



End-of-availability systems

Install and maintain

NetApp
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End-of-availability Systems

AFF A200 systems

Install and setup

Cluster configuration worksheet - AFF A200

You can use the [Cluster Configuration Worksheet](#) to gather and record your site-specific IP addresses and other information required when configuring an ONTAP cluster.

Start here: Choose your installation and setup experience

You can choose from different content formats to guide you through installing and setting up your new storage system.

- [AFF A200 Installation and Setup Instructions](#)

A printable PDF of step-by-step instructions with live links to additional content.

- [Video steps](#)

Video step-by-step instructions.

Installation and setup PDF poster - AFF A200

You can use the [AFF A200 Installation and Setup Instructions](#) poster to install and set up your new system. The PDF poster provides step-by-step instructions with live links to additional content.

Maintain

Maintain AFF A200 hardware

For the AFF A200 storage system, you can perform maintenance procedures on the following components.

Boot media

The boot media stores a primary and secondary set of boot image files that the system uses when it boots.

Caching module

You must replace the controller's caching module when your system registers a single AutoSupport (ASUP) message that the module has gone offline.

Chassis

The chassis is the physical enclosure housing all the controller components such as the controller/CPU unit, power supply, and I/O.

Controller

A controller consists of a board, firmware, and software. It controls the drives and implements the ONTAP functions.

DIMM

You must replace a DIMM (dual in-line memory module) when a memory mismatch is present, or you have a failed DIMM.

Drive

A drive is a device that provides the physical storage media for data.

NVEM Battery

A battery is included with a controller and preserves cached data if the AC power fails.

Power supply

A power supply provides a redundant power source in a controller shelf.

Real time clock battery

A real time clock battery preserves system date and time information if the power is off.

Boot media

Overview of boot media replacement - AFF A200

The boot media stores a primary and secondary set of system (boot image) files that the system uses when it boots. Depending on your network configuration, you can perform either a nondisruptive or disruptive replacement.

What you'll need

You must have a USB flash drive, formatted to FAT32, with the appropriate amount of storage to hold the `image_xxx.tgz` file.

Before you begin

- The nondisruptive and disruptive methods for replacing a boot media both require you to restore the var file system:
 - For nondisruptive replacement, the HA pair must be connected to a network to restore the var file system.
 - For disruptive replacement, you do not need a network connection to restore the var file system, but the process requires two reboots.
- You must replace the failed component with a replacement FRU component you received from your provider.
- It is important that you apply the commands in these steps on the correct controller:
 - The *impaired* controller is the controller on which you are performing maintenance.
 - The *healthy* controller is the HA partner of the impaired controller.

Check onboard encryption keys - AFF A200

Prior to shutting down the impaired controller and checking the status of the onboard encryption keys, you must check the status of the impaired controller, disable automatic giveback, and check which version of ONTAP is running on the system.

If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see the [Synchronize a node with the cluster](#).

Steps

1. Check the status of the impaired controller:
 - If the impaired controller is at the login prompt, log in as `admin`.
 - If the impaired controller is at the `LOADER` prompt and is part of HA configuration, log in as `admin` on the healthy controller.
 - If the impaired controller is in a standalone configuration and at `LOADER` prompt, contact mysupport.netapp.com.

2. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message  
MAINT=number_of_hours_downh
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:*>`

```
system node autosupport invoke -node * -type all -message MAINT=2h
```

3. Check the version of ONTAP the system is running on the impaired controller if up, or on the partner controller if the impaired controller is down, using the `version -v` command:
 - If `<Ino-DARE>` or `<1Ono-DARE>` is displayed in the command output, the system does not support NVE, proceed to shut down the controller.
 - If `<Ino-DARE>` is not displayed in the command output, and the system is running ONTAP 9.5, go to [Option 1: Checking NVE or NSE on systems running ONTAP 9.5 and earlier](#).
 - If `<Ino-DARE>` is not displayed in the command output, and the system is running ONTAP 9.6 or later, go to [Option 2: Checking NVE or NSE on systems running ONTAP 9.6 and later](#).
4. If the impaired controller is part of an HA configuration, disable automatic giveback from the healthy controller: `storage failover modify -node local -auto-giveback false` or `storage failover modify -node local -auto-giveback-after-panic false`

Option 1: Checking NVE or NSE on systems running ONTAP 9.5 and earlier

Before shutting down the impaired controller, you need to check whether the system has either NetApp Volume Encryption (NVE) or NetApp Storage Encryption (NSE) enabled. If so, you need to verify the configuration.

Steps

1. Connect the console cable to the impaired controller.
2. Check whether NVE is configured for any volumes in the cluster: `volume show -is-encrypted true`

If any volumes are listed in the output, NVE is configured and you need to verify the NVE configuration. If no volumes are listed, check whether NSE is configured.

3. Check whether NSE is configured: `storage encryption disk show`

- If the command output lists the drive details with Mode & Key ID information, NSE is configured and you need to verify the NSE configuration.
- If NVE and NSE are not configured, it's safe to shut down the impaired controller.

Verify NVE configuration

Steps

1. Display the key IDs of the authentication keys that are stored on the key management servers: `security key-manager query`
 - If the `Restored` column displays `yes` and all key managers display `available`, it's safe to shut down the impaired controller.
 - If the `Restored` column displays anything other than `yes`, or if any key manager displays `unavailable`, you need to complete some additional steps.
 - If you see the message `This command is not supported when onboard key management is enabled`, you need to complete some other additional steps.
2. If the `Restored` column displayed anything other than `yes`, or if any key manager displayed `unavailable`:
 - a. Retrieve and restore all authentication keys and associated key IDs: `security key-manager restore -address *`

If the command fails, contact NetApp Support.

mysupport.netapp.com
 - b. Verify that the `Restored` column displays `yes` for all authentication keys and that all key managers display `available`: `security key-manager query`
 - c. Shut down the impaired controller.
3. If you saw the message `This command is not supported when onboard key management is enabled`, display the keys stored in the onboard key manager: `security key-manager key show -detail`
 - a. If the `Restored` column displays `yes` manually back up the onboard key management information:
 - Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
 - Enter the command to display the OKM backup information: `security key-manager backup show`
 - Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
 - Return to admin mode: `set -priv admin`
 - Shut down the impaired controller.
 - b. If the `Restored` column displays anything other than `yes`:
 - Run the key-manager setup wizard: `security key-manager setup -node target/impaired node name`



Enter the customer's onboard key management passphrase at the prompt. If the passphrase cannot be provided, contact mysupport.netapp.com

- Verify that the `Restored` column displays `yes` for all authentication keys: `security key-manager key show -detail`
- Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
- Enter the command to display the OKM backup information: `security key-manager backup show`
- Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
- Return to admin mode: `set -priv admin`
- You can safely shutdown the controller.

Verify NSE configuration

Steps

1. Display the key IDs of the authentication keys that are stored on the key management servers: `security key-manager query`
 - If the `Restored` column displays `yes` and all key managers display `available`, it's safe to shut down the impaired controller.
 - If the `Restored` column displays anything other than `yes`, or if any key manager displays `unavailable`, you need to complete some additional steps.
 - If you see the message `This command is not supported when onboard key management is enabled`, you need to complete some other additional steps
2. If the `Restored` column displayed anything other than `yes`, or if any key manager displayed `unavailable`:
 - a. Retrieve and restore all authentication keys and associated key IDs: `security key-manager restore -address *`

If the command fails, contact NetApp Support.

mysupport.netapp.com
 - b. Verify that the `Restored` column displays `yes` for all authentication keys and that all key managers display `available`: `security key-manager query`
 - c. Shut down the impaired controller.
3. If you saw the message `This command is not supported when onboard key management is enabled`, display the keys stored in the onboard key manager: `security key-manager key show -detail`
 - a. If the `Restored` column displays `yes`, manually back up the onboard key management information:
 - Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
 - Enter the command to display the OKM backup information: `security key-manager backup show`
 - Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
 - Return to admin mode: `set -priv admin`
 - Shut down the impaired controller.

b. If the `Restored` column displays anything other than `yes`:

- Run the key-manager setup wizard: `security key-manager setup -node target/impaired node name`



Enter the customer's OKM passphrase at the prompt. If the passphrase cannot be provided, contact mysupport.netapp.com

- Verify that the `Restored` column shows `yes` for all authentication keys: `security key-manager key show -detail`
- Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
- Enter the command to back up the OKM information: `security key-manager backup show`



Make sure that OKM information is saved in your log file. This information will be needed in disaster scenarios where OKM might need to be manually recovered.

- Copy the contents of the backup information to a separate file or your log. You'll need it in disaster scenarios where you might need to manually recover OKM.
- Return to admin mode: `set -priv admin`
- You can safely shut down the controller.

Option 2: Checking NVE or NSE on systems running ONTAP 9.6 and later

Before shutting down the impaired controller, you need to verify whether the system has either NetApp Volume Encryption (NVE) or NetApp Storage Encryption (NSE) enabled. If so, you need to verify the configuration.

1. Verify whether NVE is in use for any volumes in the cluster: `volume show -is-encrypted true`

If any volumes are listed in the output, NVE is configured and you need to verify the NVE configuration. If no volumes are listed, check whether NSE is configured and in use.

2. Verify whether NSE is configured and in use: `storage encryption disk show`
 - If the command output lists the drive details with Mode & Key ID information, NSE is configured and you need to verify the NSE configuration and in use.
 - If no disks are shown, NSE is not configured.
 - If NVE and NSE are not configured, no drives are protected with NSE keys, it's safe to shut down the impaired controller.

Verify NVE configuration

1. Display the key IDs of the authentication keys that are stored on the key management servers: `security key-manager key query`




After the ONTAP 9.6 release, you may have additional key manager types. The types are KMIP, AKV, and GCP. The process for confirming these types is the same as confirming external or onboard key manager types.

- If the Key Manager type displays `external` and the `Restored` column displays `yes`, it's safe to shut down the impaired controller.

- If the Key Manager type displays onboard and the Restored column displays yes, you need to complete some additional steps.
 - If the Key Manager type displays external and the Restored column displays anything other than yes, you need to complete some additional steps.
 - If the Key Manager type displays onboard and the Restored column displays anything other than yes, you need to complete some additional steps.
2. If the Key Manager type displays onboard and the Restored column displays yes, manually back up the OKM information:
 - a. Go to advanced privilege mode and enter y when prompted to continue: `set -priv advanced`
 - b. Enter the command to display the key management information: `security key-manager onboard show-backup`
 - c. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
 - d. Return to admin mode: `set -priv admin`
 - e. Shut down the impaired controller.
 3. If the Key Manager type displays external and the Restored column displays anything other than yes:
 - a. Restore the external key management authentication keys to all nodes in the cluster: `security key-manager external restore`

If the command fails, contact NetApp Support.

mysupport.netapp.com
 - b. Verify that the Restored column equals yes for all authentication keys: `security key-manager key query`
 - c. Shut down the impaired controller.
 4. If the Key Manager type displays onboard and the Restored column displays anything other than yes:
 - a. Enter the onboard security key-manager sync command: `security key-manager onboard sync`

 Enter the customer's 32 character, alphanumeric onboard key management passphrase at the prompt. If the passphrase cannot be provided, contact NetApp Support.
mysupport.netapp.com
 - b. Verify the Restored column shows yes for all authentication keys: `security key-manager key query`
 - c. Verify that the Key Manager type shows onboard, and then manually back up the OKM information.
 - d. Go to advanced privilege mode and enter y when prompted to continue: `set -priv advanced`
 - e. Enter the command to display the key management backup information: `security key-manager onboard show-backup`
 - f. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
 - g. Return to admin mode: `set -priv admin`

- h. You can safely shut down the controller.

Verify NSE configuration

1. Display the key IDs of the authentication keys that are stored on the key management servers: `security key-manager key query -key-type NSE-AK`



After the ONTAP 9.6 release, you may have additional key manager types. The types are KMIP, AKV, and GCP. The process for confirming these types is the same as confirming external or onboard key manager types.

- If the Key Manager type displays external and the Restored column displays yes, it's safe to shut down the impaired controller.
 - If the Key Manager type displays onboard and the Restored column displays yes, you need to complete some additional steps.
 - If the Key Manager type displays external and the Restored column displays anything other than yes, you need to complete some additional steps.
 - If the Key Manager type displays external and the Restored column displays anything other than yes, you need to complete some additional steps.
2. If the Key Manager type displays onboard and the Restored column displays yes, manually back up the OKM information:
 - a. Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
 - b. Enter the command to display the key management information: `security key-manager onboard show-backup`
 - c. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
 - d. Return to admin mode: `set -priv admin`
 - e. You can safely shut down the controller.
 3. If the Key Manager type displays external and the Restored column displays anything other than yes:
 - a. Restore the external key management authentication keys to all nodes in the cluster: `security key-manager external restore`

If the command fails, contact NetApp Support.

mysupport.netapp.com
 - b. Verify that the Restored column equals yes for all authentication keys: `security key-manager key query`
 - c. You can safely shut down the controller.
 4. If the Key Manager type displays onboard and the Restored column displays anything other than yes:
 - a. Enter the onboard security key-manager sync command: `security key-manager onboard sync`

Enter the customer's 32 character, alphanumeric onboard key management passphrase at the prompt. If the passphrase cannot be provided, contact NetApp Support.

- b. Verify the `Restored` column shows `yes` for all authentication keys: `security key-manager key query`
- c. Verify that the `Key Manager` type shows `onboard`, and then manually back up the OKM information.
- d. Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
- e. Enter the command to display the key management backup information: `security key-manager onboard show-backup`
- f. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
- g. Return to admin mode: `set -priv admin`
- h. You can safely shut down the controller.

Shut down the impaired controller - AFF A200

After completing the NVE or NSE tasks, you need to complete the shutdown of the impaired controller.

Steps

- a. Take the impaired controller to the LOADER prompt:

If the impaired controller displays...	Then...
The LOADER prompt	Go to Remove controller module.
Waiting for giveback...	Press Ctrl-C, and then respond <code>y</code> when prompted.
System prompt or password prompt (enter system password)	<p>Take over or halt the impaired controller from the healthy controller: <code>storage failover takeover -ofnode impaired_node_name</code></p> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <code>y</code>.</p>

- b. From the LOADER prompt, enter: `printenv` to capture all boot environmental variables. Save the output to your log file.



This command may not work if the boot device is corrupted or non-functional.

Replace the boot media - AFF A200

To replace the boot media, you must remove the impaired controller module, install the replacement boot media, and transfer the boot image to a USB flash drive.

Step 1: Remove the controller

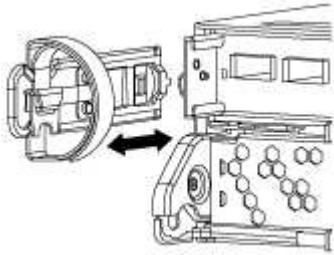
To access components inside the controller, you must first remove the controller module from the system and then remove the cover on the controller module.

Steps

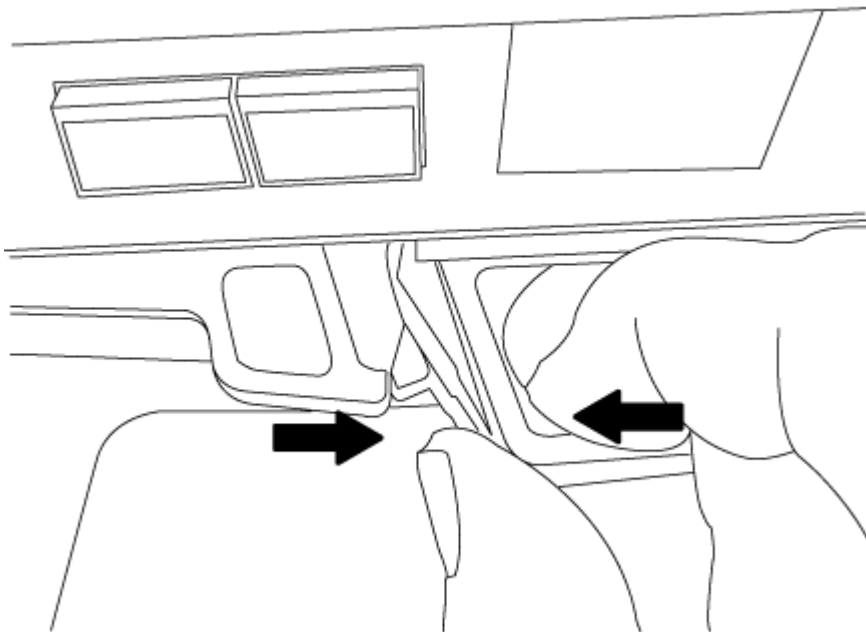
1. If you are not already grounded, properly ground yourself.
2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

3. Remove and set aside the cable management devices from the left and right sides of the controller module.



4. Squeeze the latch on the cam handle until it releases, open the cam handle fully to release the controller module from the midplane, and then, using two hands, pull the controller module out of the chassis.



5. Turn the controller module over and place it on a flat, stable surface.
6. Open the cover by sliding in the blue tabs to release the cover, and then swing the cover up and open.



Step 2: Replace the boot media

You must locate the boot media in the controller and follow the directions to replace it.

Steps

1. If you are not already grounded, properly ground yourself.
2. Locate the boot media using the following illustration or the FRU map on the controller module:
3. Press the blue button on the boot media housing to release the boot media from its housing, and then gently pull it straight out of the boot media socket.



Do not twist or pull the boot media straight up, because this could damage the socket or the boot media.

4. Align the edges of the replacement boot media with the boot media socket, and then gently push it into the socket.
5. Check the boot media to make sure that it is seated squarely and completely in the socket.

If necessary, remove the boot media and reseal it into the socket.

6. Push the boot media down to engage the locking button on the boot media housing.
7. Close the controller module cover.

Step 3: Transfer the boot image to the boot media

You can install the system image to the replacement boot media using a USB flash drive with the image

installed on it. However, you must restore the var file system during this procedure.

What you'll need

- You must have a USB flash drive, formatted to FAT32, with at least 4GB capacity.
- A copy of the same image version of ONTAP as what the impaired controller was running. You can download the appropriate image from the Downloads section on the NetApp Support Site
 - If NVE is enabled, download the image with NetApp Volume Encryption, as indicated in the download button.
 - If NVE is not enabled, download the image without NetApp Volume Encryption, as indicated in the download button.
- If your system is an HA pair, you must have a network connection.
- If your system is a stand-alone system you do not need a network connection, but you must perform an additional reboot when restoring the var file system.

Steps

1. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.
2. Reinstall the cable management device and recable the system, as needed.

When recabling, remember to reinstall the media converters (SFPs) if they were removed.

3. Insert the USB flash drive into the USB slot on the controller module.

Make sure that you install the USB flash drive in the slot labeled for USB devices, and not in the USB console port.

4. Push the controller module all the way into the system, making sure that the cam handle clears the USB flash drive, firmly push the cam handle to finish seating the controller module, push the cam handle to the closed position, and then tighten the thumbscrew.

The controller begins to boot as soon as it is completely installed into the chassis.

5. Interrupt the boot process to stop at the LOADER prompt by pressing Ctrl-C when you see Starting AUTOBOOT press Ctrl-C to abort....

If you miss this message, press Ctrl-C, select the option to boot to Maintenance mode, and then halt the controller to boot to LOADER.

6. For systems with one controller in the chassis, reconnect the power and turn on the power supplies.

The system begins to boot and stops at the LOADER prompt.

7. Set your network connection type at the LOADER prompt:

- If you are configuring DHCP: `ifconfig e0a -auto`



The target port you configure is the target port you use to communicate with the impaired controller from the healthy controller during var file system restore with a network connection. You can also use the e0M port in this command.

- If you are configuring manual connections: `ifconfig e0a -addr=filer_addr -mask=netmask`

-gw=gateway-dns=dns_addr-domain=dns_domain

- `filer_addr` is the IP address of the storage system.
- `netmask` is the network mask of the management network that is connected to the HA partner.
- `gateway` is the gateway for the network.
- `dns_addr` is the IP address of a name server on your network.
- `dns_domain` is the Domain Name System (DNS) domain name.

If you use this optional parameter, you do not need a fully qualified domain name in the netboot server URL. You need only the server's host name.



Other parameters might be necessary for your interface. You can enter `help ifconfig` at the firmware prompt for details.

Boot the recovery image - AFF A200

You must boot the ONTAP image from the USB drive, restore the file system, and verify the environmental variables.

Steps

1. From the LOADER prompt, boot the recovery image from the USB flash drive: `boot_recovery`

The image is downloaded from the USB flash drive.

2. When prompted, either enter the name of the image or accept the default image displayed inside the brackets on your screen.
3. Restore the `var` file system:

If your system has...	Then...
A network connection	<ol style="list-style-type: none">a. Press <code>y</code> when prompted to restore the backup configuration.b. Set the healthy controller to advanced privilege level: <code>set -privilege advanced</code>c. Run the restore backup command: <code>system node restore-backup -node local -target-address <i>impaired_node_IP_address</i></code>d. Return the controller to admin level: <code>set -privilege admin</code>e. Press <code>y</code> when prompted to use the restored configuration.f. Press <code>y</code> when prompted to reboot the controller.

If your system has...	Then...
No network connection	<ol style="list-style-type: none"> Press <code>n</code> when prompted to restore the backup configuration. Reboot the system when prompted by the system. Select the Update flash from backup config (sync flash) option from the displayed menu. <p>If you are prompted to continue with the update, press <code>y</code>.</p>

4. Ensure that the environmental variables are set as expected:
 - Take the controller to the LOADER prompt.
 - Check the environment variable settings with the `printenv` command.
 - If an environment variable is not set as expected, modify it with the `setenv environment-variable-name changed-value` command.
 - Save your changes using the `saveenv` command.
5. The next depends on your system configuration:
 - If your system has onboard keymanager, NSE or NVE configured, go to [Restore OKM, NSE, and NVE as needed](#)
 - If your system does not have onboard keymanager, NSE or NVE configured, complete the steps in this section.
6. From the LOADER prompt, enter the `boot_ontap` command.

If you see...	Then...
The login prompt	Go to the next Step.
Waiting for giveback...	<ol style="list-style-type: none"> Log into the partner controller. Confirm the target controller is ready for giveback with the <code>storage failover show</code> command.

7. Connect the console cable to the partner controller.
8. Give back the controller using the `storage failover giveback -fromnode local` command.
9. At the cluster prompt, check the logical interfaces with the `net int -is-home false` command.

If any interfaces are listed as "false", revert those interfaces back to their home port using the `net int revert` command.
10. Move the console cable to the repaired controller and run the `version -v` command to check the ONTAP versions.
11. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.

Once environment variables are checked, you must complete steps specific to systems that have Onboard Key Manager (OKM), NetApp Storage Encryption (NSE) or NetApp Volume Encryption (NVE) enabled.

Determine which section you should use to restore your OKM, NSE, or NVE configurations:

If NSE or NVE are enabled along with Onboard Key Manager you must restore settings you captured at the beginning of this procedure.

- If NSE or NVE are enabled and Onboard Key Manager is enabled, go to [Option 1: Restore NVE or NSE when Onboard Key Manager is enabled](#).
- If NSE or NVE are enabled for ONATP 9.5, go to [Option 2: Restore NSE/NVE on systems running ONTAP 9.5 and earlier](#).
- If NSE or NVE are enabled for ONTAP 9.6, go to [Option 3: Restore NSE/NVE on systems running ONTAP 9.6 and later](#).

Option 1: Restore NVE or NSE when Onboard Key Manager is enabled

Steps

1. Connect the console cable to the target controller.
2. Use the `boot_ontap` command at the LOADER prompt to boot the controller.
3. Check the console output:

If the console displays...	Then...
The LOADER prompt	Boot the controller to the boot menu: <code>boot_ontap menu</code>
Waiting for giveback...	<ol style="list-style-type: none">a. Enter <code>Ctrl-C</code> at the promptb. At the message: Do you wish to halt this controller rather than wait [y/n]? , enter: <code>y</code>c. At the LOADER prompt, enter the <code>boot_ontap menu</code> command.

4. At the Boot Menu, enter the hidden command, `recover_onboard_keymanager` and reply `y` at the prompt.
5. Enter the passphrase for the onboard key manager you obtained from the customer at the beginning of this procedure.
6. When prompted to enter the backup data, paste the backup data you captured at the beginning of this procedure, when asked. Paste the output of `security key-manager backup show` OR `security key-manager onboard show-backup` command.



The data is output from either `security key-manager backup show` or `security key-manager onboard show-backup` command.

Example of backup data:

```

-----BEGIN BACKUP-----
TmV0QXBwIEtleSBCbG9iAAEAAAAEAAAAcAEAAAAAADuD+byAAAAACEAAAAAAAAA
QAAAAAAAAABvOIH0AAAAAMh7qDLRyH1DBz12piVdy9ATSFMT0C0TIYFss4PDjTaV
dzRYkLd1PhQLxAWJwOlyqSr8qY1SEBgm1IWgE5DLRqkiAAAAAAAAACgAAAAAAAA
3WTh7gAAAAAAAAAAAAAAAAIAAAAAAgAZJEIWvdeHr5RCAvHGclo+wAAAAAAAAAA
lgAAAAAAAAAoAAAAAAAAAEOTcR0AAAAAAAAAAAAAAAACAAAAAAJAGr3tJA/
LRzUQRHwv+1aWvAAAAAAAAAACQAAAAAAAAAgAAAAAAAAACdhTcvAAAAAJ1PXeBf
ml4NBsSyV1B4jc4A7cvWEFY6ILG6hc6tbKLAHZuvfQ4rIbYAAAAAAAAAAAAAAAA
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H4nPQM0nrDRYRa9SCv8AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAA
-----END BACKUP-----

```

7. At the Boot Menu select the option for Normal Boot.

The system boots to `Waiting for giveback...` prompt.

8. Move the console cable to the partner controller and login as admin.
9. Confirm the target controller is ready for giveback with the `storage failover show` command.
10. Give back only the CFO aggregates with the `storage failover giveback -fromnode local -only-cfo -aggregates true` command.
 - If the command fails because of a failed disk, physically disengage the failed disk, but leave the disk in the slot until a replacement is received.
 - If the command fails because of an open CIFS session, check with the customer on how to close out CIFS sessions.



Terminating CIFS can cause loss of data.

- If the command fails because the partner is "not ready", wait 5 minutes for the NVMEMs to synchronize.
 - If the command fails because of an NDMP, SnapMirror, or SnapVault process, disable the process. See the appropriate Documentation Center for more information.
11. Once the giveback completes, check the failover and giveback status with the `storage failover show` and ``storage failover show-giveback`` commands.

Only the CFO aggregates (root aggregate and CFO style data aggregates) will be shown.

12. Move the console cable to the target controller.
13. If you are running ONTAP 9.5 and earlier, run the key-manager setup wizard:
 - a. Start the wizard using the `security key-manager setup -nodenodename` command, and then enter the passphrase for onboard key management when prompted.

- b. Enter the `key-manager key show -detail` command to see a detailed view of all keys stored in the onboard key manager and verify that the `Restored` column = `yes` for all authentication keys.



If the `Restored` column = anything other than `yes`, contact Customer Support.

- c. Wait 10 minutes for the key to synchronize across the cluster.

14. If you are running ONTAP 9.6 or later:

- a. Run the `security key-manager onboard sync` command and then enter the passphrase when prompted.
- b. Enter the `security key-manager key query` command to see a detailed view of all keys stored in the onboard key manager and verify that the `Restored` column = `yes/true` for all authentication keys.



If the `Restored` column = anything other than `yes/true`, contact Customer Support.

- c. Wait 10 minutes for the key to synchronize across the cluster.

15. Move the console cable to the partner controller.

16. Give back the target controller using the `storage failover giveback -fromnode local` command.

17. Check the giveback status, 3 minutes after it reports complete, using the `storage failover show` command.

If giveback is not complete after 20 minutes, contact Customer Support.

18. At the `clustershell` prompt, enter the `net int show -is-home false` command to list the logical interfaces that are not on their home controller and port.

If any interfaces are listed as `false`, revert those interfaces back to their home port using the `net int revert -vserver Cluster -lif nodename` command.

19. Move the console cable to the target controller and run the `version -v` command to check the ONTAP versions.

20. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.

Option 2: Restore NSE/NVE on systems running ONTAP 9.5 and earlier

Steps

1. Connect the console cable to the target controller.
2. Use the `boot_ontap` command at the `LOADER` prompt to boot the controller.
3. Check the console output:

If the console displays...	Then...
The login prompt	Go to Step 7.

If the console displays...	Then...
Waiting for giveback...	<ol style="list-style-type: none"> Log into the partner controller. Confirm the target controller is ready for giveback with the <code>storage failover show</code> command.

- Move the console cable to the partner controller and give back the target controller storage using the `storage failover giveback -fromnode local -only-cfo-aggregates true local` command.
 - If the command fails because of a failed disk, physically disengage the failed disk, but leave the disk in the slot until a replacement is received.
 - If the command fails because of an open CIFS sessions, check with customer how to close out CIFS sessions.



Terminating CIFS can cause loss of data.

- If the command fails because the partner "not ready", wait 5 minutes for the NVMEMs to synchronize.
 - If the command fails because of an NDMP, SnapMirror, or SnapVault process, disable the process. See the appropriate Documentation Center for more information.
- Wait 3 minutes and check the failover status with the `storage failover show` command.
 - At the clustershell prompt, enter the `net int show -is-home false` command to list the logical interfaces that are not on their home controller and port.

If any interfaces are listed as `false`, revert those interfaces back to their home port using the `net int revert -vserver Cluster -lif nodename` command.

- Move the console cable to the target controller and run the `version -v` command to check the ONTAP versions.
- Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.
- Use the `storage encryption disk show` at the clustershell prompt, to review the output.



This command does not work if NVE (NetApp Volume Encryption) is configured

- Use the security key-manager query to display the key IDs of the authentication keys that are stored on the key management servers.
 - If the `Restored` column = `yes` and all key managers report in an available state, go to *Complete the replacement process*.
 - If the `Restored` column = anything other than `yes`, and/or one or more key managers is not available, use the `security key-manager restore -address` command to retrieve and restore all authentication keys (AKs) and key IDs associated with all nodes from all available key management servers.

Check the output of the security key-manager query again to ensure that the `Restored` column = `yes` and all key managers report in an available state

11. If the Onboard Key Management is enabled:

- a. Use the `security key-manager key show -detail` to see a detailed view of all keys stored in the onboard key manager.
- b. Use the `security key-manager key show -detail` command and verify that the `Restored` column = `yes` for all authentication keys.

If the `Restored` column = anything other than `yes`, use the `security key-manager setup -node Repaired(Target) node` command to restore the Onboard Key Management settings.

Rerun the `security key-manager key show -detail` command to verify `Restored` column = `yes` for all authentication keys.

12. Connect the console cable to the partner controller.

13. Give back the controller using the `storage failover giveback -fromnode local` command.

14. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.

Option 3: Restore NSE/NVE on systems running ONTAP 9.6 and later

Steps

1. Connect the console cable to the target controller.
2. Use the `boot_ontap` command at the `LOADER` prompt to boot the controller.
3. Check the console output:

If the console displays...	Then...
The login prompt	Go to Step 7.
Waiting for giveback...	<ol style="list-style-type: none">a. Log into the partner controller.b. Confirm the target controller is ready for giveback with the <code>storage failover show</code> command.

4. Move the console cable to the partner controller and give back the target controller storage using the `storage failover giveback -fromnode local -only-cfo-aggregates true local` command.

- If the command fails because of a failed disk, physically disengage the failed disk, but leave the disk in the slot until a replacement is received.
- If the command fails because of an open CIFS session, check with the customer on how to close out CIFS sessions.



Terminating CIFS can cause loss of data.

- If the command fails because the partner is "not ready", wait 5 minutes for the NVMEMs to synchronize.
- If the command fails because of an NDMP, SnapMirror, or SnapVault process, disable the process. See the appropriate Documentation Center for more information.

5. Wait 3 minutes and check the failover status with the `storage failover show` command.
6. At the clustershell prompt, enter the `net int show -is-home false` command to list the logical interfaces that are not on their home controller and port.

If any interfaces are listed as `false`, revert those interfaces back to their home port using the `net int revert -vserver Cluster -lif nodename` command.

7. Move the console cable to the target controller and run the `version -v` command to check the ONTAP versions.
8. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.
9. Use the `storage encryption disk show` at the clustershell prompt, to review the output.
10. Use the `security key-manager key query` command to display the key IDs of the authentication keys that are stored on the key management servers.
 - If the `Restored` column = `yes/true`, you are done and can proceed to complete the replacement process.
 - If the `Key Manager type` = `external` and the `Restored` column = anything other than `yes/true`, use the `security key-manager external restore` command to restore the key IDs of the authentication keys.



If the command fails, contact Customer Support.

- If the `Key Manager type` = `onboard` and the `Restored` column = anything other than `yes/true`, use the `security key-manager onboard sync` command to re-sync the Key Manager type.

Use the `security key-manager key query` to verify that the `Restored` column = `yes/true` for all authentication keys.

11. Connect the console cable to the partner controller.
12. Give back the controller using the `storage failover giveback -fromnode local` command.
13. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.
14. If AutoSupport is enabled, restore/unsuppress automatic case creation by using the `system node autosupport invoke -node * -type all -message MAINT=END`

Return the failed part to NetApp - AFF A200

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

Chassis

Overview of chassis replacement - AFF A200

To replace the chassis, move the power supplies, hard drives, and controller module or modules from the impaired chassis to the new chassis, and swap out the impaired chassis from the equipment rack or system cabinet with the new chassis of the same

model as the impaired chassis.

What you'll need

All other components in the system must be functioning properly; if not, contact technical support.

About this task

- You can use this procedure with all versions of ONTAP supported by your system.
- This procedure is written with the assumption that you are moving all drives and controller module or modules to the new chassis, and that the chassis is a new component from NetApp.
- This procedure is disruptive. For a two-node cluster, you will have a complete service outage and a partial outage in a multi-node cluster.

Shut down the controllers - AFF A200

This procedure is for 2-node, non-MetroCluster configurations only. If you have a system with more than two nodes, see [How to perform a graceful shutdown and power up of one HA pair in a 4-node cluster](#).

Before you begin

You need:

- Local administrator credentials for ONTAP.
- NetApp onboard key management (OKM) cluster-wide passphrase if using storage encryption or NVE/NAE.
- BMC accessibility for each controller.
- Stop all clients/host from accessing data on the NetApp system.
- Suspend external backup jobs.
- Necessary tools and equipment for the replacement.



If the system is a NetApp StorageGRID or ONTAP S3 used as FabricPool cloud tier, refer to the [Gracefully shutdown and power up your storage system Resolution Guide](#) after performing this procedure.



If using SSDs, refer to [SU490: \(Impact: Critical\) SSD Best Practices: Avoid risk of drive failure and data loss if powered off for more than two months](#)

As a best practice before shutdown, you should:

- Perform additional [system health checks](#).
- Upgrade ONTAP to a recommended release for the system.
- Resolve any [Active IQ Wellness Alerts and Risks](#).
Make note of any faults presently on the system, such as LEDs on the system components.

Steps

1. Log into the cluster through SSH or log in from any node in the cluster using a local console cable and a laptop/console.
2. Turn off AutoSupport and indicate how long you expect the system to be offline:

```
system node autosupport invoke -node * -type all -message "MAINT=8h Power Maintenance"
```

3. Identify the SP/BMC address of all nodes:

```
system service-processor show -node * -fields address
```

4. Exit the cluster shell: `exit`

5. Log into SP/BMC over SSH using the IP address of any of the nodes listed in the output from the previous step.

If you're using a console/laptop, log into the controller using the same cluster administrator credentials.



Open an SSH session to every SP/BMC connection so that you can monitor progress.

6. Halt the 2 nodes located in the impaired chassis:

```
system node halt -node <node>,<node2> -skip-lif-migration-before-shutdown true  
-ignore-quorum-warnings true -inhibit-takeover true
```



For clusters using SnapMirror synchronous operating in StrictSync mode: `system node halt -node <node>,<node2> -skip-lif-migration-before-shutdown true -ignore-quorum-warnings true -inhibit-takeover true -ignore-strict-sync-warnings true`

7. Enter **y** for each controller in the cluster when you see *Warning: Are you sure you want to halt node "cluster <node-name> number"?*
`{y|n}:`

8. Wait for each controller to halt and display the LOADER prompt.

Move and replace hardware - AFF A200

Move the power supplies, hard drives, and controller module or modules from the impaired chassis to the new chassis, and swap out the impaired chassis from the equipment rack or system cabinet with the new chassis of the same model as the impaired chassis.

Step 1: Move the power supply

Move the power supply from the old chassis to the replacement chassis.

Steps

1. If you are not already grounded, properly ground yourself.
2. Turn off the power supply and disconnect the power cables:
 - a. Turn off the power switch on the power supply.
 - b. Open the power cable retainer, and then unplug the power cable from the power supply.
 - c. Unplug the power cable from the power source.
3. Squeeze the latch on the power supply cam handle, and then open the cam handle to fully release the

power supply from the mid plane.

4. Use the cam handle to slide the power supply out of the system.



When removing a power supply, always use two hands to support its weight.

5. Repeat the preceding steps for any remaining power supplies.
6. Using both hands, support and align the edges of the power supply with the opening in the system chassis, and then gently push the power supply into the chassis using the cam handle.

The power supplies are keyed and can only be installed one way.



Do not use excessive force when sliding the power supply into the system. You can damage the connector.

7. Close the cam handle so that the latch clicks into the locked position and the power supply is fully seated.
8. Reconnect the power cable and secure it to the power supply using the power cable locking mechanism.



Only connect the power cable to the power supply. Do not connect the power cable to a power source at this time.

Step 2: Remove the controller module

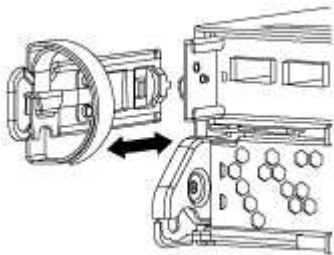
Remove the controller module or modules from the old chassis.

Steps

1. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

2. Remove and set aside the cable management devices from the left and right sides of the controller module.



3. Squeeze the latch on the cam handle until it releases, open the cam handle fully to release the controller module from the midplane, and then, using two hands, pull the controller module out of the chassis.



4. Set the controller module aside in a safe place, and repeat these steps if you have another controller module in the chassis.

Step 3: Move drives to the new chassis

Move the drives from each bay opening in the old chassis to the same bay opening in the new chassis.

Steps

1. Gently remove the bezel from the front of the system.
2. Remove the drives:
 - a. Press the release button at the top of the carrier face below the LEDs.
 - b. Pull the cam handle to its fully open position to unseat the drive from the midplane, and then gently slide the drive out of the chassis.

The drive should disengage from the chassis, allowing it to slide free of the chassis.



When removing a drive, always use two hands to support its weight.



Drives are fragile. Handle them as little as possible to prevent damage to them.

3. Align the drive from the old chassis with the same bay opening in the new chassis.
4. Gently push the drive into the chassis as far as it will go.

The cam handle engages and begins to rotate upward.

5. Firmly push the drive the rest of the way into the chassis, and then lock the cam handle by pushing it up and against the drive holder.

Be sure to close the cam handle slowly so that it aligns correctly with the front of the drive carrier. It clicks when it is secure.

6. Repeat the process for the remaining drives in the system.

Step 4: Replace a chassis from within the equipment rack or system cabinet

You must remove the existing chassis from the equipment rack or system cabinet before you can install the replacement chassis.

Steps

1. Remove the screws from the chassis mount points.
2. With the help of two or three people, slide the old chassis off the rack rails in a system cabinet or *L* brackets in an equipment rack, and then set it aside.
3. If you are not already grounded, properly ground yourself.
4. Using two or three people, install the replacement chassis into the equipment rack or system cabinet by guiding the chassis onto the rack rails in a system cabinet or *L* brackets in an equipment rack.
5. Slide the chassis all the way into the equipment rack or system cabinet.
6. Secure the front of the chassis to the equipment rack or system cabinet, using the screws you removed from the old chassis.
7. If you have not already done so, install the bezel.

Step 5: Install the controller

After you install the controller module and any other components into the new chassis, you must boot your system.

About this task

For HA pairs with two controller modules in the same chassis, the sequence in which you install the controller module is especially important because it attempts to reboot as soon as you completely seat it in the chassis.

Steps

1. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.



Do not completely insert the controller module in the chassis until instructed to do so.

2. Recable the console to the controller module, and then reconnect the management port.
3. Repeat the preceding steps if there is a second controller to install in the new chassis.
4. Complete the installation of the controller module:

If your system is in...	Then perform these steps...
An HA pair	<p>a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position.</p> <div>  <p>Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.</p> </div> <p>b. If you have not already done so, reinstall the cable management device.</p> <p>c. Bind the cables to the cable management device with the hook and loop strap.</p> <p>d. Repeat the preceding steps for the second controller module in the new chassis.</p>
A stand-alone configuration	<p>a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position.</p> <div>  <p>Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.</p> </div> <p>b. If you have not already done so, reinstall the cable management device.</p> <p>c. Bind the cables to the cable management device with the hook and loop strap.</p> <p>d. Reinstall the blanking panel and then go to the next step.</p>

5. Connect the power supplies to different power sources, and then turn them on.

6. Boot each controller to Maintenance mode:

- a. As each controller starts the booting, press `Ctrl-C` to interrupt the boot process when you see the message `Press Ctrl-C for Boot Menu`.



If you miss the prompt and the controller modules boot to ONTAP, enter `halt`, and then at the LOADER prompt enter `boot_ontap`, press `Ctrl-C` when prompted, and then repeat this step.

- b. From the boot menu, select the option for Maintenance mode.

Restore and verify the configuration - AFF A200

Step 1: Verify and set the HA state of the chassis

You must verify the HA state of the chassis, and, if necessary, update the state to match your system configuration.

Steps

1. In Maintenance mode, from either controller module, display the HA state of the local controller module and chassis: `ha-config show`

The HA state should be the same for all components.

2. If the displayed system state for the chassis does not match your system configuration:

- a. Set the HA state for the chassis: `ha-config modify chassis HA-state`

The value for HA-state can be one of the following:

- `ha`
- `non-ha`

- b. Confirm that the setting has changed: `ha-config show`

3. If you have not already done so, recable the rest of your system.

Step 2: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

Controller module

Overview of controller module replacement - AFF A200

You must review the prerequisites for the replacement procedure and select the correct one for your version of the ONTAP operating system.

What you'll need

- All drive shelves must be working properly.
- If your system is in an HA pair, the healthy controller must be able to take over the controller that is being replaced (referred to in this procedure as the "impaired node").

About this task

- You must replace the failed component with a replacement FRU component you received from your provider.
- You must replace a controller module with a controller module of the same model type. You cannot upgrade your system by just replacing the controller module.
- You cannot change any drives or drive shelves as part of this procedure.
- In this procedure, the boot device is moved from the impaired controller to the *replacement* node so that the *replacement* node will boot up in the same version of ONTAP as the old controller module.
- It is important that you apply the commands in these steps on the correct systems:
 - The *impaired* node is the controller that is being replaced.
 - The *replacement* node is the new controller that is replacing the impaired controller.
 - The *healthy* node is the surviving controller.
- You must always capture the controller's console output to a text file.

This provides you a record of the procedure so that you can troubleshoot any issues that you might encounter during the replacement process.

Shut down the impaired controller - AFF A200

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

Steps

- 1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message  
MAINT=_number_of_hours_down_h
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:*>`
`system node autosupport invoke -node * -type all -message MAINT=2h`

- 2. If the impaired controller is part of an HA pair, disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`
- 3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying...	Then...
The LOADER prompt	Go to Remove controller module.
Waiting for giveback...	Press Ctrl-C, and then respond <code>y</code> .
System prompt or password prompt (enter system password)	<div>Take over or halt the impaired controller from the healthy controller: <code>storage failover takeover -ofnode impaired_node_name</code></div> <div>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <code>y</code>.</div>

- 4. If the system has only one controller module in the chassis, turn off the power supplies, and then unplug the impaired controller’s power cords from the power source.

Replace the controller module hardware - AFF A200

To replace the controller module hardware, you must remove the impaired controller, move FRU components to the replacement controller module, install the replacement controller module in the chassis, and then boot the system to Maintenance mode.

Step 1: Remove controller module

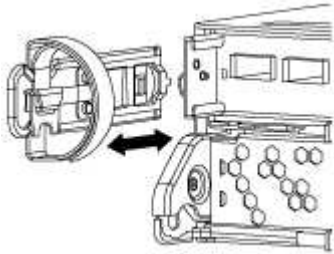
To replace the controller module, you must first remove the old controller module from the chassis.

Steps

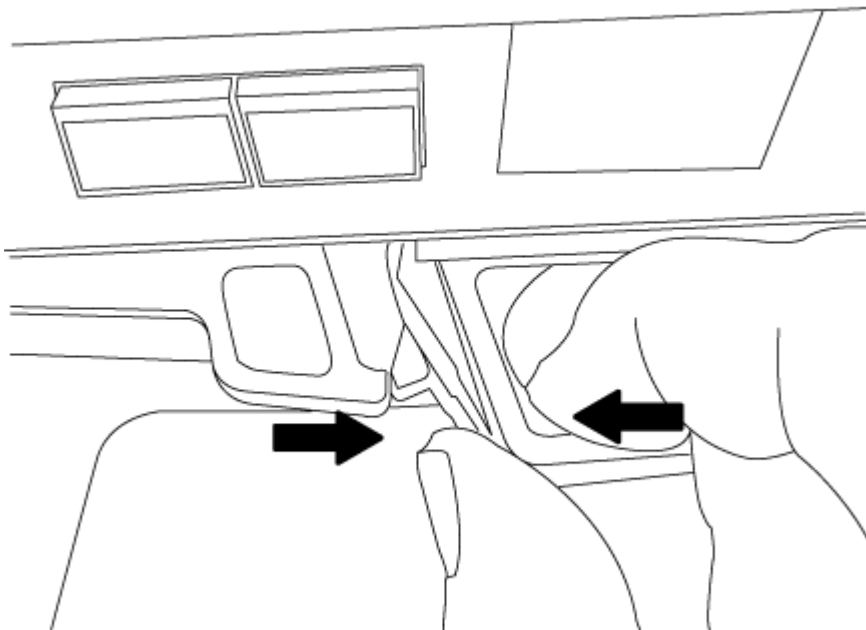
1. If you are not already grounded, properly ground yourself.
2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

3. Remove and set aside the cable management devices from the left and right sides of the controller module.



4. If you left the SFP modules in the system after removing the cables, move them to the new controller module.
5. Squeeze the latch on the cam handle until it releases, open the cam handle fully to release the controller module from the midplane, and then, using two hands, pull the controller module out of the chassis.



6. Turn the controller module over and place it on a flat, stable surface.
7. Open the cover by sliding in the blue tabs to release the cover, and then swing the cover up and open.



Step 2: Move the boot media

You must locate the boot media and follow the directions to remove it from the old controller module and insert it in the new controller module.

Steps

1. Locate the boot media using the following illustration or the FRU map on the controller module:
2. Press the blue button on the boot media housing to release the boot media from its housing, and then gently pull it straight out of the boot media socket.



Do not twist or pull the boot media straight up, because this could damage the socket or the boot media.

3. Move the boot media to the new controller module, align the edges of the boot media with the socket housing, and then gently push it into the socket.
4. Check the boot media to make sure that it is seated squarely and completely in the socket.

If necessary, remove the boot media and reseal it into the socket.

5. Push the boot media down to engage the locking button on the boot media housing.

Step 3: Move the NVMEM battery

To move the NVMEM battery from the old controller module to the new controller module, you must perform a specific sequence of steps.

Steps

1. Check the NVMEM LED:

- If your system is in an HA configuration, go to the next step.
- If your system is in a stand-alone configuration, cleanly shut down the controller module, and then check the NVRAM LED identified by the NV icon.

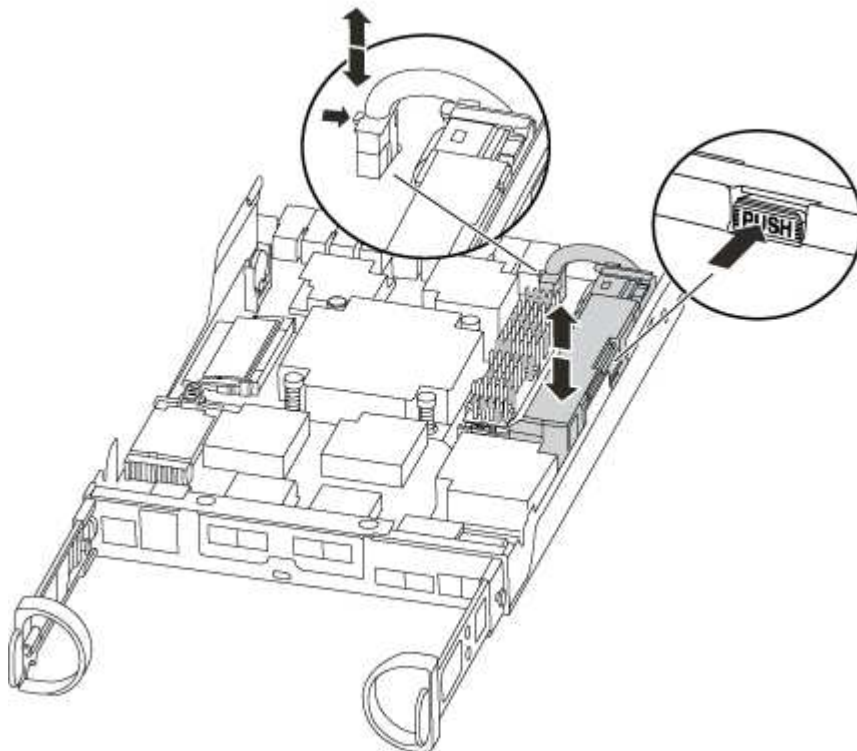


The NVRAM LED blinks while destaging contents to the flash memory when you halt the system. After the destage is complete, the LED turns off.

- If power is lost without a clean shutdown, the NVMEM LED flashes until the destage is complete, and then the LED turns off.
- If the LED is on and power is on, unwritten data is stored on NVMEM.

This typically occurs during an uncontrolled shutdown after ONTAP has successfully booted.

2. Locate the NVMEM battery in the controller module.



3. Locate the battery plug and squeeze the clip on the face of the battery plug to release the plug from the socket, and then unplug the battery cable from the socket.
4. Grasp the battery and press the blue locking tab marked PUSH, and then lift the battery out of the holder and controller module.
5. Move the battery to the replacement controller module.

6. Loop the battery cable around the cable channel on the side of the battery holder.
7. Position the battery pack by aligning the battery holder key ribs to the “V” notches on the sheet metal side wall.
8. Slide the battery pack down along the sheet metal side wall until the support tabs on the side wall hook into the slots on the battery pack, and the battery pack latch engages and clicks into the opening on the side wall.

Step 4: Move the DIMMs

To move the DIMMs, you must follow the directions to locate and move them from the old controller module into the replacement controller module.

About this task

You must have the new controller module ready so that you can move the DIMMs directly from the impaired controller module to the corresponding slots in the replacement controller module.

Steps

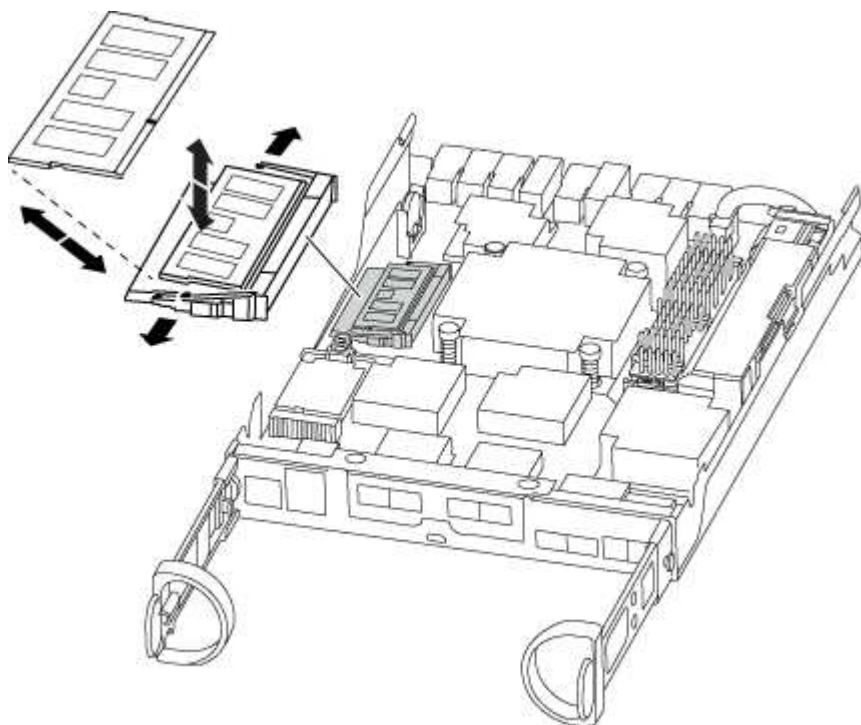
1. Locate the DIMMs on your controller module.
2. Note the orientation of the DIMM in the socket so that you can insert the DIMM in the replacement controller module in the proper orientation.
3. Eject the DIMM from its slot by slowly pushing apart the two DIMM ejector tabs on either side of the DIMM, and then slide the DIMM out of the slot.



Carefully hold the DIMM by the edges to avoid pressure on the components on the DIMM circuit board.

The number and placement of system DIMMs depends on the model of your system.

The following illustration shows the location of system DIMMs:



4. Repeat these steps to remove additional DIMMs as needed.
5. Verify that the NVMEM battery is not plugged into the new controller module.
6. Locate the slot where you are installing the DIMM.
7. Make sure that the DIMM ejector tabs on the connector are in the open position, and then insert the DIMM squarely into the slot.

The DIMM fits tightly in the slot, but should go in easily. If not, realign the DIMM with the slot and reinsert it.



Visually inspect the DIMM to verify that it is evenly aligned and fully inserted into the slot.

8. Repeat these steps for the remaining DIMMs.
9. Locate the NVMEM battery plug socket, and then squeeze the clip on the face of the battery cable plug to insert it into the socket.

Make sure that the plug locks down onto the controller module.

Step 5: Install the controller

After you install the components from the old controller module into the new controller module, you must install the new controller module into the system chassis and boot the operating system.

About this task

For HA pairs with two controller modules in the same chassis, the sequence in which you install the controller module is especially important because it attempts to reboot as soon as you completely seat it in the chassis.



The system might update system firmware when it boots. Do not abort this process. The procedure requires you to interrupt the boot process, which you can typically do at any time after prompted to do so. However, if the system updates the system firmware when it boots, you must wait until after the update is complete before interrupting the boot process.

Steps

1. If you are not already grounded, properly ground yourself.
2. If you have not already done so, replace the cover on the controller module.
3. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.





Do not completely insert the controller module in the chassis until instructed to do so.

4. Cable the management and console ports only, so that you can access the system to perform the tasks in the following sections.



You will connect the rest of the cables to the controller module later in this procedure.

5. Complete the reinstallation of the controller module:

If your system is in...	Then perform these steps...
An HA pair	<p>The controller module begins to boot as soon as it is fully seated in the chassis. Be prepared to interrupt the boot process.</p> <ol style="list-style-type: none"> With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position. <div data-bbox="699 426 756 485">  </div> <div data-bbox="818 405 1364 506"> <p>Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.</p> </div> <p>The controller begins to boot as soon as it is seated in the chassis.</p> <ol style="list-style-type: none"> If you have not already done so, reinstall the cable management device. Bind the cables to the cable management device with the hook and loop strap. When you see the message <code>Press Ctrl-C for Boot Menu</code>, press <code>Ctrl-C</code> to interrupt the boot process. <div data-bbox="699 993 756 1052">  </div> <div data-bbox="818 936 1450 1108"> <p>If you miss the prompt and the controller module boots to ONTAP, enter <code>halt</code>, and then at the <code>LOADER</code> prompt enter <code>boot_ontap</code>, press <code>Ctrl-C</code> when prompted, and then boot to Maintenance mode.</p> </div> <ol style="list-style-type: none"> Select the option to boot to Maintenance mode from the displayed menu.

If your system is in...	Then perform these steps...
A stand-alone configuration	<p>a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position.</p> <div>  <p>Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.</p> </div> <p>b. If you have not already done so, reinstall the cable management device.</p> <p>c. Bind the cables to the cable management device with the hook and loop strap.</p> <p>d. Reconnect the power cables to the power supplies and to the power sources, turn on the power to start the boot process, and then press <code>Ctrl-C</code> after you see the <code>Press Ctrl-C for Boot Menu</code> message.</p> <div>  <p>If you miss the prompt and the controller module boots to <code>ONTAP</code>, enter <code>halt</code>, and then at the <code>LOADER</code> prompt enter <code>boot_ontap</code>, press <code>Ctrl-C</code> when prompted, and then boot to Maintenance mode.</p> </div> <p>e. From the boot menu, select the option for Maintenance mode.</p>



During the boot process, you might see the following prompts:

- A prompt warning of a system ID mismatch and asking to override the system ID.
 - A prompt warning that when entering Maintenance mode in an HA configuration you must ensure that the healthy controller remains down.
- You can safely respond `y` to these prompts.

Restore and verify the system configuration - AFF A200

After completing the hardware replacement and booting to Maintenance mode, you verify the low-level system configuration of the replacement controller and reconfigure system settings as necessary.

Step 1: Set and verify system time after replacing the controller

You should check the time and date on the replacement controller module against the healthy controller module in an HA pair, or against a reliable time server in a stand-alone configuration. If the time and date do not match, you must reset them on the replacement controller module to prevent possible outages on clients due to time differences.

About this task

It is important that you apply the commands in the steps on the correct systems:

- The *replacement* node is the new node that replaced the impaired node as part of this procedure.
- The *healthy* node is the HA partner of the *replacement* node.

Steps

1. If the *replacement* node is not at the LOADER prompt, halt the system to the LOADER prompt.
2. On the *healthy* node, check the system time: `cluster date show`

The date and time are based on the configured timezone.

3. At the LOADER prompt, check the date and time on the *replacement* node: `show date`

The date and time are given in GMT.

4. If necessary, set the date in GMT on the replacement node: `set date mm/dd/yyyy`
5. If necessary, set the time in GMT on the replacement node: `set time hh:mm:ss`
6. At the LOADER prompt, confirm the date and time on the *replacement* node: `show date`

The date and time are given in GMT.

Step 2: Verify and set the HA state of the controller module

You must verify the HA state of the controller module and, if necessary, update the state to match your system configuration.

Steps

1. In Maintenance mode from the new controller module, verify that all components display the same HA state: `ha-config show`

The value for HA-state can be one of the following:

- ha
- non-ha

2. If the displayed system state of the controller module does not match your system configuration, set the HA state for the controller module: `ha-config modify controller ha-state`
3. Confirm that the setting has changed: `ha-config show`

Recable the system and reassign disks - AFF A200

Continue the replacement procedure by re-cabling the storage and confirming disk reassignment.

Step 1: Re-cable the system

Recable the controller module's storage and network connections.

Steps

1. Recable the the controller module to storage and network connnections.
2. Verify that the cabling is correct by using [Active IQ Config Advisor](#).

- a. Download and install Config Advisor.
- b. Enter the information for the target system, and then click Collect Data.
- c. Click the Cabling tab, and then examine the output. Make sure that all disk shelves are displayed and all disks appear in the output, correcting any cabling issues you find.
- d. Check other cabling by clicking the appropriate tab, and then examining the output from Config Advisor.

Step 2: Reassign disks

If the storage system is in an HA pair, the system ID of the new controller module is automatically assigned to the disks when the giveback occurs at the end of the procedure. In a stand-alone system, you must manually reassign the ID to the disks. You must use the correct procedure for your configuration.

Option 1: Verify the system ID change on an HA system

You must confirm the system ID change when you boot the *replacement* controller and then verify that the change was implemented.

About this task

This procedure applies only to systems running ONTAP in an HA pair.

Steps

1. If the *replacement* controller is in Maintenance mode (showing the `*>` prompt, exit Maintenance mode and go to the LOADER prompt: `halt`
2. From the LOADER prompt on the *replacement* controller, boot the controller, entering `y` if you are prompted to override the system ID due to a system ID mismatch. `boot_ontap`
3. Wait until the `Waiting for giveback...` message is displayed on the *replacement* controller console and then, from the healthy controller, verify that the new partner system ID has been automatically assigned: `storage failover show`

In the command output, you should see a message that the system ID has changed on the impaired controller, showing the correct old and new IDs. In the following example, node2 has undergone replacement and has a new system ID of 151759706.

```
node1> `storage failover show`
```

Node	Partner	Takeover Possible	State Description
-----	-----	-----	
node1	node2	false	System ID changed on partner (Old: 151759706), In takeover
node2	node1	-	Waiting for giveback (HA mailboxes)

4. From the healthy controller, verify that any coredumps are saved:
 - a. Change to the advanced privilege level: `set -privilege advanced`

You can respond `y` when prompted to continue into advanced mode. The advanced mode prompt appears (`*>`).

- b. Save any coredumps: `system node run -node local-node-name partner savecore`
- c. Wait for the `savecore` command to complete before issuing the giveback.

You can enter the following command to monitor the progress of the `savecore` command: `system node run -node local-node-name partner savecore -s`

- d. Return to the admin privilege level: `set -privilege admin`
5. If your storage system has Storage or Volume Encryption configured, you must restore Storage or Volume Encryption functionality by using one of the following procedures, depending on whether you are using onboard or external key management:
 - [Restore onboard key management encryption keys](#)
 - [Restore external key management encryption keys](#)
 6. Give back the controller:
 - a. From the healthy controller, give back the replaced controller's storage: `storage failover giveback -ofnode replacement_node_name`

The *replacement* controller takes back its storage and completes booting.

If you are prompted to override the system ID due to a system ID mismatch, you should enter `y`.



If the giveback is vetoed, you can consider overriding the vetoes.

[Find the High-Availability Configuration content for your version of ONTAP 9](#)

- b. After the giveback has been completed, confirm that the HA pair is healthy and that takeover is possible: `storage failover show`

The output from the `storage failover show` command should not include the System ID changed on partner message.

7. Verify that the disks were assigned correctly: `storage disk show -ownership`

The disks belonging to the *replacement* controller should show the new system ID. In the following example, the disks owned by node1 now show the new system ID, 1873775277:

```
node1> `storage disk show -ownership`
```

Disk Reserver	Aggregate Pool	Home	Owner	DR	Home	Home ID	Owner ID	DR	Home	ID
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1.0.0	aggr0_1	node1	node1	-		1873775277	1873775277	-		
1873775277	Pool0									
1.0.1	aggr0_1	node1	node1			1873775277	1873775277	-		
1873775277	Pool0									
.										
.										
.										

8. Verify that the expected volumes are present for each controller: `vol show -node node-name`
9. If you disabled automatic takeover on reboot, enable it from the healthy controller: `storage failover modify -node replacement-node-name -onreboot true`

Option 2: Manually reassign the system ID on a stand-alone system in ONTAP

In a stand-alone system, you must manually reassign disks to the new controller's system ID before you return the system to normal operating condition.



About this task

This procedure applies only to systems that are in a stand-alone configuration.

Steps

1. If you have not already done so, reboot the *replacement* node, interrupt the boot process by pressing Ctrl-C, and then select the option to boot to Maintenance mode from the displayed menu.
2. You must enter `Y` when prompted to override the system ID due to a system ID mismatch.
3. View the system IDs: `disk show -a`
4. You should make a note of the old system ID, which is displayed as part of the disk owner column.

The following example shows the old system ID of 118073209:

```
*> disk show -a
Local System ID: 118065481
```

DISK	OWNER		POOL	SERIAL NUMBER	HOME
-----	-----		-----	-----	-----
disk_name (118073209)	system-1	(118073209)	Pool0	J8XJE9LC	system-1
disk_name (118073209)	system-1	(118073209)	Pool0	J8Y478RC	system-1
.					
.					
.					

5. Reassign disk ownership by using the system ID information obtained from the disk show command: `disk reassign -s old system ID disk reassign -s 118073209`

6. Verify that the disks were assigned correctly: `disk show -a`

The disks belonging to the replacement node should show the new system ID. The following example now show the disks owned by system-1 the new system ID, 118065481:

```
*> disk show -a
Local System ID: 118065481
```

DISK	OWNER		POOL	SERIAL NUMBER	HOME
-----	-----		-----	-----	-----
disk_name (118065481)	system-1	(118065481)	Pool0	J8Y0TDZC	system-1
disk_name (118065481)	system-1	(118065481)	Pool0	J8Y0TDZC	system-1
.					
.					
.					

7. If your storage system has Storage or Volume Encryption configured, you must restore Storage or Volume Encryption functionality by using one of the following procedures, depending on whether you are using onboard or external key management:

- [Restore onboard key management encryption keys](#)
- [Restore external key management encryption keys](#)

8. Boot the node: `boot_ontap`

Complete system restoration - AFF A200

To restore your system to full operation, you must restore the NetApp Storage Encryption configuration (if necessary), and install licenses for the new controller, and return the

failed part to NetApp, as described in the RMA instructions shipped with the kit.

Step 1: Install licenses for the replacement controller in ONTAP

You must install new licenses for the *replacement* node if the impaired node was using ONTAP features that require a standard (node-locked) license. For features with standard licenses, each node in the cluster should have its own key for the feature.

About this task

Until you install license keys, features requiring standard licenses continue to be available to the *replacement* node. However, if the impaired node was the only node in the cluster with a license for the feature, no configuration changes to the feature are allowed. Also, using unlicensed features on the node might put you out of compliance with your license agreement, so you should install the replacement license key or keys on the *replacement* node as soon as possible.

Before you begin

The licenses keys must be in the 28-character format.

You have a 90-day grace period in which to install the license keys. After the grace period, all old licenses are invalidated. After a valid license key is installed, you have 24 hours to install all of the keys before the grace period ends.

Steps

1. If you need new license keys, obtain replacement license keys on the [NetApp Support Site](#) in the My Support section under Software licenses.



The new license keys that you require are automatically generated and sent to the email address on file. If you fail to receive the email with the license keys within 30 days, you should contact technical support.

2. Install each license key: `system license add -license-code license-key, license-key...`
3. Remove the old licenses, if desired:
 - a. Check for unused licenses: `license clean-up -unused -simulate`
 - b. If the list looks correct, remove the unused licenses: `license clean-up -unused`

Step 2: Verify LIFs and registering the serial number

Before returning the *replacement* node to service, you should verify that the LIFs are on their home ports, and register the serial number of the *replacement* node if AutoSupport is enabled, and reset automatic giveback.

Steps

1. Verify that the logical interfaces are reporting to their home server and ports: `network interface show -is-home false`

If any LIFs are listed as false, revert them to their home ports: `network interface revert -vserver * -lif *`

2. Register the system serial number with NetApp Support.
 - If AutoSupport is enabled, send an AutoSupport message to register the serial number.
 - If AutoSupport is not enabled, call [NetApp Support](#) to register the serial number.

3. If an AutoSupport maintenance window was triggered, end it by using the `system node autosupport invoke -node * -type all -message MAINT=END` command.
4. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`

Step 3: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

Replace a DIMM - AFF A200

You must replace a DIMM in the controller module when your system registers an increasing number of correctable error correction codes (ECC); failure to do so causes a system panic.

About this task

- All other components in the system must be functioning properly; if not, you must contact technical support.
- You must replace the failed component with a replacement FRU component you received from your provider.

Step 1: Shut down the impaired controller

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message
MAINT=_number_of_hours_down_h
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:*> system node autosupport invoke -node * -type all -message MAINT=2h`

2. If the impaired controller is part of an HA pair, disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`
3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying...	Then...
The LOADER prompt	Go to Remove controller module.
Waiting for giveback...	Press Ctrl-C, and then respond <code>y</code> .

If the impaired controller is displaying...	Then...
System prompt or password prompt (enter system password)	<p>Take over or halt the impaired controller from the healthy controller:</p> <pre>storage failover takeover -ofnode impaired_node_name</pre> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i>.</p>

4. If the system has only one controller module in the chassis, turn off the power supplies, and then unplug the impaired controller's power cords from the power source.

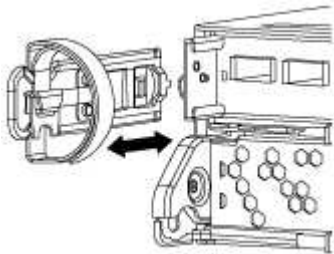
Step 2: Remove controller module

To access components inside the controller, you must first remove the controller module from the system and then remove the cover on the controller module.

1. If you are not already grounded, properly ground yourself.
2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

3. Remove and set aside the cable management devices from the left and right sides of the controller module.



4. Squeeze the latch on the cam handle until it releases, open the cam handle fully to release the controller module from the midplane, and then, using two hands, pull the controller module out of the chassis.



5. Turn the controller module over and place it on a flat, stable surface.
6. Open the cover by sliding in the blue tabs to release the cover, and then swing the cover up and open.



Step 3: Replace the DIMMs

To replace the DIMMs, locate them inside the controller and follow the specific sequence of steps.

About this task

If you are replacing a DIMM, you need to remove it after you have unplugged the NVMEM battery from the controller module.

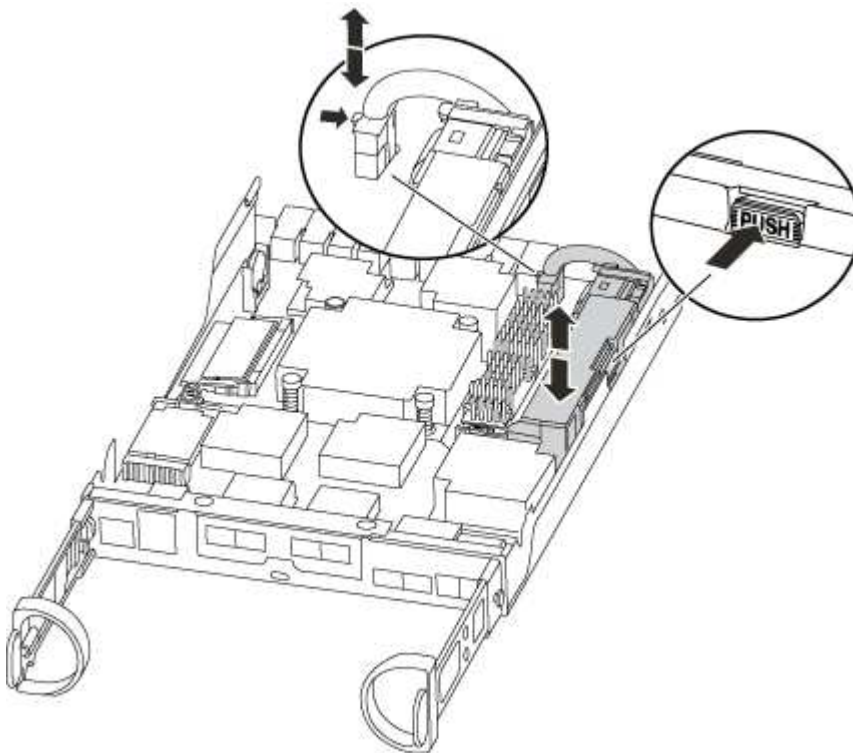
Steps

1. If you are not already grounded, properly ground yourself.
2. Check the NVMEM LED on the controller module.

You must perform a clean system shutdown before replacing system components to avoid losing unwritten data in the nonvolatile memory (NVMEM). The LED is located on the back of the controller module. Look for the following icon:



3. If the NVMEM LED is not flashing, there is no content in the NVMEM; you can skip the following steps and proceed to the next task in this procedure.
4. If the NVMEM LED is flashing, there is data in the NVMEM and you must disconnect the battery to clear the memory:
 - a. Locate the battery, press the clip on the face of the battery plug to release the lock clip from the plug socket, and then unplug the battery cable from the socket.



- b. Confirm that the NVMEM LED is no longer lit.
 - c. Reconnect the battery connector.
5. Return to step 2 of this procedure to recheck the NVMEM LED.
 6. Locate the DIMMs on your controller module.
 7. Note the orientation of the DIMM in the socket so that you can insert the replacement DIMM in the proper

orientation.

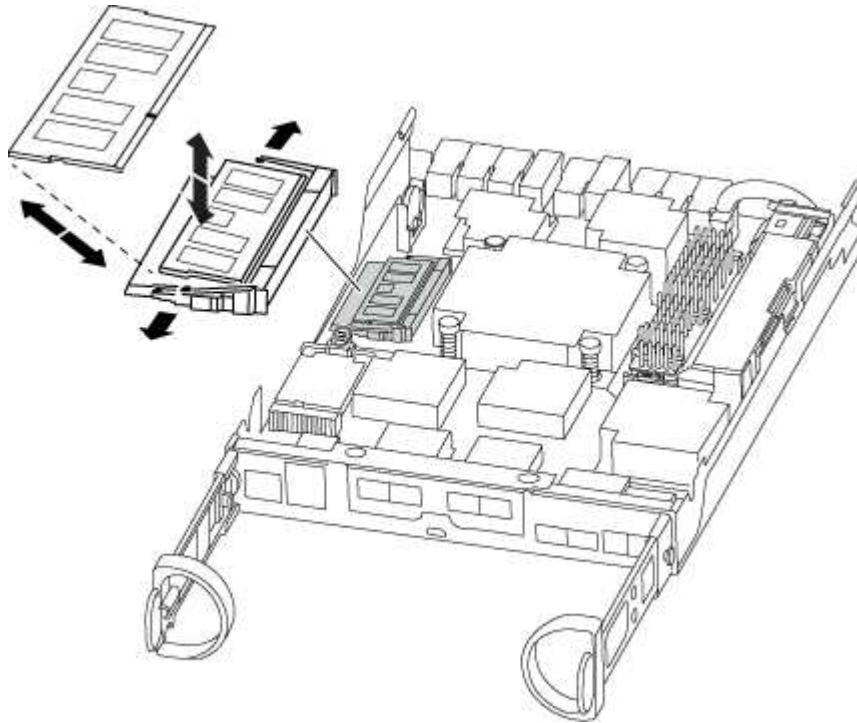
8. Eject the DIMM from its slot by slowly pushing apart the two DIMM ejector tabs on either side of the DIMM, and then slide the DIMM out of the slot.



Carefully hold the DIMM by the edges to avoid pressure on the components on the DIMM circuit board.

The number and placement of system DIMMs depends on the model of your system.

The following illustration shows the location of system DIMMs:



9. Remove the replacement DIMM from the antistatic shipping bag, hold the DIMM by the corners, and align it to the slot.

The notch among the pins on the DIMM should line up with the tab in the socket.

10. Make sure that the DIMM ejector tabs on the connector are in the open position, and then insert the DIMM squarely into the slot.

The DIMM fits tightly in the slot, but should go in easily. If not, realign the DIMM with the slot and reinsert it.



Visually inspect the DIMM to verify that it is evenly aligned and fully inserted into the slot.

11. Push carefully, but firmly, on the top edge of the DIMM until the ejector tabs snap into place over the notches at the ends of the DIMM.
12. Locate the NVMEM battery plug socket, and then squeeze the clip on the face of the battery cable plug to insert it into the socket.

Make sure that the plug locks down onto the controller module.

13. Close the controller module cover.

Step 4: Reinstall the controller module

After you replace components in the controller module, reinstall it into the chassis.

1. If you are not already grounded, properly ground yourself.
2. If you have not already done so, replace the cover on the controller module.
3. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.





Do not completely insert the controller module in the chassis until instructed to do so.

4. Recable the system, as needed.

If you removed the media converters (QSFPs or SFPs), remember to reinstall them if you are using fiber optic cables.

5. Complete the reinstallation of the controller module:

If your system is in...	Then perform these steps...
An HA pair	<p>The controller module begins to boot as soon as it is fully seated in the chassis.</p> <ol style="list-style-type: none">a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position. <div> Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.</div> <p>The controller begins to boot as soon as it is seated in the chassis.</p> <ol style="list-style-type: none">b. If you have not already done so, reinstall the cable management device.c. Bind the cables to the cable management device with the hook and loop strap.
A stand-alone configuration	<ol style="list-style-type: none">a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position. <div> Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.</div> <ol style="list-style-type: none">b. If you have not already done so, reinstall the cable management device.c. Bind the cables to the cable management device with the hook and loop strap.d. Reconnect the power cables to the power supplies and to the power sources, then turn on the power to start the boot process.

Step 5: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

Replace SSD Drive or HDD Drive - AFF A200

You can replace a failed drive nondisruptively while I/O is in progress. The procedure for replacing an SSD is meant for non-spinning drives and the procedure for replacing an HDD is meant for spinning drives.

When a drive fails, the platform logs a warning message to the system console indicating which drive has failed. In addition, both the fault LED on the operator display panel and the fault LED on the failed drive are illuminated.

Before you begin

- Follow best practice and install the current version of the Disk Qualification Package (DQP) before replacing a drive.
- Identify the failed drive by running the `storage disk show -broken` command from the system console.

The failed drive appears in the list of failed drives. If it does not, you should wait, and then run the command again.



Depending on the type and capacity, it can take up to several hours for the drive to appear in the list of failed drives.

- Determine whether SED authentication is enabled.

How you replace the drive depends on how the drive is being used. If SED authentication is enabled, you must use the SED replacement instructions in the [ONTAP 9 NetApp Encryption Power Guide](#). These Instructions describe additional steps you must perform before and after replacing an SED.

- Make sure the replacement drive is supported by your platform. See the [NetApp Hardware Universe](#).
- Make sure all other components in the system are functioning properly; if not, you must contact technical support.

About this task

- Drive firmware is automatically updated (nondisruptively) on new drives that have non current firmware versions.
- When replacing a drive, you must wait one minute between the removal of the failed drive and the insertion of the replacement drive to allow the storage system to recognize the existence of the new drive.

Option 1: Replace SSD

Steps

1. If you want to manually assign drive ownership for the replacement drive, you need to disable automatic drive assignment replacement drive, if it is enabled



You manually assign drive ownership and then reenable automatic drive assignment later in this procedure.

- a. Verify whether automatic drive assignment is enabled: `storage disk option show`

You can enter the command on either controller module.

If automatic drive assignment is enabled, the output shows `on` in the “Auto Assign” column (for each controller module).

- b. If automatic drive assignment is enabled, disable it: `storage disk option modify -node node_name -autoassign off`

You must disable automatic drive assignment on both controller modules.

2. Properly ground yourself.
3. Physically identify the failed drive.

When a drive fails, the system logs a warning message to the system console indicating which drive failed. Additionally, the attention (amber) LED on the drive shelf operator display panel and the failed drive illuminate.



The activity (green) LED on a failed drive can be illuminated (solid), which indicates that the drive has power, but should not be blinking, which indicates I/O activity. A failed drive has no I/O activity.

4. Remove the failed drive:
 - a. Press the release button on the drive face to open the cam handle.
 - b. Slide the drive out of the shelf using the cam handle and supporting the drive with your other hand.

5. Wait a minimum of 70 seconds before inserting the replacement drive.

This allows the system to recognize that a drive was removed.

6. Insert the replacement drive:
 - a. With the cam handle in the open position, use both hands to insert the replacement drive.
 - b. Push until the drive stops.
 - c. Close the cam handle so that the drive is fully seated into the midplane and the handle clicks into place.

Be sure to close the cam handle slowly so that it aligns correctly with the face of the drive.

7. Verify that the drive's activity (green) LED is illuminated.

When the drive's activity LED is solid, it means that the drive has power. When the drive's activity LED is blinking, it means that the drive has power and I/O is in progress. If the drive firmware is automatically updating, the LED blinks.

8. If you are replacing another drive, repeat Steps 3 through 7.
9. If you disabled automatic drive assignment in Step 1, then, manually assign drive ownership and then reenables automatic drive assignment if needed.

- a. Display all unowned drives: `storage disk show -container-type unassigned`

You can enter the command on either controller module.

- b. Assign each drive: `storage disk assign -disk disk_name -owner node_name`

You can enter the command on either controller module.

You can use the wildcard character to assign more than one drive at once.

- c. Reenable automatic drive assignment if needed: `storage disk option modify -node node_name -autoassign on`

You must reenables automatic drive assignment on both controller modules.

10. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit.

Contact technical support at [NetApp Support](#), 888-463-8277 (North America), 00-800-44-638277 (Europe), or +800-800-80-800 (Asia/Pacific) if you need the RMA number or additional help with the replacement procedure.

Option 2: Replace HDD

1. If you want to manually assign drive ownership for the replacement drive, you need to disable automatic drive assignment replacement drive, if it is enabled



You manually assign drive ownership and then reenables automatic drive assignment later in this procedure.

- a. Verify whether automatic drive assignment is enabled: `storage disk option show`

You can enter the command on either controller module.

If automatic drive assignment is enabled, the output shows `on` in the "Auto Assign" column (for each controller module).

- b. If automatic drive assignment is enabled, disable it: `storage disk option modify -node node_name -autoassign off`

You must disable automatic drive assignment on both controller modules.

2. Properly ground yourself.
3. Gently remove the bezel from the front of the platform.
4. Identify the failed disk drive from the system console warning message and the illuminated fault LED on the disk drive

5. Press the release button on the disk drive face.

Depending on the storage system, the disk drives have the release button located at the top or on the left of the disk drive face.

For example, the following illustration shows a disk drive with the release button located on the top of the disk drive face:

The cam handle on the disk drive springs open partially and the disk drive releases from the midplane.

6. Pull the cam handle to its fully open position to unseat the disk drive from the midplane.

7. Slide out the disk drive slightly and allow the disk to safely spin down, which can take less than one minute, and then, using both hands, remove the disk drive from the disk shelf.

8. With the cam handle in the open position, insert the replacement disk drive into the drive bay, firmly pushing until the disk drive stops.



Wait a minimum of 10 seconds before inserting a new disk drive. This allows the system to recognize that a disk drive was removed.



If your platform drive bays are not fully loaded with drives, it is important to place the replacement drive into the same drive bay from which you removed the failed drive.



Use two hands when inserting the disk drive, but do not place hands on the disk drive boards that are exposed on the underside of the disk carrier.

9. Close the cam handle so that the disk drive is fully seated into the midplane and the handle clicks into place.

Be sure to close the cam handle slowly so that it aligns correctly with the face of the disk drive..

10. If you are replacing another disk drive, repeat Steps 4 through 9.

11. Reinstall the bezel.

12. If you disabled automatic drive assignment in Step 1, then, manually assign drive ownership and then reenale automatic drive assignment if needed.

- a. Display all unowned drives: `storage disk show -container-type unassigned`

You can enter the command on either controller module.

- b. Assign each drive: `storage disk assign -disk disk_name -owner owner_name`

You can enter the command on either controller module.

You can use the wildcard character to assign more than one drive at once.

- c. Reenable automatic drive assignment if needed: `storage disk option modify -node node_name -autoassign on`

You must reenable automatic drive assignment on both controller modules.

13. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit.

Contact technical support at [NetApp Support](#), 888-463-8277 (North America), 00-800-44-638277 (Europe), or +800-800-80-800 (Asia/Pacific) if you need the RMA number or additional help with the replacement procedure.

Replace the NVMEM battery - AFF A200

To replace an NVMEM battery in the system, you must remove the controller module from the system, open it, replace the battery, and close and replace the controller module.

About this task

All other components in the system must be functioning properly; if not, you must contact technical support.

Step 1: Shut down the impaired controller

Shut down or take over the impaired controller using different procedures, depending on the storage system hardware configuration.

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message  
MAINT=_number_of_hours_down_h
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:*> system node autosupport invoke -node * -type all -message MAINT=2h`

2. If the impaired controller is part of an HA pair, disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`
3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying...	Then...
The LOADER prompt	Go to Remove controller module.
Waiting for giveback...	Press Ctrl-C, and then respond <code>y</code> .

If the impaired controller is displaying...	Then...
System prompt or password prompt (enter system password)	<p>Take over or halt the impaired controller from the healthy controller:</p> <pre>storage failover takeover -ofnode impaired_node_name</pre> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i>.</p>

4. If the system has only one controller module in the chassis, turn off the power supplies, and then unplug the impaired controller's power cords from the power source.

Step 2: Remove controller module

To access components inside the controller, you must first remove the controller module from the system and then remove the cover on the controller module.

Steps

1. If you are not already grounded, properly ground yourself.
2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

3. Remove and set aside the cable management devices from the left and right sides of the controller module.



4. Squeeze the latch on the cam handle until it releases, open the cam handle fully to release the controller module from the midplane, and then, using two hands, pull the controller module out of the chassis.



5. Turn the controller module over and place it on a flat, stable surface.
6. Open the cover by sliding in the blue tabs to release the cover, and then swing the cover up and open.



Step 3: Replace the NVMEM battery

To replace the NVMEM battery in your system, you must remove the failed NVMEM battery from the system and replace it with a new NVMEM battery.

Steps

1. If you are not already grounded, properly ground yourself.
2. Check the NVMEM LED:
 - If your system is in an HA configuration, go to the next step.
 - If your system is in a stand-alone configuration, cleanly shut down the controller module, and then check the NVRAM LED identified by the NV icon.

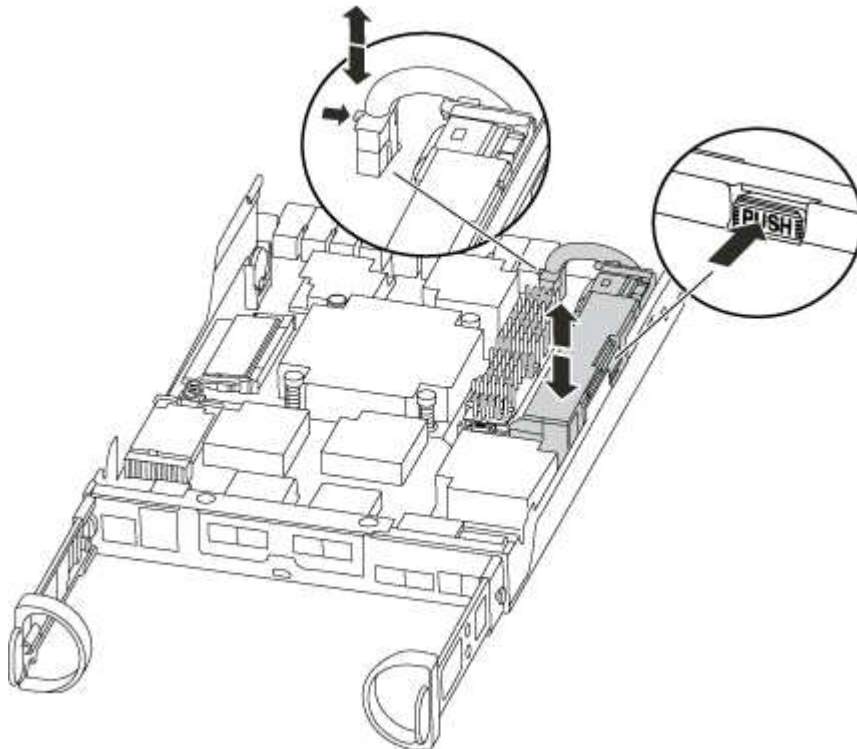


The NVRAM LED blinks while destaging contents to the flash memory when you halt the system. After the destage is complete, the LED turns off.

- If power is lost without a clean shutdown, the NVMEM LED flashes until the destage is complete, and then the LED turns off.
- If the LED is on and power is on, unwritten data is stored on NVMEM.

This typically occurs during an uncontrolled shutdown after ONTAP has successfully booted.

3. Locate the NVMEM battery in the controller module.



4. Locate the battery plug and squeeze the clip on the face of the battery plug to release the plug from the socket, and then unplug the battery cable from the socket.
5. Remove the battery from the controller module and set it aside.
6. Remove the replacement battery from its package.

7. Loop the battery cable around the cable channel on the side of the battery holder.
8. Position the battery pack by aligning the battery holder key ribs to the “V” notches on the sheet metal side wall.
9. Slide the battery pack down along the sheet metal side wall until the support tabs on the side wall hook into the slots on the battery pack, and the battery pack latch engages and clicks into the opening on the side wall.
10. Plug the battery plug back into the controller module.

Step 4: Reinstall the controller module

After you replace components in the controller module, reinstall it into the chassis.

Steps

1. If you are not already grounded, properly ground yourself.
2. If you have not already done so, replace the cover on the controller module.
3. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.




Do not completely insert the controller module in the chassis until instructed to do so.

4. Recable the system, as needed.

If you removed the media converters (QSFPs or SFPs), remember to reinstall them if you are using fiber optic cables.

5. Complete the reinstallation of the controller module:

If your system is in...	Then perform these steps...
An HA pair	<p>The controller module begins to boot as soon as it is fully seated in the chassis.</p> <ol style="list-style-type: none"> a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position. <div style="display: flex; align-items: center; margin-top: 10px;"> <p>Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.</p> </div> <p>The controller begins to boot as soon as it is seated in the chassis.</p> <ol style="list-style-type: none"> b. If you have not already done so, reinstall the cable management device. c. Bind the cables to the cable management device with the hook and loop strap.

If your system is in...	Then perform these steps...
A stand-alone configuration	<p>a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position.</p> <div>  <p>Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.</p> </div> <p>b. If you have not already done so, reinstall the cable management device.</p> <p>c. Bind the cables to the cable management device with the hook and loop strap.</p> <p>d. Reconnect the power cables to the power supplies and to the power sources, turn on the power to start the boot process.</p>

Step 5: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

Swap out a power supply - AFF A200

Swapping out a power supply involves turning off, disconnecting, and removing the old power supply and installing, connecting, and turning on the replacement power supply.

What you'll need

All other components in the system must be functioning properly; if not, you must contact technical support.

About this task

- The power supplies are redundant and hot-swappable.
- This procedure is written for replacing one power supply at a time.



