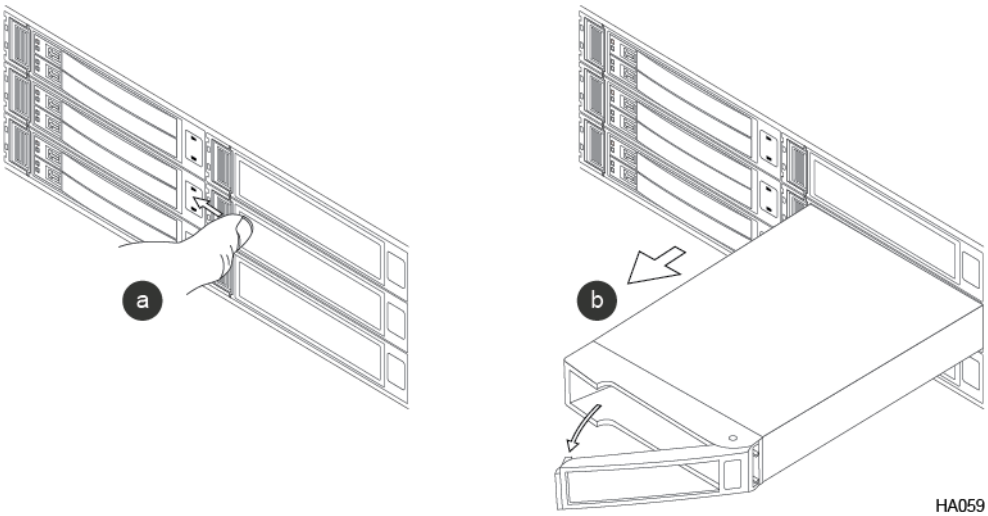


1 Bezel **2** Chassis

2 Release and remove one of the blank drive carriers from the drive set.

a) To release the handle, press the release tab toward the carrier LEDs.

b) Pull the drive carrier handle to remove the blank carrier from the chassis. Use firm, steady pressure.



3 Insert the new dual flash drive carrier into the empty chassis bay.

The carriers arrive with SSDs already installed in both drive sleds

a) Remove the black retention clip that is next to the release latch by firmly grasping it and pulling straight out. Note the location and orientation of the clip.

b) With the carrier handle open, carefully slide the new drive carrier into the empty chassis bay and close the carrier handle to lock the carrier in place.

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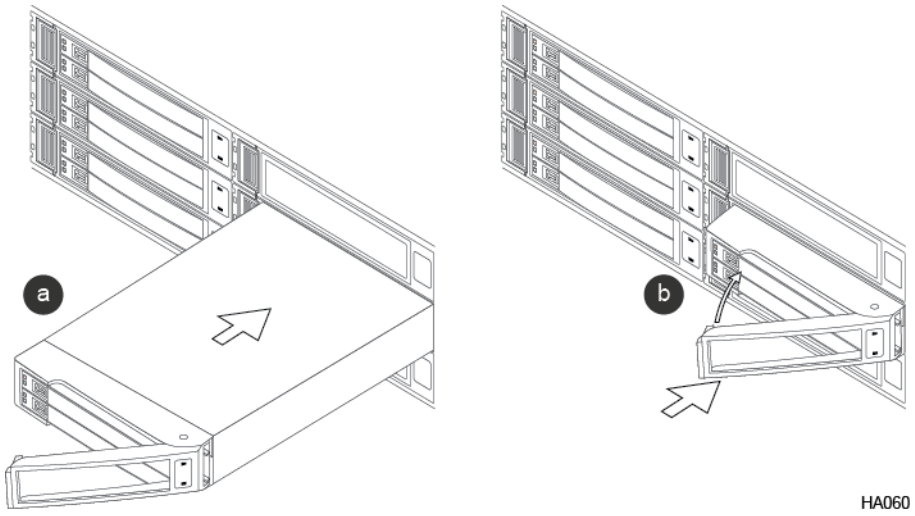

c) Reinsert the retention clip to secure the release latch.

4 Repeat steps 2 and 3 for each additional drive in the drive set.

5 Activate the new drives and verify operation.

The drive operation LED for each drive blinks red and then goes solid green when the new drive is detected.

Important Activate the drives only after all drives are properly installed and the LEDs for all drives turn green. If the LED does not light, remove and reinsert the drive. If unsuccessful, contact HPE Nimble Storage Support.

Use either the array GUI or CLI to activate the new drives.

In the GUI:

a) Click **Hardware**, and then select the array that contains the new drives.

An alert message appears when inactive drives are detected.

b) Either click the Activate Now link in the message, or click **Activate**.

In the CLI:

- Activate all drives in the drive set of the selected array. For example:

  shelf --activate *array_serial_number* **--array** *array_name* **--driveset 2**

6 Replace the bezel.

Hold the bezel in place and then firmly press the bezel until you feel the keepers lock.

Upgrade a PCIe Card

Use this procedure to upgrade network interface cards (NICs), host bus adapters (HBAs), or storage class memory (SCM) in your HPE Nimble Storage array, including upgrading from dual to quad port NICs or HBAs. Each upgrade kit contains two PCIe cards.

Note SCM is available for AF60 and AF80 model arrays.

Before you begin

Time required:	15 minutes per controller

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Parts required:	Replacement NIC, HBA, or SCM ordered from HPE Nimble Storage
Tools required:	• ESD (electrostatic discharge) strap or appropriate grounding device
Support contact:	See *Support*

HPE Nimble Storage recommends using the Maintenance Window functionality within the HPE InfoSight portal to inform HPE Nimble Storage Support of upcoming maintenance windows.

Refer to *https://infosight.hpe.com/dashboards/nimble/wellness/maintenance-windows* for more information.

You can disable automated support case generation during planned maintenance from the Manage Maintenance Windows page. After a maintenance window is set, no further communication with HPE Nimble Storage Support is required.

Important

Controllers may only be serviced in Standby mode. Never remove a controller running in Active mode. You do not have to shut down the array or expansion shelf to replace or add a PCIe card. An HPE Nimble Storage array can function with one active controller while the PCIe card is added on the standby controller.

Note

- While a controller is removed (one at a time), the internal temperature of the chassis can rise to critical levels. Keep installation time to no more than 15 minutes per controller.
- If you are adding an SCM card, slot 2 is recommended.
- If you are adding a new HBA, or moving an existing HBA to a different slot in the controller, you may need to run an update on the HBA to reconfigure it in the system.
- If you are upgrading an HBA, validate that the new WWPNs shown in the NimbleOS GUI have been added to the switch fabric zoning configuration. For port zoning, additional configuration is not required. For WWN zoning, the zoning configuration must be updated with the new WWPNs of the upgraded HBA.

Procedure

1. Identify and halt the controller that is in Standby mode.
   a) Log in to the array using the CLI.
   b) Determine which controller is in Standby or Unknown mode.
      ctrlr --list --array *array_name*
   c) Halt the standby controller.
      halt --array *array_name* **--controller** {*A* | *B*}
2. Physically remove the standby controller.
   a) Label all cables to ensure proper recabling later, then remove them from the controller.
   b) Pinch the controller release lever catch to release the controller release lever.
   c) Firmly pull the controller release lever until the controller slides out of the chassis. Then place the controller on a flat surface.

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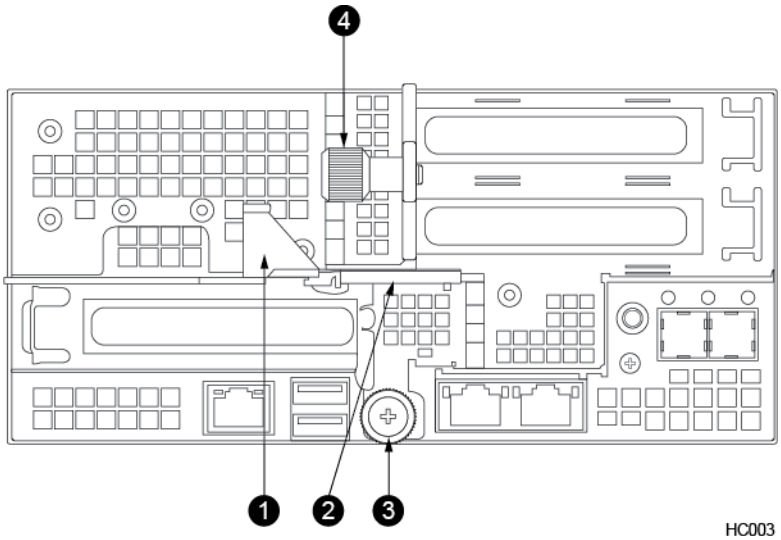


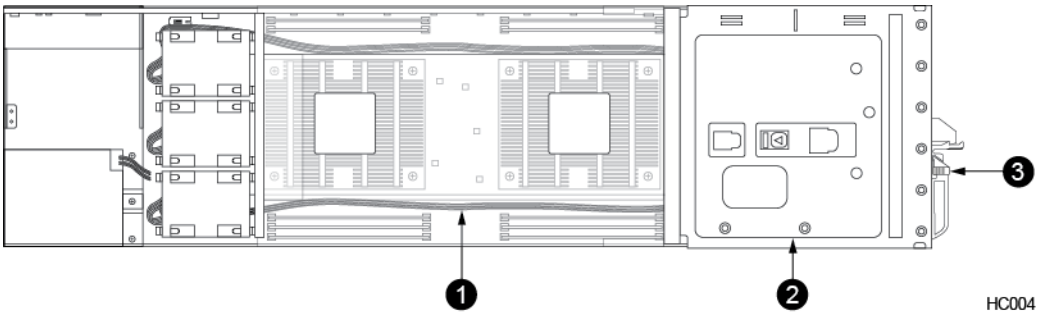
1 Controller release lever
2 Controller release lever catch
3 Thumbscrew - PCIe cage release
4 Thumbscrew - PCIe card release

3 Remove the PCIe cage.

a) Loosen the bottom thumbscrew on the PCIe cage.

Important

For AF20 and HF20 models, you must also remove the controller shroud.



1 Controller shroud
2 PCIe cage
3 Controller release lever

b) **For AF20 and HF20 models**: Grasp both sides of the PCIe cage and lift the cage out of the controller, making sure that the cage clears the guide pins and that both riser cards and the bridge board connector are properly unseated.

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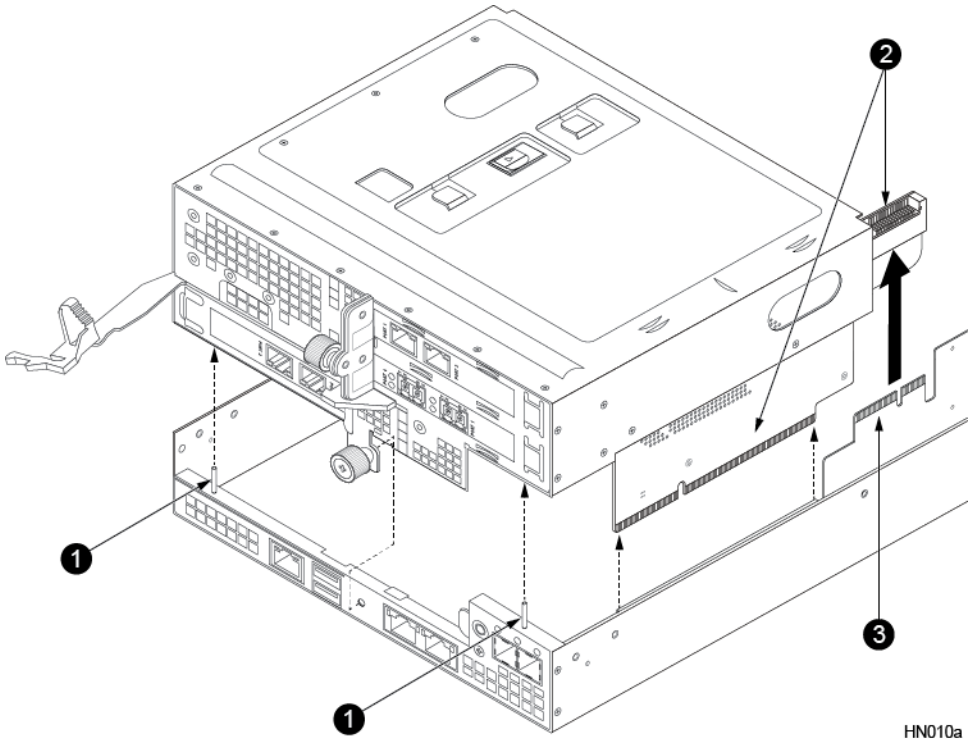

1 Guide pins
2 Riser card
3 Bridge board

c) **For all other models:** Grasp both sides of the PCIe cage and lift the cage out of the controller making sure the cage clears the guide pins and that the underlying riser cards are properly unseated from their connectors.