Cooling is integrated with the power supply, so you must replace the power supply within two minutes of removal to prevent overheating due to reduced airflow. Because the chassis provides a shared cooling configuration for the two HA nodes, a delay longer than two minutes will shut down all controller modules in the chassis. If both controller modules do shut down, make sure that both power supplies are inserted, turn both off for 30 seconds, and then turn both on.

- The number of power supplies in the system depends on the model.
- Power supplies are auto-ranging.

Steps

1. Identify the power supply you want to replace, based on console error messages or through the LEDs on the power supplies.
2. If you are not already grounded, properly ground yourself.

3. Turn off the power supply and disconnect the power cables:
 - a. Turn off the power switch on the power supply.
 - b. Open the power cable retainer, and then unplug the power cable from the power supply.
 - c. Unplug the power cable from the power source.
4. Squeeze the latch on the power supply cam handle, and then open the cam handle to fully release the power supply from the mid plane.

If you have an AFF A200 system, a plastic flap within the now empty slot is released to cover the opening and maintain air flow and cooling.

5. Use the cam handle to slide the power supply out of the system.



When removing a power supply, always use two hands to support its weight.

6. Make sure that the on/off switch of the new power supply is in the Off position.
7. Using both hands, support and align the edges of the power supply with the opening in the system chassis, and then gently push the power supply into the chassis using the cam handle.

The power supplies are keyed and can only be installed one way.



Do not use excessive force when sliding the power supply into the system. You can damage the connector.

8. Close the cam handle so that the latch clicks into the locked position and the power supply is fully seated.
9. Reconnect the power supply cabling:
 - a. Reconnect the power cable to the power supply and the power source.
 - b. Secure the power cable to the power supply using the power cable retainer.

Once power is restored to the power supply, the status LED should be green.

10. Turn on the power to the new power supply, and then verify the operation of the power supply activity LEDs.

The power supply LEDs are lit when the power supply comes online.

11. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

Replace the real-time clock battery - AFF A200

You replace the real-time clock (RTC) battery in the controller module so that your system's services and applications that depend on accurate time synchronization continue to function.

About this task

- You can use this procedure with all versions of ONTAP supported by your system
- All other components in the system must be functioning properly; if not, you must contact technical support.

Step 1: Shut down the impaired controller

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message  
MAINT=_number_of_hours_down_h
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:>`

```
system node autosupport invoke -node * -type all -message MAINT=2h
```

2. If the impaired controller is part of an HA pair, disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`
3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying...	Then...
The LOADER prompt	Go to Remove controller module.
Waiting for giveback...	Press Ctrl-C, and then respond <code>y</code> .
System prompt or password prompt (enter system password)	Take over or halt the impaired controller from the healthy controller: <code>storage failover takeover -ofnode impaired_node_name</code> When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <code>y</code> .

4. If the system has only one controller module in the chassis, turn off the power supplies, and then unplug the impaired controller's power cords from the power source.

Step 2: Remove controller module

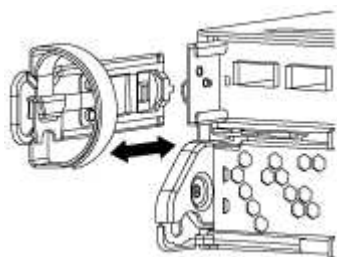
To access components inside the controller, you must first remove the controller module from the system and then remove the cover on the controller module.

Steps

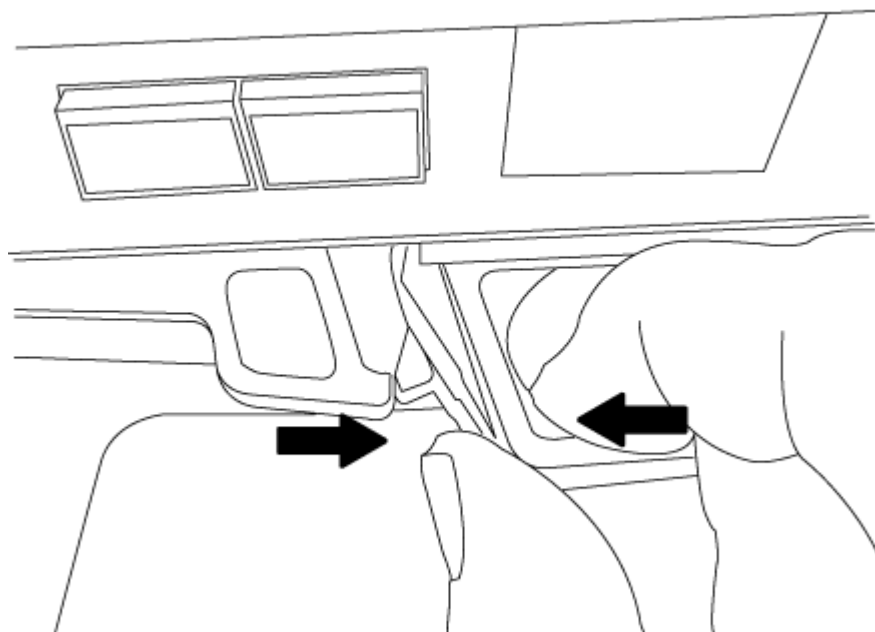
1. If you are not already grounded, properly ground yourself.
2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

3. Remove and set aside the cable management devices from the left and right sides of the controller module.



4. Squeeze the latch on the cam handle until it releases, open the cam handle fully to release the controller module from the midplane, and then, using two hands, pull the controller module out of the chassis.



5. Turn the controller module over and place it on a flat, stable surface.
6. Open the cover by sliding in the blue tabs to release the cover, and then swing the cover up and open.

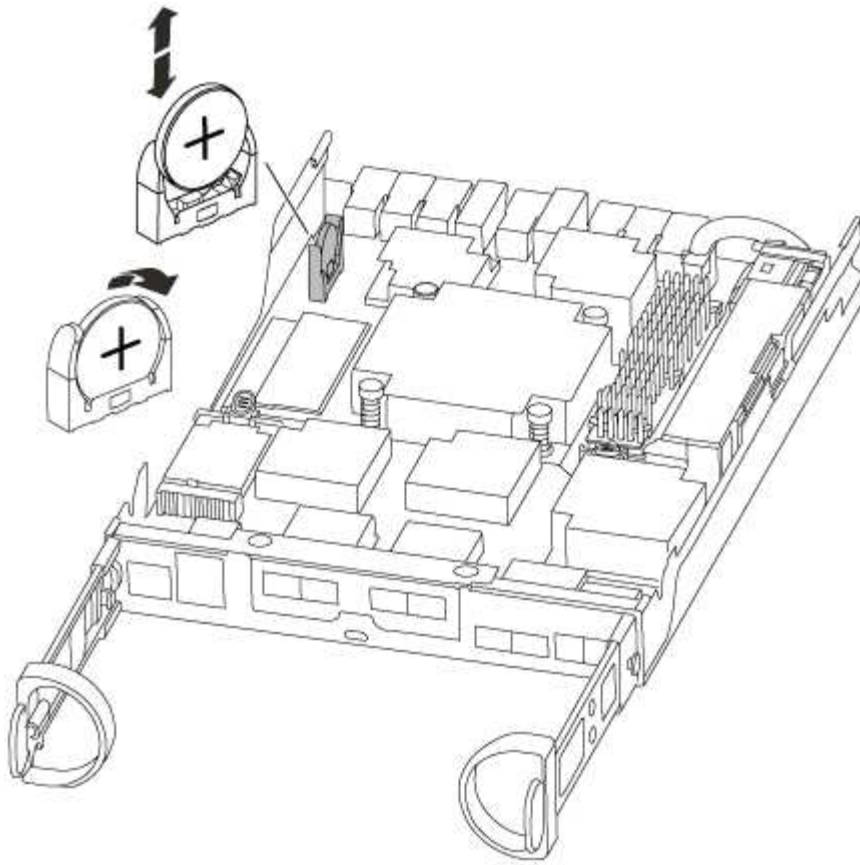


Step 3: Replace the RTC battery

To replace the RTC battery, locate it inside the controller and follow the specific sequence of steps.

Steps

1. If you are not already grounded, properly ground yourself.
2. Locate the RTC battery.



3. Gently push the battery away from the holder, rotate it away from the holder, and then lift it out of the holder.



Note the polarity of the battery as you remove it from the holder. The battery is marked with a plus sign and must be positioned in the holder correctly. A plus sign near the holder tells you how the battery should be positioned.

4. Remove the replacement battery from the antistatic shipping bag.
5. Locate the empty battery holder in the controller module.
6. Note the polarity of the RTC battery, and then insert it into the holder by tilting the battery at an angle and pushing down.
7. Visually inspect the battery to make sure that it is completely installed into the holder and that the polarity is correct.

Step 4: Reinstall the controller module and set time/date after RTC battery replacement

After you replace a component within the controller module, you must reinstall the controller module in the system chassis, reset the time and date on the controller, and then boot it.

Steps

1. If you have not already done so, close the air duct or controller module cover.
2. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.

Do not completely insert the controller module in the chassis until instructed to do so.

3. Recable the system, as needed.

If you removed the media converters (QSFPs or SFPs), remember to reinstall them if you are using fiber optic cables.

4. If the power supplies were unplugged, plug them back in and reinstall the power cable retainers.
5. Complete the reinstallation of the controller module:
 - a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position.



Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.

- b. If you have not already done so, reinstall the cable management device.
 - c. Bind the cables to the cable management device with the hook and loop strap.
 - d. Reconnect the power cables to the power supplies and to the power sources, and then turn on the power to start the boot process.
 - e. Halt the controller at the LOADER prompt.
6. Reset the time and date on the controller:
 - a. Check the date and time on the healthy controller with the `show date` command.
 - b. At the LOADER prompt on the target controller, check the time and date.
 - c. If necessary, modify the date with the `set date mm/dd/yyyy` command.
 - d. If necessary, set the time, in GMT, using the `set time hh:mm:ss` command.
 - e. Confirm the date and time on the target controller.
 7. At the LOADER prompt, enter `bye` to reinitialize the PCIe cards and other components and let the controller reboot.
 8. Return the controller to normal operation by giving back its storage: `storage failover giveback -ofnode impaired_node_name`
 9. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`

Step 5: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

AFF A220 systems

Install and setup

Start here: Choose your installation and setup experience

For most configurations, you can choose from different content formats.

- [Quick steps](#)

A printable PDF of step-by-step instructions with live links to additional content.

- [Video steps](#)

Video step-by-step instructions.

- [Detailed steps](#)

Online step-by-step instructions with live links to additional content.

If your system is in a MetroCluster IP configuration, see the [Install MetroCluster IP Configuration](#) instructions.

Quick guide - AFF A220

This page gives graphic instructions for a typical installation of your system from racking and cabling, through initial system bring-up. Use this guide if you are familiar with installing NetApp systems.

Access the *Installation and Setup Instructions* PDF poster:

[AFF A220/FAS2700 Systems Installation and Setup Instructions](#)

Video steps - AFF A220

The following video shows how to install and cable your new system.

 | <https://img.youtube.com/vi/5g-34qxG9HA?/maxresdefault.jpg>

Detailed guide - AFF A220

This page gives detailed step-by-step instructions for installing a typical NetApp system.

Step 1: Prepare for installation

To install your AFF A220 system, you need to create an account on the NetApp Support Site, register your system, and get license keys. You also need to inventory the appropriate number and type of cables for your system and collect specific network information.

You need to have access to the Hardware Universe for information about site requirements as well as additional information on your configured system. You might also want to have access to the Release Notes for your version of ONTAP for more information about this system.

[NetApp Hardware Universe](#)

[Find the Release Notes for your version of ONTAP 9](#)

You need to provide the following at your site:

- Rack space for the storage system
- Phillips #2 screwdriver
- Additional networking cables to connect your system to your network switch and laptop or console with a Web browser

- A laptop or console with an RJ-45 connection and access to a Web browser

Steps

1. Unpack the contents of all boxes.
2. Record the system serial number from the controllers.



3. Set up your account:
 - a. Log in to your existing account or create an account.
 - b. Register your system.

[NetApp Product Registration](#)





4. Download and install Config Advisor on your laptop.




[NetApp Downloads: Config Advisor](#)

5. Inventory and make a note of the number and types of cables you received.

The following table identifies the types of cables you might receive. If you receive a cable not listed in the table, see the Hardware Universe to locate the cable and identify its use.

[NetApp Hardware Universe](#)

Type of cable...	Part number and length	Connector type	For...
10 GbE cable (order dependent)	X6566B-05-R6 (112-00297), 0.5m X6566B-2-R6 (112-00299), 2m		Cluster interconnect network
10 GbE cable (order dependent)	Part number X6566B-2-R6 (112-00299), 2m or X6566B-3-R6 (112-00300), 3m X6566B-5-R6 (112-00301), 5m		Data
Optical network cables (order dependent)	X6553-R6 (112-00188), 2m X6536-R6 (112-00090), 5m X6554-R6(112-00189), 15m		FC host network
Cat 6, RJ-45 (order dependent)	Part numbers X6585-R6 (112-00291), 3m X6562-R6 (112-00196), 5m		Management network and Ethernet data

Type of cable...	Part number and length	Connector type	For...
Storage (order dependent)	Part number X66030A (112-00435), 0.5m X66031A (112-00436), 1m X66032A (112-00437), 2m X66033A (112-00438), 3m		Storage
Micro-USB console cable	Not applicable		Console connection during software setup on non-Windows or Mac laptop/console
Power cables	Not applicable		Powering up the system

6. Download and complete the *Cluster configuration worksheet*.

[Cluster Configuration Worksheet](#)

Step 2: Install the hardware

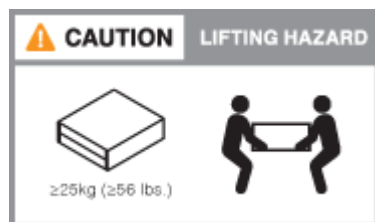
You need to install your system in a 4-post rack or NetApp system cabinet, as applicable.

Steps

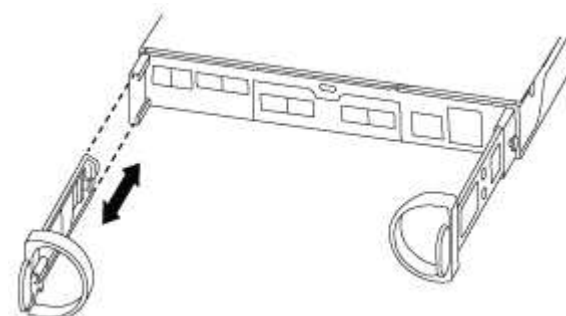
1. Install the rail kits, as needed.
2. Install and secure your system using the instructions included with the rail kit.



You need to be aware of the safety concerns associated with the weight of the system.



3. Attach cable management devices (as shown).



4. Place the bezel on the front of the system.

Step 3: Cable controllers to your network

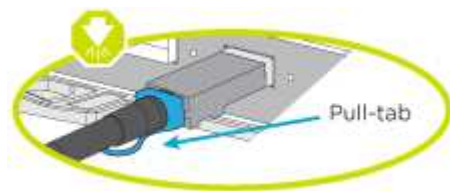
You can cable the controllers to your network by using the two-node switchless cluster method or by using the cluster interconnect network.

Option 1: Cable a two-node switchless cluster, unified network configuration

Management network, UTA2 data network, and management ports on the controllers are connected to switches. The cluster interconnect ports are cabled on both controllers.

You must have contacted your network administrator for information about connecting the system to the switches.

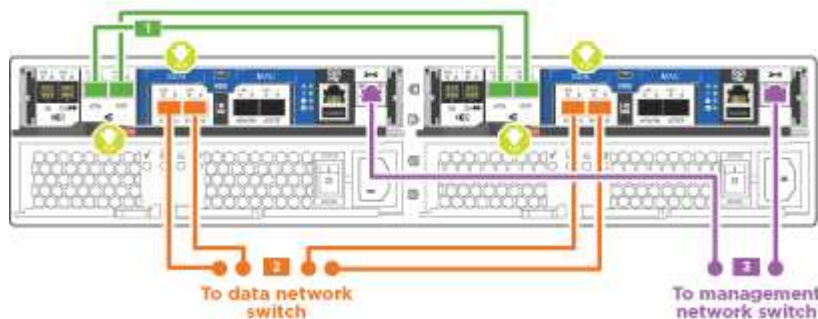
Be sure to check the illustration arrow for the proper cable connector pull-tab orientation.



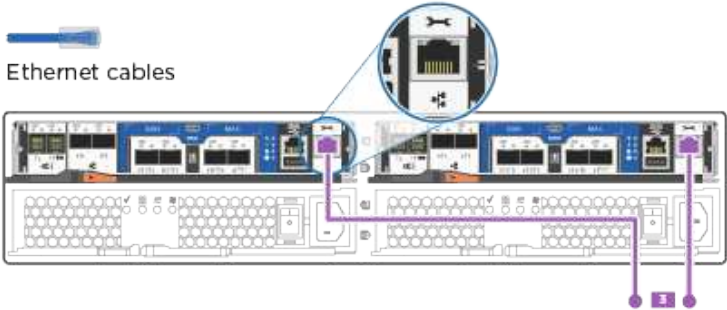

As you insert the connector, you should feel it click into place; if you do not feel it click, remove it, turn it around and try again.

Steps

1. You can use the graphic or the step-by step instructions to complete the cabling between the controllers and to the switches:



Step	Perform on each controller
<div data-bbox="183 153 245 195" data-label="Text">1</div>	<p data-bbox="509 159 1490 222">Cable the cluster interconnect ports to each other with the cluster interconnect cable:</p> <ul data-bbox="537 260 691 344" style="list-style-type: none"> • e0a to e0a • e0b to e0b <div data-bbox="678 369 1365 688" data-label="Image"> <p data-bbox="678 411 963 432">Cluster interconnect cables</p> </div>
<div data-bbox="183 762 245 804" data-label="Text">2</div>	<p data-bbox="509 768 1490 831">Use one of the following cable types to cable the UTA2 data ports to your host network:</p> <p data-bbox="509 869 654 900">An FC host</p> <ul data-bbox="537 938 747 1148" style="list-style-type: none"> • 0c and 0d • or 0e and 0f A 10GbE • e0c and e0d • or e0e and e0f <div data-bbox="542 1220 597 1272" data-label="Image"> </div> <p data-bbox="659 1199 1445 1293">You can connect one port pair as CNA and one port pair as FC, or you can connect both port pairs as CNA or both port pairs as FC.</p> <div data-bbox="516 1367 1317 1839" data-label="Image"> <p data-bbox="516 1419 711 1472">Optical network cables</p> <p data-bbox="781 1419 951 1472">SFP for optical cables</p> <p data-bbox="1117 1419 1300 1472">10GbE network cables</p> </div>

Step	Perform on each controller
3	<p>Cable the e0M ports to the management network switches with the RJ45 cables:</p> 
	DO NOT plug in the power cords at this point.

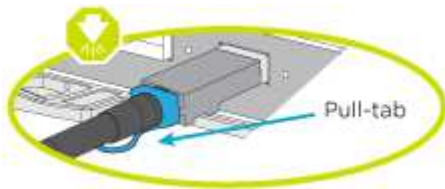
2. To cable your storage, see [Step 4: Cable controllers to drive shelves](#)

Option 2: Cable a switched cluster, unified network configuration

Management network, UTA2 data network, and management ports on the controllers are connected to switches. The cluster interconnect ports are cabled to the cluster interconnect switches.

You must have contacted your network administrator for information about connecting the system to the switches.

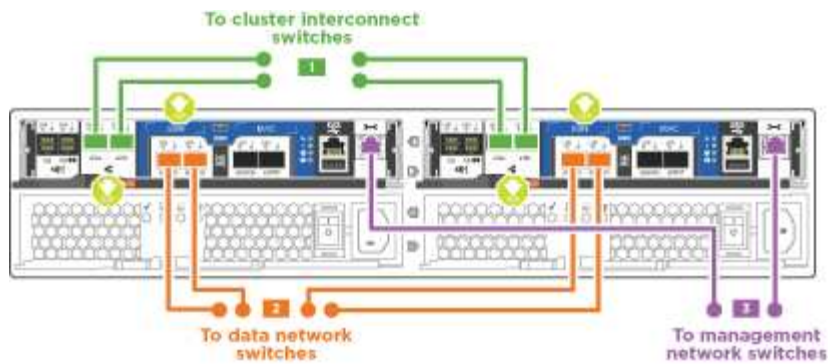
Be sure to check the illustration arrow for the proper cable connector pull-tab orientation.

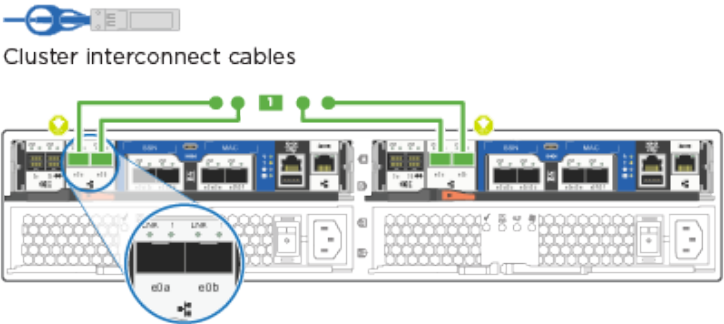


As you insert the connector, you should feel it click into place; if you do not feel it click, remove it, turn it around and try again.


Steps

1. You can use the graphic or the step-by step instructions to complete the cabling between the controllers and the switches:



Step	Perform on each controller module
1	<p>Cable e0a and e0b to the cluster interconnect switches with the cluster interconnect cable:</p>  <p>Cluster interconnect cables</p>

Step	Perform on each controller module
<div data-bbox="183 153 245 195" data-label="Text">2</div>	<p data-bbox="511 153 1484 222">Use one of the following cable types to cable the UTA2 data ports to your host network:</p> <p data-bbox="511 254 654 285">An FC host</p> <ul data-bbox="537 317 716 401" style="list-style-type: none"> • 0c and 0d • or 0e and 0f <p data-bbox="511 432 623 464">A 10GbE</p> <ul data-bbox="537 495 745 579" style="list-style-type: none"> • e0c and e0d • or e0e and e0f <div data-bbox="544 642 597 709" data-label="Image"> </div> <div data-bbox="659 621 1442 726" data-label="Text"> <p>You can connect one port pair as CNA and one port pair as FC, or you can connect both port pairs as CNA or both port pairs as FC.</p> </div> <div data-bbox="516 800 1317 1272" data-label="Image"> </div>
<div data-bbox="183 1346 245 1388" data-label="Text">3</div>	<p data-bbox="511 1346 1409 1409">Cable the e0M ports to the management network switches with the RJ45 cables:</p> <div data-bbox="641 1493 1360 1797" data-label="Image"> </div>

Step	Perform on each controller module
	DO NOT plug in the power cords at this point.

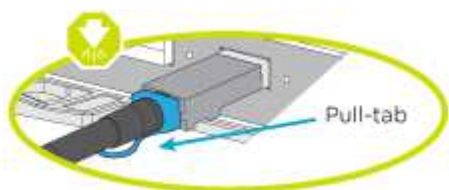
- To cable your storage, see [Step 4: Cable controllers to drive shelves](#)

Option 3: Cable a two-node switchless cluster, Ethernet network configuration

Management network, Ethernet data network, and management ports on the controllers are connected to switches. The cluster interconnect ports are cabled on both controllers.

You must have contacted your network administrator for information about connecting the system to the switches.

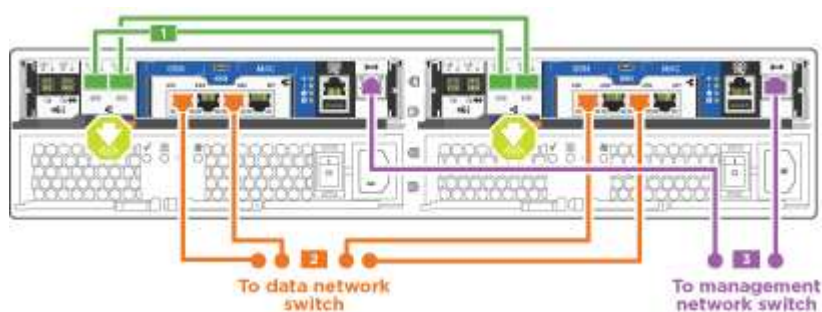
Be sure to check the illustration arrow for the proper cable connector pull-tab orientation.



As you insert the connector, you should feel it click into place; if you do not feel it click, remove it, turn it around and try again.

Steps

- You can use the graphic or the step-by step instructions to complete the cabling between the controllers and to the switches:



Step	Perform on each controller
<div data-bbox="183 153 245 195" data-label="Text">1</div>	<p data-bbox="513 159 1482 222">Cable the cluster interconnect ports to each other with the cluster interconnect cable:</p> <ul data-bbox="537 260 691 344" style="list-style-type: none"> • e0a to e0a • e0b to e0b <div data-bbox="678 373 1365 688" data-label="Image"> </div>
<div data-bbox="183 762 245 804" data-label="Text">2</div>	<p data-bbox="513 768 1406 831">Use the Cat 6 RJ45 cable to cable the e0c through e0f ports to your host network:</p> <div data-bbox="638 898 1360 1199" data-label="Image"> </div>
<div data-bbox="183 1272 245 1314" data-label="Text">3</div>	<p data-bbox="513 1278 1406 1341">Cable the e0M ports to the management network switches with the RJ45 cables:</p> <div data-bbox="638 1409 1360 1717" data-label="Image"> </div>
<div data-bbox="183 1797 245 1864" data-label="Image"> </div>	<p data-bbox="513 1797 1073 1829">DO NOT plug in the power cords at this point.</p>

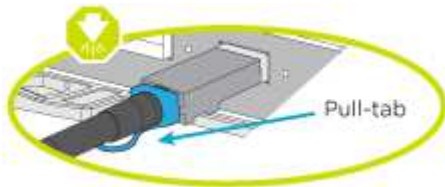
2. To cable your storage, see [Step 4: Cable controllers to drive shelves](#)

Option 4: Cable a switched cluster, Ethernet network configuration

Management network, Ethernet data network, and management ports on the controllers are connected to switches. The cluster interconnect ports are cabled to the cluster interconnect switches.

You must have contacted your network administrator for information about connecting the system to the switches.

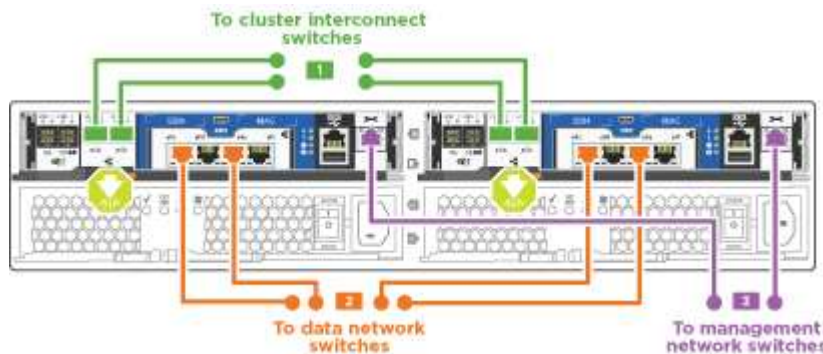
Be sure to check the illustration arrow for the proper cable connector pull-tab orientation.



As you insert the connector, you should feel it click into place; if you do not feel it click, remove it, turn it around and try again.

Steps

1. You can use the graphic or the step-by step instructions to complete the cabling between the controllers and the switches:



Step	Perform on each controller module
1	<p>Cable e0a and e0b to the cluster interconnect switches with the cluster interconnect cable:</p> <p>Cluster interconnect cables</p>

Step	Perform on each controller module
<div data-bbox="183 153 245 197" data-label="Text">2</div>	<p data-bbox="621 159 1489 226">Use the Cat 6 RJ45 cable to cable the e0c through e0f ports to your host network:</p> <div data-bbox="732 289 1375 552" data-label="Image"> <p>The diagram shows two controller modules side-by-side. Orange lines represent CAT6 RJ-45 cables connecting the e0c, e0d, e0e, and e0f ports on each module to a common host network. A callout shows a close-up of the RJ45 ports.</p> </div>
<div data-bbox="183 621 245 665" data-label="Text">3</div>	<p data-bbox="621 627 1489 695">Cable the e0M ports to the management network switches with the RJ45 cables:</p> <div data-bbox="732 751 1375 1031" data-label="Image"> <p>The diagram shows two controller modules side-by-side. Purple lines represent Ethernet cables connecting the e0M ports on each module to management network switches. A callout shows a close-up of the e0M port.</p> </div>
<div data-bbox="183 1108 245 1176" data-label="Image"> </div>	<p data-bbox="621 1104 1489 1140">DO NOT plug in the power cords at this point.</p>

2. To cable your storage, see [Step 4: Cable controllers to drive shelves](#)

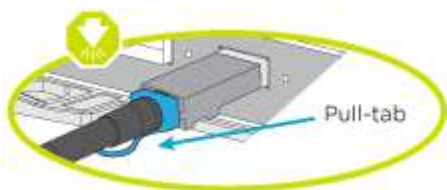
Step 4: Cable controllers to drive shelves

You must cable the controllers to your shelves using the onboard storage ports. NetApp recommends MP-HA cabling for systems with external storage. If you have a SAS tape drive, you can use single-path cabling. If you have no external shelves, MP-HA cabling to internal drives is optional (not shown) if the SAS cables are ordered with the system.

Option 1: Cable storage on an HA pair with external drive shelves

You must cable the shelf-to-shelf connections, and then cable both controllers to the drive shelves.

Be sure to check the illustration arrow for the proper cable connector pull-tab orientation.

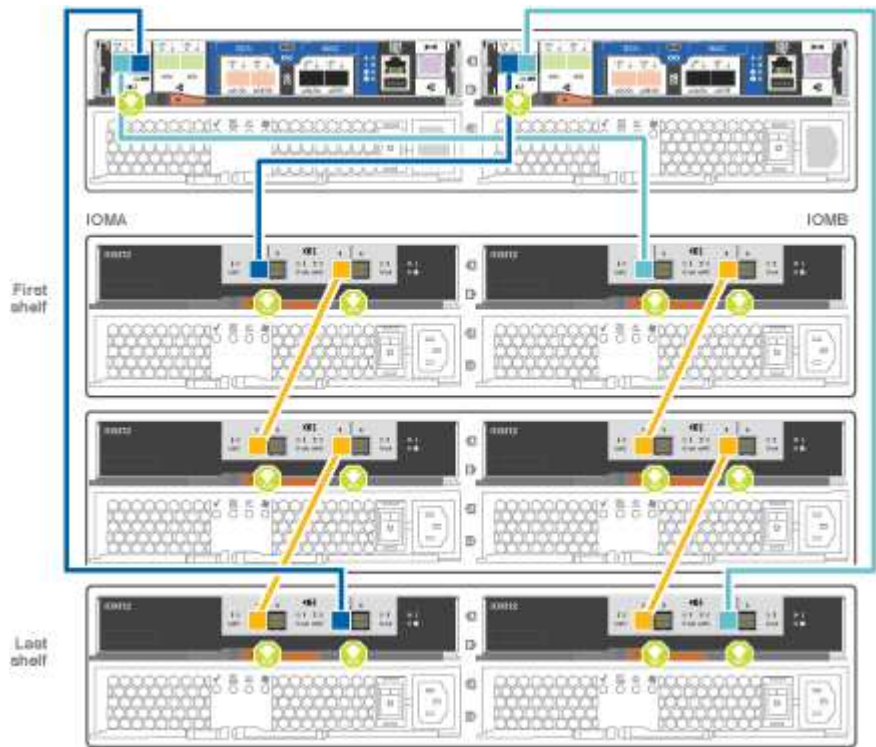





Steps

1. Cable the HA pair with external drive shelves:



The example uses DS224C. Cabling is similar with other supported drive shelves.



Step	Perform on each controller
1	<p>Cable the shelf-to-shelf ports.</p> <ul style="list-style-type: none">• Port 3 on IOM A to port 1 on the IOM A on the shelf directly below.• Port 3 on IOM B to port 1 on the IOM B on the shelf directly below. <p> mini-SAS HD to mini-SAS HD cables</p>
2	<p>Connect each node to IOM A in the stack.</p> <ul style="list-style-type: none">• Controller 1 port 0b to IOM A port 3 on last drive shelf in the stack.• Controller 2 port 0a to IOM A port 1 on the first drive shelf in the stack. <p> mini-SAS HD to mini-SAS HD cables</p>
3	<p>Connect each node to IOM B in the stack</p> <ul style="list-style-type: none">• Controller 1 port 0a to IOM B port 1 on first drive shelf in the stack.• Controller 2 port 0b to IOM B port 3 on the last drive shelf in the stack. <p> mini-SAS HD to mini-SAS HD cables</p>

If you have more than one drive shelf stack, see the *Installation and Cabling Guide* for your drive shelf type.

2. To complete setting up your system, see [Step 5: Complete system setup and configuration](#)

Step 5: Complete system setup and configuration

You can complete the system setup and configuration using cluster discovery with only a connection to the switch and laptop, or by connecting directly to a controller in the system and then connecting to the management switch.

Option 1: Complete system setup if network discovery is enabled

If you have network discovery enabled on your laptop, you can complete system setup and configuration using automatic cluster discovery.

Steps

1. Use the following animation to set one or more drive shelf IDs

[Animation - Set drive shelf IDs](#)

2. Plug the power cords into the controller power supplies, and then connect them to power sources on different circuits.
3. Turn on the power switches to both nodes.



Initial booting may take up to eight minutes.

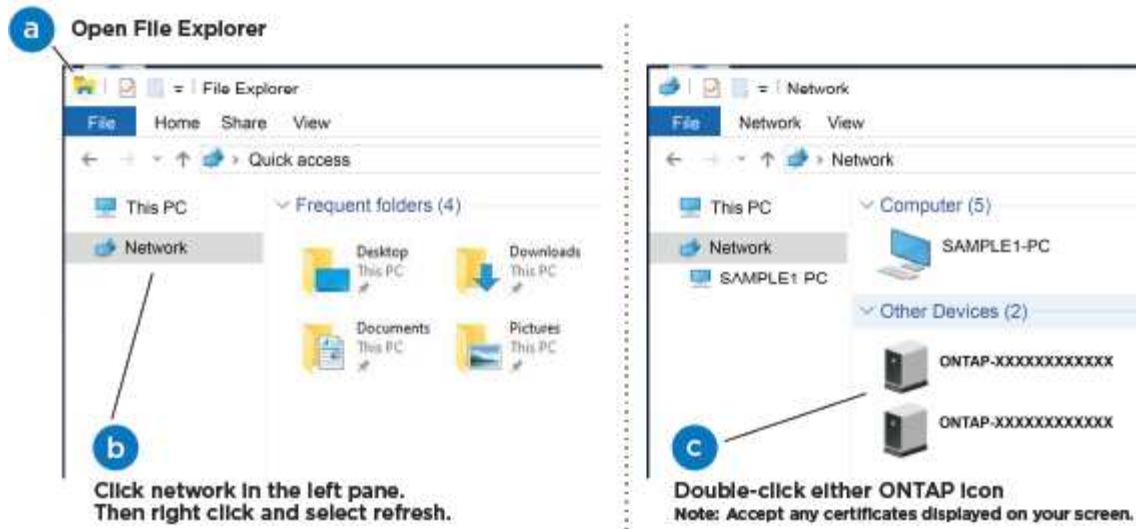
4. Make sure that your laptop has network discovery enabled.

See your laptop's online help for more information.

5. Use the following animation to connect your laptop to the Management switch.

[Animation - Connect your laptop to the Management switch](#)

6. Select an ONTAP icon listed to discover:



- a. Open File Explorer.
- b. Click network in the left pane.
- c. Right click and select refresh.
- d. Double-click either ONTAP icon and accept any certificates displayed on your screen.



XXXXX is the system serial number for the target node.

System Manager opens.

7. Use System Manager guided setup to configure your system using the data you collected in the *NetApp ONTAP Configuration Guide*.

ONTAP Configuration Guide

8. Verify the health of your system by running Config Advisor.
9. After you have completed the initial configuration, go to the [ONTAP & ONTAP System Manager Documentation Resources](#) page for information about configuring additional features in ONTAP.

Option 2: Completing system setup and configuration if network discovery is not enabled

If network discovery is not enabled on your laptop, you must complete the configuration and setup using this task.

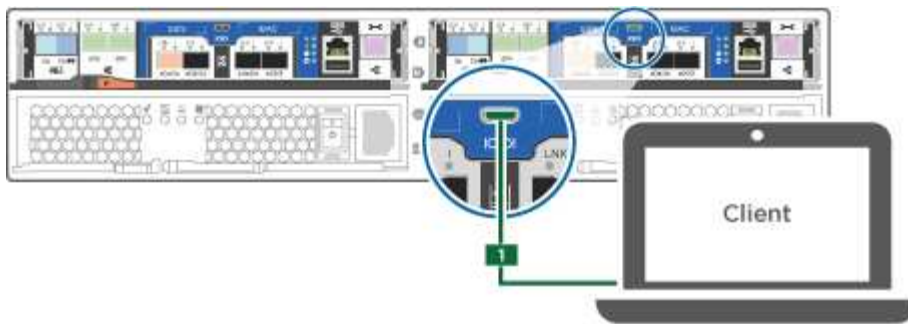
Steps

1. Cable and configure your laptop or console:
 - a. Set the console port on the laptop or console to 115,200 baud with N-8-1.

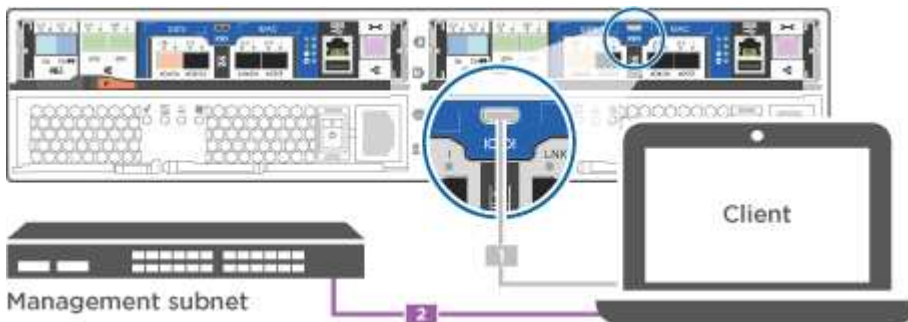


See your laptop or console's online help for how to configure the console port.

- b. Connect the console cable to the laptop or console, and connect the console port on the controller using the console cable that came with your system.



c. Connect the laptop or console to the switch on the management subnet.



d. Assign a TCP/IP address to the laptop or console, using one that is on the management subnet.

2. Use the following animation to set one or more drive shelf IDs:

[Animation - Set drive shelf IDs](#)


3. Plug the power cords into the controller power supplies, and then connect them to power sources on different circuits.
4. Turn on the power switches to both nodes.



Initial booting may take up to eight minutes.

5. Assign an initial node management IP address to one of the nodes.

If the management network has DHCP...	Then...
Configured	Record the IP address assigned to the new controllers.

If the management network has DHCP...	Then...
Not configured	<p>a. Open a console session using PuTTY, a terminal server, or the equivalent for your environment.</p> <div>  <p>Check your laptop or console's online help if you do not know how to configure PuTTY.</p> </div> <p>b. Enter the management IP address when prompted by the script.</p>

6. Using System Manager on your laptop or console, configure your cluster:

- a. Point your browser to the node management IP address.



The format for the address is https://x.x.x.x.

- b. Configure the system using the data you collected in the *NetApp ONTAP Configuration guide*.

[ONTAP Configuration Guide](#)

7. Verify the health of your system by running Config Advisor.

8. After you have completed the initial configuration, go to the [ONTAP & ONTAP System Manager Documentation Resources](#) page for information about configuring additional features in ONTAP.

Maintain

Maintain AFF A220 hardware

For the AFF A220 storage system, you can perform maintenance procedures on the following components.

Boot media

The boot media stores a primary and secondary set of boot image files that the system uses when it boots.

Caching module

You must replace the controller's caching module when your system registers a single AutoSupport (ASUP) message that the module has gone offline.

Chassis

The chassis is the physical enclosure housing all the controller components such as the controller/CPU unit, power supply, and I/O.

Controller

A controller consists of a board, firmware, and software. It controls the drives and implements the ONTAP functions.

DIMM

You must replace a DIMM (dual in-line memory module) when a memory mismatch is present, or you have a failed DIMM.

Drive

A drive is a device that provides the physical storage media for data.

NVEM Battery

A battery is included with a controller and preserves cached data if the AC power fails.

Power supply

A power supply provides a redundant power source in a controller shelf.

Real time clock battery

A real time clock battery preserves system date and time information if the power is off.

Boot media

Overview of boot media replacement - AFF A220

The boot media stores a primary and secondary set of system (boot image) files that the system uses when it boots. Depending on your network configuration, you can perform either a nondisruptive or disruptive replacement.

You must have a USB flash drive, formatted to FAT32, with the appropriate amount of storage to hold the `image_xxx.tgz` file.

You also must copy the `image_xxx.tgz` file to the USB flash drive for later use in this procedure.

- The nondisruptive and disruptive methods for replacing a boot media both require you to restore the `var` file system:
 - For nondisruptive replacement, the HA pair must be connected to a network to restore the `var` file system.
 - For disruptive replacement, you do not need a network connection to restore the `var` file system, but the process requires two reboots.
- You must replace the failed component with a replacement FRU component you received from your provider.
- It is important that you apply the commands in these steps on the correct node:
 - The *impaired* node is the node on which you are performing maintenance.
 - The *healthy node* is the HA partner of the impaired node.

Check onboard encryption keys - AFF A220

Prior to shutting down the impaired controller and checking the status of the onboard encryption keys, you must check the status of the impaired controller, disable automatic giveback, and check which version of ONTAP is running on the system.

If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see the [Synchronize a node with the cluster](#).

Steps

1. Check the status of the impaired controller:
 - If the impaired controller is at the login prompt, log in as `admin`.
 - If the impaired controller is at the `LOADER` prompt and is part of HA configuration, log in as `admin` on the healthy controller.
 - If the impaired controller is in a standalone configuration and at `LOADER` prompt, contact mysupport.netapp.com.
2. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message  
MAINT=number_of_hours_downh
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:*>`

```
system node autosupport invoke -node * -type all -message MAINT=2h
```
3. Check the version of ONTAP the system is running on the impaired controller if up, or on the partner controller if the impaired controller is down, using the `version -v` command:
 - If `<Ino-DARE>` or `<1Ono-DARE>` is displayed in the command output, the system does not support NVE, proceed to shut down the controller.
 - If `<Ino-DARE>` is not displayed in the command output, and the system is running ONTAP 9.5, go to [Option 1: Check NVE or NSE on systems running ONTAP 9.5 and earlier](#).
 - If `<Ino-DARE>` is not displayed in the command output, and the system is running ONTAP 9.6 or later, go to [Option 2: Check NVE or NSE on systems running ONTAP 9.6 and later](#).
4. If the impaired controller is part of an HA configuration, disable automatic giveback from the healthy controller:

```
storage failover modify -node local -auto-giveback false or storage  
failover modify -node local -auto-giveback-after-panic false
```

Option 1: Check NVE or NSE on systems running ONTAP 9.5 and earlier

Before shutting down the impaired controller, you need to check whether the system has either NetApp Volume Encryption (NVE) or NetApp Storage Encryption (NSE) enabled. If so, you need to verify the configuration.

Steps

1. Connect the console cable to the impaired controller.
2. Check whether NVE is configured for any volumes in the cluster: `volume show -is-encrypted true`

If any volumes are listed in the output, NVE is configured and you need to verify the NVE configuration. If no volumes are listed, check whether NSE is configured.
3. Check whether NSE is configured: `storage encryption disk show`
 - If the command output lists the drive details with Mode & Key ID information, NSE is configured and you need to verify the NSE configuration.
 - If NVE and NSE are not configured, it's safe to shut down the impaired controller.

Verify NVE configuration

Steps

1. Display the key IDs of the authentication keys that are stored on the key management servers: `security key-manager query`
 - If the `Restored` column displays `yes` and all key managers display `available`, it's safe to shut down the impaired controller.
 - If the `Restored` column displays anything other than `yes`, or if any key manager displays `unavailable`, you need to complete some additional steps.
 - If you see the message `This command is not supported when onboard key management is enabled`, you need to complete some other additional steps.
2. If the `Restored` column displayed anything other than `yes`, or if any key manager displayed `unavailable`:
 - a. Retrieve and restore all authentication keys and associated key IDs: `security key-manager restore -address *`

If the command fails, contact NetApp Support.

mysupport.netapp.com
 - b. Verify that the `Restored` column displays `yes` for all authentication keys and that all key managers display `available`: `security key-manager query`
 - c. Shut down the impaired controller.
3. If you saw the message `This command is not supported when onboard key management is enabled`, display the keys stored in the onboard key manager: `security key-manager key show -detail`
 - a. If the `Restored` column displays `yes` manually back up the onboard key management information:
 - Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
 - Enter the command to display the OKM backup information: `security key-manager backup show`
 - Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
 - Return to admin mode: `set -priv admin`
 - Shut down the impaired controller.
 - b. If the `Restored` column displays anything other than `yes`:
 - Run the key-manager setup wizard: `security key-manager setup -node target/impaired node name`



Enter the customer's onboard key management passphrase at the prompt. If the passphrase cannot be provided, contact mysupport.netapp.com

- Verify that the `Restored` column displays `yes` for all authentication key: `security key-manager key show -detail`
- Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`

- Enter the command to display the OKM backup information: `security key-manager backup show`
- Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
- Return to admin mode: `set -priv admin`
- You can safely shutdown the controller.

Verify NSE configuration

Steps

1. Display the key IDs of the authentication keys that are stored on the key management servers: `security key-manager query`
 - If the `Restored` column displays `yes` and all key managers display `available`, it's safe to shut down the impaired controller.
 - If the `Restored` column displays anything other than `yes`, or if any key manager displays `unavailable`, you need to complete some additional steps.
 - If you see the message `This command is not supported when onboard key management is enabled`, you need to complete some other additional steps
2. If the `Restored` column displayed anything other than `yes`, or if any key manager displayed `unavailable`:
 - a. Retrieve and restore all authentication keys and associated key IDs: `security key-manager restore -address *`

If the command fails, contact NetApp Support.

mysupport.netapp.com
 - b. Verify that the `Restored` column displays `yes` for all authentication keys and that all key managers display `available`: `security key-manager query`
 - c. Shut down the impaired controller.
3. If you saw the message `This command is not supported when onboard key management is enabled`, display the keys stored in the onboard key manager: `security key-manager key show -detail`
 - a. If the `Restored` column displays `yes`, manually back up the onboard key management information:
 - Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
 - Enter the command to display the OKM backup information: `security key-manager backup show`
 - Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
 - Return to admin mode: `set -priv admin`
 - Shut down the impaired controller.
 - b. If the `Restored` column displays anything other than `yes`:
 - Run the key-manager setup wizard: `security key-manager setup -node target/impaired node name`



Enter the customer's OKM passphrase at the prompt. If the passphrase cannot be provided, contact mysupport.netapp.com

- Verify that the `Restored` column shows `yes` for all authentication keys: `security key-manager key show -detail`
- Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
- Enter the command to back up the OKM information: `security key-manager backup show`



Make sure that OKM information is saved in your log file. This information will be needed in disaster scenarios where OKM might need to be manually recovered.

- Copy the contents of the backup information to a separate file or your log. You'll need it in disaster scenarios where you might need to manually recover OKM.
- Return to admin mode: `set -priv admin`
- You can safely shut down the controller.

Option 2: Check NVE or NSE on systems running ONTAP 9.6 and later

Before shutting down the impaired controller, you need to verify whether the system has either NetApp Volume Encryption (NVE) or NetApp Storage Encryption (NSE) enabled. If so, you need to verify the configuration.

1. Verify whether NVE is in use for any volumes in the cluster: `volume show -is-encrypted true`

If any volumes are listed in the output, NVE is configured and you need to verify the NVE configuration. If no volumes are listed, check whether NSE is configured and in use.

2. Verify whether NSE is configured and in use: `storage encryption disk show`
 - If the command output lists the drive details with Mode & Key ID information, NSE is configured and you need to verify the NSE configuration and in use.
 - If no disks are shown, NSE is not configured.
 - If NVE and NSE are not configured, no drives are protected with NSE keys, it's safe to shut down the impaired controller.

Verify NVE configuration

1. Display the key IDs of the authentication keys that are stored on the key management servers: `security key-manager key query`



After the ONTAP 9.6 release, you may have additional key manager types. The types are KMIP, AKV, and GCP. The process for confirming these types is the same as confirming `external` or `onboard` key manager types.

- If the `Key Manager` type displays `external` and the `Restored` column displays `yes`, it's safe to shut down the impaired controller.
- If the `Key Manager` type displays `onboard` and the `Restored` column displays `yes`, you need to complete some additional steps.
- If the `Key Manager` type displays `external` and the `Restored` column displays anything other than

yes, you need to complete some additional steps.

- If the Key Manager type displays onboard and the Restored column displays anything other than yes, you need to complete some additional steps.

2. If the Key Manager type displays onboard and the Restored column displays yes, manually back up the OKM information:
 - a. Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
 - b. Enter the command to display the key management information: `security key-manager onboard show-backup`
 - c. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
 - d. Return to admin mode: `set -priv admin`
 - e. Shut down the impaired controller.

3. If the Key Manager type displays external and the Restored column displays anything other than yes:

- a. Restore the external key management authentication keys to all nodes in the cluster: `security key-manager external restore`

If the command fails, contact NetApp Support.

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- b. Verify that the Restored column equals yes for all authentication keys: `security key-manager key query`

- c. Shut down the impaired controller.

4. If the Key Manager type displays onboard and the Restored column displays anything other than yes:

- a. Enter the onboard security key-manager sync command: `security key-manager onboard sync`



Enter the customer's 32 character, alphanumeric onboard key management passphrase at the prompt. If the passphrase cannot be provided, contact NetApp Support.
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- b. Verify the Restored column shows yes for all authentication keys: `security key-manager key query`
- c. Verify that the Key Manager type shows onboard, and then manually back up the OKM information.
- d. Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
- e. Enter the command to display the key management backup information: `security key-manager onboard show-backup`
- f. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
- g. Return to admin mode: `set -priv admin`
- h. You can safely shut down the controller.

Verify NSE configuration

1. Display the key IDs of the authentication keys that are stored on the key management servers: `security key-manager key query -key-type NSE-AK`



After the ONTAP 9.6 release, you may have additional key manager types. The types are KMIP, AKV, and GCP. The process for confirming these types is the same as confirming external or onboard key manager types.

- If the Key Manager type displays `external` and the Restored column displays `yes`, it's safe to shut down the impaired controller.
 - If the Key Manager type displays `onboard` and the Restored column displays `yes`, you need to complete some additional steps.
 - If the Key Manager type displays `external` and the Restored column displays anything other than `yes`, you need to complete some additional steps.
 - If the Key Manager type displays `external` and the Restored column displays anything other than `yes`, you need to complete some additional steps.
2. If the Key Manager type displays `onboard` and the Restored column displays `yes`, manually back up the OKM information:
 - a. Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
 - b. Enter the command to display the key management information: `security key-manager onboard show-backup`
 - c. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
 - d. Return to admin mode: `set -priv admin`
 - e. You can safely shut down the controller.
 3. If the Key Manager type displays `external` and the Restored column displays anything other than `yes`:
 - a. Restore the external key management authentication keys to all nodes in the cluster: `security key-manager external restore`

If the command fails, contact NetApp Support.

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 - b. Verify that the Restored column equals `yes` for all authentication keys: `security key-manager key query`
 - c. You can safely shut down the controller.
 4. If the Key Manager type displays `onboard` and the Restored column displays anything other than `yes`:
 - a. Enter the onboard security key-manager sync command: `security key-manager onboard sync`

Enter the customer's 32 character, alphanumeric onboard key management passphrase at the prompt. If the passphrase cannot be provided, contact NetApp Support.

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- b. Verify the `Restored` column shows `yes` for all authentication keys: `security key-manager key query`
- c. Verify that the `Key Manager` type shows `onboard`, and then manually back up the OKM information.
- d. Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
- e. Enter the command to display the key management backup information: `security key-manager onboard show-backup`
- f. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
- g. Return to admin mode: `set -priv admin`
- h. You can safely shut down the controller.

Shut down the impaired controller - AFF A220

Shut down or take over the impaired controller using the appropriate procedure for your configuration.

Option 1: Most configurations

After completing the NVE or NSE tasks, you need to complete the shutdown of the impaired controller.

Steps

- a. Take the impaired controller to the LOADER prompt:

If the impaired controller displays...	Then...
The LOADER prompt	Go to Remove controller module.
Waiting for giveback...	Press Ctrl-C, and then respond <code>y</code> when prompted.
System prompt or password prompt (enter system password)	<p>Take over or halt the impaired controller from the healthy controller:</p> <pre>storage failover takeover -ofnode impaired_node_name</pre> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <code>y</code>.</p>

- b. From the LOADER prompt, enter: `printenv` to capture all boot environmental variables. Save the output to your log file.



This command may not work if the boot device is corrupted or non-functional.

Option 2: Controller is in a MetroCluster

After completing the NVE or NSE tasks, you need to complete the shutdown of the impaired controller.



Do not use this procedure if your system is in a two-node MetroCluster configuration.

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).
- If you have a MetroCluster configuration, you must have confirmed that the MetroCluster Configuration State is configured and that the nodes are in an enabled and normal state (`metrocluster node show`).

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message  
MAINT=number_of_hours_downh
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:*> system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`
3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying...	Then...
The LOADER prompt	Go to the next step.
Waiting for giveback...	Press Ctrl-C, and then respond <code>y</code> when prompted.
System prompt or password prompt (enter system password)	<p>Take over or halt the impaired controller from the healthy controller: <code>storage failover takeover -ofnode impaired_node_name</code></p> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <code>y</code>.</p>

Replace the boot media - AFF A220

To replace the boot media, you must remove the impaired controller module, install the replacement boot media, and transfer the boot image to a USB flash drive.

Step 1: Remove the controller module

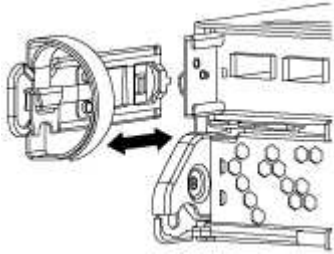
To access components inside the controller, you must first remove the controller module from the system and then remove the cover on the controller module.

1. If you are not already grounded, properly ground yourself.
2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the

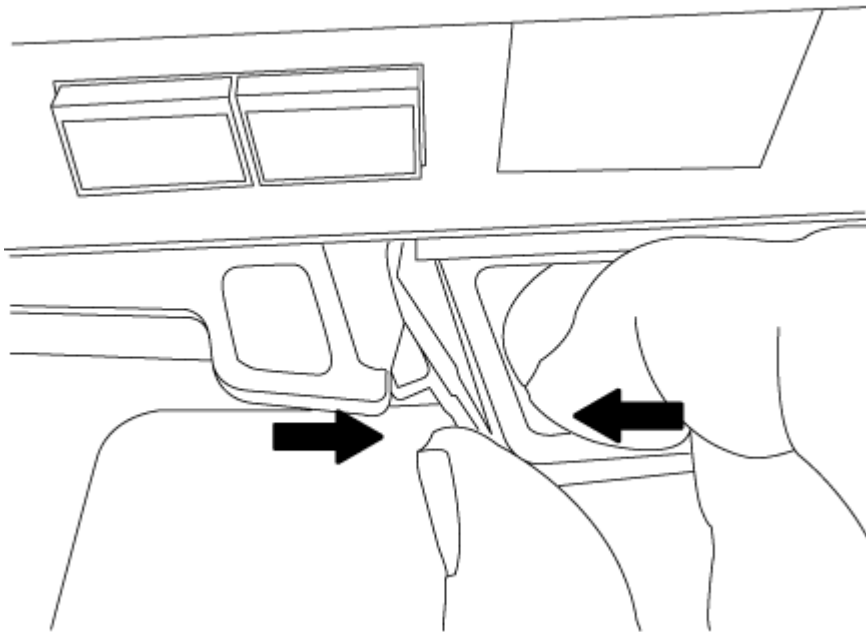
system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

3. Remove and set aside the cable management devices from the left and right sides of the controller module.



4. Squeeze the latch on the cam handle until it releases, open the cam handle fully to release the controller module from the midplane, and then, using two hands, pull the controller module out of the chassis.



5. Turn the controller module over and place it on a flat, stable surface.
6. Open the cover by sliding in the blue tabs to release the cover, and then swing the cover up and open.



Step 2: Replace the boot media

You must locate the boot media in the controller and follow the directions to replace it.

Steps

1. If you are not already grounded, properly ground yourself.
2. Locate the boot media using the following illustration or the FRU map on the controller module:



3. Press the blue button on the boot media housing to release the boot media from its housing, and then gently pull it straight out of the boot media socket.



Do not twist or pull the boot media straight up, because this could damage the socket or the boot media.

4. Align the edges of the replacement boot media with the boot media socket, and then gently push it into the socket.
5. Check the boot media to make sure that it is seated squarely and completely in the socket.

If necessary, remove the boot media and reseal it into the socket.

6. Push the boot media down to engage the locking button on the boot media housing.
7. Close the controller module cover.

Step 3: Transfer the boot image to the boot media

You can install the system image to the replacement boot media using a USB flash drive with the image installed on it. However, you must restore the var file system during this procedure.

- You must have a USB flash drive, formatted to FAT32, with at least 4GB capacity.
- A copy of the same image version of ONTAP as what the impaired controller was running. You can download the appropriate image from the Downloads section on the NetApp Support Site
 - If NVE is enabled, download the image with NetApp Volume Encryption, as indicated in the download button.
 - If NVE is not enabled, download the image without NetApp Volume Encryption, as indicated in the download button.
- If your system is an HA pair, you must have a network connection.
- If your system is a stand-alone system you do not need a network connection, but you must perform an additional reboot when restoring the var file system.

Steps

1. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.
2. Reinstall the cable management device and recable the system, as needed.

When recabling, remember to reinstall the media converters (SFPs) if they were removed.

3. Insert the USB flash drive into the USB slot on the controller module.

Make sure that you install the USB flash drive in the slot labeled for USB devices, and not in the USB console port.

4. Push the controller module all the way into the system, making sure that the cam handle clears the USB flash drive, firmly push the cam handle to finish seating the controller module, push the cam handle to the closed position, and then tighten the thumbscrew.

The controller begins to boot as soon as it is completely installed into the chassis.

5. Interrupt the boot process to stop at the LOADER prompt by pressing Ctrl-C when you see Starting AUTOBOOT press Ctrl-C to abort....

If you miss this message, press Ctrl-C, select the option to boot to Maintenance mode, and then halt the controller to boot to LOADER.

6. For systems with one controller in the chassis, reconnect the power and turn on the power supplies.

The system begins to boot and stops at the LOADER prompt.

7. Set your network connection type at the LOADER prompt:

- If you are configuring DHCP: `ifconfig e0a -auto`



The target port you configure is the target port you use to communicate with the impaired controller from the healthy controller during var file system restore with a network connection. You can also use the e0M port in this command.

- If you are configuring manual connections: `ifconfig e0a -addr=filer_addr -mask=netmask -gw=gateway-dns=dns_addr-domain=dns_domain`

- `filer_addr` is the IP address of the storage system.
- `netmask` is the network mask of the management network that is connected to the HA partner.
- `gateway` is the gateway for the network.
- `dns_addr` is the IP address of a name server on your network.
- `dns_domain` is the Domain Name System (DNS) domain name.

If you use this optional parameter, you do not need a fully qualified domain name in the netboot server URL. You need only the server's host name.



Other parameters might be necessary for your interface. You can enter `help ifconfig` at the firmware prompt for details.

You must boot the ONTAP image from the USB drive, restore the file system, and verify the environmental variables.

Steps

1. From the LOADER prompt, boot the recovery image from the USB flash drive: `boot_recovery`

The image is downloaded from the USB flash drive.

2. When prompted, either enter the name of the image or accept the default image displayed inside the brackets on your screen.
3. Restore the var file system:

If your system has...	Then...
A network connection	<ol style="list-style-type: none"> a. Press <code>y</code> when prompted to restore the backup configuration. b. Set the healthy controller to advanced privilege level: <code>set -privilege advanced</code> c. Run the restore backup command: <code>system node restore-backup -node local -target-address <i>impaired_node_IP_address</i></code> d. Return the controller to admin level: <code>set -privilege admin</code> e. Press <code>y</code> when prompted to use the restored configuration. f. Press <code>y</code> when prompted to reboot the controller.
No network connection	<ol style="list-style-type: none"> a. Press <code>n</code> when prompted to restore the backup configuration. b. Reboot the system when prompted by the system. c. Select the Update flash from backup config (sync flash) option from the displayed menu. <p>If you are prompted to continue with the update, press <code>y</code>.</p>

4. Ensure that the environmental variables are set as expected:
 - a. Take the controller to the LOADER prompt.
 - b. Check the environment variable settings with the `printenv` command.
 - c. If an environment variable is not set as expected, modify it with the `setenv environment-variable-name changed-value` command.
 - d. Save your changes using the `savenv` command.
5. The next depends on your system configuration:
 - If your system has onboard keymanager, NSE or NVE configured, go to [Restore OKM, NSE, and NVE as needed](#)
 - If your system does not have onboard keymanager, NSE or NVE configured, complete the steps in this section.

6. From the LOADER prompt, enter the `boot_ontap` command.

If you see...	Then...
The login prompt	Go to the next Step.
Waiting for giveback...	<ol style="list-style-type: none">Log into the partner controller.Confirm the target controller is ready for giveback with the <code>storage failover show</code> command.

7. Connect the console cable to the partner controller.

8. Give back the controller using the `storage failover giveback -fromnode local` command.

9. At the cluster prompt, check the logical interfaces with the `net int -is-home false` command.

If any interfaces are listed as "false", revert those interfaces back to their home port using the `net int revert` command.

10. Move the console cable to the repaired controller and run the `version -v` command to check the ONTAP versions.

11. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.

Restore OKM, NSE, and NVE as needed - AFF A220

Once environment variables are checked, you must complete steps specific to systems that have Onboard Key Manager (OKM), NetApp Storage Encryption (NSE) or NetApp Volume Encryption (NVE) enabled.

Determine which section you should use to restore your OKM, NSE, or NVE configurations:

If NSE or NVE are enabled along with Onboard Key Manager you must restore settings you captured at the beginning of this procedure.

- If NSE or NVE are enabled and Onboard Key Manager is enabled, go to [Option 1: Restore NVE or NSE when Onboard Key Manager is enabled](#).
- If NSE or NVE are enabled for ONATP 9.5, go to [Option 2: Restore NSE/NVE on systems running ONTAP 9.5 and earlier](#).
- If NSE or NVE are enabled for ONTAP 9.6, go to [Option 3: Restore NSE/NVE on systems running ONTAP 9.6 and later](#).

Option 1: Restore NVE or NSE when Onboard Key Manager is enabled

Steps

1. Connect the console cable to the target controller.

2. Use the `boot_ontap` command at the LOADER prompt to boot the controller.

3. Check the console output:

If the console displays...	Then...
The LOADER prompt	Boot the controller to the boot menu: <code>boot_ontap menu</code>
Waiting for giveback...	a. Enter <code>Ctrl-C</code> at the prompt b. At the message: Do you wish to halt this controller rather than wait [y/n]? , enter: <code>y</code> c. At the LOADER prompt, enter the <code>boot_ontap menu</code> command.

- At the Boot Menu, enter the hidden command, `recover_onboard_keymanager` and reply `y` at the prompt.
- Enter the passphrase for the onboard key manager you obtained from the customer at the beginning of this procedure.
- When prompted to enter the backup data, paste the backup data you captured at the beginning of this procedure, when asked. Paste the output of `security key-manager backup show` OR `security key-manager onboard show-backup` command.



The data is output from either `security key-manager backup show` or `security key-manager onboard show-backup` command.

Example of backup data:

```

-----BEGIN BACKUP-----
TmV0QXBwIEtleSBCbG9iAAEAAAAEAAAAcAEAAAAAADuD+byAAAAACEAAAAAAAAA
QAAAAAAAAABvOIH0AAAAAMh7qDLRyH1DBz12piVdy9ATSFMT0C0TIYFss4PDjTaV
dzRYkLd1PhQLxAWJwOlyqSr8qY1SEBgm1IWgE5DLRqkiAAAAAAAAACgAAAAAAAA
3WTh7gAAAAAAAAAAAAAAAAAIAAAAAAAgAZJEIWvdeHr5RCAvHGclo+wAAAAAAAA
lgAAAAAAAAAoAAAAAAAAAEOTcR0AAAAAAAAAAAAAAAAACAAAAAAAAJAGr3tJA/
LRzUQRHwv+1aWvAAAAAAAAAACQAAAAAAAAAgAAAAAAAAACdhTcvAAAAAJ1PXeBf
ml4NBsSyV1B4jc4A7cvWEFY6ILG6hc6tbKLAHZuvfQ4rlbYAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
.
.
.
.
H4nPQM0nrDRYRa9SCv8AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAA
-----END BACKUP-----

```

- At the Boot Menu select the option for Normal Boot.

The system boots to `Waiting for giveback...` prompt.

- Move the console cable to the partner controller and login as admin.

9. Confirm the target controller is ready for giveback with the `storage failover show` command.
10. Give back only the CFO aggregates with the `storage failover giveback -fromnode local -only-cfo -aggregates true` command.
 - If the command fails because of a failed disk, physically disengage the failed disk, but leave the disk in the slot until a replacement is received.
 - If the command fails because of an open CIFS session, check with the customer on how to close out CIFS sessions.
11. Once the giveback completes, check the failover and giveback status with the `storage failover show` and ``storage failover show-giveback`` commands.



Terminating CIFS can cause loss of data.

- If the command fails because the partner is "not ready", wait 5 minutes for the NVMEMs to synchronize.
 - If the command fails because of an NDMP, SnapMirror, or SnapVault process, disable the process. See the appropriate Documentation Center for more information.
12. Move the console cable to the target controller.
 13. If you are running ONTAP 9.5 and earlier, run the key-manager setup wizard:
 - a. Start the wizard using the `security key-manager setup -nodenodename` command, and then enter the passphrase for onboard key management when prompted.
 - b. Enter the `security key-manager key show -detail` command to see a detailed view of all keys stored in the onboard key manager and verify that the `Restored` column = `yes` for all authentication keys.



If the `Restored` column = anything other than `yes`, contact Customer Support.

- c. Wait 10 minutes for the key to synchronize across the cluster.
14. If you are running ONTAP 9.6 or later:
 - a. Run the `security key-manager onboard sync` command and then enter the passphrase when prompted.
 - b. Enter the `security key-manager key query` command to see a detailed view of all keys stored in the onboard key manager and verify that the `Restored` column = `yes/true` for all authentication keys.



If the `Restored` column = anything other than `yes/true`, contact Customer Support.

- c. Wait 10 minutes for the key to synchronize across the cluster.
15. Move the console cable to the partner controller.
16. Give back the target controller using the `storage failover giveback -fromnode local` command.
17. Check the giveback status, 3 minutes after it reports complete, using the `storage failover show` command.

If giveback is not complete after 20 minutes, contact Customer Support.

18. At the clustershell prompt, enter the `net int show -is-home false` command to list the logical interfaces that are not on their home controller and port.

If any interfaces are listed as `false`, revert those interfaces back to their home port using the `net int revert -vserver Cluster -lif nodename` command.

19. Move the console cable to the target controller and run the `version -v` command to check the ONTAP versions.
20. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.

Option 2: Restore NSE/NVE on systems running ONTAP 9.5 and earlier

Steps

1. Connect the console cable to the target controller.
2. Use the `boot_ontap` command at the LOADER prompt to boot the controller.
3. Check the console output:

If the console displays...	Then...
The login prompt	Go to Step 7.
Waiting for giveback...	<ol style="list-style-type: none">a. Log into the partner controller.b. Confirm the target controller is ready for giveback with the <code>storage failover show</code> command.

4. Move the console cable to the partner controller and give back the target controller storage using the `storage failover giveback -fromnode local -only-cfo-aggregates true local` command.
 - If the command fails because of a failed disk, physically disengage the failed disk, but leave the disk in the slot until a replacement is received.
 - If the command fails because of an open CIFS sessions, check with customer how to close out CIFS sessions.



Terminating CIFS can cause loss of data.

- If the command fails because the partner "not ready", wait 5 minutes for the NVMEMs to synchronize.
 - If the command fails because of an NDMP, SnapMirror, or SnapVault process, disable the process. See the appropriate Documentation Center for more information.
5. Wait 3 minutes and check the failover status with the `storage failover show` command.
 6. At the clustershell prompt, enter the `net int show -is-home false` command to list the logical interfaces that are not on their home controller and port.

If any interfaces are listed as `false`, revert those interfaces back to their home port using the `net int`


```
revert -vserver Cluster -lif nodename command.
```

7. Move the console cable to the target controller and run the `version -v` command to check the ONTAP versions.
8. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.
9. Use the `storage encryption disk show` at the clustershell prompt, to review the output.



This command does not work if NVE (NetApp Volume Encryption) is configured

10. Use the security key-manager query to display the key IDs of the authentication keys that are stored on the key management servers.
 - If the `Restored` column = `yes` and all key managers report in an available state, go to *Complete the replacement process*.
 - If the `Restored` column = anything other than `yes`, and/or one or more key managers is not available, use the `security key-manager restore -address` command to retrieve and restore all authentication keys (AKs) and key IDs associated with all nodes from all available key management servers.

Check the output of the security key-manager query again to ensure that the `Restored` column = `yes` and all key managers report in an available state

11. If the Onboard Key Management is enabled:
 - a. Use the `security key-manager key show -detail` to see a detailed view of all keys stored in the onboard key manager.
 - b. Use the `security key-manager key show -detail` command and verify that the `Restored` column = `yes` for all authentication keys.

If the `Restored` column = anything other than `yes`, use the `security key-manager setup -node Repaired(Target)node` command to restore the Onboard Key Management settings. Rerun the `security key-manager key show -detail` command to verify `Restored` column = `yes` for all authentication keys.

12. Connect the console cable to the partner controller.
13. Give back the controller using the `storage failover giveback -fromnode local` command.
14. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.

Option 3: Restore NSE/NVE on systems running ONTAP 9.6 and later

Steps

1. Connect the console cable to the target controller.
2. Use the `boot_ontap` command at the LOADER prompt to boot the controller.
3. Check the console output:

If the console displays...	Then...
The login prompt	Go to Step 7.
Waiting for giveback...	<ul style="list-style-type: none"> a. Log into the partner controller. b. Confirm the target controller is ready for giveback with the <code>storage failover show</code> command.

4. Move the console cable to the partner controller and give back the target controller storage using the `storage failover giveback -fromnode local -only-cfo-aggregates true local` command.
 - If the command fails because of a failed disk, physically disengage the failed disk, but leave the disk in the slot until a replacement is received.
 - If the command fails because of an open CIFS session, check with the customer on how to close out CIFS sessions.



Terminating CIFS can cause loss of data.

- If the command fails because the partner is "not ready", wait 5 minutes for the NVMEMs to synchronize.
 - If the command fails because of an NDMP, SnapMirror, or SnapVault process, disable the process. See the appropriate Documentation Center for more information.
5. Wait 3 minutes and check the failover status with the `storage failover show` command.
 6. At the clustershell prompt, enter the `net int show -is-home false` command to list the logical interfaces that are not on their home controller and port.

If any interfaces are listed as `false`, revert those interfaces back to their home port using the `net int revert -vserver Cluster -lif nodename` command.

7. Move the console cable to the target controller and run the `version -v` command to check the ONTAP versions.
8. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.
9. Use the `storage encryption disk show` at the clustershell prompt, to review the output.
10. Use the `security key-manager key query` command to display the key IDs of the authentication keys that are stored on the key management servers.
 - If the `Restored` column = `yes/true`, you are done and can proceed to complete the replacement process.
 - If the `Key Manager type` = `external` and the `Restored` column = anything other than `yes/true`, use the `security key-manager external restore` command to restore the key IDs of the authentication keys.



If the command fails, contact Customer Support.

- If the `Key Manager type = onboard` and the `Restored column = anything other than yes/true`, use the `security key-manager onboard sync` command to re-sync the Key Manager type.

Use the `security key-manager key query` to verify that the `Restored column = yes/true` for all authentication keys.

11. Connect the console cable to the partner controller.
12. Give back the controller using the `storage failover giveback -fromnode local` command.
13. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.
14. If AutoSupport is enabled, restore/unsuppress automatic case creation by using the `system node autosupport invoke -node * -type all -message MAINT=END`

Return the failed part to NetApp - AFF A220

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

Replace the caching module - AFF A220

You must replace the caching module in the controller module when your system registers a single AutoSupport (ASUP) message that the module has gone offline; failure to do so results in performance degradation.

- You must replace the failed component with a replacement FRU component you received from your provider.

Step 1: Shut down the impaired controller

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller.

Synchronize a node with the cluster

You might want to erase the contents of your caching module before replacing it.

Steps

1. Although data on the caching module is encrypted, you might want to erase any data from the impaired caching module and verify that the caching module has no data:
 - a. Erase the data on the caching module: `system controller flash-cache secure-erase run -node node_name localhost -device-id device_number`



Run the `system controller flash-cache show` command if you don't know the flashcache device ID.

- b. Verify that the data has been erased from the caching module: `system controller flash-cache secure-erase show`
2. If the impaired controller is part of an HA pair, disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`
3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying...	Then...
The LOADER prompt	Go to the next step.
Waiting for giveback...	Press Ctrl-C, and then respond <code>y</code> when prompted.
System prompt or password prompt (enter system password)	<p>Take over or halt the impaired controller:</p> <ul style="list-style-type: none"> • For an HA pair, take over the impaired controller from the healthy controller: <code>storage failover takeover -ofnode <i>impaired_node_name</i></code> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <code>y</code>.</p> <ul style="list-style-type: none"> • For a stand-alone system: <code>system node halt <i>impaired_node_name</i></code>

4. If the system has only one controller module in the chassis, turn off the power supplies, and then unplug the impaired controller's power cords from the power source.

Step 2: Remove controller module

To access components inside the controller, you must first remove the controller module from the system and then remove the cover on the controller module.

Steps

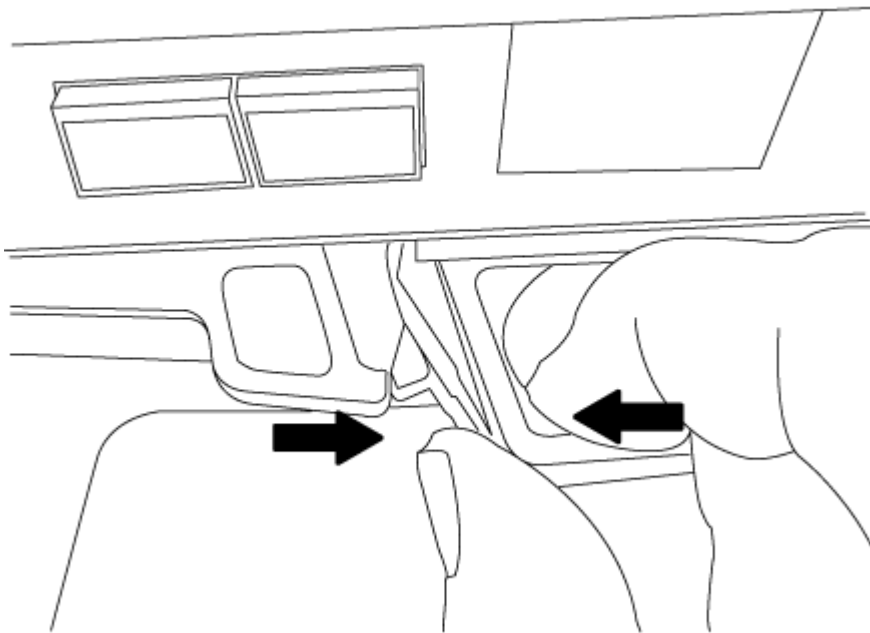
1. If you are not already grounded, properly ground yourself.
2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

3. Remove and set aside the cable management devices from the left and right sides of the controller module.



4. Squeeze the latch on the cam handle until it releases, open the cam handle fully to release the controller module from the midplane, and then, using two hands, pull the controller module out of the chassis.



5. Turn the controller module over and place it on a flat, stable surface.
6. Open the cover by sliding in the blue tabs to release the cover, and then swing the cover up and open.



Step 3: Replace a caching module

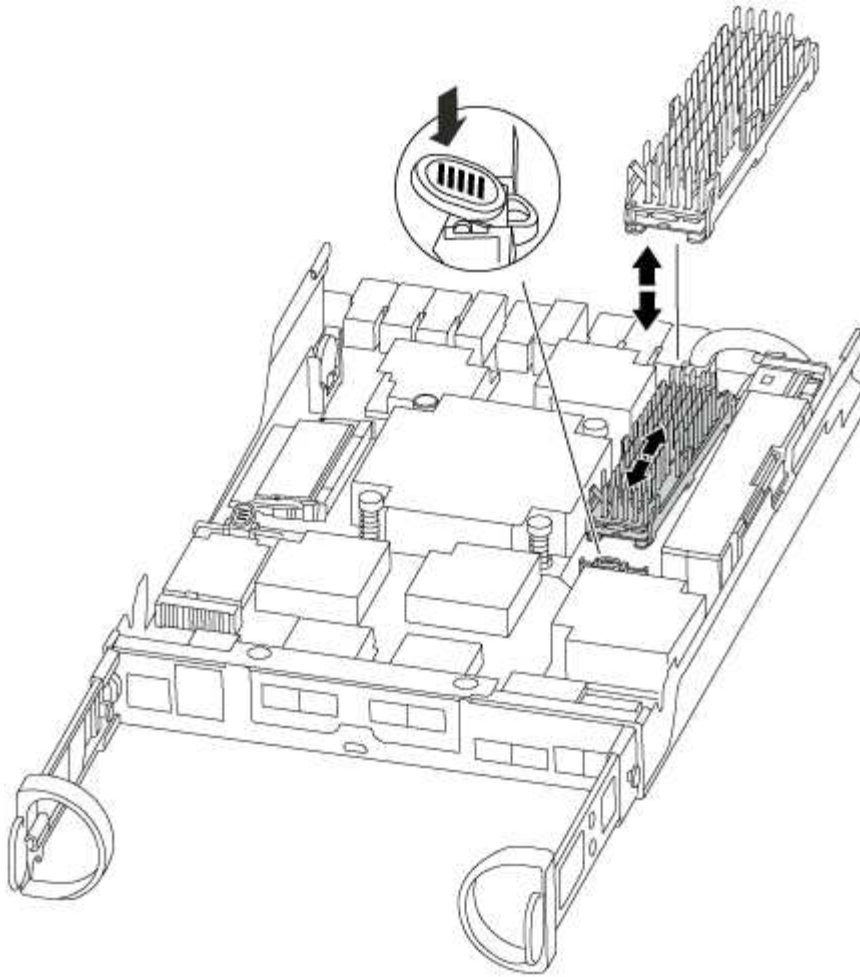
To replace a caching module referred to as the M.2 PCIe card on the label on your controller, locate the slot inside the controller and follow the specific sequence of steps.

Your storage system must meet certain criteria depending on your situation:

- It must have the appropriate operating system for the caching module you are installing.
- It must support the caching capacity.
- All other components in the storage system must be functioning properly; if not, you must contact technical support.

Steps

1. If you are not already grounded, properly ground yourself.
2. Locate the caching module at the rear of the controller module and remove it.
 - a. Press the release tab.
 - b. Remove the heatsink.



3. Gently pull the caching module straight out of the housing.
4. Align the edges of the caching module with the socket in the housing, and then gently push it into the socket.
5. Verify that the caching module is seated squarely and completely in the socket.

If necessary, remove the caching module and reseat it into the socket.

6. Reseat and push the heatsink down to engage the locking button on the caching module housing.
7. Close the controller module cover, as needed.

Step 4: Reinstall the controller module

After you replace components in the controller module, reinstall it into the chassis.

Steps

1. If you are not already grounded, properly ground yourself.
2. If you have not already done so, replace the cover on the controller module.
3. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.





Do not completely insert the controller module in the chassis until instructed to do so.

4. Recable the system, as needed.

If you removed the media converters (QSFPs or SFPs), remember to reinstall them if you are using fiber optic cables.

5. Complete the reinstallation of the controller module:

If your system is in...	Then perform these steps...
An HA pair	<p>The controller module begins to boot as soon as it is fully seated in the chassis.</p> <p>a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position.</p> <div> Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.</div> <p>The controller begins to boot as soon as it is seated in the chassis.</p> <p>b. If you have not already done so, reinstall the cable management device.</p> <p>c. Bind the cables to the cable management device with the hook and loop strap.</p>
A stand-alone configuration	<p>a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position.</p> <div> Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.</div> <p>b. If you have not already done so, reinstall the cable management device.</p> <p>c. Bind the cables to the cable management device with the hook and loop strap.</p> <p>d. Reconnect the power cables to the power supplies and to the power sources, and then turn on the power to start the boot process.</p>

Step 5: Switch back aggregates in a two-node MetroCluster configuration

After you have completed the FRU replacement in a two-node MetroCluster configuration, you can perform the MetroCluster switchback operation. This returns the configuration to its normal operating state, with the sync-source storage virtual machines (SVMs) on the formerly impaired site now active and serving data from the local disk pools.

This task only applies to two-node MetroCluster configurations.

Steps

1. Verify that all nodes are in the enabled state: `metrocluster node show`

```
cluster_B::> metrocluster node show

DR                               Configuration  DR
Group Cluster Node              State          Mirroring Mode
-----
1      cluster_A
      controller_A_1 configured      enabled    heal roots
completed
      cluster_B
      controller_B_1 configured      enabled    waiting for
switchback recovery
2 entries were displayed.
```

2. Verify that resynchronization is complete on all SVMs: `metrocluster vserver show`
3. Verify that any automatic LIF migrations being performed by the healing operations were completed successfully: `metrocluster check lif show`
4. Perform the switchback by using the `metrocluster switchback` command from any node in the surviving cluster.
5. Verify that the switchback operation has completed: `metrocluster show`

The switchback operation is still running when a cluster is in the `waiting-for-switchback` state:

```
cluster_B::> metrocluster show
Cluster              Configuration State      Mode
-----
Local: cluster_B configured      switchover
Remote: cluster_A configured      waiting-for-switchback
```

The switchback operation is complete when the clusters are in the `normal` state.:

```
cluster_B::> metrocluster show
Cluster              Configuration State      Mode
-----
Local: cluster_B configured      normal
Remote: cluster_A configured      normal
```

If a switchback is taking a long time to finish, you can check on the status of in-progress baselines by using

the `metrocluster config-replication resync-status show` command.

6. Reestablish any SnapMirror or SnapVault configurations.

Step 6: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

Chassis

Overview of chassis replacement - AFF A220

To replace the chassis, you must move the power supplies, hard drives, and controller module or modules from the impaired chassis to the new chassis, and swap out the impaired chassis from the equipment rack or system cabinet with the new chassis of the same model as the impaired chassis.

All other components in the system must be functioning properly; if not, you must contact technical support.

- You can use this procedure with all versions of ONTAP supported by your system.
- This procedure is written with the assumption that you are moving all drives and controller module or modules to the new chassis, and that the chassis is a new component from NetApp.
- This procedure is disruptive. For a two-controller cluster, you will have a complete service outage and a partial outage in a multi-node cluster.

Shut down the controllers - AFF A220

Shut down or take over the impaired controller using the appropriate procedure for your configuration.

Option 1: Most configurations

This procedure is for 2-node, non-MetroCluster configurations only. If you have a system with more than two nodes, see [How to perform a graceful shutdown and power up of one HA pair in a 4-node cluster](#).

Before you begin

You need:

- Local administrator credentials for ONTAP.
- NetApp onboard key management (OKM) cluster-wide passphrase if using storage encryption or NVE/NAE.
- BMC accessibility for each controller.
- Stop all clients/host from accessing data on the NetApp system.
- Suspend external backup jobs.
- Necessary tools and equipment for the replacement.



If the system is a NetApp StorageGRID or ONTAP S3 used as FabricPool cloud tier, refer to the [Gracefully shutdown and power up your storage system Resolution Guide](#) after performing this procedure.



If using SSDs, refer to [SU490: \(Impact: Critical\) SSD Best Practices: Avoid risk of drive failure and data loss if powered off for more than two months](#)

As a best practice before shutdown, you should:

- Perform additional [system health checks](#).
- Upgrade ONTAP to a recommended release for the system.
- Resolve any [Active IQ Wellness Alerts and Risks](#).
Make note of any faults presently on the system, such as LEDs on the system components.

Steps

1. Log into the cluster through SSH or log in from any node in the cluster using a local console cable and a laptop/console.
2. Turn off AutoSupport and indicate how long you expect the system to be offline:

```
system node autosupport invoke -node * -type all -message "MAINT=8h Power Maintenance"
```

3. Identify the SP/BMC address of all nodes:

```
system service-processor show -node * -fields address
```

4. Exit the cluster shell: `exit`
5. Log into SP/BMC over SSH using the IP address of any of the nodes listed in the output from the previous step.

If you're using a console/laptop, log into the controller using the same cluster administrator credentials.



Open an SSH session to every SP/BMC connection so that you can monitor progress.

6. Halt the 2 nodes located in the impaired chassis:

```
system node halt -node <node>,<node2> -skip-lif-migration-before-shutdown true -ignore-quorum-warnings true -inhibit-takeover true
```



For clusters using SnapMirror synchronous operating in StrictSync mode: `system node halt -node <node>,<node2> -skip-lif-migration-before-shutdown true -ignore-quorum-warnings true -inhibit-takeover true -ignore-strict-sync-warnings true`

7. Enter **y** for each controller in the cluster when you see *Warning: Are you sure you want to halt node "cluster <node-name> number"?*
`{y|n}:`
8. Wait for each controller to halt and display the LOADER prompt.

Option 2: Controller is in a MetroCluster configuration



Do not use this procedure if your system is in a two-node MetroCluster configuration.

- To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.
- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).
 - If you have a MetroCluster configuration, you must have confirmed that the MetroCluster Configuration State is configured and that the nodes are in an enabled and normal state (`metrocluster node show`).

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message  
MAINT=number_of_hours_downh
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:*> system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`
3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying...	Then...
The LOADER prompt	Go to the next step.
Waiting for giveback...	Press Ctrl-C, and then respond <code>y</code> when prompted.
System prompt or password prompt (enter system password)	<p>Take over or halt the impaired controller from the healthy controller: <code>storage failover takeover -ofnode impaired_node_name</code></p> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <code>y</code>.</p>

Move and replace hardware - AFF A220

Move the power supplies, hard drives, and controller module or modules from the impaired chassis to the new chassis, and swap out the impaired chassis from the equipment rack or system cabinet with the new chassis of the same model as the impaired chassis.

Step 1: Move a power supply

Moving out a power supply when replacing a chassis involves turning off, disconnecting, and removing the

power supply from the old chassis and installing and connecting it on the replacement chassis.

1. If you are not already grounded, properly ground yourself.
2. Turn off the power supply and disconnect the power cables:
 - a. Turn off the power switch on the power supply.
 - b. Open the power cable retainer, and then unplug the power cable from the power supply.
 - c. Unplug the power cable from the power source.
3. Squeeze the latch on the power supply cam handle, and then open the cam handle to fully release the power supply from the mid plane.
4. Use the cam handle to slide the power supply out of the system.



When removing a power supply, always use two hands to support its weight.

5. Repeat the preceding steps for any remaining power supplies.
6. Using both hands, support and align the edges of the power supply with the opening in the system chassis, and then gently push the power supply into the chassis using the cam handle.

The power supplies are keyed and can only be installed one way.



Do not use excessive force when sliding the power supply into the system. You can damage the connector.

7. Close the cam handle so that the latch clicks into the locked position and the power supply is fully seated.
8. Reconnect the power cable and secure it to the power supply using the power cable locking mechanism.



Only connect the power cable to the power supply. Do not connect the power cable to a power source at this time.

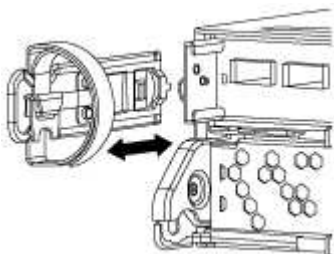
Step 2: Remove the controller module

Remove the controller module or modules from the old chassis.

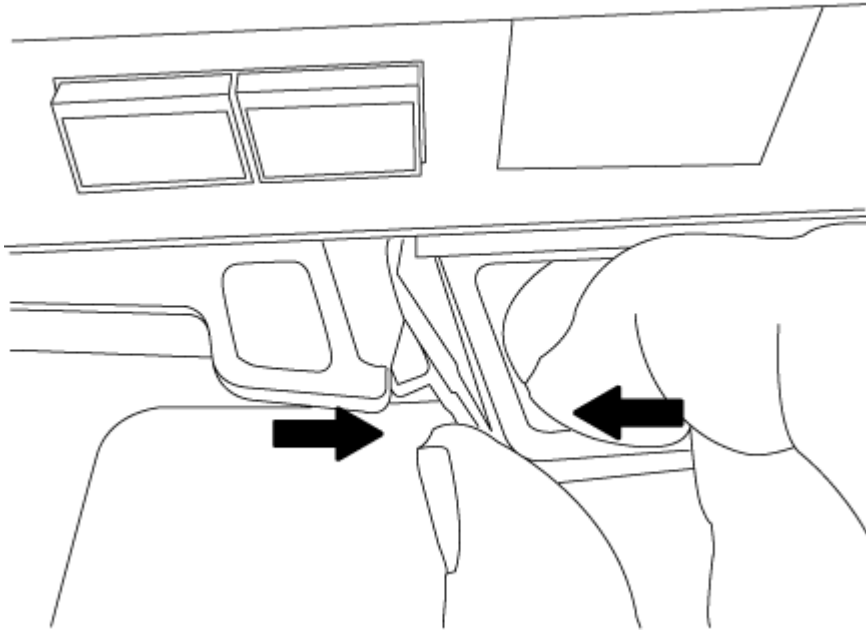
1. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

2. Remove and set aside the cable management devices from the left and right sides of the controller module.



3. Squeeze the latch on the cam handle until it releases, open the cam handle fully to release the controller module from the midplane, and then, using two hands, pull the controller module out of the chassis.



4. Set the controller module aside in a safe place, and repeat these steps if you have another controller module in the chassis.

Step 3: Move drives to the new chassis

You need to move the drives from each bay opening in the old chassis to the same bay opening in the new chassis.

1. Gently remove the bezel from the front of the system.
2. Remove the drives:
 - a. Press the release button at the top of the carrier face below the LEDs.
 - b. Pull the cam handle to its fully open position to unseat the drive from the midplane, and then gently slide the drive out of the chassis.

The drive should disengage from the chassis, allowing it to slide free of the chassis.



When removing a drive, always use two hands to support its weight.



Drives are fragile. Handle them as little as possible to prevent damage to them.

3. Align the drive from the old chassis with the same bay opening in the new chassis.
4. Gently push the drive into the chassis as far as it will go.

The cam handle engages and begins to rotate upward.

5. Firmly push the drive the rest of the way into the chassis, and then lock the cam handle by pushing it up and against the drive holder.

Be sure to close the cam handle slowly so that it aligns correctly with the front of the drive carrier. It click

when it is secure.

6. Repeat the process for the remaining drives in the system.

Step 4: Replace a chassis from within the equipment rack or system cabinet

You must remove the existing chassis from the equipment rack or system cabinet before you can install the replacement chassis.

1. Remove the screws from the chassis mount points.
2. With the help of two or three people, slide the old chassis off the rack rails in a system cabinet or *L* brackets in an equipment rack, and then set it aside.
3. If you are not already grounded, properly ground yourself.
4. Using two or three people, install the replacement chassis into the equipment rack or system cabinet by guiding the chassis onto the rack rails in a system cabinet or *L* brackets in an equipment rack.
5. Slide the chassis all the way into the equipment rack or system cabinet.
6. Secure the front of the chassis to the equipment rack or system cabinet, using the screws you removed from the old chassis.
7. If you have not already done so, install the bezel.

Step 5: Install the controller

After you install the controller module and any other components into the new chassis, boot it the system.

For HA pairs with two controller modules in the same chassis, the sequence in which you install the controller module is especially important because it attempts to reboot as soon as you completely seat it in the chassis.

1. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.



Do not completely insert the controller module in the chassis until instructed to do so.

2. Recable the console to the controller module, and then reconnect the management port.
3. Repeat the preceding steps if there is a second controller to install in the new chassis.
4. Complete the installation of the controller module:

If your system is in...	Then perform these steps...
An HA pair	<p>a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position.</p> <div>  <p>Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.</p> </div> <p>b. If you have not already done so, reinstall the cable management device.</p> <p>c. Bind the cables to the cable management device with the hook and loop strap.</p> <p>d. Repeat the preceding steps for the second controller module in the new chassis.</p>
A stand-alone configuration	<p>a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position.</p> <div>  <p>Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.</p> </div> <p>b. If you have not already done so, reinstall the cable management device.</p> <p>c. Bind the cables to the cable management device with the hook and loop strap.</p> <p>d. Reinstall the blanking panel and then go to the next step.</p>

5. Connect the power supplies to different power sources, and then turn them on.

6. Boot each controller to Maintenance mode:

- a. As each controller starts the booting, press `Ctrl-C` to interrupt the boot process when you see the message `Press Ctrl-C for Boot Menu`.



If you miss the prompt and the controller modules boot to ONTAP, enter `halt`, and then at the LOADER prompt enter `boot_ontap`, press `Ctrl-C` when prompted, and then repeat this step.

- b. From the boot menu, select the option for Maintenance mode.

Restore and verify the configuration - AFF A220

You must verify the HA state of the chassis, switch back aggregates, and return the failed part to NetApp, as described in the RMA instructions shipped with the kit.

Step 1: Verify and set the HA state of the chassis

You must verify the HA state of the chassis, and, if necessary, update the state to match your system configuration.

1. In Maintenance mode, from either controller module, display the HA state of the local controller module and chassis: `ha-config show`

The HA state should be the same for all components.

2. If the displayed system state for the chassis does not match your system configuration:
 - a. Set the HA state for the chassis: `ha-config modify chassis HA-state`

The value for HA-state can be one of the following:

- `ha`
- `mcc`
- `mcc-2n`
- `mccip`
- `non-ha`

- b. Confirm that the setting has changed: `ha-config show`

3. If you have not already done so, recable the rest of your system.
4. The next step depends on your system configuration.
5. Reboot the system.

Step 2: Switch back aggregates in a two-node MetroCluster configuration

After you have completed the FRU replacement in a two-node MetroCluster configuration, you can perform the MetroCluster switchback operation. This returns the configuration to its normal operating state, with the sync-source storage virtual machines (SVMs) on the formerly impaired site now active and serving data from the local disk pools.

This task only applies to two-node MetroCluster configurations.

Steps

1. Verify that all nodes are in the `enabled state`: `metrocluster node show`

```
cluster_B::> metrocluster node show
```

DR		Configuration	DR
Group	Cluster Node	State	Mirroring Mode
-----	-----	-----	-----
1	cluster_A		
	controller_A_1	configured	enabled
completed	cluster_B		
	controller_B_1	configured	enabled
	switchback recovery		waiting for

2 entries were displayed.

2. Verify that resynchronization is complete on all SVMs: `metrocluster vserver show`
3. Verify that any automatic LIF migrations being performed by the healing operations were completed successfully: `metrocluster check lif show`
4. Perform the switchback by using the `metrocluster switchback` command from any node in the surviving cluster.
5. Verify that the switchback operation has completed: `metrocluster show`

The switchback operation is still running when a cluster is in the `waiting-for-switchback` state:

```
cluster_B::> metrocluster show
```

Cluster	Configuration	State	Mode
-----	-----	-----	-----
Local: cluster_B	configured	switchover	
Remote: cluster_A	configured	waiting-for-switchback	

The switchback operation is complete when the clusters are in the `normal` state.:

```
cluster_B::> metrocluster show
```

Cluster	Configuration	State	Mode
-----	-----	-----	-----
Local: cluster_B	configured	normal	
Remote: cluster_A	configured	normal	

If a switchback is taking a long time to finish, you can check on the status of in-progress baselines by using the `metrocluster config-replication resync-status show` command.

6. Reestablish any SnapMirror or SnapVault configurations.

Step 3: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

Controller

Overview of controller module replacement - AFF A220

You must review the prerequisites for the replacement procedure and select the correct one for your version of the ONTAP operating system.

- All drive shelves must be working properly.
- If your system is in an HA pair, the healthy controller must be able to take over the controller that is being replaced (referred to in this procedure as the “impaired controller”).
- If your system is in a MetroCluster configuration, you must review the section [Choosing the correct recovery procedure](#) to determine whether you should use this procedure.

If this is the procedure you should use, note that the controller replacement procedure for a controller in a four or eight node MetroCluster configuration is the same as that in an HA pair. No MetroCluster-specific steps are required because the failure is restricted to an HA pair and storage failover commands can be used to provide nondisruptive operation during the replacement.

- This procedure includes steps for automatically or manually reassigning drives to the *replacement* controller, depending on your system’s configuration.

You should perform the drive reassignment as directed in the procedure.

- You must replace the failed component with a replacement FRU component you received from your provider.
- You must be replacing a controller module with a controller module of the same model type. You cannot upgrade your system by just replacing the controller module.
- You cannot change any drives or drive shelves as part of this procedure.
- In this procedure, the boot device is moved from the impaired controller to the *replacement* controller so that the *replacement* controller will boot up in the same version of ONTAP as the old controller module.
- It is important that you apply the commands in these steps on the correct systems:
 - The *impaired* controller is the controller that is being replaced.
 - The *replacement* controller is the new controller that is replacing the impaired controller.
 - The *healthy* controller is the surviving controller.
- You must always capture the controller’s console output to a text file.

This provides you a record of the procedure so that you can troubleshoot any issues that you might encounter during the replacement process.

Shut down the impaired controller - AFF A220

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced` mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:
- ```
system node autosupport invoke -node * -type all -message MAINT=<# of hours>h
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:>`

```
system node autosupport invoke -node * -type all -message MAINT=2h
```

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`



When you see *Do you want to disable auto-giveback?*, enter *y*.

3. Take the impaired controller to the LOADER prompt:

| If the impaired controller is displaying... | Then...                                                                                                                                                                                                                                                       |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                           | Go to the next step.                                                                                                                                                                                                                                          |
| Waiting for giveback...                     | Press Ctrl-C, and then respond <i>y</i> when prompted.                                                                                                                                                                                                        |
| System prompt or password prompt            | <p>Take over or halt the impaired controller from the healthy controller:</p> <pre>storage failover takeover -ofnode<br/>impaired_node_name</pre> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i>.</p> |

Replace the controller module hardware - AFF A220

To replace the controller module hardware, you must remove the impaired controller, move FRU components to the replacement controller module, install the replacement controller module in the chassis, and then boot the system to Maintenance mode.

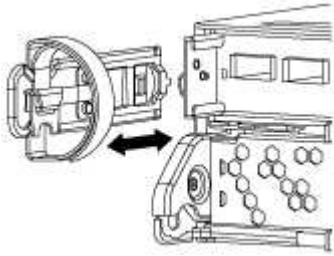
## Step 1: Remove controller module

To replace the controller module, you must first remove the old controller module from the chassis.

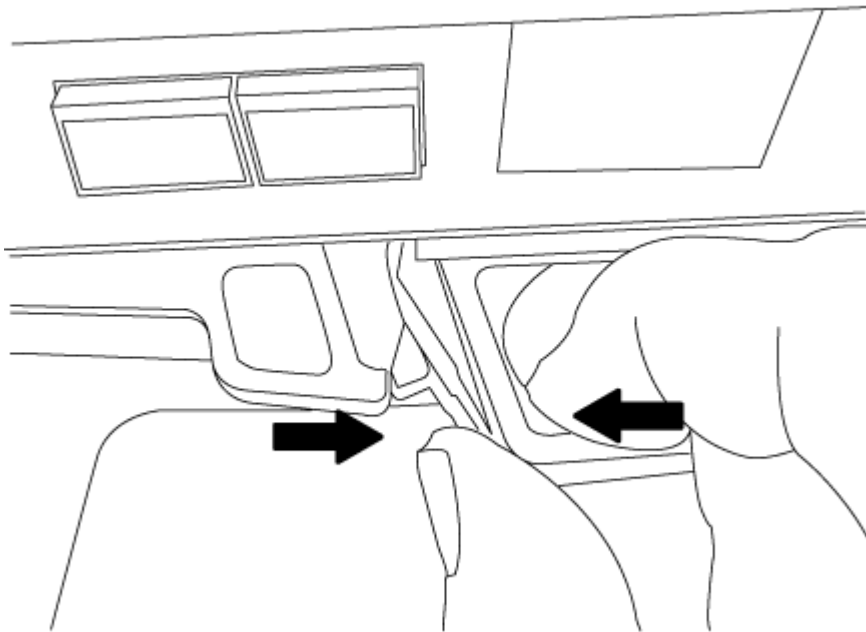
1. If you are not already grounded, properly ground yourself.
2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

3. Remove and set aside the cable management devices from the left and right sides of the controller module.



4. If you left the SFP modules in the system after removing the cables, move them to the new controller module.
5. Squeeze the latch on the cam handle until it releases, open the cam handle fully to release the controller module from the midplane, and then, using two hands, pull the controller module out of the chassis.



6. Turn the controller module over and place it on a flat, stable surface.
7. Open the cover by sliding in the blue tabs to release the cover, and then swing the cover up and open.



## Step 2: Move the NVMEM battery

To move the NVMEM battery from the old controller module to the new controller module, you must perform a specific sequence of steps.

### 1. Check the NVMEM LED:

- If your system is in an HA configuration, go to the next step.
- If your system is in a stand-alone configuration, cleanly shut down the controller module, and then check the NVRAM LED identified by the NV icon.



The NVRAM LED blinks while destaging contents to the flash memory when you halt the system. After the destage is complete, the LED turns off.

- If power is lost without a clean shutdown, the NVMEM LED flashes until the destage is complete, and then the LED turns off.
- If the LED is on and power is on, unwritten data is stored on NVMEM.

This typically occurs during an uncontrolled shutdown after ONTAP has successfully booted.

### 2. Locate the NVMEM battery in the controller module.



3. Locate the battery plug and squeeze the clip on the face of the battery plug to release the plug from the socket, and then unplug the battery cable from the socket.
4. Grasp the battery and press the blue locking tab marked PUSH, and then lift the battery out of the holder and controller module.
5. Move the battery to the replacement controller module.
6. Loop the battery cable around the cable channel on the side of the battery holder.
7. Position the battery pack by aligning the battery holder key ribs to the “V” notches on the sheet metal side wall.
8. Slide the battery pack down along the sheet metal side wall until the support tabs on the side wall hook into the slots on the battery pack, and the battery pack latch engages and clicks into the opening on the side wall.

### Step 3: Move the boot media

You must locate the boot media and follow the directions to remove it from the old controller module and insert it in the new controller module.

1. Locate the boot media using the following illustration or the FRU map on the controller module:



2. Press the blue button on the boot media housing to release the boot media from its housing, and then gently pull it straight out of the boot media socket.



Do not twist or pull the boot media straight up, because this could damage the socket or the boot media.

3. Move the boot media to the new controller module, align the edges of the boot media with the socket housing, and then gently push it into the socket.
4. Check the boot media to make sure that it is seated squarely and completely in the socket.

If necessary, remove the boot media and reseal it into the socket.

5. Push the boot media down to engage the locking button on the boot media housing.

#### Step 4: Move the DIMMs

To move the DIMMs, you must follow the directions to locate and move them from the old controller module into the replacement controller module.

You must have the new controller module ready so that you can move the DIMMs directly from the impaired controller module to the corresponding slots in the replacement controller module.

1. Locate the DIMMs on your controller module.
2. Note the orientation of the DIMM in the socket so that you can insert the DIMM in the replacement controller module in the proper orientation.
3. Eject the DIMM from its slot by slowly pushing apart the two DIMM ejector tabs on either side of the DIMM, and then slide the DIMM out of the slot.

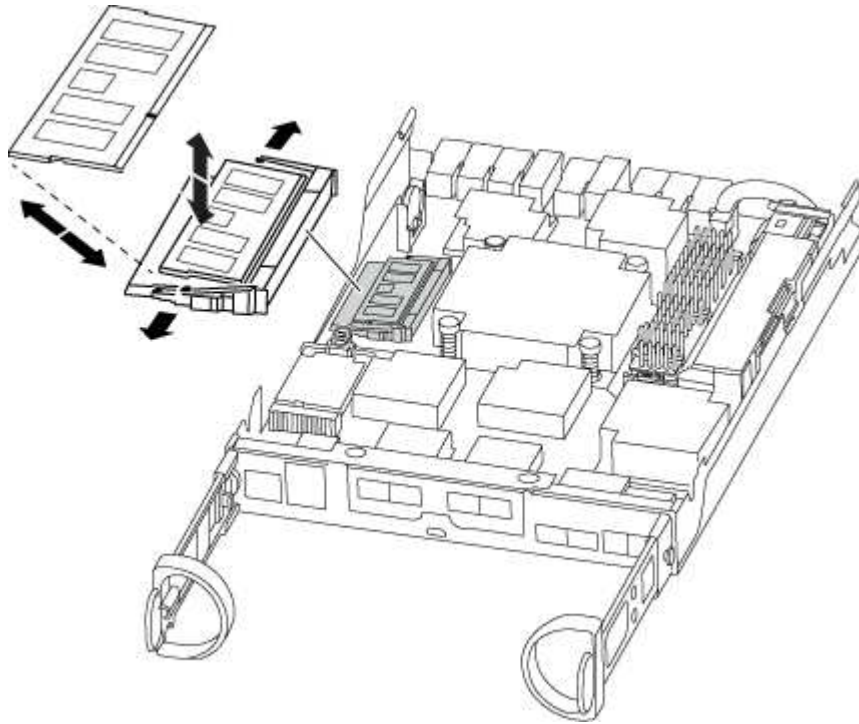


Carefully hold the DIMM by the edges to avoid pressure on the components on the DIMM circuit board.

The number and placement of system DIMMs depends on the model of your system.



The following illustration shows the location of system DIMMs:



4. Repeat these steps to remove additional DIMMs as needed.
5. Verify that the NVMEM battery is not plugged into the new controller module.
6. Locate the slot where you are installing the DIMM.
7. Make sure that the DIMM ejector tabs on the connector are in the open position, and then insert the DIMM squarely into the slot.

The DIMM fits tightly in the slot, but should go in easily. If not, realign the DIMM with the slot and reinsert it.



Visually inspect the DIMM to verify that it is evenly aligned and fully inserted into the slot.

8. Repeat these steps for the remaining DIMMs.
9. Locate the NVMEM battery plug socket, and then squeeze the clip on the face of the battery cable plug to insert it into the socket.

Make sure that the plug locks down onto the controller module.

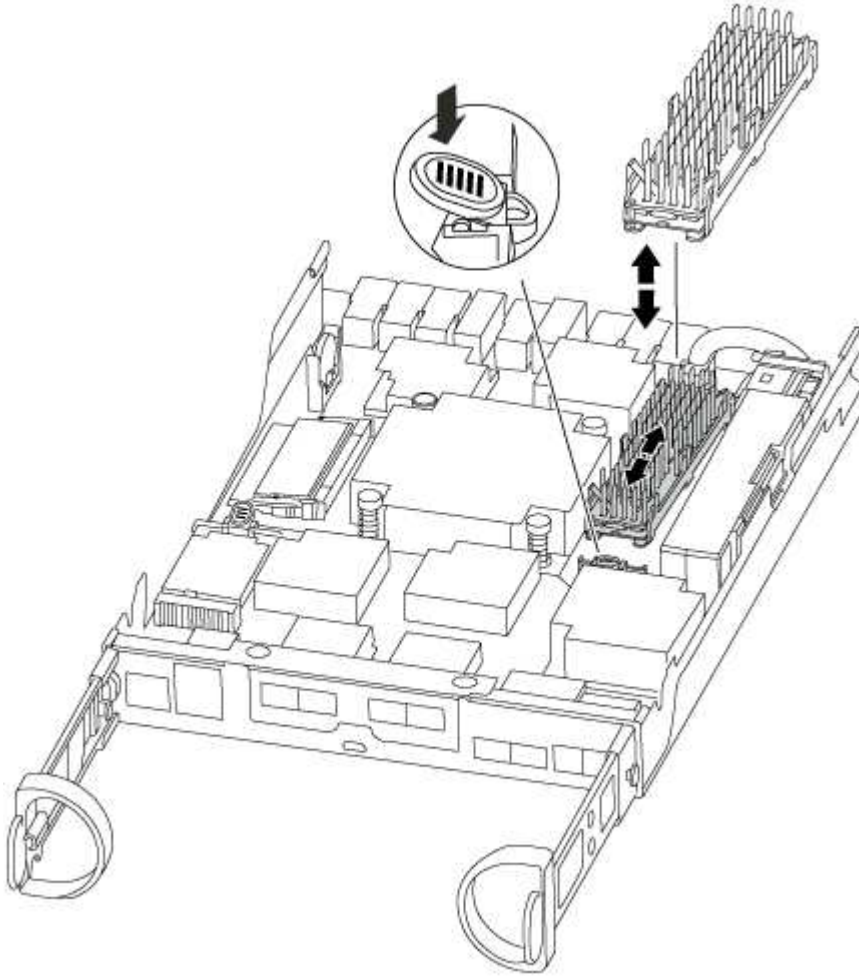
### Step 5: Move a caching module, if present

If your AFF A220 or FAS2700 system has a caching module, you need to move the caching module from the old controller module to the replacement controller module. The caching module is referred to as the “M.2 PCIe card” on the controller module label.

You must have the new controller module ready so that you can move the caching module directly from the old controller module to the corresponding slot in the new one. All other components in the storage system must be functioning properly; if not, you must contact technical support.

1. Locate the caching module at the rear of the controller module and remove it.

- a. Press the release tab.
- b. Remove the heatsink.



2. Gently pull the caching module straight out of the housing.
3. Move the caching module to the new controller module, and then align the edges of the caching module with the socket housing and gently push it into the socket.
4. Verify that the caching module is seated squarely and completely in the socket.

If necessary, remove the caching module and reseal it into the socket.

5. Reseat and push the heatsink down to engage the locking button on the caching module housing.
6. Close the controller module cover, as needed.

### Step 6: Install the controller

After you install the components from the old controller module into the new controller module, you must install the new controller module into the system chassis and boot the operating system.

For HA pairs with two controller modules in the same chassis, the sequence in which you install the controller module is especially important because it attempts to reboot as soon as you completely seat it in the chassis.



The system might update system firmware when it boots. Do not abort this process. The procedure requires you to interrupt the boot process, which you can typically do at any time after prompted to do so. However, if the system updates the system firmware when it boots, you must wait until after the update is complete before interrupting the boot process.

1. If you are not already grounded, properly ground yourself.
2. If you have not already done so, replace the cover on the controller module.
3. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.



Do not completely insert the controller module in the chassis until instructed to do so.



4. Cable the management and console ports only, so that you can access the system to perform the tasks in the following sections.



You will connect the rest of the cables to the controller module later in this procedure.

5. Complete the reinstallation of the controller module:

| If your system is in... | Then perform these steps...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| An HA pair              | <p>The controller module begins to boot as soon as it is fully seated in the chassis. Be prepared to interrupt the boot process.</p> <ol style="list-style-type: none"> <li>With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position.</li> </ol> <div data-bbox="699 426 756 478" data-label="Image"></div> <div data-bbox="818 405 1370 501" data-label="Text"> <p>Do not use excessive force when sliding the controller module into the chassis; you might damage the connectors.</p> </div> <p>The controller begins to boot as soon as it is seated in the chassis.</p> <ol style="list-style-type: none"> <li>If you have not already done so, reinstall the cable management device.</li> <li>Bind the cables to the cable management device with the hook and loop strap.</li> <li>Interrupt the boot process <b>only</b> after determining the correct timing:</li> </ol> <p>You must look for an Automatic firmware update console message. If the update message appears, do not press <code>Ctrl-C</code> to interrupt the boot process until after you see a message confirming that the update is complete.</p> <p>Only press <code>Ctrl-C</code> when you see the message <code>Press Ctrl-C for Boot Menu</code>.</p> <div data-bbox="699 1278 756 1331" data-label="Image"></div> <div data-bbox="818 1205 1451 1404" data-label="Text"> <p>If the firmware update is aborted, the boot process exits to the LOADER prompt. You must run the <code>update_flash</code> command and then exit LOADER and boot to Maintenance mode by pressing <code>Ctrl-C</code> when you see <code>Starting AUTOBOOT</code> press <code>Ctrl-C</code> to abort.</p> </div> <p>If you miss the prompt and the controller module boots to ONTAP, enter <code>halt</code>, and then at the LOADER prompt enter <code>boot_ontap</code>, press <code>Ctrl-C</code> when prompted, and then boot to Maintenance mode.</p> <ol style="list-style-type: none"> <li>Select the option to boot to Maintenance mode from the displayed menu.</li> </ol> |

| If your system is in...     | Then perform these steps...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A stand-alone configuration | <p>a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position.</p> <div data-bbox="699 323 756 380">  </div> <div data-bbox="818 302 1360 401"> <p>Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.</p> </div> <p>b. If you have not already done so, reinstall the cable management device.</p> <p>c. Bind the cables to the cable management device with the hook and loop strap.</p> <p>d. Reconnect the power cables to the power supplies and to the power sources, and then turn on the power to start the boot process.</p> <p>e. Interrupt the boot process <b>only</b> after determining the correct timing:</p> <p>You must look for an Automatic firmware update console message. If the update message appears, do not press <code>Ctrl-C</code> to interrupt the boot process until after you see a message confirming that the update is complete.</p> <p>Only press <code>Ctrl-C</code> after you see the <code>Press Ctrl-C for Boot Menu</code> message.</p> <div data-bbox="699 1197 756 1253">  </div> <div data-bbox="818 1121 1453 1325"> <p>If the firmware update is aborted, the boot process exits to the LOADER prompt. You must run the <code>update_flash</code> command and then exit LOADER and boot to Maintenance mode by pressing <code>Ctrl-C</code> when you see <code>Starting AUTOBOOT</code> press <code>Ctrl-C</code> to abort.</p> </div> <p>If you miss the prompt and the controller module boots to ONTAP, enter <code>halt</code>, and then at the LOADER prompt enter <code>boot_ontap</code>, press <code>Ctrl-C</code> when prompted, and then boot to Maintenance mode.</p> <p>f. From the boot menu, select the option for Maintenance mode.</p> |

**Important:** During the boot process, you might see the following prompts:

- A prompt warning of a system ID mismatch and asking to override the system ID.
- A prompt warning that when entering Maintenance mode in an HA configuration you must ensure that the healthy controller remains down.  
You can safely respond `y` to these prompts.

After completing the hardware replacement and booting to Maintenance mode, you verify the low-level system configuration of the replacement controller and reconfigure system settings as necessary.

### Step 1: Set and verify system time

You should check the time and date on the replacement controller module against the healthy controller module in an HA pair, or against a reliable time server in a stand-alone configuration. If the time and date do not match, you must reset them on the replacement controller module to prevent possible outages on clients due to time differences.

#### About this task

It is important that you apply the commands in the steps on the correct systems:

- The *replacement* node is the new node that replaced the impaired node as part of this procedure.
- The *healthy* node is the HA partner of the *replacement* node.

#### Steps

1. If the *replacement* node is not at the LOADER prompt, halt the system to the LOADER prompt.
2. On the *healthy* node, check the system time: `cluster date show`

The date and time are based on the configured timezone.

3. At the LOADER prompt, check the date and time on the *replacement* node: `show date`

The date and time are given in GMT.

4. If necessary, set the date in GMT on the replacement node: `set date mm/dd/yyyy`
5. If necessary, set the time in GMT on the replacement node: `set time hh:mm:ss`
6. At the LOADER prompt, confirm the date and time on the *replacement* node: `show date`

The date and time are given in GMT.

### Step 2: Verify and set the controller's HA state

You must verify the HA state of the controller module and, if necessary, update the state to match your system configuration.

1. In Maintenance mode from the new controller module, verify that all components display the same HA state: `ha-config show`

The HA state should be the same for all components.

2. If the displayed system state for the chassis does not match your system configuration:
  - a. Set the HA state for the chassis: `ha-config modify chassis HA-state`

The value for HA-state can be one of the following:

- ha
- mcc
- mcc-2n
- mccip
- non-ha

b. Confirm that the setting has changed: `ha-config show`

#### Recable the system and reassign disks - AFF A220

To complete the replacement procedure and restore your system to full operation, you must recable the storage, confirm disk reassignment, restore the NetApp Storage Encryption configuration (if necessary), and install licenses for the new controller. You must complete a series of tasks before restoring your system to full operation.

#### Step 1: Recable the system

Recable the controller module's storage and network connections.

##### Steps

1. Recable the the controller module to storage and network connections.
2. Verify that the cabling is correct by using [Active IQ Config Advisor](#).
  - a. Download and install Config Advisor.
  - b. Enter the information for the target system, and then click Collect Data.
  - c. Click the Cabling tab, and then examine the output. Make sure that all disk shelves are displayed and all disks appear in the output, correcting any cabling issues you find.
  - d. Check other cabling by clicking the appropriate tab, and then examining the output from Config Advisor.

#### Step 2: Reassign disks

If the storage system is in an HA pair, the system ID of the new controller module is automatically assigned to the disks when the giveback occurs at the end of the procedure. In a stand-alone system, you must manually reassign the ID to the disks.

You must use the correct procedure for your configuration:

| Controller redundancy               | Then use this procedure...                                                                                    |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------|
| HA pair                             | <a href="#">Option 1: Verify the system ID change on an HA system</a>                                         |
| Stand-alone                         | <a href="#">Option 2: Manually reassign the system ID on a stand-alone system in ONTAP</a>                    |
| Two-node MetroCluster configuration | <a href="#">Option 3: Manually reassign the system ID on systems in a two-node MetroCluster configuration</a> |

## Option 1: Verify the system ID change on an HA system

You must confirm the system ID change when you boot the *replacement* controller and then verify that the change was implemented.

This procedure applies only to systems running ONTAP in an HA pair.

1. If the *replacement* controller is in Maintenance mode (showing the `*>` prompt, exit Maintenance mode and go to the LOADER prompt: `halt`
2. From the LOADER prompt on the *replacement* controller, boot the controller, entering `y` if you are prompted to override the system ID due to a system ID mismatch: `boot_ontap`
3. Wait until the `Waiting for giveback...` message is displayed on the *replacement* controller console and then, from the healthy controller, verify that the new partner system ID has been automatically assigned: `storage failover show`

In the command output, you should see a message that the system ID has changed on the impaired controller, showing the correct old and new IDs. In the following example, node2 has undergone replacement and has a new system ID of 151759706.

```
node1> `storage failover show`
```

| Node  | Partner | Takeover Possible | State Description                                                          |
|-------|---------|-------------------|----------------------------------------------------------------------------|
| ----- | -----   | -----             |                                                                            |
| ----- |         |                   |                                                                            |
| node1 | node2   | false             | System ID changed on partner (Old: 151759755, New: 151759706), In takeover |
| node2 | node1   | -                 | Waiting for giveback (HA mailboxes)                                        |

4. From the healthy controller, verify that any coredumps are saved:
  - a. Change to the advanced privilege level: `set -privilege advanced`

You can respond `y` when prompted to continue into advanced mode. The advanced mode prompt appears (`*>`).
  - b. Save any coredumps: `system node run -node local-node-name partner savecore`
  - c. Wait for the `savecore` command to complete before issuing the giveback.

You can enter the following command to monitor the progress of the `savecore` command: `system node run -node local-node-name partner savecore -s`
  - d. Return to the admin privilege level: `set -privilege admin`
5. If your storage system has Storage or Volume Encryption configured, you must restore Storage or Volume Encryption functionality by using one of the following procedures, depending on whether you are using onboard or external key management:



- [Restore onboard key management encryption keys](#)
- [Restore external key management encryption keys](#)

6. Give back the controller:

- From the healthy controller, give back the replaced controller's storage: `storage failover giveback -ofnode replacement_node_name`

The *replacement* controller takes back its storage and completes booting.

If you are prompted to override the system ID due to a system ID mismatch, you should enter *y*.



If the giveback is vetoed, you can consider overriding the vetoes.

[Find the High-Availability Configuration content for your version of ONTAP 9](#)

- After the giveback has been completed, confirm that the HA pair is healthy and that takeover is possible: `storage failover show`

The output from the `storage failover show` command should not include the System ID changed on partner message.

7. Verify that the disks were assigned correctly: `storage disk show -ownership`

The disks belonging to the *replacement* controller should show the new system ID. In the following example, the disks owned by node1 now show the new system ID, 1873775277:

```
node1> `storage disk show -ownership`

Disk Aggregate Home Owner DR Home Home ID Owner ID DR Home ID
Reserver Pool

1.0.0 aggr0_1 node1 node1 - 1873775277 1873775277 -
1873775277 Pool0
1.0.1 aggr0_1 node1 node1 - 1873775277 1873775277 -
1873775277 Pool0
.
.
.
```

## Option 2: Manually reassign the system ID on a stand-alone system in ONTAP

In a stand-alone system, you must manually reassign disks to the new controller's system ID before you return the system to normal operating condition.



### About this task

This procedure applies only to systems that are in a stand-alone configuration.

## Steps

1. If you have not already done so, reboot the *replacement* node, interrupt the boot process by pressing Ctrl-C, and then select the option to boot to Maintenance mode from the displayed menu.
2. You must enter Y when prompted to override the system ID due to a system ID mismatch.
3. View the system IDs: `disk show -a`
4. You should make a note of the old system ID, which is displayed as part of the disk owner column.

The following example shows the old system ID of 118073209:

```
*> disk show -a
Local System ID: 118065481

 DISK OWNER POOL SERIAL NUMBER HOME
 ----- -
disk_name system-1 (118073209) Pool0 J8XJE9LC system-1
(118073209)
disk_name system-1 (118073209) Pool0 J8Y478RC system-1
(118073209)
.
.
.
```

5. Reassign disk ownership by using the system ID information obtained from the disk show command: `disk reassign -s old system ID disk reassign -s 118073209`
6. Verify that the disks were assigned correctly: `disk show -a`

The disks belonging to the replacement node should show the new system ID. The following example now show the disks owned by system-1 the new system ID, 118065481:

```
*> disk show -a
Local System ID: 118065481

 DISK OWNER POOL SERIAL NUMBER HOME
 ----- -
disk_name system-1 (118065481) Pool0 J8Y0TDZC system-1
(118065481)
disk_name system-1 (118065481) Pool0 J8Y0TDZC system-1
(118065481)
.
.
.
```

7. If your storage system has Storage or Volume Encryption configured, you must restore Storage or Volume Encryption functionality by using one of the following procedures, depending on whether you are using onboard or external key management:

- [Restore onboard key management encryption keys](#)
- [Restore external key management encryption keys](#)

8. Boot the node: `boot_ontap`

### Option 3: Manually reassign the system ID on systems in a two-node MetroCluster configuration

In a two-node MetroCluster configuration running ONTAP, you must manually reassign disks to the new controller's system ID before you return the system to normal operating condition.

#### About this task

This procedure applies only to systems in a two-node MetroCluster configuration running ONTAP.

You must be sure to issue the commands in this procedure on the correct node:

- The *impaired* node is the node on which you are performing maintenance.
- The *replacement* node is the new node that replaced the impaired node as part of this procedure.
- The *healthy* node is the DR partner of the impaired node.

#### Steps

1. If you have not already done so, reboot the *replacement* node, interrupt the boot process by entering `Ctrl-C`, and then select the option to boot to Maintenance mode from the displayed menu.

You must enter `Y` when prompted to override the system ID due to a system ID mismatch.

2. View the old system IDs from the healthy node: ``metrocluster node show -fields node-systemid,dr-partner-systemid``

In this example, the `Node_B_1` is the old node, with the old system ID of 118073209:

```
dr-group-id cluster node node-systemid dr-
partner-systemid

1 Cluster_A Node_A_1 536872914
118073209
1 Cluster_B Node_B_1 118073209
536872914
2 entries were displayed.
```

3. View the new system ID at the Maintenance mode prompt on the impaired node: `disk show`

In this example, the new system ID is 118065481:

```
Local System ID: 118065481
...
...
```

4. Reassign disk ownership (for FAS systems) or LUN ownership (for FlexArray systems), by using the system ID information obtained from the disk show command: `disk reassign -s old system ID`

In the case of the preceding example, the command is: `disk reassign -s 118073209`

You can respond `Y` when prompted to continue.

5. Verify that the disks (or FlexArray LUNs) were assigned correctly: `disk show -a`

Verify that the disks belonging to the *replacement* node show the new system ID for the *replacement* node. In the following example, the disks owned by system-1 now show the new system ID, 118065481:

```
*> disk show -a
Local System ID: 118065481

 DISK OWNER POOL SERIAL NUMBER HOME

disk_name system-1 (118065481) Pool0 J8Y0TDZC system-1
(118065481)
disk_name system-1 (118065481) Pool0 J8Y09DXC system-1
(118065481)
.
.
.
```

6. From the healthy node, verify that any coredumps are saved:

- a. Change to the advanced privilege level: `set -privilege advanced`

You can respond `Y` when prompted to continue into advanced mode. The advanced mode prompt appears (`*>`).

- b. Verify that the coredumps are saved: `system node run -node local-node-name partner savecore`

If the command output indicates that savecore is in progress, wait for savecore to complete before issuing the giveback. You can monitor the progress of the savecore using the `system node run -node local-node-name partner savecore -s command.</info>`.

- c. Return to the admin privilege level: `set -privilege admin`

7. If the *replacement* node is in Maintenance mode (showing the `*>` prompt), exit Maintenance mode and go to the LOADER prompt: `halt`
8. Boot the *replacement* node: `boot_ontap`
9. After the *replacement* node has fully booted, perform a switchback: `metrocluster switchback`
10. Verify the MetroCluster configuration: `metrocluster node show - fields configuration-state`

```

node1_siteA::> metrocluster node show -fields configuration-state

dr-group-id cluster node configuration-state

1 node1_siteA node1mcc-001 configured
1 node1_siteA node1mcc-002 configured
1 node1_siteB node1mcc-003 configured
1 node1_siteB node1mcc-004 configured

4 entries were displayed.

```

## 11. Verify the operation of the MetroCluster configuration in Data ONTAP:

- Check for any health alerts on both clusters: `system health alert show`
- Confirm that the MetroCluster is configured and in normal mode: `metrocluster show`
- Perform a MetroCluster check: `metrocluster check run`
- Display the results of the MetroCluster check: `metrocluster check show`
- Run Config Advisor. Go to the Config Advisor page on the NetApp Support Site at [support.netapp.com/NOW/download/tools/config\\_advisor/](http://support.netapp.com/NOW/download/tools/config_advisor/).

After running Config Advisor, review the tool's output and follow the recommendations in the output to address any issues discovered.

## 12. Simulate a switchover operation:

- From any node's prompt, change to the advanced privilege level: `set -privilege advanced`

You need to respond with `y` when prompted to continue into advanced mode and see the advanced mode prompt (`*>`).

- Perform the switchback operation with the `-simulate` parameter: `metrocluster switchover -simulate`
- Return to the admin privilege level: `set -privilege admin`

## Complete system restoration - AFF A220

To restore your system to full operation, you must restore the NetApp Storage Encryption configuration (if necessary), and install licenses for the new controller, and return the failed part to NetApp, as described in the RMA instructions shipped with the kit.

### Step 1: Install licenses for the replacement controller in ONTAP

You must install new licenses for the *replacement* node if the impaired node was using ONTAP features that require a standard (node-locked) license. For features with standard licenses, each node in the cluster should have its own key for the feature.

#### About this task

Until you install license keys, features requiring standard licenses continue to be available to the *replacement* node. However, if the impaired node was the only node in the cluster with a license for the feature, no configuration changes to the feature are allowed. Also, using unlicensed features on the node might put you out of compliance with your license agreement, so you should install the replacement license key or keys on the *replacement* node as soon as possible.

### Before you begin

The licenses keys must be in the 28-character format.

You have a 90-day grace period in which to install the license keys. After the grace period, all old licenses are invalidated. After a valid license key is installed, you have 24 hours to install all of the keys before the grace period ends.

### Steps

1. If you need new license keys, obtain replacement license keys on the [NetApp Support Site](#) in the My Support section under Software licenses.



The new license keys that you require are automatically generated and sent to the email address on file. If you fail to receive the email with the license keys within 30 days, you should contact technical support.

2. Install each license key: `system license add -license-code license-key, license-key...`
3. Remove the old licenses, if desired:
  - a. Check for unused licenses: `license clean-up -unused -simulate`
  - b. If the list looks correct, remove the unused licenses: `license clean-up -unused`

### Step 2: Verify LIFs and register the serial number

Before returning the *replacement* node to service, you should verify that the LIFs are on their home ports, and register the serial number of the *replacement* node if AutoSupport is enabled, and reset automatic giveback.

### Steps

1. Verify that the logical interfaces are reporting to their home server and ports: `network interface show -is-home false`  
  
If any LIFs are listed as false, revert them to their home ports: `network interface revert -vserver * -lif *`
2. Register the system serial number with NetApp Support.
  - If AutoSupport is enabled, send an AutoSupport message to register the serial number.
  - If AutoSupport is not enabled, call [NetApp Support](#) to register the serial number.
3. If an AutoSupport maintenance window was triggered, end it by using the `system node autosupport invoke -node * -type all -message MAINT=END` command.
4. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`

### Step 3: Switch back aggregates in a two-node MetroCluster configuration

After you have completed the FRU replacement in a two-node MetroCluster configuration, you can perform the

MetroCluster switchback operation. This returns the configuration to its normal operating state, with the sync-source storage virtual machines (SVMs) on the formerly impaired site now active and serving data from the local disk pools.

This task only applies to two-node MetroCluster configurations.

### Steps

1. Verify that all nodes are in the enabled state: `metrocluster node show`

```
cluster_B::> metrocluster node show

DR Configuration DR
Group Cluster Node State Mirroring Mode

1 cluster_A
 controller_A_1 configured enabled heal roots
completed
 cluster_B
 controller_B_1 configured enabled waiting for
switchback recovery
2 entries were displayed.
```

2. Verify that resynchronization is complete on all SVMs: `metrocluster vserver show`
3. Verify that any automatic LIF migrations being performed by the healing operations were completed successfully: `metrocluster check lif show`
4. Perform the switchback by using the `metrocluster switchback` command from any node in the surviving cluster.
5. Verify that the switchback operation has completed: `metrocluster show`

The switchback operation is still running when a cluster is in the `waiting-for-switchback` state:

```
cluster_B::> metrocluster show

Cluster Configuration State Mode

Local: cluster_B configured switchover
Remote: cluster_A configured waiting-for-switchback
```

The switchback operation is complete when the clusters are in the `normal` state.:

```
cluster_B::> metrocluster show
Cluster Configuration State Mode

Local: cluster_B configured normal
Remote: cluster_A configured normal
```

If a switchback is taking a long time to finish, you can check on the status of in-progress baselines by using the `metrocluster config-replication resync-status show` command.

6. Reestablish any SnapMirror or SnapVault configurations.

#### Step 4: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

#### Replace a DIMM - AFF A220

You must replace a DIMM in the controller module when your system registers an increasing number of correctable error correction codes (ECC); failure to do so causes a system panic.

All other components in the system must be functioning properly; if not, you must contact technical support.

You must replace the failed component with a replacement FRU component you received from your provider.

#### Step 1: Shut down the impaired controller

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

#### About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced` mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

#### Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:  
`system node autosupport invoke -node * -type all -message MAINT=<# of hours>h`

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:>`  
`system node autosupport invoke -node * -type all -message MAINT=2h`



2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`



When you see *Do you want to disable auto-giveback?*, enter *y*.

3. Take the impaired controller to the LOADER prompt:

| If the impaired controller is displaying... | Then...                                                                                                                                                                                                                                                             |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                           | Go to the next step.                                                                                                                                                                                                                                                |
| Waiting for giveback...                     | Press Ctrl-C, and then respond <i>y</i> when prompted.                                                                                                                                                                                                              |
| System prompt or password prompt            | <p>Take over or halt the impaired controller from the healthy controller:<br/><code>storage failover takeover -ofnode<br/>impaired_node_name</code></p> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i>.</p> |

4. If the system has only one controller module in the chassis, turn off the power supplies, and then unplug the impaired controller's power cords from the power source.

## Step 2: Remove controller module

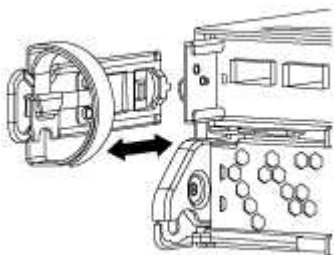
To access components inside the controller, you must first remove the controller module from the system and then remove the cover on the controller module.

### Steps

1. If you are not already grounded, properly ground yourself.
2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

3. Remove and set aside the cable management devices from the left and right sides of the controller module.



4. Squeeze the latch on the cam handle until it releases, open the cam handle fully to release the controller module from the midplane, and then, using two hands, pull the controller module out of the chassis.



5. Turn the controller module over and place it on a flat, stable surface.
6. Open the cover by sliding in the blue tabs to release the cover, and then swing the cover up and open.



### Step 3: Replace the DIMMs

To replace the DIMMs, locate them inside the controller and follow the specific sequence of steps.

If you are replacing a DIMM, you need to remove it after you have unplugged the NVMEM battery from the controller module.

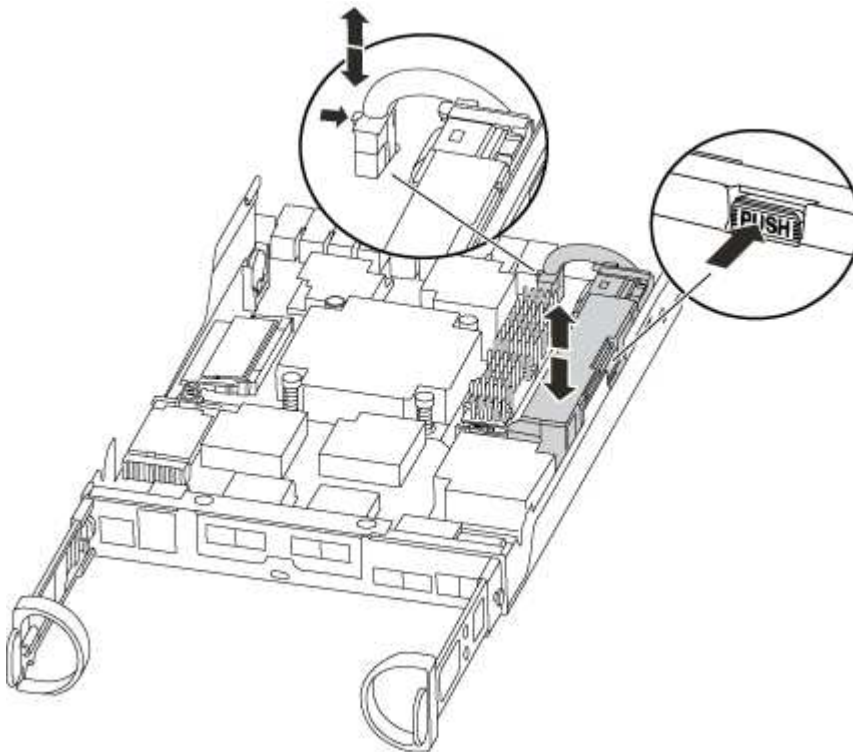
### Steps

1. If you are not already grounded, properly ground yourself.
2. Check the NVMEM LED on the back of controller module.

You must perform a clean system shutdown before replacing system components to avoid losing unwritten data in the nonvolatile memory (NVMEM). The LED is located on the back of the controller module. Look for the following icon:



3. If the NVMEM LED is not flashing, there is no content in the NVMEM; you can skip the following steps and proceed to the next task in this procedure.
4. If the NVMEM LED is flashing, there is data in the NVMEM and you must disconnect the battery to clear the memory:
  - a. Locate the battery, press the clip on the face of the battery plug to release the lock clip from the plug socket, and then unplug the battery cable from the socket.



- b. Confirm that the NVMEM LED is no longer lit.
  - c. Reconnect the battery connector.
5. Return to [Step 3: Replace the DIMMs](#) in this procedure to recheck the NVMEM LED.
  6. Locate the DIMMs on your controller module.
  7. Note the orientation of the DIMM in the socket so that you can insert the replacement DIMM in the proper

orientation.

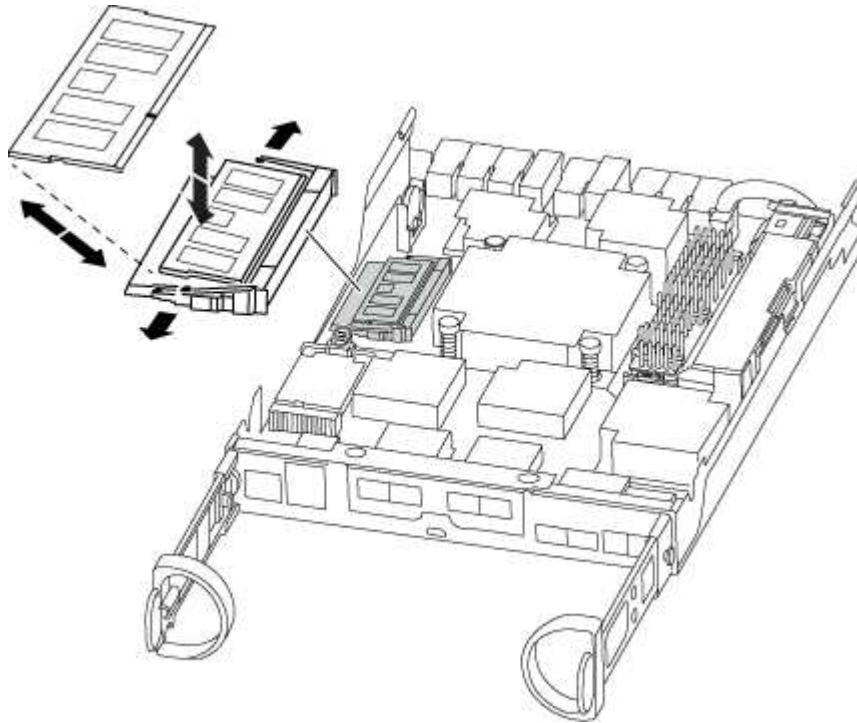
8. Eject the DIMM from its slot by slowly pushing apart the two DIMM ejector tabs on either side of the DIMM, and then slide the DIMM out of the slot.



Carefully hold the DIMM by the edges to avoid pressure on the components on the DIMM circuit board.

The number and placement of system DIMMs depends on the model of your system.

The following illustration shows the location of system DIMMs:



9. Remove the replacement DIMM from the antistatic shipping bag, hold the DIMM by the corners, and align it to the slot.

The notch among the pins on the DIMM should line up with the tab in the socket.

10. Make sure that the DIMM ejector tabs on the connector are in the open position, and then insert the DIMM squarely into the slot.

The DIMM fits tightly in the slot, but should go in easily. If not, realign the DIMM with the slot and reinsert it.



Visually inspect the DIMM to verify that it is evenly aligned and fully inserted into the slot.

11. Push carefully, but firmly, on the top edge of the DIMM until the ejector tabs snap into place over the notches at the ends of the DIMM.
12. Locate the NVMEM battery plug socket, and then squeeze the clip on the face of the battery cable plug to insert it into the socket.

Make sure that the plug locks down onto the controller module.

13. Close the controller module cover.

**Step 4: Reinstall the controller module**

After you replace components in the controller module, reinstall it into the chassis.

**Steps**

- 1. If you are not already grounded, properly ground yourself.
- 2. If you have not already done so, replace the cover on the controller module.
- 3. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.




Do not completely insert the controller module in the chassis until instructed to do so.

- 4. Recable the system, as needed.

If you removed the media converters (QSFPs or SFPs), remember to reinstall them if you are using fiber optic cables.

- 5. Complete the reinstallation of the controller module:

| If your system is in... | Then perform these steps...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| An HA pair              | <div>The controller module begins to boot as soon as it is fully seated in the chassis.</div> <div><ul style="list-style-type: none"><li>a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position.</li></ul></div> <div><div></div><div>Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.</div></div> <div>The controller begins to boot as soon as it is seated in the chassis.</div> <div><ul style="list-style-type: none"><li>b. If you have not already done so, reinstall the cable management device.</li><li>c. Bind the cables to the cable management device with the hook and loop strap.</li></ul></div> |

| If your system is in...     | Then perform these steps...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A stand-alone configuration | <p>a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position.</p> <div style="display: flex; align-items: center; margin: 10px 0;">  <div> <p>Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.</p> </div> </div> <p>b. If you have not already done so, reinstall the cable management device.</p> <p>c. Bind the cables to the cable management device with the hook and loop strap.</p> <p>d. Reconnect the power cables to the power supplies and to the power sources, and then turn on the power to start the boot process.</p> |

#### Step 5: Switch back aggregates in a two-node MetroCluster configuration

After you have completed the FRU replacement in a two-node MetroCluster configuration, you can perform the MetroCluster switchback operation. This returns the configuration to its normal operating state, with the sync-source storage virtual machines (SVMs) on the formerly impaired site now active and serving data from the local disk pools.

This task only applies to two-node MetroCluster configurations.

#### Steps

1. Verify that all nodes are in the enabled state: `metrocluster node show`

```
cluster_B::> metrocluster node show

DR Configuration DR
Group Cluster Node State Mirroring Mode

1 cluster_A
 controller_A_1 configured enabled heal roots
completed
 cluster_B
 controller_B_1 configured enabled waiting for
switchback recovery
2 entries were displayed.
```

2. Verify that resynchronization is complete on all SVMs: `metrocluster vserver show`
3. Verify that any automatic LIF migrations being performed by the healing operations were completed successfully: `metrocluster check lif show`

4. Perform the switchback by using the `metrocluster switchback` command from any node in the surviving cluster.
5. Verify that the switchback operation has completed: `metrocluster show`

The switchback operation is still running when a cluster is in the `waiting-for-switchback` state:

```
cluster_B::> metrocluster show
Cluster Configuration State Mode

Local: cluster_B configured switchover
Remote: cluster_A configured waiting-for-switchback
```

The switchback operation is complete when the clusters are in the `normal` state.:

```
cluster_B::> metrocluster show
Cluster Configuration State Mode

Local: cluster_B configured normal
Remote: cluster_A configured normal
```

If a switchback is taking a long time to finish, you can check on the status of in-progress baselines by using the `metrocluster config-replication resync-status show` command.

6. Reestablish any SnapMirror or SnapVault configurations.

#### Step 6: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

#### Replace SSD Drive or HDD Drive - AFF A220

You can replace a failed drive nondisruptively while I/O is in progress. The procedure for replacing an SSD is meant for non-spinning drives and the procedure for replacing an HDD is meant for spinning drives.

When a drive fails, the platform logs a warning message to the system console indicating which drive has failed. In addition, both the fault LED on the operator display panel and the fault LED on the failed drive are illuminated.

#### Before you begin

- Follow best practice and install the current version of the Disk Qualification Package (DQP) before replacing a drive.
- Identify the failed drive by running the `storage disk show -broken` command from the system console.

The failed drive appears in the list of failed drives. If it does not, you should wait, and then run the

command again.



Depending on the type and capacity, it can take up to several hours for the drive to appear in the list of failed drives.

- Determine whether SED authentication is enabled.

How you replace the drive depends on how the drive is being used. If SED authentication is enabled, you must use the SED replacement instructions in the [ONTAP 9 NetApp Encryption Power Guide](#). These Instructions describe additional steps you must perform before and after replacing an SED.

- Make sure the replacement drive is supported by your platform. See the [NetApp Hardware Universe](#).
- Make sure all other components in the system are functioning properly; if not, you must contact technical support.

#### About this task

- Drive firmware is automatically updated (nondisruptively) on new drives that have non current firmware versions.
- When replacing a drive, you must wait one minute between the removal of the failed drive and the insertion of the replacement drive to allow the storage system to recognize the existence of the new drive.



## Option 1: Replace SSD

### Steps

1. If you want to manually assign drive ownership for the replacement drive, you need to disable automatic drive assignment replacement drive, if it is enabled



You manually assign drive ownership and then reenable automatic drive assignment later in this procedure.

- a. Verify whether automatic drive assignment is enabled: `storage disk option show`

You can enter the command on either controller module.

If automatic drive assignment is enabled, the output shows `on` in the “Auto Assign” column (for each controller module).

- b. If automatic drive assignment is enabled, disable it: `storage disk option modify -node node_name -autoassign off`

You must disable automatic drive assignment on both controller modules.

2. Properly ground yourself.
3. Physically identify the failed drive.

When a drive fails, the system logs a warning message to the system console indicating which drive failed. Additionally, the attention (amber) LED on the drive shelf operator display panel and the failed drive illuminate.



The activity (green) LED on a failed drive can be illuminated (solid), which indicates that the drive has power, but should not be blinking, which indicates I/O activity. A failed drive has no I/O activity.

4. Remove the failed drive:
  - a. Press the release button on the drive face to open the cam handle.
  - b. Slide the drive out of the shelf using the cam handle and supporting the drive with your other hand.

5. Wait a minimum of 70 seconds before inserting the replacement drive.

This allows the system to recognize that a drive was removed.

6. Insert the replacement drive:
  - a. With the cam handle in the open position, use both hands to insert the replacement drive.
  - b. Push until the drive stops.
  - c. Close the cam handle so that the drive is fully seated into the midplane and the handle clicks into place.

Be sure to close the cam handle slowly so that it aligns correctly with the face of the drive.

7. Verify that the drive's activity (green) LED is illuminated.

When the drive's activity LED is solid, it means that the drive has power. When the drive's activity LED is blinking, it means that the drive has power and I/O is in progress. If the drive firmware is automatically updating, the LED blinks.

8. If you are replacing another drive, repeat Steps 3 through 7.
9. If you disabled automatic drive assignment in Step 1, then, manually assign drive ownership and then reenables automatic drive assignment if needed.

- a. Display all unowned drives: `storage disk show -container-type unassigned`

You can enter the command on either controller module.

- b. Assign each drive: `storage disk assign -disk disk_name -owner node_name`

You can enter the command on either controller module.

You can use the wildcard character to assign more than one drive at once.

- c. Reenable automatic drive assignment if needed: `storage disk option modify -node node_name -autoassign on`

You must reenables automatic drive assignment on both controller modules.

10. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit.

Contact technical support at [NetApp Support](#), 888-463-8277 (North America), 00-800-44-638277 (Europe), or +800-800-80-800 (Asia/Pacific) if you need the RMA number or additional help with the replacement procedure.

## Option 2: Replace HDD

1. If you want to manually assign drive ownership for the replacement drive, you need to disable automatic drive assignment replacement drive, if it is enabled



You manually assign drive ownership and then reenables automatic drive assignment later in this procedure.

- a. Verify whether automatic drive assignment is enabled: `storage disk option show`

You can enter the command on either controller module.

If automatic drive assignment is enabled, the output shows `on` in the "Auto Assign" column (for each controller module).

- b. If automatic drive assignment is enabled, disable it: `storage disk option modify -node node_name -autoassign off`

You must disable automatic drive assignment on both controller modules.

2. Properly ground yourself.
3. Gently remove the bezel from the front of the platform.
4. Identify the failed disk drive from the system console warning message and the illuminated fault LED on the disk drive

5. Press the release button on the disk drive face.

Depending on the storage system, the disk drives have the release button located at the top or on the left of the disk drive face.

For example, the following illustration shows a disk drive with the release button located on the top of the disk drive face:

The cam handle on the disk drive springs open partially and the disk drive releases from the midplane.

6. Pull the cam handle to its fully open position to unseat the disk drive from the midplane.

7. Slide out the disk drive slightly and allow the disk to safely spin down, which can take less than one minute, and then, using both hands, remove the disk drive from the disk shelf.

8. With the cam handle in the open position, insert the replacement disk drive into the drive bay, firmly pushing until the disk drive stops.



Wait a minimum of 10 seconds before inserting a new disk drive. This allows the system to recognize that a disk drive was removed.



If your platform drive bays are not fully loaded with drives, it is important to place the replacement drive into the same drive bay from which you removed the failed drive.



Use two hands when inserting the disk drive, but do not place hands on the disk drive boards that are exposed on the underside of the disk carrier.

9. Close the cam handle so that the disk drive is fully seated into the midplane and the handle clicks into place.

Be sure to close the cam handle slowly so that it aligns correctly with the face of the disk drive..

10. If you are replacing another disk drive, repeat Steps 4 through 9.

11. Reinstall the bezel.

12. If you disabled automatic drive assignment in Step 1, then, manually assign drive ownership and then reenale automatic drive assignment if needed.

- a. Display all unowned drives: `storage disk show -container-type unassigned`

You can enter the command on either controller module.

- b. Assign each drive: `storage disk assign -disk disk_name -owner owner_name`

You can enter the command on either controller module.

You can use the wildcard character to assign more than one drive at once.

- c. Reenable automatic drive assignment if needed: `storage disk option modify -node node_name -autoassign on`

You must reenable automatic drive assignment on both controller modules.

13. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit.

Contact technical support at [NetApp Support](#), 888-463-8277 (North America), 00-800-44-638277 (Europe), or +800-800-80-800 (Asia/Pacific) if you need the RMA number or additional help with the replacement procedure.

## Replace the NVMEM battery - AFF A220

To replace an NVMEM battery in the system, you must remove the controller module from the system, open it, replace the battery, and close and replace the controller module.

All other components in the system must be functioning properly; if not, you must contact technical support.

### Step 1: Shut down the impaired controller

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

#### About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced` mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

### Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:  
`system node autosupport invoke -node * -type all -message MAINT=<# of hours>h`

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`



When you see *Do you want to disable auto-giveback?*, enter *y*.

3. Take the impaired controller to the LOADER prompt:

| If the impaired controller is displaying... | Then...              |
|---------------------------------------------|----------------------|
| The LOADER prompt                           | Go to the next step. |

| If the impaired controller is displaying... | Then...                                                                                                                                                                                                                                                   |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Waiting for giveback...                     | Press Ctrl-C, and then respond <i>y</i> when prompted.                                                                                                                                                                                                    |
| System prompt or password prompt            | <p>Take over or halt the impaired controller from the healthy controller:</p> <pre>storage failover takeover -ofnode impaired_node_name</pre> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i>.</p> |

4. If the system has only one controller module in the chassis, turn off the power supplies, and then unplug the impaired controller's power cords from the power source.

## Step 2: Remove controller module

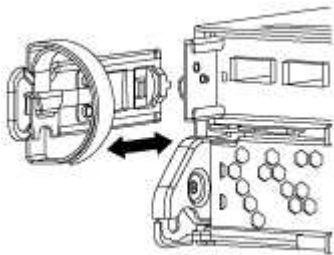
To access components inside the controller, you must first remove the controller module from the system and then remove the cover on the controller module.

### Steps

1. If you are not already grounded, properly ground yourself.
2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

3. Remove and set aside the cable management devices from the left and right sides of the controller module.



4. Squeeze the latch on the cam handle until it releases, open the cam handle fully to release the controller module from the midplane, and then, using two hands, pull the controller module out of the chassis.



5. Turn the controller module over and place it on a flat, stable surface.
6. Open the cover by sliding in the blue tabs to release the cover, and then swing the cover up and open.

### Step 3: Replace the NVMEM battery

To replace the NVMEM battery in your system, you must remove the failed NVMEM battery from the system and replace it with a new NVMEM battery.

#### Steps

1. If you are not already grounded, properly ground yourself.
2. Check the NVMEM LED:
  - If your system is in an HA configuration, go to the next step.
  - If your system is in a stand-alone configuration, cleanly shut down the controller module, and then check the NVRAM LED identified by the NV icon.

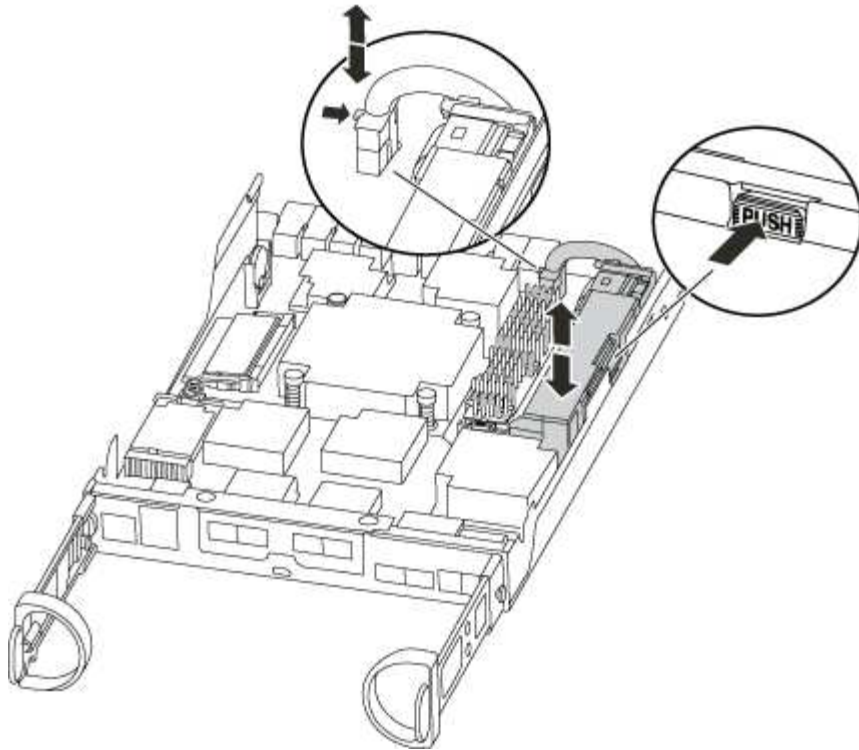


The NVRAM LED blinks while destaging contents to the flash memory when you halt the system. After the destage is complete, the LED turns off.

- If power is lost without a clean shutdown, the NVMEM LED flashes until the destage is complete, and then the LED turns off.
- If the LED is on and power is on, unwritten data is stored on NVMEM.

This typically occurs during an uncontrolled shutdown after ONTAP has successfully booted.

3. Locate the NVMEM battery in the controller module.



4. Locate the battery plug and squeeze the clip on the face of the battery plug to release the plug from the socket, and then unplug the battery cable from the socket.
5. Remove the battery from the controller module and set it aside.
6. Remove the replacement battery from its package.
7. Loop the battery cable around the cable channel on the side of the battery holder.
8. Position the battery pack by aligning the battery holder key ribs to the “V” notches on the sheet metal side wall.
9. Slide the battery pack down along the sheet metal side wall until the support tabs on the side wall hook into the slots on the battery pack, and the battery pack latch engages and clicks into the opening on the side wall.
10. Plug the battery plug back into the controller module.

#### Step 4: Reinstall the controller module

After you replace components in the controller module, reinstall it into the chassis.

##### Steps

1. If you are not already grounded, properly ground yourself.
2. If you have not already done so, replace the cover on the controller module.
3. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.





Do not completely insert the controller module in the chassis until instructed to do so.

4. Recable the system, as needed.

If you removed the media converters (QSFPs or SFPs), remember to reinstall them if you are using fiber

optic cables.

5. Complete the reinstallation of the controller module:

| If your system is in...     | Then perform these steps...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| An HA pair                  | <p>The controller module begins to boot as soon as it is fully seated in the chassis.</p> <p>a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position.</p> <div><p>Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.</p></div> <p>The controller begins to boot as soon as it is seated in the chassis.</p> <p>b. If you have not already done so, reinstall the cable management device.</p> <p>c. Bind the cables to the cable management device with the hook and loop strap.</p> |
| A stand-alone configuration | <p>a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position.</p> <div><p>Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.</p></div> <p>b. If you have not already done so, reinstall the cable management device.</p> <p>c. Bind the cables to the cable management device with the hook and loop strap.</p> <p>d. Reconnect the power cables to the power supplies and to the power sources, and then turn on the power to start the boot process.</p>                           |

#### Step 5: Switch back aggregates in a two-node MetroCluster configuration

After you have completed the FRU replacement in a two-node MetroCluster configuration, you can perform the MetroCluster switchback operation. This returns the configuration to its normal operating state, with the sync-source storage virtual machines (SVMs) on the formerly impaired site now active and serving data from the local disk pools.

This task only applies to two-node MetroCluster configurations.

#### Steps



1. Verify that all nodes are in the enabled state: `metrocluster node show`

```
cluster_B::> metrocluster node show

DR Configuration DR
Group Cluster Node State Mirroring Mode

1 cluster_A
 controller_A_1 configured enabled heal roots
completed
 cluster_B
 controller_B_1 configured enabled waiting for
switchback recovery
2 entries were displayed.
```

2. Verify that resynchronization is complete on all SVMs: `metrocluster vserver show`
3. Verify that any automatic LIF migrations being performed by the healing operations were completed successfully: `metrocluster check lif show`
4. Perform the switchback by using the `metrocluster switchback` command from any node in the surviving cluster.
5. Verify that the switchback operation has completed: `metrocluster show`

The switchback operation is still running when a cluster is in the `waiting-for-switchback` state:

```
cluster_B::> metrocluster show

Cluster Configuration State Mode

Local: cluster_B configured switchover
Remote: cluster_A configured waiting-for-switchback
```

The switchback operation is complete when the clusters are in the `normal` state.:

```
cluster_B::> metrocluster show

Cluster Configuration State Mode

Local: cluster_B configured normal
Remote: cluster_A configured normal
```

If a switchback is taking a long time to finish, you can check on the status of in-progress baselines by using the `metrocluster config-replication resync-status show` command.

6. Reestablish any SnapMirror or SnapVault configurations.

## Step 6: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

### Swap out a power supply - AFF A220

Swapping out a power supply involves turning off, disconnecting, and removing the old power supply and installing, connecting, and turning on the replacement power supply.

All other components in the system must be functioning properly; if not, you must contact technical support.

- The power supplies are redundant and hot-swappable.
- This procedure is written for replacing one power supply at a time.



Cooling is integrated with the power supply, so you must replace the power supply within two minutes of removal to prevent overheating due to reduced airflow. Because the chassis provides a shared cooling configuration for the two HA nodes, a delay longer than two minutes will shut down all controller modules in the chassis. If both controller modules do shut down, make sure that both power supplies are inserted, turn both off for 30 seconds, and then turn both on.

- Power supplies are auto-ranging.

### Steps

1. Identify the power supply you want to replace, based on console error messages or through the LEDs on the power supplies.
2. If you are not already grounded, properly ground yourself.
3. Turn off the power supply and disconnect the power cables:
  - a. Turn off the power switch on the power supply.
  - b. Open the power cable retainer, and then unplug the power cable from the power supply.
  - c. Unplug the power cable from the power source.
4. Squeeze the latch on the power supply cam handle, and then open the cam handle to fully release the power supply from the mid plane.



5. Use the cam handle to slide the power supply out of the system.



When removing a power supply, always use two hands to support its weight.

6. Make sure that the on/off switch of the new power supply is in the Off position.
7. Using both hands, support and align the edges of the power supply with the opening in the system chassis, and then gently push the power supply into the chassis using the cam handle.

The power supplies are keyed and can only be installed one way.



Do not use excessive force when sliding the power supply into the system. You can damage the connector.

8. Close the cam handle so that the latch clicks into the locked position and the power supply is fully seated.
9. Reconnect the power supply cabling:

- a. Reconnect the power cable to the power supply and the power source.
- b. Secure the power cable to the power supply using the power cable retainer.

Once power is restored to the power supply, the status LED should be green.

10. Turn on the power to the new power supply, and then verify the operation of the power supply activity LEDs.

The power supply LEDs are lit when the power supply comes online.

11. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

## Replace the real-time clock battery - AFF A220

You replace the real-time clock (RTC) battery in the controller module so that your system's services and applications that depend on accurate time synchronization continue to function.

- You can use this procedure with all versions of ONTAP supported by your system
- All other components in the system must be functioning properly; if not, you must contact technical support.

### Step 1: Shut down the impaired controller

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

#### About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced` mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

### Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:  
`system node autosupport invoke -node * -type all -message MAINT=<# of hours>h`

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:>`  
`system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`



When you see *Do you want to disable auto-giveback?*, enter *y*.

3. Take the impaired controller to the LOADER prompt:

| If the impaired controller is displaying... | Then...                                                |
|---------------------------------------------|--------------------------------------------------------|
| The LOADER prompt                           | Go to the next step.                                   |
| Waiting for giveback...                     | Press Ctrl-C, and then respond <i>y</i> when prompted. |

| If the impaired controller is displaying... | Then...                                                                                                                                                                                                                                                   |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| System prompt or password prompt            | <p>Take over or halt the impaired controller from the healthy controller:</p> <pre>storage failover takeover -ofnode impaired_node_name</pre> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i>.</p> |

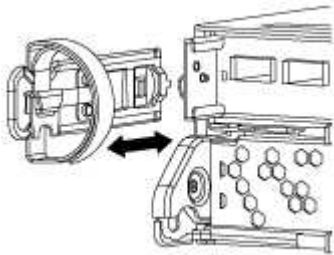
## Step 2: Remove controller module

To access components inside the controller, you must first remove the controller module from the system and then remove the cover on the controller module.

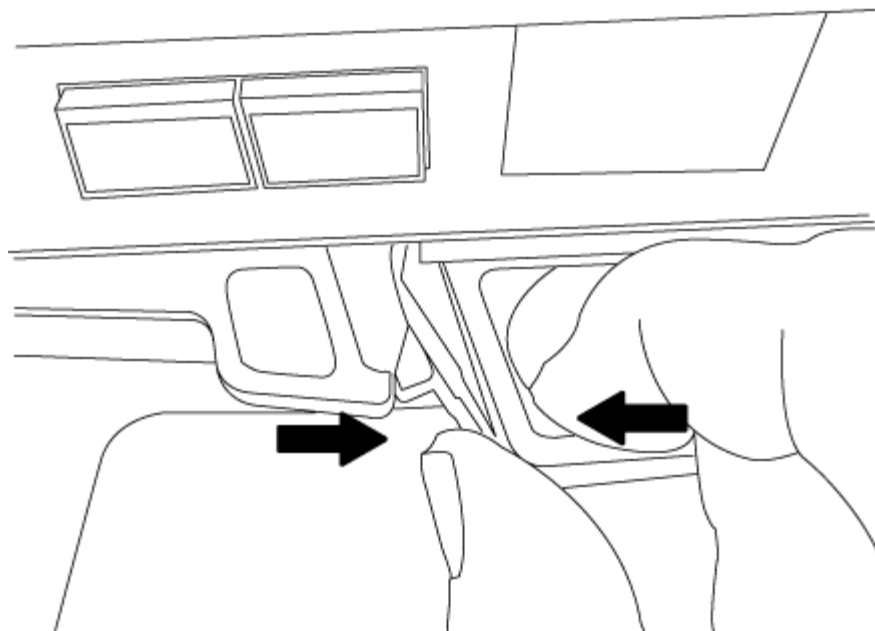
1. If you are not already grounded, properly ground yourself.
2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

3. Remove and set aside the cable management devices from the left and right sides of the controller module.



4. Squeeze the latch on the cam handle until it releases, open the cam handle fully to release the controller module from the midplane, and then, using two hands, pull the controller module out of the chassis.



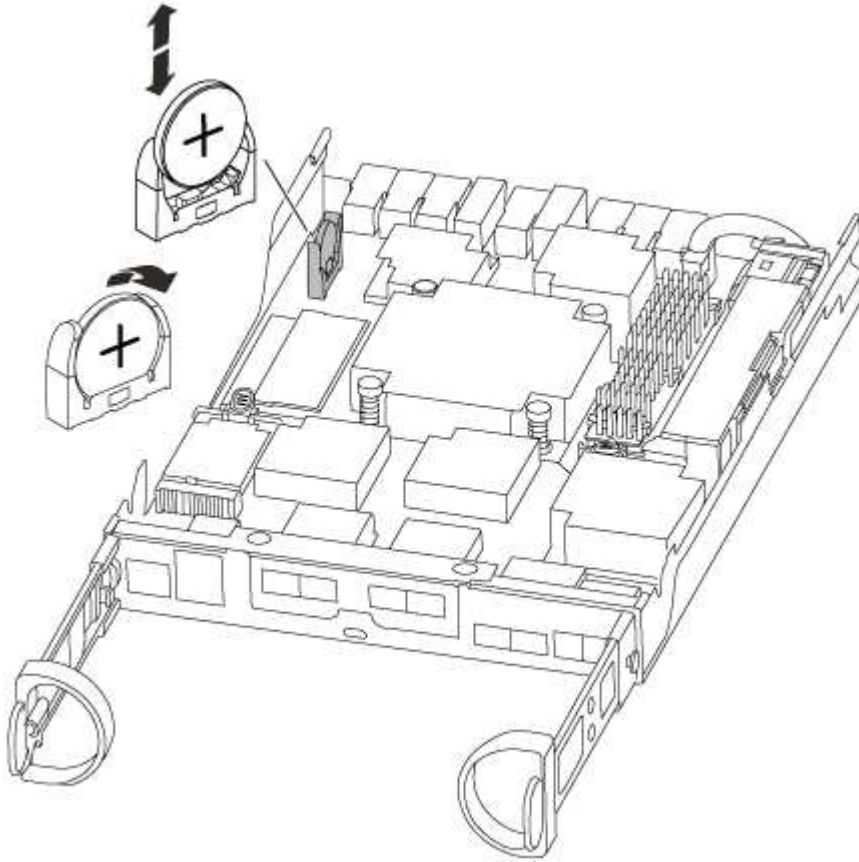
5. Turn the controller module over and place it on a flat, stable surface.
6. Open the cover by sliding in the blue tabs to release the cover, and then swing the cover up and open.



### Step 3: Replace the RTC battery

To replace the RTC battery, locate it inside the controller and follow the specific sequence of steps.

1. If you are not already grounded, properly ground yourself.
2. Locate the RTC battery.



3. Gently push the battery away from the holder, rotate it away from the holder, and then lift it out of the holder.



Note the polarity of the battery as you remove it from the holder. The battery is marked with a plus sign and must be positioned in the holder correctly. A plus sign near the holder tells you how the battery should be positioned.

4. Remove the replacement battery from the antistatic shipping bag.
5. Locate the empty battery holder in the controller module.
6. Note the polarity of the RTC battery, and then insert it into the holder by tilting the battery at an angle and pushing down.
7. Visually inspect the battery to make sure that it is completely installed into the holder and that the polarity is correct.

#### **Step 4: Reinstall the controller module and set time/date after RTC battery replacement**

After you replace a component within the controller module, you must reinstall the controller module in the system chassis, reset the time and date on the controller, and then boot it.

1. If you have not already done so, close the air duct or controller module cover.
2. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.

Do not completely insert the controller module in the chassis until instructed to do so.

3. Recable the system, as needed.

If you removed the media converters (QSFPs or SFPs), remember to reinstall them if you are using fiber optic cables.

4. If the power supplies were unplugged, plug them back in and reinstall the power cable retainers.
5. Complete the reinstallation of the controller module:

- a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position.



Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.

- b. If you have not already done so, reinstall the cable management device.
  - c. Bind the cables to the cable management device with the hook and loop strap.
  - d. Reconnect the power cables to the power supplies and to the power sources, and then turn on the power to start the boot process.
  - e. Halt the controller at the **LOADER** prompt.
6. Reset the time and date on the controller:
    - a. Check the date and time on the healthy controller with the `show date` command.
    - b. At the **LOADER** prompt on the target controller, check the time and date.
    - c. If necessary, modify the date with the `set date mm/dd/yyyy` command.
    - d. If necessary, set the time, in GMT, using the `set time hh:mm:ss` command.
    - e. Confirm the date and time on the target controller.
  7. At the **LOADER** prompt, enter `bye` to reinitialize the PCIe cards and other components and let the controller reboot.
  8. Return the controller to normal operation by giving back its storage: `storage failover giveback -ofnode impaired_node_name`
  9. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`

### Step 5: Switch back aggregates in a two-node MetroCluster configuration

After you have completed the FRU replacement in a two-node MetroCluster configuration, you can perform the MetroCluster switchback operation. This returns the configuration to its normal operating state, with the sync-source storage virtual machines (SVMs) on the formerly impaired site now active and serving data from the local disk pools.

This task only applies to two-node MetroCluster configurations.

#### Steps

1. Verify that all nodes are in the **enabled** state: `metrocluster node show`



```
cluster_B::> metrocluster node show
```

| DR        |                     | Configuration | DR             |
|-----------|---------------------|---------------|----------------|
| Group     | Cluster Node        | State         | Mirroring Mode |
| -----     | -----               | -----         | -----          |
| 1         | cluster_A           |               |                |
|           | controller_A_1      | configured    | enabled        |
| completed | cluster_B           |               |                |
|           | controller_B_1      | configured    | enabled        |
|           | switchback recovery |               | waiting for    |

2 entries were displayed.

2. Verify that resynchronization is complete on all SVMs: `metrocluster vserver show`
3. Verify that any automatic LIF migrations being performed by the healing operations were completed successfully: `metrocluster check lif show`
4. Perform the switchback by using the `metrocluster switchback` command from any node in the surviving cluster.
5. Verify that the switchback operation has completed: `metrocluster show`

The switchback operation is still running when a cluster is in the `waiting-for-switchback` state:

```
cluster_B::> metrocluster show
```

| Cluster           | Configuration | State                  | Mode  |
|-------------------|---------------|------------------------|-------|
| -----             | -----         | -----                  | ----- |
| Local: cluster_B  | configured    | switchover             |       |
| Remote: cluster_A | configured    | waiting-for-switchback |       |

The switchback operation is complete when the clusters are in the `normal` state.:

```
cluster_B::> metrocluster show
```

| Cluster           | Configuration | State  | Mode  |
|-------------------|---------------|--------|-------|
| -----             | -----         | -----  | ----- |
| Local: cluster_B  | configured    | normal |       |
| Remote: cluster_A | configured    | normal |       |

If a switchback is taking a long time to finish, you can check on the status of in-progress baselines by using the `metrocluster config-replication resync-status show` command.

6. Reestablish any SnapMirror or SnapVault configurations.

## Step 6: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

# AFF A300 systems

## Install and setup

### Cluster configuration worksheet - AFF A300

You can use the worksheet to gather and record your site-specific IP addresses and other information required when configuring an ONTAP cluster.

[Cluster Configuration Worksheet](#)

### Start here: Choose your installation and setup experience

For most configurations, you can choose from different content formats.

- [Quick steps](#)

A printable PDF of step-by-step instructions with live links to additional content.

- [Video steps](#)

Video step-by-step instructions.

For MetroCluster configurations, see either:

- [Install MetroCluster IP configuration](#)
- [Install MetroCluster Fabric-Attached configuration](#)

### Installation and setup PDF poster - AFF A300

You can use the PDF poster to install and set up your new system. The PDF poster provides step-by-step instructions with live links to additional content.

[AFF A300 Installation and Setup Instructions](#)

## Maintain

### Maintain AFF A300 hardware

For the AFF A300 storage system, you can perform maintenance procedures on the following components.

#### Boot media

The boot media stores a primary and secondary set of boot image files that the system uses when it boots.

## **Chassis**

The chassis is the physical enclosure housing all the controller components such as the controller/CPU unit, power supply, and I/O.

## **Controller**

A controller consists of a board, firmware, and software. It controls the drives and implements the ONTAP functions.

## **DIMM**

You must replace a DIMM (dual in-line memory module) when a memory mismatch is present, or you have a failed DIMM.

## **Fan**

The fan cools the controller.

## **NVDIMM battery**

A NVDIMM battery is responsible for maintaining power to the NVDIMM module.

## **PCIe**

A PCIe (peripheral component interconnect express) card is an expansion card that plugs into the PCIe slot on the motherboard.

## **Power supply**

A power supply provides a redundant power source in a controller shelf.

## **Real time clock battery**

A real time clock battery preserves system date and time information if the power is off.

## **Boot media**

### **Overview of boot media replacement - AFF A300**

The boot media stores a primary and secondary set of system (boot image) files that the system uses when it boots. Depending on your network configuration, you can perform either a nondisruptive or disruptive replacement.

You must have a USB flash drive, formatted to FAT32, with the appropriate amount of storage to hold the `image_XXX.tgz` file.

You also must copy the `image_XXX.tgz` file to the USB flash drive for later use in this procedure.

- The nondisruptive and disruptive methods for replacing a boot media both require you to restore the `var` file system:
  - For nondisruptive replacement, the HA pair must be connected to a network to restore the `var` file system.

- For disruptive replacement, you do not need a network connection to restore the `var` file system, but the process requires two reboots.
- You must replace the failed component with a replacement FRU component you received from your provider.
- It is important that you apply the commands in these steps on the correct node:
  - The *impaired* node is the node on which you are performing maintenance.
  - The *healthy node* is the HA partner of the impaired node.

#### Check onboard encryption keys - AFF A300

Prior to shutting down the impaired controller and checking the status of the onboard encryption keys, you must check the status of the impaired controller, disable automatic giveback, and check which version of ONTAP is running on the system.

If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see the [Synchronize a node with the cluster](#).

#### Steps

1. Check the status of the impaired controller:
  - If the impaired controller is at the login prompt, log in as `admin`.
  - If the impaired controller is at the `LOADER` prompt and is part of HA configuration, log in as `admin` on the healthy controller.
  - If the impaired controller is in a standalone configuration and at `LOADER` prompt, contact [mysupport.netapp.com](https://mysupport.netapp.com).

2. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message
MAINT=number_of_hours_downh
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:*>`

```
system node autosupport invoke -node * -type all -message MAINT=2h
```

3. Check the version of ONTAP the system is running on the impaired controller if up, or on the partner controller if the impaired controller is down, using the `version -v` command:
  - If `<Ino-DARE>` or `<1Ono-DARE>` is displayed in the command output, the system does not support NVE, proceed to shut down the controller.
  - If `<Ino-DARE>` is not displayed in the command output, and the system is running ONTAP 9.5, go to [Option 1: Check NVE or NSE on systems running ONTAP 9.5 and earlier](#).
  - If `<Ino-DARE>` is not displayed in the command output, and the system is running ONTAP 9.6 or later, go to [Option 2: Check NVE or NSE on systems running ONTAP 9.6 and later](#).
4. If the impaired controller is part of an HA configuration, disable automatic giveback from the healthy controller: `storage failover modify -node local -auto-giveback false` or `storage failover modify -node local -auto-giveback-after-panic false`

#### Option 1: Check NVE or NSE on systems running ONTAP 9.5 and earlier

Before shutting down the impaired controller, you need to check whether the system has either NetApp Volume

Encryption (NVE) or NetApp Storage Encryption (NSE) enabled. If so, you need to verify the configuration.

### Steps

1. Connect the console cable to the impaired controller.
2. Check whether NVE is configured for any volumes in the cluster: `volume show -is-encrypted true`

If any volumes are listed in the output, NVE is configured and you need to verify the NVE configuration. If no volumes are listed, check whether NSE is configured.

3. Check whether NSE is configured: `storage encryption disk show`
  - If the command output lists the drive details with Mode & Key ID information, NSE is configured and you need to verify the NSE configuration.
  - If NVE and NSE are not configured, it's safe to shut down the impaired controller.

### Verify NVE configuration

#### Steps

1. Display the key IDs of the authentication keys that are stored on the key management servers: `security key-manager query`
  - If the `Restored` column displays `yes` and all key managers display `available`, it's safe to shut down the impaired controller.
  - If the `Restored` column displays anything other than `yes`, or if any key manager displays `unavailable`, you need to complete some additional steps.
  - If you see the message `This command is not supported when onboard key management is enabled`, you need to complete some other additional steps.
2. If the `Restored` column displayed anything other than `yes`, or if any key manager displayed `unavailable`:
  - a. Retrieve and restore all authentication keys and associated key IDs: `security key-manager restore -address *`  
  
If the command fails, contact NetApp Support.  
  
[mysupport.netapp.com](https://mysupport.netapp.com)
  - b. Verify that the `Restored` column displays `yes` for all authentication keys and that all key managers display `available`: `security key-manager query`
  - c. Shut down the impaired controller.
3. If you saw the message `This command is not supported when onboard key management is enabled`, display the keys stored in the onboard key manager: `security key-manager key show -detail`
  - a. If the `Restored` column displays `yes` manually back up the onboard key management information:
    - Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
    - Enter the command to display the OKM backup information: `security key-manager backup show`
    - Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.

- Return to admin mode: `set -priv admin`
- Shut down the impaired controller.

b. If the `Restored` column displays anything other than `yes`:

- Run the key-manager setup wizard: `security key-manager setup -node target/impaired node name`



Enter the customer's onboard key management passphrase at the prompt. If the passphrase cannot be provided, contact [mysupport.netapp.com](https://mysupport.netapp.com)

- Verify that the `Restored` column displays `yes` for all authentication key: `security key-manager key show -detail`
- Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
- Enter the command to display the OKM backup information: `security key-manager backup show`
- Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
- Return to admin mode: `set -priv admin`
- You can safely shutdown the controller.

## Verify NSE configuration

### Steps

1. Display the key IDs of the authentication keys that are stored on the key management servers: `security key-manager query`
  - If the `Restored` column displays `yes` and all key managers display `available`, it's safe to shut down the impaired controller.
  - If the `Restored` column displays anything other than `yes`, or if any key manager displays `unavailable`, you need to complete some additional steps.
  - If you see the message `This command is not supported when onboard key management is enabled`, you need to complete some other additional steps
2. If the `Restored` column displayed anything other than `yes`, or if any key manager displayed `unavailable`:
  - a. Retrieve and restore all authentication keys and associated key IDs: `security key-manager restore -address *`  
  
If the command fails, contact NetApp Support.  
  
[mysupport.netapp.com](https://mysupport.netapp.com)
  - b. Verify that the `Restored` column displays `yes` for all authentication keys and that all key managers display `available`: `security key-manager query`
  - c. Shut down the impaired controller.
3. If you saw the message `This command is not supported when onboard key management is enabled`, display the keys stored in the onboard key manager: `security key-manager key show -detail`

- a. If the Restored column displays `yes`, manually back up the onboard key management information:
  - Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
  - Enter the command to display the OKM backup information: `security key-manager backup show`
  - Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
  - Return to admin mode: `set -priv admin`
  - Shut down the impaired controller.
- b. If the Restored column displays anything other than `yes`:
  - Run the key-manager setup wizard: `security key-manager setup -node target/impaired node name`



Enter the customer's OKM passphrase at the prompt. If the passphrase cannot be provided, contact [mysupport.netapp.com](https://mysupport.netapp.com)

- Verify that the Restored column shows `yes` for all authentication keys: `security key-manager key show -detail`
- Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
- Enter the command to back up the OKM information: `security key-manager backup show`



Make sure that OKM information is saved in your log file. This information will be needed in disaster scenarios where OKM might need to be manually recovered.

- Copy the contents of the backup information to a separate file or your log. You'll need it in disaster scenarios where you might need to manually recover OKM.
- Return to admin mode: `set -priv admin`
- You can safely shut down the controller.

## Option 2: Check NVE or NSE on systems running ONTAP 9.6 and later

Before shutting down the impaired controller, you need to verify whether the system has either NetApp Volume Encryption (NVE) or NetApp Storage Encryption (NSE) enabled. If so, you need to verify the configuration.

1. Verify whether NVE is in use for any volumes in the cluster: `volume show -is-encrypted true`

If any volumes are listed in the output, NVE is configured and you need to verify the NVE configuration. If no volumes are listed, check whether NSE is configured and in use.

2. Verify whether NSE is configured and in use: `storage encryption disk show`
  - If the command output lists the drive details with Mode & Key ID information, NSE is configured and you need to verify the NSE configuration and in use.
  - If no disks are shown, NSE is not configured.
  - If NVE and NSE are not configured, no drives are protected with NSE keys, it's safe to shut down the impaired controller.

## Verify NVE configuration

1. Display the key IDs of the authentication keys that are stored on the key management servers: `security key-manager key query`



After the ONTAP 9.6 release, you may have additional key manager types. The types are KMIP, AKV, and GCP. The process for confirming these types is the same as confirming external or onboard key manager types.

- If the Key Manager type displays `external` and the Restored column displays `yes`, it's safe to shut down the impaired controller.
  - If the Key Manager type displays `onboard` and the Restored column displays `yes`, you need to complete some additional steps.
  - If the Key Manager type displays `external` and the Restored column displays anything other than `yes`, you need to complete some additional steps.
  - If the Key Manager type displays `onboard` and the Restored column displays anything other than `yes`, you need to complete some additional steps.
2. If the Key Manager type displays `onboard` and the Restored column displays `yes`, manually back up the OKM information:
    - a. Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
    - b. Enter the command to display the key management information: `security key-manager onboard show-backup`
    - c. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
    - d. Return to admin mode: `set -priv admin`
    - e. Shut down the impaired controller.
  3. If the Key Manager type displays `external` and the Restored column displays anything other than `yes`:
    - a. Restore the external key management authentication keys to all nodes in the cluster: `security key-manager external restore`  
  
If the command fails, contact NetApp Support.  
  
[mysupport.netapp.com](https://mysupport.netapp.com)
    - b. Verify that the Restored column equals `yes` for all authentication keys: `security key-manager key query`
    - c. Shut down the impaired controller.
  4. If the Key Manager type displays `onboard` and the Restored column displays anything other than `yes`:
    - a. Enter the onboard security key-manager sync command: `security key-manager onboard sync`



Enter the customer's 32 character, alphanumeric onboard key management passphrase at the prompt. If the passphrase cannot be provided, contact NetApp Support.  
[mysupport.netapp.com](https://mysupport.netapp.com)



- b. Verify the `Restored` column shows `yes` for all authentication keys: `security key-manager key query`
- c. Verify that the `Key Manager` type shows `onboard`, and then manually back up the OKM information.
- d. Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
- e. Enter the command to display the key management backup information: `security key-manager onboard show-backup`
- f. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
- g. Return to admin mode: `set -priv admin`
- h. You can safely shut down the controller.

## Verify NSE configuration

1. Display the key IDs of the authentication keys that are stored on the key management servers: `security key-manager key query -key-type NSE-AK`



After the ONTAP 9.6 release, you may have additional key manager types. The types are KMIP, AKV, and GCP. The process for confirming these types is the same as confirming `external` or `onboard` key manager types.

- If the `Key Manager` type displays `external` and the `Restored` column displays `yes`, it's safe to shut down the impaired controller.
  - If the `Key Manager` type displays `onboard` and the `Restored` column displays `yes`, you need to complete some additional steps.
  - If the `Key Manager` type displays `external` and the `Restored` column displays anything other than `yes`, you need to complete some additional steps.
  - If the `Key Manager` type displays `external` and the `Restored` column displays anything other than `yes`, you need to complete some additional steps.
2. If the `Key Manager` type displays `onboard` and the `Restored` column displays `yes`, manually back up the OKM information:
    - a. Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
    - b. Enter the command to display the key management information: `security key-manager onboard show-backup`
    - c. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
    - d. Return to admin mode: `set -priv admin`
    - e. You can safely shut down the controller.
  3. If the `Key Manager` type displays `external` and the `Restored` column displays anything other than `yes`:
    - a. Restore the external key management authentication keys to all nodes in the cluster: `security key-manager external restore`

If the command fails, contact NetApp Support.

- b. Verify that the `Restored` column equals `yes` for all authentication keys: `security key-manager key query`
  - c. You can safely shut down the controller.
4. If the `Key Manager` type displays `onboard` and the `Restored` column displays anything other than `yes`:
- a. Enter the onboard security key-manager sync command: `security key-manager onboard sync`
- Enter the customer's 32 character, alphanumeric onboard key management passphrase at the prompt. If the passphrase cannot be provided, contact NetApp Support.

- b. Verify the `Restored` column shows `yes` for all authentication keys: `security key-manager key query`
- c. Verify that the `Key Manager` type shows `onboard`, and then manually back up the OKM information.
- d. Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
- e. Enter the command to display the key management backup information: `security key-manager onboard show-backup`
- f. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
- g. Return to admin mode: `set -priv admin`
- h. You can safely shut down the controller.

#### Shut down the impaired controller - AFF A300

Shut down or take over the impaired controller using the appropriate procedure for your configuration.

#### Option 1: Most configurations

After completing the NVE or NSE tasks, you need to complete the shutdown of the impaired controller.

#### Steps

- a. Take the impaired controller to the `LOADER` prompt:

| If the impaired controller displays... | Then...                                                                    |
|----------------------------------------|----------------------------------------------------------------------------|
| The <code>LOADER</code> prompt         | Go to Remove controller module.                                            |
| Waiting for giveback...                | Press <code>Ctrl-C</code> , and then respond <code>y</code> when prompted. |

| If the impaired controller displays...                   | Then...                                                                                                                                                                                                                                                         |
|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| System prompt or password prompt (enter system password) | <p>Take over or halt the impaired controller from the healthy controller:</p> <pre>storage failover takeover -ofnode impaired_node_name</pre> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <code>y</code>.</p> |

- b. From the LOADER prompt, enter: `printenv` to capture all boot environmental variables. Save the output to your log file.



This command may not work if the boot device is corrupted or non-functional.

## Option 2: Controller is in a MetroCluster configuration

After completing the NVE or NSE tasks, you need to complete the shutdown of the impaired node.



Do not use this procedure if your system is in a two-node MetroCluster configuration.

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).
- If you have a MetroCluster configuration, you must have confirmed that the MetroCluster Configuration State is configured and that the nodes are in an enabled and normal state (`metrocluster node show`).

## Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message
MAINT=number_of_hours_downh
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:*>`

```
system node autosupport invoke -node * -type all -message MAINT=2h
```

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`
3. Take the impaired controller to the LOADER prompt:

| If the impaired controller is displaying... | Then...                                                      |
|---------------------------------------------|--------------------------------------------------------------|
| The LOADER prompt                           | Go to the next step.                                         |
| Waiting for giveback...                     | Press Ctrl-C, and then respond <code>y</code> when prompted. |

| If the impaired controller is displaying...              | Then...                                                                                                                                                                                                                                                   |
|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| System prompt or password prompt (enter system password) | <p>Take over or halt the impaired controller from the healthy controller:</p> <pre>storage failover takeover -ofnode impaired_node_name</pre> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i>.</p> |

### Option 3: Controller is in a two-node MetroCluster

After completing the NVE or NSE tasks, you need to complete the shutdown of the impaired node.

To shut down the impaired controller, you must determine the status of the controller and, if necessary, switch over the controller so that the healthy controller continues to serve data from the impaired controller storage.

#### About this task

- You must leave the power supplies turned on at the end of this procedure to provide power to the healthy controller.

#### Steps

- Check the MetroCluster status to determine whether the impaired controller has automatically switched over to the healthy controller: `metrocluster show`
- Depending on whether an automatic switchover has occurred, proceed according to the following table:

| If the impaired controller...                                                                                                                      | Then...                                                                                                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Has automatically switched over                                                                                                                    | Proceed to the next step.                                                                                                                      |
| Has not automatically switched over                                                                                                                | Perform a planned switchover operation from the healthy controller:<br><code>metrocluster switchover</code>                                    |
| Has not automatically switched over, you attempted switchover with the <code>metrocluster switchover</code> command, and the switchover was vetoed | Review the veto messages and, if possible, resolve the issue and try again. If you are unable to resolve the issue, contact technical support. |

- Resynchronize the data aggregates by running the `metrocluster heal -phase aggregates` command from the surviving cluster.