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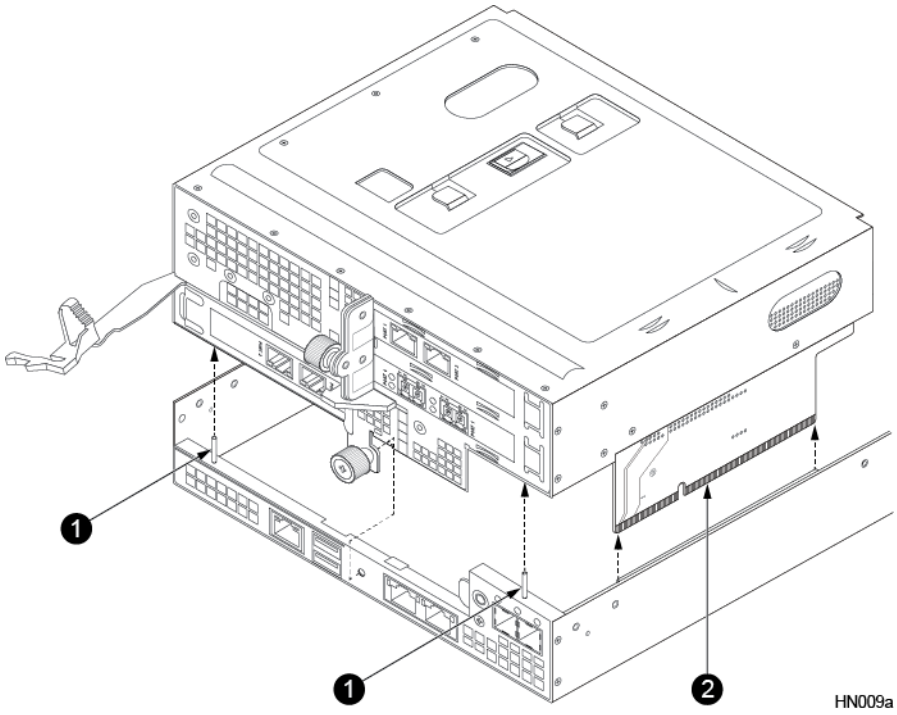
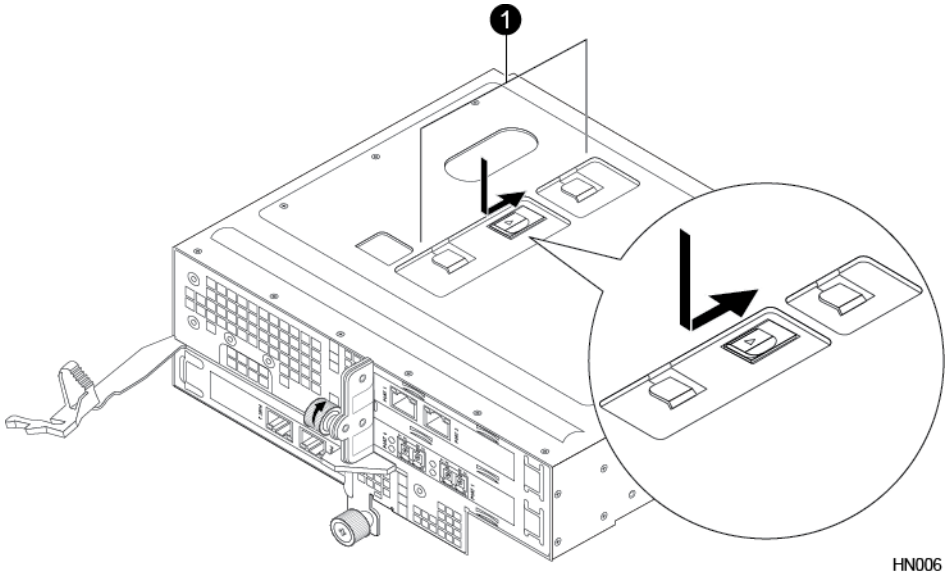


1 Guide pins **2** Riser card

4 Loosen the PCIe card holder.

a) The PCIe card holder protrudes through the top of the PCIe cage in three sections. Push down on the center section and slide the PCIe card holder in the direction of the arrow to loosen it from the cage.



1 PCIe card holder release

5 Remove the PCIe card holder.

a) Turn the PCIe cage upside down and place on a flat surface.

b) Remove the loosened PCIe card holder by sliding it away from the PCIe cards.

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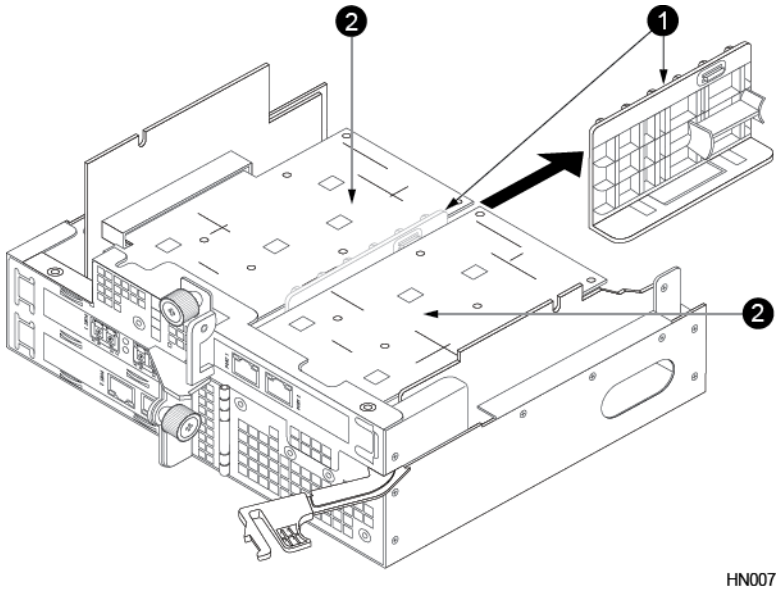

1 PCIe card holder **2** PCIe card

Important

Note the card holder orientation relative to the PCIe card when you remove it as you will reinstall the card holder in a later step.

6 Remove the PCIe card.

a) Loosen and then swing the thumbscrew next to the PCIe card into the open position.
b) Pull the PCIe card out of the card slot.

Note If you are installing a quad port 10Gb SFP+ NIC card, you must remove the transceivers from the ports before attempting to the install the card.

7 Insert the new PCIe card.

a) Insert the new PCIe card into the card slot.

Note

- For AF20 and HF20 models: NIC or HBA cards should be inserted in slot 1 and then slot 3. Slot 2 is not supported.
- For AF60 and AF80 models: SCM cards should be inserted in slot 2 if slot 2 is available.

b) Swing the thumbscrew into the closed position and tighten.

Tip You can temporarily remove the SFP and the rubber port covers on the new PCIe card to make it easier to angle the card into the slot.

Note After the card is successfully installed, reinsert the transceiver into the port if you removed it.

8 Reinsert the PCIe card holder.

a) Rotate the card holder 45 degrees clockwise and line up the top most PCIe card with the plastic tabs.
b) Insert the card holder until it hits the rear stop.

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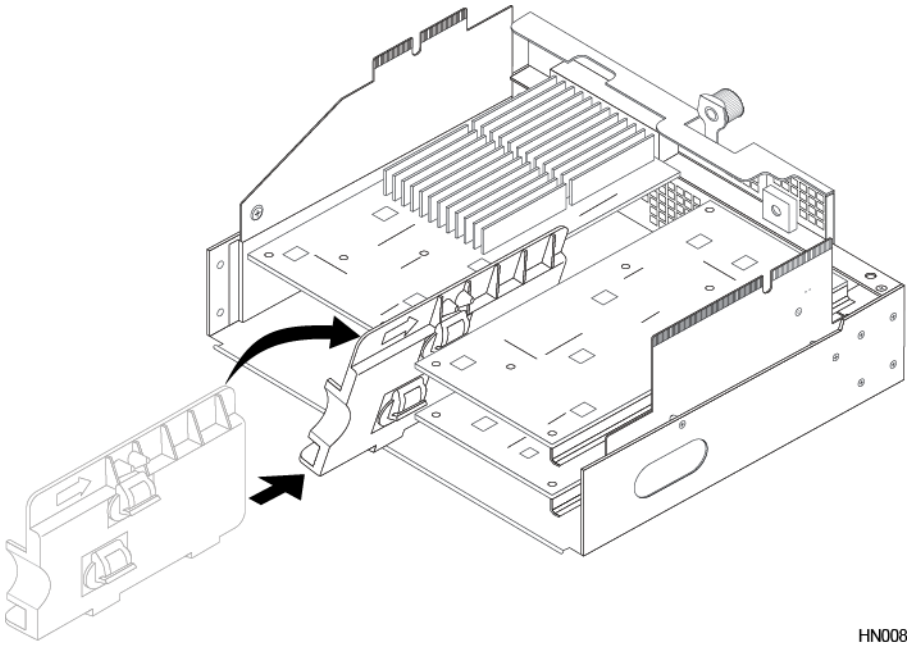
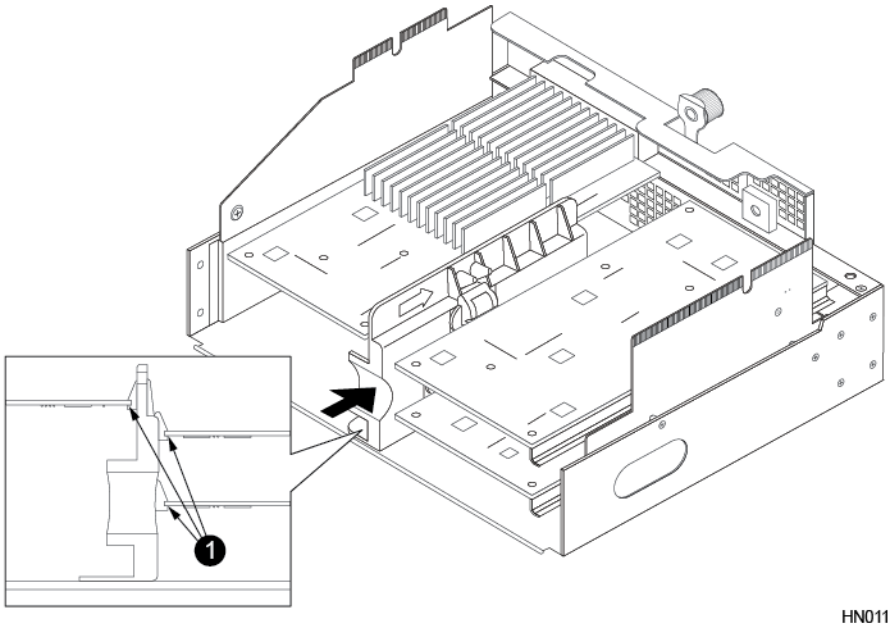


c) Twist the card holder into place ensuring the rubber tabs engage all PCIe cards properly.



1 Rubber tabs

d) Continue to slide the card holder into the PCIe cage until it locks into place.

9 Insert the PCIe cage into the controller.

a) Turn the PCIe cage right side up.

b) **For AF20 and HF20 models:** Lower the PCIe cage back into the controller, making sure that the PCIe cage aligns with the guide pins, and that the riser card with the bridge board connector aligns with the bridge board. Press down on the top of the PCIe cage ensuring that both riser cards and the bridge board connector are properly seated. Then replace the controller shroud.

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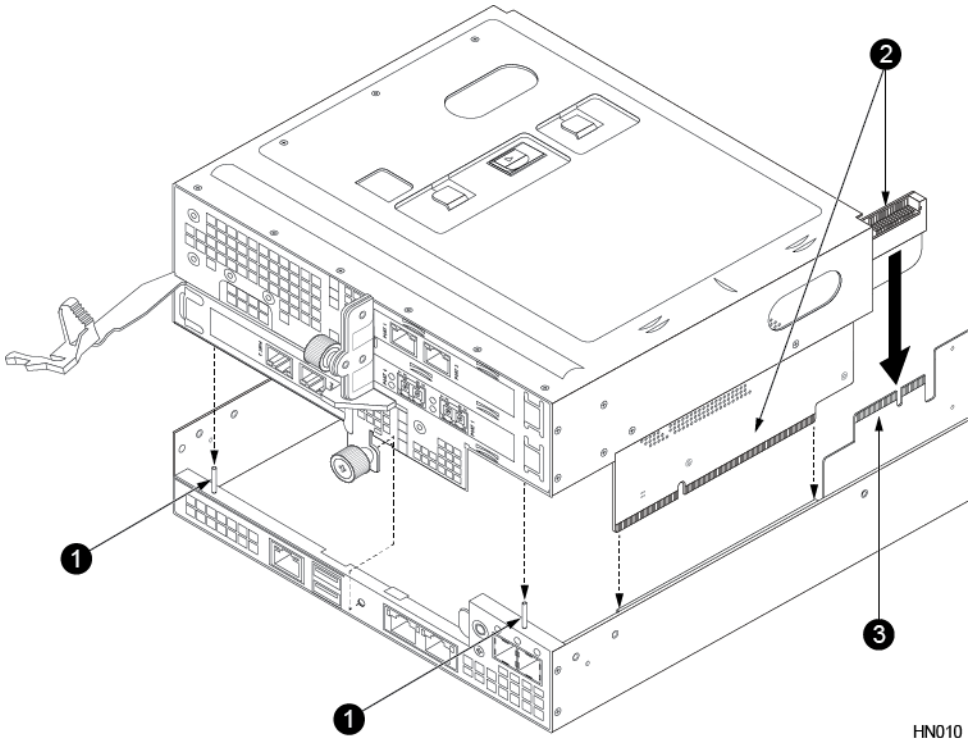

1 Guide pins
2 Riser card
3 Bridge board

To replace the controller shroud:

1. Align the notches in the shroud (marked by arrows) with the pegs on the controller.
2. Lower the shroud into place, making sure the tabs on the shroud seat properly in the controller.

c) **For all other models:** Lower the PCIe cage back into the controller, making sure that the PCIe cage aligns with the guide pins. Press down on the top of the PCIe cage ensuring that both riser cards are properly seated in the connectors. Also make sure that the PCIe cards clear the controller shroud during installation.