```
controller_A_1::> metrocluster heal -phase aggregates
[Job 130] Job succeeded: Heal Aggregates is successful.
```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

4. Verify that the operation has been completed by using the `metrocluster operation show` command.

```
controller_A_1:> metrocluster operation show
 Operation: heal-aggregates
 State: successful
Start Time: 7/25/2016 18:45:55
 End Time: 7/25/2016 18:45:56
 Errors: -
```

5. Check the state of the aggregates by using the `storage aggregate show` command.

```
controller_A_1:> storage aggregate show
Aggregate Size Available Used% State #Vols Nodes RAID
Status

...
aggr_b2 227.1GB 227.1GB 0% online 0 mcc1-a2
raid_dp, mirrored, normal...
```

6. Heal the root aggregates by using the `metrocluster heal -phase root-aggregates` command.

```
mcc1A:> metrocluster heal -phase root-aggregates
[Job 137] Job succeeded: Heal Root Aggregates is successful
```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

7. Verify that the heal operation is complete by using the `metrocluster operation show` command on the destination cluster:

```
mcc1A:> metrocluster operation show
 Operation: heal-root-aggregates
 State: successful
Start Time: 7/29/2016 20:54:41
 End Time: 7/29/2016 20:54:42
 Errors: -
```

8. On the impaired controller module, disconnect the power supplies.

To replace the boot media, you must remove the impaired controller module, install the replacement boot media, and transfer the boot image to a USB flash drive.

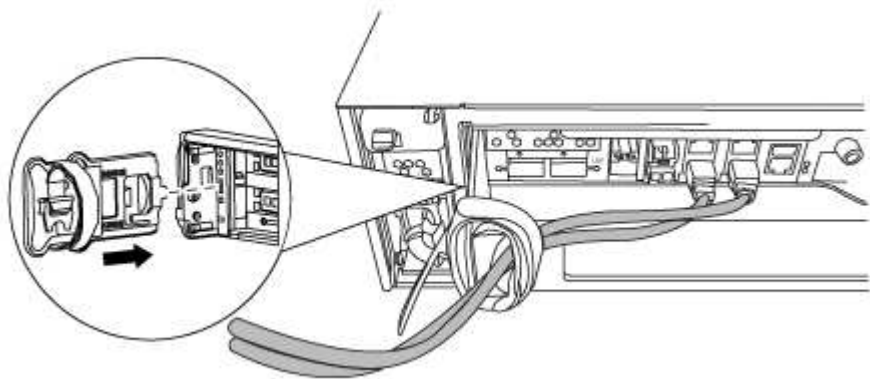
**Step 1: Remove the controller module**

To access components inside the controller, you must first remove the controller module from the system and then remove the cover on the controller module.

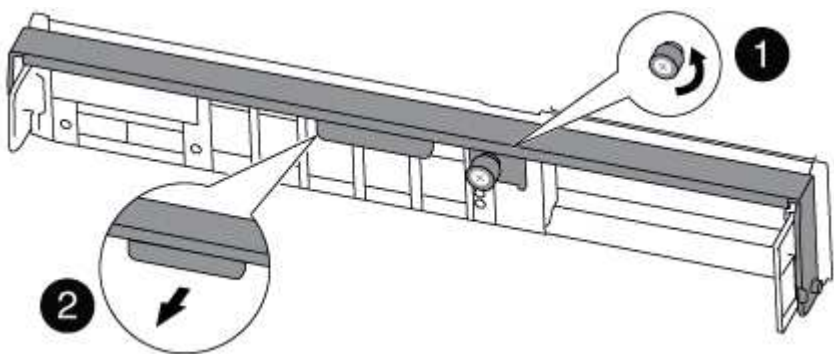
- 1. If you are not already grounded, properly ground yourself.
- 2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

- 3. Remove and set aside the cable management devices from the left and right sides of the controller module.



- 4. Loosen the thumbscrew on the cam handle on the controller module.



|   |            |
|---|------------|
| 1 | Thumbscrew |
| 2 | Cam handle |

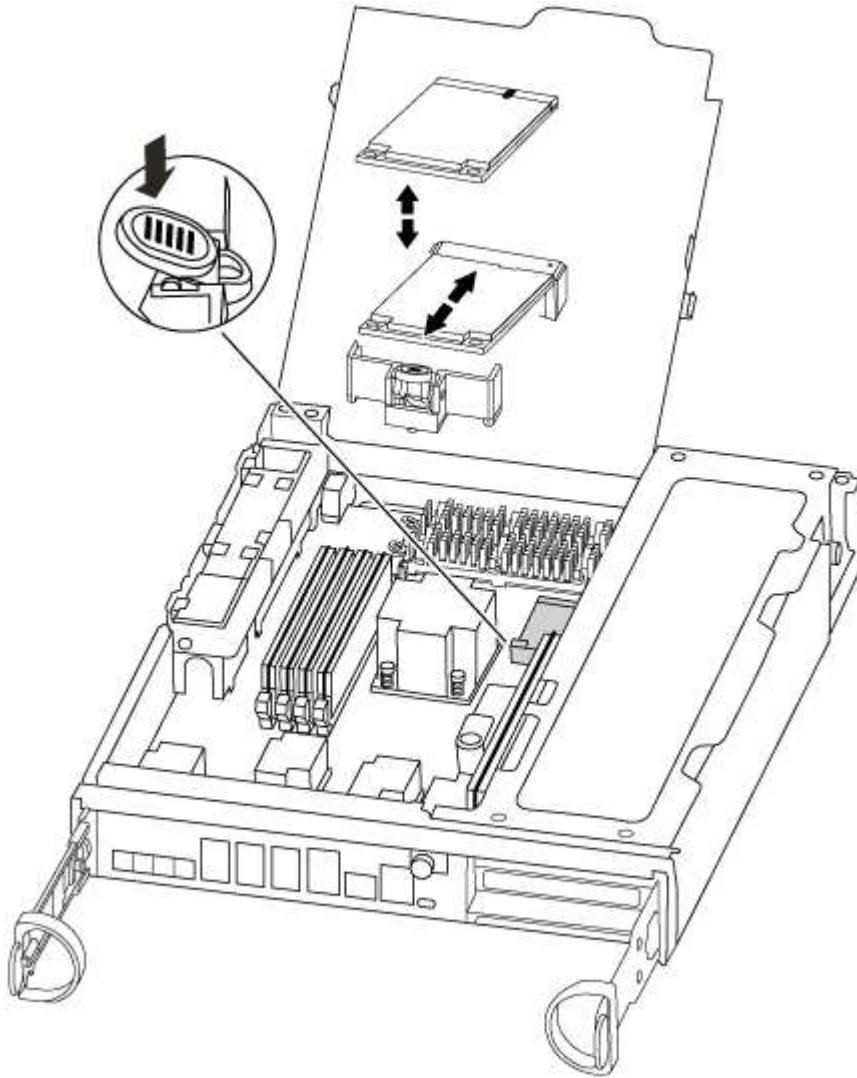
- 5. Pull the cam handle downward and begin to slide the controller module out of the chassis.

Make sure that you support the bottom of the controller module as you slide it out of the chassis.

## Step 2: Replace the boot media - AFF A300

You must locate the boot media in the controller and follow the directions to replace it.

1. If you are not already grounded, properly ground yourself.
2. Locate the boot media using the following illustration or the FRU map on the controller module:



3. Press the blue button on the boot media housing to release the boot media from its housing, and then gently pull it straight out of the boot media socket.



Do not twist or pull the boot media straight up, because this could damage the socket or the boot media.

4. Align the edges of the replacement boot media with the boot media socket, and then gently push it into the socket.
5. Check the boot media to make sure that it is seated squarely and completely in the socket.

If necessary, remove the boot media and reseal it into the socket.

6. Push the boot media down to engage the locking button on the boot media housing.
7. Close the controller module cover.

### Step 3: Transfer the boot image to the boot media

You can install the system image to the replacement boot media using a USB flash drive with the image installed on it. However, you must restore the var file system during this procedure.

- You must have a USB flash drive, formatted to FAT32, with at least 4GB capacity.
- A copy of the same image version of ONTAP as what the impaired controller was running. You can download the appropriate image from the Downloads section on the NetApp Support Site
  - If NVE is enabled, download the image with NetApp Volume Encryption, as indicated in the download button.
  - If NVE is not enabled, download the image without NetApp Volume Encryption, as indicated in the download button.
- If your system is an HA pair, you must have a network connection.
- If your system is a stand-alone system you do not need a network connection, but you must perform an additional reboot when restoring the var file system.

1. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.
2. Reinstall the cable management device and recable the system, as needed.

When recabling, remember to reinstall the media converters (SFPs) if they were removed.

3. Insert the USB flash drive into the USB slot on the controller module.

Make sure that you install the USB flash drive in the slot labeled for USB devices, and not in the USB console port.

4. Push the controller module all the way into the system, making sure that the cam handle clears the USB flash drive, firmly push the cam handle to finish seating the controller module, push the cam handle to the closed position, and then tighten the thumbscrew.

The controller begins to boot as soon as it is completely installed into the chassis.

5. Interrupt the boot process to stop at the LOADER prompt by pressing Ctrl-C when you see Starting AUTOBOOT press Ctrl-C to abort....

If you miss this message, press Ctrl-C, select the option to boot to Maintenance mode, and then halt the controller to boot to LOADER.

6. For systems with one controller in the chassis, reconnect the power and turn on the power supplies.

The system begins to boot and stops at the LOADER prompt.

7. Set your network connection type at the LOADER prompt:

- If you are configuring DHCP: `ifconfig e0a -auto`





The target port you configure is the target port you use to communicate with the impaired controller from the healthy controller during var file system restore with a network connection. You can also use the e0M port in this command.

- If you are configuring manual connections: `ifconfig e0a -addr=filer_addr -mask=netmask -gw=gateway-dns=dns_addr-domain=dns_domain`
  - `filer_addr` is the IP address of the storage system.
  - `netmask` is the network mask of the management network that is connected to the HA partner.
  - `gateway` is the gateway for the network.
  - `dns_addr` is the IP address of a name server on your network.
  - `dns_domain` is the Domain Name System (DNS) domain name.

If you use this optional parameter, you do not need a fully qualified domain name in the netboot server URL. You need only the server's host name.



Other parameters might be necessary for your interface. You can enter `help ifconfig` at the firmware prompt for details.

8. If the controller is in a stretch or fabric-attached MetroCluster, you must restore the FC adapter configuration:

- a. Boot to Maintenance mode: `boot_ontap maint`
- b. Set the MetroCluster ports as initiators: `ucadmin modify -m fc -t initiator adapter_name`
- c. Halt to return to Maintenance mode: `halt`

The changes will be implemented when the system is booted.

### Boot the recovery image - AFF A300

The procedure for booting the impaired controller from the recovery image depends on whether the system is in a two-controller MetroCluster configuration.

#### Option 1: Most systems

You must boot the ONTAP image from the USB drive, restore the file system, and verify the environmental variables.

This procedure applies to systems that are not in a two-node MetroCluster configuration.

1. From the LOADER prompt, boot the recovery image from the USB flash drive: `boot_recovery`

The image is downloaded from the USB flash drive.

2. When prompted, either enter the name of the image or accept the default image displayed inside the brackets on your screen.
3. Restore the var file system:

| If your system has... | Then...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A network connection  | <ol style="list-style-type: none"> <li>Press <code>y</code> when prompted to restore the backup configuration.</li> <li>Set the healthy controller to advanced privilege level: <code>set -privilege advanced</code></li> <li>Run the restore backup command: <code>system node restore-backup -node local -target-address <i>impaired_node_IP_address</i></code></li> <li>Return the controller to admin level: <code>set -privilege admin</code></li> <li>Press <code>y</code> when prompted to use the restored configuration.</li> <li>Press <code>y</code> when prompted to reboot the controller.</li> </ol> |
| No network connection | <ol style="list-style-type: none"> <li>Press <code>n</code> when prompted to restore the backup configuration.</li> <li>Reboot the system when prompted by the system.</li> <li>Select the <b>Update flash from backup config</b> (sync flash) option from the displayed menu.</li> </ol> <p>If you are prompted to continue with the update, press <code>y</code>.</p>                                                                                                                                                                                                                                            |

- Ensure that the environmental variables are set as expected:
  - Take the controller to the LOADER prompt.
  - Check the environment variable settings with the `printenv` command.
  - If an environment variable is not set as expected, modify it with the `setenv environment-variable-name changed-value` command.
  - Save your changes using the `savenv` command.
- The next depends on your system configuration:
  - If your system has onboard keymanager, NSE or NVE configured, go to [Restore OKM, NSE, and NVE as needed](#)
  - If your system does not have onboard keymanager, NSE or NVE configured, complete the steps in this section.
- From the LOADER prompt, enter the `boot_ontap` command.

| If you see...           | Then...                                                                                                                                                                                              |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The login prompt        | Go to the next Step.                                                                                                                                                                                 |
| Waiting for giveback... | <ol style="list-style-type: none"> <li>Log into the partner controller.</li> <li>Confirm the target controller is ready for giveback with the <code>storage failover show</code> command.</li> </ol> |

- Connect the console cable to the partner controller.

8. Give back the controller using the `storage failover giveback -fromnode local` command.
9. At the cluster prompt, check the logical interfaces with the `net int -is-home false` command.

If any interfaces are listed as "false", revert those interfaces back to their home port using the `net int revert` command.

10. Move the console cable to the repaired controller and run the `version -v` command to check the ONTAP versions.
11. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.

## Option 2: Controller is in a two-node MetroCluster

You must boot the ONTAP image from the USB drive and verify the environmental variables.

This procedure applies to systems in a two-node MetroCluster configuration.

### Steps

1. From the LOADER prompt, boot the recovery image from the USB flash drive: `boot_recovery`

The image is downloaded from the USB flash drive.

2. When prompted, either enter the name of the image or accept the default image displayed inside the brackets on your screen.
3. After the image is installed, start the restoration process:
  - a. Press `n` when prompted to restore the backup configuration.
  - b. Press `y` when prompted to reboot to start using the newly installed software.

You should be prepared to interrupt the boot process when prompted.

4. As the system boots, press `Ctrl-C` after you see the `Press Ctrl-C for Boot Menu message.`, and when the Boot Menu is displayed select option 6.
5. Verify that the environmental variables are set as expected.
  - a. Take the node to the LOADER prompt.
  - b. Check the environment variable settings with the `printenv` command.
  - c. If an environment variable is not set as expected, modify it with the `setenv environment-variable-name changed-value` command.
  - d. Save your changes using the `savenv` command.
  - e. Reboot the node.

## Switch back aggregates in a two-node MetroCluster configuration - AFF A300

After you have completed the FRU replacement in a two-node MetroCluster configuration, you can perform the MetroCluster switchback operation. This returns the configuration to its normal operating state, with the sync-source storage virtual machines (SVMs) on the formerly impaired site now active and serving data from the local disk pools.

This task only applies to two-node MetroCluster configurations.

## Steps

1. Verify that all nodes are in the enabled state: `metrocluster node show`

```
cluster_B::> metrocluster node show

DR Configuration DR
Group Cluster Node State Mirroring Mode

1 cluster_A
 controller_A_1 configured enabled heal roots
completed
 cluster_B
 controller_B_1 configured enabled waiting for
switchback recovery
2 entries were displayed.
```

2. Verify that resynchronization is complete on all SVMs: `metrocluster vserver show`
3. Verify that any automatic LIF migrations being performed by the healing operations were completed successfully: `metrocluster check lif show`
4. Perform the switchback by using the `metrocluster switchback` command from any node in the surviving cluster.
5. Verify that the switchback operation has completed: `metrocluster show`

The switchback operation is still running when a cluster is in the `waiting-for-switchback` state:

```
cluster_B::> metrocluster show
Cluster Configuration State Mode

Local: cluster_B configured switchover
Remote: cluster_A configured waiting-for-switchback
```

The switchback operation is complete when the clusters are in the `normal` state.:

```
cluster_B::> metrocluster show
Cluster Configuration State Mode

Local: cluster_B configured normal
Remote: cluster_A configured normal
```

If a switchback is taking a long time to finish, you can check on the status of in-progress baselines by using

the `metrocluster config-replication resync-status show` command.

6. Reestablish any SnapMirror or SnapVault configurations.

#### Restore OKM, NSE, and NVE as needed - AFF A300

Once environment variables are checked, you must complete steps specific to systems that have Onboard Key Manager (OKM), NetApp Storage Encryption (NSE) or NetApp Volume Encryption (NVE) enabled.

Determine which section you should use to restore your OKM, NSE, or NVE configurations:

If NSE or NVE are enabled along with Onboard Key Manager you must restore settings you captured at the beginning of this procedure.

- If NSE or NVE are enabled and Onboard Key Manager is enabled, go to [Option 1: Restore NVE or NSE when Onboard Key Manager is enabled](#).
- If NSE or NVE are enabled for ONATP 9.5, go to [Option 2: Restore NSE/NVE on systems running ONTAP 9.5 and earlier](#).
- If NSE or NVE are enabled for ONTAP 9.6, go to [Option 3: Restore NSE/NVE on systems running ONTAP 9.6 and later](#).

#### Option 1: Restore NVE or NSE when Onboard Key Manager is enabled

##### Steps

1. Connect the console cable to the target controller.
2. Use the `boot_ontap` command at the LOADER prompt to boot the controller.
3. Check the console output:

| If the console displays... | Then...                                                                                                                                                                                                                                                                                    |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt          | Boot the controller to the boot menu: <code>boot_ontap menu</code>                                                                                                                                                                                                                         |
| Waiting for giveback...    | <ol style="list-style-type: none"><li>a. Enter <code>Ctrl-C</code> at the prompt</li><li>b. At the message: Do you wish to halt this controller rather than wait [y/n]? , enter: <code>y</code></li><li>c. At the LOADER prompt, enter the <code>boot_ontap menu</code> command.</li></ol> |

4. At the Boot Menu, enter the hidden command, `recover_onboard_keymanager` and reply `y` at the prompt.
5. Enter the passphrase for the onboard key manager you obtained from the customer at the beginning of this procedure.
6. When prompted to enter the backup data, paste the backup data you captured at the beginning of this procedure, when asked. Paste the output of `security key-manager backup show` OR `security key-manager onboard show-backup` command.



The data is output from either `security key-manager backup show` or `security key-manager onboard show-backup` command.

Example of backup data:

```
-----BEGIN BACKUP-----
TmV0QXBwIEtleSBGbG9iAAEAAAAEAAAAcAEAAAAAADuD+byAAAAACEAAAAAAAAA
QAAAAAAAAABvOIH0AAAAAMh7qDLRyH1DBz12piVdy9ATSFMT0C0TIYFss4PDjTaV
dzRYkLd1PhQLxAWJwOlyqSr8qY1SEBgm1IWgE5DLRqkiAAAAAAAAACgAAAAAAAA
3WTh7gAAAAAAAAAAAAAAAAAIAAAAAAgAZJEIWvdeHr5RCAvHGclo+wAAAAAAAAA
lgAAAAAAAAAoAAAAAAAAAEOTcR0AAAAAAAAAAAAAAAACAAAAAAJAGr3tJA/
LRzUQRHwv+1aWvAAAAAAAAAACQAAAAAAAAAgAAAAAAAAACdhTcvAAAAAJ1PXeBf
ml4NBsSyV1B4jc4A7cvWEFY6ILG6hc6tbKLAHZuvfQ4rlbYAAAAAAAAAAAAAAAA
AA
AA
.
.
.
.
H4nPQM0nrDRYRa9SCv8AA
AA
AAAAAAAA
-----END BACKUP-----
```

7. At the Boot Menu select the option for Normal Boot.

The system boots to `Waiting for giveback...` prompt.

8. Move the console cable to the partner controller and login as admin.

9. Confirm the target controller is ready for giveback with the `storage failover show` command.

10. Give back only the CFO aggregates with the `storage failover giveback -fromnode local -only-cfo -aggregates true` command.

- If the command fails because of a failed disk, physically disengage the failed disk, but leave the disk in the slot until a replacement is received.
- If the command fails because of an open CIFS session, check with the customer on how to close out CIFS sessions.



Terminating CIFS can cause loss of data.

- If the command fails because the partner is "not ready", wait 5 minutes for the NVMEMs to synchronize.
- If the command fails because of an NDMP, SnapMirror, or SnapVault process, disable the process. See the appropriate Documentation Center for more information.

11. Once the giveback completes, check the failover and giveback status with the `storage failover show` and ``storage failover show-giveback`` commands.

Only the CFO aggregates (root aggregate and CFO style data aggregates) will be shown.

12. Move the console cable to the target controller.
13. If you are running ONTAP 9.5 and earlier, run the key-manager setup wizard:
  - a. Start the wizard using the `security key-manager setup -nodenodename` command, and then enter the passphrase for onboard key management when prompted.
  - b. Enter the `key-manager key show -detail` command to see a detailed view of all keys stored in the onboard key manager and verify that the `Restored` column = `yes` for all authentication keys.



If the `Restored` column = anything other than `yes`, contact Customer Support.

- c. Wait 10 minutes for the key to synchronize across the cluster.
14. If you are running ONTAP 9.6 or later:
  - a. Run the `security key-manager onboard sync` command and then enter the passphrase when prompted.
  - b. Enter the `security key-manager key query` command to see a detailed view of all keys stored in the onboard key manager and verify that the `Restored` column = `yes/true` for all authentication keys.



If the `Restored` column = anything other than `yes/true`, contact Customer Support.

- c. Wait 10 minutes for the key to synchronize across the cluster.
15. Move the console cable to the partner controller.
16. Give back the target controller using the `storage failover giveback -fromnode local` command.
17. Check the giveback status, 3 minutes after it reports complete, using the `storage failover show` command.

If giveback is not complete after 20 minutes, contact Customer Support.
18. At the clustershell prompt, enter the `net int show -is-home false` command to list the logical interfaces that are not on their home controller and port.

If any interfaces are listed as `false`, revert those interfaces back to their home port using the `net int revert -vserver Cluster -lif nodename` command.
19. Move the console cable to the target controller and run the `version -v` command to check the ONTAP versions.
20. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.

## Option 2: Restore NSE/NVE on systems running ONTAP 9.5 and earlier

### Steps

1. Connect the console cable to the target controller.
2. Use the `boot_ontap` command at the LOADER prompt to boot the controller.
3. Check the console output:

| If the console displays... | Then...                                                                                                                                                                                                    |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The login prompt           | Go to Step 7.                                                                                                                                                                                              |
| Waiting for giveback...    | <ul style="list-style-type: none"> <li>a. Log into the partner controller.</li> <li>b. Confirm the target controller is ready for giveback with the <code>storage failover show</code> command.</li> </ul> |

4. Move the console cable to the partner controller and give back the target controller storage using the `storage failover giveback -fromnode local -only-cfo-aggregates true local` command.
  - If the command fails because of a failed disk, physically disengage the failed disk, but leave the disk in the slot until a replacement is received.
  - If the command fails because of an open CIFS sessions, check with customer how to close out CIFS sessions.



Terminating CIFS can cause loss of data.

- If the command fails because the partner "not ready", wait 5 minutes for the NVMEMs to synchronize.
  - If the command fails because of an NDMP, SnapMirror, or SnapVault process, disable the process. See the appropriate Documentation Center for more information.
5. Wait 3 minutes and check the failover status with the `storage failover show` command.
  6. At the clustershell prompt, enter the `net int show -is-home false` command to list the logical interfaces that are not on their home controller and port.  
  
If any interfaces are listed as `false`, revert those interfaces back to their home port using the `net int revert -vserver Cluster -lif nodename` command.
  7. Move the console cable to the target controller and run the `version -v` command to check the ONTAP versions.
  8. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.
  9. Use the `storage encryption disk show` at the clustershell prompt, to review the output.



This command does not work if NVE (NetApp Volume Encryption) is configured

10. Use the security key-manager query to display the key IDs of the authentication keys that are stored on the key management servers.
  - If the `Restored` column = `yes` and all key managers report in an available state, go to *Complete the replacement process*.
  - If the `Restored` column = anything other than `yes`, and/or one or more key managers is not available, use the `security key-manager restore -address` command to retrieve and restore all authentication keys (AKs) and key IDs associated with all nodes from all available key management servers.



Check the output of the security key-manager query again to ensure that the Restored column = yes and all key managers report in an available state

11. If the Onboard Key Management is enabled:

- a. Use the `security key-manager key show -detail` to see a detailed view of all keys stored in the onboard key manager.
- b. Use the `security key-manager key show -detail` command and verify that the Restored column = yes for all authentication keys.

If the Restored column = anything other than yes, use the `security key-manager setup -node Repaired(Target)node` command to restore the Onboard Key Management settings. Rerun the `security key-manager key show -detail` command to verify Restored column = yes for all authentication keys.

12. Connect the console cable to the partner controller.

13. Give back the controller using the `storage failover giveback -fromnode local` command.

14. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.

### Option 3: Restore NSE/NVE on systems running ONTAP 9.6 and later

#### Steps

1. Connect the console cable to the target controller.
2. Use the `boot_ontap` command at the LOADER prompt to boot the controller.
3. Check the console output:

| If the console displays... | Then...                                                                                                                                                                                                 |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The login prompt           | Go to Step 7.                                                                                                                                                                                           |
| Waiting for giveback...    | <ol style="list-style-type: none"><li>a. Log into the partner controller.</li><li>b. Confirm the target controller is ready for giveback with the <code>storage failover show</code> command.</li></ol> |

4. Move the console cable to the partner controller and give back the target controller storage using the `storage failover giveback -fromnode local -only-cfo-aggregates true local` command.
  - If the command fails because of a failed disk, physically disengage the failed disk, but leave the disk in the slot until a replacement is received.
  - If the command fails because of an open CIFS session, check with the customer on how to close out CIFS sessions.



Terminating CIFS can cause loss of data.

- If the command fails because the partner is "not ready", wait 5 minutes for the NVMEMs to synchronize.

- If the command fails because of an NDMP, SnapMirror, or SnapVault process, disable the process. See the appropriate Documentation Center for more information.

5. Wait 3 minutes and check the failover status with the `storage failover show` command.

6. At the clustershell prompt, enter the `net int show -is-home false` command to list the logical interfaces that are not on their home controller and port.

If any interfaces are listed as `false`, revert those interfaces back to their home port using the `net int revert -vserver Cluster -lif nodename` command.

7. Move the console cable to the target controller and run the `version -v` command to check the ONTAP versions.
8. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.
9. Use the `storage encryption disk show` at the clustershell prompt, to review the output.
10. Use the `security key-manager key query` command to display the key IDs of the authentication keys that are stored on the key management servers.
  - If the `Restored` column = `yes/true`, you are done and can proceed to complete the replacement process.
  - If the `Key Manager type` = `external` and the `Restored` column = anything other than `yes/true`, use the `security key-manager external restore` command to restore the key IDs of the authentication keys.



If the command fails, contact Customer Support.

- If the `Key Manager type` = `onboard` and the `Restored` column = anything other than `yes/true`, use the `security key-manager onboard sync` command to re-sync the Key Manager type.

Use the `security key-manager key query` to verify that the `Restored` column = `yes/true` for all authentication keys.

11. Connect the console cable to the partner controller.
12. Give back the controller using the `storage failover giveback -fromnode local` command.
13. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.
14. If AutoSupport is enabled, restore/unsuppress automatic case creation by using the `system node autosupport invoke -node * -type all -message MAINT=END`

#### Return the failed part to NetApp - AFF A300

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

## Chassis

### Overview of chassis replacement - AFF A300

To replace the chassis, you must move the power supplies, fans, and controller modules

from the impaired chassis to the new chassis, and swap out the impaired chassis from the equipment rack or system cabinet with the new chassis of the same model as the impaired chassis.

All other components in the system must be functioning properly; if not, you must contact technical support.

- You can use this procedure with all versions of ONTAP supported by your system.
- This procedure is written with the assumption that you are moving the controller module or modules to the new chassis, and that the chassis is a new component from NetApp.
- This procedure is disruptive. For a two-node cluster, you will have a complete service outage and a partial outage in a multi-node cluster.

### Shut down the controllers - - AFF A300

To replace the chassis, you must shutdown the controllers.

#### Option 1: Shut down the controller

This procedure is for 2-node, non-MetroCluster configurations only. If you have a system with more than two nodes, see [How to perform a graceful shutdown and power up of one HA pair in a 4-node cluster](#).

#### Before you begin

You need:

- Local administrator credentials for ONTAP.
- NetApp onboard key management (OKM) cluster-wide passphrase if using storage encryption or NVE/NAE.
- BMC accessibility for each controller.
- Stop all clients/host from accessing data on the NetApp system.
- Suspend external backup jobs.
- Necessary tools and equipment for the replacement.



If the system is a NetApp StorageGRID or ONTAP S3 used as FabricPool cloud tier, refer to the [Gracefully shutdown and power up your storage system Resolution Guide](#) after performing this procedure.



If using SSDs, refer to [SU490: \(Impact: Critical\) SSD Best Practices: Avoid risk of drive failure and data loss if powered off for more than two months](#)

As a best practice before shutdown, you should:

- Perform additional [system health checks](#).
- Upgrade ONTAP to a recommended release for the system.
- Resolve any [Active IQ Wellness Alerts and Risks](#).  
Make note of any faults presently on the system, such as LEDs on the system components.

#### Steps

1. Log into the cluster through SSH or log in from any node in the cluster using a local console cable and a

laptop/console.

2. Turn off AutoSupport and indicate how long you expect the system to be offline:

```
system node autosupport invoke -node * -type all -message "MAINT=8h Power Maintenance"
```

3. Identify the SP/BMC address of all nodes:

```
system service-processor show -node * -fields address
```

4. Exit the cluster shell: `exit`

5. Log into SP/BMC over SSH using the IP address of any of the nodes listed in the output from the previous step.

If you're using a console/laptop, log into the controller using the same cluster administrator credentials.



Open an SSH session to every SP/BMC connection so that you can monitor progress.

6. Halt the 2 nodes located in the impaired chassis:

```
system node halt -node <node>,<node2> -skip-lif-migration-before-shutdown true -ignore-quorum-warnings true -inhibit-takeover true
```



For clusters using SnapMirror synchronous operating in StrictSync mode: `system node halt -node <node>,<node2> -skip-lif-migration-before-shutdown true -ignore-quorum-warnings true -inhibit-takeover true -ignore-strict-sync-warnings true`

7. Enter **y** for each controller in the cluster when you see *Warning: Are you sure you want to halt node "cluster <node-name> number"?*

`{y|n}:`

8. Wait for each controller to halt and display the LOADER prompt.

## Option 2: Controllers are in a two-node MetroCluster configuration

To shut down the impaired controller, you must determine the status of the controller and, if necessary, switch over the controller so that the healthy controller continues to serve data from the impaired controller storage.

### About this task

- You must leave the power supplies turned on at the end of this procedure to provide power to the healthy controller.

### Steps

1. Check the MetroCluster status to determine whether the impaired controller has automatically switched over to the healthy controller: `metrocluster show`
2. Depending on whether an automatic switchover has occurred, proceed according to the following table:

| If the impaired controller...                                                                                                                      | Then...                                                                                                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Has automatically switched over                                                                                                                    | Proceed to the next step.                                                                                                                      |
| Has not automatically switched over                                                                                                                | Perform a planned switchover operation from the healthy controller:<br><code>metrocluster switchover</code>                                    |
| Has not automatically switched over, you attempted switchover with the <code>metrocluster switchover</code> command, and the switchover was vetoed | Review the veto messages and, if possible, resolve the issue and try again. If you are unable to resolve the issue, contact technical support. |

3. Resynchronize the data aggregates by running the `metrocluster heal -phase aggregates` command from the surviving cluster.

```
controller_A_1::> metrocluster heal -phase aggregates
[Job 130] Job succeeded: Heal Aggregates is successful.
```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

4. Verify that the operation has been completed by using the `metrocluster operation show` command.

```
controller_A_1::> metrocluster operation show
Operation: heal-aggregates
State: successful
Start Time: 7/25/2016 18:45:55
End Time: 7/25/2016 18:45:56
Errors: -
```

5. Check the state of the aggregates by using the `storage aggregate show` command.

```
controller_A_1::> storage aggregate show
Aggregate Size Available Used% State #Vols Nodes RAID
Status

...
aggr_b2 227.1GB 227.1GB 0% online 0 mcc1-a2
raid_dp, mirrored, normal...
```

6. Heal the root aggregates by using the `metrocluster heal -phase root-aggregates` command.

```
mcclA::> metrocluster heal -phase root-aggregates
[Job 137] Job succeeded: Heal Root Aggregates is successful
```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

7. Verify that the heal operation is complete by using the `metrocluster operation show` command on the destination cluster:

```
mcclA::> metrocluster operation show
Operation: heal-root-aggregates
State: successful
Start Time: 7/29/2016 20:54:41
End Time: 7/29/2016 20:54:42
Errors: -
```

8. On the impaired controller module, disconnect the power supplies.

#### **Replace hardware - AFF A300**

Move the power supplies, fans, and controller modules from the impaired chassis to the new chassis, and swap out the impaired chassis from the equipment rack or system cabinet with the new chassis of the same model as the impaired chassis.

#### **Step 1: Move a power supply**

Moving out a power supply when replacing a chassis involves turning off, disconnecting, and removing the power supply from the old chassis and installing and connecting it on the replacement chassis.

1. If you are not already grounded, properly ground yourself.
2. Turn off the power supply and disconnect the power cables:
  - a. Turn off the power switch on the power supply.
  - b. Open the power cable retainer, and then unplug the power cable from the power supply.
  - c. Unplug the power cable from the power source.
3. Press down the release latch on the power supply cam handle, and then lower the cam handle to the fully open position to release the power supply from the mid plane.



|   |                          |
|---|--------------------------|
| 1 | Power supply             |
| 2 | Cam handle release latch |
| 3 | Power and Fault LEDs     |
| 4 | Cam handle               |

4. Use the cam handle to slide the power supply out of the system.



When removing a power supply, always use two hands to support its weight.

5. Repeat the preceding steps for any remaining power supplies.
6. Using both hands, support and align the edges of the power supply with the opening in the system chassis, and then gently push the power supply into the chassis using the cam handle.

The power supplies are keyed and can only be installed one way.



Do not use excessive force when sliding the power supply into the system. You can damage the connector.

7. Push firmly on the power supply cam handle to seat it all the way into the chassis, and then push the cam handle to the closed position, making sure that the cam handle release latch clicks into its locked position.
8. Reconnect the power cable and secure it to the power supply using the power cable locking mechanism.



Only connect the power cable to the power supply. Do not connect the power cable to a power source at this time.

## Step 2: Move a fan

Moving out a fan module when replacing the chassis involves a specific sequence of tasks.

1. Remove the bezel (if necessary) with two hands, by grasping the openings on each side of the bezel, and then pulling it toward you until the bezel releases from the ball studs on the chassis frame.
2. Press down the release latch on the fan module cam handle, and then pull the cam handle downward.

The fan module moves a little bit away from the chassis.





|   |                          |
|---|--------------------------|
| 1 | Cam handle               |
| 2 | Fan module               |
| 3 | Cam handle release latch |
| 4 | Fan module Attention LED |

3. Pull the fan module straight out from the chassis, making sure that you support it with your free hand so that it does not swing out of the chassis.



The fan modules are short. Always support the bottom of the fan module with your free hand so that it does not suddenly drop free from the chassis and injure you.

4. Set the fan module aside.
5. Repeat the preceding steps for any remaining fan modules.
6. Insert the fan module into the replacement chassis by aligning it with the opening, and then sliding it into the chassis.
7. Push firmly on the fan module cam handle so that it is seated all the way into the chassis.

The cam handle raises slightly when the fan module is completely seated.

8. Swing the cam handle up to its closed position, making sure that the cam handle release latch clicks into the locked position.

The fan LED should be green after the fan is seated and has spun up to operational speed.

9. Repeat these steps for the remaining fan modules.

10. Align the bezel with the ball studs, and then gently push the bezel onto the ball studs.

### Step 3: Remove the controller module

To replace the chassis, you must remove the controller module or modules from the old chassis.

1. If you are not already grounded, properly ground yourself.
2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

3. Remove and set aside the cable management devices from the left and right sides of the controller module.



4. Loosen the thumbscrew on the cam handle on the controller module.



|   |            |
|---|------------|
| 1 | Thumbscrew |
| 2 | Cam handle |

5. Pull the cam handle downward and begin to slide the controller module out of the chassis.

Make sure that you support the bottom of the controller module as you slide it out of the chassis.

6. Set the controller module aside in a safe place, and repeat these steps if you have another controller module in the chassis.

#### Step 4: Replace a chassis from within the equipment rack or system cabinet

You must remove the existing chassis from the equipment rack or system cabinet before you can install the replacement chassis.

1. Remove the screws from the chassis mount points.



If the system is in a system cabinet, you might need to remove the rear tie-down bracket.

2. With the help of two or three people, slide the old chassis off the rack rails in a system cabinet or *L* brackets in an equipment rack, and then set it aside.
3. If you are not already grounded, properly ground yourself.
4. Using two or three people, install the replacement chassis into the equipment rack or system cabinet by guiding the chassis onto the rack rails in a system cabinet or *L* brackets in an equipment rack.
5. Slide the chassis all the way into the equipment rack or system cabinet.
6. Secure the front of the chassis to the equipment rack or system cabinet, using the screws you removed from the old chassis.
7. If you have not already done so, install the bezel.

#### Step 5: Install the controller

After you install the controller module and any other components into the new chassis, you must boot your system.

For HA pairs with two controller modules in the same chassis, the sequence in which you install the controller module is especially important because it attempts to reboot as soon as you completely seat it in the chassis.

1. If you are not already grounded, properly ground yourself.
2. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.



Do not completely insert the controller module in the chassis until instructed to do so.

3. Recable the console to the controller module, and then reconnect the management port.
4. Repeat the preceding steps if there is a second controller to install in the new chassis.
5. Complete the installation of the controller module:

| If your system is in...     | Then perform these steps...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| An HA pair                  | <p>a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position. Tighten the thumbscrew on the cam handle on back of the controller module.</p> <div>  <p>Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.</p> </div> <p>b. If you have not already done so, reinstall the cable management device.</p> <p>c. Bind the cables to the cable management device with the hook and loop strap.</p> <p>d. Repeat the preceding steps for the second controller module in the new chassis.</p> |
| A stand-alone configuration | <p>a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position. Tighten the thumbscrew on the cam handle on back of the controller module.</p> <div>  <p>Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.</p> </div> <p>b. If you have not already done so, reinstall the cable management device.</p> <p>c. Bind the cables to the cable management device with the hook and loop strap.</p> <p>d. Reinstall the blanking panel and then go to the next step.</p>                     |

6. Connect the power supplies to different power sources, and then turn them on.

7. Boot each controller to Maintenance mode:

- a. As each controller starts the booting, press `Ctrl-C` to interrupt the boot process when you see the message `Press Ctrl-C for Boot Menu`.



If you miss the prompt and the controller modules boot to ONTAP, enter `halt`, and then at the `LOADER` prompt enter `boot_ontap`, press `Ctrl-C` when prompted, and then repeat this step.

- b. From the boot menu, select the option for Maintenance mode.

#### Restore and verify the configuration - AFF A300

You must verify the HA state of the chassis, switch back aggregates, and return the failed part to NetApp, as described in the RMA instructions shipped with the kit.

**Step 1: Verify and set the HA state of the chassis**

You must verify the HA state of the chassis, and, if necessary, update the state to match your system configuration.

- 1. In Maintenance mode, from either controller module, display the HA state of the local controller module and chassis: `ha-config show`

The HA state should be the same for all components.

- 2. If the displayed system state for the chassis does not match your system configuration:
  - a. Set the HA state for the chassis: `ha-config modify chassis HA-state`

The value for HA-state can be one of the following:

- `ha`
- `mcc`
- `mcc-2n`
- `mccip`
- `non-ha`

- b. Confirm that the setting has changed: `ha-config show`

- 3. If you have not already done so, recable the rest of your system.
- 4. The next step depends on your system configuration.

| If your system is in...                    | Then...                                                                                                                                                                |
|--------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A stand-alone configuration                | <ul style="list-style-type: none"><li>a. Exit Maintenance mode: <code>halt</code></li><li>b. Go to <a href="#">Step 3: Return the failed part to NetApp</a>.</li></ul> |
| An HA pair with a second controller module | Exit Maintenance mode: <code>halt</code> The LOADER prompt appears.                                                                                                    |

**Step 2: Switch back aggregates in a two-node MetroCluster configuration**

After you have completed the FRU replacement in a two-node MetroCluster configuration, you can perform the MetroCluster switchback operation. This returns the configuration to its normal operating state, with the sync-source storage virtual machines (SVMs) on the formerly impaired site now active and serving data from the local disk pools.

This task only applies to two-node MetroCluster configurations.

**Steps**

- 1. Verify that all nodes are in the enabled state: `metrocluster node show`

```
cluster_B::> metrocluster node show
```

| DR        |                     | Configuration | DR             |
|-----------|---------------------|---------------|----------------|
| Group     | Cluster Node        | State         | Mirroring Mode |
| 1         | cluster_A           |               |                |
|           | controller_A_1      | configured    | enabled        |
| completed | cluster_B           |               |                |
|           | controller_B_1      | configured    | enabled        |
|           | switchback recovery |               | waiting for    |

2 entries were displayed.

2. Verify that resynchronization is complete on all SVMs: `metrocluster vserver show`
3. Verify that any automatic LIF migrations being performed by the healing operations were completed successfully: `metrocluster check lif show`
4. Perform the switchback by using the `metrocluster switchback` command from any node in the surviving cluster.
5. Verify that the switchback operation has completed: `metrocluster show`

The switchback operation is still running when a cluster is in the `waiting-for-switchback` state:

```
cluster_B::> metrocluster show
```

| Cluster           | Configuration | State                  | Mode |
|-------------------|---------------|------------------------|------|
| Local: cluster_B  | configured    | switchover             |      |
| Remote: cluster_A | configured    | waiting-for-switchback |      |

The switchback operation is complete when the clusters are in the `normal` state.:

```
cluster_B::> metrocluster show
```

| Cluster           | Configuration | State  | Mode |
|-------------------|---------------|--------|------|
| Local: cluster_B  | configured    | normal |      |
| Remote: cluster_A | configured    | normal |      |

If a switchback is taking a long time to finish, you can check on the status of in-progress baselines by using the `metrocluster config-replication resync-status show` command.

6. Reestablish any SnapMirror or SnapVault configurations.

### Step 3: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

## Controller module

### Overview of controller module replacement - AFF A300

You must review the prerequisites for the replacement procedure and select the correct one for your version of the ONTAP operating system.

- All drive shelves must be working properly.
- If your system is in an HA pair, the healthy controller must be able to take over the controller that is being replaced (referred to in this procedure as the “impaired controller”).
- If your system is in a MetroCluster configuration, you must review the section [Choosing the correct recovery procedure](#) to determine whether you should use this procedure.

If this is the procedure you should use, note that the controller replacement procedure for a controller in a four or eight node MetroCluster configuration is the same as that in an HA pair. No MetroCluster-specific steps are required because the failure is restricted to an HA pair and storage failover commands can be used to provide nondisruptive operation during the replacement.

- This procedure includes steps for automatically or manually reassigning drives to the *replacement* controller, depending on your system’s configuration.

You should perform the drive reassignment as directed in the procedure.

- You must replace the failed component with a replacement FRU component you received from your provider.
- You must be replacing a controller module with a controller module of the same model type. You cannot upgrade your system by just replacing the controller module.
- You cannot change any drives or drive shelves as part of this procedure.
- In this procedure, the boot device is moved from the impaired controller to the *replacement* controller so that the *replacement* controller will boot up in the same version of ONTAP as the old controller module.
- Any PCIe cards moved from the old controller module to the new controller module or added from existing customer site inventory must be supported by the replacement controller module.

### NetApp Hardware Universe

- It is important that you apply the commands in these steps on the correct systems:
  - The *impaired* controller is the controller that is being replaced.
  - The *replacement* controller is the new controller that is replacing the impaired controller.
  - The *healthy* controller is the surviving controller.
- You must always capture the controller’s console output to a text file.

This provides you a record of the procedure so that you can troubleshoot any issues that you might encounter during the replacement process.

#### **Shut down the impaired controller - AFF A300**

Shut down or take over the impaired controller using the appropriate procedure for your configuration.



## Option 1: Most configurations

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

### About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced` mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

### Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:  

```
system node autosupport invoke -node * -type all -message MAINT=<# of hours>h
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller: 

```
storage failover modify -node local -auto-giveback false
```



When you see *Do you want to disable auto-giveback?*, enter *y*.

3. Take the impaired controller to the LOADER prompt:

| If the impaired controller is displaying... | Then...                                                                                                                                                                                                                                                            |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                           | Go to the next step.                                                                                                                                                                                                                                               |
| Waiting for giveback...                     | Press Ctrl-C, and then respond <i>y</i> when prompted.                                                                                                                                                                                                             |
| System prompt or password prompt            | <p>Take over or halt the impaired controller from the healthy controller: <code>storage failover takeover -ofnode <i>impaired_node_name</i></code></p> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i>.</p> |

## Option 2: Controller is in a two-node MetroCluster

To shut down the impaired controller, you must determine the status of the controller and, if necessary,

switch over the controller so that the healthy controller continues to serve data from the impaired controller storage.

#### About this task

- You must leave the power supplies turned on at the end of this procedure to provide power to the healthy controller.

#### Steps

1. Check the MetroCluster status to determine whether the impaired controller has automatically switched over to the healthy controller: `metrocluster show`
2. Depending on whether an automatic switchover has occurred, proceed according to the following table:

| If the impaired controller...                                                                                                                      | Then...                                                                                                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Has automatically switched over                                                                                                                    | Proceed to the next step.                                                                                                                      |
| Has not automatically switched over                                                                                                                | Perform a planned switchover operation from the healthy controller: <code>metrocluster switchover</code>                                       |
| Has not automatically switched over, you attempted switchover with the <code>metrocluster switchover</code> command, and the switchover was vetoed | Review the veto messages and, if possible, resolve the issue and try again. If you are unable to resolve the issue, contact technical support. |

3. Resynchronize the data aggregates by running the `metrocluster heal -phase aggregates` command from the surviving cluster.

```
controller_A_1::> metrocluster heal -phase aggregates
[Job 130] Job succeeded: Heal Aggregates is successful.
```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

4. Verify that the operation has been completed by using the `metrocluster operation show` command.

```
controller_A_1::> metrocluster operation show
Operation: heal-aggregates
State: successful
Start Time: 7/25/2016 18:45:55
End Time: 7/25/2016 18:45:56
Errors: -
```

5. Check the state of the aggregates by using the `storage aggregate show` command.

```

controller_A_1::> storage aggregate show
Aggregate Size Available Used% State #Vols Nodes
RAID Status

...
aggr_b2 227.1GB 227.1GB 0% online 0 mcc1-a2
raid_dp, mirrored, normal...

```

6. Heal the root aggregates by using the `metrocluster heal -phase root-aggregates` command.

```

mcc1A::> metrocluster heal -phase root-aggregates
[Job 137] Job succeeded: Heal Root Aggregates is successful

```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

7. Verify that the heal operation is complete by using the `metrocluster operation show` command on the destination cluster:

```

mcc1A::> metrocluster operation show
Operation: heal-root-aggregates
State: successful
Start Time: 7/29/2016 20:54:41
End Time: 7/29/2016 20:54:42
Errors: -

```

8. On the impaired controller module, disconnect the power supplies.

### Replace the controller module - AFF A300

To replace the controller module hardware, you must remove the impaired controller, move FRU components to the replacement controller module, install the replacement controller module in the chassis, and then boot the system to Maintenance mode.

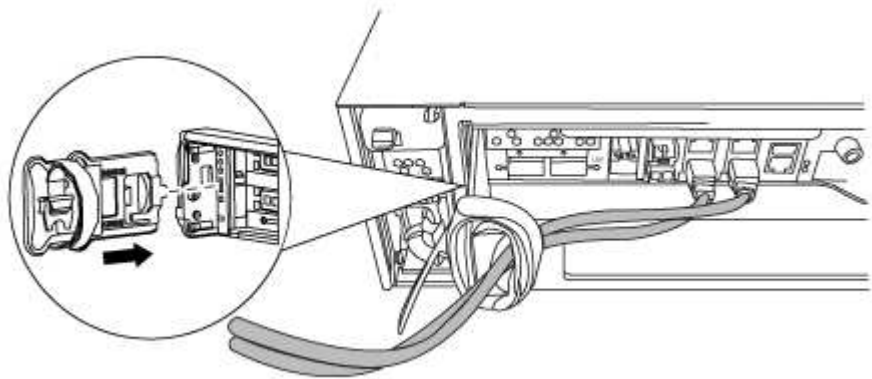
#### Step 1: Open the controller module

To replace the controller module, you must first remove the old controller module from the chassis.

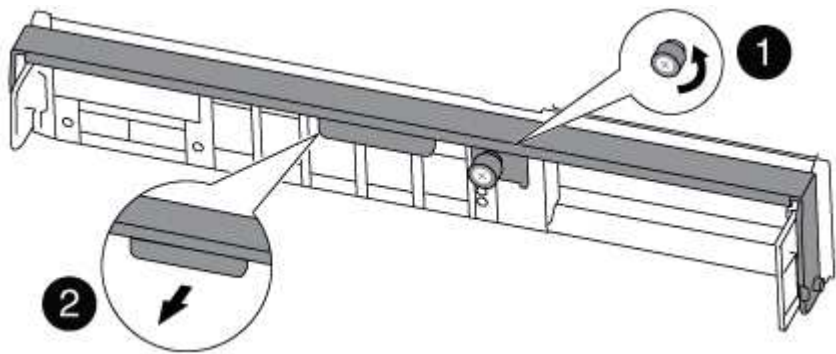
1. If you are not already grounded, properly ground yourself.
2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

- 3. Remove and set aside the cable management devices from the left and right sides of the controller module.



- 4. If you left the SFP modules in the system after removing the cables, move them to the new controller module.
- 5. Loosen the thumbscrew on the cam handle on the controller module.



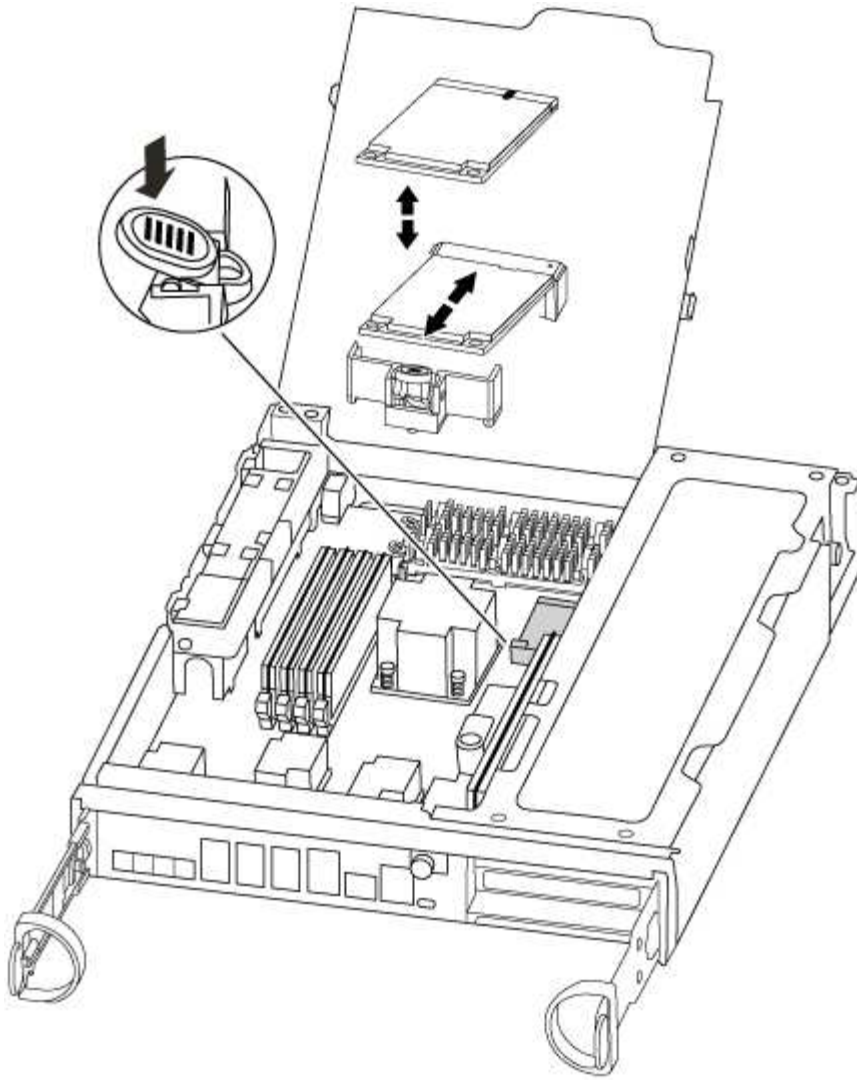
|   |            |
|---|------------|
| 1 | Thumbscrew |
| 2 | Cam handle |

- 6. Pull the cam handle downward and begin to slide the controller module out of the chassis.  
Make sure that you support the bottom of the controller module as you slide it out of the chassis.

**Step 2: Move the boot device**

You must locate the boot media and follow the directions to remove it from the old controller and insert it in the new controller.

- 1. Locate the boot media using the following illustration or the FRU map on the controller module:



2. Press the blue button on the boot media housing to release the boot media from its housing, and then gently pull it straight out of the boot media socket.



Do not twist or pull the boot media straight up, because this could damage the socket or the boot media.

3. Move the boot media to the new controller module, align the edges of the boot media with the socket housing, and then gently push it into the socket.
4. Check the boot media to make sure that it is seated squarely and completely in the socket.

If necessary, remove the boot media and reseal it into the socket.

5. Push the boot media down to engage the locking button on the boot media housing.

### Step 3: Move the NVMEM battery

To move the NVMEM battery from the old controller module to the new controller module, you must perform a specific sequence of steps.

1. Check the NVMEM LED:
  - If your system is in an HA configuration, go to the next step.

- If your system is in a stand-alone configuration, cleanly shut down the controller module, and then check the NVRAM LED identified by the NV icon.

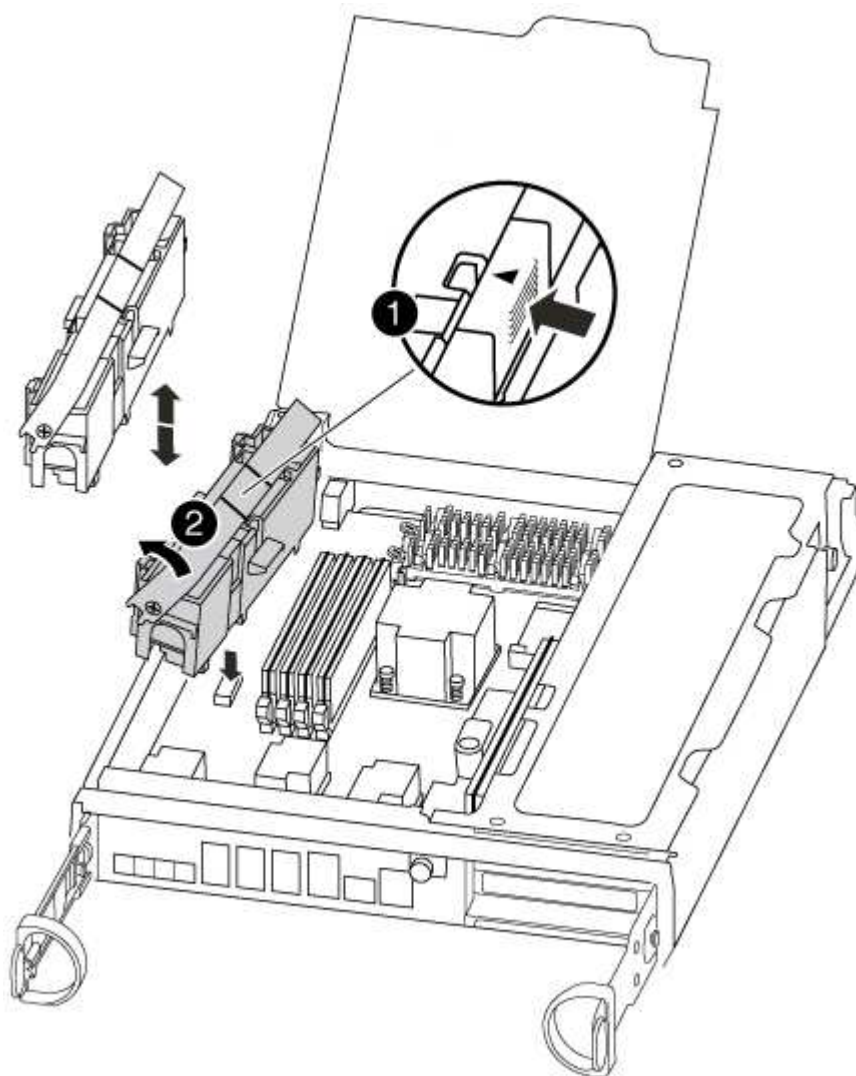


The NVRAM LED blinks while destaging contents to the flash memory when you halt the system. After the destage is complete, the LED turns off.

- If power is lost without a clean shutdown, the NVMEM LED flashes until the destage is complete, and then the LED turns off.
- If the LED is on and power is on, unwritten data is stored on NVMEM.

This typically occurs during an uncontrolled shutdown after ONTAP has successfully booted.

2. Open the CPU air duct and locate the NVMEM battery.



|   |                    |
|---|--------------------|
| 1 | Battery lock tab   |
| 2 | NVMEM battery pack |

3. Grasp the battery and press the blue locking tab marked PUSH, and then lift the battery out of the holder and controller module.
4. Remove the battery from the controller module and set it aside.

#### Step 4: Move the DIMMs

To move the DIMMs, locate and move them from the old controller into the replacement controller and follow the specific sequence of steps.

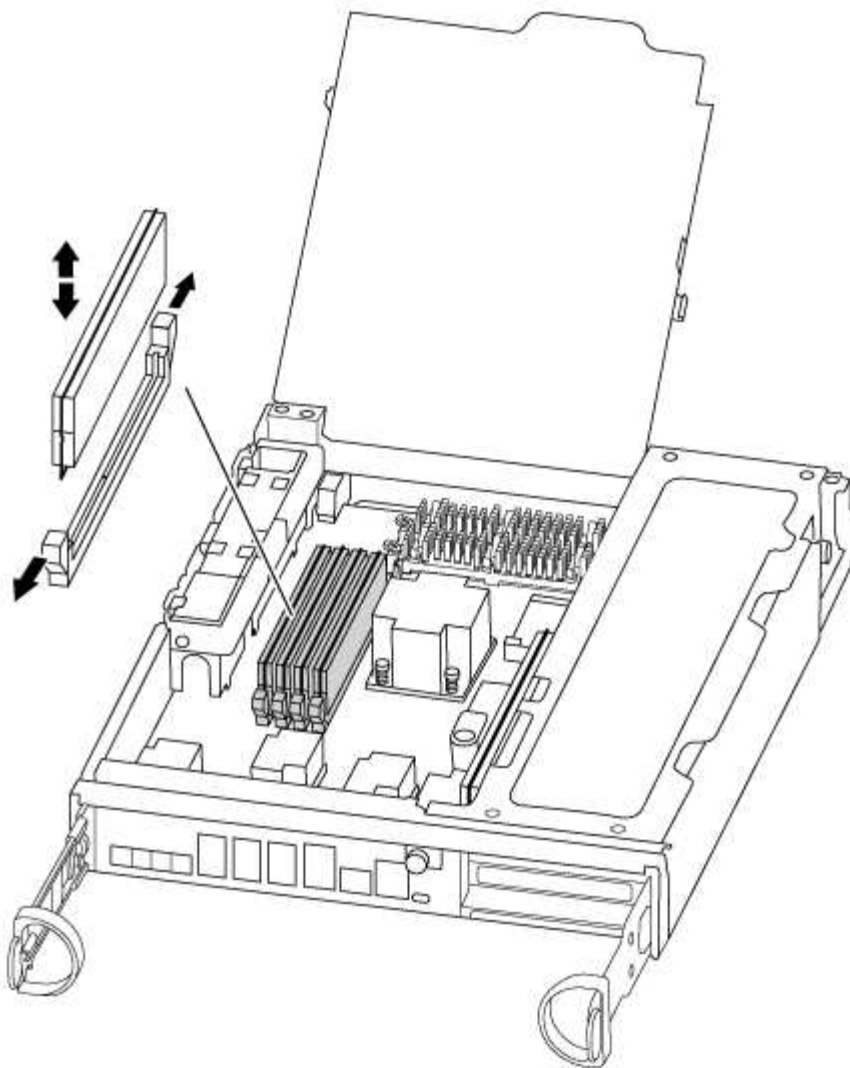
1. Locate the DIMMs on your controller module.
2. Note the orientation of the DIMM in the socket so that you can insert the DIMM in the replacement controller module in the proper orientation.
3. Eject the DIMM from its slot by slowly pushing apart the two DIMM ejector tabs on either side of the DIMM, and then slide the DIMM out of the slot.



Carefully hold the DIMM by the edges to avoid pressure on the components on the DIMM circuit board.

The number and placement of system DIMMs depends on the model of your system.

The following illustration shows the location of system DIMMs:



4. Locate the slot where you are installing the DIMM.
5. Make sure that the DIMM ejector tabs on the connector are in the open position, and then insert the DIMM squarely into the slot.

The DIMM fits tightly in the slot, but should go in easily. If not, realign the DIMM with the slot and reinsert it.



Visually inspect the DIMM to verify that it is evenly aligned and fully inserted into the slot.

6. Repeat these steps for the remaining DIMMs.
7. Move the NVMEM battery to the replacement controller module.
8. Align the tab or tabs on the battery holder with the notches in the controller module side, and then gently push down on the battery housing until the battery housing clicks into place.

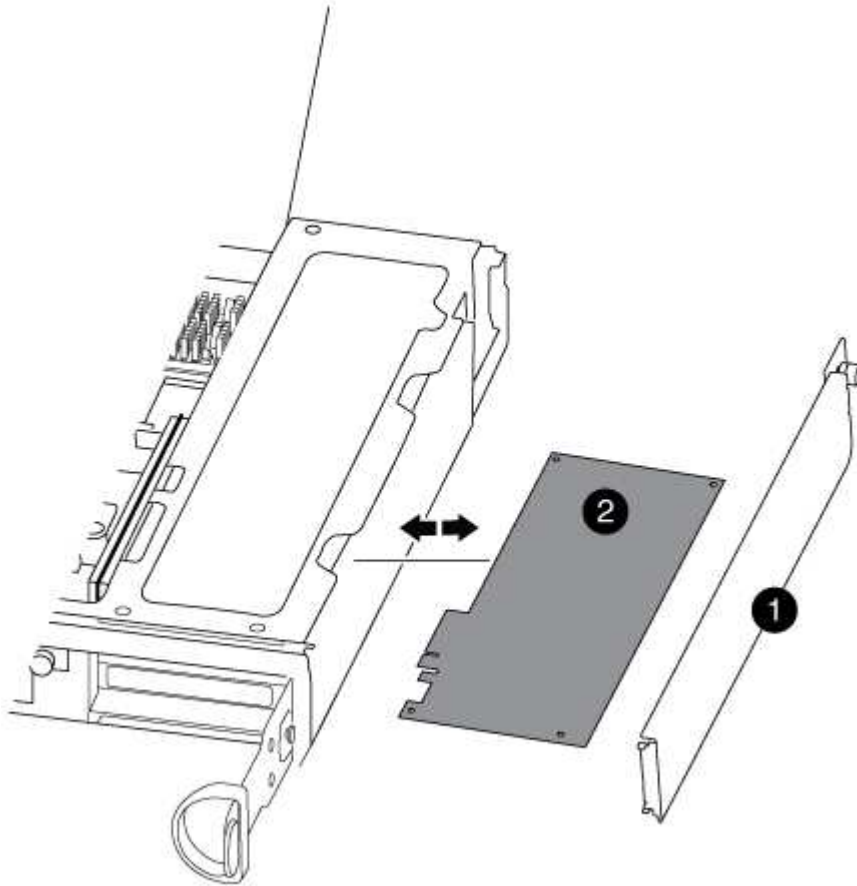
### Step 5: Move a PCIe card

To move PCIe cards, locate and move them from the old controller into the replacement controller and follow the specific sequence of steps.

You must have the new controller module ready so that you can move the PCIe cards directly from the old controller module to the corresponding slots in the new one.



1. Loosen the thumbscrew on the controller module side panel.
2. Swing the side panel off the controller module.



1

Side panel

2

PCIe card

3. Remove the PCIe card from the old controller module and set it aside.

Make sure that you keep track of which slot the PCIe card was in.

4. Repeat the preceding step for the remaining PCIe cards in the old controller module.
5. Open the new controller module side panel, if necessary, slide off the PCIe card filler plate, as needed, and carefully install the PCIe card.

Be sure that you properly align the card in the slot and exert even pressure on the card when seating it in the socket. The card must be fully and evenly seated in the slot.

6. Repeat the preceding step for the remaining PCIe cards that you set aside.

7. Close the side panel and tighten the thumbscrew.

## Step 6: Install the controller

After you install the components from the old controller module into the new controller module, you must install the new controller module into the system chassis and boot the operating system.

For HA pairs with two controller modules in the same chassis, the sequence in which you install the controller module is especially important because it attempts to reboot as soon as you completely seat it in the chassis.



The system might update system firmware when it boots. Do not abort this process. The procedure requires you to interrupt the boot process, which you can typically do at any time after prompted to do so. However, if the system updates the system firmware when it boots, you must wait until after the update is complete before interrupting the boot process.

1. If you are not already grounded, properly ground yourself.
2. If you have not already done so, close the CPU air duct.
3. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.





Do not completely insert the controller module in the chassis until instructed to do so.



4. Cable the management and console ports only, so that you can access the system to perform the tasks in the following sections.



You will connect the rest of the cables to the controller module later in this procedure.

5. Complete the reinstallation of the controller module:

| If your system is in... | Then perform these steps...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| An HA pair              | <div data-bbox="646 184 1429 304"> <p>The controller module begins to boot as soon as it is fully seated in the chassis. Be prepared to interrupt the boot process.</p> </div> <p data-bbox="634 369 1484 504">a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position. Tighten the thumbscrew on the cam handle on back of the controller module.</p> <div data-bbox="699 569 756 625">  </div> <div data-bbox="818 548 1364 651"> <p>Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.</p> </div> <p data-bbox="670 693 1385 758">The controller begins to boot as soon as it is seated in the chassis.</p> <p data-bbox="634 793 1463 858">b. If you have not already done so, reinstall the cable management device.</p> <p data-bbox="634 877 1446 942">c. Bind the cables to the cable management device with the hook and loop strap.</p> <p data-bbox="634 961 1468 1033">d. When you see the message <code>Press Ctrl-C for Boot Menu</code>, press <code>Ctrl-C</code> to interrupt the boot process.</p> <div data-bbox="699 1136 756 1192">  </div> <div data-bbox="818 1079 1451 1251"> <p>If you miss the prompt and the controller module boots to ONTAP, enter <code>halt</code>, and then at the <code>LOADER</code> prompt enter <code>boot_ontap</code>, press <code>Ctrl-C</code> when prompted, and then boot to Maintenance mode.</p> </div> <p data-bbox="634 1295 1484 1360">e. Select the option to boot to Maintenance mode from the displayed menu.</p> |

| If your system is in...     | Then perform these steps...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A stand-alone configuration | <p>a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position. Tighten the thumbscrew on the cam handle on back of the controller module.</p> <div style="display: flex; align-items: center; margin-top: 10px;">  <div> <p>Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.</p> </div> </div> <p>b. If you have not already done so, reinstall the cable management device.</p> <p>c. Bind the cables to the cable management device with the hook and loop strap.</p> <p>d. Reconnect the power cables to the power supplies and to the power sources, turn on the power to start the boot process, and then press <code>Ctrl-C</code> after you see the <code>Press Ctrl-C for Boot Menu</code> message.</p> <div style="display: flex; align-items: center; margin-top: 10px;">  <div> <p>If you miss the prompt and the controller module boots to <code>ONTAP</code>, enter <code>halt</code>, and then at the <code>LOADER</code> prompt enter <code>boot_ontap</code>, press <code>Ctrl-C</code> when prompted, and then boot to Maintenance mode.</p> </div> </div> <p>e. From the boot menu, select the option for Maintenance mode.</p> |

**Important:** During the boot process, you might see the following prompts:

- A prompt warning of a system ID mismatch and asking to override the system ID.
  - A prompt warning that when entering Maintenance mode in an HA configuration you must ensure that the healthy controller remains down.
- You can safely respond `y` to these prompts.

#### Restore and verify the system configuration - AFF A300

After completing the hardware replacement and booting to Maintenance mode, you verify the low-level system configuration of the replacement controller and reconfigure system settings as necessary.

#### Step 1: Set and verify system time after replacing the controller

You should check the time and date on the replacement controller module against the healthy controller module in an HA pair, or against a reliable time server in a stand-alone configuration. If the time and date do not match, you must reset them on the replacement controller module to prevent possible outages on clients due to time differences.

#### About this task

It is important that you apply the commands in the steps on the correct systems:

- The *replacement* node is the new node that replaced the impaired node as part of this procedure.
- The *healthy* node is the HA partner of the *replacement* node.

### Steps

1. If the *replacement* node is not at the LOADER prompt, halt the system to the LOADER prompt.
2. On the *healthy* node, check the system time: `cluster date show`

The date and time are based on the configured timezone.

3. At the LOADER prompt, check the date and time on the *replacement* node: `show date`

The date and time are given in GMT.

4. If necessary, set the date in GMT on the replacement node: `set date mm/dd/yyyy`
5. If necessary, set the time in GMT on the replacement node: `set time hh:mm:ss`
6. At the LOADER prompt, confirm the date and time on the *replacement* node: `show date`

The date and time are given in GMT.

### Step 2: Verify and set the HA state of the controller module

You must verify the HA state of the controller module and, if necessary, update the state to match your system configuration.

1. In Maintenance mode from the new controller module, verify that all components display the same HA state: `ha-config show`

The HA state should be the same for all components.

2. If the displayed system state of the controller module does not match your system configuration, set the HA state for the controller module: `ha-config modify controller ha-state`

The value for HA-state can be one of the following:

- `ha`
- `mcc`
- `mcc-2n`
- `mccip`
- `non-ha`

3. If the displayed system state of the controller module does not match your system configuration, set the HA state for the controller module: `ha-config modify controller ha-state`
4. Confirm that the setting has changed: `ha-config show`

### Recable the system and reassign disks - AFF A300

Continue the replacement procedure by recabling the storage and confirming disk reassignment.

## Step 1: Recable the system

Recable the controller module's storage and network connections.

### Steps

1. Recable the the controller module to storage and network connnections.
2. Verify that the cabling is correct by using [Active IQ Config Advisor](#).
  - a. Download and install Config Advisor.
  - b. Enter the information for the target system, and then click Collect Data.
  - c. Click the Cabling tab, and then examine the output. Make sure that all disk shelves are displayed and all disks appear in the output, correcting any cabling issues you find.
  - d. Check other cabling by clicking the appropriate tab, and then examining the output from Config Advisor.

## Step 2: Reassign disks

If the storage system is in an HA pair, the system ID of the new controller module is automatically assigned to the disks when the giveback occurs at the end of the procedure. You must use the correct procedure for your configuration.

### Option 1: Verify the system ID change on an HA system

You must confirm the system ID change when you boot the *replacement* node and then verify that the change was implemented.

This procedure applies only to systems running ONTAP in an HA pair.

1. If the *replacement* node is in Maintenance mode (showing the `*>` prompt, exit Maintenance mode and go to the LOADER prompt: `halt`
2. From the LOADER prompt on the *replacement* node, boot the node, entering `y` if you are prompted to override the system ID due to a system ID mismatch: `boot_ontap`
3. Wait until the `Waiting for giveback...` message is displayed on the *replacement* node console and then, from the healthy node, verify that the new partner system ID has been automatically assigned:  
`storage failover show`

In the command output, you should see a message that the system ID has changed on the impaired node, showing the correct old and new IDs. In the following example, node2 has undergone replacement and has a new system ID of 151759706.

```
node1> `storage failover show`
```

| Node           | Partner | Takeover<br>Possible | State Description                     |
|----------------|---------|----------------------|---------------------------------------|
| -----          | -----   | -----                |                                       |
| -----          |         |                      |                                       |
| node1          | node2   | false                | System ID changed on<br>partner (Old: |
|                |         |                      | 151759706), In takeover               |
|                |         |                      | 151759755, New:                       |
| node2          | node1   | -                    | Waiting for giveback                  |
| (HA mailboxes) |         |                      |                                       |

4. From the healthy node, verify that any coredumps are saved:

- a. Change to the advanced privilege level: `set -privilege advanced`

You can respond `y` when prompted to continue into advanced mode. The advanced mode prompt appears (`*>`).

- b. Save any coredumps: `system node run -node local-node-name partner savecore`

- c. Wait for the `savecore` command to complete before issuing the giveback.

You can enter the following command to monitor the progress of the `savecore` command: `system node run -node local-node-name partner savecore -s`

- d. Return to the admin privilege level: `set -privilege admin`

5. If your storage system has Storage or Volume Encryption configured, you must restore Storage or Volume Encryption functionality by using one of the following procedures, depending on whether you are using onboard or external key management:

- [Restore onboard key management encryption keys](#)
- [Restore external key management encryption keys](#)

6. Give back the node:

- a. From the healthy node, give back the replaced node's storage: `storage failover giveback -ofnode replacement_node_name`

The *replacement* node takes back its storage and completes booting.

If you are prompted to override the system ID due to a system ID mismatch, you should enter `y`.



If the giveback is vetoed, you can consider overriding the vetoes.

[Find the High-Availability Configuration content for your version of ONTAP 9](#)

- b. After the giveback has been completed, confirm that the HA pair is healthy and that takeover is possible: `storage failover show`

The output from the `storage failover show` command should not include the System ID changed

on partner message.

7. Verify that the disks were assigned correctly: `storage disk show -ownership`

The disks belonging to the *replacement* node should show the new system ID. In the following example, the disks owned by node1 now show the new system ID, 1873775277:

```
node1> `storage disk show -ownership`

Disk Aggregate Home Owner DR Home Home ID Owner ID DR Home ID
Reserver Pool

1.0.0 aggr0_1 node1 node1 - 1873775277 1873775277 -
1873775277 Pool0
1.0.1 aggr0_1 node1 node1 1873775277 1873775277 -
1873775277 Pool0
.
.
.
```

## Option 2: Manually reassign the system ID on systems in a two-node MetroCluster configuration

In a two-node MetroCluster configuration running ONTAP, you must manually reassign disks to the new controller's system ID before you return the system to normal operating condition.

### About this task

This procedure applies only to systems in a two-node MetroCluster configuration running ONTAP.

You must be sure to issue the commands in this procedure on the correct node:

- The *impaired* node is the node on which you are performing maintenance.
- The *replacement* node is the new node that replaced the impaired node as part of this procedure.
- The *healthy* node is the DR partner of the impaired node.

### Steps

1. If you have not already done so, reboot the *replacement* node, interrupt the boot process by entering `Ctrl-C`, and then select the option to boot to Maintenance mode from the displayed menu.

You must enter `Y` when prompted to override the system ID due to a system ID mismatch.

2. View the old system IDs from the healthy node: ``metrocluster node show -fields node-systemid,dr-partner-systemid``

In this example, the `Node_B_1` is the old node, with the old system ID of 118073209:



```

dr-group-id cluster node node-systemid dr-
partner-systemid

1 Cluster_A Node_A_1 536872914
118073209
1 Cluster_B Node_B_1 118073209
536872914
2 entries were displayed.

```

3. View the new system ID at the Maintenance mode prompt on the impaired node: `disk show`

In this example, the new system ID is 118065481:

```

Local System ID: 118065481
...
...

```

4. Reassign disk ownership (for FAS systems) or LUN ownership (for FlexArray systems), by using the system ID information obtained from the `disk show` command: `disk reassign -s old system ID`

In the case of the preceding example, the command is: `disk reassign -s 118073209`

You can respond `Y` when prompted to continue.

5. Verify that the disks (or FlexArray LUNs) were assigned correctly: `disk show -a`

Verify that the disks belonging to the *replacement* node show the new system ID for the *replacement* node. In the following example, the disks owned by system-1 now show the new system ID, 118065481:

```

*> disk show -a
Local System ID: 118065481

 DISK OWNER POOL SERIAL NUMBER HOME

disk_name system-1 (118065481) Pool0 J8Y0TDZC system-1
(118065481)
disk_name system-1 (118065481) Pool0 J8Y09DXC system-1
(118065481)
.
.
.

```

6. From the healthy node, verify that any coredumps are saved:

- a. Change to the advanced privilege level: `set -privilege advanced`

You can respond `Y` when prompted to continue into advanced mode. The advanced mode prompt appears (`*>`).

- b. Verify that the coredumps are saved: `system node run -node local-node-name partner savecore`

If the command output indicates that `savecore` is in progress, wait for `savecore` to complete before issuing the giveback. You can monitor the progress of the `savecore` using the `system node run -node local-node-name partner savecore -s command.</info>`.

- c. Return to the admin privilege level: `set -privilege admin`

7. If the *replacement* node is in Maintenance mode (showing the `*>` prompt), exit Maintenance mode and go to the LOADER prompt: `halt`
8. Boot the *replacement* node: `boot_ontap`
9. After the *replacement* node has fully booted, perform a switchback: `metrocluster switchback`
10. Verify the MetroCluster configuration: `metrocluster node show - fields configuration-state`

```
node1_siteA::> metrocluster node show -fields configuration-state
```

| dr-group-id   | cluster node | configuration-state |
|---------------|--------------|---------------------|
| -----         | -----        | -----               |
| 1 node1_siteA | node1mcc-001 | configured          |
| 1 node1_siteA | node1mcc-002 | configured          |
| 1 node1_siteB | node1mcc-003 | configured          |
| 1 node1_siteB | node1mcc-004 | configured          |

4 entries were displayed.

11. Verify the operation of the MetroCluster configuration in Data ONTAP:
  - a. Check for any health alerts on both clusters: `system health alert show`
  - b. Confirm that the MetroCluster is configured and in normal mode: `metrocluster show`
  - c. Perform a MetroCluster check: `metrocluster check run`
  - d. Display the results of the MetroCluster check: `metrocluster check show`
  - e. Run Config Advisor. Go to the Config Advisor page on the NetApp Support Site at [support.netapp.com/NOW/download/tools/config\\_advisor/](https://support.netapp.com/NOW/download/tools/config_advisor/).

After running Config Advisor, review the tool's output and follow the recommendations in the output to address any issues discovered.

12. Simulate a switchover operation:
  - a. From any node's prompt, change to the advanced privilege level: `set -privilege advanced`

You need to respond with `y` when prompted to continue into advanced mode and see the advanced mode prompt (`*>`).

- b. Perform the switchback operation with the `-simulate` parameter: `metrocluster switchover -simulate`
- c. Return to the admin privilege level: `set -privilege admin`

### Complete system restoration - AFF A300

To restore your system to full operation, you must restore the NetApp Storage Encryption configuration (if necessary), and install licenses for the new controller, and return the failed part to NetApp, as described in the RMA instructions shipped with the kit.

### Step 1: Install licenses for the replacement node in ONTAP

You must install new licenses for the *replacement* node if the impaired node was using ONTAP features that require a standard (node-locked) license. For features with standard licenses, each node in the cluster should have its own key for the feature.

#### About this task

Until you install license keys, features requiring standard licenses continue to be available to the *replacement* node. However, if the impaired node was the only node in the cluster with a license for the feature, no configuration changes to the feature are allowed. Also, using unlicensed features on the node might put you out of compliance with your license agreement, so you should install the replacement license key or keys on the *replacement* node as soon as possible.

#### Before you begin

The licenses keys must be in the 28-character format.

You have a 90-day grace period in which to install the license keys. After the grace period, all old licenses are invalidated. After a valid license key is installed, you have 24 hours to install all of the keys before the grace period ends.

#### Steps

1. If you need new license keys, obtain replacement license keys on the [NetApp Support Site](#) in the My Support section under Software licenses.



The new license keys that you require are automatically generated and sent to the email address on file. If you fail to receive the email with the license keys within 30 days, you should contact technical support.

2. Install each license key: `system license add -license-code license-key, license-key...`
3. Remove the old licenses, if desired:
  - a. Check for unused licenses: `license clean-up -unused -simulate`
  - b. If the list looks correct, remove the unused licenses: `license clean-up -unused`

### Step 2: Verify LIFs and register the serial number

Before returning the *replacement* node to service, you should verify that the LIFs are on their home ports, and register the serial number of the *replacement* node if AutoSupport is enabled, and reset automatic giveback.

## Steps

1. Verify that the logical interfaces are reporting to their home server and ports: `network interface show -is-home false`  
  
If any LIFs are listed as false, revert them to their home ports: `network interface revert -vserver * -lif *`
2. Register the system serial number with NetApp Support.
  - If AutoSupport is enabled, send an AutoSupport message to register the serial number.
  - If AutoSupport is not enabled, call [NetApp Support](#) to register the serial number.
3. If an AutoSupport maintenance window was triggered, end it by using the `system node autosupport invoke -node * -type all -message MAINT=END` command.
4. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`

## Step 3: Switch back aggregates in a two-node MetroCluster configuration

After you have completed the FRU replacement in a two-node MetroCluster configuration, you can perform the MetroCluster switchback operation. This returns the configuration to its normal operating state, with the sync-source storage virtual machines (SVMs) on the formerly impaired site now active and serving data from the local disk pools.