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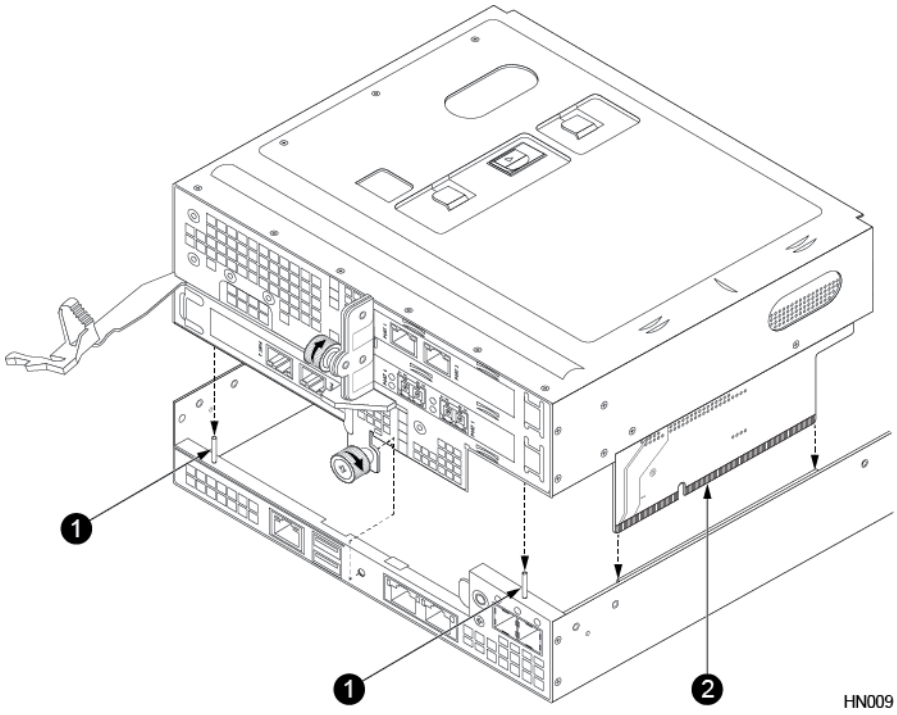

1 Guide pins **2** Riser card

d) Tighten the bottom thumbscrew.

10 Insert the controller into the chassis.

a) Make sure the controller release lever is fully extended.

b) Insert the controller into the chassis and push the controller all the way in until the controller release lever locks into the release lever catch.

The controller will automatically start.

11 Do the following:

a) On the active controller, unconfigure any NICs that were removed from the standby controller:

nic --unassign *interface_name* **--netconfig draft --subnet** *subnet_name*

netconfig --validate draft

netconfig --activate draft --force_ip_update

b) Perform a failover to reverse the controller roles:

failover

c) When failover is complete, repeat steps 1-9 on the new standby controller.

12 Verify configuration of new PCIe cards.

a) If you are upgrading an HBA, communicate the new Fibre Channel configuration out to the fabric:

fc --update_config

Note Use this command only when *upgrading* an HBA, not when replacing a failed HBA. Running the command outside of an upgrade causes the WWPNs on the HBA to change, triggering an outage.

WWPN values are tied to the physical slot in the system, not the physical HBA. When an HBA is replaced, the same WWPN values are automatically assigned to the new card that occupies the same physical slot. If a new HBA is added in a slot that did not previously hold an HBA, WWPN information is not available to the ports on the HBA until the configuration is updated or setup is run again.

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For a quad port HBA, the two WWPNs from the previously installed dual port HBA are reused and two new WWPNs are generated for the other two ports.

Note Validate that the new WWPNs shown in the NimbleOS GUI have been added to the switch fabric zoning configuration. If port zoning is being used, additional configuration is not required. If WWN zoning is being used, the zoning configuration must be updated with the new WWPNs of the upgraded HBA.

b) In the GUI, click **Hardware**.
c) Verify that the controllers are in Active and Standby modes. For NICs or HBAs, verify that the ports are connected (green). For SCM, verify that the icon is blue.

Note Ports that are not configured for management traffic (NIC ports only) or data traffic (NIC or HBA ports) will have an unconfigured (gray) status. HBA ports cannot be configured for management traffic.

Upgrade the Controller

Use these procedures to upgrade the controllers in your existing HPE Nimble Storage array.

- *Upgrade Controllers (AF20)* on page 113
- *Upgrade Controllers (AF40)* on page 121
- *Upgrade Controllers (AF60)* on page 127

Upgrade Controllers (AF20)

Use this procedure to upgrade the controllers in your existing HPE Nimble Storage array.

Before you begin

Time required:	Up to 60 minutes per controller
Parts required:	New controllers ordered from HPE Nimble Storage
Information required:	• RMA (Return Material Authorization) work order • Case number • Array name or serial number. (The array serial number can be found on the back of Controller A.)
Tools required:	• Phillips screwdriver • ESD (electrostatic discharge) strap or appropriate grounding device
Support contact:	See *Support*.

Refer to the following table to determine what models you can upgrade your controller model to.

Original Model	To New Model
AF20	AF40, AF60, AF80
AF20Q	AF40Q Upgrade to AF40Q requires the AF20Q to be fully populated with drives first.

HPE Nimble Storage recommends using the Maintenance Window functionality within the HPE InfoSight portal to inform HPE Nimble Storage Support of upcoming maintenance windows.

Refer to *https://infosight.hpe.com/dashboards/nimble/wellness/maintenance-windows* for more information.

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You can disable automated support case generation during planned maintenance from the Manage Maintenance Windows page. After a maintenance window is set, no further communication with HPE Nimble Storage Support is required.

Note

- If one controller fails, the other controller takes over. The array can function with one healthy controller while the new one is installed.
- The upgrade kit for AF20 and HF20 models includes new PCIe cages. Before installing the new controller, you must move the PCIe cards from the existing PCIe cage to the new PCIe cage and install the new PCIe cage in the new controller.
- Replace the array controller if any of its components have failed. If replacing a controller, see *Replace a Controller* on page 71.
- If upgrading NICs or FC HBAs, see *Upgrade a PCIe Card* on page 104.

Caution

Before you attempt to install the controller:

- Ensure that the array is updated to NimbleOS 5.0.5 or later.
- Do not remove the existing controller until you are ready to install the upgrade.
- Determine which controller to upgrade before installation.
- Determine the model, NimbleOS version running on the array, and the state of the controllers. See *Check Array Model Number, NimbleOS Version, and Operating State Using the GUI* on page 50.
- Note the slot number for each NIC or HBA.

Procedure

1. Prepare the existing controller for the upgrade.
   a) Log in to the array using the CLI.
   b) Determine whether the existing controller is in Standby mode.
      ctrlr --list --array *array_name*
   c) Halt the standby controller.
      halt --array *array_name* **--controller** {*A* | *B*}

      Example

      ```
      NimbleOS $ halt --array array123 --controller A
      ```

2. Remove the existing Standby controller to be upgraded.
   a) Label all cables to ensure proper recabling later, then remove them from the controller.
   b) Pinch the controller release lever catch to release the controller release lever.

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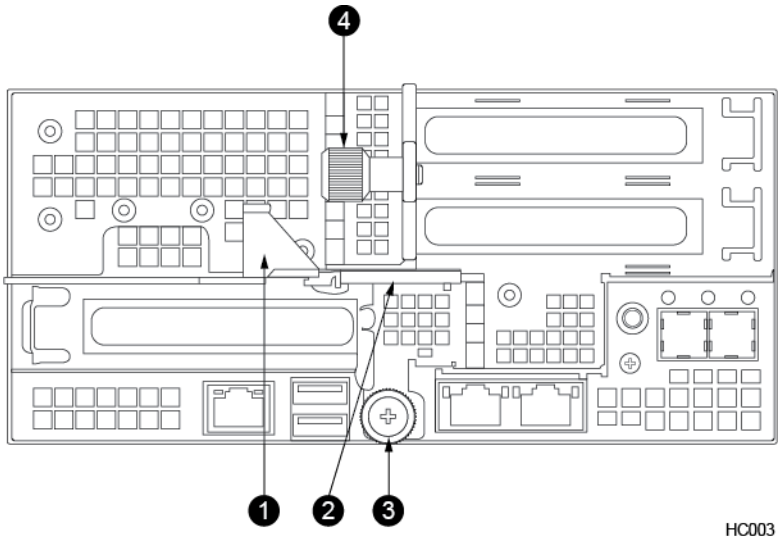


1 Controller release lever
2 Controller release lever catch
3 Thumbscrew - PCIe cage release
4 Thumbscrew - PCIe card release

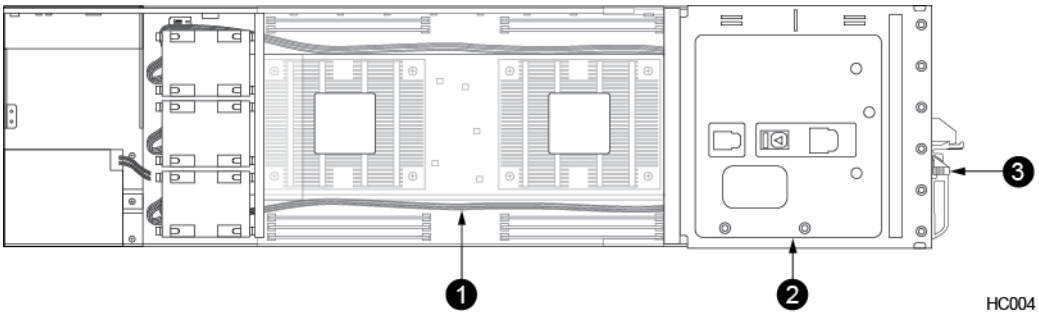
c) Using one hand to support the bottom of the controller, firmly pull the controller release lever with the other hand until the controller slides out of the chassis. Then place the controller on a flat surface.

Important

To avoid electrostatic damage, place array components on a grounded anti-static mat. Use an ESD wrist strap during removal and replacement.

3 Remove the PCIe cage from the existing controller.

a) Loosen the bottom thumbscrew on the PCIe cage.
b) Remove the transparent controller shroud from the controller.



1 Controller shroud
2 PCIe cage
3 Controller release lever

c) Grasp both sides of the PCIe cage and lift the cage out of the controller, making sure that the cage clears the guide pins and that both riser cards and the bridge board connector are properly unseated.

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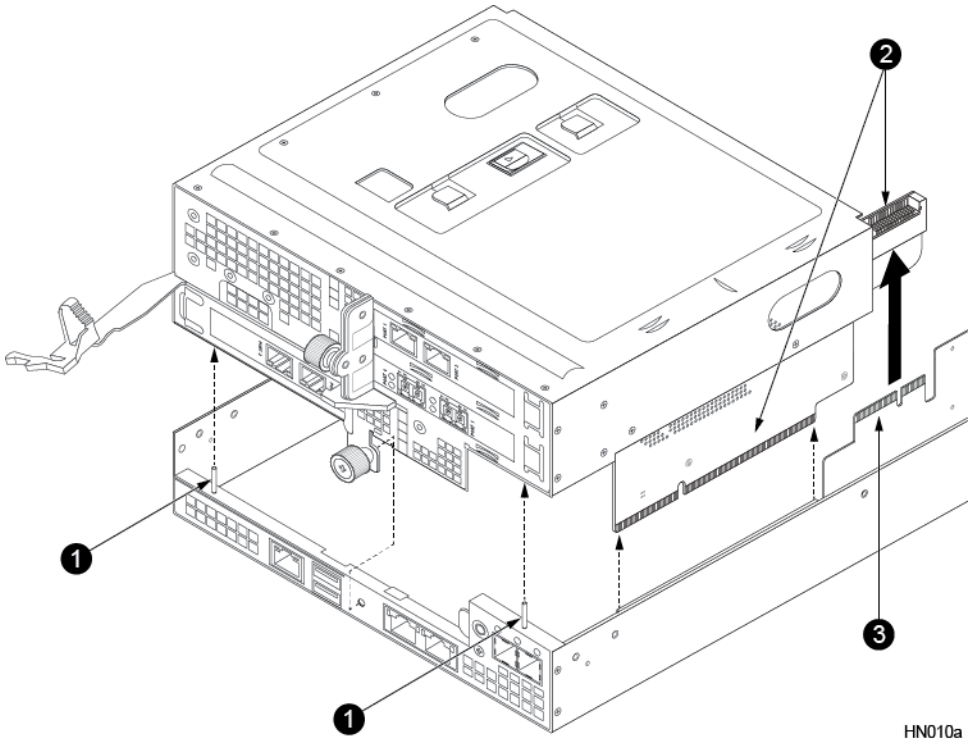
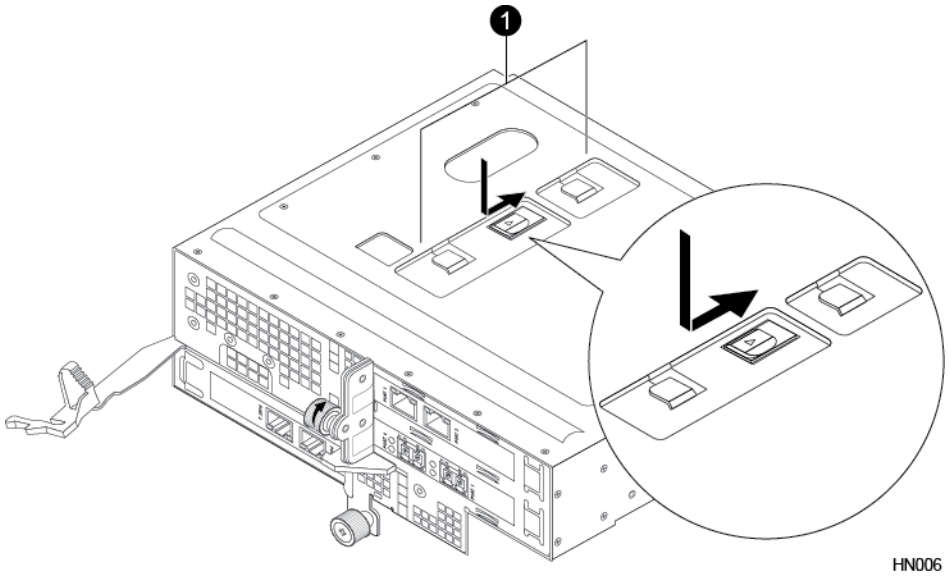


1 Guide pins
2 Riser card
3 Bridge board

4 Loosen the PCIe card holder.

a) The PCIe card holder protrudes through the top of the PCIe cage in 3 sections. Push down on the center section and slide the PCIe card holder in the direction of the arrow to loosen it from the cage.