This task only applies to two-node MetroCluster configurations.

## Steps

1. Verify that all nodes are in the enabled state: `metrocluster node show`

```
cluster_B::> metrocluster node show
```

| DR                  | Configuration             | DR                  |
|---------------------|---------------------------|---------------------|
| Group Cluster Node  | State                     | Mirroring Mode      |
| -----               |                           |                     |
| -----               |                           |                     |
| 1                   | cluster_A                 |                     |
|                     | controller_A_1 configured | enabled heal roots  |
| completed           |                           |                     |
|                     | cluster_B                 |                     |
|                     | controller_B_1 configured | enabled waiting for |
| switchback recovery |                           |                     |

2 entries were displayed.

2. Verify that resynchronization is complete on all SVMs: `metrocluster vserver show`
3. Verify that any automatic LIF migrations being performed by the healing operations were completed successfully: `metrocluster check lif show`
4. Perform the switchback by using the `metrocluster switchback` command from any node in the surviving cluster.

5. Verify that the switchback operation has completed: `metrocluster show`

The switchback operation is still running when a cluster is in the `waiting-for-switchback` state:

```
cluster_B::> metrocluster show
Cluster Configuration State Mode

Local: cluster_B configured switchover
Remote: cluster_A configured waiting-for-switchback
```

The switchback operation is complete when the clusters are in the `normal` state.:

```
cluster_B::> metrocluster show
Cluster Configuration State Mode

Local: cluster_B configured normal
Remote: cluster_A configured normal
```

If a switchback is taking a long time to finish, you can check on the status of in-progress baselines by using the `metrocluster config-replication resync-status show` command.

6. Reestablish any SnapMirror or SnapVault configurations.

#### Step 4: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

#### Replace a DIMM - AFF A300

You must replace a DIMM in the controller module when your system registers an increasing number of correctable error correction codes (ECC); failure to do so causes a system panic.

All other components in the system must be functioning properly; if not, you must contact technical support.

You must replace the failed component with a replacement FRU component you received from your provider.

##### Step 1: Shut down the impaired controller

Shut down or take over the impaired controller using the appropriate procedure for your configuration.

## Option 1: Most configurations

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

### About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced` mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

### Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:  

```
system node autosupport invoke -node * -type all -message MAINT=<# of hours>h
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller: 

```
storage failover modify -node local -auto-giveback false
```



When you see *Do you want to disable auto-giveback?*, enter *y*.

3. Take the impaired controller to the LOADER prompt:

| If the impaired controller is displaying... | Then...                                                                                                                                                                                                                                                            |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                           | Go to the next step.                                                                                                                                                                                                                                               |
| Waiting for giveback...                     | Press Ctrl-C, and then respond <i>y</i> when prompted.                                                                                                                                                                                                             |
| System prompt or password prompt            | <p>Take over or halt the impaired controller from the healthy controller: <code>storage failover takeover -ofnode <i>impaired_node_name</i></code></p> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i>.</p> |

## Option 2: Controller is in a two-node MetroCluster

To shut down the impaired controller, you must determine the status of the controller and, if necessary,

switch over the controller so that the healthy controller continues to serve data from the impaired controller storage.

#### About this task

- You must leave the power supplies turned on at the end of this procedure to provide power to the healthy controller.

#### Steps

1. Check the MetroCluster status to determine whether the impaired controller has automatically switched over to the healthy controller: `metrocluster show`
2. Depending on whether an automatic switchover has occurred, proceed according to the following table:

| If the impaired controller...                                                                                                                      | Then...                                                                                                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Has automatically switched over                                                                                                                    | Proceed to the next step.                                                                                                                      |
| Has not automatically switched over                                                                                                                | Perform a planned switchover operation from the healthy controller: <code>metrocluster switchover</code>                                       |
| Has not automatically switched over, you attempted switchover with the <code>metrocluster switchover</code> command, and the switchover was vetoed | Review the veto messages and, if possible, resolve the issue and try again. If you are unable to resolve the issue, contact technical support. |

3. Resynchronize the data aggregates by running the `metrocluster heal -phase aggregates` command from the surviving cluster.

```
controller_A_1::> metrocluster heal -phase aggregates
[Job 130] Job succeeded: Heal Aggregates is successful.
```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

4. Verify that the operation has been completed by using the `metrocluster operation show` command.

```
controller_A_1::> metrocluster operation show
Operation: heal-aggregates
State: successful
Start Time: 7/25/2016 18:45:55
End Time: 7/25/2016 18:45:56
Errors: -
```

5. Check the state of the aggregates by using the `storage aggregate show` command.

```

controller_A_1::> storage aggregate show
Aggregate Size Available Used% State #Vols Nodes
RAID Status

...
aggr_b2 227.1GB 227.1GB 0% online 0 mcc1-a2
raid_dp, mirrored, normal...

```

6. Heal the root aggregates by using the `metrocluster heal -phase root-aggregates` command.

```

mcc1A::> metrocluster heal -phase root-aggregates
[Job 137] Job succeeded: Heal Root Aggregates is successful

```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

7. Verify that the heal operation is complete by using the `metrocluster operation show` command on the destination cluster:

```

mcc1A::> metrocluster operation show
Operation: heal-root-aggregates
State: successful
Start Time: 7/29/2016 20:54:41
End Time: 7/29/2016 20:54:42
Errors: -

```

8. On the impaired controller module, disconnect the power supplies.

## Step 2: Open the controller module

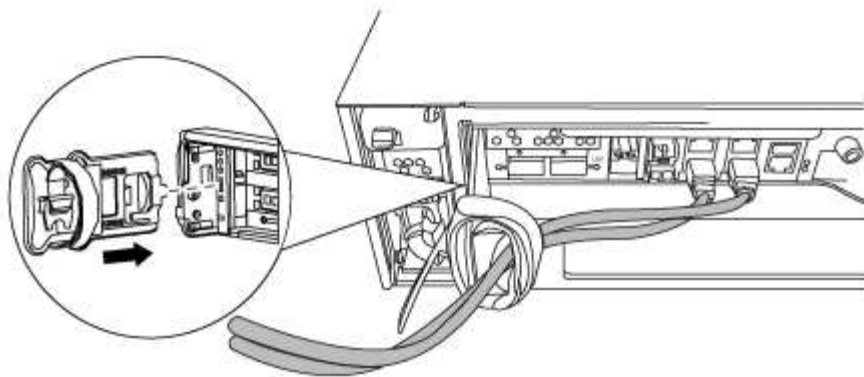
To access components inside the controller, you must first remove the controller module from the system and then remove the cover on the controller module.

1. If you are not already grounded, properly ground yourself.
2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

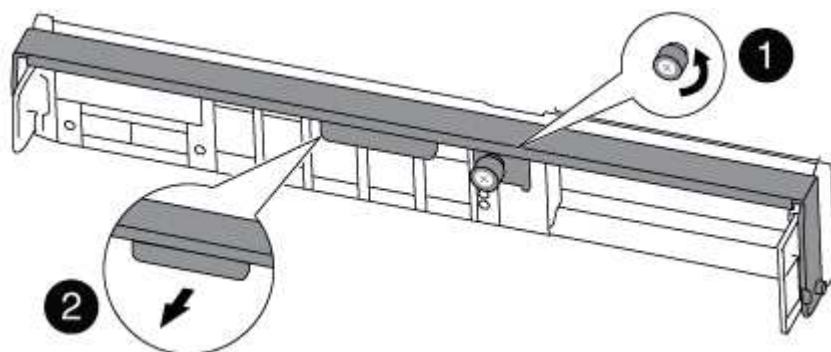
Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

3. Remove and set aside the cable management devices from the left and right sides of the controller module.





4. Loosen the thumbscrew on the cam handle on the controller module.



|   |            |
|---|------------|
| 1 | Thumbscrew |
| 2 | Cam handle |

5. Pull the cam handle downward and begin to slide the controller module out of the chassis.

Make sure that you support the bottom of the controller module as you slide it out of the chassis.

### Step 3: Replace the DIMMs

To replace the DIMMs, locate them inside the controller and follow the specific sequence of steps.

1. If you are not already grounded, properly ground yourself.
2. Check the NVMEM LED on the controller module.

You must perform a clean system shutdown before replacing system components to avoid losing unwritten data in the nonvolatile memory (NVMEM). The LED is located on the back of the controller module. Look for the following icon:



3. If the NVMEM LED is not flashing, there is no content in the NVMEM; you can skip the following steps and

proceed to the next task in this procedure.

#### 4. Unplug the battery:

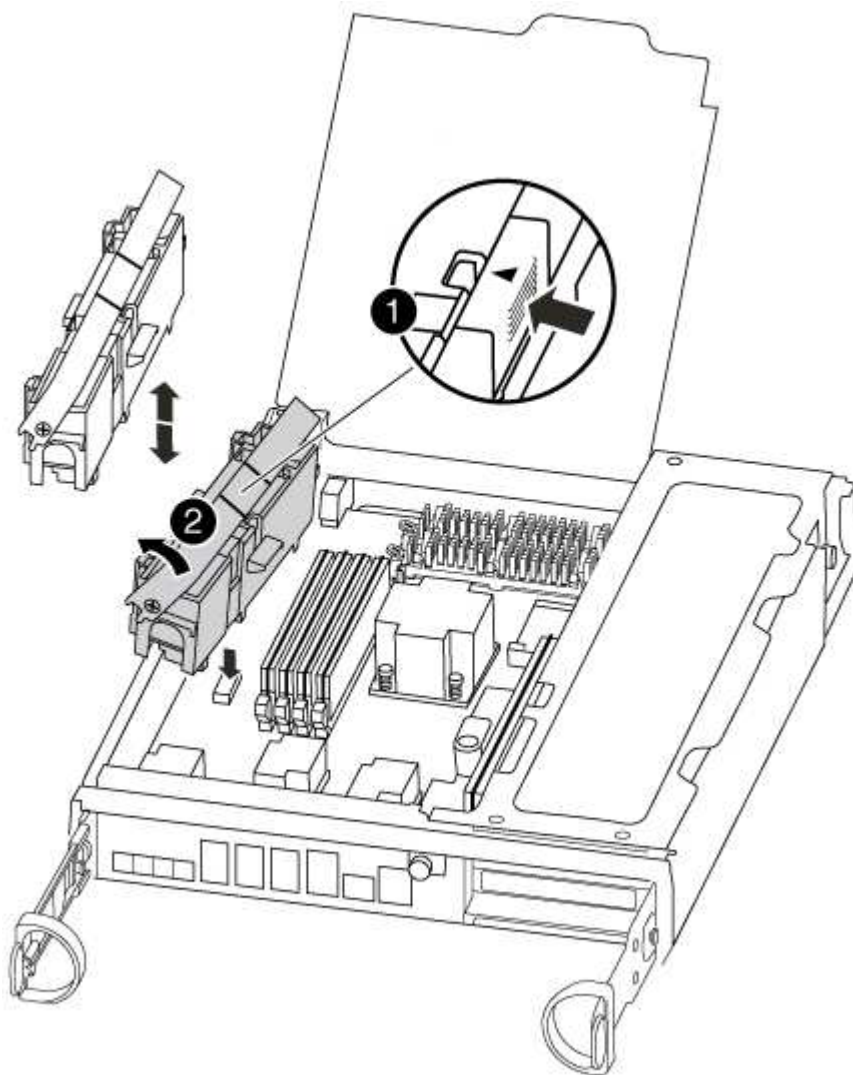


The NVMEM LED blinks while destaging contents to the flash memory when you halt the system. After the destage is complete, the LED turns off.

- If power is lost without a clean shutdown, the NVMEM LED flashes until the destage is complete, and then the LED turns off.
- If the LED is on and power is on, unwritten data is stored on NVMEM.

This typically occurs during an uncontrolled shutdown after Data ONTAP has successfully booted.

- a. Open the CPU air duct and locate the NVMEM battery.



|   |                        |
|---|------------------------|
| 1 | NVMEM battery lock tab |
| 2 | NVMEM battery          |

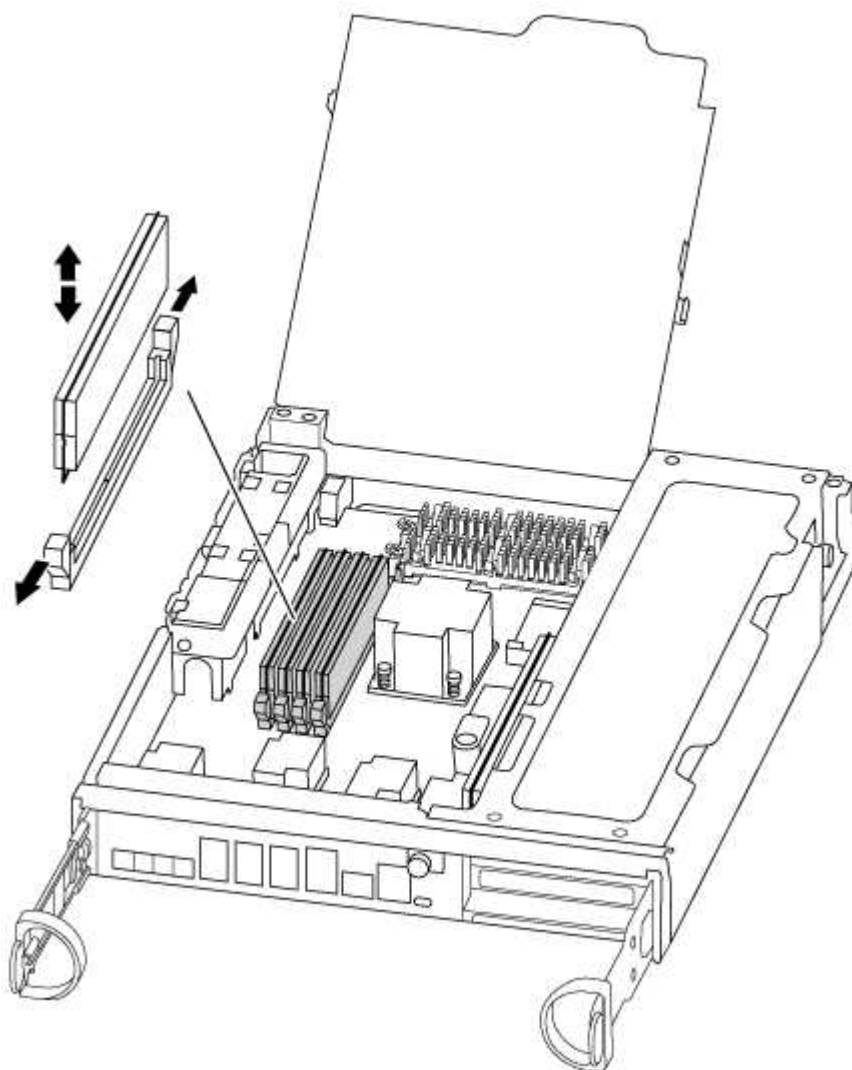
- b. Locate the battery plug and squeeze the clip on the face of the battery plug to release the plug from the socket, and then unplug the battery cable from the socket.
  - c. Wait a few seconds, and then plug the battery back into the socket.
5. Return to step 2 of this procedure to recheck the NVMEM LED.
6. Locate the DIMMs on your controller module.
7. Note the orientation of the DIMM in the socket so that you can insert the replacement DIMM in the proper orientation.
8. Eject the DIMM from its slot by slowly pushing apart the two DIMM ejector tabs on either side of the DIMM, and then slide the DIMM out of the slot.



Carefully hold the DIMM by the edges to avoid pressure on the components on the DIMM circuit board.

The number and placement of system DIMMs depends on the model of your system.

The following illustration shows the location of system DIMMs:



9. Remove the replacement DIMM from the antistatic shipping bag, hold the DIMM by the corners, and align it to the slot.

The notch among the pins on the DIMM should line up with the tab in the socket.

10. Make sure that the DIMM ejector tabs on the connector are in the open position, and then insert the DIMM squarely into the slot.

The DIMM fits tightly in the slot, but should go in easily. If not, realign the DIMM with the slot and reinsert it.



Visually inspect the DIMM to verify that it is evenly aligned and fully inserted into the slot.

11. Push carefully, but firmly, on the top edge of the DIMM until the ejector tabs snap into place over the notches at the ends of the DIMM.
12. Locate the NVMEM battery plug socket, and then squeeze the clip on the face of the battery cable plug to insert it into the socket.

Make sure that the plug locks down onto the controller module.

13. Close the controller module cover.

#### Step 4: Reinstall the controller

After you replace a component within the controller module, you must reinstall the controller module in the system chassis.

1. If you are not already grounded, properly ground yourself.
2. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.



Do not completely insert the controller module in the chassis until instructed to do so.

3. Recable the system, as needed.

If you removed the media converters (QSFPs or SFPs), remember to reinstall them if you are using fiber optic cables.

4. Complete the reinstallation of the controller module:

The controller module begins to boot as soon as it is fully seated in the chassis.

- a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position.



Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.

- b. Tighten the thumbscrew on the cam handle on back of the controller module.
- c. If you have not already done so, reinstall the cable management device.
- d. Bind the cables to the cable management device with the hook and loop strap.

#### Step 5: (Two-node MetroCluster only): Switch back aggregates

After you have completed the FRU replacement in a two-node MetroCluster configuration, you can perform the MetroCluster switchback operation. This returns the configuration to its normal operating state, with the sync-

source storage virtual machines (SVMs) on the formerly impaired site now active and serving data from the local disk pools.

This task only applies to two-node MetroCluster configurations.

**Steps**

- 1. Verify that all nodes are in the enabled state: `metrocluster node show`

```
cluster_B::> metrocluster node show

DR Configuration DR
Group Cluster Node State Mirroring Mode

1 cluster_A
 controller_A_1 configured enabled heal roots
completed
 cluster_B
 controller_B_1 configured enabled waiting for
switchback recovery
2 entries were displayed.
```

- 2. Verify that resynchronization is complete on all SVMs: `metrocluster vserver show`
- 3. Verify that any automatic LIF migrations being performed by the healing operations were completed successfully: `metrocluster check lif show`
- 4. Perform the switchback by using the `metrocluster switchback` command from any node in the surviving cluster.
- 5. Verify that the switchback operation has completed: `metrocluster show`

The switchback operation is still running when a cluster is in the waiting-for-switchback state:

```
cluster_B::> metrocluster show

Cluster Configuration State Mode

Local: cluster_B configured switchover
Remote: cluster_A configured waiting-for-switchback
```

The switchback operation is complete when the clusters are in the normal state.:

```
cluster_B::> metrocluster show
Cluster Configuration State Mode

Local: cluster_B configured normal
Remote: cluster_A configured normal
```

If a switchback is taking a long time to finish, you can check on the status of in-progress baselines by using the `metrocluster config-replication resync-status show` command.

6. Reestablish any SnapMirror or SnapVault configurations.

#### Step 6: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

#### Swap out a fan - AFF A300

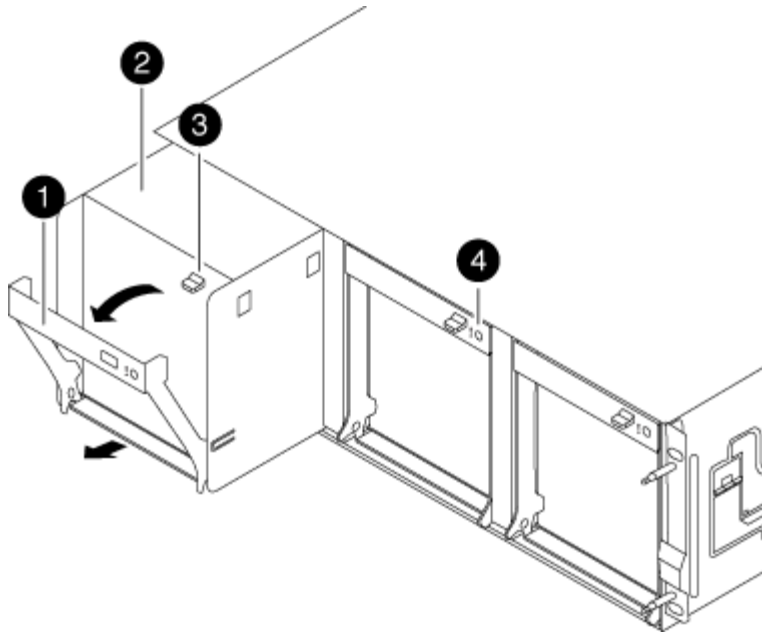
To swap out a fan module without interrupting service, you must perform a specific sequence of tasks.



You must replace the fan module within two minutes of removing it from the chassis. System airflow is disrupted and the controller module or modules shut down after two minutes to avoid overheating.

1. If you are not already grounded, properly ground yourself.
2. Remove the bezel (if necessary) with two hands, by grasping the openings on each side of the bezel, and then pulling it toward you until the bezel releases from the ball studs on the chassis frame.
3. Identify the fan module that you must replace by checking the console error messages and looking at the Attention LED on each fan module.
4. Press down the release latch on the fan module cam handle, and then pull the cam handle downward.

The fan module moves a little bit away from the chassis.



|   |                          |
|---|--------------------------|
| 1 | Cam handle               |
| 2 | Fan module               |
| 2 | Cam handle release latch |
| 4 | Fan module Attention LED |

5. Pull the fan module straight out from the chassis, making sure that you support it with your free hand so that it does not swing out of the chassis.



The fan modules are short. Always support the bottom of the fan module with your free hand so that it does not suddenly drop free from the chassis and injure you.

6. Set the fan module aside.
7. Insert the replacement fan module into the chassis by aligning it with the opening, and then sliding it into the chassis.
8. Push firmly on the fan module cam handle so that it is seated all the way into the chassis.

The cam handle raises slightly when the fan module is completely seated.

9. Swing the cam handle up to its closed position, making sure that the cam handle release latch clicks into the locked position.

The fan LED should be green after the fan is seated and has spun up to operational speed.

10. Align the bezel with the ball studs, and then gently push the bezel onto the ball studs.
11. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

## **Replace the NVMEM battery - AFF A300**

To replace an NVMEM battery in the system, you must remove the controller module from the system, open it, replace the battery, and close and replace the controller module.

All other components in the system must be functioning properly; if not, you must contact technical support.

### **Step 1: Shut down the impaired controller**

You can shut down or take over the impaired controller using different procedures, depending on the storage system hardware configuration.



## Option 1: Most configurations

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

### About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced` mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

### Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message MAINT=<# of hours>h
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`



When you see *Do you want to disable auto-giveback?*, enter *y*.

3. Take the impaired controller to the LOADER prompt:

| If the impaired controller is displaying... | Then...                                                                                                                                                                                                                                                            |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                           | Go to the next step.                                                                                                                                                                                                                                               |
| Waiting for giveback...                     | Press Ctrl-C, and then respond <i>y</i> when prompted.                                                                                                                                                                                                             |
| System prompt or password prompt            | <p>Take over or halt the impaired controller from the healthy controller: <code>storage failover takeover -ofnode <i>impaired_node_name</i></code></p> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i>.</p> |

## Option 2: Controller is in a two-node MetroCluster

To shut down the impaired controller, you must determine the status of the controller and, if necessary,

switch over the controller so that the healthy controller continues to serve data from the impaired controller storage.

#### About this task

- You must leave the power supplies turned on at the end of this procedure to provide power to the healthy controller.

#### Steps

1. Check the MetroCluster status to determine whether the impaired controller has automatically switched over to the healthy controller: `metrocluster show`
2. Depending on whether an automatic switchover has occurred, proceed according to the following table:

| If the impaired controller...                                                                                                                      | Then...                                                                                                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Has automatically switched over                                                                                                                    | Proceed to the next step.                                                                                                                      |
| Has not automatically switched over                                                                                                                | Perform a planned switchover operation from the healthy controller: <code>metrocluster switchover</code>                                       |
| Has not automatically switched over, you attempted switchover with the <code>metrocluster switchover</code> command, and the switchover was vetoed | Review the veto messages and, if possible, resolve the issue and try again. If you are unable to resolve the issue, contact technical support. |

3. Resynchronize the data aggregates by running the `metrocluster heal -phase aggregates` command from the surviving cluster.

```
controller_A_1::> metrocluster heal -phase aggregates
[Job 130] Job succeeded: Heal Aggregates is successful.
```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

4. Verify that the operation has been completed by using the `metrocluster operation show` command.

```
controller_A_1::> metrocluster operation show
Operation: heal-aggregates
State: successful
Start Time: 7/25/2016 18:45:55
End Time: 7/25/2016 18:45:56
Errors: -
```

5. Check the state of the aggregates by using the `storage aggregate show` command.

```

controller_A_1::> storage aggregate show
Aggregate Size Available Used% State #Vols Nodes
RAID Status

...
aggr_b2 227.1GB 227.1GB 0% online 0 mcc1-a2
raid_dp, mirrored, normal...

```

6. Heal the root aggregates by using the `metrocluster heal -phase root-aggregates` command.

```

mcc1A::> metrocluster heal -phase root-aggregates
[Job 137] Job succeeded: Heal Root Aggregates is successful

```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

7. Verify that the heal operation is complete by using the `metrocluster operation show` command on the destination cluster:

```

mcc1A::> metrocluster operation show
Operation: heal-root-aggregates
State: successful
Start Time: 7/29/2016 20:54:41
End Time: 7/29/2016 20:54:42
Errors: -

```

8. On the impaired controller module, disconnect the power supplies.

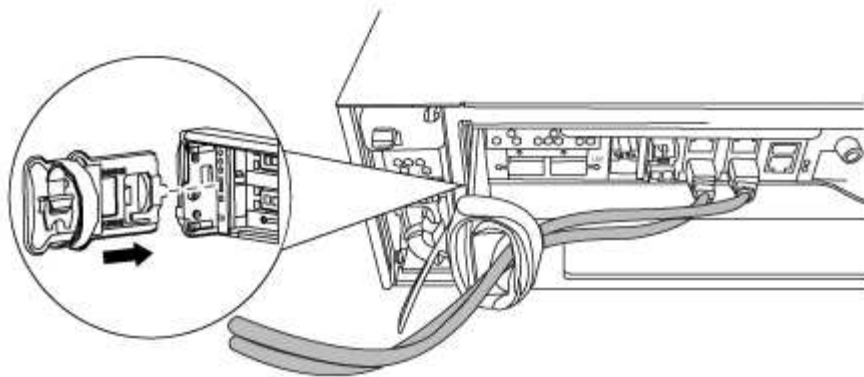
## Step 2: Open the controller module

To access components inside the controller, you must first remove the controller module from the system and then remove the cover on the controller module.

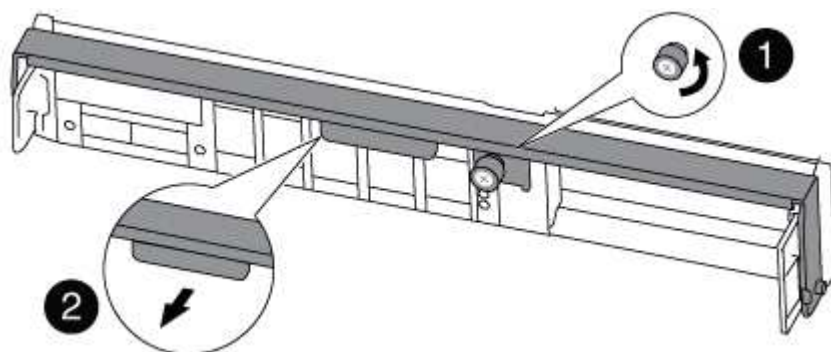
1. If you are not already grounded, properly ground yourself.
2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

3. Remove and set aside the cable management devices from the left and right sides of the controller module.



4. Loosen the thumbscrew on the cam handle on the controller module.



|   |            |
|---|------------|
| 1 | Thumbscrew |
| 2 | Cam handle |

5. Pull the cam handle downward and begin to slide the controller module out of the chassis.

Make sure that you support the bottom of the controller module as you slide it out of the chassis.

### Step 3: Replace the NVMEM battery

To replace the NVMEM battery in your system, you must remove the failed NVMEM battery from the system and replace it with a new NVMEM battery.

1. If you are not already grounded, properly ground yourself.
2. Check the NVMEM LED:
  - If your system is in an HA configuration, go to the next step.
  - If your system is in a stand-alone configuration, cleanly shut down the controller module, and then check the NVRAM LED identified by the NV icon.



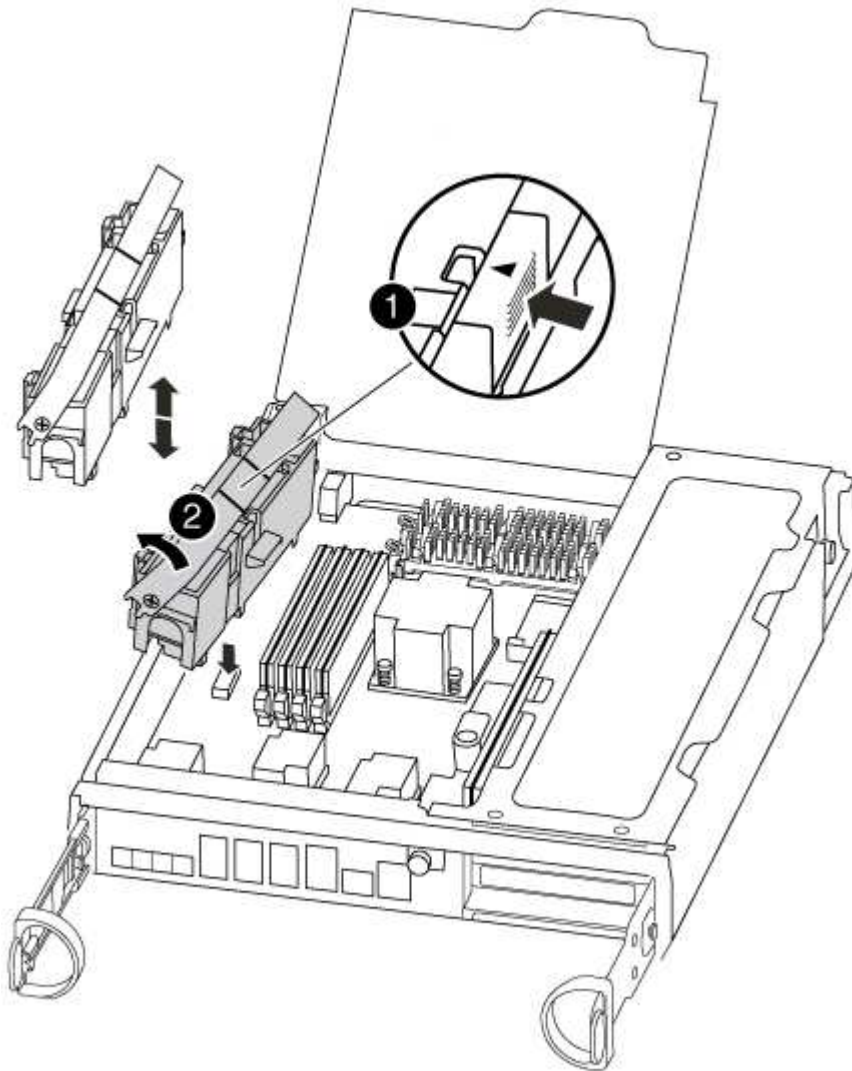


The NVRAM LED blinks while destaging contents to the flash memory when you halt the system. After the destage is complete, the LED turns off.

- If power is lost without a clean shutdown, the NVMEM LED flashes until the destage is complete, and then the LED turns off.
- If the LED is on and power is on, unwritten data is stored on NVMEM.

This typically occurs during an uncontrolled shutdown after ONTAP has successfully booted.

3. Open the CPU air duct and locate the NVMEM battery.



|   |                    |
|---|--------------------|
| 1 | Battery lock tab   |
| 2 | NVMEM battery pack |

4. Grasp the battery and press the blue locking tab marked PUSH, and then lift the battery out of the holder and controller module.
5. Remove the replacement battery from its package.

6. Align the tab or tabs on the battery holder with the notches in the controller module side, and then gently push down on the battery housing until the battery housing clicks into place.
7. Close the CPU air duct.

Make sure that the plug locks down to the socket.

#### Step 4: Reinstall the controller

After you replace a component within the controller module, you must reinstall the controller module in the system chassis and boot it.

1. If you are not already grounded, properly ground yourself.
2. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.



Do not completely insert the controller module in the chassis until instructed to do so.

3. Recable the system, as needed.

If you removed the media converters (QSFPs or SFPs), remember to reinstall them if you are using fiber optic cables.

4. Complete the reinstallation of the controller module:

The controller module begins to boot as soon as it is fully seated in the chassis.

- a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position.



Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.

- b. Tighten the thumbscrew on the cam handle on back of the controller module.
- c. If you have not already done so, reinstall the cable management device.
- d. Bind the cables to the cable management device with the hook and loop strap.

#### Step 5: (two-node MetroCluster only): Switch back aggregates

After you have completed the FRU replacement in a two-node MetroCluster configuration, you can perform the MetroCluster switchback operation. This returns the configuration to its normal operating state, with the sync-source storage virtual machines (SVMs) on the formerly impaired site now active and serving data from the local disk pools.

This task only applies to two-node MetroCluster configurations.

#### Steps

1. Verify that all nodes are in the `enabled` state: `metrocluster node show`

```
cluster_B::> metrocluster node show
```

| DR                        |                     | Configuration | DR                  |
|---------------------------|---------------------|---------------|---------------------|
| Group                     | Cluster Node        | State         | Mirroring Mode      |
| -----                     | -----               | -----         | -----               |
| 1                         | cluster_A           |               |                     |
|                           | controller_A_1      | configured    | enabled heal roots  |
| completed                 | cluster_B           |               |                     |
|                           | controller_B_1      | configured    | enabled waiting for |
|                           | switchback recovery |               |                     |
| 2 entries were displayed. |                     |               |                     |

2. Verify that resynchronization is complete on all SVMs: `metrocluster vserver show`
3. Verify that any automatic LIF migrations being performed by the healing operations were completed successfully: `metrocluster check lif show`
4. Perform the switchback by using the `metrocluster switchback` command from any node in the surviving cluster.
5. Verify that the switchback operation has completed: `metrocluster show`

The switchback operation is still running when a cluster is in the **waiting-for-switchback** state:

```
cluster_B::> metrocluster show
```

| Cluster           | Configuration | State                  | Mode  |
|-------------------|---------------|------------------------|-------|
| -----             | -----         | -----                  | ----- |
| Local: cluster_B  | configured    | switchover             |       |
| Remote: cluster_A | configured    | waiting-for-switchback |       |

The switchback operation is complete when the clusters are in the **normal** state.:

```
cluster_B::> metrocluster show
```

| Cluster           | Configuration | State  | Mode  |
|-------------------|---------------|--------|-------|
| -----             | -----         | -----  | ----- |
| Local: cluster_B  | configured    | normal |       |
| Remote: cluster_A | configured    | normal |       |

If a switchback is taking a long time to finish, you can check on the status of in-progress baselines by using the `metrocluster config-replication resync-status show` command.

6. Reestablish any SnapMirror or SnapVault configurations.

#### **Step 6: Return the failed part to NetApp**

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

#### **Replace a PCIe card - AFF A300**

To replace a PCIe card, you must perform a specific sequence of tasks.

- You can use this procedure with all versions of ONTAP supported by your system
- All other components in the system must be functioning properly; if not, you must contact technical support.

#### **Step 1: Shut down the impaired controller**

You can shut down or take over the impaired controller using different procedures, depending on the storage system hardware configuration.



## Option 1: Most configurations

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

### About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced` mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

### Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message MAINT=<# of hours>h
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`



When you see *Do you want to disable auto-giveback?*, enter *y*.

3. Take the impaired controller to the LOADER prompt:

| If the impaired controller is displaying... | Then...                                                                                                                                                                                                                                                            |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                           | Go to the next step.                                                                                                                                                                                                                                               |
| Waiting for giveback...                     | Press Ctrl-C, and then respond <i>y</i> when prompted.                                                                                                                                                                                                             |
| System prompt or password prompt            | <p>Take over or halt the impaired controller from the healthy controller: <code>storage failover takeover -ofnode <i>impaired_node_name</i></code></p> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i>.</p> |

## Option 2: Controller is in a two-node MetroCluster

To shut down the impaired controller, you must determine the status of the controller and, if necessary,

switch over the controller so that the healthy controller continues to serve data from the impaired controller storage.

#### About this task

- You must leave the power supplies turned on at the end of this procedure to provide power to the healthy controller.

#### Steps

1. Check the MetroCluster status to determine whether the impaired controller has automatically switched over to the healthy controller: `metrocluster show`
2. Depending on whether an automatic switchover has occurred, proceed according to the following table:

| If the impaired controller...                                                                                                                      | Then...                                                                                                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Has automatically switched over                                                                                                                    | Proceed to the next step.                                                                                                                      |
| Has not automatically switched over                                                                                                                | Perform a planned switchover operation from the healthy controller: <code>metrocluster switchover</code>                                       |
| Has not automatically switched over, you attempted switchover with the <code>metrocluster switchover</code> command, and the switchover was vetoed | Review the veto messages and, if possible, resolve the issue and try again. If you are unable to resolve the issue, contact technical support. |

3. Resynchronize the data aggregates by running the `metrocluster heal -phase aggregates` command from the surviving cluster.

```
controller_A_1::> metrocluster heal -phase aggregates
[Job 130] Job succeeded: Heal Aggregates is successful.
```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

4. Verify that the operation has been completed by using the `metrocluster operation show` command.

```
controller_A_1::> metrocluster operation show
Operation: heal-aggregates
State: successful
Start Time: 7/25/2016 18:45:55
End Time: 7/25/2016 18:45:56
Errors: -
```

5. Check the state of the aggregates by using the `storage aggregate show` command.

```

controller_A_1:> storage aggregate show
Aggregate Size Available Used% State #Vols Nodes
RAID Status

...
aggr_b2 227.1GB 227.1GB 0% online 0 mcc1-a2
raid_dp, mirrored, normal...

```

6. Heal the root aggregates by using the `metrocluster heal -phase root-aggregates` command.

```

mcc1A:> metrocluster heal -phase root-aggregates
[Job 137] Job succeeded: Heal Root Aggregates is successful

```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

7. Verify that the heal operation is complete by using the `metrocluster operation show` command on the destination cluster:

```

mcc1A:> metrocluster operation show
Operation: heal-root-aggregates
State: successful
Start Time: 7/29/2016 20:54:41
End Time: 7/29/2016 20:54:42
Errors: -

```

8. On the impaired controller module, disconnect the power supplies.

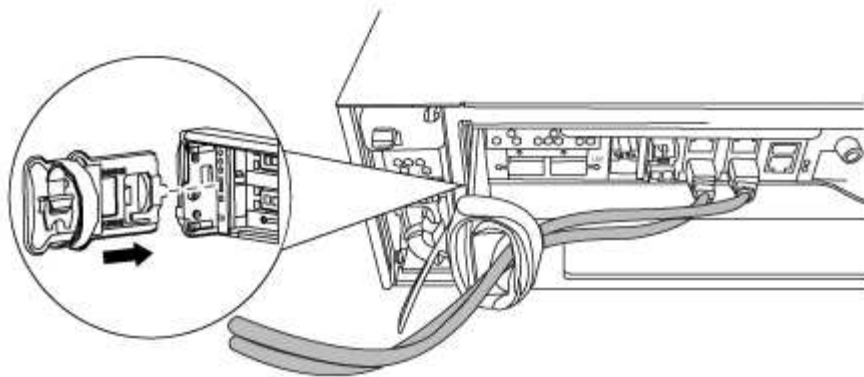
## Step 2: Open the controller module

To access components inside the controller, you must first remove the controller module from the system and then remove the cover on the controller module.

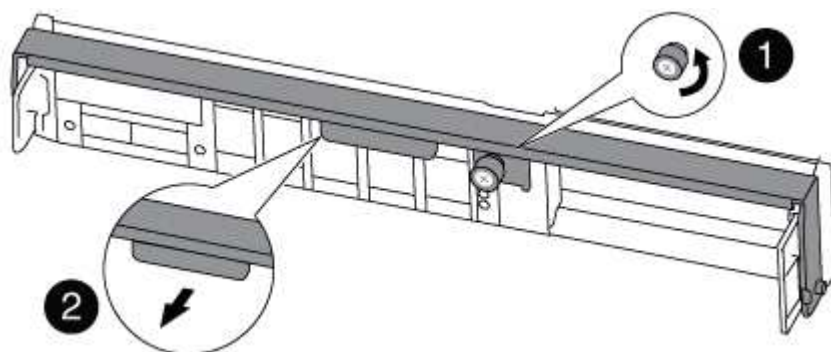
1. If you are not already grounded, properly ground yourself.
2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

3. Remove and set aside the cable management devices from the left and right sides of the controller module.



4. Loosen the thumbscrew on the cam handle on the controller module.



|   |            |
|---|------------|
| 1 | Thumbscrew |
| 2 | Cam handle |

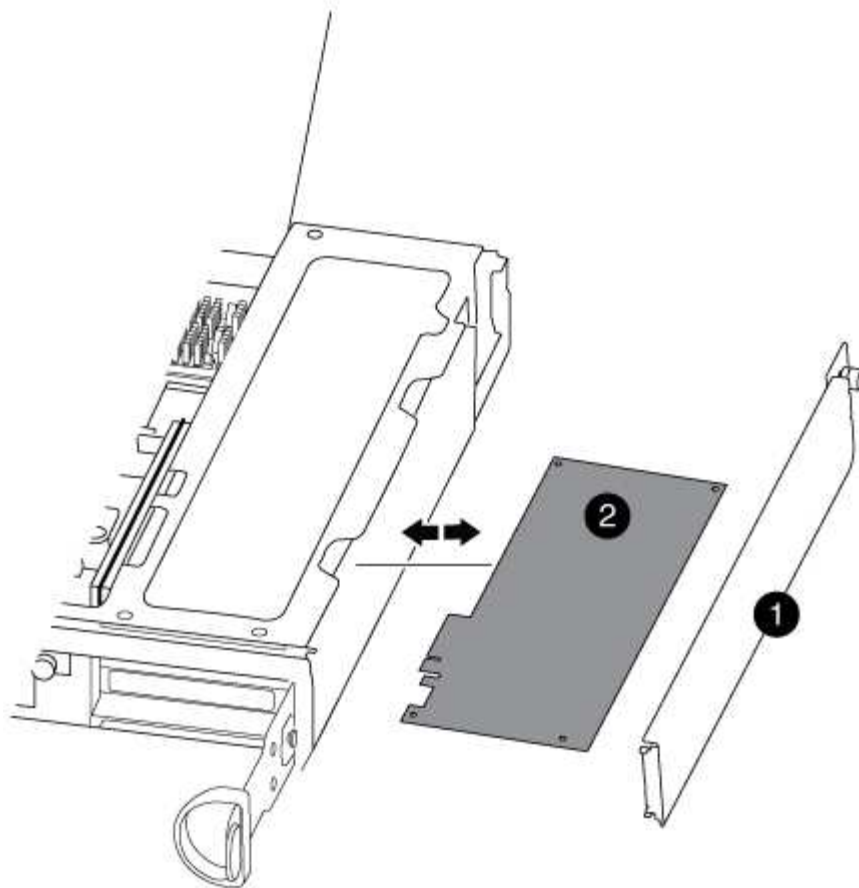
5. Pull the cam handle downward and begin to slide the controller module out of the chassis.

Make sure that you support the bottom of the controller module as you slide it out of the chassis.

### Step 3: Replace a PCIe card

To replace a PCIe card, locate it within the controller and follow the specific sequence of steps.

1. If you are not already grounded, properly ground yourself.
2. Loosen the thumbscrew on the controller module side panel.
3. Swing the side panel off the controller module.



|   |            |
|---|------------|
| 1 | Side panel |
| 2 | PCIe card  |

4. Remove the PCIe card from the controller module and set it aside.
5. Install the replacement PCIe card.

Be sure that you properly align the card in the slot and exert even pressure on the card when seating it in the socket. The PCIe card must be fully and evenly seated in the slot.



If you are installing a card in the bottom slot and cannot see the card socket well, remove the top card so that you can see the card socket, install the card, and then reinstall the card you removed from the top slot.

6. Close the side panel and tighten the thumbscrew.

#### Step 4: Reinstall the controller

After you replace a component within the controller module, you must reinstall the controller module in the system chassis and boot it.

1. If you are not already grounded, properly ground yourself.
2. Align the end of the controller module with the opening in the chassis, and then gently push the controller

module halfway into the system.



Do not completely insert the controller module in the chassis until instructed to do so.

3. Recable the system, as needed.

If you removed the media converters (QSFPs or SFPs), remember to reinstall them if you are using fiber optic cables.

4. Complete the reinstallation of the controller module:

The controller module begins to boot as soon as it is fully seated in the chassis.

| If your system is in...               | Then perform these steps...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| An HA pair                            | <div><div>a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position. Tighten the thumbscrew on the cam handle on back of the controller module.</div><div><div></div><div>Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.</div></div><div><div>b. If you have not already done so, reinstall the cable management device.</div><div>c. If you have not already done so, reconnect the cables to the controller module.</div><div>d. Bind the cables to the cable management device with the hook and loop strap.</div></div></div>                                                                                                                                               |
| A two-node MetroCluster configuration | <div><div>a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position. Tighten the thumbscrew on the cam handle on back of the controller module.</div><div><div></div><div>Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.</div></div><div><div>b. If you have not already done so, reinstall the cable management device.</div><div>c. If you have not already done so, reconnect the cables to the controller module.</div><div>d. Bind the cables to the cable management device with the hook and loop strap.</div><div>e. Reconnect the power cables to the power supplies and to the power sources, and then turn on the power to start the boot process.</div></div></div> |

5. If your system is configured to support 10 GbE cluster interconnect and data connections on 40 GbE NICs or onboard ports, convert these ports to 10 GbE connections by using the `nicadmin convert` command from Maintenance mode.



Be sure to exit Maintenance mode after completing the conversion.

6. Return the controller to normal operation:

| If your system is in...               | Issue this command from the partner's console...                                                                     |
|---------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| An HA pair                            | <code>storage failover giveback -ofnode <i>impaired_node_name</i></code>                                             |
| A two-node MetroCluster configuration | Proceed to the next step. The MetroCluster switchback procedure is done in the next task in the replacement process. |

7. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`

#### Step 5 (two-node MetroCluster only): Switch back aggregate

After you have completed the FRU replacement in a two-node MetroCluster configuration, you can perform the MetroCluster switchback operation. This returns the configuration to its normal operating state, with the sync-source storage virtual machines (SVMs) on the formerly impaired site now active and serving data from the local disk pools.

This task only applies to two-node MetroCluster configurations.

#### Steps

1. Verify that all nodes are in the enabled state: `metrocluster node show`

```
cluster_B::> metrocluster node show

DR Configuration DR
Group Cluster Node State Mirroring Mode

1 cluster_A
 controller_A_1 configured enabled heal roots
completed
 cluster_B
 controller_B_1 configured enabled waiting for
switchback recovery
2 entries were displayed.
```

2. Verify that resynchronization is complete on all SVMs: `metrocluster vserver show`
3. Verify that any automatic LIF migrations being performed by the healing operations were completed successfully: `metrocluster check lif show`

4. Perform the switchback by using the `metrocluster switchback` command from any node in the surviving cluster.
5. Verify that the switchback operation has completed: `metrocluster show`

The switchback operation is still running when a cluster is in the `waiting-for-switchback` state:

```
cluster_B::> metrocluster show
Cluster Configuration State Mode

Local: cluster_B configured switchover
Remote: cluster_A configured waiting-for-switchback
```

The switchback operation is complete when the clusters are in the `normal` state.:

```
cluster_B::> metrocluster show
Cluster Configuration State Mode

Local: cluster_B configured normal
Remote: cluster_A configured normal
```

If a switchback is taking a long time to finish, you can check on the status of in-progress baselines by using the `metrocluster config-replication resync-status show` command.

6. Reestablish any SnapMirror or SnapVault configurations.

#### Step 6: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

#### Swap out a power supply - AFF A300

Swapping out a power supply involves turning off, disconnecting, and removing the old power supply and installing, connecting, and turning on the replacement power supply.

All other components in the system must be functioning properly; if not, you must contact technical support.

- The power supplies are redundant and hot-swappable.
- This procedure is written for replacing one power supply at a time.

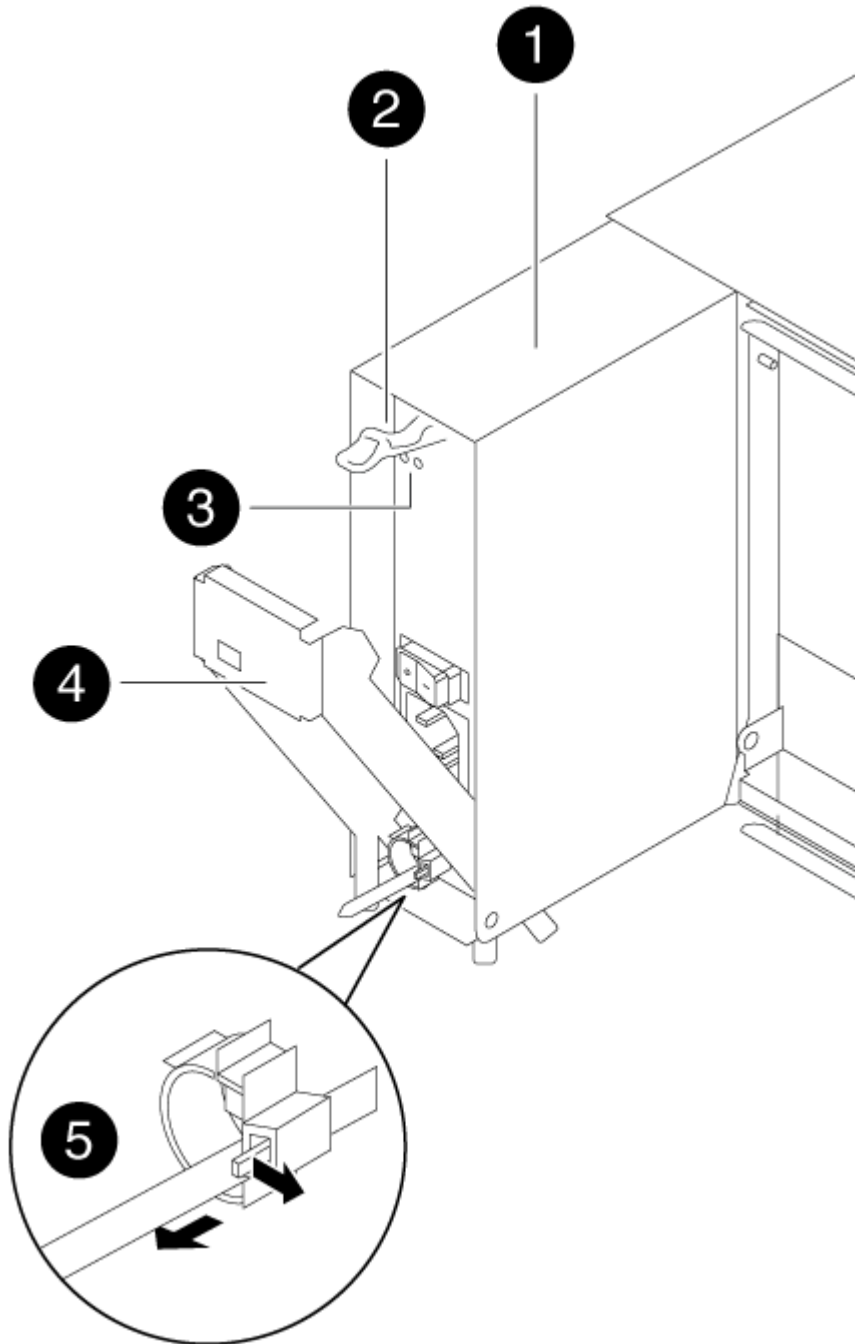


It is a best practice to replace the power supply within two minutes of removing it from the chassis. The system continues to function, but ONTAP sends messages to the console about the degraded power supply until the power supply is replaced.

- The number of power supplies in the system depends on the model.
- Power supplies are auto-ranging.



1. Identify the power supply you want to replace, based on console error messages or through the LEDs on the power supplies.
2. If you are not already grounded, properly ground yourself.
3. Turn off the power supply and disconnect the power cables:
  - a. Turn off the power switch on the power supply.
  - b. Open the power cable retainer, and then unplug the power cable from the power supply.
  - c. Unplug the power cable from the power source.
4. Press down the release latch on the power supply cam handle, and then lower the cam handle to the fully open position to release the power supply from the mid plane.



|   |                               |
|---|-------------------------------|
| 1 | Power supply                  |
| 2 | Cam handle release latch      |
| 2 | Power and Fault LEDs          |
| 4 | Cam handle                    |
| 5 | Power cable locking mechanism |

5. Use the cam handle to slide the power supply out of the system.



When removing a power supply, always use two hands to support its weight.

6. Make sure that the on/off switch of the new power supply is in the Off position.

7. Using both hands, support and align the edges of the power supply with the opening in the system chassis, and then gently push the power supply into the chassis using the cam handle.

The power supplies are keyed and can only be installed one way.



Do not use excessive force when sliding the power supply into the system. You can damage the connector.

8. Push firmly on the power supply cam handle to seat it all the way into the chassis, and then push the cam handle to the closed position, making sure that the cam handle release latch clicks into its locked position.

9. Reconnect the power supply cabling:

- a. Reconnect the power cable to the power supply and the power source.
- b. Secure the power cable to the power supply using the power cable retainer.

Once power is restored to the power supply, the status LED should be green.

1. Turn on the power to the new power supply, and then verify the operation of the power supply activity LEDs.

The power supply LEDs are lit when the power supply comes online.

2. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

## Replace the real-time clock battery - AFF A300

You replace the real-time clock (RTC) battery in the controller module so that your system's services and applications that depend on accurate time synchronization continue to function.

- You can use this procedure with all versions of ONTAP supported by your system
- All other components in the system must be functioning properly; if not, you must contact technical support.

**Step 1: Shut down the impaired controller**

Shut down or take over the impaired controller using the appropriate procedure for your configuration.

## Option 1: Most configurations

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

### About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced` mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

### Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message MAINT=<# of hours>h
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`



When you see *Do you want to disable auto-giveback?*, enter *y*.

3. Take the impaired controller to the LOADER prompt:

| If the impaired controller is displaying... | Then...                                                                                                                                                                                                                                                            |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                           | Go to the next step.                                                                                                                                                                                                                                               |
| Waiting for giveback...                     | Press Ctrl-C, and then respond <i>y</i> when prompted.                                                                                                                                                                                                             |
| System prompt or password prompt            | <p>Take over or halt the impaired controller from the healthy controller: <code>storage failover takeover -ofnode <i>impaired_node_name</i></code></p> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i>.</p> |

## Option 2: Controller is in a two-node MetroCluster

To shut down the impaired controller, you must determine the status of the controller and, if necessary,

switch over the controller so that the healthy controller continues to serve data from the impaired controller storage.

#### About this task

- You must leave the power supplies turned on at the end of this procedure to provide power to the healthy controller.

#### Steps

1. Check the MetroCluster status to determine whether the impaired controller has automatically switched over to the healthy controller: `metrocluster show`
2. Depending on whether an automatic switchover has occurred, proceed according to the following table:

| If the impaired controller...                                                                                                                      | Then...                                                                                                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Has automatically switched over                                                                                                                    | Proceed to the next step.                                                                                                                      |
| Has not automatically switched over                                                                                                                | Perform a planned switchover operation from the healthy controller: <code>metrocluster switchover</code>                                       |
| Has not automatically switched over, you attempted switchover with the <code>metrocluster switchover</code> command, and the switchover was vetoed | Review the veto messages and, if possible, resolve the issue and try again. If you are unable to resolve the issue, contact technical support. |

3. Resynchronize the data aggregates by running the `metrocluster heal -phase aggregates` command from the surviving cluster.

```
controller_A_1::> metrocluster heal -phase aggregates
[Job 130] Job succeeded: Heal Aggregates is successful.
```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

4. Verify that the operation has been completed by using the `metrocluster operation show` command.

```
controller_A_1::> metrocluster operation show
Operation: heal-aggregates
State: successful
Start Time: 7/25/2016 18:45:55
End Time: 7/25/2016 18:45:56
Errors: -
```

5. Check the state of the aggregates by using the `storage aggregate show` command.

```

controller_A_1::> storage aggregate show
Aggregate Size Available Used% State #Vols Nodes
RAID Status

...
aggr_b2 227.1GB 227.1GB 0% online 0 mcc1-a2
raid_dp, mirrored, normal...

```

6. Heal the root aggregates by using the `metrocluster heal -phase root-aggregates` command.

```

mcc1A::> metrocluster heal -phase root-aggregates
[Job 137] Job succeeded: Heal Root Aggregates is successful

```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

7. Verify that the heal operation is complete by using the `metrocluster operation show` command on the destination cluster:

```

mcc1A::> metrocluster operation show
Operation: heal-root-aggregates
State: successful
Start Time: 7/29/2016 20:54:41
End Time: 7/29/2016 20:54:42
Errors: -

```

8. On the impaired controller module, disconnect the power supplies.

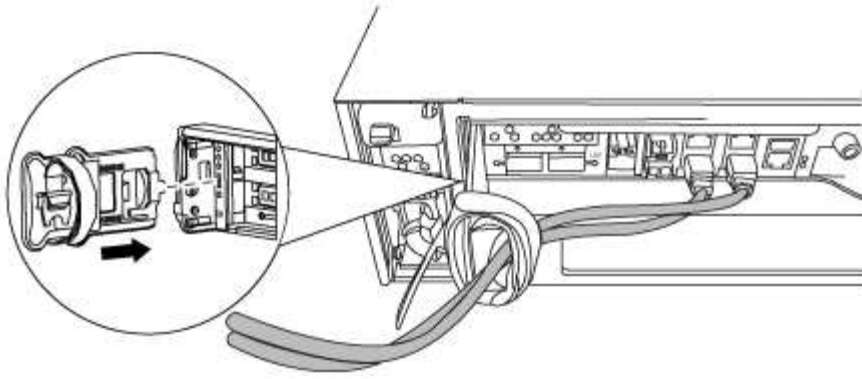
## Step 2: Open the controller module

To access components inside the controller, you must first remove the controller module from the system and then remove the cover on the controller module.

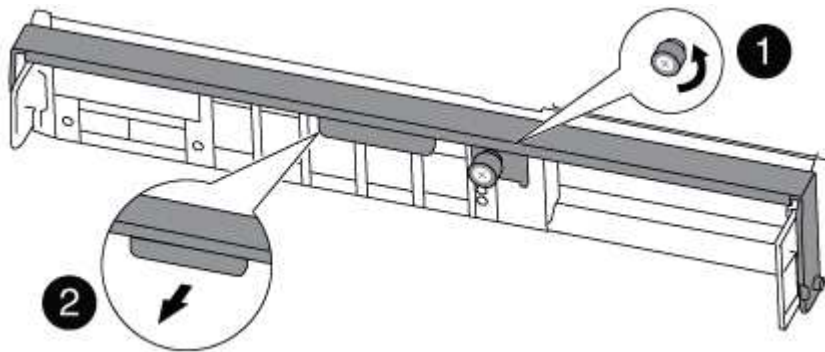
1. If you are not already grounded, properly ground yourself.
2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

3. Remove and set aside the cable management devices from the left and right sides of the controller module.



4. Loosen the thumbscrew on the cam handle on the controller module.



|          |            |
|----------|------------|
| <b>1</b> | Thumbscrew |
| <b>2</b> | Cam handle |

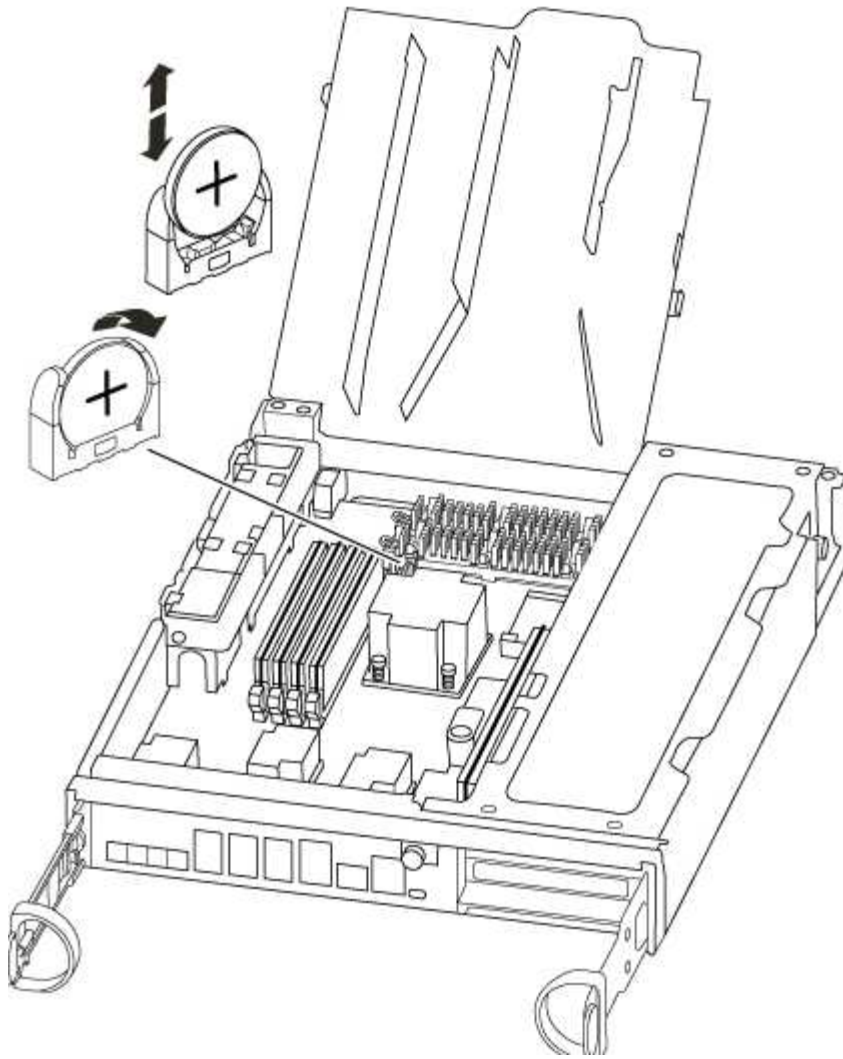
5. Pull the cam handle downward and begin to slide the controller module out of the chassis.

Make sure that you support the bottom of the controller module as you slide it out of the chassis.

### Step 3: Replace the RTC Battery

To replace the RTC battery, locate them inside the controller and follow the specific sequence of steps.

1. If you are not already grounded, properly ground yourself.
2. Locate the RTC battery.



3. Gently push the battery away from the holder, rotate it away from the holder, and then lift it out of the holder.



Note the polarity of the battery as you remove it from the holder. The battery is marked with a plus sign and must be positioned in the holder correctly. A plus sign near the holder tells you how the battery should be positioned.

4. Remove the replacement battery from the antistatic shipping bag.
5. Locate the empty battery holder in the controller module.
6. Note the polarity of the RTC battery, and then insert it into the holder by tilting the battery at an angle and pushing down.
7. Visually inspect the battery to make sure that it is completely installed into the holder and that the polarity is correct.

#### **Step 4: Reinstall the controller module and setting time/date after RTC battery replacement**

After you replace a component within the controller module, you must reinstall the controller module in the system chassis, reset the time and date on the controller, and then boot it.

1. If you have not already done so, close the air duct or controller module cover.



2. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.

Do not completely insert the controller module in the chassis until instructed to do so.

3. Recable the system, as needed.

If you removed the media converters (QSFPs or SFPs), remember to reinstall them if you are using fiber optic cables.

4. If the power supplies were unplugged, plug them back in and reinstall the power cable retainers.
5. Complete the reinstallation of the controller module:

- a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position.

Tighten the thumbscrew on the cam handle on back of the controller module.



Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.

- b. If you have not already done so, reinstall the cable management device.
  - c. Bind the cables to the cable management device with the hook and loop strap.
  - d. Reconnect the power cables to the power supplies and to the power sources, and then turn on the power to start the boot process.
  - e. Halt the controller at the LOADER prompt.
6. Reset the time and date on the controller:
    - a. Check the date and time on the healthy controller with the `show date` command.
    - b. At the LOADER prompt on the target controller, check the time and date.
    - c. If necessary, modify the date with the `set date mm/dd/yyyy` command.
    - d. If necessary, set the time, in GMT, using the `set time hh:mm:ss` command.
    - e. Confirm the date and time on the target controller.
  7. At the LOADER prompt, enter `bye` to reinitialize the PCIe cards and other components and let the controller reboot.
  8. Return the controller to normal operation by giving back its storage: `storage failover giveback -ofnode impaired_node_name`
  9. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`

#### Step 5: Switch back aggregates in a two-node MetroCluster configuration

After you have completed the FRU replacement in a two-node MetroCluster configuration, you can perform the MetroCluster switchback operation. This returns the configuration to its normal operating state, with the sync-source storage virtual machines (SVMs) on the formerly impaired site now active and serving data from the local disk pools.

This task only applies to two-node MetroCluster configurations.

## Steps

1. Verify that all nodes are in the enabled state: `metrocluster node show`

```
cluster_B::> metrocluster node show

DR Configuration DR
Group Cluster Node State Mirroring Mode

1 cluster_A
 controller_A_1 configured enabled heal roots
completed
 cluster_B
 controller_B_1 configured enabled waiting for
switchback recovery
2 entries were displayed.
```

2. Verify that resynchronization is complete on all SVMs: `metrocluster vserver show`
3. Verify that any automatic LIF migrations being performed by the healing operations were completed successfully: `metrocluster check lif show`
4. Perform the switchback by using the `metrocluster switchback` command from any node in the surviving cluster.
5. Verify that the switchback operation has completed: `metrocluster show`

The switchback operation is still running when a cluster is in the `waiting-for-switchback` state:

```
cluster_B::> metrocluster show

Cluster Configuration State Mode

Local: cluster_B configured switchover
Remote: cluster_A configured waiting-for-switchback
```

The switchback operation is complete when the clusters are in the `normal` state.:

```
cluster_B::> metrocluster show

Cluster Configuration State Mode

Local: cluster_B configured normal
Remote: cluster_A configured normal
```

If a switchback is taking a long time to finish, you can check on the status of in-progress baselines by using the `metrocluster config-replication resync-status show` command.

6. Reestablish any SnapMirror or SnapVault configurations.

#### **Step 6: Return the failed part to NetApp**

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

## **AFF A320 systems**

### **Install and setup**

#### **Start here: Choose your installation and setup experience**

For most configurations, you can choose from different content formats.

- [Quick steps](#)

A printable PDF of step-by-step instructions with live links to additional content.

- [Video steps](#)

Video step-by-step instructions.

- [Detailed steps](#)

Online step-by-step instructions with live links to additional content.

If your system is in a MetroCluster IP configuration, see the [Install MetroCluster IP Configuration](#) instructions.

#### **Quick guide - AFF A320**

This guide gives graphic instructions for a typical installation of your system from racking and cabling, through initial system bring-up. Use this guide if you are familiar with installing NetApp systems.

Access the *Installation and Setup Instructions* PDF poster:

[AFF A320 Installation and Setup Instructions](#)

#### **Video steps - AFF A320**

The following video shows how to install and cable your new system.

 | <https://img.youtube.com/vi/ILuiL0js7dI/?maxresdefault.jpg>

#### **Detailed guide - AFF A320**

This guide gives detailed step-by-step instructions for installing a typical NetApp system. Use this guide if you want more detailed installation instructions.

Prepare for installation

To install your AFF A320 system, you need to create an account, register the system, and get license keys. You also need to inventory the appropriate number and type of cables for your system and collect specific network information.

You need to have access to the Hardware Universe for information about site requirements as well as additional information on your configured system. You might also want to have access to the Release Notes for your version of ONTAP for more information about this system.

NetApp Hardware Universe

Find the Release Notes for your version of ONTAP 9

You need to provide the following at your site:

- Rack space for the storage system
- Phillips #2 screwdriver
- Additional networking cables to connect your system to your network switch and laptop or console with a Web browser
- A laptop or console with an RJ-45 connection and access to a Web browser
  1. Unpack the contents of all boxes.
  2. Record the system serial number from the controllers.



3. Set up your account:
  - a. Log in to your existing account or create an account.
  - b. Register your system.

NetApp Product Registration

4. Inventory and make a note of the number and types of cables you received.

The following table identifies the types of cables you might receive. If you receive a cable not listed in the table, see the Hardware Universe to locate the cable and identify its use.

NetApp Hardware Universe

| Type of cable...       | Part number and length                                                                                              | Connector type | For...                                                                |
|------------------------|---------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------------------------------------|
| 100 GbE cable (QSFP28) | X66211A-05 (112-00595), 0.5m<br>X66211A-1 (112-00573), 1m<br>X66211A-2 (112-00574), 2m<br>X66211A-5 (112-00574), 5m |                | Storage, cluster interconnect/HA, and Ethernet data (order-dependent) |

| Type of cable...        | Part number and length                                                                                                                                                                 | Connector type                                                                       | For...                                                                                                 |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| 40 GbE cable            | X66211A-1 (112-00573), 1m;<br>X66211A-3 (112-00543), 3m;<br>X66211A-5 (112-00576), 5m                                                                                                  |    | Storage, cluster interconnect/HA, and Ethernet data (order-dependent)                                  |
| Ethernet cable - MPO    | X66200-2 (112-00326), 2m<br>X66250-5 (112-00328), 5m<br>X66250-30 (112-00331), 30m                                                                                                     |    | Ethernet cable (order dependent)                                                                       |
| Optical cables          | SR:<br>X6553-R6 (112-00188), 2m<br>X6554-R6 (112-00189), 15m<br>X6537-R6 (112-00091), 30m<br>LR:<br>X66250-3 (112-00342), 2m<br>X66260-5 (112-00344), 5m<br>X66260-30 (112-00354), 30m |    | FC configurations (order-dependent)                                                                    |
| RJ-45 (order dependent) | X6585-R6 (112-00291), 3m<br>X6562-R6 (112-00196), 5m                                                                                                                                   |   | Management network                                                                                     |
| Micro-USB console cable | Not applicable                                                                                                                                                                         |  | Console connection used during software setup if laptop or console does not support network discovery. |
| Power cables            | Not applicable                                                                                                                                                                         |   | Powering up the system                                                                                 |

5. Download and complete the *Cluster configuration worksheet*.

[Cluster Configuration Worksheet](#)

### Install the hardware

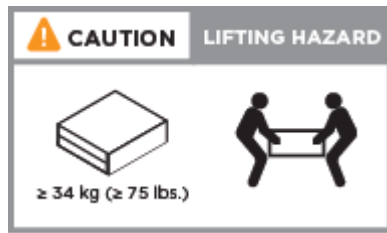
You need to install your system in a 4-post rack or NetApp system cabinet, as applicable.

1. Install the rail kits, as needed.

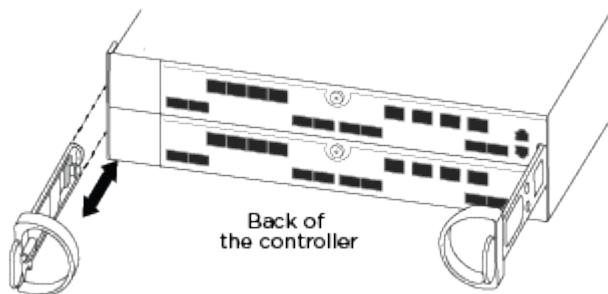
2. Install and secure your system using the instructions included with the rail kit.



You need to be aware of the safety concerns associated with the weight of the system.



3. Attach cable management devices (as shown).



4. Place the bezel on the front of the system.

#### Cable controllers to your network

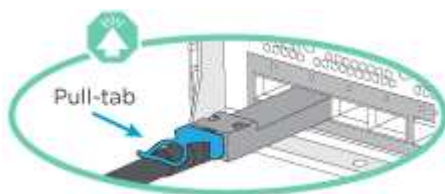
You can cable the controllers to your network by using the two-node switchless cluster method or by using the cluster interconnect network.

#### Option 1: Cable a two-node switchless cluster

The optional data ports, optional NIC cards, and management ports on the controller modules are connected to switches. The cluster interconnect/HA ports are cabled on both controller modules.

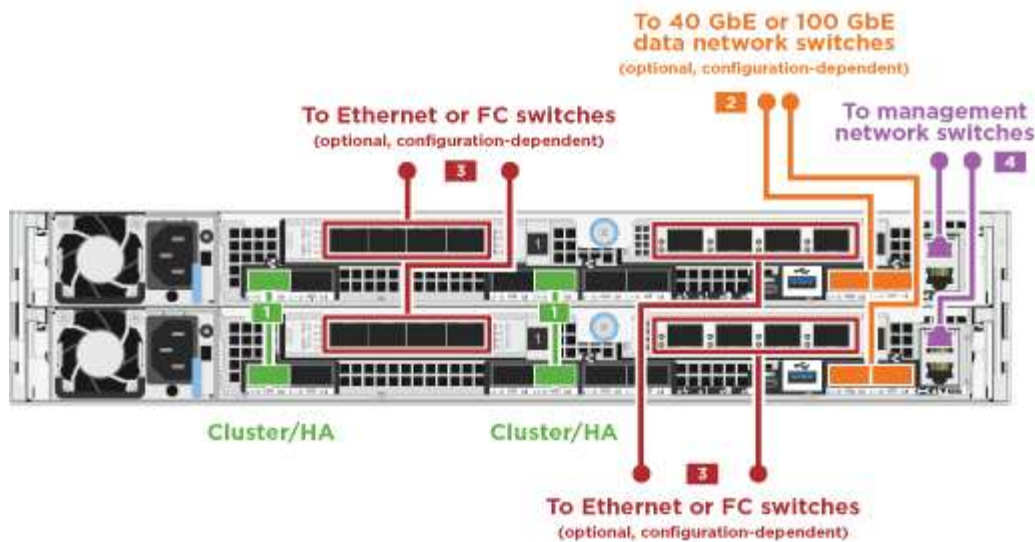
You must have contacted your network administrator for information about connecting the system to the switches.


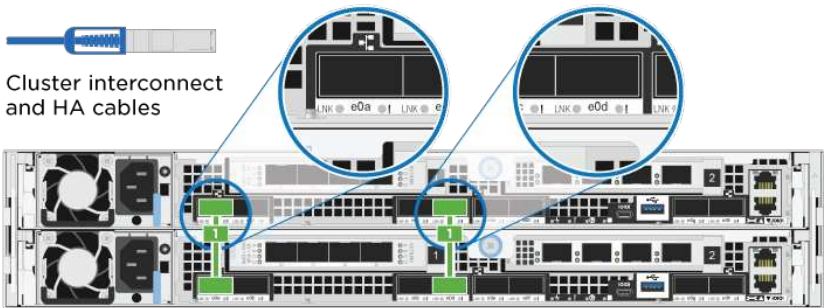
Be sure to check the illustration arrow for the proper cable connector pull-tab orientation.



As you insert the connector, you should feel it click into place; if you do not feel it click, remove it, turn it around and try again.

1. You can use the illustration or the step-by-step instructions to complete the cabling between the controllers and to the switches:



| Step | Perform on each controller module                                                                                                                                                                                                                                                                                                                                                                                   |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | <p>Cable the cluster/HA ports to each other with the 100 GbE (QSFP28) cable:</p> <ul style="list-style-type: none"> <li>• e0a to e0a</li> <li>• e0d to e0d</li> </ul> <p> Cluster interconnect and HA cables</p>  <p>Cluster/HA Cluster/HA</p> |

**Step****Perform on each controller module****2**

If you are using your onboard ports for a data network connection, connect the 100GbE or 40GbE cables to the appropriate data network switches:

- e0g and e0h

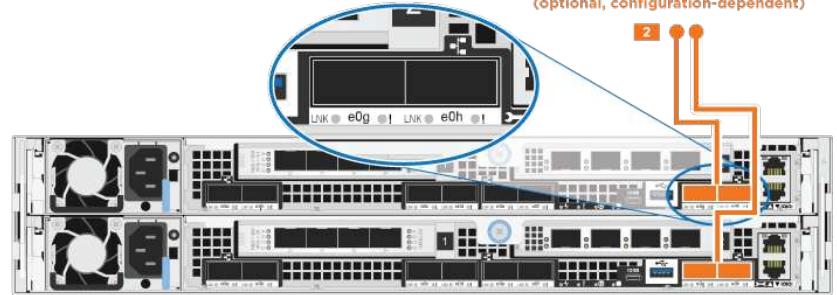


100 GbE cables



40 GbE cables

To 40 GbE or 100 GbE  
data network switches  
(optional, configuration-dependent)

**3**

If you are using your NIC cards for Ethernet or FC connections, connect the NIC card(s) to the appropriate switches:



100 GbE cables

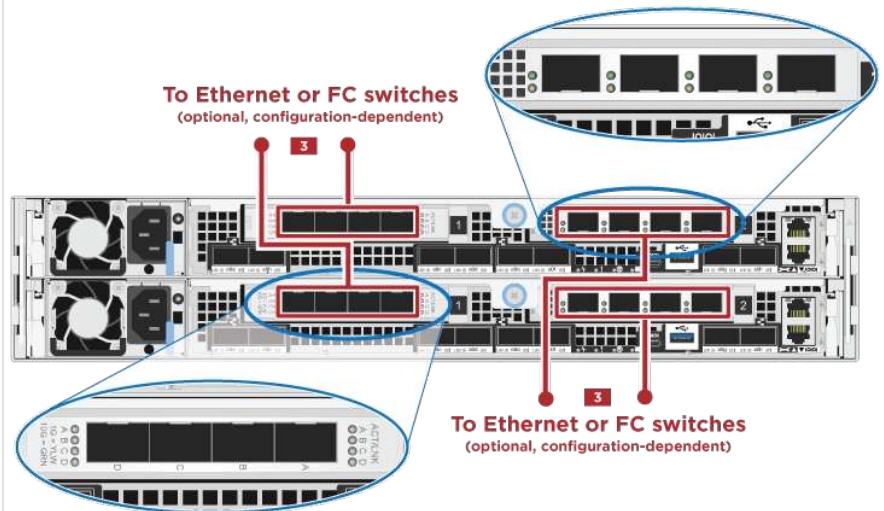


40 GbE cables



FC cables

To Ethernet or FC switches  
(optional, configuration-dependent)



To Ethernet or FC switches  
(optional, configuration-dependent)



| Step                                                                              | Perform on each controller module                                                                                                                                                                                                   |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4                                                                                 | <p>Cable the e0M ports to the management network switches with the RJ45 cables.</p>  <p>Ethernet cables</p> <p>To management network switches</p> |
|  | DO NOT plug in the power cords at this point.                                                                                                                                                                                       |

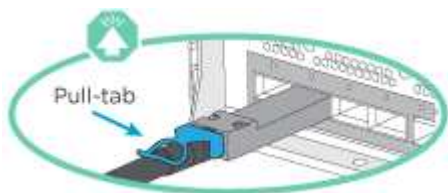
2. Cable your storage: [Cable controllers to drive shelves](#)

## Option 2: Cabling a switched cluster

The optional data ports, optional NIC cards, and management ports on the controller modules are connected to switches. The cluster interconnect/HA ports are cabled on to the cluster/HA switch.

You must have contacted your network administrator for information about connecting the system to the switches.

Be sure to check the illustration arrow for the proper cable connector pull-tab orientation.



As you insert the connector, you should feel it click into place; if you do not feel it click, remove it, turn it around and try again.

1. You can used the illustration or the step-by step instructions to complete the cabling between the controllers and to the switches:



| Step                                                       | Perform on each controller module                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div data-bbox="183 751 245 789" data-label="Text">1</div> | <p data-bbox="511 751 1356 819">Cable the cluster/HA ports to the cluster/HA switch with the 100 GbE (QSFP28) cable:</p> <ul data-bbox="535 850 1144 934" style="list-style-type: none"> <li>• e0a on both controllers to the cluster/HA switch</li> <li>• e0d on both controllers to the cluster/HA switch</li> </ul> <div data-bbox="560 966 1485 1417"> <p data-bbox="560 1029 812 1081">Cluster interconnect and HA cables</p> <p data-bbox="609 1323 755 1354">Cluster/HA</p> <p data-bbox="836 1386 1031 1417">To cluster switches</p> <p data-bbox="1112 1323 1258 1354">Cluster/HA</p> </div> |

**Step****Perform on each controller module****2**

If you are using your onboard ports for a data network connection, connect the 100GbE or 40GbE cables to the appropriate data network switches:

- e0g and e0h



100 GbE cables



40 GbE cables

**3**

If you are using your NIC cards for Ethernet or FC connections, connect the NIC card(s) to the appropriate switches:



100 GbE cables

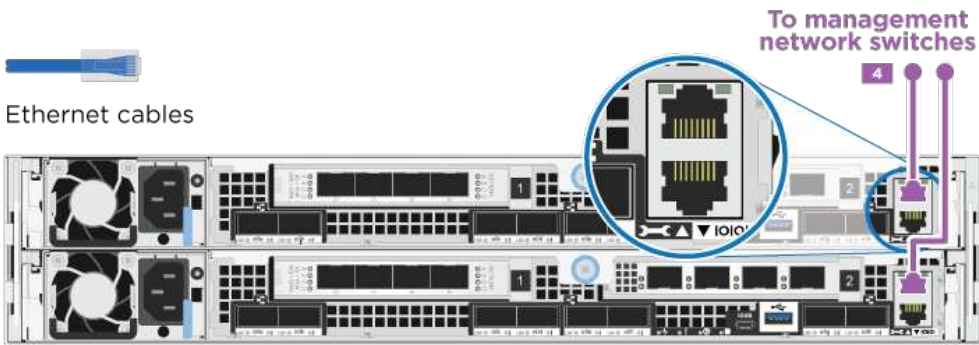



40 GbE cables



FC cables



| Step                                                                              | Perform on each controller module                                                                                                                                                                                                   |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4                                                                                 | <p>Cable the e0M ports to the management network switches with the RJ45 cables.</p>  <p>Ethernet cables</p> <p>To management network switches</p> |
|  | DO NOT plug in the power cords at this point.                                                                                                                                                                                       |

## 2. Cable your storage: [Cable controllers to drive shelves](#)

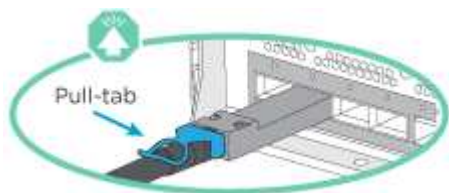
### Cable controllers to drive shelves

You must cable the controllers to your shelves using the onboard storage ports.

#### Option 1: Cable the controllers to a single drive shelf

You must cable each controller to the NSM modules on the NS224 drive shelf.

Be sure to check the illustration arrow for the proper cable connector pull-tab orientation.



As you insert the connector, you should feel it click into place; if you do not feel it click, remove it, turn it around and try again.

1. You can use the illustration or the step-by-step instructions to cable your controllers to a single shelf.



| Step                                                                | Perform on each controller module                                                                                                                                                                                                                                                                                                    |
|---------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div data-bbox="181 682 246 724" data-label="Text"> <p>1</p> </div> | <div data-bbox="509 682 1487 1421" data-label="Diagram"> <p>100 GbE cables</p> <p>Diagram illustrating the connection of 100 GbE cables from Controller A to the Shelf. The diagram includes callouts for specific ports: e0a, e0b, e0c, and e0f. The connections are as follows: e0a to e0b, e0c to e0f, and e0d to e0g.</p> </div> |



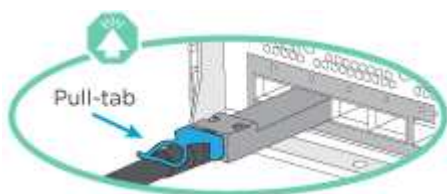
| Step                                                       | Perform on each controller module                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div data-bbox="183 159 245 197" data-label="Text">2</div> | <div data-bbox="513 159 886 191" data-label="Text">Cable controller B to the shelf:</div> <div data-bbox="513 222 1468 926" data-label="Image"> <p>The diagram illustrates the cabling for Controller B to the shelf. At the top, a blue 100 GbE cable is shown. Below it, the shelf components are labeled: NSM A, NSM B, Controller A, and Controller B. A yellow box highlights the connection points for Controller B. Callouts show the cable connectors on the NSM modules (labeled e0a, e0b) and the Controller modules (labeled e0c, e0d). The label 'Shelf' is on the right side of the diagram.</p> </div> |

2. To complete setting up your system, see [Complete system setup and configuration](#)

### Option 2: Cable the controllers to two drive shelves

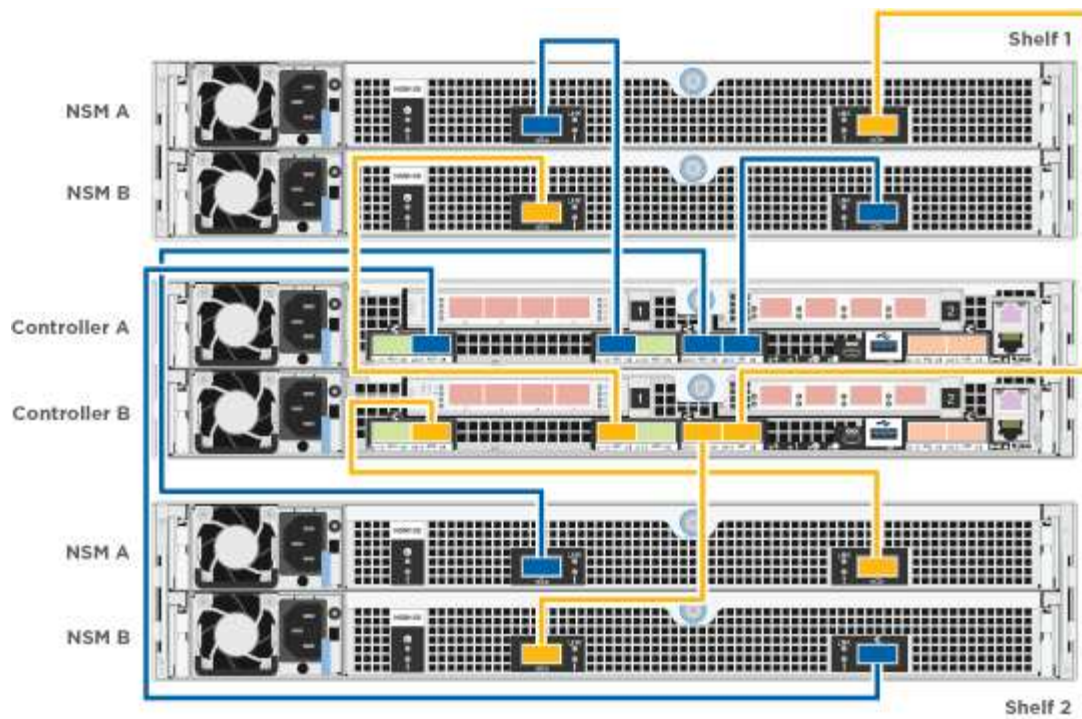
You must cable each controller to the NSM modules on both NS224 drive shelves.

Be sure to check the illustration arrow for the proper cable connector pull-tab orientation.



As you insert the connector, you should feel it click into place; if you do not feel it click, remove it, turn it around and try again.

1. You can use the following illustration or the written steps to cable your controllers to two drive shelves.

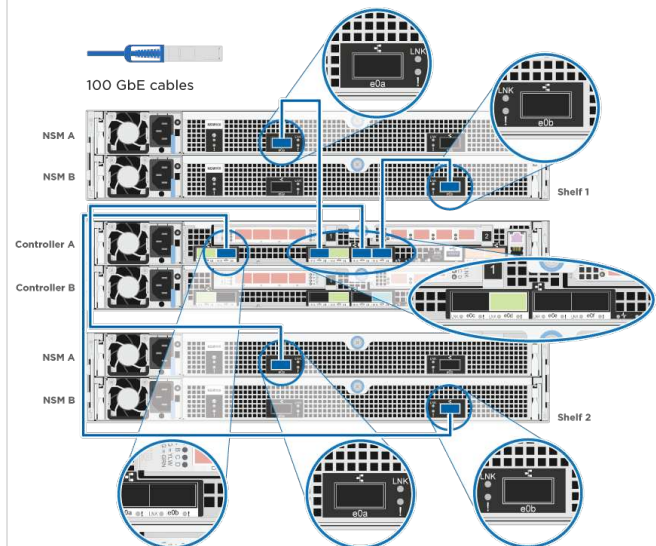


## Step

1

## Perform on each controller module

Cable controller A to the shelves:



| Step                                                       | Perform on each controller module                                                                                                                         |
|------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div data-bbox="183 159 245 197" data-label="Text">2</div> | <p data-bbox="841 159 1252 191">Cable controller B to the shelves:</p>  |

- To complete setting up your system, see [Complete system setup and configuration](#)

### Complete system setup and configuration

You can complete the system setup and configuration using cluster discovery with only a connection to the switch and laptop, or by connecting directly to a controller in the system and then connecting to the management switch.

#### Option 1: Completing system setup and configuration if network discovery is enabled

If you have network discovery enabled on your laptop, you can complete system setup and configuration using automatic cluster discovery.

- Plug the power cords into the controller power supplies, and then connect them to power sources on different circuits.

The system begins to boot. Initial booting may take up to eight minutes

- Make sure that your laptop has network discovery enabled.

See your laptop's online help for more information.

- Use the following animation to connect your laptop to the Management switch.

[Animation - Connect your laptop to the Management switch](#)

- Select an ONTAP icon listed to discover:





- a. Open File Explorer .
- b. Click network in the left pane.
- c. Right click and select refresh.
- d. Double-click either ONTAP icon and accept any certificates displayed on your screen.



XXXXX is the system serial number for the target node.

System Manager opens.

5. Use System Manager guided setup to configure your system using the data you collected in the *NetApp ONTAP Configuration Guide*.

#### [ONTAP Configuration Guide](#)

6. Verify the health of your system by running Config Advisor.
7. After you have completed the initial configuration, go to the [ONTAP & ONTAP System Manager Documentation Resources](#) page for information about configuring additional features in ONTAP.

### Option 2: Completing system setup and configuration if network discovery is not enabled

If network discovery is not enabled on your laptop, you must complete the configuration and setup using this task.

1. Cable and configure your laptop or console:
  - a. Set the console port on the laptop or console to 115,200 baud with N-8-1.



See your laptop or console's online help for how to configure the console port.

- b. Connect the console cable to the laptop or console using the console cable that came with your system, and then connect the laptop to the management switch on the management subnet.



- c. Assign a TCP/IP address to the laptop or console, using one that is on the management subnet.
2. Use the following animation to set one or more drive shelf IDs:

[Animation - Set drive shelf IDs](#)

3. Plug the power cords into the controller power supplies, and then connect them to power sources on different circuits.

The system begins to boot. Initial booting may take up to eight minutes

4. Assign an initial node management IP address to one of the nodes.

| If the management network has DHCP... | Then...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Configured                            | Record the IP address assigned to the new controllers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Not configured                        | <ol style="list-style-type: none"> <li>a. Open a console session using PuTTY, a terminal server, or the equivalent for your environment.</li> </ol> <div style="display: flex; align-items: center; margin: 10px 0;"> <div style="border: 1px solid black; border-radius: 50%; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center; margin-right: 10px;">i</div> <div>Check your laptop or console's online help if you do not know how to configure PuTTY.</div> </div> <ol style="list-style-type: none"> <li>b. Enter the management IP address when prompted by the script.</li> </ol> |

5. Using System Manager on your laptop or console, configure your cluster:
  - a. Point your browser to the node management IP address.



The format for the address is https://x.x.x.x.

- b. Configure the system using the data you collected in the *NetApp ONTAP Configuration guide*.

[ONTAP Configuration Guide](#)

6. Verify the health of your system by running Config Advisor.

7. After you have completed the initial configuration, go to the [ONTAP & ONTAP System Manager Documentation Resources](#) page for information about configuring additional features in ONTAP.

## Maintain

### Maintain AFF A320 hardware

For the AFF A320 storage system, you can perform maintenance procedures on the following components.

#### Boot media

The boot media stores a primary and secondary set of boot image files that the system uses when it boots.

#### Chassis

The chassis is the physical enclosure housing all the controller components such as the controller/CPU unit, power supply, and I/O.

#### Controller

A controller consists of a board, firmware, and software. It controls the drives and implements the ONTAP functions.

#### DIMM

You must replace a DIMM (dual in-line memory module) when a memory mismatch is present, or you have a failed DIMM.

#### Fan

The fan cools the controller.

#### NVDIMM

The NVDIMM (non-volatile dual in-line memory module) manages the data transfer from the volatile memory to the non-volatile storage, and maintains data integrity in the event of a power loss or system shutdown.

#### NVDIMM battery

A NVDIMM battery is responsible for maintaining power to the NVDIMM module.

#### PCIe

A PCIe (peripheral component interconnect express) card is an expansion card that plugs into the PCIe slot on the motherboard.

#### Power supply

A power supply provides a redundant power source in a controller shelf.

## Real time clock battery

A real time clock battery preserves system date and time information if the power is off.

## Boot media

### Overview of boot media replacement - AFF A320

The boot media stores a primary and secondary set of system (boot image) files that the system uses when it boots. Depending on your network configuration, you can perform either a nondisruptive or disruptive replacement.

You must have a USB flash drive, formatted to FAT32, with the appropriate amount of storage to hold the `image_xxx.tgz` file.

You also must copy the `image_xxx.tgz` file to the USB flash drive for later use in this procedure.

- The nondisruptive and disruptive methods for replacing a boot media both require you to restore the `var` file system:
  - For nondisruptive replacement, the HA pair must be connected to a network to restore the `var` file system.
  - For disruptive replacement, you do not need a network connection to restore the `var` file system, but the process requires two reboots.
- You must replace the failed component with a replacement FRU component you received from your provider.
- It is important that you apply the commands in these steps on the correct node:
  - The *impaired* node is the node on which you are performing maintenance.
  - The *healthy node* is the HA partner of the impaired node.

### Check onboard encryption keys - AFF A320

Prior to shutting down the impaired controller and checking the status of the onboard encryption keys, you must check the status of the impaired controller, disable automatic giveback, and check which version of ONTAP is running on the system.

If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see the [Synchronize a node with the cluster](#).

## Steps

1. Check the status of the impaired controller:
  - If the impaired controller is at the login prompt, log in as `admin`.
  - If the impaired controller is at the LOADER prompt and is part of HA configuration, log in as `admin` on the healthy controller.
  - If the impaired controller is in a standalone configuration and at LOADER prompt, contact [mysupport.netapp.com](https://mysupport.netapp.com).
2. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message
```

```
MAINT=number_of_hours_downh
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:*> system node autosupport invoke -node * -type all -message MAINT=2h`

3. Check the version of ONTAP the system is running on the impaired controller if up, or on the partner controller if the impaired controller is down, using the `version -v` command:
  - If `<Ino-DARE>` or `<1Ono-DARE>` is displayed in the command output, the system does not support NVE, proceed to shut down the controller.
  - If `<Ino-DARE>` is not displayed in the command output, and the system is running ONTAP 9.6 or later, go to go to the next section.

### Check NVE or NSE on systems running ONTAP 9.6 and later

Before shutting down the impaired controller, you need to verify whether the system has either NetApp Volume Encryption (NVE) or NetApp Storage Encryption (NSE) enabled. If so, you need to verify the configuration.

1. Verify whether NVE is in use for any volumes in the cluster: `volume show -is-encrypted true`

If any volumes are listed in the output, NVE is configured and you need to verify the NVE configuration. If no volumes are listed, check whether NSE is configured and in use.

2. Verify whether NSE is configured and in use: `storage encryption disk show`
  - If the command output lists the drive details with Mode & Key ID information, NSE is configured and you need to verify the NSE configuration and in use.
  - If no disks are shown, NSE is not configured.
  - If NVE and NSE are not configured, no drives are protected with NSE keys, it's safe to shut down the impaired controller.


### Verify NVE configuration

1. Display the key IDs of the authentication keys that are stored on the key management servers: `security key-manager key query`



After the ONTAP 9.6 release, you may have additional key manager types. The types are KMIP, AKV, and GCP. The process for confirming these types is the same as confirming external or onboard key manager types.

- If the Key Manager type displays `external` and the Restored column displays `yes`, it's safe to shut down the impaired controller.
  - If the Key Manager type displays `onboard` and the Restored column displays `yes`, you need to complete some additional steps.
  - If the Key Manager type displays `external` and the Restored column displays anything other than `yes`, you need to complete some additional steps.
  - If the Key Manager type displays `onboard` and the Restored column displays anything other than `yes`, you need to complete some additional steps.
2. If the Key Manager type displays `onboard` and the Restored column displays `yes`, manually back up the OKM information:

- a. Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
  - b. Enter the command to display the key management information: `security key-manager onboard show-backup`
  - c. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
  - d. Return to admin mode: `set -priv admin`
  - e. Shut down the impaired controller.
3. If the `Key Manager` type displays `external` and the `Restored` column displays anything other than `yes`:
- a. Restore the external key management authentication keys to all nodes in the cluster: `security key-manager external restore`
- If the command fails, contact NetApp Support.
- [mysupport.netapp.com](https://mysupport.netapp.com)
- b. Verify that the `Restored` column equals `yes` for all authentication keys: `security key-manager key query`
  - c. Shut down the impaired controller.
4. If the `Key Manager` type displays `onboard` and the `Restored` column displays anything other than `yes`:
- a. Enter the onboard security key-manager sync command: `security key-manager onboard sync`
-  Enter the customer's 32 character, alphanumeric onboard key management passphrase at the prompt. If the passphrase cannot be provided, contact NetApp Support.

[mysupport.netapp.com](https://mysupport.netapp.com)
- b. Verify the `Restored` column shows `yes` for all authentication keys: `security key-manager key query`
  - c. Verify that the `Key Manager` type shows `onboard`, and then manually back up the OKM information.
  - d. Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
  - e. Enter the command to display the key management backup information: `security key-manager onboard show-backup`
  - f. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
  - g. Return to admin mode: `set -priv admin`
  - h. You can safely shut down the controller.

## Verify NSE configuration

1. Display the key IDs of the authentication keys that are stored on the key management servers: `security key-manager key query -key-type NSE-AK`



After the ONTAP 9.6 release, you may have additional key manager types. The types are KMIP, AKV, and GCP. The process for confirming these types is the same as confirming external or onboard key manager types.

- If the Key Manager type displays `external` and the Restored column displays `yes`, it's safe to shut down the impaired controller.
  - If the Key Manager type displays `onboard` and the Restored column displays `yes`, you need to complete some additional steps.
  - If the Key Manager type displays `external` and the Restored column displays anything other than `yes`, you need to complete some additional steps.
  - If the Key Manager type displays `external` and the Restored column displays anything other than `yes`, you need to complete some additional steps.
2. If the Key Manager type displays `onboard` and the Restored column displays `yes`, manually back up the OKM information:
    - a. Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
    - b. Enter the command to display the key management information: `security key-manager onboard show-backup`
    - c. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
    - d. Return to admin mode: `set -priv admin`
    - e. You can safely shut down the controller.
  3. If the Key Manager type displays `external` and the Restored column displays anything other than `yes`:
    - a. Restore the external key management authentication keys to all nodes in the cluster: `security key-manager external restore`  
  
If the command fails, contact NetApp Support.  
  
[mysupport.netapp.com](https://mysupport.netapp.com)
    - b. Verify that the Restored column equals `yes` for all authentication keys: `security key-manager key query`
    - c. You can safely shut down the controller.
  4. If the Key Manager type displays `onboard` and the Restored column displays anything other than `yes`:
    - a. Enter the onboard security key-manager sync command: `security key-manager onboard sync`  
  
Enter the customer's 32 character, alphanumeric onboard key management passphrase at the prompt. If the passphrase cannot be provided, contact NetApp Support.  
  
[mysupport.netapp.com](https://mysupport.netapp.com)
    - b. Verify the Restored column shows `yes` for all authentication keys: `security key-manager key query`
    - c. Verify that the Key Manager type shows `onboard`, and then manually back up the OKM information.

- d. Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
- e. Enter the command to display the key management backup information: `security key-manager onboard show-backup`
- f. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
- g. Return to admin mode: `set -priv admin`
- h. You can safely shut down the controller.

#### Shut down the node - AFF A320

After completing the NVE or NSE tasks, you need to complete the shutdown of the impaired node. Shut down or take over the impaired controller using the appropriate procedure for your configuration.

#### Option 1: Most systems

After completing the NVE or NSE tasks, you need to complete the shutdown of the impaired controller.

##### Steps

- a. Take the impaired controller to the LOADER prompt:

| If the impaired controller displays...                   | Then...                                                                                                                                                                                                                                                                     |
|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                                        | Go to Remove controller module.                                                                                                                                                                                                                                             |
| Waiting for giveback...                                  | Press Ctrl-C, and then respond <code>y</code> when prompted.                                                                                                                                                                                                                |
| System prompt or password prompt (enter system password) | <p>Take over or halt the impaired controller from the healthy controller:<br/> <code>storage failover takeover -ofnode<br/> impaired_node_name</code></p> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <code>y</code>.</p> |

- b. From the LOADER prompt, enter: `printenv` to capture all boot environmental variables. Save the output to your log file.



This command may not work if the boot device is corrupted or non-functional.

#### Option 2: System is in a MetroCluster



Do not use this procedure if your system is in a two-node MetroCluster configuration.

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.



- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).
- If you have a MetroCluster configuration, you must have confirmed that the MetroCluster Configuration State is configured and that the nodes are in an enabled and normal state (`metrocluster node show`).

## Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message
MAINT=number_of_hours_downh
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:*>`