1 PCIe card holder release

5 Remove the PCIe card holder.

a) Turn the PCIe cage upside down and place on a flat surface.

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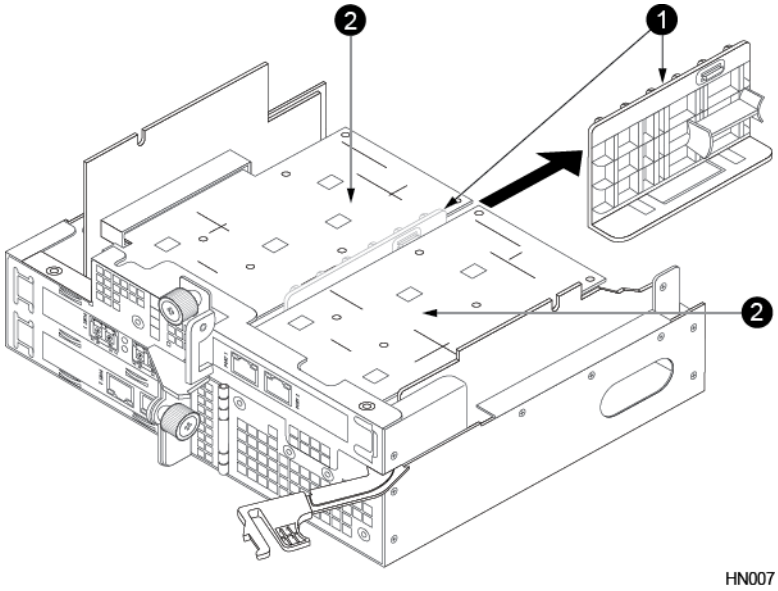
b) Remove the loosened PCIe card holder by sliding it away from the NIC/HBA cards.



1 PCIe card holder **2** PCIe card

Important Note the card holder orientation relative to the NIC/HBA card when you remove it as you will reinstall the card holder in a later step.

6 Remove the PCIe cage from the upgrade controller.

a) Loosen the bottom thumbscrew on the PCIe cage.

b) Grasp both sides of the PCIe cage and lift the cage out of the controller making sure the cage clears the guide pins and that the underlying riser cards are properly unseated from their connectors.

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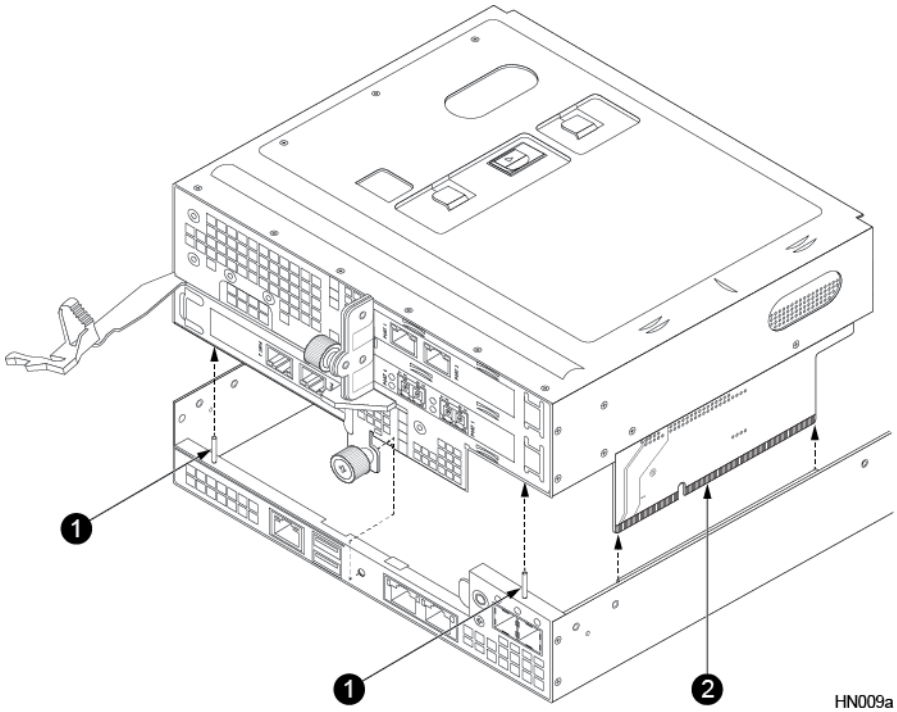

1 Guide pins **2** Riser card

7 Remove a NIC/HBA card from the AF20 or HF20 PCIe cage.
   a) Loosen and then swing the thumbscrew next to the NIC/HBA card into the open position.
   b) Pull the NIC/HBA card out of the card slot.

   Note If you are installing a quad port 10Gbps SFP+ NIC card, you must remove the transceivers from the ports before attempting to the install the card.

8 Insert the NIC/HBA card into the upgrade PCIe cage.
   a) Insert the NIC/HBA card into the same card slot in the upgrade PCIe cage.
   b) Swing the thumbscrew next to the card into the closed position and tighten.

   Tip You can temporarily remove the SFPs and the rubber port covers on the new NIC/HBA card to make it easier to angle the card into the slot.

   Note After the card is successfully installed, reinsert the transceiver into the port if you removed it.

9 Repeat steps 7 and 8 for the remaining NIC/HBA cards.

10 Reinsert the upgrade PCIe card holder into the upgrade controller.
   a) Rotate the card holder 45 degrees clockwise and line up the top most PCIe card with the plastic tabs.
   b) Insert the card holder in the direction of the arrow until it hits the rear stop.

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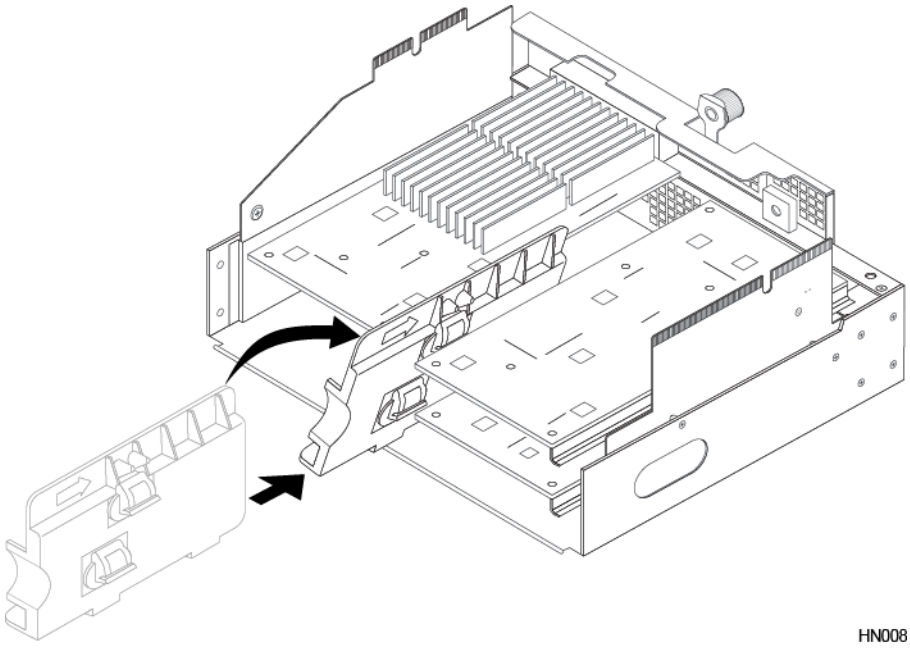
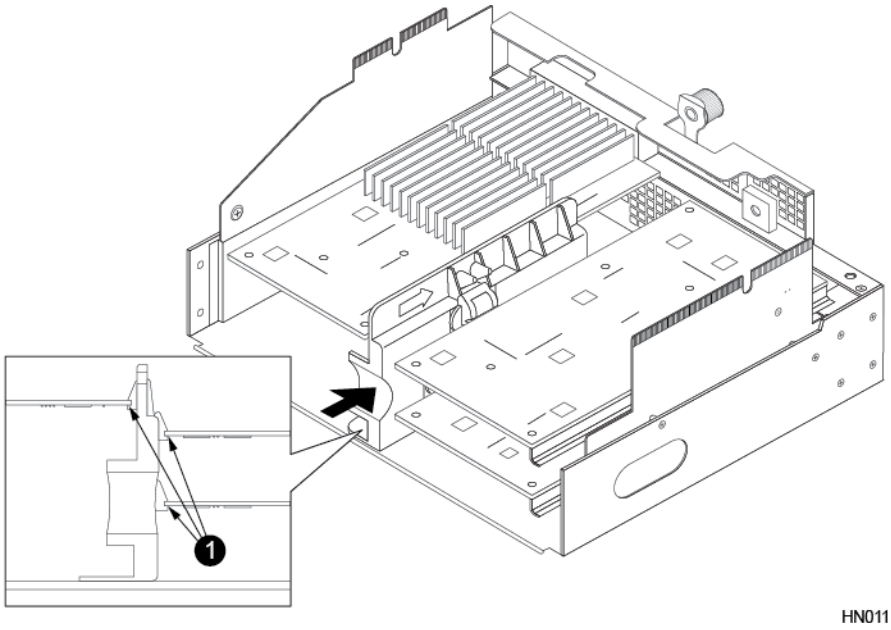


c) Twist the card holder into place ensuring the rubber tabs engage all PCIe cards properly.



1 Rubber tabs

d) Continue to slide the card holder into the PCIe cage until it locks into place.

11 Return the PCIe cage into the upgrade controller.

a) Lower the PCIe cage back into the controller, making sure that the PCIe cage aligns with the guide pins, and that the riser card with the bridge board connector aligns with the bridge board. Press down on the top of the PCIe cage ensuring that both riser cards and the bridge board connector are properly seated. Then replace the controller shroud. Tighten the bottom thumbscrew on the PCIe cage after it is in place.

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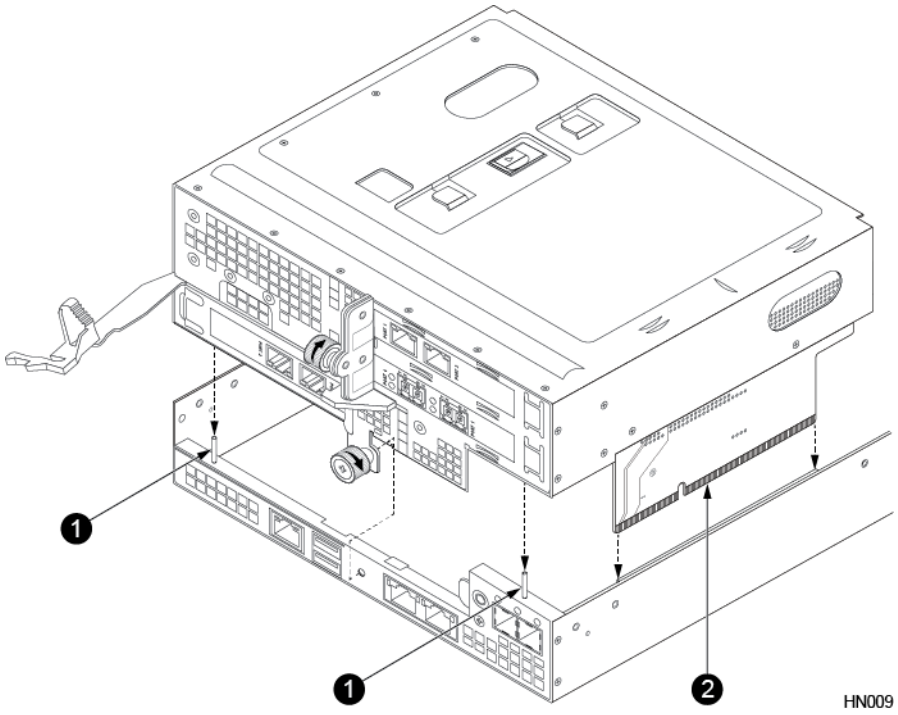

1 Guide pins **2** Riser card

b) Tighten the bottom thumbscrew.