```
system node autosupport invoke -node * -type all -message MAINT=2h
```

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`
3. Take the impaired controller to the LOADER prompt:

| If the impaired controller is displaying...              | Then...                                                                                                                                                                                                                                                         |
|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                                        | Go to the next step.                                                                                                                                                                                                                                            |
| Waiting for giveback...                                  | Press Ctrl-C, and then respond <code>y</code> when prompted.                                                                                                                                                                                                    |
| System prompt or password prompt (enter system password) | <p>Take over or halt the impaired controller from the healthy controller:</p> <pre>storage failover takeover -ofnode impaired_node_name</pre> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <code>y</code>.</p> |

## Replace the boot media - AFF A320

To replace the boot media, you must remove the impaired controller module, install the replacement boot media, and transfer the boot image to a USB flash drive.

### Step 1: Remove the controller module

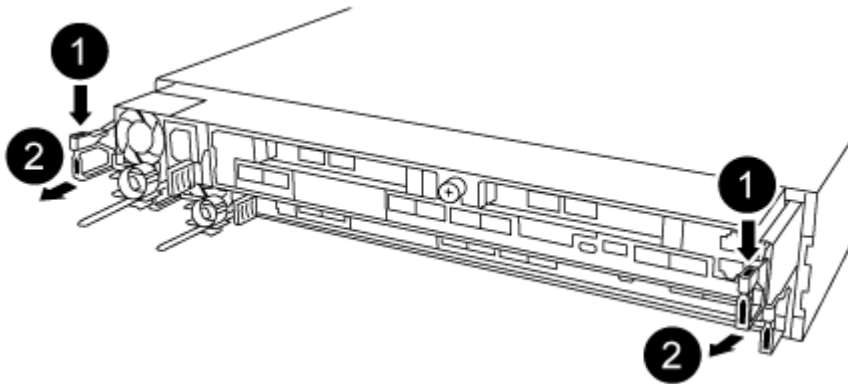
To access components inside the controller module, you must remove the controller module from the chassis.

1. If you are not already grounded, properly ground yourself.
2. Unplug the controller module power supply from the power source.
3. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.



Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

4. Remove and set aside the cable management devices from the left and right sides of the controller module.
5. Remove the controller module from the chassis:



- a. Insert your forefinger into the latching mechanism on either side of the controller module.
- b. Press down on the orange tab on top of the latching mechanism until it clears the latching pin on the chassis.

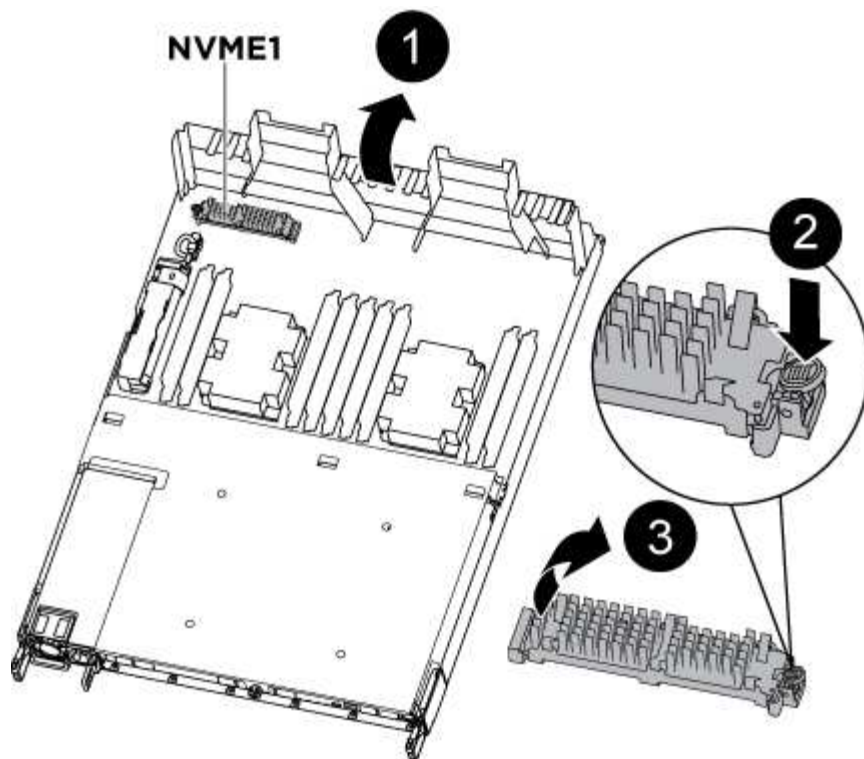
The latching mechanism hook should be nearly vertical and should be clear of the chassis pin.

- c. Gently pull the controller module a few inches toward you so that you can grasp the controller module sides.
- d. Using both hands, gently pull the controller module out of the chassis and set it on a flat, stable surface.

## Step 2: Replace the boot media

You must locate the boot media in the controller module, and then follow the directions to replace it.

1. Open the air duct and locate the boot media using the following illustration or the FRU map on the controller module:
2. Locate and remove the boot media from the controller module:



- a. Press the blue button at the end of the boot media until the lip on the boot media clears the blue button.
- b. Rotate the boot media up and gently pull the boot media out of the socket.
1. Check the boot media to make sure that it is seated squarely and completely in the socket.

If necessary, remove the boot media and reseal it into the socket.

3. Lock the boot media in place:
  - a. Rotate the boot media down toward the motherboard.
  - b. Placing a finger at the end of the boot media by the blue button, push down on the boot media end to engage the blue locking button.
  - c. While pushing down on the boot media, lift the blue locking button to lock the boot media in place.
4. Close the air duct.

### Step 3: Transfer the boot image to the boot media using a USB flash drive

The replacement boot media that you installed does not have a boot image, so you need to transfer a boot image using a USB flash drive.

- You must have a USB flash drive, formatted to MBR/FAT32, with at least 4GB capacity
- A copy of the same image version of ONTAP as what the impaired controller was running. You can download the appropriate image from the Downloads section on the NetApp Support Site
  - If NVE is enabled, download the image with NetApp Volume Encryption, as indicated in the download button.
  - If NVE is not enabled, download the image without NetApp Volume Encryption, as indicated in the download button.
- If your system is an HA pair, you must have a network connection.

- If your system is a stand-alone system you do not need a network connection, but you must perform an additional reboot when restoring the var file system.

1. Download and copy the appropriate service image from the NetApp Support Site to the USB flash drive.
  - a. Download the service image to your work space on your laptop.
  - b. Unzip the service image.



If you are extracting the contents using Windows, do not use winzip to extract the netboot image. Use another extraction tool, such as 7-Zip or WinRAR.

There are two folders in the unzipped service image file:

- boot
  - efi
- c. Copy the efi folder to the top directory on the USB flash drive.

The USB flash drive should have the efi folder and the same Service Image (BIOS) version of what the impaired controller is running.

- d. Remove the USB flash drive from your laptop.
2. If you have not already done so, close the air duct.
  3. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.
  4. Reinstall the cable management device and recable the system, as needed.

When recabling, remember to reinstall the media converters (SFPs or QSFPs) if they were removed.

5. Plug the power cable into the power supply and reinstall the power cable retainer.
6. Insert the USB flash drive into the USB slot on the controller module.

Make sure that you install the USB flash drive in the slot labeled for USB devices, and not in the USB console port.

7. Complete the reinstallation of the controller module:
  - a. Make sure the latch arms are locked in the extended position.
  - b. Using the latch arms, push the controller module into the chassis bay until it stops.



Do not push down on the latching mechanism at the top of the latch arms. Doing so will raise the locking mechanism and prohibit sliding the controller module into the chassis.

- c. Press down and hold the orange tabs on top of the latching mechanism.
- d. Gently push the controller module into the chassis bay until it is flush with the edges of the chassis.



The latching mechanism arms slide into the chassis.

The controller module begins to boot as soon as it is fully seated in the chassis.

- e. Release the latches to lock the controller module into place.
- f. If you have not already done so, reinstall the cable management device.

8. Interrupt the boot process by pressing Ctrl-C to stop at the LOADER prompt.

If you miss this message, press Ctrl-C, select the option to boot to Maintenance mode, and then halt the node to boot to LOADER.

9. From the LOADER prompt, boot the recovery image from the USB flash drive: `boot_recovery`

The image is downloaded from the USB flash drive.

10. When prompted, either enter the name of the image or accept the default image displayed inside the brackets on your screen.

11. After the image is installed, start the restoration process:

- a. Record the IP address of the impaired node that is displayed on the screen.
- b. Press `y` when prompted to restore the backup configuration.
- c. Press `y` when prompted to overwrite `/etc/ssh/ssh_host_dsa_key`.

12. From the partner node in advanced privilege level, start the configuration synchronization using the IP address recorded in the previous step: `system node restore-backup -node local -target -address impaired_node_IP_address`

13. If the restore is successful, press `y` on the impaired node when prompted to use the restored copy?.

14. Press `y` when you see confirm backup procedure was successful, and then press `y` when prompted to reboot the node.

15. Verify that the environmental variables are set as expected.

- a. Take the node to the LOADER prompt.

From the ONTAP prompt, you can issue the command `system node halt -skip-lif-migration-before-shutdown true -ignore-quorum-warnings true -inhibit-takeover true`.


- b. Check the environment variable settings with the `printenv` command.

- c. If an environment variable is not set as expected, modify it with the `setenv environment-variable-name changed-value` command.

- d. Save your changes using the `savenv` command.

- e. Reboot the node.

16. With the rebooted impaired node displaying the `Waiting for giveback...` message, perform a giveback from the healthy node:

| If your system is in... | Then...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| An HA pair              | <p data-bbox="652 157 1484 233">After the impaired node is displaying the <code>Waiting for giveback...</code> message, perform a giveback from the healthy node:</p> <p data-bbox="652 262 1484 338">a. From the healthy node: <code>storage failover giveback -ofnode partner_node_name</code></p> <p data-bbox="652 367 1484 443">The impaired node takes back its storage, finishes booting, and then reboots and is again taken over by the healthy node.</p> <div data-bbox="732 472 1382 548">  <p data-bbox="849 485 1382 548">If the giveback is vetoed, you can consider overriding the vetoes.</p> </div> <p data-bbox="699 590 966 625"><a href="#">HA pair management</a></p> <p data-bbox="652 655 1484 730">b. Monitor the progress of the giveback operation by using the <code>storage failover show-giveback</code> command.</p> <p data-bbox="652 739 1484 848">c. After the giveback operation is complete, confirm that the HA pair is healthy and that takeover is possible by using the <code>storage failover show</code> command.</p> <p data-bbox="652 856 1484 932">d. Restore automatic giveback if you disabled it using the <code>storage failover modify</code> command.</p> |

17. Exit advanced privilege level on the healthy node.

#### Boot the recovery image - AFF A320

You must boot the ONTAP image from the USB drive, restore the file system, and verify the environmental variables.

1. From the LOADER prompt, boot the recovery image from the USB flash drive: `boot_recovery`

The image is downloaded from the USB flash drive.

2. When prompted, either enter the name of the image or accept the default image displayed inside the brackets on your screen.
3. Restore the var file system:

| If your system has... | Then...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A network connection  | <ul style="list-style-type: none"> <li>a. Press <b>y</b> when prompted to restore the backup configuration.</li> <li>b. Set the healthy node to advanced privilege level: <code>set -privilege advanced</code></li> <li>c. Run the restore backup command: <code>system node restore-backup -node local -target-address impaired_node_IP_address</code></li> <li>d. Return the node to admin level: <code>set -privilege admin</code></li> <li>e. Press <b>y</b> when prompted to use the restored configuration.</li> <li>f. Press <b>y</b> when prompted to reboot the node.</li> </ul> |
| No network connection | <ul style="list-style-type: none"> <li>a. Press <b>n</b> when prompted to restore the backup configuration.</li> <li>b. Reboot the system when prompted by the system.</li> <li>c. Select the <b>Update flash from backup config</b> (sync flash) option from the displayed menu.</li> </ul> <p>If you are prompted to continue with the update, press <b>y</b>.</p>                                                                                                                                                                                                                      |

| If your system has...                                           | Then...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No network connection and is in a MetroCluster IP configuration | <p>a. Press <b>n</b> when prompted to restore the backup configuration.</p> <p>b. Reboot the system when prompted by the system.</p> <p>c. Wait for the iSCSI storage connections to connect.</p> <p>You can proceed after you see the following messages:</p> <div data-bbox="672 394 1489 1260" style="border: 1px solid #ccc; padding: 10px; margin: 10px 0;"> <pre> date-and-time [node- name:iscsi.session.stateChanged:notice]: iSCSI session state is changed to Connected for the target iSCSI-target (type: dr_auxiliary, address: ip-address). date-and-time [node- name:iscsi.session.stateChanged:notice]: iSCSI session state is changed to Connected for the target iSCSI-target (type: dr_partner, address: ip-address). date-and-time [node- name:iscsi.session.stateChanged:notice]: iSCSI session state is changed to Connected for the target iSCSI-target (type: dr_auxiliary, address: ip-address). date-and-time [node- name:iscsi.session.stateChanged:notice]: iSCSI session state is changed to Connected for the target iSCSI-target (type: dr_partner, address: ip-address).</pre> </div> <p>d. Select the <b>Update flash from backup config</b> (sync flash) option from the displayed menu.</p> <p>If you are prompted to continue with the update, press <b>y</b>.</p> |

4. Ensure that the environmental variables are set as expected:
  - a. Take the node to the LOADER prompt.
  - b. Check the environment variable settings with the `printenv` command.
  - c. If an environment variable is not set as expected, modify it with the `setenv environment_variable_name changed_value` command.
  - d. Save your changes using the `savenv` command.
5. The next depends on your system configuration:
  - If your system has onboard keymanager, NSE or NVE configured, go to [Post boot media replacement steps for OKM, NSE, and NVE](#)



- If your system does not have onboard keymanager, NSE or NVE configured, complete the steps in this section.

6. From the LOADER prompt, enter the `boot_ontap` command.

| If you see...           | Then...                                                                                                                                |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| The login prompt        | Go to the next Step.                                                                                                                   |
| Waiting for giveback... | a. Log into the partner node.<br>b. Confirm the target node is ready for giveback with the <code>storage failover show</code> command. |

7. Connect the console cable to the partner node.

8. Give back the node using the `storage failover giveback -fromnode local` command

9. At the cluster prompt, check the logical interfaces with the `net int -is-home false` command.

If any interfaces are listed as "false", revert those interfaces back to their home port using the `net int revert` command.

10. Move the console cable to the repaired node and run the `version -v` command to check the ONTAP versions.

11. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.

#### Restore OKM, NSE, and NVE as needed - AFF A320

Once environment variables are checked, you must complete steps specific to systems that have Onboard Key Manager (OKM), NetApp Storage Encryption (NSE) or NetApp Volume Encryption (NVE) enabled.

- Determine which section you should use to restore your OKM, NSE, or NVE configurations: If NSE or NVE are enabled along with Onboard Key Manager you must restore settings you captured at the beginning of this procedure.
  - If NSE or NVE are enabled and Onboard Key Manager is enabled, go to [Restore NVE or NSE when Onboard Key Manager is enabled](#).
  - If NSE or NVE are enabled for ONTAP 9.6, go to [Restore NSE/NVE on systems running ONTAP 9.6 and later](#).

#### Restore NVE or NSE when Onboard Key Manager is enabled

##### Steps

- Connect the console cable to the target controller.
- Use the `boot_ontap` command at the LOADER prompt to boot the controller.
- Check the console output:

| If the console displays... | Then...                                                                                                                                                                                                                    |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt          | Boot the controller to the boot menu: <code>boot_ontap menu</code>                                                                                                                                                         |
| Waiting for giveback....   | a. Enter <code>Ctrl-C</code> at the prompt<br>b. At the message: Do you wish to halt this node rather than wait [y/n]? , enter: <code>y</code><br>c. At the LOADER prompt, enter the <code>boot_ontap menu</code> command. |

- At the Boot Menu, enter the hidden command, `recover_onboard_keymanager` and reply `y` at the prompt
- Enter the passphrase for the onboard key manager you obtained from the customer at the beginning of this procedure.
- When prompted to enter the backup data, paste the backup data you captured at the beginning of this procedure, when asked. Paste the output of `security key-manager backup show` OR `security key-manager onboard show-backup` command



The data is output from either `security key-manager backup show` or `security key-manager onboard show-backup` command.

Example of backup data:

```
-----BEGIN BACKUP-----
TmV0QXBwIEtleSBGbG9iAAEAAAAEAAAAcAEAAAAAADuD+byAAAAACEAAAAAAAAA
QAAAAAAAAABvOIH0AAAAAMh7qDLRyH1DBz12piVdy9ATSFMT0C0TIYFss4PDjTaV
dzRYkLd1PhQLxAWJwOlyqSr8qY1SEBgm1IWgE5DLRqkiAAAAAAAACgAAAAAAAA
3WTh7gAAAAAAAAAAAAAAAAAIAAAAAAAgAZJEIWvdeHr5RCAvHGclo+wAAAAAAAA
lgAAAAAAAAAoAAAAAAAAAEOTcR0AAAAAAAAAAAAAAAAACAAAAAAJAGr3tJA/
LRzUQRHwv+1aWvAAAAAAAAAACQAAAAAAAAAgAAAAAAAAACdhTcvAAAAAJ1PXeBf
ml4NBsSyV1B4jc4A7cvWEFY6ILG6hc6tbKLAHZuvfQ4rlbYAAAAAAAAAAAAAAAA
AA
AA
.
.
.
.
H4nPQM0nrDRYRa9SCv8AAA
AA
AAAAAAA
-----END BACKUP-----
```

- At the Boot Menu select the option for Normal Boot.

The system boots to Waiting for giveback... prompt.

- Confirm the target controller is ready for giveback with the `storage failover show` command.

9. Giveback only the CFO aggregates with the `storage failover giveback -fromnode local -only-cfo-aggregates true` command.
- If the command fails because of a failed disk, physically disengage the failed disk, but leave the disk in the slot until a replacement is received.
  - If the command fails because of an open CIFS sessions, check with customer how to close out CIFS sessions.



Terminating CIFS can cause loss of data.

- If the command fails because the partner "not ready", wait 5 minutes for the NVMEMs to synchronize.
  - If the command fails because of an NDMP, SnapMirror, or SnapVault process, disable the process. See the appropriate Documentation Center for more information.
10. Once the giveback completes, check the failover and giveback status with the `storage failover show` and ``storage failover show-giveback`` commands.

Only the CFO aggregates (root aggregate and CFO style data aggregates) will be shown.

11. Move the console cable to the target controller.
- a. If you are running ONTAP 9.6 or later, run the security key-manager onboard sync:
  - b. Run the `security key-manager onboard sync` command and then enter the passphrase when prompted.
  - c. Enter the `security key-manager key query` command to see a detailed view of all keys stored in the onboard key manager and verify that the `Restored` column = `yes/true` for all authentication keys.



If the `Restored` column = anything other than `yes/true`, contact Customer Support.

- d. Wait 10 minutes for the key to synchronize across the cluster.
12. Move the console cable to the partner controller.
13. Give back the target controller using the `storage failover giveback -fromnode local` command.
14. Check the giveback status, 3 minutes after it reports complete, using the `storage failover show` command.

If giveback is not complete after 20 minutes, contact Customer Support.

15. At the clustershell prompt, enter the `net int show -is-home false` command to list the logical interfaces that are not on their home controller and port.

If any interfaces are listed as `false`, revert those interfaces back to their home port using the `net int revert -vserver Cluster -lif nodename` command.

16. Move the console cable to the target controller and run the `version -v` command to check the ONTAP versions.
17. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.

## Restore NSE/NVE on systems running ONTAP 9.6 and later

### Steps

1. Connect the console cable to the target controller.
2. Use the `boot_ontap` command at the LOADER prompt to boot the controller.
3. Check the console output:

| If the console displays... | Then...                                                                                                                                                                                                 |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The login prompt           | Go to Step 7.                                                                                                                                                                                           |
| Waiting for giveback...    | <ol style="list-style-type: none"><li>a. Log into the partner controller.</li><li>b. Confirm the target controller is ready for giveback with the <code>storage failover show</code> command.</li></ol> |

4. Move the console cable to the partner controller and give back the target controller storage using the `storage failover giveback -fromnode local -only-cfo-aggregates true local` command.
  - If the command fails because of a failed disk, physically disengage the failed disk, but leave the disk in the slot until a replacement is received.
  - If the command fails because of an open CIFS sessions, check with customer how to close out CIFS sessions.



Terminating CIFS can cause loss of data.

- If the command fails because the partner "not ready", wait 5 minutes for the NVMEMs to synchronize.
  - If the command fails because of an NDMP, SnapMirror, or SnapVault process, disable the process. See the appropriate Documentation Center for more information.
5. Wait 3 minutes and check the failover status with the `storage failover show` command.
  6. At the clustershell prompt, enter the `net int show -is-home false` command to list the logical interfaces that are not on their home controller and port.

If any interfaces are listed as `false`, revert those interfaces back to their home port using the `net int revert -vserver Cluster -lif nodename` command.

7. Move the console cable to the target controller and run the `version -v` command to check the ONTAP versions.
8. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.
9. Use the `storage encryption disk show` at the clustershell prompt, to review the output.
10. Use the `security key-manager key query` command to display the key IDs of the authentication keys that are stored on the key management servers.
  - If the `Restored` column = `yes/true`, you are done and can proceed to complete the replacement process.

- If the `Key Manager type = external` and the `Restored` column = anything other than `yes/true`, use the `security key-manager external restore` command to restore the key IDs of the authentication keys.



If the command fails, contact Customer Support.

- If the `Key Manager type = onboard` and the `Restored` column = anything other than `yes/true`, use the `security key-manager onboard sync` command to re-sync the Key Manager type.

Use the `security key-manager key query` command to verify that the `Restored` column = `yes/true` for all authentication keys.

11. Connect the console cable to the partner controller.
12. Give back the controller using the `storage failover giveback -fromnode local` command.
13. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.

#### **Return the failed part to NetApp - AFF A320**

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

## **Chassis**

#### **Overview of chassis replacement - AFF A320**

To replace the chassis, you must move the fans and controller modules from the impaired chassis to the new chassis of the same model as the impaired chassis.

All other components in the system must be functioning properly; if not, you must contact technical support.

- You can use this procedure with all versions of ONTAP supported by your system.
- This procedure is written with the assumption that you are moving the controller modules to the new chassis, and that the chassis is a new component from NetApp.
- This procedure is disruptive. For a two-node cluster, you will have a complete service outage and a partial outage in a multi-node cluster.

#### **Shut down the controllers - AFF A320**

This procedure is for 2-node, non-MetroCluster configurations only. If you have a system with more than two nodes, see [How to perform a graceful shutdown and power up of one HA pair in a 4-node cluster](#).

#### **Before you begin**

You need:

- Local administrator credentials for ONTAP.
- NetApp onboard key management (OKM) cluster-wide passphrase if using storage encryption or NVE/NAE.

- BMC accessibility for each controller.
- Stop all clients/host from accessing data on the NetApp system.
- Suspend external backup jobs.
- Necessary tools and equipment for the replacement.



If the system is a NetApp StorageGRID or ONTAP S3 used as FabricPool cloud tier, refer to the [Gracefully shutdown and power up your storage system Resolution Guide](#) after performing this procedure.



If using SSDs, refer to [SU490: \(Impact: Critical\) SSD Best Practices: Avoid risk of drive failure and data loss if powered off for more than two months](#)

As a best practice before shutdown, you should:

- Perform additional [system health checks](#).
- Upgrade ONTAP to a recommended release for the system.
- Resolve any [Active IQ Wellness Alerts and Risks](#).  
Make note of any faults presently on the system, such as LEDs on the system components.

## Steps

1. Log into the cluster through SSH or log in from any node in the cluster using a local console cable and a laptop/console.
2. Turn off AutoSupport and indicate how long you expect the system to be offline:

```
system node autosupport invoke -node * -type all -message "MAINT=8h Power Maintenance"
```

3. Identify the SP/BMC address of all nodes:

```
system service-processor show -node * -fields address
```

4. Exit the cluster shell: `exit`
5. Log into SP/BMC over SSH using the IP address of any of the nodes listed in the output from the previous step.

If your're using a console/laptop, log into the controller using the same cluster administrator credentials.



Open an SSH session to every SP/BMC connection so that you can monitor progress.

6. Halt the 2 nodes located in the impaired chassis:

```
system node halt -node <node>,<node2> -skip-lif-migration-before-shutdown true -ignore-quorum-warnings true -inhibit-takeover true
```



For clusters using SnapMirror synchronous operating in StrictSync mode: `system node halt -node <node>,<node2> -skip-lif-migration-before-shutdown true -ignore-quorum-warnings true -inhibit-takeover true -ignore-strict-sync-warnings true`

7. Enter **y** for each controller in the cluster when you see *Warning: Are you sure you want to halt node "cluster <node-name> number"?*  
*{y|n}:*
8. Wait for each controller to halt and display the LOADER prompt.

### Replace hardware - AFF A320

Move the fans, hard drives, and controller module or modules from the impaired chassis to the new chassis, and swap out the impaired chassis from the equipment rack or system cabinet with the new chassis of the same model as the impaired chassis.

#### Step 1: Remove the controller modules

To replace the chassis, you must remove the controller modules from the old chassis.

1. If you are not already grounded, properly ground yourself.
2. Release the power cable retainers, and then unplug the cables from the power supplies.
3. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

4. Remove and set aside the cable management devices from the left and right sides of the controller module.
5. Remove the controller module from the chassis:
  - a. Insert your forefinger into the latching mechanism on either side of the controller module.
  - b. Press down on the orange tab on top of the latching mechanism until it clears the latching pin on the chassis.

The latching mechanism hook should be nearly vertical and should be clear of the chassis pin.

- c. Gently pull the controller module a few inches toward you so that you can grasp the controller module sides.
  - d. Using both hands, gently pull the controller module out of the chassis and set it on a flat, stable surface.
6. Repeat these steps for the other controller module in the chassis.

#### Step 2: Move the fans

To move the fan modules to the replacement chassis when replacing the chassis, you must perform a specific sequence of tasks.

1. If you are not already grounded, properly ground yourself.
2. Remove the bezel (if necessary) with two hands, by grasping the openings on each side of the bezel, and then pulling it toward you until the bezel releases from the ball studs on the chassis frame.
3. Press down the release latch on the fan module cam handle, and then rotate the cam handle downward.

The fan module moves a little bit away from the chassis.

4. Pull the fan module straight out from the chassis, making sure that you support it with your free hand so that it does not swing out of the chassis.



The fan modules are short. Always support the bottom of the fan module with your free hand so that it does not suddenly drop free from the chassis and injure you.

5. Set the fan module aside.
6. Repeat the preceding steps for any remaining fan modules.
7. Insert the fan module into the replacement chassis by aligning it with the opening, and then sliding it into the chassis.
8. Push firmly on the fan module cam handle so that it is seated all the way into the chassis.

The cam handle raises slightly when the fan module is completely seated.

9. Swing the cam handle up to its closed position, making sure that the cam handle release latch clicks into the locked position.

The fan LED should be green after the fan is seated and has spun up to operational speed.

10. Repeat these steps for the remaining fan modules.

### Step 3: Replace a chassis from within the equipment rack or system cabinet

You must remove the existing chassis from the equipment rack or system cabinet before you can install the replacement chassis.

1. Remove the screws from the chassis mount points.
2. With two people, slide the old chassis off the rack rails in a system cabinet or equipment rack, and then set it aside.
3. If you are not already grounded, properly ground yourself.
4. Using two people, install the replacement chassis into the equipment rack or system cabinet by guiding the chassis onto the rack rails in a system cabinet or equipment rack.
5. Slide the chassis all the way into the equipment rack or system cabinet.
6. Secure the front of the chassis to the equipment rack or system cabinet, using the screws you removed from the old chassis.
7. If you have not already done so, install the bezel.

### Step 4: Install the controller modules

After you install the controller modules into the new chassis, you must boot your system.

For HA pairs with two controller modules in the same chassis, the sequence in which you install the controller module is especially important because it attempts to reboot as soon as you completely seat it in the chassis.

1. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.



Do not completely insert the controller module in the chassis until instructed to do so.



2. Recable the console to the controller module, and then reconnect the management port.
3. Plug the power cables into the power supplies and reinstall the power cable retainers.
4. Complete the reinstallation of the controller module:
  - a. Make sure the latch arms are locked in the extended position.
  - b. Using the latch arms, push the controller module into the chassis bay until it stops.
  - c. Press down and hold the orange tabs on top of the latching mechanism.
  - d. Gently push the controller module into the chassis bay until it is flush with the edges of the chassis.



The latching mechanism arms slide into the chassis.

The controller module begins to boot as soon as it is fully seated in the chassis.

- e. Release the latches to lock the controller module into place.
  - f. Recable the power supply.
  - g. If you have not already done so, reinstall the cable management device.
  - h. Interrupt the normal boot process by pressing `Ctrl-C`.
5. Repeat the preceding steps to install the second controller into the new chassis.

#### Complete the restoration and replacement process - AFF A320

You must verify the HA state of the chassis and return the failed part to NetApp, as described in the RMA instructions shipped with the kit.

#### Step 1: Verify and set the HA state of the chassis

You must verify the HA state of the chassis, and, if necessary, update the state to match your system configuration.

1. In Maintenance mode, from either controller module, display the HA state of the local controller module and chassis: `ha-config show`

The HA state should be the same for all components.

2. If the displayed system state for the chassis does not match your system configuration:
  - a. Set the HA state for the chassis: `ha-config modify chassis HA-state`

The value for HA-state can be one of the following:

- `ha`
- `mcc`
- `mccip`
- `non-ha`

- b. Confirm that the setting has changed: `ha-config show`
3. If you have not already done so, recable the rest of your system.
4. Reinstall the bezel on the front of the system.

## Step 2: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

### Controller module

#### Overview of controller module replacement - AFF A320

You must review the prerequisites for the replacement procedure and select the correct one for your version of the ONTAP operating system.

- All drive shelves must be working properly.
- The healthy controller must be able to take over the controller that is being replaced (referred to in this procedure as the “impaired controller”).
- If your system is in a MetroCluster configuration, you must review the section [Choosing the correct recovery procedure](#) to determine whether you should use this procedure.

If this is the procedure you should use, note that the controller replacement procedure for a controller in a four or eight node MetroCluster configuration is the same as that in an HA pair. No MetroCluster-specific steps are required because the failure is restricted to an HA pair and storage failover commands can be used to provide nondisruptive operation during the replacement.

- You must replace the failed component with a replacement FRU component you received from your provider.
- You must be replacing a controller module with a controller module of the same model type. You cannot upgrade your system by just replacing the controller module.
- You cannot change any drives or drive shelves as part of this procedure.
- In this procedure, the boot device is moved from the impaired controller to the *replacement* controller so that the *replacement* controller will boot up in the same version of ONTAP as the old controller module.
- It is important that you apply the commands in these steps on the correct systems:
  - The *impaired* controller is the controller that is being replaced.
  - The *replacement* controller is the new controller that is replacing the impaired controller.
  - The *healthy* controller is the surviving controller.
- You must always capture the controller’s console output to a text file.

This provides you a record of the procedure so that you can troubleshoot any issues that you might encounter during the replacement process.

#### Shut down the impaired controller - AFF A320

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

#### About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv`


advanced mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:  
`system node autosupport invoke -node * -type all -message MAINT=<# of hours>h`  
  
The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h`
2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`



When you see *Do you want to disable auto-giveback?*, enter *y*.

3. Take the impaired controller to the LOADER prompt:

| If the impaired controller is displaying... | Then...                                                                                                                                                                                                                                                      |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                           | Go to the next step.                                                                                                                                                                                                                                         |
| Waiting for giveback...                     | Press Ctrl-C, and then respond <i>y</i> when prompted.                                                                                                                                                                                                       |
| System prompt or password prompt            | Take over or halt the impaired controller from the healthy controller:<br><code>storage failover takeover -ofnode<br/>impaired_node_name</code><br><br>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i> . |

Replace the controller module hardware - AFF A320

To replace the controller module hardware, you must remove the impaired controller, move FRU components to the replacement controller module, install the replacement controller module in the chassis, and then boot the system to Maintenance mode.

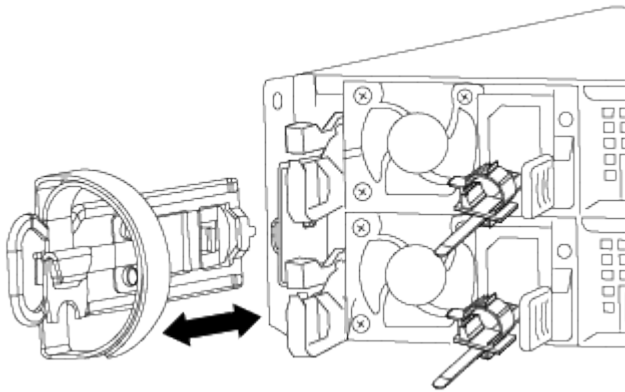
Step 1: Remove the controller module

To access components inside the controller module, you must remove the controller module from the chassis.

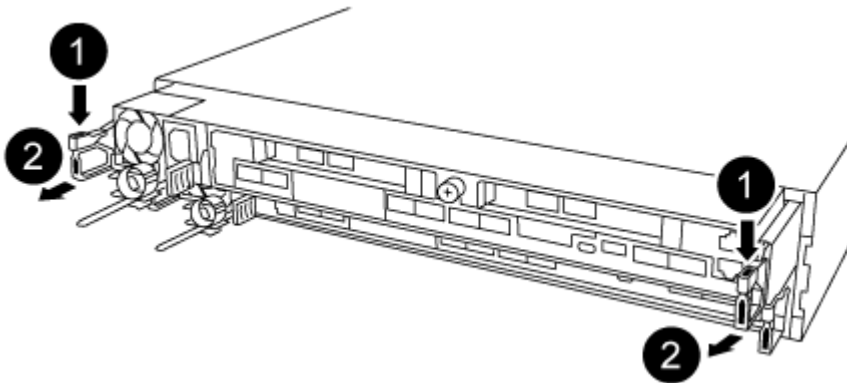
You can use the following images or the written steps to remove the controller module from the chassis.

The following image shows removing the cables and cable management arms from the impaired controller

module:



The following image shows removing the impaired controller module from the chassis:



1. If you are not already grounded, properly ground yourself.
2. Unplug the controller module power supply from the power source.
3. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

4. Remove and set aside the cable management devices from the left and right sides of the controller module.
5. Remove the controller module from the chassis:

- a. Insert your forefinger into the latching mechanism on either side of the controller module.
- b. Press down on the orange tab on top of the latching mechanism until it clears the latching pin on the chassis.

The latching mechanism hook should be nearly vertical and should be clear of the chassis pin.

- c. Gently pull the controller module a few inches toward you so that you can grasp the controller module sides.
- d. Using both hands, gently pull the controller module out of the chassis and set it on a flat, stable surface.

## Step 2: Move the power supplies

You must move the power supply from the impaired controller module to the replacement controller module when you replace a controller module.

1. Rotate the cam handle such that it can be used to pull power supply out of the controller module while pressing the blue locking tab.



The power supply is short. Always use two hands to support it when removing it from the controller module so that it does not suddenly swing free from the controller module and injure you.

2. Move the power supply to the new controller module, and then install it.
3. Using both hands, support and align the edges of the power supply with the opening in the controller module, and then gently push the power supply into the controller module until the locking tab clicks into place.

The power supplies will only properly engage with the internal connector and lock in place one way.



To avoid damaging the internal connector, do not use excessive force when sliding the power supply into the system.

## Step 3: Move the NVDIMM battery

To move the NVDIMM battery from the impaired controller module to the replacement controller module, you must perform a specific sequence of steps.

You can use the following illustration or the written steps to move the NVDIMM battery from the impaired controller module to the replacement controller module.



1. Locate the NVDIMM battery in the controller module.
2. Locate the battery plug and squeeze the clip on the face of the battery plug to release the plug from the socket, and then unplug the battery cable from the socket.
3. Grasp the battery and press the blue locking tab marked PUSH, and then lift the battery out of the holder and controller module.
4. Move the battery to the replacement controller module.
5. Align the battery module with the opening for the battery, and then gently push the battery into slot until it locks into place.



Do not plug the battery cable back into the motherboard until instructed to do so.

#### Step 4: Move the boot media

You must locate the boot media, and then follow the directions to remove it from the impaired controller module and insert it into the replacement controller module.

You can use the following illustration or the written steps to move the boot media from the impaired controller module to the replacement controller module.



1. Open the air duct and locate the boot media using the following illustration or the FRU map on the controller module:
2. Locate and remove the boot media from the controller module:
  - a. Press the blue button at the end of the boot media until the lip on the boot media clears the blue button.
  - b. Rotate the boot media up and gently pull the boot media out of the socket.
3. Move the boot media to the new controller module, align the edges of the boot media with the socket housing, and then gently push it into the socket.
4. Check the boot media to make sure that it is seated squarely and completely in the socket.

If necessary, remove the boot media and reseal it into the socket.

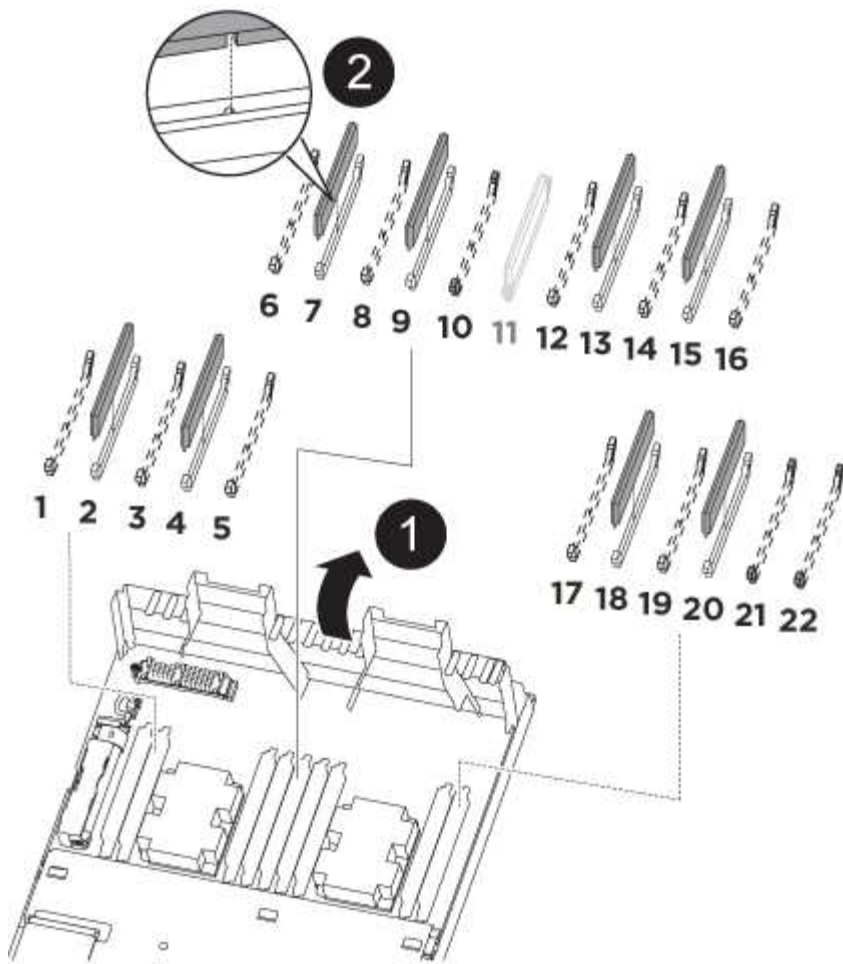
5. Lock the boot media in place:
  - a. Rotate the boot media down toward the motherboard.
  - b. Placing a finger at the end of the boot media by the blue button, push down on the boot media end to engage the blue locking button.
  - c. While pushing down on the boot media, lift the blue locking button to lock the boot media in place.

## Step 5: Move the DIMMs

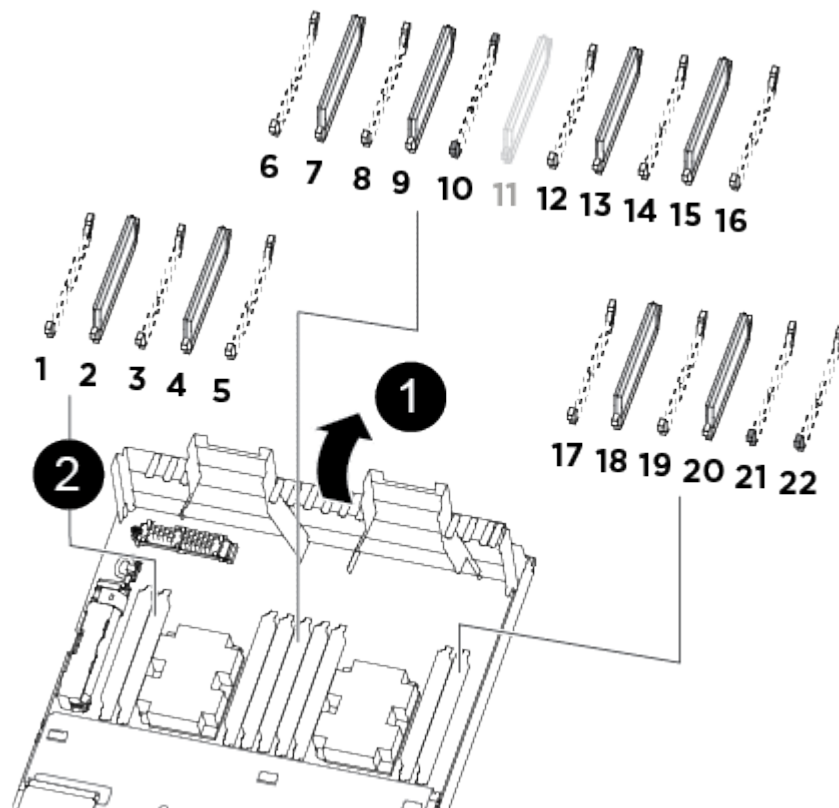
You need to locate the DIMMs, and then move them from the impaired controller module to the replacement controller module.

You must have the new controller module ready so that you can move the DIMMs directly from the impaired controller module to the corresponding slots in the replacement controller module.


You can use the following illustrations or the written steps to move the DIMMs from the impaired controller module to the replacement controller module.



1. Locate the DIMMs on your controller module.





|   |                                                                                                                                                                                                                                                                                                    |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Air duct                                                                                                                                                                                                                                                                                           |
| 2 | <ul style="list-style-type: none"> <li>• System DIMMs slots: 2,4, 7, 9, 13, 15, 18, and 20</li> <li>• NVDIMM slot: 11</li> </ul> <div>  <p>The NVDIMM looks significantly different than system DIMMs.</p> </div> |

2. Note the orientation of the DIMM in the socket so that you can insert the DIMM in the replacement controller module in the proper orientation.

3. Verify that the NVDIMM battery is not plugged into the new controller module.

4. Move the DIMMs from the impaired controller module to the replacement controller module:



Make sure that you install the each DIMM into the same slot it occupied in the impaired controller module.

a. Eject the DIMM from its slot by slowly pushing apart the DIMM ejector tabs on either side of the DIMM, and then slide the DIMM out of the slot.



Carefully hold the DIMM by the edges to avoid pressure on the components on the DIMM circuit board.

b. Locate the corresponding DIMM slot on the replacement controller module.

c. Make sure that the DIMM ejector tabs on the DIMM socket are in the open position, and then insert the DIMM squarely into the socket.

The DIMMs fit tightly in the socket, but should go in easily. If not, realign the DIMM with the socket and reinsert it.

d. Visually inspect the DIMM to verify that it is evenly aligned and fully inserted into the socket.

e. Repeat these substeps for the remaining DIMMs.

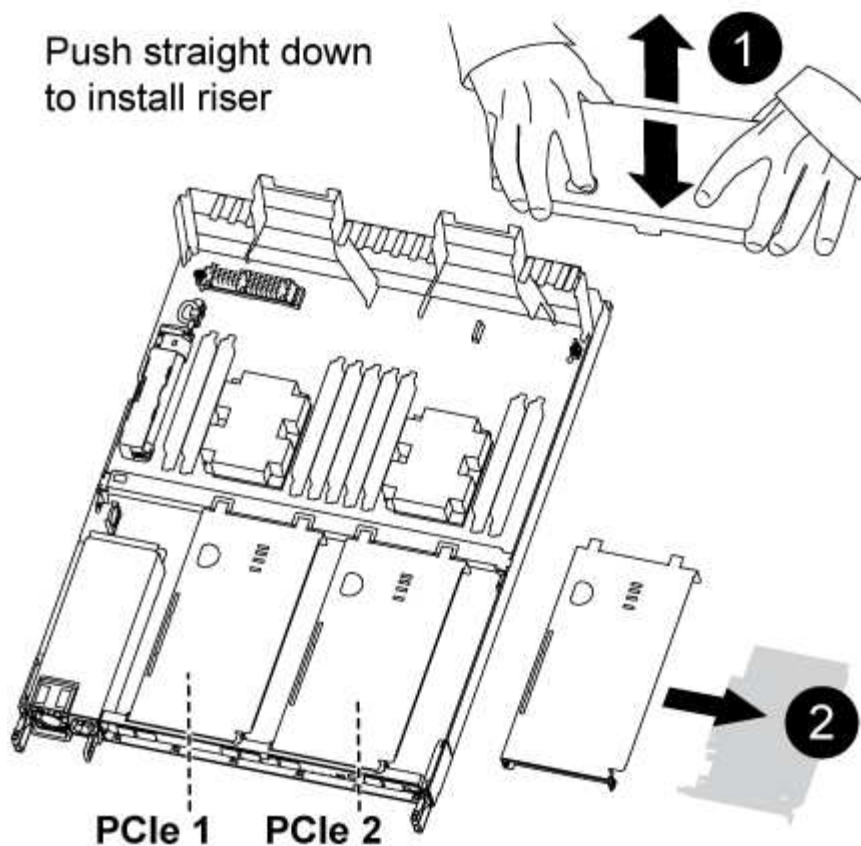
5. Plug the NVDIMM battery into the motherboard.

Make sure that the plug locks down onto the controller module.

## Step 6: Move the PCIe risers

You must move the PCIe risers, with the PCIe cards installed in them, from the impaired controller module to the replacement controller module.

You can use the following illustration or the written steps to move the PCIe risers from the impaired controller module to the replacement controller module.



1. Remove the cover over the PCIe risers by unscrewing the blue thumbscrew on the cover, slide the cover toward you, rotate the cover upward, lift it off the controller module, and then set it aside.
2. Remove the empty risers from the replacement controller module.
  - a. Place your forefinger into the hole on the left side of the riser module and grasp the riser with your thumb.
  - b. Lift the riser straight up and out of the bay, and then set it aside.
  - c. Repeat these substeps for the second riser.
3. Move the PCIe risers from the impaired controller module to the same riser bays on the replacement controller module:
  - a. Remove a riser from the impaired controller module and move it to the replacement controller module.
  - b. Lower the riser straight into the bay, so that it is square with the bay and the pins of the riser slide into the guide holes at the rear of the bay.
  - c. Seat the riser into the motherboard socket straight down into the socket by applying even downward pressure along the edges of the riser until it seats.
 

The riser should seat smoothly with little resistance. Reseat the riser in the bay if you encounter significant resistance seating the riser into the socket.
  - d. Repeat these substeps for the second riser.
  - e. Reinstall the cover over the PCIe risers.

## Step 7: Install the controller module

After all of the components have been moved from the impaired controller module to the replacement controller

module, you must install the replacement controller module into the chassis, and then boot it to Maintenance mode.

You can use the following illustration or the written steps to install the replacement controller module in the chassis.



1. If you have not already done so, close the air duct at the rear of the controller module and reinstall the cover over the PCIe cards.
2. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.



Do not completely insert the controller module in the chassis until instructed to do so.

3. Cable the management and console ports only, so that you can access the system to perform the tasks in the following sections.



You will connect the rest of the cables to the controller module later in this procedure.

4. Complete the reinstallation of the controller module:
  - a. Make sure the latch arms are locked in the extended position.
  - b. Using the latch arms, push the controller module into the chassis bay until it stops.
  - c. Press down and hold the orange tabs on top of the latching mechanism.
  - d. Gently push the controller module into the chassis bay until it is flush with the edges of the chassis.



The latching mechanism arms slide into the chassis.

The controller module begins to boot as soon as it is fully seated in the chassis.

- e. Release the latches to lock the controller module into place.
- f. Recable the power supply.
- g. If you have not already done so, reinstall the cable management device.
- h. Interrupt the normal boot process by pressing `Ctrl-C`.

#### Restore and verify the system configuration - AFF A320

After completing the hardware replacement and booting to Maintenance mode, you verify the low-level system configuration of the replacement controller and reconfigure system

settings as necessary.

### Step 1: Set and verify the system time after replacing the controller module

You should check the time and date on the replacement controller module against the healthy controller module in an HA pair, or against a reliable time server in a stand-alone configuration. If the time and date do not match, you must reset them on the replacement controller module to prevent possible outages on clients due to time differences.

#### About this task

It is important that you apply the commands in the steps on the correct systems:

- The *replacement* node is the new node that replaced the impaired node as part of this procedure.
- The *healthy* node is the HA partner of the *replacement* node.

#### Steps

1. If the *replacement* node is not at the LOADER prompt, halt the system to the LOADER prompt.
2. On the *healthy* node, check the system time: `cluster date show`

The date and time are based on the configured timezone.

3. At the LOADER prompt, check the date and time on the *replacement* node: `show date`

The date and time are given in GMT.

4. If necessary, set the date in GMT on the replacement node: `set date mm/dd/yyyy`
5. If necessary, set the time in GMT on the replacement node: `set time hh:mm:ss`
6. At the LOADER prompt, confirm the date and time on the *replacement* node: `show date`

The date and time are given in GMT.

### Step 2: Verify and set the HA state of the controller module

You must verify the HA state of the controller module and, if necessary, update the state to match your system configuration.

1. In Maintenance mode from the new controller module, verify that all components display the same HA state: `ha-config show`

The HA state should be the same for all components.

2. If the displayed system state of the controller module does not match your system configuration, set the HA state for the controller module: `ha-config modify controller ha-state`

The value for HA-state can be one of the following:

- `ha`
- `mcc`
- `mccip`

- non-ha

3. If the displayed system state of the controller module does not match your system configuration, set the HA state for the controller module: `ha-config modify controller ha-state`
4. Confirm that the setting has changed: `ha-config show`

## Recable the system and reassign disks - AFF A320

Continue the replacement procedure by recabling the storage and confirming disk reassignment.

### Step 1: Recable the system

Recable the controller module's storage and network connections.

#### Steps

1. Recable the the controller module to storage and network connnections.
2. Verify that the cabling is correct by using [Active IQ Config Advisor](#).
  - a. Download and install Config Advisor.
  - b. Enter the information for the target system, and then click Collect Data.
  - c. Click the Cabling tab, and then examine the output. Make sure that all disk shelves are displayed and all disks appear in the output, correcting any cabling issues you find.
  - d. Check other cabling by clicking the appropriate tab, and then examining the output from Config Advisor.

### Step 2: Reassign disks

If the storage system is in an HA pair, the system ID of the new controller module is automatically assigned to the disks when the giveback occurs at the end of the procedure. You must confirm the system ID change when you boot the *replacement* controller and then verify that the change was implemented.

This procedure applies only to systems running ONTAP in an HA pair.

1. If the *replacement* controller is in Maintenance mode (showing the `*>` prompt, exit Maintenance mode and go to the LOADER prompt: `halt`
2. From the LOADER prompt on the *replacement* controller, boot the controller, entering `y` if you are prompted to override the system ID due to a system ID mismatch: `boot_ontap`
3. Wait until the `Waiting for giveback...` message is displayed on the *replacement* controller console and then, from the healthy controller, verify that the new partner system ID has been automatically assigned: `storage failover show`

In the command output, you should see a message that the system ID has changed on the impaired controller, showing the correct old and new IDs. In the following example, node2 has undergone replacement and has a new system ID of 151759706.

```
node1> `storage failover show`
```

| Node           | Partner | Takeover<br>Possible | State Description                     |
|----------------|---------|----------------------|---------------------------------------|
| -----          | -----   | -----                |                                       |
| -----          |         |                      |                                       |
| node1          | node2   | false                | System ID changed on<br>partner (Old: |
|                |         |                      | 151759706), In takeover               |
|                |         |                      | 151759755, New:                       |
| node2          | node1   | -                    | Waiting for giveback                  |
| (HA mailboxes) |         |                      |                                       |

4. From the healthy controller, verify that any coredumps are saved:

- a. Change to the advanced privilege level: `set -privilege advanced`

You can respond `y` when prompted to continue into advanced mode. The advanced mode prompt appears (`*>`).

- b. Save any coredumps: `system node run -node local-node-name partner savecore`

- c. Wait for the `savecore` command to complete before issuing the giveback.

You can enter the following command to monitor the progress of the `savecore` command: `system node run -node local-node-name partner savecore -s`

- d. Return to the admin privilege level: `set -privilege admin`

5. If your storage system has Storage or Volume Encryption configured, you must restore Storage or Volume Encryption functionality by using one of the following procedures, depending on whether you are using onboard or external key management:

- [Restore onboard key management encryption keys](#)
- [Restore external key management encryption keys](#)

6. Give back the controller:

- a. From the healthy controller, give back the replaced controller's storage: `storage failover giveback -ofnode replacement_node_name`

The *replacement* controller takes back its storage and completes booting.

If you are prompted to override the system ID due to a system ID mismatch, you should enter `y`.



If the giveback is vetoed, you can consider overriding the vetoes.

[Find the High-Availability Configuration content for your version of ONTAP 9](#)

- b. After the giveback has been completed, confirm that the HA pair is healthy and that takeover is possible: `storage failover show`

The output from the `storage failover show` command should not include the System ID changed

on partner message.

7. Verify that the disks were assigned correctly: `storage disk show -ownership`

The disks belonging to the *replacement* controller should show the new system ID. In the following example, the disks owned by node1 now show the new system ID, 1873775277:

```
node1> `storage disk show -ownership`

Disk Aggregate Home Owner DR Home Home ID Owner ID DR Home ID
Reserver Pool

1.0.0 aggr0_1 node1 node1 - 1873775277 1873775277 -
1873775277 Pool0
1.0.1 aggr0_1 node1 node1 - 1873775277 1873775277 -
1873775277 Pool0
.
.
.
```

8. Verify that the expected volumes are present for each controller: `vol show -node node-name`
9. If you disabled automatic takeover on reboot, enable it from the healthy controller: `storage failover modify -node replacement-node-name -onreboot true`

### Complete system restoration - AFF A320

To restore your system to full operation, you must restore the NetApp Storage Encryption configuration (if necessary), and install licenses for the new controller, and return the failed part to NetApp, as described in the RMA instructions shipped with the kit.

#### Step 1: Install licenses for the replacement controller in ONTAP

You must install new licenses for the *replacement* node if the impaired node was using ONTAP features that require a standard (node-locked) license. For features with standard licenses, each node in the cluster should have its own key for the feature.

##### About this task

Until you install license keys, features requiring standard licenses continue to be available to the *replacement* node. However, if the impaired node was the only node in the cluster with a license for the feature, no configuration changes to the feature are allowed. Also, using unlicensed features on the node might put you out of compliance with your license agreement, so you should install the replacement license key or keys on the *replacement* node as soon as possible.

##### Before you begin

The licenses keys must be in the 28-character format.

You have a 90-day grace period in which to install the license keys. After the grace period, all old licenses are invalidated. After a valid license key is installed, you have 24 hours to install all of the keys before the grace

period ends.

## Steps

1. If you need new license keys, obtain replacement license keys on the [NetApp Support Site](#) in the My Support section under Software licenses.



The new license keys that you require are automatically generated and sent to the email address on file. If you fail to receive the email with the license keys within 30 days, you should contact technical support.

2. Install each license key: `system license add -license-code license-key, license-key...`
3. Remove the old licenses, if desired:
  - a. Check for unused licenses: `license clean-up -unused -simulate`
  - b. If the list looks correct, remove the unused licenses: `license clean-up -unused`

## Step 2: Verify LIFs and registering the serial number

Before returning the *replacement* node to service, you should verify that the LIFs are on their home ports, and register the serial number of the *replacement* node if AutoSupport is enabled, and reset automatic giveback.

### Steps

1. Verify that the logical interfaces are reporting to their home server and ports: `network interface show -is-home false`  
  
If any LIFs are listed as false, revert them to their home ports: `network interface revert -vserver * -lif *`
2. Register the system serial number with NetApp Support.
  - If AutoSupport is enabled, send an AutoSupport message to register the serial number.
  - If AutoSupport is not enabled, call [NetApp Support](#) to register the serial number.
3. If an AutoSupport maintenance window was triggered, end it by using the `system node autosupport invoke -node * -type all -message MAINT=END` command.
4. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`

## Step 3: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

### Replace a DIMM - AFF A320

You must replace a DIMM in the controller module when your system registers an increasing number of correctable error correction codes (ECC); failure to do so causes a system panic.

All other components in the system must be functioning properly; if not, you must contact technical support.

You must replace the failed component with a replacement FRU component you received from your provider.



**Step 1: Shut down the controller**

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

**About this task**

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced` mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

**Steps**

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:
- ```
system node autosupport invoke -node * -type all -message MAINT=<# of hours>h
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:>`

```
system node autosupport invoke -node * -type all -message MAINT=2h
```

2. Disable automatic giveback from the console of the healthy controller:
- ```
storage failover modify -node local -auto-giveback false
```



When you see *Do you want to disable auto-giveback?*, enter *y*.

3. Take the impaired controller to the LOADER prompt:

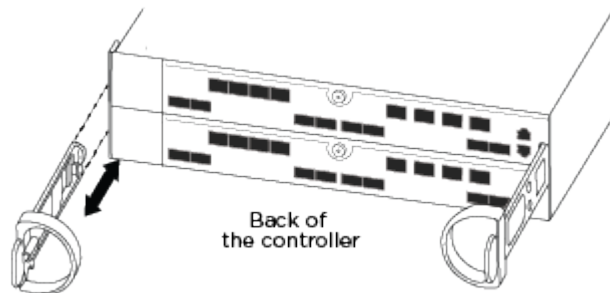
| If the impaired controller is displaying... | Then...                                                                                                                                                                                                                                                |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                           | Go to the next step.                                                                                                                                                                                                                                   |
| Waiting for giveback...                     | Press Ctrl-C, and then respond <i>y</i> when prompted.                                                                                                                                                                                                 |
| System prompt or password prompt            | Take over or halt the impaired controller from the healthy controller:<br><pre>storage failover takeover -ofnode<br/>impaired_node_name</pre><br>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i> . |

**Step 2: Remove the controller module**

To access components inside the controller module, you must remove the controller module from the chassis.

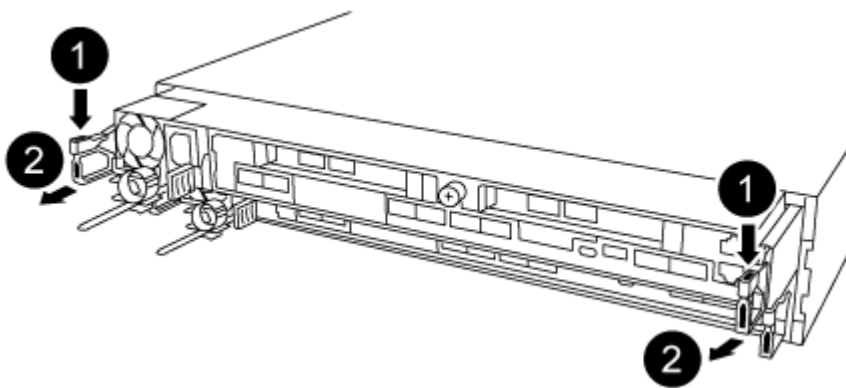
1. If you are not already grounded, properly ground yourself.

2. Unplug the controller module power supply from the power source.
3. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.



Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

4. Remove and set aside the cable management devices from the left and right sides of the controller module.
5. Remove the controller module from the chassis:



- a. Insert your forefinger into the latching mechanism on either side of the controller module.
- b. Press down on the orange tab on top of the latching mechanism until it clears the latching pin on the chassis.

The latching mechanism hook should be nearly vertical and should be clear of the chassis pin.

- c. Gently pull the controller module a few inches toward you so that you can grasp the controller module sides.
- d. Using both hands, gently pull the controller module out of the chassis and set it on a flat, stable surface.

### Step 3: Replace system DIMMs

Replacing a system DIMM involves identifying the target DIMM through the associated error message, locating the target DIMM using the FRU map on the air duct, and then replacing the DIMM.

1. Rotate the air duct to the open position.
2. Locate the DIMMs on your controller module.



|   |                                                                                                                                                                                                                                                                                                                                                                                                             |
|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Air duct                                                                                                                                                                                                                                                                                                                                                                                                    |
| 2 | <ul style="list-style-type: none"> <li>• System DIMMs slots: 2,4, 7, 9, 13, 15, 18, and 20</li> <li>• NVDIMM slot: 11</li> </ul> <div data-bbox="922 1220 976 1276" style="display: inline-block; vertical-align: middle;"> <i>i</i> </div> <div data-bbox="1036 1220 1430 1283" style="display: inline-block; vertical-align: middle;"> The NVDIMM looks significantly different than system DIMMs. </div> |

3. Note the orientation of the DIMM in the socket so that you can insert the replacement DIMM in the proper orientation.
4. Eject the DIMM from its socket by slowly pushing apart the two DIMM ejector tabs on either side of the DIMM, and then slide the DIMM out of the socket.



Carefully hold the DIMM by the edges to avoid pressure on the components on the DIMM circuit board.

5. Remove the replacement DIMM from the antistatic shipping bag, hold the DIMM by the corners, and align it to the slot.

The notch among the pins on the DIMM should line up with the tab in the socket.

6. Make sure that the DIMM ejector tabs on the connector are in the open position, and then insert the DIMM squarely into the slot.

The DIMM fits tightly in the slot, but should go in easily. If not, realign the DIMM with the slot and reinsert it.



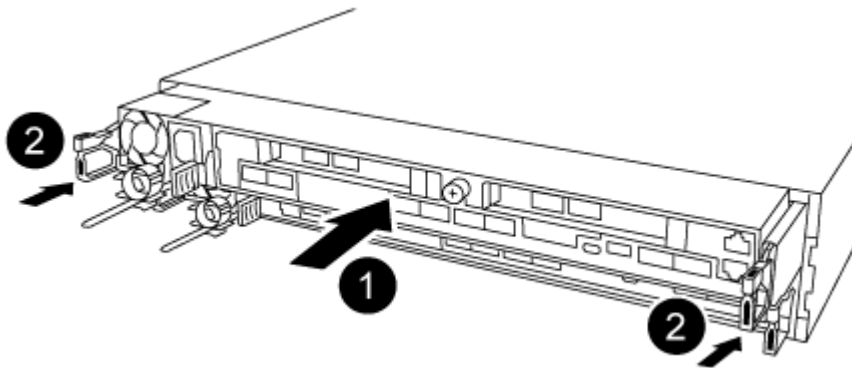
Visually inspect the DIMM to verify that it is evenly aligned and fully inserted into the slot.

7. Push carefully, but firmly, on the top edge of the DIMM until the ejector tabs snap into place over the notches at the ends of the DIMM.
8. Close the air duct.

#### Step 4: Install the controller module

After you have replaced the component in the controller module, you must reinstall the controller module into the chassis.

1. If you have not already done so, close the air duct at the rear of the controller module and reinstall the cover over the PCIe cards.
2. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.



Do not completely insert the controller module in the chassis until instructed to do so.

3. Cable the management and console ports only, so that you can access the system to perform the tasks in the following sections.



You will connect the rest of the cables to the controller module later in this procedure.

4. Complete the reinstallation of the controller module:
  - a. Make sure the latch arms are locked in the extended position.
  - b. Using the latch arms, push the controller module into the chassis bay until it stops.
  - c. Press down and hold the orange tabs on top of the latching mechanism.
  - d. Gently push the controller module into the chassis bay until it is flush with the edges of the chassis.



The latching mechanism arms slide into the chassis.

The controller module begins to boot as soon as it is fully seated in the chassis.

- e. Release the latches to lock the controller module into place.
- f. Recable the power supply.

g. If you have not already done so, reinstall the cable management device.

#### Step 5: Restore the controller module to operation

You must recable the system, give back the controller module, and then reenabling automatic giveback.

1. Recable the system, as needed.

If you removed the media converters (QSFPs or SFPs), remember to reinstall them if you are using fiber optic cables.

2. Return the controller to normal operation by giving back its storage: `storage failover giveback -ofnode impaired_node_name`
3. If automatic giveback was disabled, reenabling it: `storage failover modify -node local -auto-giveback true`

#### Step 6: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

#### Hot-swap a fan module - AFF A320

To swap out a fan module without interrupting service, you must perform a specific sequence of tasks.



You must replace the fan module within two minutes of removing it from the chassis. System airflow is disrupted and the controller module or modules shut down after two minutes to avoid overheating.



1. If you are not already grounded, properly ground yourself.
2. Remove the bezel (if necessary) with two hands, by grasping the openings on each side of the bezel, and then pulling it toward you until the bezel releases from the ball studs on the chassis frame.
3. Identify the fan module that you must replace by checking the console error messages and looking at the Attention LED on each fan module.
4. Press down the release latch on the fan module cam handle, and then rotate the cam handle downward.

The fan module moves a little bit away from the chassis.

5. Pull the fan module straight out from the chassis, making sure that you support it with your free hand so that it does not swing out of the chassis.



The fan modules are short. Always support the bottom of the fan module with your free hand so that it does not suddenly drop free from the chassis and injure you.

6. Set the fan module aside.
7. Insert the replacement fan module into the chassis by aligning it with the opening, and then sliding it into the chassis.
8. Push firmly on the fan module cam handle so that it is seated all the way into the chassis.

The cam handle raises slightly when the fan module is completely seated.

9. Swing the cam handle up to its closed position, making sure that the cam handle release latch clicks into the locked position.

The Attention LED should not be lit after the fan is seated and has spun up to operational speed.

10. Align the bezel with the ball studs, and then gently push the bezel onto the ball studs.

## Replace an NVDIMM - AFF A320

You must replace the NVDIMM in the controller module when your system registers that the flash lifetime is almost at an end or that the identified NVDIMM is not healthy in general; failure to do so causes a system panic.

All other components in the system must be functioning properly; if not, you must contact technical support.

You must replace the failed component with a replacement FRU component you received from your provider.

### Step 1: Shut down the impaired controller

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

#### About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced` mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

#### Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:  
`system node autosupport invoke -node * -type all -message MAINT=<# of hours>h`

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:>`  
`system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`



When you see *Do you want to disable auto-giveback?*, enter *y*.

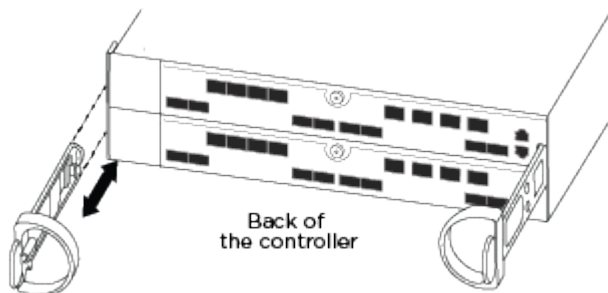
3. Take the impaired controller to the LOADER prompt:

| If the impaired controller is displaying... | Then...                                                                                                                                                                                                                                                         |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                           | Go to the next step.                                                                                                                                                                                                                                            |
| Waiting for giveback...                     | Press Ctrl-C, and then respond <code>y</code> when prompted.                                                                                                                                                                                                    |
| System prompt or password prompt            | <p>Take over or halt the impaired controller from the healthy controller:</p> <pre>storage failover takeover -ofnode impaired_node_name</pre> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <code>y</code>.</p> |

## Step 2: Remove the controller module

To access components inside the controller module, you must remove the controller module from the chassis.

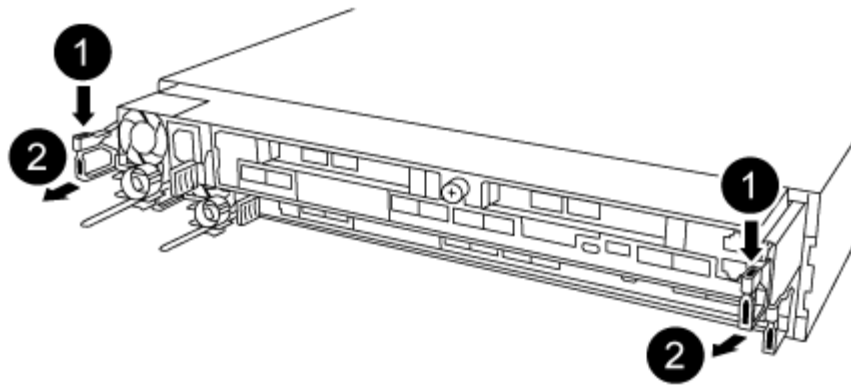
1. If you are not already grounded, properly ground yourself.
2. Unplug the controller module power supply from the power source.
3. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.



Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

4. Remove and set aside the cable management devices from the left and right sides of the controller module.
5. Remove the controller module from the chassis:





- a. Insert your forefinger into the latching mechanism on either side of the controller module.
- b. Press down on the orange tab on top of the latching mechanism until it clears the latching pin on the chassis.

The latching mechanism hook should be nearly vertical and should be clear of the chassis pin.

- c. Gently pull the controller module a few inches toward you so that you can grasp the controller module sides.
- d. Using both hands, gently pull the controller module out of the chassis and set it on a flat, stable surface.

### **Step 3: Replace the NVDIMM**

To replace the NVDIMM, you must locate it in the controller module using the NVDIMM map label on top of the air duct, and then replace it following the specific sequence of steps.



1. Open the air duct and then locate the NVDIMM in slot 11 on your controller module.



The NVDIMM looks significantly different than system DIMMs.

2. Note the orientation of the NVDIMM in the socket so that you can insert the NVDIMM in the replacement controller module in the proper orientation.
3. Eject the NVDIMM from its slot by slowly pushing apart the two NVDIMM ejector tabs on either side of the NVDIMM, and then slide the NVDIMM out of the socket and set it aside.



Carefully hold the NVDIMM by the edges to avoid pressure on the components on the NVDIMM circuit board.

4. Remove the replacement NVDIMM from the antistatic shipping bag, hold the NVDIMM by the corners, and then align it to the slot.

The notch among the pins on the NVDIMM should line up with the tab in the socket.

5. Locate the slot where you are installing the NVDIMM.
6. Insert the NVDIMM squarely into the slot.

The NVDIMM fits tightly in the slot, but should go in easily. If not, realign the NVDIMM with the slot and reinsert it.



Visually inspect the NVDIMM to verify that it is evenly aligned and fully inserted into the slot.

7. Push carefully, but firmly, on the top edge of the NVDIMM until the ejector tabs snap into place over the notches at the ends of the NVDIMM.
8. Close the air duct.

#### Step 4: Install the controller module

After you have replaced the component in the controller module, you must reinstall the controller module into the chassis.

1. If you have not already done so, close the air duct at the rear of the controller module and reinstall the cover over the PCIe cards.
2. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.



Do not completely insert the controller module in the chassis until instructed to do so.

3. Cable the management and console ports only, so that you can access the system to perform the tasks in the following sections.



You will connect the rest of the cables to the controller module later in this procedure.

4. Complete the reinstallation of the controller module:
  - a. Make sure the latch arms are locked in the extended position.
  - b. Using the latch arms, push the controller module into the chassis bay until it stops.
  - c. Press down and hold the orange tabs on top of the latching mechanism.
  - d. Gently push the controller module into the chassis bay until it is flush with the edges of the chassis.



The latching mechanism arms slide into the chassis.

The controller module begins to boot as soon as it is fully seated in the chassis.

- e. Release the latches to lock the controller module into place.
- f. Recable the power supply.
- g. If you have not already done so, reinstall the cable management device.

#### Step 5: Restore the controller module to operation

You must recable the system, give back the controller module, and then reenabling automatic giveback.

1. Recable the system, as needed.

If you removed the media converters (QSFPs or SFPs), remember to reinstall them if you are using fiber optic cables.

2. Return the controller to normal operation by giving back its storage: `storage failover giveback -ofnode impaired_node_name`

3. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`

#### Step 6: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

### Replace the NVDIMM battery - AFF A320

To replace the NVDIMM battery, you must remove the controller module, remove the battery, replace the battery, and then reinstall the controller module.

All other components in the system must be functioning properly; if not, you must contact technical support.

#### Step 1: Shut down the controller

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

#### About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced` mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

#### Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:  
`system node autosupport invoke -node * -type all -message MAINT=<# of hours>h`

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`



When you see *Do you want to disable auto-giveback?*, enter *y*.

3. Take the impaired controller to the LOADER prompt:

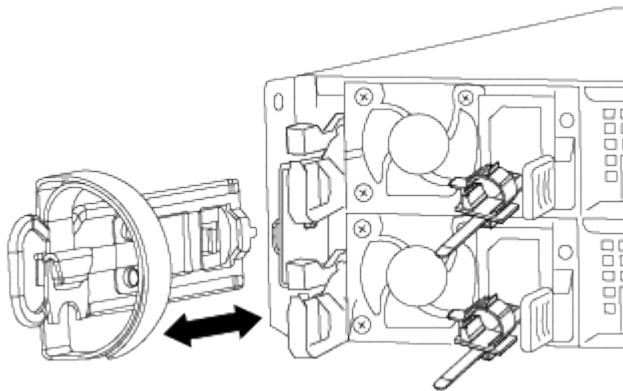
| If the impaired controller is displaying... | Then...              |
|---------------------------------------------|----------------------|
| The LOADER prompt                           | Go to the next step. |

| If the impaired controller is displaying... | Then...                                                                                                                                                                                                                                                   |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Waiting for giveback...                     | Press Ctrl-C, and then respond <i>y</i> when prompted.                                                                                                                                                                                                    |
| System prompt or password prompt            | <p>Take over or halt the impaired controller from the healthy controller:</p> <pre>storage failover takeover -ofnode impaired_node_name</pre> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i>.</p> |

## Step 2: Remove the controller module

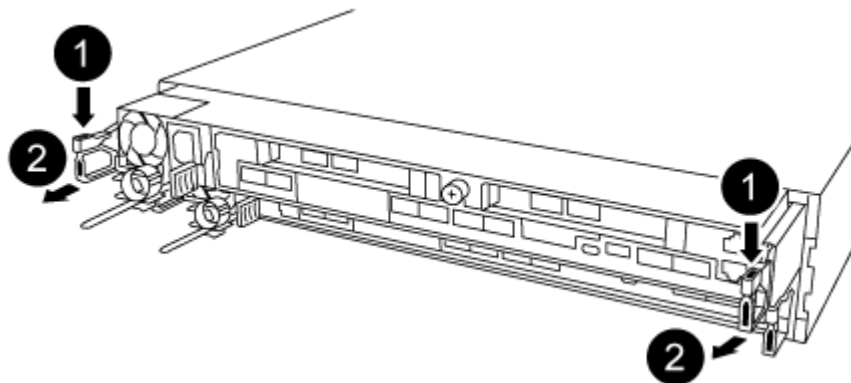
To access components inside the controller module, you must remove the controller module from the chassis.

1. If you are not already grounded, properly ground yourself.
2. Unplug the controller module power supply from the power source.
3. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.



Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

4. Remove and set aside the cable management devices from the left and right sides of the controller module.
5. Remove the controller module from the chassis:



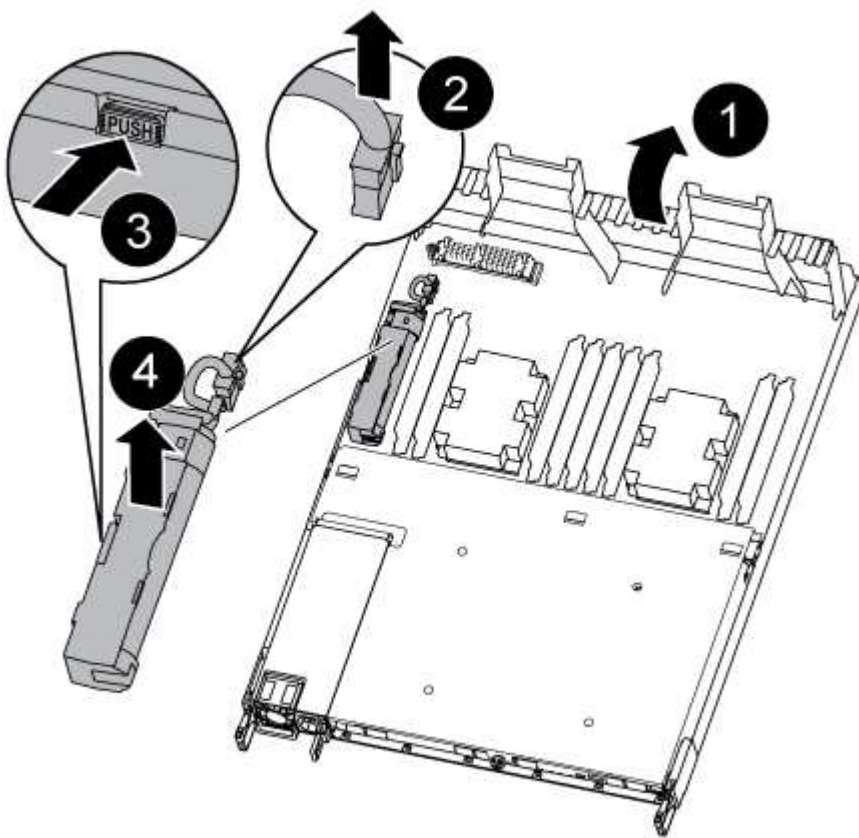
- a. Insert your forefinger into the latching mechanism on either side of the controller module.
- b. Press down on the orange tab on top of the latching mechanism until it clears the latching pin on the chassis.