12 Return the controller shroud into place if you removed it to access the PCIe cage.

a) Align the notches in the shroud (marked by arrows) with the pegs on the controller.

b) Lower the shroud into place. Make sure the tabs on the shroud seat properly in the controller.

Important

If you are upgrading to an HF60, AF60, or AF80 controller and your existing array uses 1200W power supplies, you must upgrade to 3000W power supplies now before proceeding with installation of the new controller. Controller upgrade kits ship with 3000W power supply units (PSUs) if required.

Before installing an HF60, AF60, or AF80 controller, complete *Upgrade to 3000W Power Supplies*.

13 Install the new controller.

a) Make sure the controller release lever is fully extended.

b) Slide the new controller into the chassis bay. Do not force the controller. If it does not slide in easily, remove it and retry.

c) After the new controller is in place, return the controller release lever to its original closed position until the catch clicks.

d) Reconnect all the cables to the new controller (as labeled from step 2).

14 Verify that the new controller is powered on.

Once installed, the new controller powers on automatically. The controller LEDs on both the left and right side of the array remain on. If the controller does not power on automatically, contact HPE Nimble Storage Support.

15 Verify that the array recognizes the new controller and that the new controller is in Standby mode.

Do one of the following:

- In the GUI, click **Hardware**, then look for the controller labeled STANDBY.

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- In the CLI, enter the command **ctrlr --list --array** *array_name*, then look for the controller labeled standby.

Note The new controller might take up to 45 minutes to appear in the user interface because some firmware components on the new controller must be updated by the NimbleOS.

Do not remove the controller during this period because interrupted firmware updates might render the hardware non-functional.

If the controller takes longer than 45 minutes to report an Active/Standby state, contact HPE Nimble Storage Support for assistance.

16 While still logged in to the array, perform a failover to the new controller.

failover *array_name*

17 After failover, verify that the new controller is in the expected mode.

ctrlr --list --array *array_name*

For HF20, HF20H, and HF20C: During the failover, the Standby controller goes into Solo mode. The previously active controller goes into unknown mode and then into Stale mode.

For AF20: During the failover, the Standby controller goes into solo mode and then into Active mode. The previously active controller goes into unknown mode, then into stale mode, and finally into Standby mode.

18 Repeat steps 2 through 15 to upgrade the other controller.

For HF20, HF20H, and HF20C: Shortly after both controllers are upgraded, the active controller automatically fails over a second time to upgrade the NVRAM format.

19 Verify that the controllers are in Active and Standby modes.

ctrlr --list --array *array_name*

20 Verify that the model number of the array has changed.

shelf --array *array_name* **--list**

Look for *Model* in the list of information.

21 Prepare and return both replaced controllers and PCIe cages.

a) Lower the PCIe cage back into the controller, making sure that the PCIe cage aligns with the guide pins, and that the riser card with the bridge board connector aligns with the bridge board. Press down on the top of the PCIe cage ensuring that both riser cards and the bridge board connector are properly seated.
b) Return the controller shroud into position.
c) Tighten the bottom thunbscrew on the PCIe cage.
d) Return the components using the RMA instructions that came with the upgrade kit.

Upgrade Controllers (AF40)

Use this procedure to upgrade the controllers in your existing HPE Nimble Storage array.

This procedure applies to the following models:

Before you begin

Time required:	Up to 60 minutes per controller
Parts required:	New controllers ordered from HPE Nimble Storage

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Information required:	• RMA (Return Material Authorization) work order • Case number • Array name or serial number. (The array serial number can be found on the back of Controller A.)
Tools required:	• Phillips screwdriver • ESD (electrostatic discharge) strap or appropriate grounding device
Support contact:	See *Support*.

Refer to the following table to determine what models you can upgrade your controller model to.

Original Model	To New Model
AF40	AF60, AF80

HPE Nimble Storage recommends using the Maintenance Window functionality within the HPE InfoSight portal to inform HPE Nimble Storage Support of upcoming maintenance windows.

Refer to *https://infosight.hpe.com/dashboards/nimble/wellness/maintenance-windows* for more information.

You can disable automated support case generation during planned maintenance from the Manage Maintenance Windows page. After a maintenance window is set, no further communication with HPE Nimble Storage Support is required.

Note

- If one controller fails, the other controller takes over. The array can function with one healthy controller while the new one is installed.
- Upgrade controllers are shipped without the PCIe cage installed. Before installing the new controller, you must move the PCIe cage from the existing controller and install it into the new controller.
- Replace the array controller if any of its components have failed. If replacing a controller, see *Replace a Controller* on page 71.
- If upgrading NICs or FC HBAs, see *Upgrade a PCIe Card* on page 104.

Caution

Before you attempt to install the controller:

- Ensure that the array is updated to NimbleOS 5.0.5 or later.
- Do not remove the existing controller until you are ready to install the upgrade.
- Determine which controller to upgrade before installation.
- Determine the model, NimbleOS version running on the array, and the state of the controllers. See *Check Array Model Number, NimbleOS Version, and Operating State Using the GUI* on page 50.

Procedure

1 Prepare the existing controller for the upgrade.
   a) Log in to the array using the CLI.
   b) Determine whether the existing controller is in Standby mode.
      ctrlr --list --array *array_name*
   c) Halt the standby controller.
      halt --array *array_name* **--controller** {*A* | *B*}
      Example

```
NimbleOS $ halt --array array123 --controller A
```

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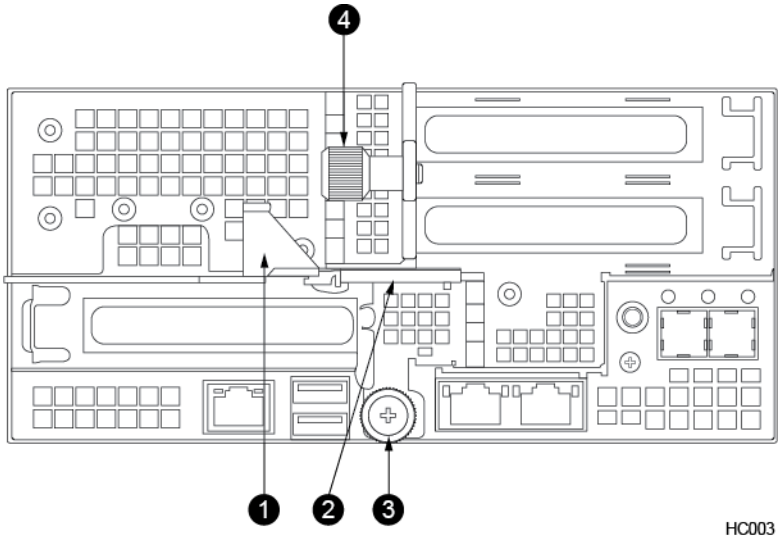
2 Remove the existing Standby controller to be upgraded.

a) Label all cables to ensure proper recabling later, then remove them from the controller.

b) Pinch the controller release lever catch to release the controller release lever.



1 Controller release lever
2 Controller release lever catch
3 Thumbscrew - PCIe cage release
4 Thumbscrew - PCIe card release

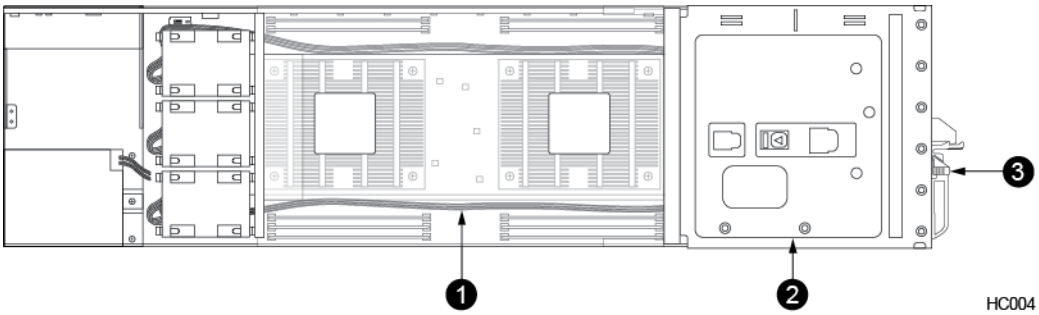
c) Using one hand to support the bottom of the controller, firmly pull the controller release lever with the other hand until the controller slides out of the chassis. Then place the controller on a flat surface.

Important

To avoid electrostatic damage, place array components on a grounded anti-static mat. Use an ESD wrist strap during removal and replacement.

3 Remove the PCIe cage from the existing controller.

a) Loosen the bottom thumbscrew on the PCIe cage.



1 Controller shroud
2 PCIe cage
3 Controller release lever

b) Grasp both sides of the PCIe cage and lift the cage out of the controller making sure the cage clears the guide pins and that the underlying riser cards are properly unseated from their connectors.

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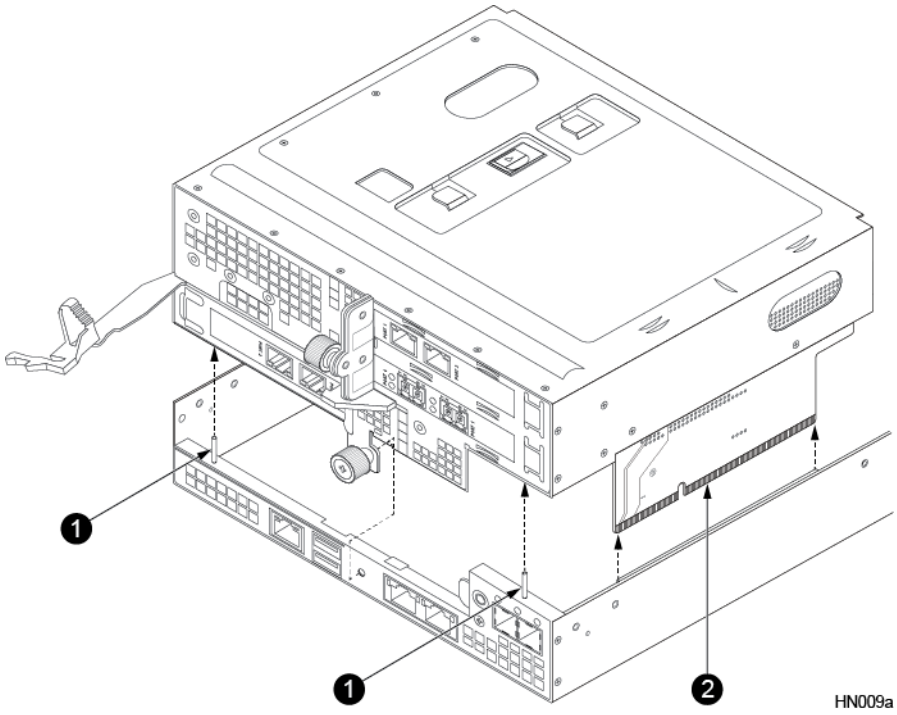

1 Guide pins **2** Riser card

4 Insert the PCIe cage into the new controller.

a) Lower the PCIe cage back into the controller, making sure that the PCIe cage aligns with the guide pins. Press down on the top of the PCIe cage ensuring that both riser cards are properly seated in the connectors. Also make sure that the NIC cards clear the controller shroud during installation. Tighten the bottom thumbscrew on the PCIe cage after it is in place.

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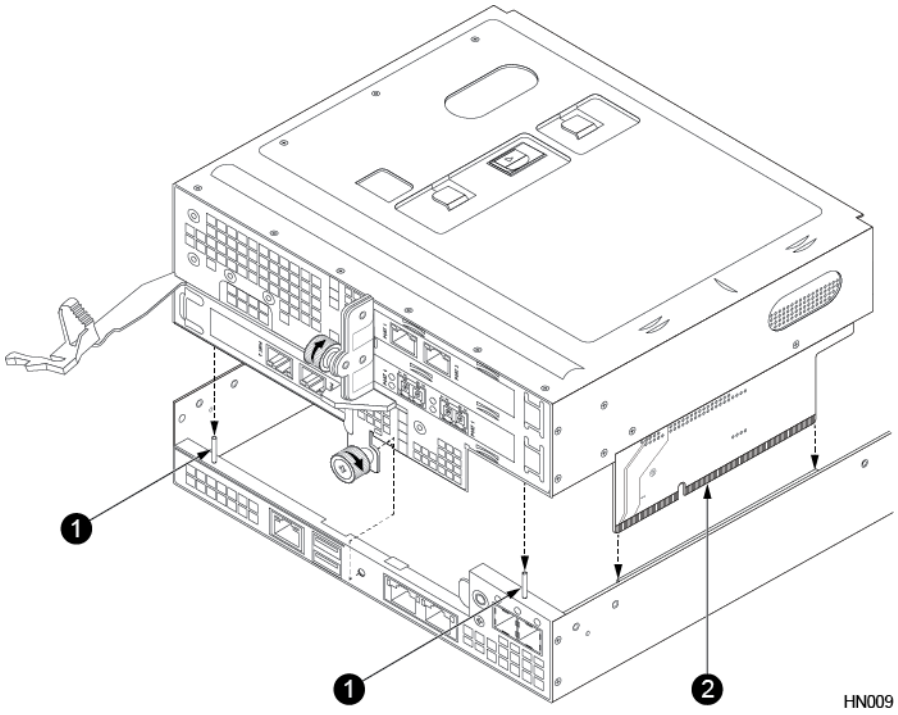

1 Guide pins **2** Riser card

b) Tighten the bottom thumbscrew.

5 Return the controller shroud into place if you removed it to access the PCIe cage.

a) Align the notches in the shroud (marked by arrows) with the pegs on the controller.

b) Lower the shroud into place. Make sure the tabs on the shroud seat properly in the controller.

Important

If you are upgrading to an HF60, AF60, or AF80 controller and your existing array uses 1200W power supplies, you must upgrade to 3000W power supplies now before proceeding with installation of the new controller. Controller upgrade kits ship with 3000W power supply units (PSUs) if required.

Before installing an HF60, AF60, or AF80 controller, complete *Upgrade to 3000W Power Supplies*.

6 Install the new controller.

a) Make sure the controller release lever is fully extended.

b) Slide the new controller into the chassis bay. Do not force the controller. If it does not slide in easily, remove it and retry.

c) After the new controller is in place, return the controller release lever to its original closed position until the catch clicks.

d) Reconnect all the cables to the new controller (as labeled from step 2.)

7 Verify that the new controller is powered on.

Once installed, the new controller powers on automatically. The controller LEDs on both the left and right side of the array remain on. If the controller does not power on automatically, contact HPE Nimble Storage Support.

8 Verify that the array recognizes the new controller and that the new controller is in Standby mode.

Do one of the following:

- In the GUI, click **Hardware**, then look for the controller labeled STANDBY.

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- In the CLI, enter the command:**ctrlr --list --array** *array_name*, then look for the controller labeled standby.

Note The new controller might take up to 45 minutes to appear in the user interface because some firmware components on the new controller must be updated by the NimbleOS.

Do not remove the controller during this period because interrupted firmware updates might render the hardware non-functional.

If the controller takes longer than 45 minutes to report an Active/Standby state, contact HPE Nimble Storage Support for assistance.

9 While still logged in to the array, perform a failover to the new controller.

Type **failover** *array_name*

10 Verify that the new controller is in Active mode.

ctrlr --list --array *array_name*

During the failover, the Standby controller first goes into solo mode and then into Active mode. The previously active controller goes into unknown mode, then into stale mode, and finally into Standby mode.

11 Repeat steps 2 through 8 to upgrade the other controller, now in Standby mode.

12 Verify that the model number of the array has changed.

shelf --array *array_name* **--list**

Look for *Model* in the list of information.

13 Return both replaced controllers using the RMA instructions that came with the upgrade kit.

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Upgrade Controllers (AF60)

Use this procedure to upgrade the controllers in your existing HPE Nimble Storage array.

This procedure applies to the following models:

Before you begin

Time required:	Up to 60 minutes per controller
Parts required:	New controllers ordered from HPE Nimble Storage
Information required:	• RMA (Return Material Authorization) work order • Case number • Array name or serial number. (The array serial number can be found on the back of Controller A.)
Tools required:	• Phillips screwdriver • ESD (electrostatic discharge) strap or appropriate grounding device
Support contact:	See *Support*.

Refer to the following table to determine what models you can upgrade your controller model to.

Original Model	To New Model
AF60	AF80

HPE Nimble Storage recommends using the Maintenance Window functionality within the HPE InfoSight portal to inform HPE Nimble Storage Support of upcoming maintenance windows.

Refer to *https://infosight.hpe.com/dashboards/nimble/wellness/maintenance-windows* for more information.

You can disable automated support case generation during planned maintenance from the Manage Maintenance Windows page. After a maintenance window is set, no further communication with HPE Nimble Storage Support is required.

Note

- If one controller fails, the other controller takes over. The array can function with one healthy controller while the new one is installed.
- Upgrade controllers are shipped without the PCIe cage installed. Before installing the new controller, you must move the PCIe cage from the existing controller and install it into the new controller.
- Replace the array controller if any of its components have failed. If replacing a controller, see *Replace a Controller* on page 71.
- If upgrading NICs or FC HBAs, see *Upgrade a PCIe Card* on page 104.

Caution

Before you attempt to install the controller:

- Ensure that the array is updated to NimbleOS 5.0.5 or later.
- Do not remove the existing controller until you are ready to install the upgrade.
- Determine which controller to upgrade before installation.
- Determine the model, NimbleOS version running on the array, and the state of the controllers. See *Check Array Model Number, NimbleOS Version, and Operating State Using the GUI* on page 50.

Procedure

1 Prepare the existing controller for the upgrade.

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a) Log in to the array using the CLI.
b) Determine whether the controller is in Standby mode.

ctrlr --list --array *array_name*

c) Halt the standby controller.

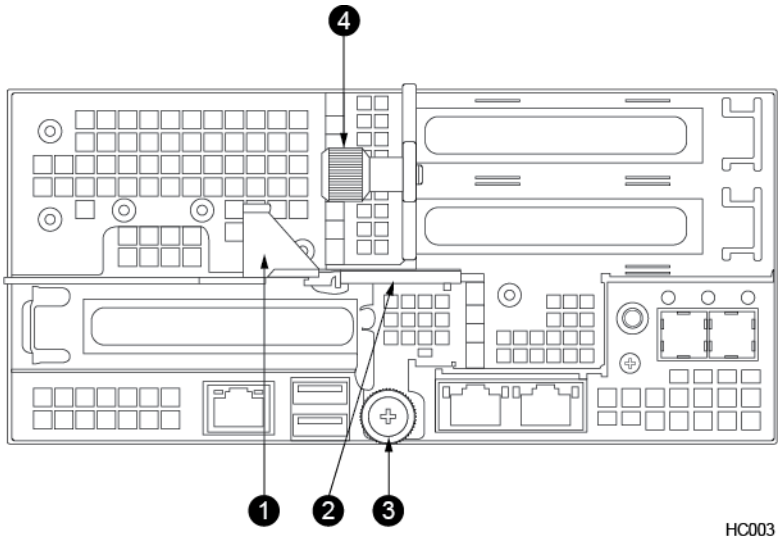
halt --array *array_name* **--controller** {*A* | *B*}

Example

```
NimbleOS $ halt --array array123 --controller A
```

2 Remove the existing Standby controller to be upgraded.

a) Label all cables to ensure proper recabling later, then remove them from the controller.
b) Pinch the controller release lever catch to release the controller release lever.



1 Controller release lever
2 Controller release lever catch
3 Thumbscrew - PCIe cage release
4 Thumbscrew - PCIe card release

c) Using one hand to support the bottom of the controller, firmly pull the controller release lever with the other hand until the controller slides out of the chassis. Then place the controller on a flat surface.

Important

To avoid electrostatic damage, place array components on a grounded anti-static mat. Use an ESD wrist strap during removal and replacement.

3 Remove the PCIe cage from the existing controller.

a) Loosen the bottom thumbscrew on the PCIe cage.

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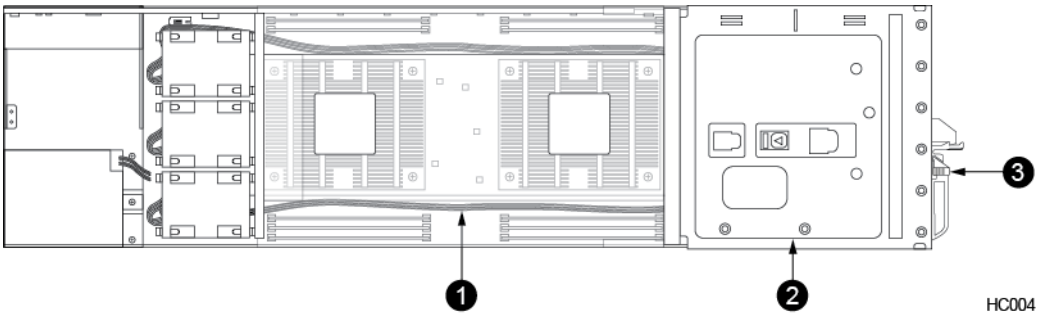
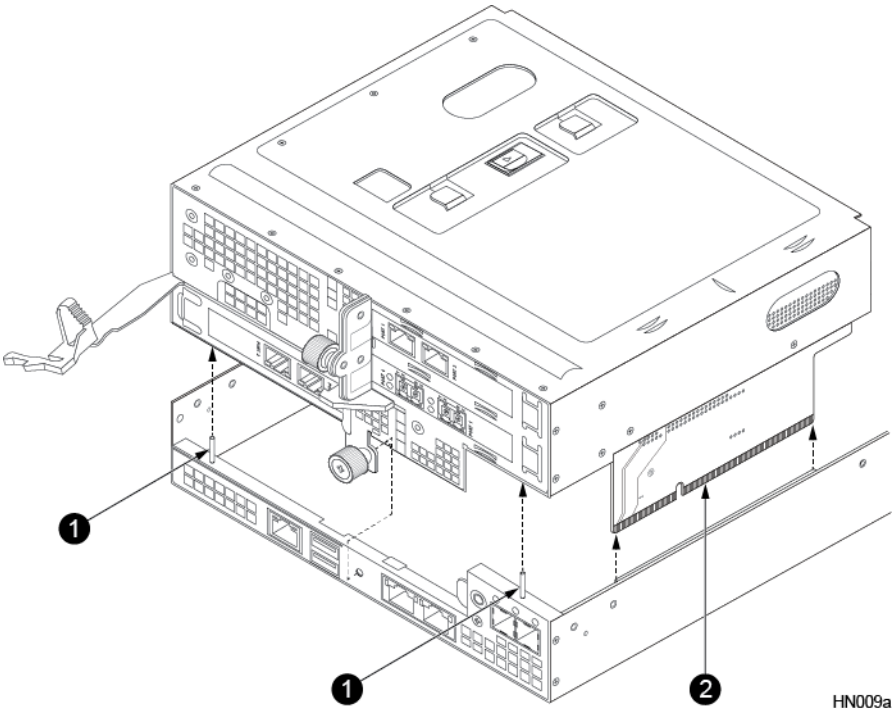


1 Controller shroud
2 PCIe cage
3 Controller release lever

b) Grasp both sides of the PCIe cage and lift the cage out of the controller making sure the cage clears the guide pins and that the underlying riser cards are properly unseated from their connectors.



1 Guide pins
2 Riser card

4 Insert the PCIe cage into the new controller.

a) Lower the PCIe cage into the controller, making sure that the PCIe cage aligns with the guide pins. Press down on the top of the PCIe cage ensuring that both riser cards are properly seated in the connectors. Also make sure that the NIC cards clear the controller shroud during installation. Tighten the bottom thumbscrew on the PCIe cage after it is in place.

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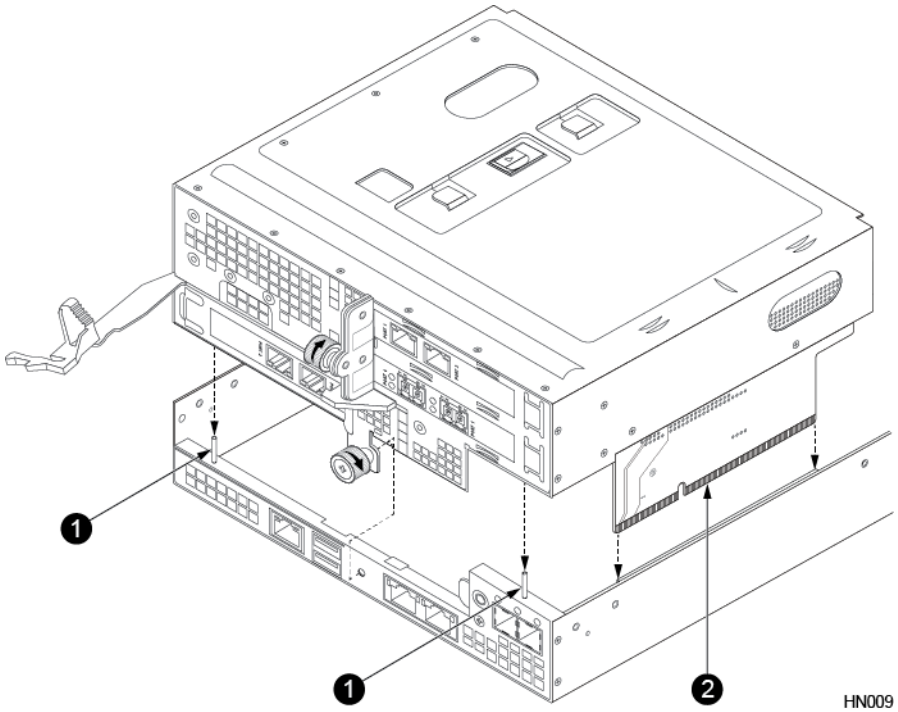


1 Guide pins **2** Riser card

b) Tighten the bottom thumbscrew.

5 Return the controller shroud into place if you removed it to access the PCIe cage.

a) Align the notches in the shroud (marked by arrows) with the pegs on the controller.

b) Lower the shroud into place. Make sure the tabs on the shroud seat properly in the controller.