The latching mechanism hook should be nearly vertical and should be clear of the chassis pin.

- c. Gently pull the controller module a few inches toward you so that you can grasp the controller module sides.
- d. Using both hands, gently pull the controller module out of the chassis and set it on a flat, stable surface.

### Step 3: Replace the NVDIMM battery

To replace the NVDIMM battery, you must remove the failed battery from the controller module and install the replacement battery into the controller module.

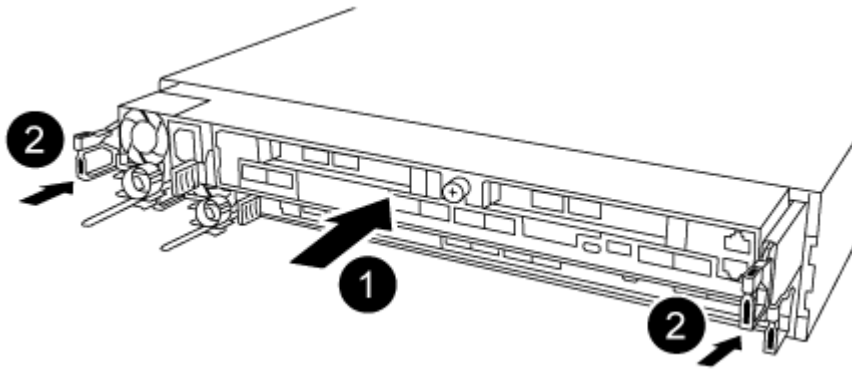


1. Open the air duct and locate the NVDIMM battery.
2. Locate the battery plug and squeeze the clip on the face of the battery plug to release the plug from the socket, and then unplug the battery cable from the socket.
3. Grasp the battery and press the blue locking tab marked PUSH, and then lift the battery out of the holder and controller module.
4. Remove the replacement battery from its package.
5. Align the battery module with the opening for the battery, and then gently push the battery into slot until it locks into place.
6. Plug the battery plug back into the controller module, and then close the air duct.

#### Step 4: Install the controller module

After you have replaced the component in the controller module, you must reinstall the controller module into the chassis, and then boot it..

1. If you have not already done so, close the air duct at the rear of the controller module and reinstall the cover over the PCIe cards.
2. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.



Do not completely insert the controller module in the chassis until instructed to do so.

3. Cable the management and console ports only, so that you can access the system to perform the tasks in the following sections.



You will connect the rest of the cables to the controller module later in this procedure.

4. Complete the reinstallation of the controller module:
  - a. Make sure the latch arms are locked in the extended position.
  - b. Using the latch arms, push the controller module into the chassis bay until it stops.
  - c. Press down and hold the orange tabs on top of the latching mechanism.
  - d. Gently push the controller module into the chassis bay until it is flush with the edges of the chassis.



The latching mechanism arms slide into the chassis.

The controller module begins to boot as soon as it is fully seated in the chassis.

- e. Release the latches to lock the controller module into place.
- f. Recable the power supply.
- g. If you have not already done so, reinstall the cable management device.

#### Step 5: Restore the controller module to operation

You must recable the system, give back the controller module, and then reen able automatic giveback.

1. Recable the system, as needed.

If you removed the media converters (QSFPs or SFPs), remember to reinstall them if you are using fiber

optic cables.

2. Return the controller to normal operation by giving back its storage: `storage failover giveback -ofnode impaired_node_name`
3. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`

#### Step 6: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

### Replace a PCIe card - AFF A320

To replace a PCIe card, you must disconnect the cables from the cards, remove the SFP and QSFP modules from the cards before removing the riser, reinstall the riser, and then reinstall the SFP and QSFP modules before cabling the cards.

- You can use this procedure with all versions of ONTAP supported by your system
- All other components in the system must be functioning properly; if not, you must contact technical support.

#### Step 1: Shut down the impaired controller

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

#### About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced` mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

#### Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:  
`system node autosupport invoke -node * -type all -message MAINT=<# of hours>h`  
  
The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h`
2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`



When you see *Do you want to disable auto-giveback?*, enter `y`.



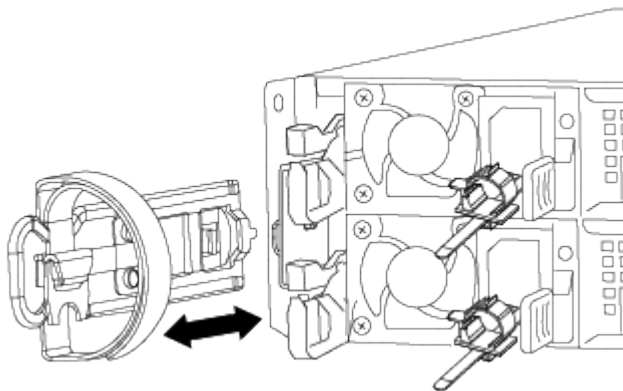
3. Take the impaired controller to the LOADER prompt:

| If the impaired controller is displaying... | Then...                                                                                                                                                                                                                                                                          |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                           | Go to the next step.                                                                                                                                                                                                                                                             |
| Waiting for giveback...                     | Press Ctrl-C, and then respond <i>y</i> when prompted.                                                                                                                                                                                                                           |
| System prompt or password prompt            | <p>Take over or halt the impaired controller from the healthy controller:<br/><code>storage failover takeover -ofnode</code><br/><code>impaired_node_name</code></p> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i>.</p> |

**Step 2: Remove the controller module**

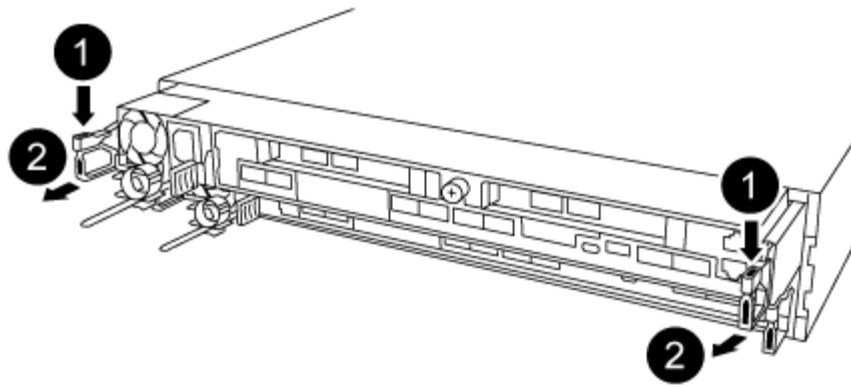
To access components inside the controller module, you must remove the controller module from the chassis.

1. If you are not already grounded, properly ground yourself.
2. Unplug the controller module power supply from the power source.
3. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.



Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

4. Remove and set aside the cable management devices from the left and right sides of the controller module.
5. Remove the controller module from the chassis:



- a. Insert your forefinger into the latching mechanism on either side of the controller module.
- b. Press down on the orange tab on top of the latching mechanism until it clears the latching pin on the chassis.

The latching mechanism hook should be nearly vertical and should be clear of the chassis pin.

- c. Gently pull the controller module a few inches toward you so that you can grasp the controller module sides.
- d. Using both hands, gently pull the controller module out of the chassis and set it on a flat, stable surface.

### Step 3: Replace a PCIe card

You must remove the PCIe riser containing the failed PCIe card from the controller module, remove the failed PCIe card from the riser, install the replacement PCIe card in the riser, and then reinstall the riser into the controller module.



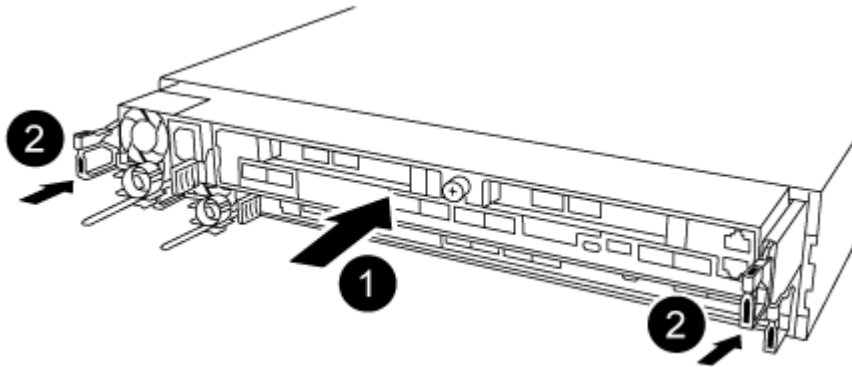
1. Remove the cover over the PCIe risers by unscrewing the blue thumbscrew on the cover, slide the cover toward you, rotate the cover upward, lift it off the controller module, and then set it aside.
2. Remove the riser with the failed PCIe card:
  - a. Remove any SFP or QSFP modules that might be in the PCIe cards.
  - b. Place your forefinger into the hole on the left side of the riser module and grasp the riser with your thumb.
  - c. Lift the riser straight out of the socket and set it aside.
3. Replace the card in the riser:
  - a. Place the riser on a stable surface, and then turn the riser so that you can access the PCIe card.
  - b. Place your thumbs just below the bottom edge of the PCIe card on either side of the socket, and then gently push up to release the card from the socket.
  - c. Slide the card out of the riser and set it aside.
  - d. Align the replacement card bezel with the edge of the riser and the outside edge of the card with the alignment guide on the left side of the riser.
  - e. Gently slide the card until the card connector aligns with the riser socket, and then gently push the card down into the socket.
4. Reinstall the riser in the controller module:
  - a. Align the riser over the opening so that the front edges of the riser are directly over the openings on the riser bay.
  - b. Aligning the back edge of the riser so that the pins on the underside of the riser are over the holes in the sheet metal at the back riser bay.
  - c. Apply even downward pressure to seat the riser straight down into the socket on the controller module.

- d. Reinstall the PCIe riser cover on the controller module.

#### Sep 4: Install the controller module

After you have replaced the component in the controller module, you must reinstall the controller module into the chassis, and then boot it.

1. If you have not already done so, close the air duct at the rear of the controller module and reinstall the cover over the PCIe cards.
2. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.



Do not completely insert the controller module in the chassis until instructed to do so.

3. Cable the management and console ports only, so that you can access the system to perform the tasks in the following sections.



You will connect the rest of the cables to the controller module later in this procedure.

4. Complete the reinstallation of the controller module:
  - a. Make sure the latch arms are locked in the extended position.
  - b. Using the latch arms, push the controller module into the chassis bay until it stops.
  - c. Press down and hold the orange tabs on top of the latching mechanism.
  - d. Gently push the controller module into the chassis bay until it is flush with the edges of the chassis.



The latching mechanism arms slide into the chassis.

The controller module begins to boot as soon as it is fully seated in the chassis.

- e. Release the latches to lock the controller module into place.
- f. Recable the power supply.
- g. If you have not already done so, reinstall the cable management device.

#### Step 5: Restore the controller module to operation

You must recable the system, give back the controller module, and then reen able automatic giveback.

1. Recable the system, as needed.

If you removed the media converters (QSFPs or SFPs), remember to reinstall them if you are using fiber optic cables.

2. Return the controller to normal operation by giving back its storage: `storage failover giveback -ofnode impaired_node_name`
3. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`

#### Step 6: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

#### Replace a power supply - AFF A320

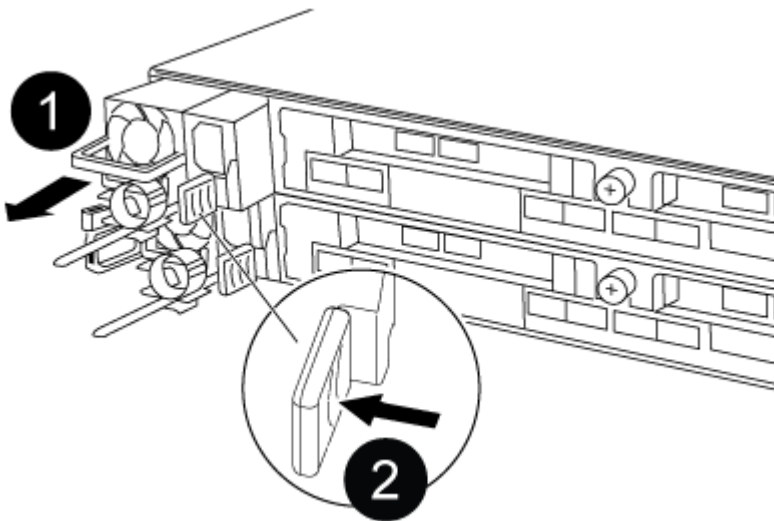
Replacing a power supply (PSU) involves disconnecting the target PSU from the power source, unplugging the power cable, removing the old PSU and installing the replacement PSU, and then reconnecting the replacement PSU to the power source.

- The power supplies are redundant and hot-swappable.
- This procedure is written for replacing one power supply at a time.



It is a best practice to replace the power supply within two minutes of removing it from the chassis. The system continues to function, but ONTAP sends messages to the console about the degraded power supply until the power supply is replaced.

- Power supplies are auto-ranging.



**Figure 1. Steps**

1. If you are not already grounded, properly ground yourself.
2. Identify the power supply you want to replace, based on console error messages or through the LEDs on the power supplies.
3. Disconnect the power supply:
  - a. Open the power cable retainer, and then unplug the power cable from the power supply.

- b. Unplug the power cable from the power source.
4. Remove the power supply:
  - a. Rotate the cam handle so that it can be used to pull the power supply out of the chassis.
  - b. Press the blue locking tab to release the power supply from the chassis.
  - c. Using both hands, pull the power supply out of the chassis, and then set it aside.
5. Using both hands, support and align the edges of the power supply with the opening in the controller module, and then gently push the power supply into the controller module until the locking tab clicks into place.

The power supplies will only properly engage with the internal connector and lock in place one way.



To avoid damaging the internal connector, do not use excessive force when sliding the power supply into the system.

6. Rotate the cam handle so that it is flush against the power supply.
7. Reconnect the power supply cabling:
  - a. Reconnect the power cable to the power supply and the power source.
  - b. Secure the power cable to the power supply using the power cable retainer.Once power is restored to the power supply, the status LED should be green.
8. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

## Replace the real-time clock battery - AFF A320

You replace the real-time clock (RTC) battery in the controller module so that your system's services and applications that depend on accurate time synchronization continue to function.

- You can use this procedure with all versions of ONTAP supported by your system
- All other components in the system must be functioning properly; if not, you must contact technical support.

### Step 1: Shut down the controller

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

### About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv` advanced mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the

impaired controller; see [Synchronize a node with the cluster](#).

## Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:  
`system node autosupport invoke -node * -type all -message MAINT=<# of hours>h`

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`



When you see *Do you want to disable auto-giveback?*, enter *y*.

3. Take the impaired controller to the LOADER prompt:

| If the impaired controller is displaying... | Then...                                                                                                                                                                                                                                                             |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                           | Go to the next step.                                                                                                                                                                                                                                                |
| Waiting for giveback...                     | Press Ctrl-C, and then respond <i>y</i> when prompted.                                                                                                                                                                                                              |
| System prompt or password prompt            | <p>Take over or halt the impaired controller from the healthy controller:<br/><code>storage failover takeover -ofnode<br/>impaired_node_name</code></p> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i>.</p> |

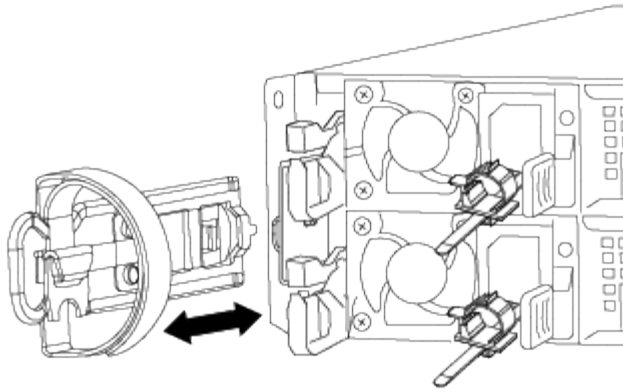
## Step 2: Replace the RTC battery

You need to locate the RTC battery inside the controller module, and then follow the specific sequence of steps.

## Step 3: Remove the controller module

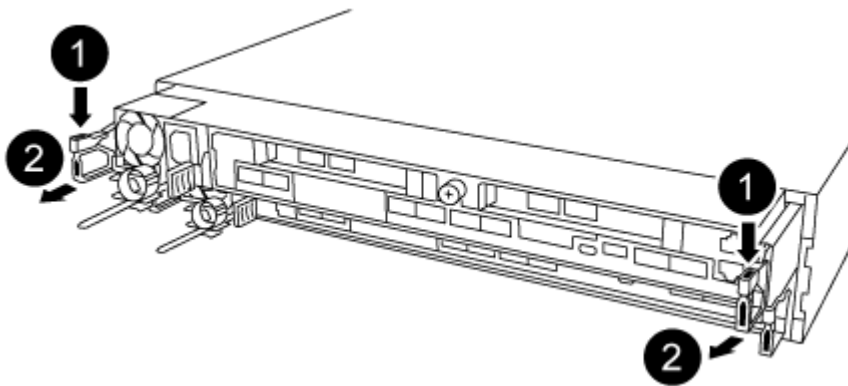
To access components inside the controller module, you must remove the controller module from the chassis.

1. If you are not already grounded, properly ground yourself.
2. Unplug the controller module power supply from the power source.
3. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.



Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

4. Remove and set aside the cable management devices from the left and right sides of the controller module.
5. Remove the controller module from the chassis:



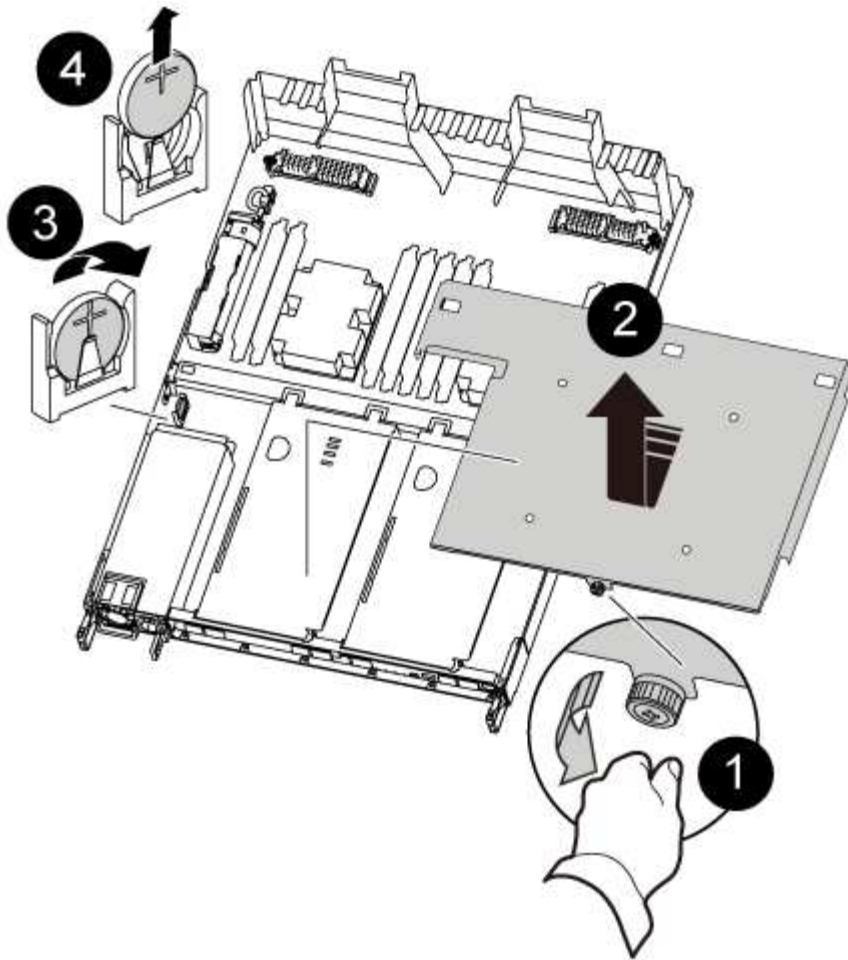
- a. Insert your forefinger into the latching mechanism on either side of the controller module.
- b. Press down on the orange tab on top of the latching mechanism until it clears the latching pin on the chassis.

The latching mechanism hook should be nearly vertical and should be clear of the chassis pin.

- c. Gently pull the controller module a few inches toward you so that you can grasp the controller module sides.
- d. Using both hands, gently pull the controller module out of the chassis and set it on a flat, stable surface.

#### Step 4: Replace the RTC battery





1. Remove the PCIe cover.
  - a. Unscrew the blue thumbscrew located above the onboard ports at the back of the controller module.
  - b. Slide the cover toward you and rotate the cover upward.
  - c. Remove the cover and set it aside.
2. Locate, remove, and then replace the RTC battery:
  - a. Using the FRU map, locate the RTC battery on the controller module.
  - b. Gently push the battery away from the holder, rotate it away from the holder, and then lift it out of the holder.

A circular icon with a lowercase 'i' inside, indicating a note or important information.

Note the polarity of the battery as you remove it from the holder. The battery is marked with a plus sign and must be positioned in the holder correctly. A plus sign near the holder tells you how the battery should be positioned.

  - c. Remove the replacement battery from the antistatic shipping bag.
  - d. Note the polarity of the RTC battery, and then insert it into the holder by tilting the battery at an angle and pushing down.
3. Visually inspect the battery to make sure that it is completely installed into the holder and that the polarity is correct.
4. Reinstall the PCIe cover on the controller module.

### Step 5: Reinstall the controller module and setting time/date after RTC battery replacement

After you replace a component within the controller module, you must reinstall the controller module in the system chassis, reset the time and date on the controller, and then boot it.

1. If you have not already done so, close the air duct or controller module cover.
2. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.

Do not completely insert the controller module in the chassis until instructed to do so.

3. Recable the system, as needed.

If you removed the media converters (QSFPs or SFPs), remember to reinstall them if you are using fiber optic cables.

4. If the power supplies were unplugged, plug them back in and reinstall the power cable retainers.
5. Complete the reinstallation of the controller module:
  - a. Make sure the latch arms are locked in the extended position.
  - b. Using the latch arms, push the controller module into the chassis bay until it stops.



Do not push down on the latching mechanism at the top of the latch arms. Doing so will raise the locking mechanism and prohibit sliding the controller module into the chassis.

- c. Press down and hold the orange tabs on top of the latching mechanism.
- d. Gently push the controller module into the chassis bay until it is flush with the edges of the chassis.



The latching mechanism arms slide into the chassis.

The controller module begins to boot as soon as it is fully seated in the chassis.

- e. Release the latches to lock the controller module into place.
  - f. If you have not already done so, reinstall the cable management device.
  - g. Halt the controller at the `LOADER` prompt.
6. Reset the time and date on the controller:
    - a. Check the date and time on the healthy controller with the `show date` command.
    - b. At the `LOADER` prompt on the target controller, check the time and date.
    - c. If necessary, modify the date with the `set date mm/dd/yyyy` command.
    - d. If necessary, set the time, in GMT, using the `set time hh:mm:ss` command.
    - e. Confirm the date and time on the target controller.
  7. At the `LOADER` prompt, enter `bye` to reinitialize the PCIe cards and other components and let the controller reboot.
  8. Return the controller to normal operation by giving back its storage: `storage failover giveback -ofnode impaired_node_name`
  9. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`

## Step 6: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

# AFF A700 systems

## Install and setup

### Start here: Choose your installation and setup experience

For most configurations, you can choose from different content formats.

- [Quick steps](#)

A printable PDF of step-by-step instructions with live links to additional content.

- [Video steps](#)

Video step-by-step instructions.

- [Detailed steps](#)

Online step-by-step instructions with live links to additional content.

For MetroCluster configurations, see either:

- [Install MetroCluster IP configuration](#)
- [Install MetroCluster Fabric-Attached configuration](#)

### Quick steps - AFF A700

This guide gives graphic instructions for a typical installation of your system from racking and cabling, through initial system bring-up. Use this guide if you are familiar with installing NetApp systems.

Access the *Installation and Setup Instructions* PDF poster:

[AFF A700 Installation and Setup Instructions](#)

[FAS9000 Installation and Setup Instructions](#)

### Video steps - AFF A700

The following video shows how to install and cable your new system.

[Animation - Install and setup of an AFF A700 or FAS9000](#)

### Detailed guide - AFF A700

This guide gives detailed step-by-step instructions for installing a typical NetApp system. Use this guide if you want more detailed installation instructions.

Step 1: Prepare for installation

To install your system, you need to create an account on the NetApp Support Site, register your system, and get license keys. You also need to inventory the appropriate number and type of cables for your system and collect specific network information.

Before you begin

You need to have access to the Hardware Universe for information about site requirements as well as additional information on your configured system. You might also want to have access to the Release Notes for your version of ONTAP for more information about this system.

[NetApp Hardware Universe](#)

[Find the Release Notes for your version of ONTAP 9](#)

You need to provide the following at your site:

- Rack space for the storage system
- Phillips #2 screwdriver
- Additional networking cables to connect your system to your network switch and laptop or console with a Web browser

Steps

1. Unpack the contents of all boxes.
2. Record the system serial number from the controllers.










3. Inventory and make a note of the number and types of cables you received.

The following table identifies the types of cables you might receive. If you receive a cable not listed in the table, see the Hardware Universe to locate the cable and identify its use.

[NetApp Hardware Universe](#)

| Type of cable...                                        | Part number and length                                                                    | Connector type | For...                                     |
|---------------------------------------------------------|-------------------------------------------------------------------------------------------|----------------|--------------------------------------------|
| 10 GbE network cable                                    | X6566B-2-R6, (112-00299), 2m<br>X6566B-3-R6, 112-00300, 3m<br>X6566B-5-R6 , 112-00301, 5m |                | Network cable                              |
| 40 GbE network cable<br><br>40 GbE cluster interconnect | X66100-1,112-00542, 1m<br><br>X66100-3,112-00543, 3m                                      |                | 40 GbE network<br><br>Cluster interconnect |

| Type of cable...                         | Part number and length                                                        | Connector type                                                                      | For...                                                                                                                   |
|------------------------------------------|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| 100 GbE network cable                    | X66211A-05 (112-00595), 0.5m                                                  |   | Network cable                                                                                                            |
| 100 GbE storage cable                    | X66211A-1 (112-00573), 1m                                                     |                                                                                     | Storage cable                                                                                                            |
|                                          | X66211A-2 (112-00574), 2m                                                     |                                                                                     |  This cable applies to AFF A700 only. |
|                                          | X66211A-5 (112-00574), 5m                                                     |                                                                                     |                                                                                                                          |
| Optical network cables (order dependent) | X6553-R6 (112-00188), 2m<br>X6536-R6 (112-00090), 5m                          |   | FC host network                                                                                                          |
| Cat 6, RJ-45 (order dependent)           | Part numbers X6585-R6 (112-00291), 3m<br>X6562-R6 (112-00196), 5m             |    | Management network and Ethernet data                                                                                     |
| Storage                                  | X66031A (112-00436), 1m<br>X66032A (112-00437), 2m<br>X66033A (112-00438), 3m |   | Storage                                                                                                                  |
| Micro-USB console cable                  | Not applicable                                                                |  | Console connection during software setup on non-Windows or Mac laptop/console                                            |
| Power cables                             | Not applicable                                                                |  | Powering up the system                                                                                                   |

4. Review the *NetApp ONTAP Configuration Guide* and collect the required information listed in that guide.

[ONTAP Configuration Guide](#)

## Step 2: Install the hardware

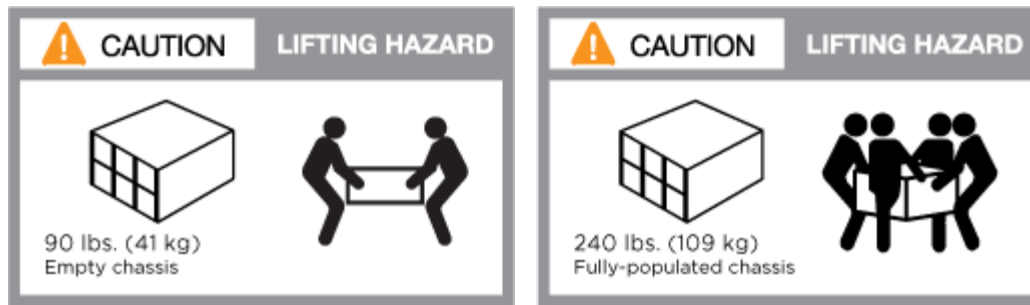
You need to install your system in a 4-post rack or NetApp system cabinet, as applicable.

### Steps

1. Install the rail kits, as needed.
2. Install and secure your system using the instructions included with the rail kit.

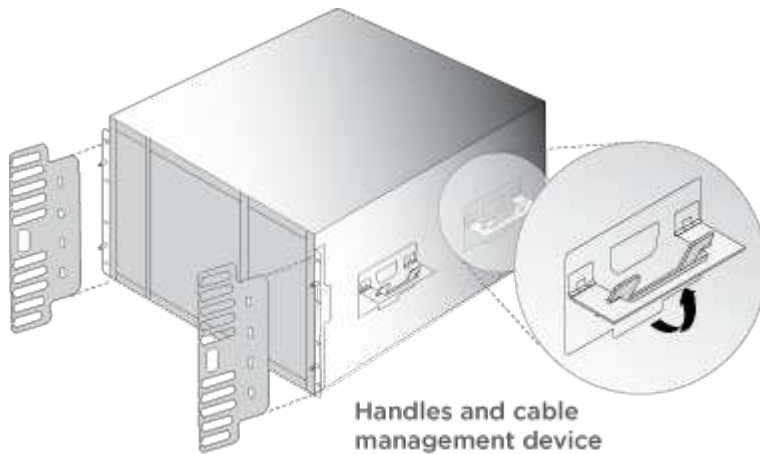


You need to be aware of the safety concerns associated with the weight of the system.



The label on the left indicates an empty chassis, while the label on the right indicates a fully-populated system.

1. Attach cable management devices (as shown).



2. Place the bezel on the front of the system.

### Step 3: Cable controllers to your network

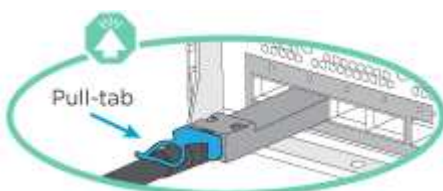
You can cable the controllers to your network by using the two-node switchless cluster method or by using the cluster interconnect network.

#### Option 1: Two-node switchless cluster

Management network, data network, and management ports on the controllers are connected to switches. The cluster interconnect ports are cabled on both controllers.

You must have contacted your network administrator for information about connecting the system to the switches.

Be sure to check the direction of the cable pull-tabs when inserting the cables in the ports. Cable pull-tabs are up for all networking module ports.



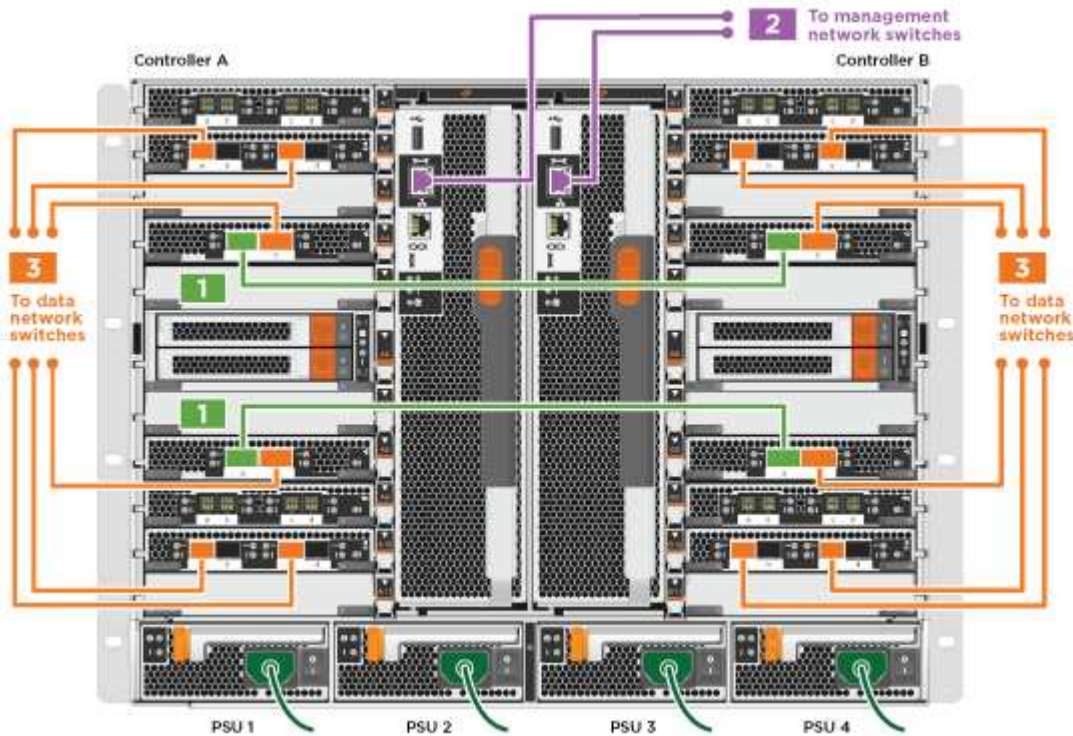


As you insert the connector, you should feel it click into place; if you do not feel it click, remove it, turn it around and try again.

## Steps

1. Use the animation or illustration to complete the cabling between the controllers and to the switches:

[Animation - Cable a two-node switchless cluster](#)



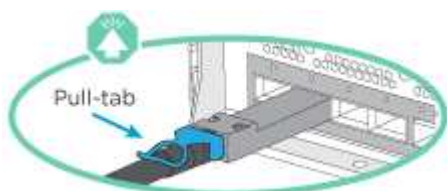
1. Go to [Step 4: Cable controllers to drive shelves](#) for drive shelf cabling instructions.

## Option 2: Switched cluster

Management network, data network, and management ports on the controllers are connected to switches. The cluster interconnect and HA ports are cabled on to the cluster/HA switch.

You must have contacted your network administrator for information about connecting the system to the switches.

Be sure to check the direction of the cable pull-tabs when inserting the cables in the ports. Cable pull-tabs are up for all networking module ports.



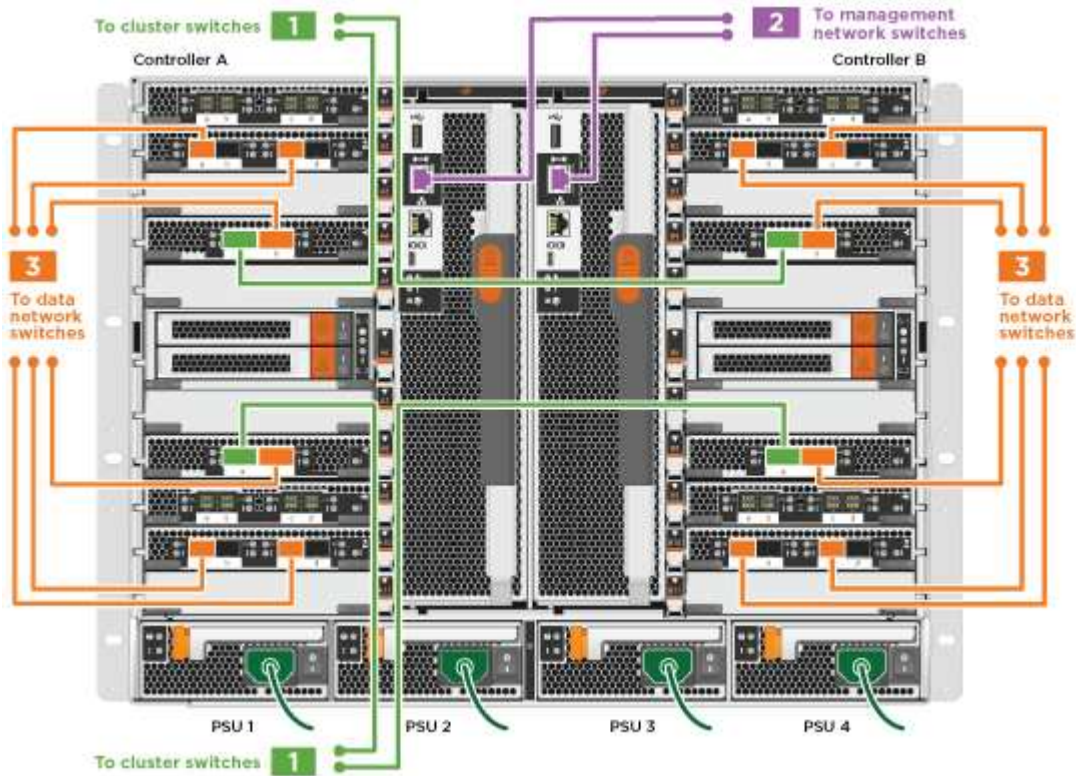
As you insert the connector, you should feel it click into place; if you do not feel it click, remove it, turn it around and try again.



## Steps

1. Use the animation or illustration to complete the cabling between the controllers and to the switches:

### Animation - Switched cluster cabling



1. Go to [Step 4: Cable controllers to drive shelves](#) for drive shelf cabling instructions.

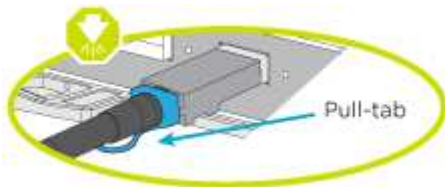
## Step 4: Cable controllers to drive shelves

You can cable your new system to DS212C, DS224C, or NS224 shelves, depending on if it is an AFF or FAS system.

### Option 1: Cable the controllers to DS212C or DS224C drive shelves

You must cable the shelf-to-shelf connections, and then cable both controllers to the DS212C or DS224C drive shelves.

The cables are inserted into the drive shelf with the pull-tabs facing down, while the other end of the cable is inserted into the controller storage modules with the pull-tabs up.







## Steps

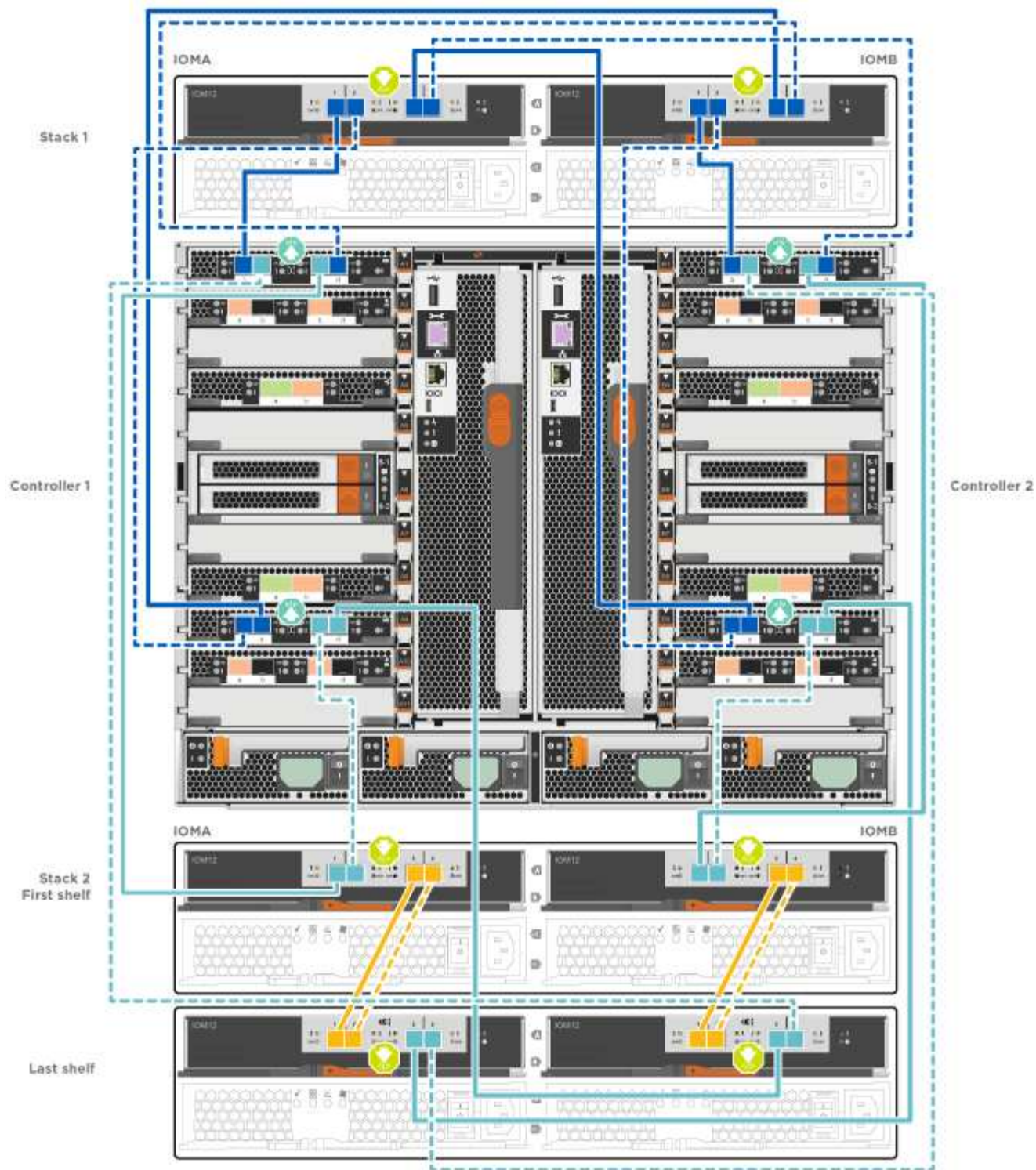
1. Use the following animations or illustrations to cable your drive shelves to your controllers.



The examples use DS224C shelves. Cabling is similar with other supported SAS drive shelves.

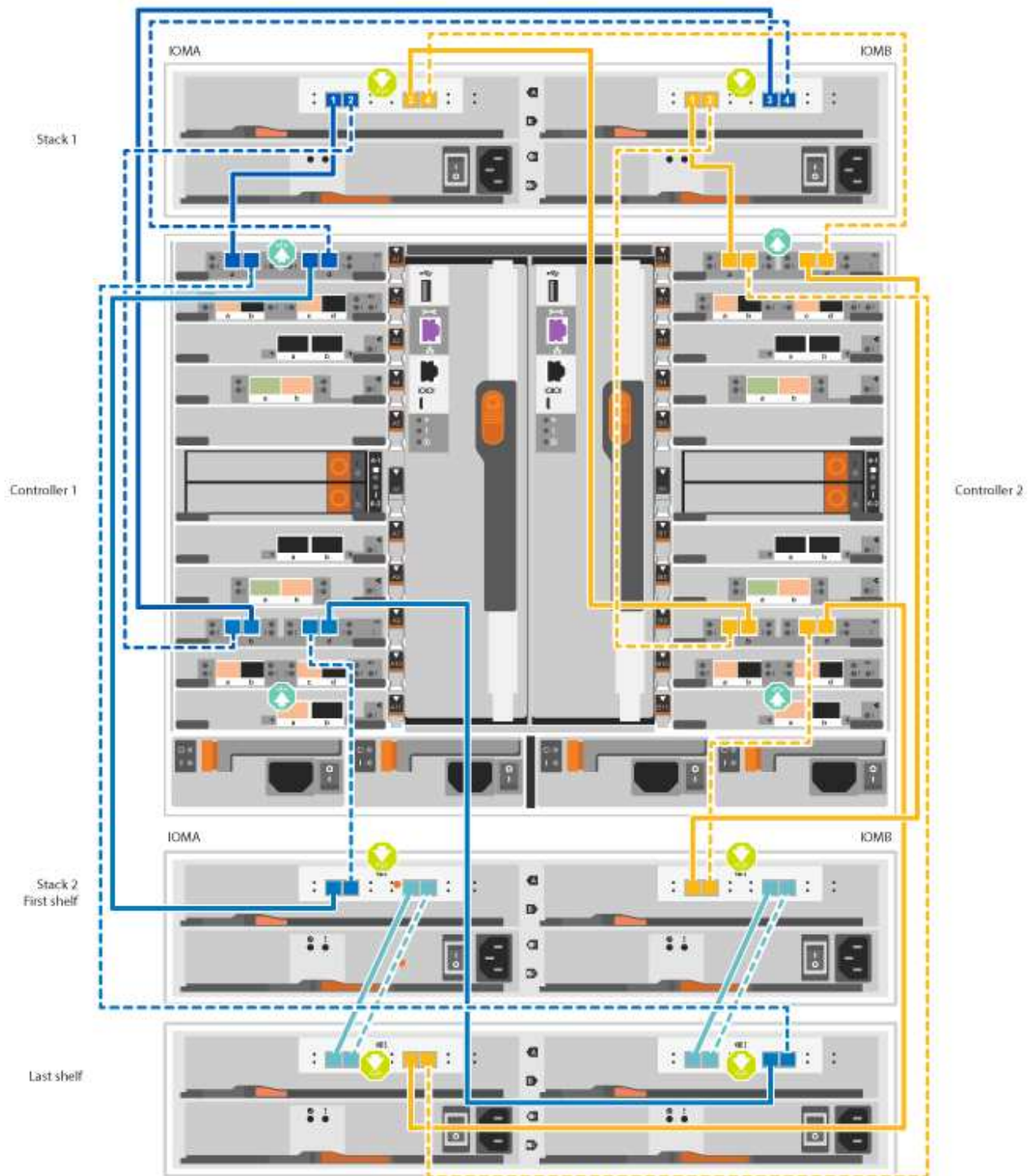
- Cabling SAS shelves in FAS9000, AFF A700, and ASA AFF A700, ONTAP 9.7 and earlier:

[Animation - Cable SAS storage - ONTAP 9.7 and earlier](#)



- Cabling SAS shelves in FAS9000, AFF A700, and ASA AFF A700, ONTAP 9.8 and later:

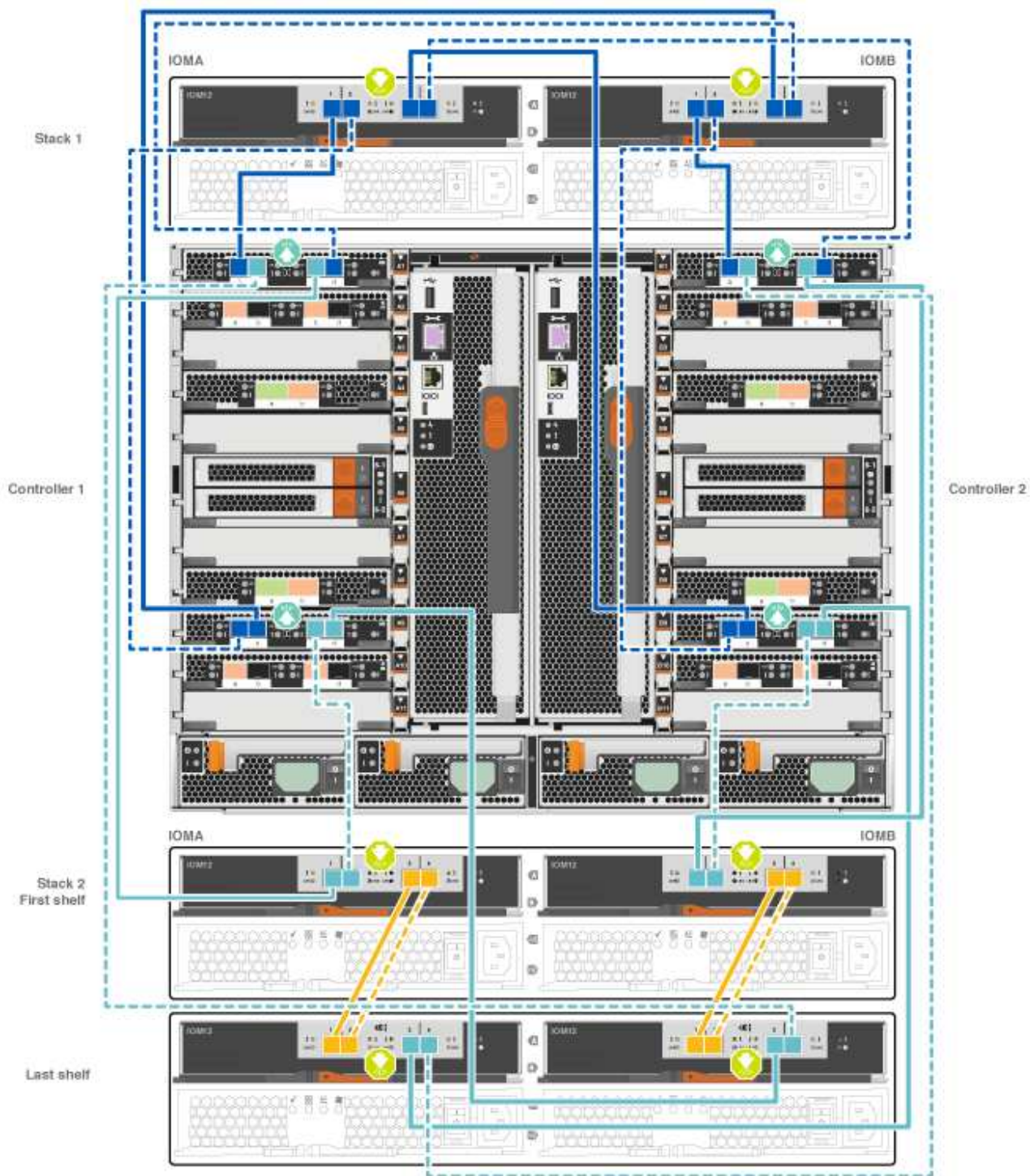
[Animation - Cable SAS storage - ONTAP 9.8 and later](#)



If you have more than one drive shelf stack, see the *Installation and Cabling Guide* for your drive shelf type.

Install and cable shelves for a new system installation - shelves with IOM12 modules





2. Go to [Step 5: Complete system setup and configuration](#) to complete system setup and configuration.

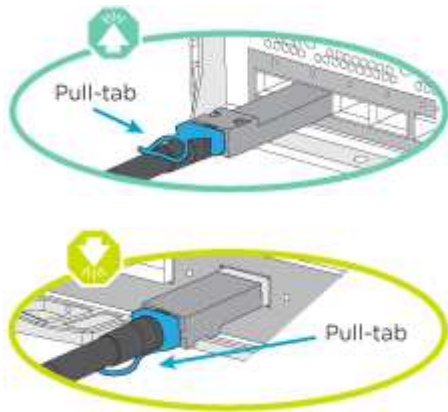
**Option 2: Cable the controllers to a single NS224 drive shelf in AFF A700 and ASA AFF A700 systems running ONTAP 9.8 and later only**

You must cable each controller to the NSM modules on the NS224 drive shelf on an AFF A700 or ASA AFF A700 running system ONTAP 9.8 or later.

- This task applies to AFF A700 and ASA AFF A700 running ONTAP 9.8 or later only.
- The systems must have at least one X91148A module installed in slots 3 and/or 7 for each controller. The

animation or illustrations show this module installed in both slots 3 and 7.

- Be sure to check the illustration arrow for the proper cable connector pull-tab orientation. The cable pull-tab for the storage modules are up, while the pull tabs on the shelves are down.

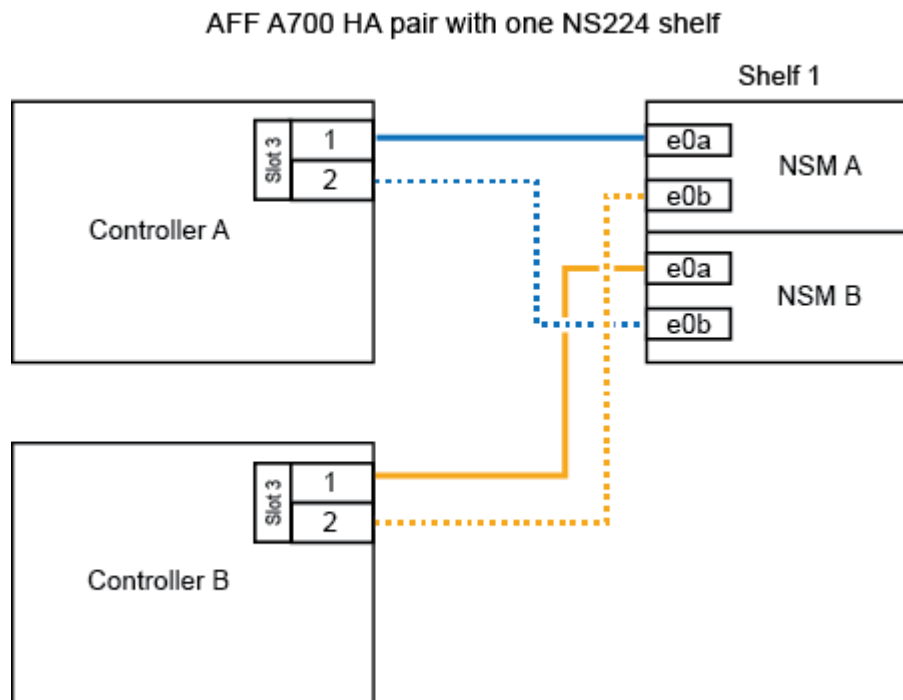


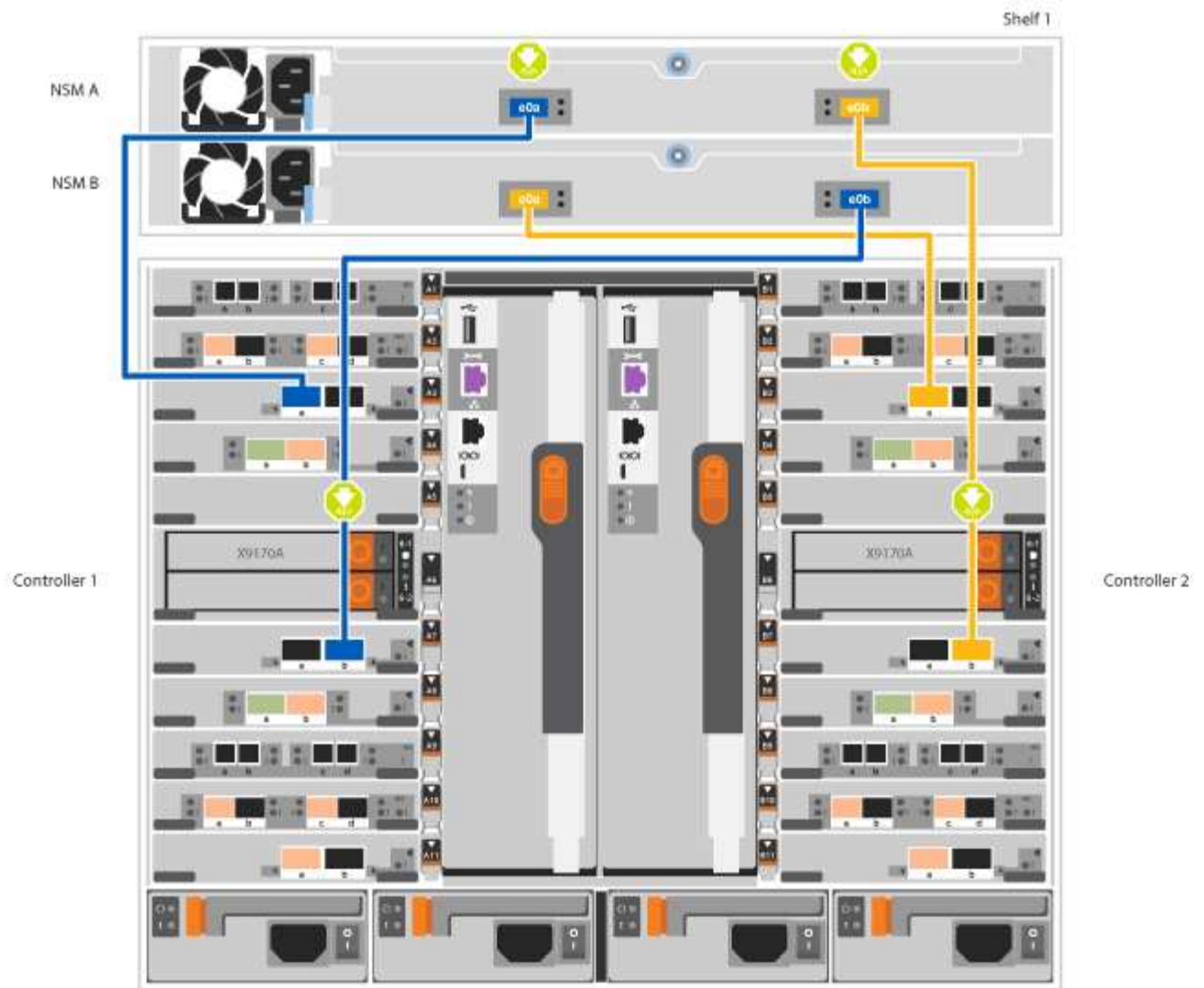
As you insert the connector, you should feel it click into place; if you do not feel it click, remove it, turn it around and try again.

### Steps

1. Use the following animation or illustrations to cable your controllers with two X91148A storage modules to a single NS224 drive shelf, or use the diagram to cable your controllers with one X91148A storage module to a single NS224 drive shelf.

[Animation - Cable a single NS224 shelf - ONTAP 9.8 and later](#)



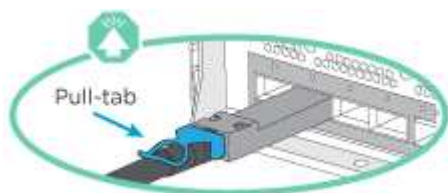


2. Go to [Step 5: Complete system setup and configuration](#) to complete system setup and configuration.

### Option 3: Cable the controllers to two NS224 drive shelves in AFF A700 and ASA AFF A700 systems running ONTAP 9.8 and later only

You must cable each controller to the NSM modules on the NS224 drive shelves on an AFF A700 or ASA AFF A700 running system ONTAP 9.8 or later.

- This task applies to AFF A700 and ASA AFF A700 running ONTAP 9.8 or later only.
- The systems must have two X91148A modules, per controller, installed in slots 3 and 7.
- Be sure to check the illustration arrow for the proper cable connector pull-tab orientation. The cable pull-tab for the storage modules are up, while the pull tabs on the shelves are down.





As you insert the connector, you should feel it click into place; if you do not feel it click, remove it, turn it around and try again.

## Steps

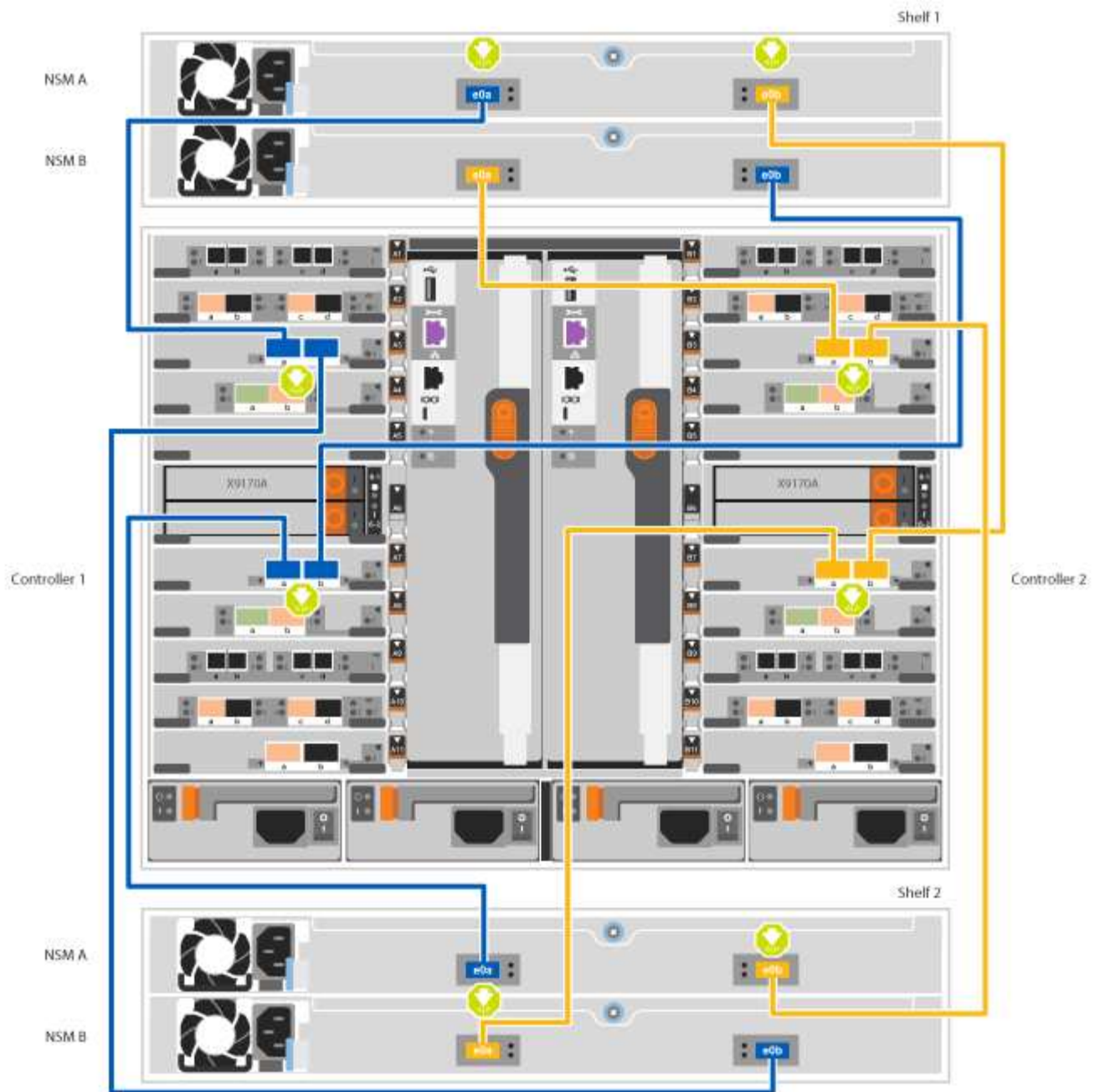
1. Use the following animation or illustrations to cable your controllers to two NS224 drive shelves.

[Animation - Cable two NS224 shelves - ONTAP 9.8 and later](#)

AFF A700 HA pair with two NS224 shelves







2. Go to [Step 5: Complete system setup and configuration](#) to complete system setup and configuration.

### Step 5: Complete system setup and configuration

You can complete the system setup and configuration using cluster discovery with only a connection to the switch and laptop, or by connecting directly to a controller in the system and then connecting to the management switch.

#### Option 1: Completing system setup and configuration if network discovery is enabled

If you have network discovery enabled on your laptop, you can complete system setup and configuration using automatic cluster discovery.

#### Steps

1. Use the following animation to set one or more drive shelf IDs:



If your system has NS224 drive shelves, the shelves are pre-set to shelf ID 00 and 01. If you want to change the shelf IDs, you must create a tool to insert into the hole where button is located.

#### Animation - Set SAS or NVMe drive shelf IDs

2. Plug the power cords into the controller power supplies, and then connect them to power sources on different circuits.
3. Turn on the power switches to both nodes.

#### Animation - Turn on the power to the controllers



Initial booting may take up to eight minutes.

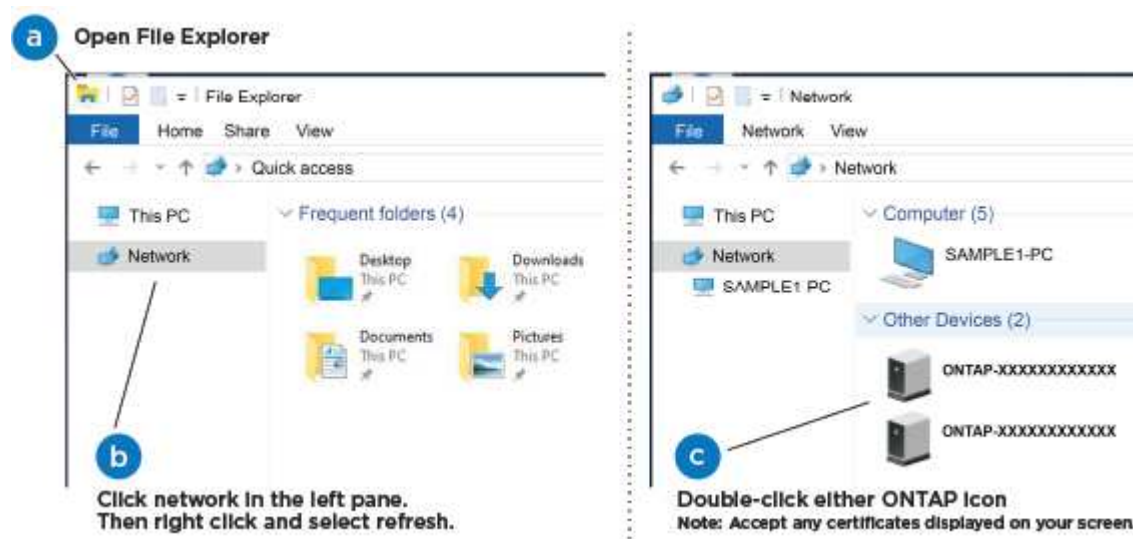
4. Make sure that your laptop has network discovery enabled.

See your laptop's online help for more information.

5. Use the following animation to connect your laptop to the Management switch.

#### Animation - Connect your laptop to the Management switch

6. Select an ONTAP icon listed to discover:



- a. Open File Explorer.
- b. Click network in the left pane.
- c. Right click and select refresh.
- d. Double-click either ONTAP icon and accept any certificates displayed on your screen.



XXXXX is the system serial number for the target node.

System Manager opens.

7. Use System Manager guided setup to configure your system using the data you collected in the *NetApp ONTAP Configuration Guide*.

### 8. Set up your account and download Active IQ Config Advisor:

- a. Log in to your existing account or create an account.

[NetApp Support Registration](#)

- b. Register your system.

[NetApp Product Registration](#)

- c. Download Active IQ Config Advisor.

[NetApp Downloads: Config Advisor](#)

### 9. Verify the health of your system by running Config Advisor.

10. After you have completed the initial configuration, go to the [ONTAP & ONTAP System Manager Documentation Resources](#) page for information about configuring additional features in ONTAP.

## Option 2: Completing system setup and configuration if network discovery is not enabled

If network discovery is not enabled on your laptop, you must complete the configuration and setup using this task.

### Steps

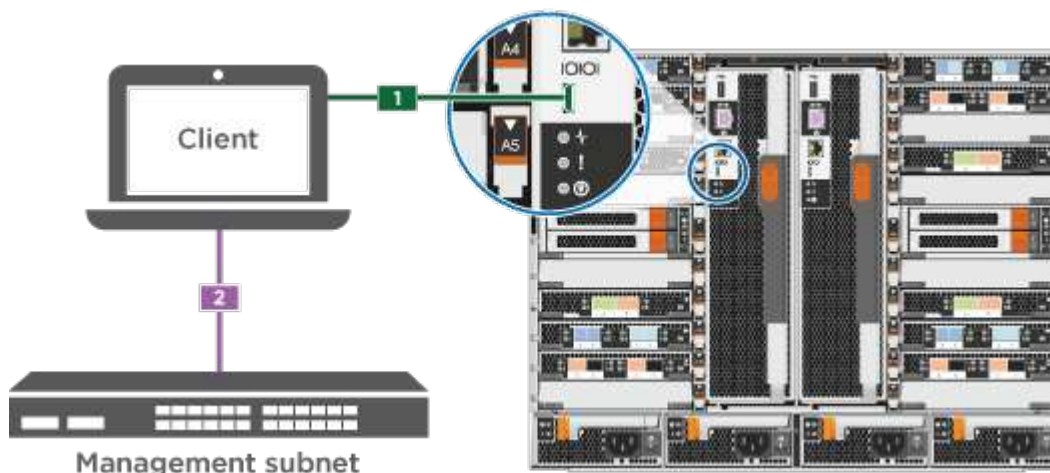
#### 1. Cable and configure your laptop or console:

- a. Set the console port on the laptop or console to 115,200 baud with N-8-1.



See your laptop or console's online help for how to configure the console port.

- b. Connect the console cable to the laptop or console using the console cable that came with your system, and then connect the laptop to the management switch on the management subnet .



- c. Assign a TCP/IP address to the laptop or console, using one that is on the management subnet.

#### 2. Use the following animation to set one or more drive shelf IDs:

If your system has NS224 drive shelves, the shelves are pre-set to shelf ID 00 and 01. If you want to change the shelf IDs, you must create a tool to insert into the hole where button is located.

[Animation - Set SAS or NVMe drive shelf IDs](#)

3. Plug the power cords into the controller power supplies, and then connect them to power sources on different circuits.
4. Turn on the power switches to both nodes.

[Animation - Turn on the power to the controllers](#)



Initial booting may take up to eight minutes.

5. Assign an initial node management IP address to one of the nodes.

| If the management network has DHCP... | Then...                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Configured                            | Record the IP address assigned to the new controllers.                                                                                                                                                                                                                                                                                        |
| Not configured                        | <div><div><div><div></div><div>Check your laptop or console's online help if you do not know how to configure PuTTY.</div></div></div><div><div>a. Open a console session using PuTTY, a terminal server, or the equivalent for your environment.</div><div>b. Enter the management IP address when prompted by the script.</div></div></div> |

6. Using System Manager on your laptop or console, configure your cluster:
  - a. Point your browser to the node management IP address.



The format for the address is https://x.x.x.x.

- b. Configure the system using the data you collected in the *NetApp ONTAP Configuration guide*.

[ONTAP Configuration Guide](#)

7. Set up your account and download Active IQ Config Advisor:
  - a. Log in to your existing account or create an account.

[NetApp Support Registration](#)

- b. Register your system.

[NetApp Product Registration](#)

- c. Download Active IQ Config Advisor.

[NetApp Downloads: Config Advisor](#)

8. Verify the health of your system by running Config Advisor.
9. After you have completed the initial configuration, go to the [ONTAP & ONTAP System Manager Documentation Resources](#) page for information about configuring additional features in ONTAP.

# Maintain

## Maintain AFF A700 hardware

For the AFF A700 storage system, you can perform maintenance procedures on the following components.

### Boot media

The boot media stores a primary and secondary set of boot image files that the system uses when it boots.

### Caching module

You must replace the controller's caching module when your system registers a single AutoSupport (ASUP) message that the module has gone offline.

### Chassis

The chassis is the physical enclosure housing all the controller components such as the controller/CPU unit, power supply, and I/O.

### Controller

A controller consists of a board, firmware, and software. It controls the drives and implements the ONTAP functions.

### DCPM

The DCPM (destage controller power module) contains the NVRAM11 battery.

### DIMM

You must replace a DIMM (dual in-line memory module) when a memory mismatch is present, or you have a failed DIMM.

### Fan

The fan cools the controller.

### I/O module

The I/O module (Input/Output module) is a hardware component that acts as an intermediary between the controller and various devices or systems that need to exchange data with the controller.

### LED USB

The LED USB module provides connectivity to console ports and system status.

### NVRAM

The NVRAM module (Non-Volatile Random Access Memory) allows the controller to retain data across power cycles or system reboots.

## Power supply

A power supply provides a redundant power source in a controller shelf.

## Real-time clock battery

A real time clock battery preserves system date and time information if the power is off.

## X91148A module

The X91148A module is an I/O module that acts as an intermediary between the controller and various devices or systems that need to exchange data with the controller.

## Boot media

### Overview of boot media replacement - AFF A700 and FAS9000

The boot media stores a primary and secondary set of system (boot image) files that the system uses when it boots. Depending on your network configuration, you can perform either a nondisruptive or disruptive replacement.

You must have a USB flash drive, formatted to FAT32, with the appropriate amount of storage to hold the `image_XXX.tgz`.

You also must copy the `image_XXX.tgz` file to the USB flash drive for later use in this procedure.

- The nondisruptive and disruptive methods for replacing a boot media both require you to restore the `var` file system:
  - For nondisruptive replacement, the HA pair does not require connection to a network to restore the `var` file system. The HA pair in a single chassis has an internal eOS connection, which is used to transfer `var` config between them.
  - For disruptive replacement, you do not need a network connection to restore the `var` file system, but the process requires two reboots.
- You must replace the failed component with a replacement FRU component you received from your provider.
- It is important that you apply the commands in these steps on the correct node:
  - The *impaired* node is the node on which you are performing maintenance.
  - The *healthy node* is the HA partner of the impaired node.

If you need to replace the secondary boot media while the primary boot media is installed and healthy, contact NetApp Support and mention the [How to replace the secondary boot device of an AFF A700s](#) KB article.

### Check onboard encryption keys

Prior to shutting down the impaired controller and checking the status of the onboard encryption keys, you must check the status of the impaired controller, disable automatic giveback, and check which version of ONTAP is running on the system.

If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see the [Synchronize a node with the cluster](#).

## Steps

1. Check the status of the impaired controller:
  - If the impaired controller is at the login prompt, log in as `admin`.
  - If the impaired controller is at the `LOADER` prompt and is part of HA configuration, log in as `admin` on the healthy controller.
  - If the impaired controller is in a standalone configuration and at `LOADER` prompt, contact [mysupport.netapp.com](https://mysupport.netapp.com).
2. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:  

```
system node autosupport invoke -node * -type all -message
MAINT=number_of_hours_downh
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:*>`  

```
system node autosupport invoke -node * -type all -message MAINT=2h
```
3. Check the version of ONTAP the system is running on the impaired controller if up, or on the partner controller if the impaired controller is down, using the `version -v` command:
  - If `<Ino-DARE>` or `<1Ono-DARE>` is displayed in the command output, the system does not support NVE, proceed to shut down the controller.
  - If `<Ino-DARE>` is not displayed in the command output, and the system is running ONTAP 9.5, go to [Option 1: Check NVE or NSE on systems running ONTAP 9.5 and earlier](#).
  - If `<Ino-DARE>` is not displayed in the command output, and the system is running ONTAP 9.6 or later, go to [Option 2: Check NVE or NSE on systems running ONTAP 9.6 and later](#).
4. If the impaired node is part of an HA configuration, disable automatic giveback from the healthy node:  

```
storage failover modify -node local -auto-giveback false or storage failover
modify -node local -auto-giveback-after-panic false
```

## Option 1: Check NVE or NSE on systems running ONTAP 9.5 and earlier

Before shutting down the impaired controller, you need to check whether the system has either NetApp Volume Encryption (NVE) or NetApp Storage Encryption (NSE) enabled. If so, you need to verify the configuration.

## Steps

1. Connect the console cable to the impaired controller.
2. Check whether NVE is configured for any volumes in the cluster: `volume show -is-encrypted true`  
  
If any volumes are listed in the output, NVE is configured and you need to verify the NVE configuration. If no volumes are listed, check whether NSE is configured.
3. Check whether NSE is configured: `storage encryption disk show`
  - If the command output lists the drive details with Mode & Key ID information, NSE is configured and you need to verify the NSE configuration.
  - If NVE and NSE are not configured, it's safe to shut down the impaired controller.

## Verify NVE configuration

## Steps

1. Display the key IDs of the authentication keys that are stored on the key management servers: `security`

key-manager query

- If the Restored column displays yes and all key managers display available, it's safe to shut down the impaired controller.
- If the Restored column displays anything other than yes, or if any key manager displays unavailable, you need to complete some additional steps.
- If you see the message This command is not supported when onboard key management is enabled, you need to complete some other additional steps.

2. If the Restored column displayed anything other than yes, or if any key manager displayed unavailable:

- a. Retrieve and restore all authentication keys and associated key IDs: `security key-manager restore -address *`

If the command fails, contact NetApp Support.

[mysupport.netapp.com](https://mysupport.netapp.com)

- b. Verify that the Restored column displays yes for all authentication keys and that all key managers display available: `security key-manager query`

- c. Shut down the impaired controller.

3. If you saw the message This command is not supported when onboard key management is enabled, display the keys stored in the onboard key manager: `security key-manager key show -detail`

- a. If the Restored column displays yes manually back up the onboard key management information:

- Go to advanced privilege mode and enter y when prompted to continue: `set -priv advanced`
- Enter the command to display the OKM backup information: `security key-manager backup show`
- Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
- Return to admin mode: `set -priv admin`
- Shut down the impaired controller.

- b. If the Restored column displays anything other than yes:

- Run the key-manager setup wizard: `security key-manager setup -node target/impaired node name`



Enter the customer's onboard key management passphrase at the prompt. If the passphrase cannot be provided, contact [mysupport.netapp.com](https://mysupport.netapp.com)

- Verify that the Restored column displays yes for all authentication key: `security key-manager key show -detail`
- Go to advanced privilege mode and enter y when prompted to continue: `set -priv advanced`
- Enter the command to display the OKM backup information: `security key-manager backup show`
- Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.

- Return to admin mode: `set -priv admin`
- You can safely shutdown the controller.

## Verify NSE configuration

### Steps

1. Display the key IDs of the authentication keys that are stored on the key management servers: `security key-manager query`
    - If the `Restored` column displays `yes` and all key managers display `available`, it's safe to shut down the impaired controller.
    - If the `Restored` column displays anything other than `yes`, or if any key manager displays `unavailable`, you need to complete some additional steps.
    - If you see the message `This command is not supported when onboard key management is enabled`, you need to complete some other additional steps
  2. If the `Restored` column displayed anything other than `yes`, or if any key manager displayed `unavailable`:
    - a. Retrieve and restore all authentication keys and associated key IDs: `security key-manager restore -address *`  
  
If the command fails, contact NetApp Support.  
  
[mysupport.netapp.com](https://mysupport.netapp.com)
    - b. Verify that the `Restored` column displays `yes` for all authentication keys and that all key managers display `available`: `security key-manager query`
    - c. Shut down the impaired controller.
  3. If you saw the message `This command is not supported when onboard key management is enabled`, display the keys stored in the onboard key manager: `security key-manager key show -detail`
    - a. If the `Restored` column displays `yes`, manually back up the onboard key management information:
      - Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
      - Enter the command to display the OKM backup information: `security key-manager backup show`
      - Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
      - Return to admin mode: `set -priv admin`
      - Shut down the impaired controller.
    - b. If the `Restored` column displays anything other than `yes`:
      - Run the key-manager setup wizard: `security key-manager setup -node target/impaired node name`

Enter the customer's OKM passphrase at the prompt. If the passphrase cannot be provided, contact [mysupport.netapp.com](https://mysupport.netapp.com)
- Verify that the `Restored` column shows `yes` for all authentication keys: `security key-`



```
manager key show -detail
```

- Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
- Enter the command to back up the OKM information: `security key-manager backup show`



Make sure that OKM information is saved in your log file. This information will be needed in disaster scenarios where OKM might need to be manually recovered.

- Copy the contents of the backup information to a separate file or your log. You'll need it in disaster scenarios where you might need to manually recover OKM.
- Return to admin mode: `set -priv admin`
- You can safely shut down the controller.

## Option 2: Check NVE or NSE on systems running ONTAP 9.6 and later

Before shutting down the impaired controller, you need to verify whether the system has either NetApp Volume Encryption (NVE) or NetApp Storage Encryption (NSE) enabled. If so, you need to verify the configuration.

1. Verify whether NVE is in use for any volumes in the cluster: `volume show -is-encrypted true`

If any volumes are listed in the output, NVE is configured and you need to verify the NVE configuration. If no volumes are listed, check whether NSE is configured and in use.

2. Verify whether NSE is configured and in use: `storage encryption disk show`
  - If the command output lists the drive details with Mode & Key ID information, NSE is configured and you need to verify the NSE configuration and in use.
  - If no disks are shown, NSE is not configured.
  - If NVE and NSE are not configured, no drives are protected with NSE keys, it's safe to shut down the impaired controller.

## Verify NVE configuration

1. Display the key IDs of the authentication keys that are stored on the key management servers: `security key-manager key query`



After the ONTAP 9.6 release, you may have additional key manager types. The types are KMIP, AKV, and GCP. The process for confirming these types is the same as confirming external or onboard key manager types.

- If the Key Manager type displays `external` and the Restored column displays `yes`, it's safe to shut down the impaired controller.
  - If the Key Manager type displays `onboard` and the Restored column displays `yes`, you need to complete some additional steps.
  - If the Key Manager type displays `external` and the Restored column displays anything other than `yes`, you need to complete some additional steps.
  - If the Key Manager type displays `onboard` and the Restored column displays anything other than `yes`, you need to complete some additional steps.
2. If the Key Manager type displays `onboard` and the Restored column displays `yes`, manually back up

the OKM information:

- a. Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
  - b. Enter the command to display the key management information: `security key-manager onboard show-backup`
  - c. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
  - d. Return to admin mode: `set -priv admin`
  - e. Shut down the impaired controller.
3. If the Key Manager type displays `external` and the Restored column displays anything other than `yes`:
- a. Restore the external key management authentication keys to all nodes in the cluster: `security key-manager external restore`
- If the command fails, contact NetApp Support.
- [mysupport.netapp.com](https://mysupport.netapp.com)
- b. Verify that the Restored column equals `yes` for all authentication keys: `security key-manager key query`
  - c. Shut down the impaired controller.
4. If the Key Manager type displays `onboard` and the Restored column displays anything other than `yes`:
- a. Enter the onboard security key-manager sync command: `security key-manager onboard sync`



Enter the customer's 32 character, alphanumeric onboard key management passphrase at the prompt. If the passphrase cannot be provided, contact NetApp Support.

[mysupport.netapp.com](https://mysupport.netapp.com)

- b. Verify the Restored column shows `yes` for all authentication keys: `security key-manager key query`
- c. Verify that the Key Manager type shows `onboard`, and then manually back up the OKM information.
- d. Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
- e. Enter the command to display the key management backup information: `security key-manager onboard show-backup`
- f. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
- g. Return to admin mode: `set -priv admin`
- h. You can safely shut down the controller.

## Verify NSE configuration

1. Display the key IDs of the authentication keys that are stored on the key management servers: `security key-manager key query -key-type NSE-AK`



After the ONTAP 9.6 release, you may have additional key manager types. The types are KMIP, AKV, and GCP. The process for confirming these types is the same as confirming external or onboard key manager types.

- If the Key Manager type displays `external` and the Restored column displays `yes`, it's safe to shut down the impaired controller.
  - If the Key Manager type displays `onboard` and the Restored column displays `yes`, you need to complete some additional steps.
  - If the Key Manager type displays `external` and the Restored column displays anything other than `yes`, you need to complete some additional steps.
  - If the Key Manager type displays `external` and the Restored column displays anything other than `yes`, you need to complete some additional steps.
2. If the Key Manager type displays `onboard` and the Restored column displays `yes`, manually back up the OKM information:
    - a. Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
    - b. Enter the command to display the key management information: `security key-manager onboard show-backup`
    - c. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
    - d. Return to admin mode: `set -priv admin`
    - e. You can safely shut down the controller.
  3. If the Key Manager type displays `external` and the Restored column displays anything other than `yes`:
    - a. Restore the external key management authentication keys to all nodes in the cluster: `security key-manager external restore`  
  
If the command fails, contact NetApp Support.  
  
[mysupport.netapp.com](https://mysupport.netapp.com)
    - b. Verify that the Restored column equals `yes` for all authentication keys: `security key-manager key query`
    - c. You can safely shut down the controller.
  4. If the Key Manager type displays `onboard` and the Restored column displays anything other than `yes`:
    - a. Enter the onboard security key-manager sync command: `security key-manager onboard sync`  
  
Enter the customer's 32 character, alphanumeric onboard key management passphrase at the prompt. If the passphrase cannot be provided, contact NetApp Support.  
  
[mysupport.netapp.com](https://mysupport.netapp.com)
    - b. Verify the Restored column shows `yes` for all authentication keys: `security key-manager key query`
    - c. Verify that the Key Manager type shows `onboard`, and then manually back up the OKM information.

- d. Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
- e. Enter the command to display the key management backup information: `security key-manager onboard show-backup`
- f. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
- g. Return to admin mode: `set -priv admin`
- h. You can safely shut down the controller.

#### Shut down the impaired controller - AFF A700

Shut down or take over the impaired controller using the appropriate procedure for your configuration.

#### Option 1: Most systems

After completing the NVE or NSE tasks, you need to complete the shutdown of the impaired controller.

##### Steps

- a. Take the impaired controller to the LOADER prompt:

| If the impaired controller displays...                   | Then...                                                                                                                                                                                                                                                         |
|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                                        | Go to Remove controller module.                                                                                                                                                                                                                                 |
| Waiting for giveback...                                  | Press Ctrl-C, and then respond <code>y</code> when prompted.                                                                                                                                                                                                    |
| System prompt or password prompt (enter system password) | <p>Take over or halt the impaired controller from the healthy controller:</p> <pre>storage failover takeover -ofnode impaired_node_name</pre> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <code>y</code>.</p> |

- b. From the LOADER prompt, enter: `printenv` to capture all boot environmental variables. Save the output to your log file.



This command may not work if the boot device is corrupted or non-functional.

#### Option 2: Controller is in a MetroCluster

After completing the NVE or NSE tasks, you need to complete the shutdown of the impaired node.

NOTE: Do not use this procedure if your system is in a two-node MetroCluster configuration.

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a

healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

- If you have a MetroCluster configuration, you must have confirmed that the MetroCluster Configuration State is configured and that the nodes are in an enabled and normal state (`metrocluster node show`).

### Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message
MAINT=number_of_hours_downh
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:>`  
`system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`
3. Take the impaired controller to the LOADER prompt:

| If the impaired controller is displaying...              | Then...                                                                                                                                                                                                                                                                   |
|----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                                        | Go to the next step.                                                                                                                                                                                                                                                      |
| Waiting for giveback...                                  | Press Ctrl-C, and then respond <code>y</code> when prompted.                                                                                                                                                                                                              |
| System prompt or password prompt (enter system password) | <p>Take over or halt the impaired controller from the healthy controller:<br/><code>storage failover takeover -ofnode<br/>impaired_node_name</code></p> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <code>y</code>.</p> |

### Option 3: Controller is in a two-node MetroCluster

After completing the NVE or NSE tasks, you need to complete the shutdown of the impaired node.



Do not use this procedure if your system is in a two-node MetroCluster configuration.

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).
- If you have a MetroCluster configuration, you must have confirmed that the MetroCluster Configuration State is configured and that the nodes are in an enabled and normal state (`metrocluster node show`).

### Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message
```

MAINT=number\_of\_hours\_downh

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`
3. Take the impaired controller to the LOADER prompt:

| If the impaired controller is displaying...              | Then...                                                                                                                                                                                                                                                                      |
|----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                                        | Go to the next step.                                                                                                                                                                                                                                                         |
| Waiting for giveback...                                  | Press Ctrl-C, and then respond <code>y</code> when prompted.                                                                                                                                                                                                                 |
| System prompt or password prompt (enter system password) | <p>Take over or halt the impaired controller from the healthy controller:<br/><code>storage failover takeover -ofnode <i>impaired_node_name</i></code></p> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <code>y</code>.</p> |

## Replace the boot media - AFF A700

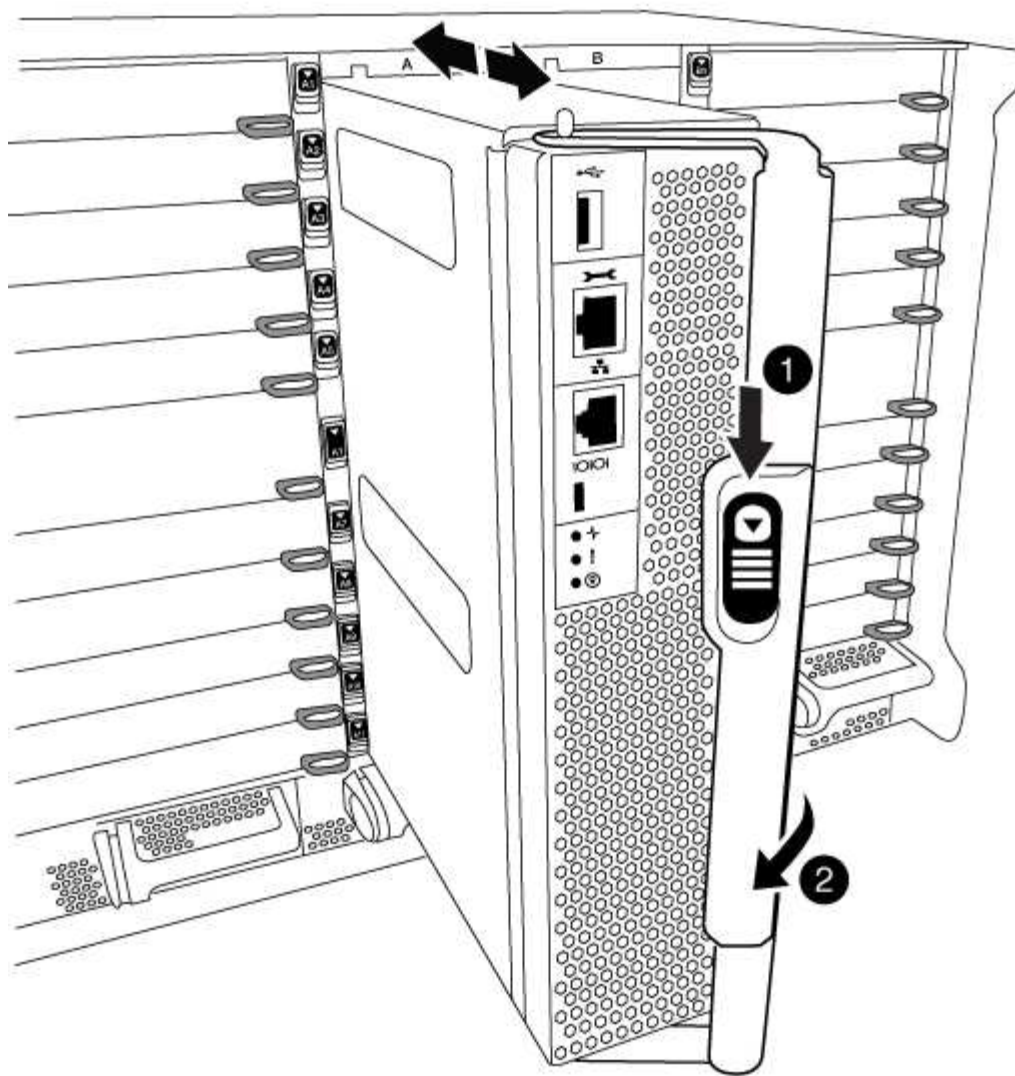
To replace the boot media, you must remove the impaired controller module, install the replacement boot media, and transfer the boot image to a USB flash drive.