Important

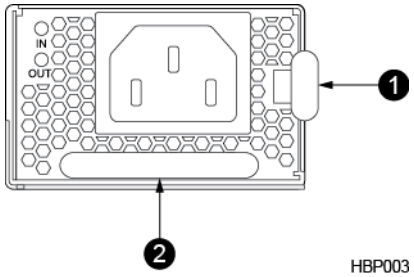
If your existing array uses 1200W power supplies, you must upgrade to 3000W power supplies now before proceeding with installation of the new controller.

6 If your AF60 array uses 1200W power supplies, upgrade to 3000W power supplies.

AF80 controller upgrade kits ship with the required 3000W power supply units (PSUs).

a) Remove the power cord from one of the 1200W PSUs. Pull back on the sliding tabs (if present) on the connector and then pull the connector out of the socket.

b) Push the power supply release lever to the left, grasp the handle, and pull out the PSU.



1 Power supply release lever **2** Power supply handle

c) Insert the 3000W PSU. Push in gently until you hear a click.

d) Plug in the power cord.

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The power supply LEDs blink and then go solid green.

If the LED does not stop blinking and go solid green, check the connection to the power source. If that does not work, contact HPE Nimble Storage Support.

e) Repeat steps a through d for the second power supply.

7 Install the new controller.

a) Make sure the controller release lever is fully extended.
b) Slide the new controller into the chassis bay. Do not force the controller. If it does not slide in easily, remove it and retry.
c) After the new controller is in place, return the controller release lever to its original closed position until the catch clicks.
d) Reconnect all the cables to the new controller (as labeled from step 2.)

8 Verify that the new controller is powered on.

Once installed, the new controller powers on automatically. The controller LEDs on both the left and right side of the array remain on. If the controller does not power on automatically, contact HPE Nimble Storage Support.

9 Verify that the array recognizes the new controller and that the new controller is in Standby mode.

Do one of the following:

- In the GUI, click **Hardware**, then look for the controller labeled STANDBY.
- In the CLI, enter the command:**ctrlr --list --array** *array_name*, then look for the controller labeled standby.

Note The new controller might take up to 45 minutes to appear in the user interface because some firmware components on the new controller must be updated by the NimbleOS.

Do not remove the controller during this period because interrupted firmware updates might render the hardware non-functional.

If the controller takes longer than 45 minutes to report an Active/Standby state, contact HPE Nimble Storage Support for assistance.

10 While still logged in to the array, perform a failover to the new controller.

Type **failover** *array_name*

11 Verify that the new controller is in Active mode.

ctrlr --list --array *array_name*

During the failover, the Standby controller first goes into solo mode and then into Active mode. The previously active controller goes into unknown mode, then into stale mode, and finally into Standby mode.

12 Repeat steps 2 through 5 to upgrade the other controller, now in Standby mode.

13 Repeat steps 7 through 9 for the controller.

14 Verify that the model number of the array has changed.

shelf --array *array_name* **--list**

Look for *Model* in the list of information.

15 Return both replaced controllers and PSUs using the RMA instructions that came with the upgrade kit.

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Hardware and Model Specifications

This section describes the environmental, electrical, and physical specifications of HPE Nimble Storage AF-model arrays.

Model Specifications

The latest specifications for the AFxx arrays and the AFS3 expansion shelf can be found on the HPE Nimble Storage website at: *https://h20195.www2.hpe.com/v2/GetDocument.aspx?docname=a00008273enw*.

Generic specifications that apply to all models appear first, followed by model-specific hardware specifications.

Table 10: Chassis Dimensions and Weight

Component	Specification
Height	17.58 cm (6.92 in)
Width	43.9 cm (17.3 in)
Depth	89 cm (35 in)
Rack Units	4U
Approximate Weight	AFxx models: • Chassis only: 52 kg (115 lb) • With packaging: 70 kg (154 lb)
	AFS3: • Chassis only: 43 kg (95 lb) • With packaging: 61 kg (134 lb)

Table 11: Operating Environment

Component	Specification
Temperature	Operating: 10° to 35° C (50° to 95° F)
Humidity	Operating: 8 to 90% non-condensing
Altitude	Operating: -305 to 3048 m (-1000 to 10,000 feet)

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Table 12: Electrical Requirements

Component	Specification

Power supplies	**AF20, AF20Q, AF40, AF60** (Regulatory model number NMBLA-0002-1200)
	1200 W power supply (Delta DTQ1201AN12F11)
	• AC input voltage: 100-120V or 200-240V
	• Maximum rated input current:
	  • 11A at 100-120V
	  • 7A at 200-240V
	• Rated input frequency: 50/60 Hz
	1200 W power supply (Delta DTQ1200AN12F12)
	• AC input voltage: 100-120V or 200-240V
	  AC input of 200-240V is recommended for AF20, AF20Q, and AF40 under normal operation with Delta DTQ1200AN12F12 power supplies.
	• Maximum rated input current: 7A
	• Rated input frequency: 50/60 Hz
	3000 W AC power supply (AF60 *requires* 3000 W power supply)
	• AC input voltage: 100-120V or 200-240V
	• Maximum rated input current:
	  • 12A at 100-120V
	  • 7A at 200-240V
	• Rated input frequency: 50/60 Hz
	3000 W DC power supply
	• DC input voltage: -40 to -72V
	• Maximum rated input current: 40A
	AF80 (Regulatory model number NMBLA-0002-3000)
	3000 W AC power supply
	• AC input voltage: 200-240V only
	• Maximum rated input current: 13A
	• Rated input frequency: 50/60 Hz
	3000 W DC power supply
	• DC input voltage: -40 to -72V
	• Maximum rated input current: 40A
	AFS3 expansion shelf (Regulatory model number NMBLA-0002-1200E)
	1200 W power supply
	• AC input voltage: 100-120V or 200-240V
	• Maximum rated input current: 7A
	• Rated input frequency: 50/60 Hz

Power supply connectors	1200 W power supply: IEC320 C14 connector 3000 W AC power supply: IEC320 C20 connector

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Component	Specification
Power cords	Type varies by region.
Power consumption (approximate)	• AF20Q: 500 W • AF20: 550 W • AF40: 700 W • AF60: 800 W • AF80: 1200 W • AFS3: 300 W • Startup: 7A @ 120V • Startup: 3.5A @ 240V **Caution** Startup current draw may exceed 7A.
BTU (estimate)	• AF20: 1804 BTU/hr typical • AF20Q: 1640 BTU/hr typical • AF40: 2296 BTU/hr typical • AF60: 2624 BTU/hr typical • AF80: 4264 BTU/hr typical • AFS3: 656 BTU/hr typical Formula: Max wattage x .96 = Avg wattage x 3.412141633 = BTU/hr

Table 13: Connectors and Ports

Component	Specification
Controllers / Expanders	• AFxx models: Two controllers per chassis • AFS3: Two expanders per chassis
Ethernet ports	AF20 and AF20Q: • 10GBASE-T (10 per controller) • 10G SFP+ (up to 8 per controller) AF40, AF60, AF80: • 10GBASE-T (14 per controller) • 10G SFP+ (12 per controller)
Fibre Channel ports	AF20 and AF20Q: • 16Gb FC ports (8 per controller) • 32Gb FC ports (4 per controller) AF40, AF60, and AF80: • 16Gb FC ports (12 per controller) • 32Gb FC ports (6 per controller) **Note** For Fibre Channel arrays, 10Gb Ethernet ports can be ordered (for any available ports) for group and/or replication traffic.

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Component	Specification
Network connectors	AFxx models: • 2-port 1GBASE-T • 2-port 10GbE SFP+ • 2-port 10GBASE-T • 2-port 16Gb FC • 2-port 32Gb FC • 4-port 1GBASE-T • 4-port 10GbE SFP+ • 4-port 10GBASE-T • 4-port 16Gb FC
SAS ports	• AFxx models: 2 SAS Out ports per controller • AFS3: 2 SAS In ports, 2 SAS Out ports per expander
	Four lanes wide, 12 Gb/s per lane = 48 Gb/s totalSAS connection and connector type • SFF-8644 Mini-SAS High Density

Table 14: AF20 Specifications

Model	Cores	Maximum Expansion Shelves	Data SSD
AF20	6 cores x 1	1	11 TB to 46 TB
AF20Q	6 cores x 1	1	6 TB to 46 TB

Note The AF20Q uses *6* of the *24* drive bays that are on all AFxx models.

Table 15: AF40 Specifications

Model	Cores	Maximum Expansion Shelves	Data SSD
AF40	8 cores x 2	1	11 TB to 184 TB

Table 16: AF60 Specifications

Model	Cores	Maximum Expansion Shelves	Data SSD
AF60	14 cores x 2	2	11 TB to 553 TB

Table 17: AF80 Specifications

Model	Cores	Maximum Expansion Shelves	Data SSD
AF80	28 cores x 2	2	23 TB to 1106 TB

You can add an AFS3 to any of the AFxx models.

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Table 18: AFS3 All-Flash Shelf Specifications

Model	Maximum Expansion Shelves	Data SSD
AFS3	2	60 TB to 184 TB

SFP Specifications

Optical Fiber

HPE Nimble Storage Array 10GbE cards and 16Gb Fibre Channel (FC) cards include SFP+ optical transceivers. The following tables list all supported SFP+ transceivers.

SFP+ Specifications (10GbE)

Table 19: Finisar

Item	Description	Description
Manufacturer / Part number	Finisar FTLX8574D3BCV	Finisar FTLX8571D3BCL
Media type	Multimode	Multimode
Data Rate	10Gb/s (9.95 to 10.3)	10Gb/s (9.95 to 10.5)
Wavelength	850nm VCSEL laser	850nm VCSEL laser
Applications	10GBASE-SR/SW 10Gb/s Ethernet	10GBASE-SR/SW 10Gb/s Ethernet
Voltage, per power supply	3.3V	3.3V
Connector type	LC Duplex	LC Duplex
RoHS	RoHS-6 compliant (lead free)	RoHS-6 compliant (lead free)
Operating temperature	-5° to 70°C (23° to 158°F)	0° to 70°C (32° to 158°F)
Maximum link length	400m on OM4 multimode fiber	300m on 2000 MHz multimode fiber
IEEE Standard	802.3-2012	802.3ae

Table 20: Applied Optoelectronics

Item	Description
Manufacturer / Part number	Applied Optoelectronics A7ELSN85ADMA0684
Media type	Multimode
Data Rate	10Gb/s
Wavelength	850nm VCSEL laser
Applications	10GBASE-SR Ethernet 10Gb/s Ethernet
Voltage, per power supply	3.3V
Connector type	Dual LC
RoHS	2011/65/EU
Operating temperature	-5° to 70°C (23° to 158°F)
Maximum link length	300m on OM3 multimode fiber

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Item	Description
IEEE Standard	802.3ae

SFP+ Specifications (16Gb FC)

Table 21: Finisar

Item	Description
Manufacturer / Part number	Finisar FTLF8529P3BCV-EM
Media type	Multimode
Data Rate	14Gb/s
Wavelength	850nm VCSEL laser
Applications	Tri-Rate 4.25/8.5/14.025 Fibre Channel
Voltage, per power supply	3.3V
Connector type	LC Duplex
RoHS	RoHS-6 compliant (lead free)
Operating temperature	0° to 70°C (32° to 158°F)
Maximum link length	100m MHz multimode fiber
IEEE Standard	802.3ae

Table 22: Avago/Broadcom/Emulex

Item	Description	
Manufacturer / Part number	Avago AFBR-57F5MZ-ELX	Avago LPe16002B-M6 Broadcom LPe16002B-M6 Emulex LPe16002B-M6
Media type	Multimode	Multimode
Data Rate	14Gb/s	14Gb/s
Wavelength	850nm VCSEL laser	short wave laser
Applications	Tri-Rate 4.25/8.5/14.025 Fibre Channel	16Gb/s Fibre Channel
Voltage, per power supply	3.3V	3.3V
Connector type	LC Duplex	LC Duplex
RoHS	RoHS-6 compliant (lead free)	RoHS-6 compliant (lead free)
Operating temperature	0° to 70°C (32° to 158°F)	0° to 55°C (32° to 131°F)
Maximum link length	100m MHz multimode fiber	125m on OM4 multimode fiber
IEEE Standard	802.3ae	802.3ae

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Table 23: 10GBASE-SR Cabling

Cable Grade	Maximum Link Distance
62.5 µm multimode 160MHz FDDI	26 meters (85 ft)
62.5 µm multimode 200MHz OM1	33 meters (108 ft)
50 µm multimode 400MHz OM1	66 meters (216 ft)
50 µm multimode 500MHz OM2	82 meters (269 ft)
50 µm multimode 2000MHz OM3	300 meters (980 ft)

Note HPE Nimble Storage recommends OM3 or better Fibre Channel (FC) cables.

Table 24: Fibre Channel Cabling

Cable Grade	Speed	Maximum Distance by Optical Cable/Media Type			
		OM1 62.5µm multi mode 200 MHz M6	OM2 50µm multi mode 500 MHz M6	OM3 50µm multi mode 2000 MHz M6	OM4 50µm multi mode 4700 MHz M6
Short Wave	4 Gbps	70 m	150 m	380 m	400 m
	8 Gbps	21 m	50 m	150 m	190 m
	16 Gbps	15 m	35 m	100 m	125 m

Note Short Wave Cable Grade and Speeds correspond to four types of Maximum Distance by Optical Cable/Media.

Direct Attach Copper

All model arrays also support *SFP+ Direct Attach*, also known as *10GSFP+Cu*. This IEEE Standard network topology uses 10Gb Ethernet over twinaxial copper cables that plug directly into SFP sockets. No transceivers are used.

Direct Attach twinaxial can be designed as "Active" or "Passive" cables, and can have a maximum link distance of about 10 meters (33 feet). HPE Nimble Arrays support Passive Direct Attach twinaxial cables of the appropriate length. Active Direct Attach twinaxial cables are not currently supported.

Note HPE Nimble Storage does not supply 10GSFP+Cu cables.

Statement of Volatility

Nimble AFx0 Product Family

Description - Below are the identifications of all the volatile and non-volatile devices found in the Nimble products AF20, AF20Q, AF40, AF60, and AF80 model arrays.

Table 25: Table of Volatile and Non-Volatile Devices

Item	Non-Volatile or Volatile	Quantity	Location	User Data?	Procedure to Clear
PCH	Non-Volatile	2	Motherboard	No	Remove AC and CMOS Battery for 5 minutes

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Item	Non-Volatile or Volatile	Quantity	Location	User Data?	Procedure to Clear
BIOS FW Flash	Non-Volatile	2	Motherboard	No	Use Programmer to erase
BMC FW Flash	Non-Volatile	2	Motherboard	No	Use Programmer to erase
10G LAN FW EEPROM	Non-Volatile	2	Motherboard	No	Use Programmer to erase
PLX EEPROM	Non-Volatile	2	Motherboard	No	Use Programmer to erase
CPLD	Non-Volatile	2	Motherboard	No	Use Programmer to erase
VGA memory	Volatile	2	Motherboard	Yes	Power off for 2 seconds
SAS Expander EEPROM	Non-Volatile	2	Lower Docking Board	No	Use Programmer to erase
Serial EEPROM	Non-Volatile	2	Lower Docking Board	No	Use Programmer to erase
HBA FW EEPROM	Non-Volatile	2	Upper Docking Board	No	Use Programmer to erase
Serial EEPROM	Non-Volatile	8	Bridge Board	No	Use Programmer to erase
System Memory DRAM	Volatile	20	DIMM	Yes	Power off for 2 seconds
System Memory EEPROM	Non-Volatile	20	DIMM	No	Use Programmer to erase
Backplane EEPROM	Non-Volatile	1	Backplane	No	Use Programmer to erase
Backplane CPLD	Non-Volatile	1	Backplane	No	Use Programmer to erase
PSU EEPROM	Non-Volatile	2	Power Supply	No	Use Programmer to erase
Disk Drive Media*	Non-Volatile	21	Storage Drive	Yes	Use media erase tool
Disk Drive EEPROM*	Non-Volatile	21	Storage Drive	No	Use Programmer to erase
Solid State Drive NAND	Non-Volatile	24	Storage Drive	Yes	Use media erase tool
Solid State Drive EEPROM	Non-Volatile	24	Storage Drive	No	Use Programmer to erase
M.2 Flash Drive	Non-Volatile	2	Motherboard	No	Use media erase tool

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Item	Non-Volatile or Volatile	Quantity	Location	User Data?	Procedure to Clear
CPLD FW	Non-Volatile	2	NVDIMM	No	Use Programmer to erase
NVDIMM Flash NAND	Non-Volatile	2	NVDIMM	Yes	Use Programmer to erase
NVDIMM DRAM	Volatile	2	NVDIMM	Yes	Remove AC for 5 minutes
NVDIMM EEPROM	Non-Volatile	2	NVDIMM	No	Use Programmer to erase
1G LAN FW EEPROM*	Non-Volatile	6	NIC PCIe card	No	Use Programmer to erase
10G LAN FW EEPROM*	Non-Volatile	6	NIC PCIe card	No	Use Programmer to erase
16Gb FC FW EEPROM *	Non-Volatile	6	Fibre Channel PCIe card	No	Use Programmer to erase

Note The 1G and 10G LAN FW EEPROM, 16Gb FC FW EEPROM, disk drive media, and disk drive EEPROM items apply if configured.

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Troubleshooting

This section describes how to check the temperature of your Nimble array and expansion shelves to prevent overheating, and keep your system operating at safe levels.

Check System Temperature

Like any electronic device, HPE Nimble storage arrays and expansion shelves generate heat, from 1300 to 1800 BTU per hour, depending on the model.

Fans and Sensors

HPE Nimble Storage arrays and expansion shelves have multiple cooling fans. They remove excess heat from the controllers, expanders, backplane, and drives. There is also a fan in each power supply unit designed to remove excess heat from the power supply. Because of the redundant fans in the arrays, a single fan failure does not result in an overheat condition.

The arrays and expansion shelves also have temperature sensors in each controller, each expander, and the backplane. These sensors monitor the temperatures inside the chassis. External temperature is monitored by redundant sensors on the front of the chassis. The array generates alerts and alarms based on internal temperatures of the chassis and external temperature.

Note The term *external temperature* refers to the ambient air temperature in front of, and around the HPE Nimble Storage array or expansion shelf.

Table 26: External Temperatures

External Temperature	Environment	Result
Below 35°C (95°F)	Proper temperature	System operates normally
At approximately 33°C (91.4°F)	Temperature too warm	Controller sends an information alert that the system is approaching the safe operating limit
At approximately 35°C (95°F)	Temperature too high	Controller sends a warning alert prompting user to take corrective action to check airflow and cooling
At approximately 40°C (104°F)	AF80 only: Temperature too hot	AF80 only: Controller sends a critical alert indicating imminent shutdown if temperature continues to rise
At approximately 45°C (113°F)	• AF80 only: Exceeds safe operating temperature • All other models: Temperature too hot	• AF80 only: Controller shuts down the array • All other models: Controller sends a critical alert indicating imminent shutdown if temperature continues to rise
At approximately 50°C (122°F)	Exceeds safe operating temperature	

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What You Should Do

Temperature alert messages from the HPE Nimble Storage array are the result of:

- Inadequate air circulation
- Excessive external temperature
- A combination of both conditions

Check for these conditions surrounding the array and expansion shelves, and take the necessary corrective action to cool down the environment in front of and around the array.

When the air conditioning system fails, the external temperature in your environment rises. If you believe that the ambient temperature might exceed the specified safe level for the array, consider stopping I/O and then manually shutting down the array and its attached expansion shelves. That action avoids the possibility of a sudden array shutdown.

See *Shut Down the Array Using the GUI* on page 44.

If the external temperature in your environment is below the specified safe level for the array, you have verified that there is ample air flow around the system, and you still get alert messages, contact HPE Nimble Storage Support. See *Support*.

Check System Temperature using the GUI

Procedure

1. In the GUI, click **Hardware**.
2. Click the individual array/
3. Mouse over the Temp icon in each controller view to check its current temperature.

Check System Temperature using the CLI

Procedure

In the CLI, type:

shelf --info [*serial_number*] **--array** [*array_name*]

```
shelf --info AB-103052 --array array144
```

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Regulatory and Safety Information

For important safety, environmental, and regulatory information, refer to this section and to the *Safety and Compliance Information for Server, Storage, Power, Networking, and Rack Products* guide available at *http://www.hpe.com/support/Safety-Compliance-EnterpriseProducts*.

Regulatory Warnings

This section describes all regulatory warnings that apply to HPE Nimble Storage arrays.

Regulatory Model Numbers: NMBLA-0002-1200, NMBLA-0002-1200E, NMBLA-0002-3000

European Union (EU)

Warning

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Israel

Warning

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

אזהרה

מוצר זה הוא מוצר Class A.
בסביבה ביתית,מוצר זה עלול לגרום הפרעות בתדר רדיו,ובמקרה זה ,המשתמש עשוי להידרש לנקוט אמצעים מתאימים.

Japan

Warning

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Class A Products: この装置は、クラスA 情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策 を講ずるよう要求されることがあります。 VCCI-A

Saudi Arabia

Warning

HPE Nimble Storage product arrays comply with the CITC Technical Specification CITC IT001.

South Korea

Warning

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

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경고:
이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을
주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

Taiwan

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Warning

警告使用者：
此為甲類資訊技術設備，於居住環境中使用時，可能會造成射頻
擾動，在此種情況下，使用者會被要求採取某些適當的對策。

·使用前，請檢查每一條連接線是否都已經依照使用手冊指示連接妥當，以及電源線是否有任何破損，
或是連接不正確的情形發生。如有任何破損情形，請儘速與您的授權經銷商聯絡，更換良好的線路。
·安放的位置請遠離灰塵過多，溫度過高，太陽直射的地方。
·保持機器在乾燥的環境下使用，雨水、溼氣、液體等含有礦物質將會腐蝕電子線路。
·使用時，務必保持周遭散熱空間，以利散熱。
·使用前，請檢查各項周邊設備是否都已經連接妥當再開機。
·避免邊吃東西邊使用工作站，以免污染機件造成故障。
·請避免讓紙張碎片、螺絲及線頭等小東西靠近工作站之連接器、插槽、孔位等處，避免短路及
接觸不良等情況發生。
·請勿將任何物品塞入機件內，以避免引起機件短路或電路損毀。
·開機一段時間之後，散熱片及部份 IC 表面可能會發熱、發燙，請勿用手觸摸，並請檢查系統是否散熱不良。
·在安裝或是移除周邊產品時請先關閉電源。
·在更換熱插拔式連接器的零件（如：Power Supply unit、HDD、DC Fan 等）之前，需先將產品的電源移除。
·電源供應器若壞掉，切勿自行修理，請交由授權經銷商處理。
·請不要試圖拆開機器內部，非專業人員自行拆開機器將會造成機器故障問題。
·機殼、鐵片大部分都經過防割傷處理，但是您仍必須注意避免被某些細部鐵片尖端及邊緣割傷，拆裝機殼
時最好能夠戴上手套。
·當你有一陣子不使用工作站時，休假或是颱風天，請關閉電源之後將電源線拔掉。
·本產品建議之環境操作溫度為 35°C。
·主機板上之 RTC 電池如果更換不正確會有爆炸的危險，請依照製造商說明書處理用過的電池。

產品：儲存系統
報驗義務人: 慧與科技股份有限公司
地址: 11568 台北市南港區經貿二路66號10樓之1

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台灣限用物質含有情況標示

單元	限用物質及其化學符號					
	鉛 (Pb)	汞 (Hg)	鎘 (Cd)	六價鉻 (Cr^{+6})	多溴聯苯 (PBB)	多溴二苯醚 (PBDE)
傳輸線和線材	○	○	○	○	○	○
外殼	-	○	○	○	○	○
記憶體	○	○	○	○	○	○
其他機械組裝設備	-	○	○	○	○	○
印刷電路零組件 (PCAs)	-	○	○	○	○	○
風扇(選配)	○	○	○	○	○	○
存取裝置(HDD) (選配)	-	○	○	○	○	○
變壓器/電源供應器(選配)	-	○	○	○	○	○
備考 1. 〝○〞係指該項限用物質之百分比含量未超出百分比含量基準值。 備考 2. 〝 - 〞係指該項限用物質為排除項目。						

選配單元使用於特定產品型號，詳細規格請參照產品說明書。

USA

Warning

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Any changes or modifications not expressly approved by the grantee of this device could void the user`s authority to operate the equipment.

Safety Warnings

This section describes the safety warnings that apply to HPE Nimble Storage arrays.

Note

- Access can only be gained by Service Persons or by Users who have been instructed about the reasons for the restrictions applied to the location and about any precautions that shall be taken.The storage is intended for installation only in a Server Room or Computer Room where both of these conditions apply:
- Access is through the use of a Tool or lock and key, or other means of security, and is controlled by the authority responsible for the location.

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Electrical Safety

Follow basic electrical safety precautions to protect yourself from harm and to protect the storage array from damage:

Note The AC input voltage for each power supply is 100 V to 240 V. Start-up current draw may exceed 6 A.

- Locate the power switch on the array and the emergency power switch of the room so that you can quickly stop power to the system if an electrical issue occurs.
- When working with high-voltage components or exposed electrical circuits, have another person who is familiar with emergency power-off locations nearby to switch off the power, if necessary.
- Use an approved power cord with a grounded plug for the power supply, and plug the power cord into a grounded electrical outlet.
- When connecting power to power supplies, install the power supply before connecting the power cable to it. When disconnecting power to power supplies, unplug the power cable before removing the power supply.
- Unplug the power cord before removing a power supply from the chassis.
- In the rare event that you must shut down an array for maintenance, such as chassis replacement, power down the system and unplug the power cords from all power supplies.

System Safety

Electrostatic discharge (ESD) can damage system components. To avoid damage to equipment from electrostatic discharge:

- Prepare an ESD work surface by placing an antistatic mat on the floor or on a table near the storage system. Attach the ground lead of the mat to an unpainted surface of the rack.
- Always use an ESD wrist strap when touching system components. Attach the grounding strap clip directly to an unpainted surface of the rack.
- Keep each component in its antistatic package until you are ready to install it.
- Avoid contact between electronic components and clothing. Even if you are wearing a wrist strap, your clothing may still retain a charge.

Battery Safety

All HPE Nimble Storage arrays ship with a super-capacitor to power the NVDIMM. The super-capacitor is not user-replaceable.

Motherboard Battery

Warning There is a danger of explosion if the on-board battery is installed upside down, which will reverse its polarities. This battery must be replaced only with the same or an equivalent type recommended by the manufacturer. Dispose of used batteries according to the battery manufacturer's instructions.

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