### Step 1: Remove the controller

To access components inside the controller, you must first remove the controller module from the system and then remove the cover on the controller module.

#### Steps

1. If you are not already grounded, properly ground yourself.
2. Unplug the cables from the impaired controller module, and keep track of where the cables were connected.
3. Slide the orange button on the cam handle downward until it unlocks.



1

Cam handle release button

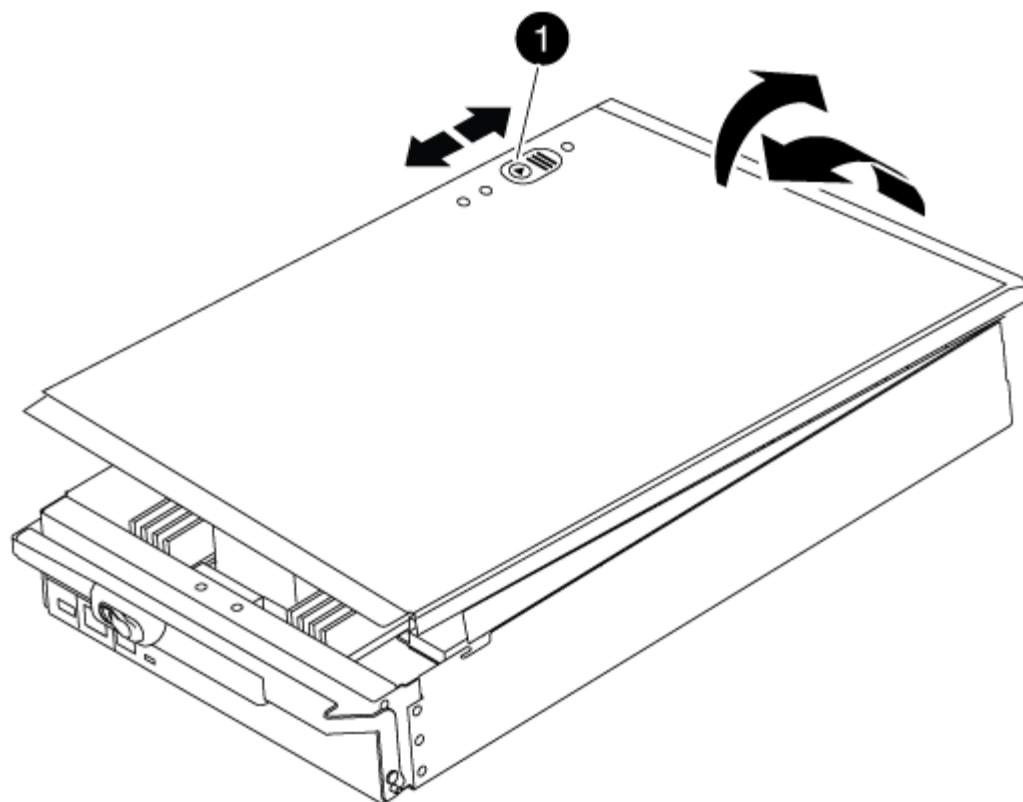
2

Cam handle

4. Rotate the cam handle so that it completely disengages the controller module from the chassis, and then slide the controller module out of the chassis.

Make sure that you support the bottom of the controller module as you slide it out of the chassis.

5. Place the controller module lid-side up on a stable, flat surface, press the blue button on the cover, slide the cover to the back of the controller module, and then swing the cover up and lift it off of the controller module.

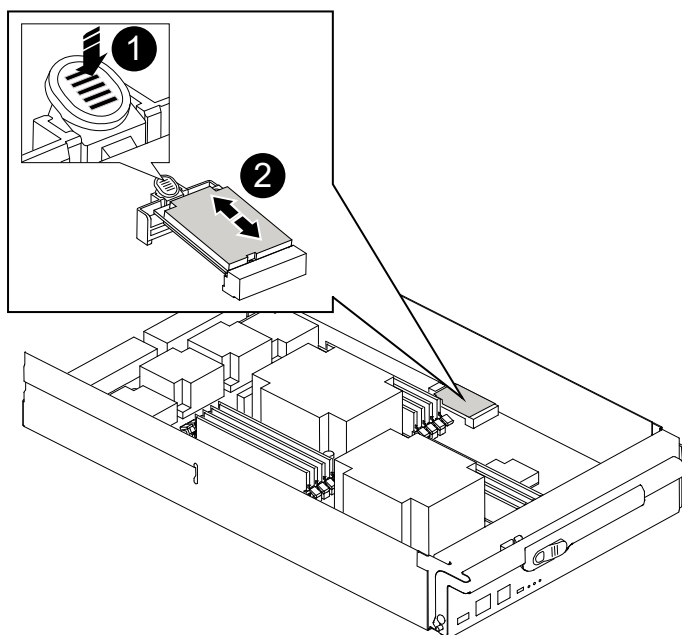


1

Controller module cover locking button

## Step 2: Replace the boot media

Locate the boot media using the following illustration or the FRU map on the controller module:





|   |                   |
|---|-------------------|
| 1 |                   |
|   | Press release tab |
| 2 |                   |
|   | Boot media        |

1. Press the blue button on the boot media housing to release the boot media from its housing, and then gently pull it straight out of the boot media socket.



Do not twist or pull the boot media straight up, because this could damage the socket or the boot media.

2. Align the edges of the replacement boot media with the boot media socket, and then gently push it into the socket.
3. Check the boot media to make sure that it is seated squarely and completely in the socket.

If necessary, remove the boot media and reseal it into the socket.

4. Push the boot media down to engage the locking button on the boot media housing.
5. Reinstall the controller module lid by aligning the pins on the lid with the slots on the motherboard carrier, and then slide the lid into place.

### Step 3: Transfer the boot image to the boot media

You can install the system image to the replacement boot media using a USB flash drive with the image installed on it. However, you must restore the `var` file system during this procedure.

- You must have a USB flash drive, formatted to FAT32, with at least 4GB capacity.
- A copy of the same image version of ONTAP as what the impaired controller was running. You can download the appropriate image from the Downloads section on the NetApp Support Site
  - If NVE is enabled, download the image with NetApp Volume Encryption, as indicated in the download button.
  - If NVE is not enabled, download the image without NetApp Volume Encryption, as indicated in the download button.
- If your system is a stand-alone system you do not need a network connection, but you must perform an additional reboot when restoring the `var` file system.

### Steps

1. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.
2. Recable the controller module, as needed.
3. Insert the USB flash drive into the USB slot on the controller module.

Make sure that you install the USB flash drive in the slot labeled for USB devices, and not in the USB

console port.

4. Push the controller module all the way into the system, making sure that the cam handle clears the USB flash drive, firmly push the cam handle to finish seating the controller module, and then push the cam handle to the closed position.

The node begins to boot as soon as it is completely installed into the chassis.

5. Interrupt the boot process to stop at the LOADER prompt by pressing Ctrl-C when you see Starting AUTOBOOT press Ctrl-C to abort....

If you miss this message, press Ctrl-C, select the option to boot to Maintenance mode, and then halt the node to boot to LOADER.

6. Set your network connection type at the LOADER prompt:

- If you are configuring DHCP: `ifconfig e0a -auto`



The target port you configure is the target port you use to communicate with the impaired node from the healthy node during `var` file system restore with a network connection. You can also use the `e0M` port in this command.

- If you are configuring manual connections: `ifconfig e0a -addr=filer_addr -mask=netmask -gw=gateway-dns=dns_addr-domain=dns_domain`
  - `filer_addr` is the IP address of the storage system.
  - `netmask` is the network mask of the management network that is connected to the HA partner.
  - `gateway` is the gateway for the network.
  - `dns_addr` is the IP address of a name server on your network.
  - `dns_domain` is the Domain Name System (DNS) domain name.

If you use this optional parameter, you do not need a fully qualified domain name in the netboot server URL. You need only the server's host name.



Other parameters might be necessary for your interface. You can enter `help ifconfig` at the firmware prompt for details.

7. If the controller is in a stretch or fabric-attached MetroCluster, you must restore the FC adapter configuration:

- a. Boot to Maintenance mode: `boot_ontap maint`
- b. Set the MetroCluster ports as initiators: `ucadmin modify -m fc -t initiator adapter_name`
- c. Halt to return to Maintenance mode: `halt`

The changes will be implemented when the system is booted.

#### Boot the recovery image - AFF A700

The procedure for booting the impaired node from the recovery image depends on whether the system is in a two-node MetroCluster configuration.

## Option 1: Boot the recovery image in most systems

You must boot the ONTAP image from the USB drive, restore the file system, and verify the environmental variables.

This procedure applies to systems that are not in a two-node MetroCluster configuration.

### Steps

1. From the LOADER prompt, boot the recovery image from the USB flash drive: `boot_recovery`

The image is downloaded from the USB flash drive.

2. When prompted, either enter the name of the image or accept the default image displayed inside the brackets on your screen.
3. Restore the `var` file system:

| If your system has... | Then...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A network connection  | <ol style="list-style-type: none"><li>a. Press <code>y</code> when prompted to restore the backup configuration.</li><li>b. Set the healthy node to advanced privilege level: <code>set -privilege advanced</code></li><li>c. Run the restore backup command: <code>system node restore-backup -node local -target-address <i>impaired_node_IP_address</i></code></li><li>d. Return the node to admin level: <code>set -privilege admin</code></li><li>e. Press <code>y</code> when prompted to use the restored configuration.</li><li>f. Press <code>y</code> when prompted to reboot the node.</li></ol> |
| No network connection | <ol style="list-style-type: none"><li>a. Press <code>n</code> when prompted to restore the backup configuration.</li><li>b. Reboot the system when prompted by the system.</li><li>c. Select the <b>Update flash from backup config</b> (sync flash) option from the displayed menu.<br/><br/>If you are prompted to continue with the update, press <code>y</code>.</li></ol>                                                                                                                                                                                                                              |

| If your system has...                                           | Then...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No network connection and is in a MetroCluster IP configuration | <p>a. Press <b>n</b> when prompted to restore the backup configuration.</p> <p>b. Reboot the system when prompted by the system.</p> <p>c. Wait for the iSCSI storage connections to connect.</p> <p>You can proceed after you see the following messages:</p> <pre data-bbox="672 394 1489 1255"> date-and-time [node- name:iscsi.session.stateChanged:notice]: iSCSI session state is changed to Connected for the target iSCSI-target (type: dr_auxiliary, address: ip-address). date-and-time [node- name:iscsi.session.stateChanged:notice]: iSCSI session state is changed to Connected for the target iSCSI-target (type: dr_partner, address: ip-address). date-and-time [node- name:iscsi.session.stateChanged:notice]: iSCSI session state is changed to Connected for the target iSCSI-target (type: dr_auxiliary, address: ip-address). date-and-time [node- name:iscsi.session.stateChanged:notice]: iSCSI session state is changed to Connected for the target iSCSI-target (type: dr_partner, address: ip-address).</pre> <p>d. Select the <b>Update flash from backup config</b> (sync flash) option from the displayed menu.</p> <p>If you are prompted to continue with the update, press <b>y</b>.</p> |

4. Ensure that the environmental variables are set as expected:
  - a. Take the node to the LOADER prompt.
  - b. Check the environment variable settings with the `printenv` command.
  - c. If an environment variable is not set as expected, modify it with the `setenv environment-variable-name changed-value` command.
  - d. Save your changes using the `savenv` command.
5. The next depends on your system configuration:
  - If your system has onboard keymanager, NSE or NVE configured, go to [Restore OKM, NSE, and NVE as needed](#)

- If your system does not have onboard keymanager, NSE or NVE configured, complete the steps in this section.

6. From the LOADER prompt, enter the `boot_ontap` command.

| *If you see...          | Then...*                                                                                                                               |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| The login prompt        | Go to the next Step.                                                                                                                   |
| Waiting for giveback... | a. Log into the partner node.<br>b. Confirm the target node is ready for giveback with the <code>storage failover show</code> command. |

7. Connect the console cable to the partner node.

8. Give back the node using the `storage failover giveback -fromnode local` command.

9. At the cluster prompt, check the logical interfaces with the `net int -is-home false` command.

If any interfaces are listed as "false", revert those interfaces back to their home port using the `net int revert` command.

10. Move the console cable to the repaired node and run the `version -v` command to check the ONTAP versions.

11. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.

## Option 2: Boot the recovery image in a two-node MetroCluster configuration

You must boot the ONTAP image from the USB drive and verify the environmental variables.

This procedure applies to systems in a two-node MetroCluster configuration.

### Steps

1. From the LOADER prompt, boot the recovery image from the USB flash drive: `boot_recovery`

The image is downloaded from the USB flash drive.

2. When prompted, either enter the name of the image or accept the default image displayed inside the brackets on your screen.

3. After the image is installed, start the restoration process:

- Press `n` when prompted to restore the backup configuration.
- Press `y` when prompted to reboot to start using the newly installed software.

You should be prepared to interrupt the boot process when prompted.

4. As the system boots, press `Ctrl-C` after you see the `Press Ctrl-C for Boot Menu` message., and when the Boot Menu is displayed select option 6.

5. Verify that the environmental variables are set as expected.

- Take the node to the LOADER prompt.

- b. Check the environment variable settings with the `printenv` command.
- c. If an environment variable is not set as expected, modify it with the `setenv environment-variable-name changed-value` command.
- d. Save your changes using the `savenv` command.
- e. Reboot the node.

#### Switch back aggregates in a two-node MetroCluster configuration - AFF A700 and FAS9000

After you have completed the FRU replacement in a two-node MetroCluster configuration, you can perform the MetroCluster switchback operation. This returns the configuration to its normal operating state, with the sync-source storage virtual machines (SVMs) on the formerly impaired site now active and serving data from the local disk pools.

This task only applies to two-node MetroCluster configurations.

#### Steps

1. Verify that all nodes are in the enabled state: `metrocluster node show`

```
cluster_B::> metrocluster node show
```

| DR                        | Configuration             | DR                  |
|---------------------------|---------------------------|---------------------|
| Group Cluster Node        | State                     | Mirroring Mode      |
| -----                     | -----                     | -----               |
| 1                         | cluster_A                 |                     |
|                           | controller_A_1 configured | enabled heal roots  |
| completed                 |                           |                     |
|                           | cluster_B                 |                     |
|                           | controller_B_1 configured | enabled waiting for |
|                           | switchback recovery       |                     |
| 2 entries were displayed. |                           |                     |

2. Verify that resynchronization is complete on all SVMs: `metrocluster vserver show`
3. Verify that any automatic LIF migrations being performed by the healing operations were completed successfully: `metrocluster check lif show`
4. Perform the switchback by using the `metrocluster switchback` command from any node in the surviving cluster.
5. Verify that the switchback operation has completed: `metrocluster show`

The switchback operation is still running when a cluster is in the `waiting-for-switchback` state:

```
cluster_B::> metrocluster show
Cluster Configuration State Mode

Local: cluster_B configured switchover
Remote: cluster_A configured waiting-for-switchback
```

The switchback operation is complete when the clusters are in the normal state.:

```
cluster_B::> metrocluster show
Cluster Configuration State Mode

Local: cluster_B configured normal
Remote: cluster_A configured normal
```

If a switchback is taking a long time to finish, you can check on the status of in-progress baselines by using the `metrocluster config-replication resync-status show` command.

#### 6. Reestablish any SnapMirror or SnapVault configurations.

#### Restore OKM, NSE, and NVE as needed - AFF A700 and FAS9000

Once environment variables are checked, you must complete steps specific to systems that have Onboard Key Manager (OKM), NetApp Storage Encryption (NSE) or NetApp Volume Encryption (NVE) enabled.

Determine which section you should use to restore your OKM, NSE, or NVE configurations:

If NSE or NVE are enabled along with Onboard Key Manager you must restore settings you captured at the beginning of this procedure.

- If NSE or NVE are enabled and Onboard Key Manager is enabled, go to [Option 1: Restore NVE or NSE when Onboard Manager is enabled](#).
- If NSE or NVE are enabled for ONATP 9.5, go to [Option 2: Restore NSE/NVE on systems running ONTAP 9.5 and earlier](#).
- If NSE or NVE are enabled for ONTAP 9.6, go to [Option 3: Restore NSE/NVE on systems running ONTAP 9.6 and later](#).

#### Option 1: Restore NVE or NSE when Onboard Key Manager is enabled

##### Steps

1. Connect the console cable to the target controller.
2. Use the `boot_ontap` command at the LOADER prompt to boot the controller.
3. Check the console output:

| If the console displays... | Then...                                                                                                                                                                                                                          |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt          | Boot the controller to the boot menu: <code>boot_ontap menu</code>                                                                                                                                                               |
| Waiting for giveback...    | a. Enter <code>Ctrl-C</code> at the prompt<br>b. At the message: Do you wish to halt this controller rather than wait [y/n]? , enter: <code>y</code><br>c. At the LOADER prompt, enter the <code>boot_ontap menu</code> command. |

- At the Boot Menu, enter the hidden command, `recover_onboard_keymanager` and reply `y` at the prompt.
- Enter the passphrase for the onboard key manager you obtained from the customer at the beginning of this procedure.
- When prompted to enter the backup data, paste the backup data you captured at the beginning of this procedure, when asked. Paste the output of `security key-manager backup show` OR `security key-manager onboard show-backup` command.



The data is output from either `security key-manager backup show` or `security key-manager onboard show-backup` command.

Example of backup data:

```

-----BEGIN BACKUP-----
TmV0QXBwIEtleSB0bG9iAAEAAAAEAAAAcAEAAAAAADuD+byAAAAACEAAAAAAAAA
QAAAAAAAAABvOIH0AAAAAMh7qDLRyH1DBz12piVdy9ATSFMT0C0TIYFss4PDjTaV
dzRYkLd1PhQLxAWJwOlyqSr8qY1SEBgm1IWgE5DLRqkiAAAAAAAAACgAAAAAAAA
3WTh7gAAAAAAAAAAAAAAAAAIAAAAAAAgAZJEIWvdeHr5RCAvHGclo+wAAAAAAAAA
lgAAAAAAAAAoAAAAAAAAAEOTcR0AAAAAAAAAAAAAAAAACAAAAAAAAJAGr3tJA/
LRzUQRHwv+1aWvAAAAAAAAAACQAAAAAAAAAgAAAAAAAAACdhTcvAAAAAJ1PXeBf
ml4NBsSyV1B4jc4A7cvWEFY6ILG6hc6tbKLAHZuvfQ4rlbYAAAAAAAAAAAAAAAA
AA
AA
.
.
.
.
H4nPQM0nrDRYRa9SCv8AA
AA
AAAAAAA
-----END BACKUP-----

```

- At the Boot Menu select the option for Normal Boot.

The system boots to `Waiting for giveback...` prompt.

- Move the console cable to the partner controller and login as admin.



9. Confirm the target controller is ready for giveback with the `storage failover show` command.
10. Give back only the CFO aggregates with the `storage failover giveback -fromnode local -only-cfo -aggregates true` command.
  - If the command fails because of a failed disk, physically disengage the failed disk, but leave the disk in the slot until a replacement is received.
  - If the command fails because of an open CIFS session, check with the customer on how to close out CIFS sessions.
11. Once the giveback completes, check the failover and giveback status with the `storage failover show` and ``storage failover show-giveback`` commands.



Terminating CIFS can cause loss of data.

- If the command fails because the partner is "not ready", wait 5 minutes for the NVMEMs to synchronize.
  - If the command fails because of an NDMP, SnapMirror, or SnapVault process, disable the process. See the appropriate Documentation Center for more information.
12. Move the console cable to the target controller.
  13. If you are running ONTAP 9.5 and earlier, run the key-manager setup wizard:
    - a. Start the wizard using the `security key-manager setup -nodenodename` command, and then enter the passphrase for onboard key management when prompted.
    - b. Enter the `security key-manager key show -detail` command to see a detailed view of all keys stored in the onboard key manager and verify that the `Restored` column = `yes` for all authentication keys.



If the `Restored` column = anything other than `yes`, contact Customer Support.

- c. Wait 10 minutes for the key to synchronize across the cluster.
14. If you are running ONTAP 9.6 or later:
  - a. Run the `security key-manager onboard sync` command and then enter the passphrase when prompted.
  - b. Enter the `security key-manager key query` command to see a detailed view of all keys stored in the onboard key manager and verify that the `Restored` column = `yes/true` for all authentication keys.



If the `Restored` column = anything other than `yes/true`, contact Customer Support.

- c. Wait 10 minutes for the key to synchronize across the cluster.
15. Move the console cable to the partner controller.
16. Give back the target controller using the `storage failover giveback -fromnode local` command.
17. Check the giveback status, 3 minutes after it reports complete, using the `storage failover show` command.

If giveback is not complete after 20 minutes, contact Customer Support.

18. At the clustershell prompt, enter the `net int show -is-home false` command to list the logical interfaces that are not on their home controller and port.

If any interfaces are listed as `false`, revert those interfaces back to their home port using the `net int revert -vserver Cluster -lif nodename` command.

19. Move the console cable to the target controller and run the `version -v` command to check the ONTAP versions.
20. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.

## Option 2: Restore NSE/NVE on systems running ONTAP 9.5 and earlier

### Steps

1. Connect the console cable to the target controller.
2. Use the `boot_ontap` command at the LOADER prompt to boot the controller.
3. Check the console output:

| If the console displays... | Then...                                                                                                                                                                                                 |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The login prompt           | Go to Step 7.                                                                                                                                                                                           |
| Waiting for giveback...    | <ol style="list-style-type: none"><li>a. Log into the partner controller.</li><li>b. Confirm the target controller is ready for giveback with the <code>storage failover show</code> command.</li></ol> |

4. Move the console cable to the partner controller and give back the target controller storage using the `storage failover giveback -fromnode local -only-cfo-aggregates true local` command.
  - If the command fails because of a failed disk, physically disengage the failed disk, but leave the disk in the slot until a replacement is received.
  - If the command fails because of an open CIFS sessions, check with customer how to close out CIFS sessions.



Terminating CIFS can cause loss of data.

- If the command fails because the partner "not ready", wait 5 minutes for the NVMEMs to synchronize.
  - If the command fails because of an NDMP, SnapMirror, or SnapVault process, disable the process. See the appropriate Documentation Center for more information.
5. Wait 3 minutes and check the failover status with the `storage failover show` command.
  6. At the clustershell prompt, enter the `net int show -is-home false` command to list the logical interfaces that are not on their home controller and port.

If any interfaces are listed as `false`, revert those interfaces back to their home port using the `net int`

```
revert -vserver Cluster -lif nodename command.
```

7. Move the console cable to the target controller and run the `version -v` command to check the ONTAP versions.
8. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.
9. Use the `storage encryption disk show` at the clustershell prompt, to review the output.



This command does not work if NVE (NetApp Volume Encryption) is configured

10. Use the security key-manager query to display the key IDs of the authentication keys that are stored on the key management servers.
  - If the `Restored` column = `yes` and all key managers report in an available state, go to *Complete the replacement process*.
  - If the `Restored` column = anything other than `yes`, and/or one or more key managers is not available, use the `security key-manager restore -address` command to retrieve and restore all authentication keys (AKs) and key IDs associated with all nodes from all available key management servers.

Check the output of the security key-manager query again to ensure that the `Restored` column = `yes` and all key managers report in an available state

11. If the Onboard Key Management is enabled:
  - a. Use the `security key-manager key show -detail` to see a detailed view of all keys stored in the onboard key manager.
  - b. Use the `security key-manager key show -detail` command and verify that the `Restored` column = `yes` for all authentication keys.

If the `Restored` column = anything other than `yes`, use the `security key-manager setup -node Repaired(Target)node` command to restore the Onboard Key Management settings. Rerun the `security key-manager key show -detail` command to verify `Restored` column = `yes` for all authentication keys.

12. Connect the console cable to the partner controller.
13. Give back the controller using the `storage failover giveback -fromnode local` command.
14. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.

### Option 3: Restore NSE/NVE on systems running ONTAP 9.6 and later

#### Steps

1. Connect the console cable to the target controller.
2. Use the `boot_ontap` command at the LOADER prompt to boot the controller.
3. Check the console output:

| If the console displays... | Then...                                                                                                                                                                                                    |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The login prompt           | Go to Step 7.                                                                                                                                                                                              |
| Waiting for giveback...    | <ul style="list-style-type: none"> <li>a. Log into the partner controller.</li> <li>b. Confirm the target controller is ready for giveback with the <code>storage failover show</code> command.</li> </ul> |

4. Move the console cable to the partner controller and give back the target controller storage using the `storage failover giveback -fromnode local -only-cfo-aggregates true local` command.
  - If the command fails because of a failed disk, physically disengage the failed disk, but leave the disk in the slot until a replacement is received.
  - If the command fails because of an open CIFS session, check with the customer on how to close out CIFS sessions.



Terminating CIFS can cause loss of data.

- If the command fails because the partner is "not ready", wait 5 minutes for the NVMEMs to synchronize.
  - If the command fails because of an NDMP, SnapMirror, or SnapVault process, disable the process. See the appropriate Documentation Center for more information.
5. Wait 3 minutes and check the failover status with the `storage failover show` command.
  6. At the clustershell prompt, enter the `net int show -is-home false` command to list the logical interfaces that are not on their home controller and port.

If any interfaces are listed as `false`, revert those interfaces back to their home port using the `net int revert -vserver Cluster -lif nodename` command.

7. Move the console cable to the target controller and run the `version -v` command to check the ONTAP versions.
8. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.
9. Use the `storage encryption disk show` at the clustershell prompt, to review the output.
10. Use the `security key-manager key query` command to display the key IDs of the authentication keys that are stored on the key management servers.
  - If the `Restored` column = `yes/true`, you are done and can proceed to complete the replacement process.
  - If the `Key Manager type` = `external` and the `Restored` column = anything other than `yes/true`, use the `security key-manager external restore` command to restore the key IDs of the authentication keys.



If the command fails, contact Customer Support.

- If the `Key Manager type = onboard` and the `Restored column = anything other than yes/true`, use the `security key-manager onboard sync` command to re-sync the Key Manager type.

Use the `security key-manager key query` to verify that the `Restored column = yes/true` for all authentication keys.

11. Connect the console cable to the partner controller.
12. Give back the controller using the `storage failover giveback -fromnode local` command.
13. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.
14. If AutoSupport is enabled, restore/unsuppress automatic case creation by using the `system node autosupport invoke -node * -type all -message MAINT=END`

#### **Return the failed part to NetApp - AFF A700 and FAS9000**

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

### **Chassis**

#### **Overview of chassis replacement - AFF A700**

All other components in the system must be functioning properly; if not, you must contact technical support.

- You can use this procedure with all versions of ONTAP supported by your system.
- This procedure is disruptive. For a two-node cluster, you will have a complete service outage and a partial outage in a multi-node cluster.

#### **Shut down the controllers - AFF A700**

To replace the chassis, you must shutdown the controllers.

#### **Option 1: Shut down the controllers**

This procedure is for 2-node, non-MetroCluster configurations only. If you have a system with more than two nodes, see [How to perform a graceful shutdown and power up of one HA pair in a 4-node cluster](#).

#### **Before you begin**

You need:

- Local administrator credentials for ONTAP.
- NetApp onboard key management (OKM) cluster-wide passphrase if using storage encryption or NVE/NAE.
- BMC accessibility for each controller.
- Stop all clients/host from accessing data on the NetApp system.
- Suspend external backup jobs.
- Necessary tools and equipment for the replacement.



If the system is a NetApp StorageGRID or ONTAP S3 used as FabricPool cloud tier, refer to the [Gracefully shutdown and power up your storage system Resolution Guide](#) after performing this procedure.



If using SSDs, refer to [SU490: \(Impact: Critical\) SSD Best Practices: Avoid risk of drive failure and data loss if powered off for more than two months](#)

As a best practice before shutdown, you should:

- Perform additional [system health checks](#).
- Upgrade ONTAP to a recommended release for the system.
- Resolve any [Active IQ Wellness Alerts and Risks](#).  
Make note of any faults presently on the system, such as LEDs on the system components.

### Steps

1. Log into the cluster through SSH or log in from any node in the cluster using a local console cable and a laptop/console.
2. Turn off AutoSupport and indicate how long you expect the system to be offline:

```
system node autosupport invoke -node * -type all -message "MAINT=8h Power Maintenance"
```

3. Identify the SP/BMC address of all nodes:

```
system service-processor show -node * -fields address
```

4. Exit the cluster shell: `exit`
5. Log into SP/BMC over SSH using the IP address of any of the nodes listed in the output from the previous step.

If you're using a console/laptop, log into the controller using the same cluster administrator credentials.



Open an SSH session to every SP/BMC connection so that you can monitor progress.

6. Halt the 2 nodes located in the impaired chassis:

```
system node halt -node <node>,<node2> -skip-lif-migration-before-shutdown true -ignore-quorum-warnings true -inhibit-takeover true
```



For clusters using SnapMirror synchronous operating in StrictSync mode: `system node halt -node <node>,<node2> -skip-lif-migration-before-shutdown true -ignore-quorum-warnings true -inhibit-takeover true -ignore-strict-sync-warnings true`

7. Enter **y** for each controller in the cluster when you see *Warning: Are you sure you want to halt node "cluster <node-name> number"?*  
`{y|n}:`
8. Wait for each controller to halt and display the LOADER prompt.

## Option 2: Shut down a node in a two-node MetroCluster configuration

To shut down the impaired controller, you must determine the status of the controller and, if necessary, switch over the controller so that the healthy controller continues to serve data from the impaired controller storage.

### About this task

- You must leave the power supplies turned on at the end of this procedure to provide power to the healthy controller.

### Steps

1. Check the MetroCluster status to determine whether the impaired controller has automatically switched over to the healthy controller: `metrocluster show`
2. Depending on whether an automatic switchover has occurred, proceed according to the following table:

| If the impaired controller...                                                                                                                      | Then...                                                                                                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Has automatically switched over                                                                                                                    | Proceed to the next step.                                                                                                                      |
| Has not automatically switched over                                                                                                                | Perform a planned switchover operation from the healthy controller:<br><code>metrocluster switchover</code>                                    |
| Has not automatically switched over, you attempted switchover with the <code>metrocluster switchover</code> command, and the switchover was vetoed | Review the veto messages and, if possible, resolve the issue and try again. If you are unable to resolve the issue, contact technical support. |

3. Resynchronize the data aggregates by running the `metrocluster heal -phase aggregates` command from the surviving cluster.

```
controller_A_1::> metrocluster heal -phase aggregates
[Job 130] Job succeeded: Heal Aggregates is successful.
```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

4. Verify that the operation has been completed by using the `metrocluster operation show` command.

```
controller_A_1::> metrocluster operation show
Operation: heal-aggregates
State: successful
Start Time: 7/25/2016 18:45:55
End Time: 7/25/2016 18:45:56
Errors: -
```

5. Check the state of the aggregates by using the `storage aggregate show` command.

```

controller_A_1::> storage aggregate show
Aggregate Size Available Used% State #Vols Nodes RAID
Status

...
aggr_b2 227.1GB 227.1GB 0% online 0 mcc1-a2
raid_dp, mirrored, normal...

```

6. Heal the root aggregates by using the `metrocluster heal -phase root-aggregates` command.

```

mcc1A::> metrocluster heal -phase root-aggregates
[Job 137] Job succeeded: Heal Root Aggregates is successful

```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

7. Verify that the heal operation is complete by using the `metrocluster operation show` command on the destination cluster:

```

mcc1A::> metrocluster operation show
Operation: heal-root-aggregates
State: successful
Start Time: 7/29/2016 20:54:41
End Time: 7/29/2016 20:54:42
Errors: -

```

8. On the impaired controller module, disconnect the power supplies.

#### Move and replace hardware - AFF A700

Move the fans, hard drives, and controller module or modules from the impaired chassis to the new chassis, and swap out the impaired chassis from the equipment rack or system cabinet with the new chassis of the same model as the impaired chassis.

#### Step 1: Remove the power supplies

##### Steps

Removing the power supplies when replacing a chassis involves turning off, disconnecting, and then removing the power supply from the old chassis.

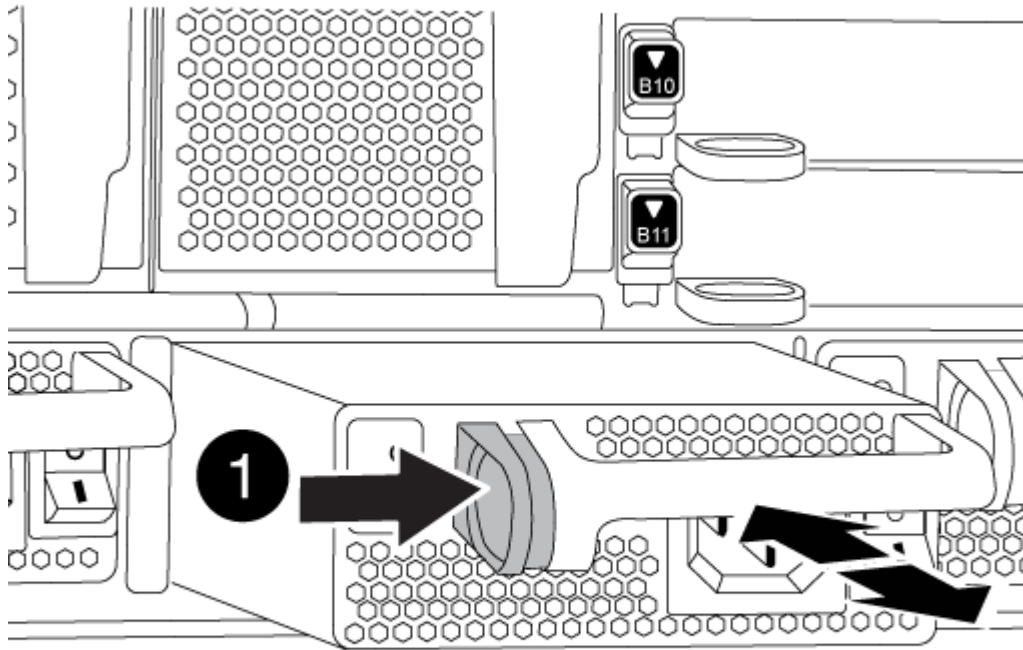
1. If you are not already grounded, properly ground yourself.
2. Turn off the power supply and disconnect the power cables:



- a. Turn off the power switch on the power supply.
  - b. Open the power cable retainer, and then unplug the power cable from the power supply.
  - c. Unplug the power cable from the power source.
3. Press and hold the orange button on the power supply handle, and then pull the power supply out of the chassis.



When removing a power supply, always use two hands to support its weight.



|   |                |
|---|----------------|
| 1 | Locking button |
|---|----------------|

4. Repeat the preceding steps for any remaining power supplies.

## Step 2: Remove the fans

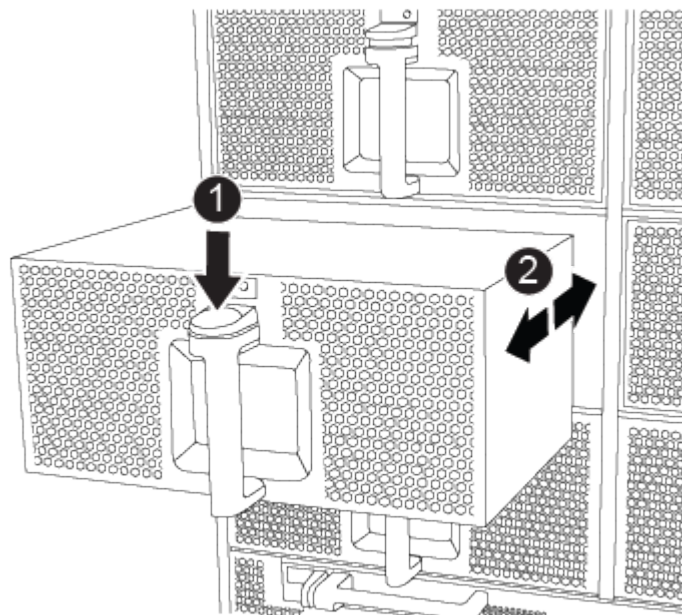
To remove the fan modules when replacing the chassis, you must perform a specific sequence of tasks.

### Steps

1. Remove the bezel (if necessary) with two hands, by grasping the openings on each side of the bezel, and then pulling it toward you until the bezel releases from the ball studs on the chassis frame.
2. Press the orange button on the fan module and pull the fan module straight out of the chassis, making sure that you support it with your free hand.



The fan modules are short. Always support the bottom of the fan module with your free hand so that it does not suddenly drop free from the chassis and injure you.



1

Orange release button

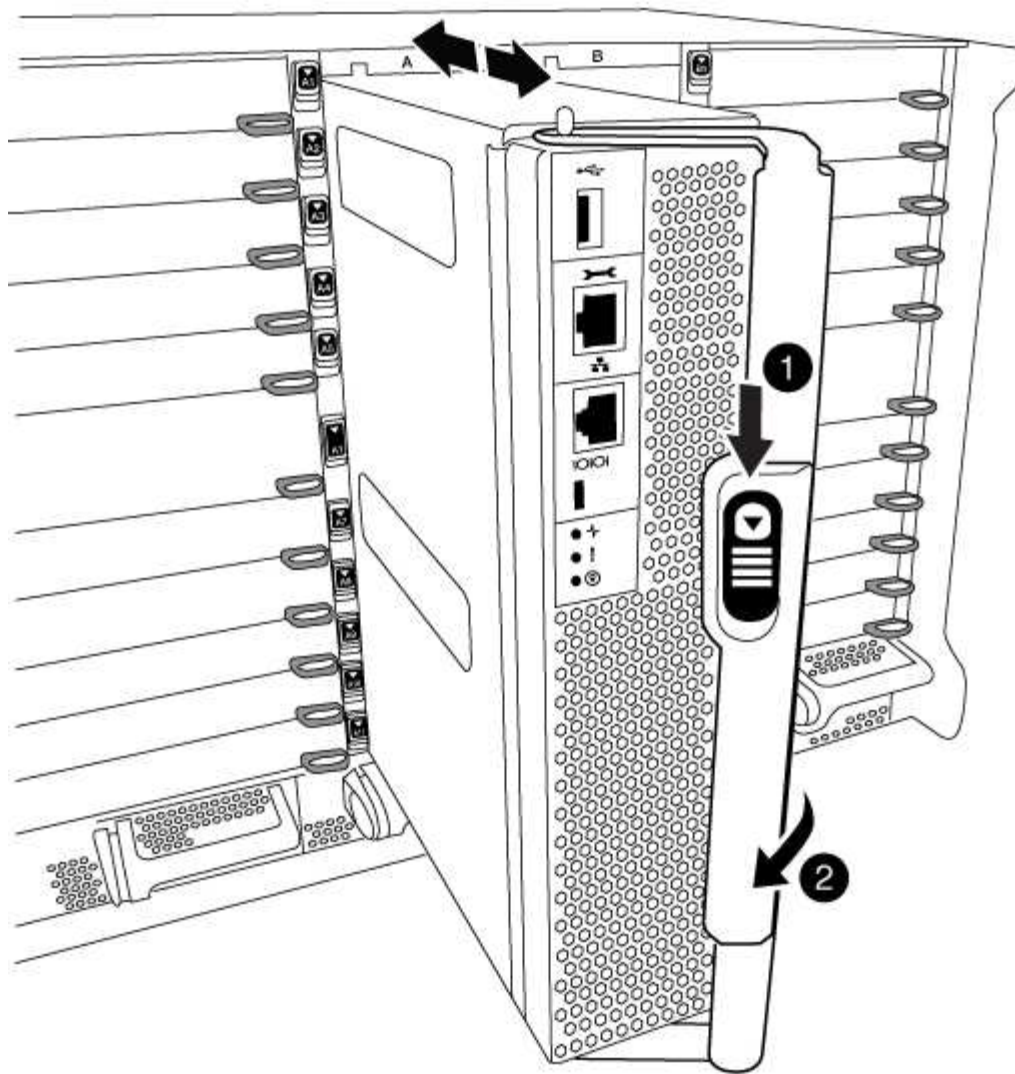
3. Set the fan module aside.
4. Repeat the preceding steps for any remaining fan modules.

### Step 3: Remove the controller module

To replace the chassis, you must remove the controller module or modules from the old chassis.

#### Steps

1. Unplug the cables from the impaired controller module, and keep track of where the cables were connected.
2. Slide the orange button on the cam handle downward until it unlocks.



|   |                           |
|---|---------------------------|
| 1 | Cam handle release button |
| 2 | Cam handle                |

3. Rotate the cam handle so that it completely disengages the controller module from the chassis, and then slide the controller module out of the chassis.

Make sure that you support the bottom of the controller module as you slide it out of the chassis.

4. Set the controller module aside in a safe place, and repeat these steps if you have another controller module in the chassis.

#### Step 4: Remove the I/O modules

##### Steps

To remove I/O modules from the old chassis, including the NVRAM modules, follow the specific sequence of steps. You do not have to remove the FlashCache module from the NVRAM module when moving it to a new chassis.

1. Unplug any cabling associated with the target I/O module.

Make sure that you label the cables so that you know where they came from.

2. Remove the target I/O module from the chassis:

- a. Depress the lettered and numbered cam button.

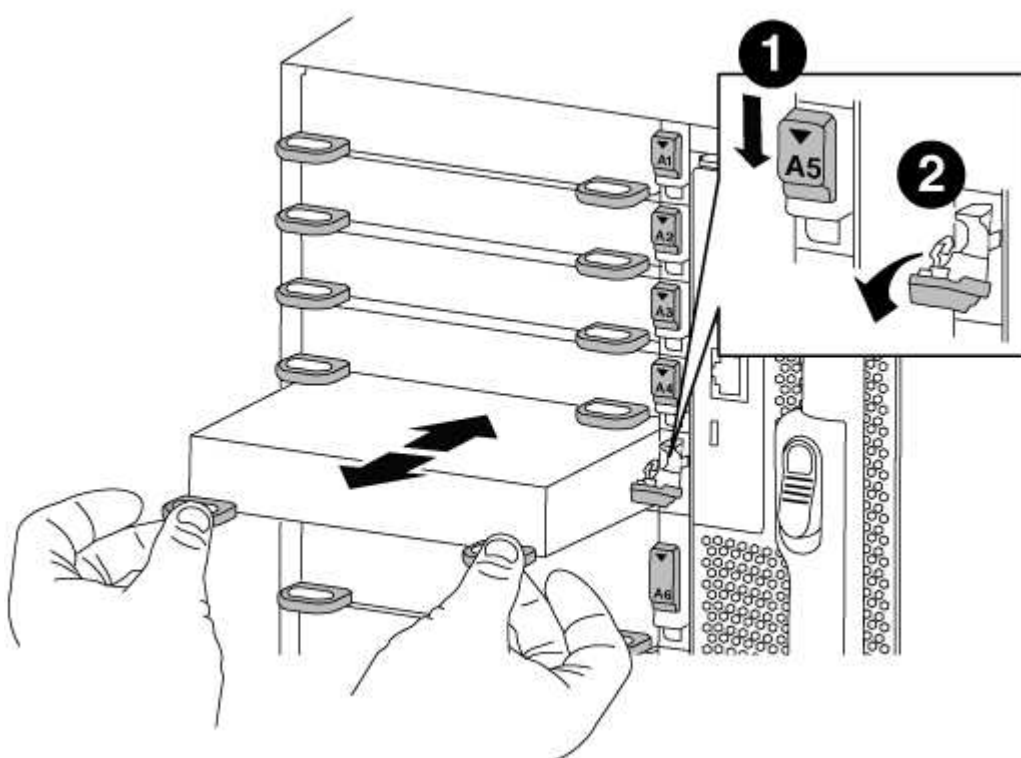
The cam button moves away from the chassis.

- b. Rotate the cam latch down until it is in a horizontal position.

The I/O module disengages from the chassis and moves about 1/2 inch out of the I/O slot.

- c. Remove the I/O module from the chassis by pulling on the pull tabs on the sides of the module face.

Make sure that you keep track of which slot the I/O module was in.



|   |                                     |
|---|-------------------------------------|
| 1 | Lettered and numbered I/O cam latch |
| 2 | I/O cam latch completely unlocked   |

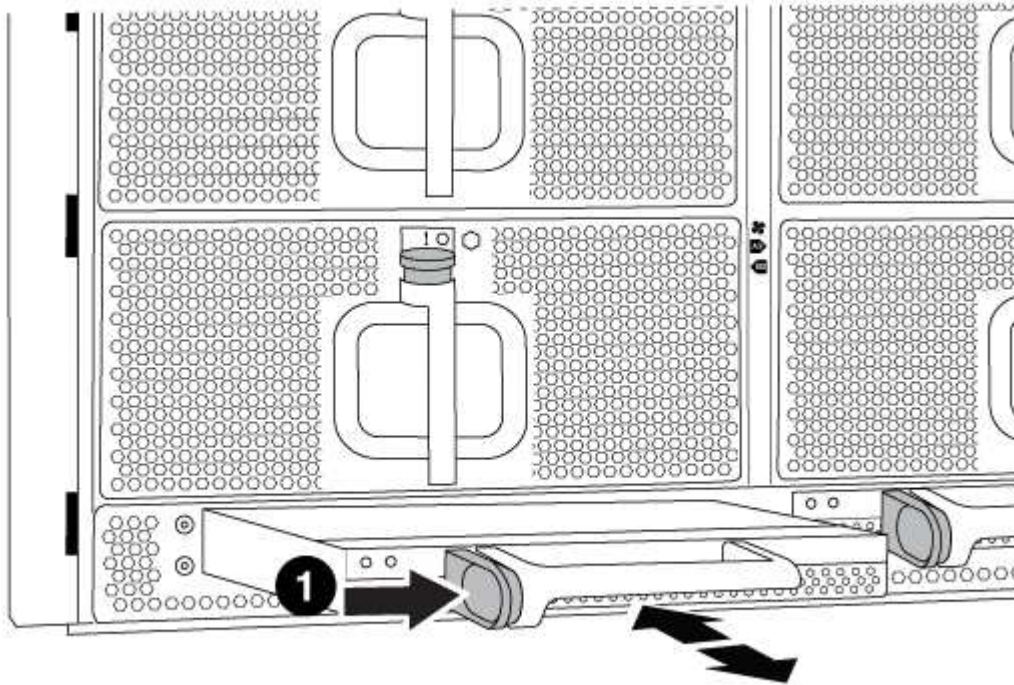
3. Set the I/O module aside.
4. Repeat the preceding step for the remaining I/O modules in the old chassis.

## Step 5: Remove the De-stage Controller Power Module

### Steps

You must remove the de-stage controller power modules from the old chassis in preparation for installing the replacement chassis.

1. Press the orange locking button on the module handle, and then slide the DCPM module out of the chassis.



1

DCPM module orange locking button

2. Set the DCPM module aside in a safe place and repeat this step for the remaining DCPM module.

## Step 6: Replace a chassis from within the equipment rack or system cabinet

### Steps

You must remove the existing chassis from the equipment rack or system cabinet before you can install the replacement chassis.

1. Remove the screws from the chassis mount points.



If the system is in a system cabinet, you might need to remove the rear tie-down bracket.

2. With the help of two or three people, slide the old chassis off the rack rails in a system cabinet or L brackets in an equipment rack, and then set it aside.
3. If you are not already grounded, properly ground yourself.
4. Using two or three people, install the replacement chassis into the equipment rack or system cabinet by guiding the chassis onto the rack rails in a system cabinet or L brackets in an equipment rack.

5. Slide the chassis all the way into the equipment rack or system cabinet.
6. Secure the front of the chassis to the equipment rack or system cabinet, using the screws you removed from the old chassis.
7. Secure the rear of the chassis to the equipment rack or system cabinet.
8. If you are using the cable management brackets, remove them from the old chassis, and then install them on the replacement chassis.
9. If you have not already done so, install the bezel.

## **Step 7: Move the USB LED module to the new chassis**

### **Steps**

Once the new chassis is installed into the rack or cabinet, you must move the USB LED module from the old chassis to the new chassis.

1. Locate the USB LED module on the front of the old chassis, directly under the power supply bays.
2. Press the black locking button on the right side of the module to release the module from the chassis, and then slide it out of the old chassis.
3. Align the edges of the module with the USB LED bay at the bottom-front of the replacement chassis, and gently push the module all the way into the chassis until it clicks into place.

## **Step 8: Install the de-stage controller power module when replacing the chassis**

### **Steps**

Once the replacement chassis is installed into the rack or system cabinet, you must reinstall the de-stage controller power modules into it.

1. Align the end of the DCPM module with the chassis opening, and then gently slide it into the chassis until it clicks into place.



The module and slot are keyed. Do not force the module into the opening. If the module does not go in easily, realign the module and slide it into the chassis.

2. Repeat this step for the remaining DCPM module.

## **Step 9: Install fans into the chassis**

### **Steps**

To install the fan modules when replacing the chassis, you must perform a specific sequence of tasks.

1. Align the edges of the replacement fan module with the opening in the chassis, and then slide it into the chassis until it snaps into place.

When inserted into a live system, the amber Attention LED flashes four times when the fan module is successfully inserted into the chassis.

2. Repeat these steps for the remaining fan modules.
3. Align the bezel with the ball studs, and then gently push the bezel onto the ball studs.

## Step 10: Install I/O modules

### Steps

To install I/O modules, including the NVRAM/FlashCache modules from the old chassis, follow the specific sequence of steps.

You must have the chassis installed so that you can install the I/O modules into the corresponding slots in the new chassis.

1. After the replacement chassis is installed in the rack or cabinet, install the I/O modules into their corresponding slots in the replacement chassis by gently sliding the I/O module into the slot until the lettered and numbered I/O cam latch begins to engage, and then push the I/O cam latch all the way up to lock the module in place.
2. Recable the I/O module, as needed.
3. Repeat the preceding step for the remaining I/O modules that you set aside.



If the old chassis has blank I/O panels, move them to the replacement chassis at this time.

## Step 11: Install the power supplies

### Steps

Installing the power supplies when replacing a chassis involves installing the power supplies into the replacement chassis, and connecting to the power source.

1. Using both hands, support and align the edges of the power supply with the opening in the system chassis, and then gently push the power supply into the chassis until it locks into place.

The power supplies are keyed and can only be installed one way.



Do not use excessive force when sliding the power supply into the system. You can damage the connector.

2. Reconnect the power cable and secure it to the power supply using the power cable locking mechanism.



Only connect the power cable to the power supply. Do not connect the power cable to a power source at this time.

3. Repeat the preceding steps for any remaining power supplies.

## Step 12: Install the controller

### Steps

After you install the controller module and any other components into the new chassis, boot it.

1. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.



Do not completely insert the controller module in the chassis until instructed to do so.

2. Recable the console to the controller module, and then reconnect the management port.



3. Connect the power supplies to different power sources, and then turn them on.
4. With the cam handle in the open position, slide the controller module into the chassis and firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle until it clicks into the locked position.



Do not use excessive force when sliding the controller module into the chassis; you might damage the connectors.

The controller module begins to boot as soon as it is fully seated in the chassis.

5. Repeat the preceding steps to install the second controller into the new chassis.
6. Boot each node to Maintenance mode:
  - a. As each node starts the booting, press `Ctrl-C` to interrupt the boot process when you see the message `Press Ctrl-C for Boot Menu`.



If you miss the prompt and the controller modules boot to ONTAP, enter `halt`, and then at the `LOADER` prompt enter `boot_ontap`, press `Ctrl-C` when prompted, and then repeat this step.

- b. From the boot menu, select the option for Maintenance mode.

#### Complete the restoration and replacement process - AFF A700

You must verify the HA state of the chassis and return the failed part to NetApp, as described in the RMA instructions shipped with the kit.

#### Step 1: Verify and set the HA state of the chassis

You must verify the HA state of the chassis, and, if necessary, update the state to match your system configuration.

##### Steps

1. In Maintenance mode, from either controller module, display the HA state of the local controller module and chassis: `ha-config show`

The HA state should be the same for all components.

2. If the displayed system state for the chassis does not match your system configuration:
  - a. Set the HA state for the chassis: `ha-config modify chassis HA-state`

The value for `HA-state` can be one of the following:

- `ha`
- `mcc`
- `mcc-2n`
- `mccip`
- `non-ha`



- b. Confirm that the setting has changed: `ha-config show`
3. If you have not already done so, recable the rest of your system.
4. Exit Maintenance mode: `halt`

The LOADER prompt appears.

## Step 2: Switch back aggregates in a two-node MetroCluster configuration

After you have completed the FRU replacement in a two-node MetroCluster configuration, you can perform the MetroCluster switchback operation. This returns the configuration to its normal operating state, with the sync-source storage virtual machines (SVMs) on the formerly impaired site now active and serving data from the local disk pools.

This task only applies to two-node MetroCluster configurations.

### Steps

1. Verify that all nodes are in the enabled state: `metrocluster node show`

```
cluster_B::> metrocluster node show
```

| DR                        | Configuration             | DR                  |
|---------------------------|---------------------------|---------------------|
| Group Cluster Node        | State                     | Mirroring Mode      |
| -----                     | -----                     | -----               |
| 1                         | cluster_A                 |                     |
|                           | controller_A_1 configured | enabled heal roots  |
| completed                 | cluster_B                 |                     |
|                           | controller_B_1 configured | enabled waiting for |
| switchback recovery       |                           |                     |
| 2 entries were displayed. |                           |                     |

2. Verify that resynchronization is complete on all SVMs: `metrocluster vserver show`
3. Verify that any automatic LIF migrations being performed by the healing operations were completed successfully: `metrocluster check lif show`
4. Perform the switchback by using the `metrocluster switchback` command from any node in the surviving cluster.
5. Verify that the switchback operation has completed: `metrocluster show`

The switchback operation is still running when a cluster is in the `waiting-for-switchback` state:

```
cluster_B::> metrocluster show
Cluster Configuration State Mode

Local: cluster_B configured switchover
Remote: cluster_A configured waiting-for-switchback
```

The switchback operation is complete when the clusters are in the normal state.:

```
cluster_B::> metrocluster show
Cluster Configuration State Mode

Local: cluster_B configured normal
Remote: cluster_A configured normal
```

If a switchback is taking a long time to finish, you can check on the status of in-progress baselines by using the `metrocluster config-replication resync-status show` command.

6. Reestablish any SnapMirror or SnapVault configurations.

### Step 3: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

## Controller module

### Overview of controller module replacement - AFF A700

You must review the prerequisites for the replacement procedure and select the correct one for your version of the ONTAP operating system.

- All drive shelves must be working properly.
- If your system is a FlexArray system or has a V\_StorageAttach license, you must refer to the additional required steps before performing this procedure.
- If your system is in an HA pair, the healthy node must be able to take over the node that is being replaced (referred to in this procedure as the “impaired node”).
- If your system is in a MetroCluster configuration, you must review the section [Choosing the correct recovery procedure](#) to determine whether you should use this procedure.

If this is the procedure you should use, note that the controller replacement procedure for a node in a four or eight node MetroCluster configuration is the same as that in an HA pair. No MetroCluster-specific steps are required because the failure is restricted to an HA pair and storage failover commands can be used to provide nondisruptive operation during the replacement.

- You must replace the failed component with a replacement FRU component you received from your provider.
- You must be replacing a controller module with a controller module of the same model type. You cannot

upgrade your system by just replacing the controller module.

- You cannot change any drives or drive shelves as part of this procedure.
- In this procedure, the boot device is moved from the impaired node to the *replacement* node so that the *replacement* node will boot up in the same version of ONTAP as the old controller module.
- It is important that you apply the commands in these steps on the correct systems:
  - The *impaired* node is the node that is being replaced.
  - The *replacement* node is the new node that is replacing the impaired node.
  - The *healthy* node is the surviving node.
- You must always capture the node's console output to a text file.

This provides you a record of the procedure so that you can troubleshoot any issues that you might encounter during the replacement process.

#### **Shut down the impaired controller - AFF 700**

Shut down or take over the impaired controller using the appropriate procedure for your configuration.

## Option 1: Most systems

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

### About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced` mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

### Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message MAINT=<# of hours>h
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`



When you see *Do you want to disable auto-giveback?*, enter *y*.

3. Take the impaired controller to the LOADER prompt:

| If the impaired controller is displaying... | Then...                                                                                                                                                                                                                                                            |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                           | Go to the next step.                                                                                                                                                                                                                                               |
| Waiting for giveback...                     | Press Ctrl-C, and then respond <i>y</i> when prompted.                                                                                                                                                                                                             |
| System prompt or password prompt            | <p>Take over or halt the impaired controller from the healthy controller: <code>storage failover takeover -ofnode <i>impaired_node_name</i></code></p> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i>.</p> |

## Option 2: Controller is in a two-node MetroCluster

To shut down the impaired controller, you must determine the status of the controller and, if necessary,

switch over the controller so that the healthy controller continues to serve data from the impaired controller storage.

#### About this task

- You must leave the power supplies turned on at the end of this procedure to provide power to the healthy controller.

#### Steps

1. Check the MetroCluster status to determine whether the impaired controller has automatically switched over to the healthy controller: `metrocluster show`
2. Depending on whether an automatic switchover has occurred, proceed according to the following table:

| If the impaired controller...                                                                                                                      | Then...                                                                                                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Has automatically switched over                                                                                                                    | Proceed to the next step.                                                                                                                      |
| Has not automatically switched over                                                                                                                | Perform a planned switchover operation from the healthy controller: <code>metrocluster switchover</code>                                       |
| Has not automatically switched over, you attempted switchover with the <code>metrocluster switchover</code> command, and the switchover was vetoed | Review the veto messages and, if possible, resolve the issue and try again. If you are unable to resolve the issue, contact technical support. |

3. Resynchronize the data aggregates by running the `metrocluster heal -phase aggregates` command from the surviving cluster.

```
controller_A_1::> metrocluster heal -phase aggregates
[Job 130] Job succeeded: Heal Aggregates is successful.
```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

4. Verify that the operation has been completed by using the `metrocluster operation show` command.

```
controller_A_1::> metrocluster operation show
Operation: heal-aggregates
State: successful
Start Time: 7/25/2016 18:45:55
End Time: 7/25/2016 18:45:56
Errors: -
```

5. Check the state of the aggregates by using the `storage aggregate show` command.

```

controller_A_1::> storage aggregate show
Aggregate Size Available Used% State #Vols Nodes
RAID Status

...
aggr_b2 227.1GB 227.1GB 0% online 0 mcc1-a2
raid_dp, mirrored, normal...

```

6. Heal the root aggregates by using the `metrocluster heal -phase root-aggregates` command.

```

mcc1A::> metrocluster heal -phase root-aggregates
[Job 137] Job succeeded: Heal Root Aggregates is successful

```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

7. Verify that the heal operation is complete by using the `metrocluster operation show` command on the destination cluster:

```

mcc1A::> metrocluster operation show
Operation: heal-root-aggregates
State: successful
Start Time: 7/29/2016 20:54:41
End Time: 7/29/2016 20:54:42
Errors: -

```

8. On the impaired controller module, disconnect the power supplies.

## Replace the controller module hardware - AFF A700

To replace the controller module hardware, you must remove the impaired node, move FRU components to the replacement controller module, install the replacement controller module in the chassis, and then boot the system to Maintenance mode.

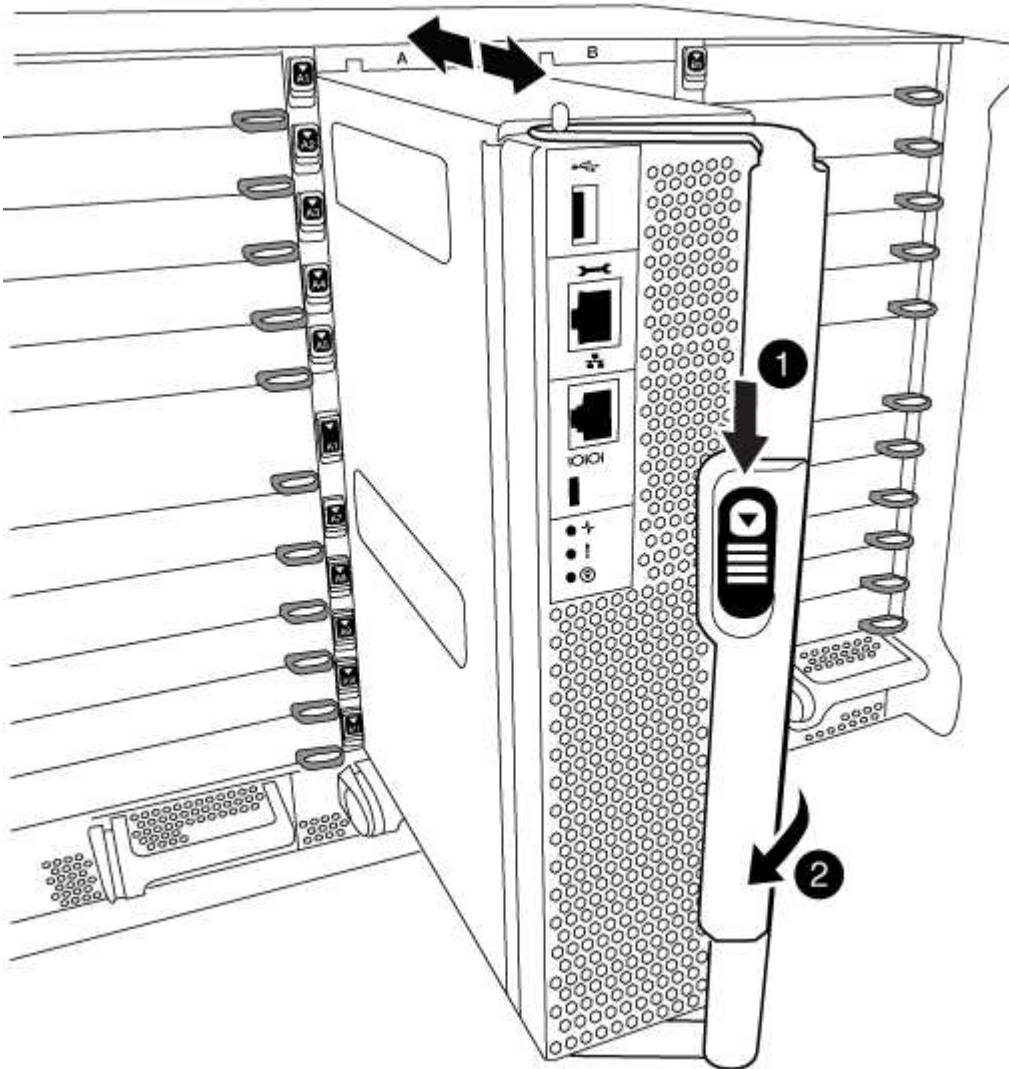
### Step 1: Remove the controller module

To access components inside the controller, you must first remove the controller module from the system and then remove the cover on the controller module.

#### Steps

1. If you are not already grounded, properly ground yourself.

2. Unplug the cables from the impaired controller module, and keep track of where the cables were connected.
3. Slide the orange button on the cam handle downward until it unlocks.

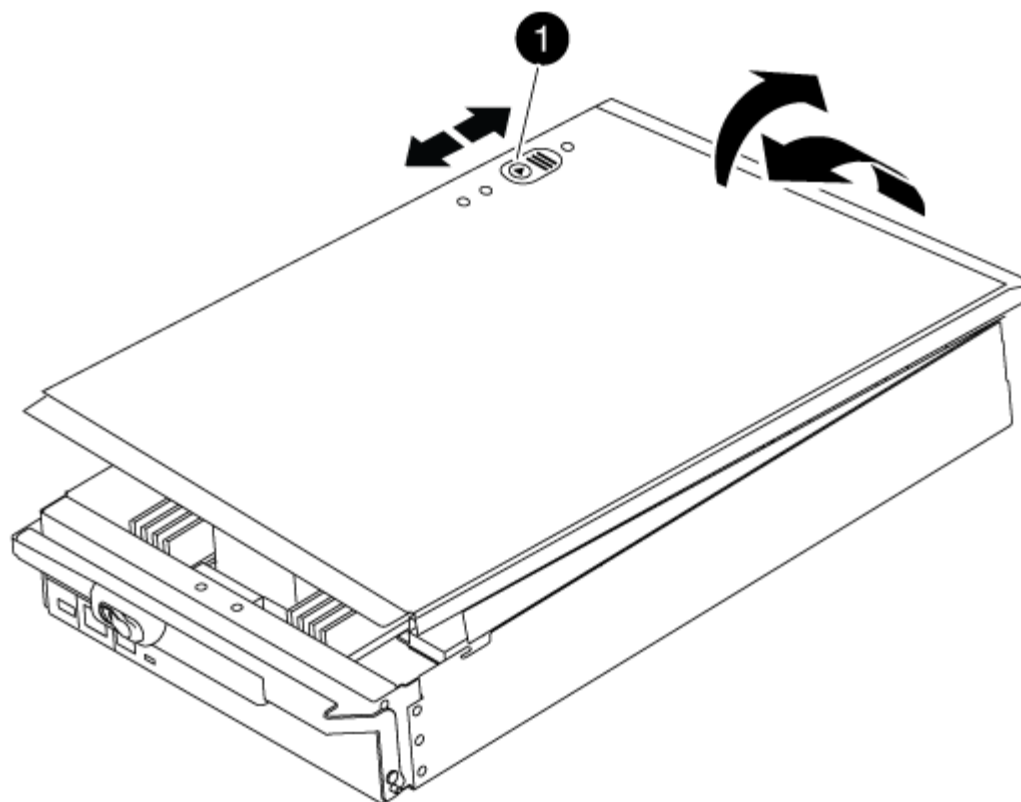


|   |                           |
|---|---------------------------|
| 1 | Cam handle release button |
| 2 | Cam handle                |

1. Rotate the cam handle so that it completely disengages the controller module from the chassis, and then slide the controller module out of the chassis.

Make sure that you support the bottom of the controller module as you slide it out of the chassis.

2. Place the controller module lid-side up on a stable, flat surface, press the blue button on the cover, slide the cover to the back of the controller module, and then swing the cover up and lift it off of the controller module.



|   |                                        |
|---|----------------------------------------|
| 1 | Controller module cover locking button |
|---|----------------------------------------|

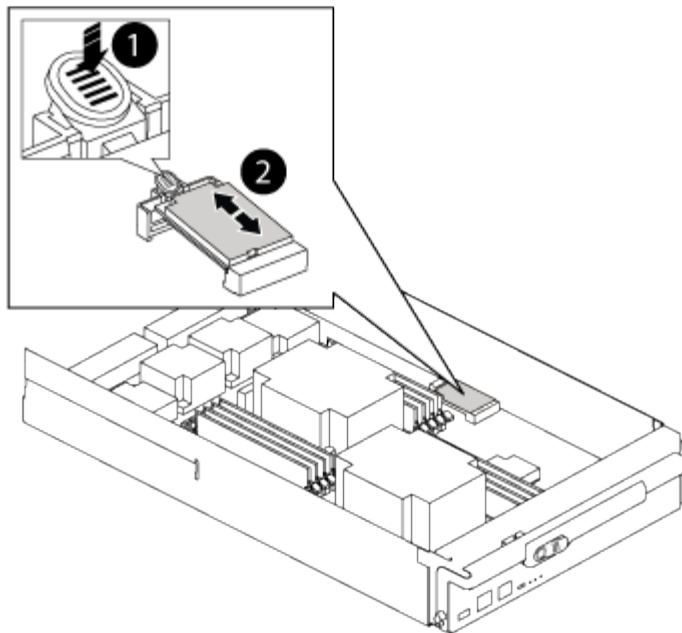
## Step 2: Move the boot media

You must locate the boot media and follow the directions to remove it from the old controller and insert it in the new controller.

### Steps

1. Lift the black air duct at the back of the controller module and then locate the boot media using the following illustration or the FRU map on the controller module:





|   |                   |
|---|-------------------|
| 1 | Press release tab |
| 2 | Boot media        |

2. Press the blue button on the boot media housing to release the boot media from its housing, and then gently pull it straight out of the boot media socket.



Do not twist or pull the boot media straight up, because this could damage the socket or the boot media.

3. Move the boot media to the new controller module, align the edges of the boot media with the socket housing, and then gently push it into the socket.
4. Check the boot media to make sure that it is seated squarely and completely in the socket.

If necessary, remove the boot media and reseal it into the socket.

5. Push the boot media down to engage the locking button on the boot media housing.


### Step 3: Move the system DIMMs

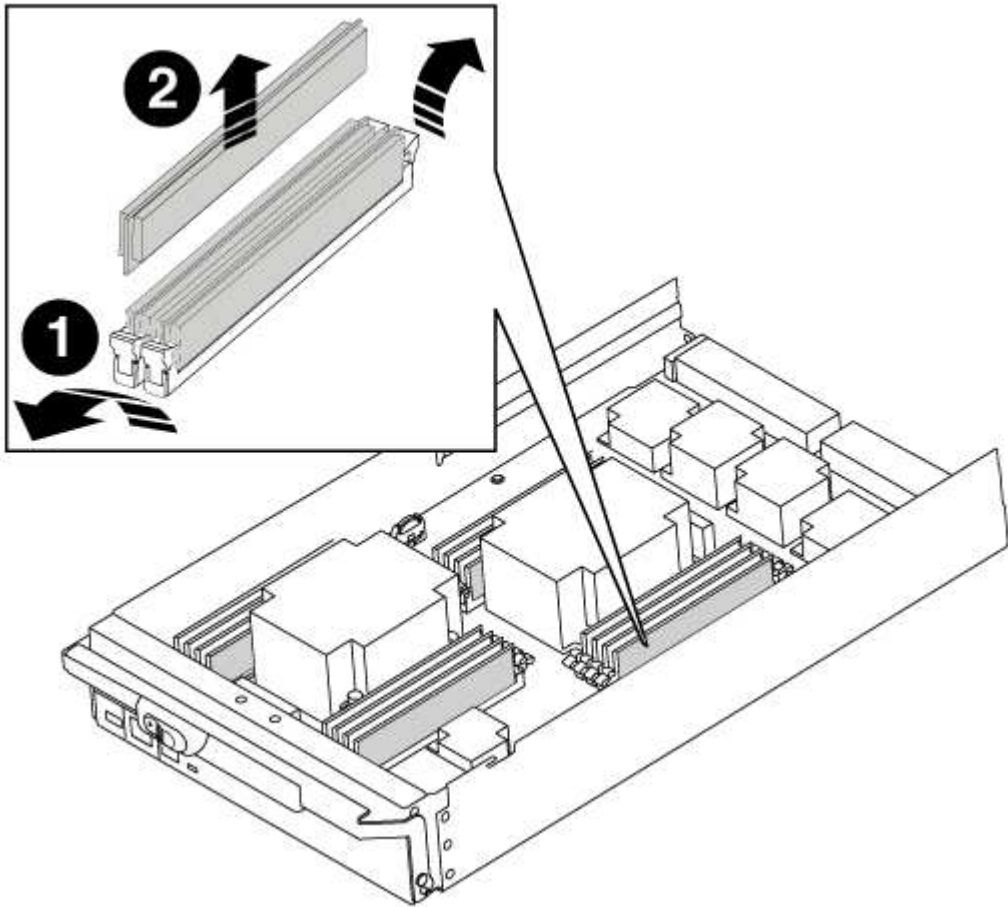
To move the DIMMs, locate and move them from the old controller into the replacement controller and follow the specific sequence of steps.



#### Steps

1. If you are not already grounded, properly ground yourself.
2. Locate the DIMMs on your controller module.
3. Note the orientation of the DIMM in the socket so that you can insert the DIMM in the replacement controller module in the proper orientation.
4. Eject the DIMM from its slot by slowly pushing apart the two DIMM ejector tabs on either side of the DIMM,

and then slide the DIMM out of the slot.


- 
- Carefully hold the DIMM by the edges to avoid pressure on the components on the DIMM circuit board.



|                                                                                     |                   |
|-------------------------------------------------------------------------------------|-------------------|
|  | DIMM ejector tabs |
|  | DIMM              |


5. Locate the slot where you are installing the DIMM.
6. Make sure that the DIMM ejector tabs on the connector are in the open position, and then insert the DIMM squarely into the slot.

The DIMM fits tightly in the slot, but should go in easily. If not, realign the DIMM with the slot and reinsert it.

- 
- Visually inspect the DIMM to verify that it is evenly aligned and fully inserted into the slot.

7. Insert the DIMM squarely into the slot.

The DIMM fits tightly in the slot, but should go in easily. If not, realign the DIMM with the slot and reinsert it.

- 
- Visually inspect the DIMM to verify that it is evenly aligned and fully inserted into the slot.

8. Push carefully, but firmly, on the top edge of the DIMM until the ejector tabs snap into place over the notches at the ends of the DIMM.
9. Repeat these steps for the remaining DIMMs.

#### Step 4: Install the controller

After you install the components into the controller module, you must install the controller module back into the system chassis and boot the operating system.

For HA pairs with two controller modules in the same chassis, the sequence in which you install the controller module is especially important because it attempts to reboot as soon as you completely seat it in the chassis.



The system might update system firmware when it boots. Do not abort this process. The procedure requires you to interrupt the boot process, which you can typically do at any time after prompted to do so. However, if the system updates the system firmware when it boots, you must wait until after the update is complete before interrupting the boot process.

#### Steps

1. If you are not already grounded, properly ground yourself.
2. If you have not already done so, replace the cover on the controller module.
3. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.



Do not completely insert the controller module in the chassis until instructed to do so.

4. Cable the management and console ports only, so that you can access the system to perform the tasks in the following sections.



You will connect the rest of the cables to the controller module later in this procedure.

5. Complete the reinstallation of the controller module:
  - a. If you have not already done so, reinstall the cable management device.
  - b. Firmly push the controller module into the chassis until it meets the midplane and is fully seated.

The locking latches rise when the controller module is fully seated.



Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.

The controller module begins to boot as soon as it is fully seated in the chassis. Be prepared to interrupt the boot process.

- c. Rotate the locking latches upward, tilting them so that they clear the locking pins, and then lower them into the locked position.
- d. Interrupt the boot process by pressing `Ctrl-C` when you see `Press Ctrl-C for Boot Menu`.
- e. Select the option to boot to Maintenance mode from the displayed menu.

After completing the hardware replacement and booting to Maintenance mode, you verify the low-level system configuration of the replacement controller and reconfigure system settings as necessary.

### Step 1: Set and verify system time

You should check the time and date on the replacement controller module against the healthy controller module in an HA pair, or against a reliable time server in a stand-alone configuration. If the time and date do not match, you must reset them on the replacement controller module to prevent possible outages on clients due to time differences.

#### About this task

It is important that you apply the commands in the steps on the correct systems:

- The *replacement* node is the new node that replaced the impaired node as part of this procedure.
- The *healthy* node is the HA partner of the *replacement* node.

#### Steps

1. If the *replacement* node is not at the LOADER prompt, halt the system to the LOADER prompt.
2. On the *healthy* node, check the system time: `cluster date show`

The date and time are based on the configured timezone.

3. At the LOADER prompt, check the date and time on the *replacement* node: `show date`

The date and time are given in GMT.

4. If necessary, set the date in GMT on the replacement node: `set date mm/dd/yyyy`
5. If necessary, set the time in GMT on the replacement node: `set time hh:mm:ss`
6. At the LOADER prompt, confirm the date and time on the *replacement* node: `show date`

The date and time are given in GMT.

### Step 2: Verify and set the controller's HA state

You must verify the HA state of the controller module and, if necessary, update the state to match your system configuration.

#### Steps

1. In Maintenance mode from the new controller module, verify that all components display the same HA state: `ha-config show`

The value for HA-state can be one of the following:

- `ha`
- `mcc`
- `mcc-2n`

- `mccip`
- `non-ha`
  - a. Confirm that the setting has changed: `ha-config show`

## Recable the system and reassign disks - AFF A700

Continue the replacement procedure by recabling the storage and confirming disk reassignment.

### Step 1: Recable the system

Recable the controller module's storage and network connections.

#### Steps

1. Recable the the controller module to storage and network connections.
2. Verify that the cabling is correct by using [Active IQ Config Advisor](#).
  - a. Download and install Config Advisor.
  - b. Enter the information for the target system, and then click Collect Data.
  - c. Click the Cabling tab, and then examine the output. Make sure that all disk shelves are displayed and all disks appear in the output, correcting any cabling issues you find.
  - d. Check other cabling by clicking the appropriate tab, and then examining the output from Config Advisor.

### Step 2: Reassign disks

If the storage system is in an HA pair, the system ID of the new controller module is automatically assigned to the disks when the giveback occurs at the end of the procedure. You must confirm the system ID change when you boot the *replacement* node and then verify that the change was implemented.

This procedure applies only to systems running ONTAP in an HA pair.

1. If the *replacement* node is in Maintenance mode (showing the `*>` prompt, exit Maintenance mode and go to the LOADER prompt: `halt`
2. From the LOADER prompt on the *replacement* node, boot the node, entering `y` if you are prompted to override the system ID due to a system ID mismatch. `boot_ontap`
3. Wait until the `Waiting for giveback...` message is displayed on the *replacement* node console and then, from the healthy node, verify that the new partner system ID has been automatically assigned: `storage failover show`

In the command output, you should see a message that the system ID has changed on the impaired node, showing the correct old and new IDs. In the following example, node2 has undergone replacement and has a new system ID of 151759706.

```
node1> `storage failover show`
```

| Node  | Partner | Takeover<br>Possible | State Description                      |
|-------|---------|----------------------|----------------------------------------|
| ----- | -----   | -----                |                                        |
| ----- |         |                      |                                        |
| node1 | node2   | false                | System ID changed on<br>partner (Old:  |
|       |         |                      | 151759706), In takeover                |
|       |         |                      | 151759755, New:                        |
| node2 | node1   | -                    | Waiting for giveback<br>(HA mailboxes) |

4. From the healthy node, verify that any coredumps are saved:

- a. Change to the advanced privilege level: `set -privilege advanced`

You can respond `y` when prompted to continue into advanced mode. The advanced mode prompt appears (`*>`).

- b. Save any coredumps: `system node run -node local-node-name partner savecore`

- c. Wait for the `savecore` command to complete before issuing the giveback.

You can enter the following command to monitor the progress of the `savecore` command: `system node run -node local-node-name partner savecore -s`

- d. Return to the admin privilege level: `set -privilege admin`

5. If your storage system has Storage or Volume Encryption configured, you must restore Storage or Volume Encryption functionality by using one of the following procedures, depending on whether you are using onboard or external key management:

- [Restore onboard key management encryption keys](#)
- [Restore external key management encryption keys](#)

6. Give back the node:

- a. From the healthy node, give back the replaced node's storage: `storage failover giveback -ofnode replacement_node_name`

The *replacement* node takes back its storage and completes booting.

If you are prompted to override the system ID due to a system ID mismatch, you should enter `y`.



If the giveback is vetoed, you can consider overriding the vetoes.

[Find the High-Availability Configuration Guide for your version of ONTAP 9](#)

- b. After the giveback has been completed, confirm that the HA pair is healthy and that takeover is possible: `storage failover show`

The output from the `storage failover show` command should not include the System ID changed

on partner message.

7. Verify that the disks were assigned correctly: `storage disk show -ownership`

The disks belonging to the *replacement* node should show the new system ID. In the following example, the disks owned by node1 now show the new system ID, 1873775277:

```
node1> `storage disk show -ownership`

Disk Aggregate Home Owner DR Home Home ID Owner ID DR Home ID
Reserver Pool

1.0.0 aggr0_1 node1 node1 - 1873775277 1873775277 -
1873775277 Pool0
1.0.1 aggr0_1 node1 node1 1873775277 1873775277 -
1873775277 Pool0
.
.
.
```

8. If the system is in a MetroCluster configuration, monitor the status of the node: `metrocluster node show`

The MetroCluster configuration takes a few minutes after the replacement to return to a normal state, at which time each node will show a configured state, with DR Mirroring enabled and a mode of normal. The `metrocluster node show -fields node-systemid` command output displays the old system ID until the MetroCluster configuration returns to a normal state.

9. If the node is in a MetroCluster configuration, depending on the MetroCluster state, verify that the DR home ID field shows the original owner of the disk if the original owner is a node on the disaster site.

This is required if both of the following are true:

- The MetroCluster configuration is in a switchover state.
- The *replacement* node is the current owner of the disks on the disaster site.

[Disk ownership changes during HA takeover and MetroCluster switchover in a four-node MetroCluster configuration](#)

10. If your system is in a MetroCluster configuration, verify that each node is configured: `metrocluster node show - fields configuration-state`

```

node1_siteA::> metrocluster node show -fields configuration-state

dr-group-id cluster node configuration-state

1 node1_siteA node1mcc-001 configured
1 node1_siteA node1mcc-002 configured
1 node1_siteB node1mcc-003 configured
1 node1_siteB node1mcc-004 configured

4 entries were displayed.

```

11. Verify that the expected volumes are present for each node: `vol show -node node-name`
12. If you disabled automatic takeover on reboot, enable it from the healthy node: `storage failover modify -node replacement-node-name -onreboot true`

### Complete system restoration - AFF A700

To complete the replacement procedure and restore your system to full operation, you must recable the storage, restore the NetApp Storage Encryption configuration (if necessary), and install licenses for the new controller. You must complete a series of tasks before restoring your system to full operation.

#### Step 1: Install licenses for the replacement node in ONTAP

You must install new licenses for the *replacement* node if the impaired node was using ONTAP features that require a standard (node-locked) license. For features with standard licenses, each node in the cluster should have its own key for the feature.

##### About this task

Until you install license keys, features requiring standard licenses continue to be available to the *replacement* node. However, if the impaired node was the only node in the cluster with a license for the feature, no configuration changes to the feature are allowed.

Also, using unlicensed features on the node might put you out of compliance with your license agreement, so you should install the replacement license key or keys on the *replacement* node as soon as possible.

The licenses keys must be in the 28-character format.

You have a 90-day grace period in which to install the license keys. After the grace period, all old licenses are invalidated. After a valid license key is installed, you have 24 hours to install all of the keys before the grace period ends.

If the node is in a MetroCluster configuration and all nodes at a site have been replaced, license keys must be installed on the *replacement* node or nodes prior to switchback.

#### Steps

1. If you need new license keys, obtain replacement license keys on the [NetApp Support site](#) in the My Support section under Software licenses.





The new license keys that you require are automatically generated and sent to the email address on file. If you fail to receive the email with the license keys within 30 days, you should contact technical support.

2. Install each license key: `system license add -license-code license-key, license-key...`
3. Remove the old licenses, if desired:
  - a. Check for unused licenses: `license clean-up -unused -simulate`
  - b. If the list looks correct, remove the unused licenses: `license clean-up -unused`

## Step 2: Verifying LIFs and registering the serial number

Before returning the *replacement* node to service, you should verify that the LIFs are on their home ports, and register the serial number of the *replacement* node if AutoSupport is enabled, and reset automatic giveback.

### Steps

1. Verify that the logical interfaces are reporting to their home server and ports: `network interface show -is-home false`  
  
If any LIFs are listed as false, revert them to their home ports: `network interface revert -vserver * -lif *`
2. Register the system serial number with NetApp Support.
  - If AutoSupport is enabled, send an AutoSupport message to register the serial number.
  - If AutoSupport is not enabled, call [NetApp Support](#) to register the serial number.
3. If an AutoSupport maintenance window was triggered, end it by using the `system node autosupport invoke -node * -type all -message MAINT=END` command.
4. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`

## Step 3: (MetroCluster only): Switching back aggregates in a two-node MetroCluster configuration

After you have completed the FRU replacement in a two-node MetroCluster configuration, you can perform the MetroCluster switchback operation. This returns the configuration to its normal operating state, with the sync-source storage virtual machines (SVMs) on the formerly impaired site now active and serving data from the local disk pools.

This task only applies to two-node MetroCluster configurations.

### Steps

1. Verify that all nodes are in the enabled state: `metrocluster node show`

```
cluster_B::> metrocluster node show
```

| DR        |                     | Configuration | DR             |
|-----------|---------------------|---------------|----------------|
| Group     | Cluster Node        | State         | Mirroring Mode |
| -----     | -----               | -----         | -----          |
| 1         | cluster_A           |               |                |
|           | controller_A_1      | configured    | enabled        |
| completed | cluster_B           |               |                |
|           | controller_B_1      | configured    | enabled        |
|           | switchback recovery |               | waiting for    |

2 entries were displayed.

2. Verify that resynchronization is complete on all SVMs: `metrocluster vserver show`
3. Verify that any automatic LIF migrations being performed by the healing operations were completed successfully: `metrocluster check lif show`
4. Perform the switchback by using the `metrocluster switchback` command from any node in the surviving cluster.
5. Verify that the switchback operation has completed: `metrocluster show`

The switchback operation is still running when a cluster is in the **waiting-for-switchback** state:

```
cluster_B::> metrocluster show
```

| Cluster           | Configuration | State                  | Mode  |
|-------------------|---------------|------------------------|-------|
| -----             | -----         | -----                  | ----- |
| Local: cluster_B  | configured    | switchover             |       |
| Remote: cluster_A | configured    | waiting-for-switchback |       |

The switchback operation is complete when the clusters are in the **normal** state.:

```
cluster_B::> metrocluster show
```

| Cluster           | Configuration | State  | Mode  |
|-------------------|---------------|--------|-------|
| -----             | -----         | -----  | ----- |
| Local: cluster_B  | configured    | normal |       |
| Remote: cluster_A | configured    | normal |       |

If a switchback is taking a long time to finish, you can check on the status of in-progress baselines by using the `metrocluster config-replication resync-status show` command.

6. Reestablish any SnapMirror or SnapVault configurations.

#### Step 4: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

#### Hot-swap a de-stage controller power module (DCPM) - AFF A700

To hot-swap a de-stage controller power module (DCPM), which contains the NVRAM10 battery, you must locate the failed DCPM module, remove it from the chassis, and install the replacement DCPM module.

You must have a replacement DCPM module in-hand before removing the failed module from the chassis and it must be replaced within five minutes of removal. Once the DCPM module is removed from the chassis, there is no shutdown protection for the controller module that owns the DCPM module, other than failover to the other controller module.

##### Step 1: Replace the DCPM module

To replace the DCPM module in your system, you must remove the failed DCPM module from the system and then replace it with a new DCPM module.

##### Steps

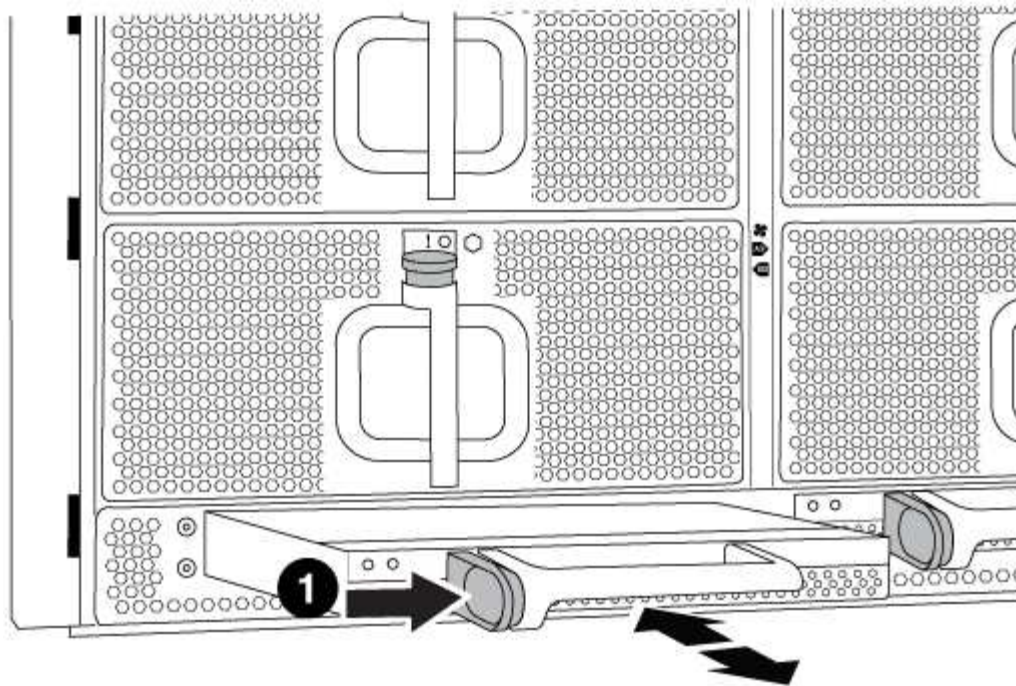
1. If you are not already grounded, properly ground yourself.
2. Remove the bezel on the front of the system and set it aside.
3. Locate the failed DCPM module in the front of the system by looking for the Attention LED on the module.

The LED will be steady amber if the module is faulty.



The DCPM module must be replaced in the chassis within five minutes of removal or the associated controller will shut down.

4. Press the orange locking button on the module handle, and then slide the DCPM module out of the chassis.



|   |                                   |
|---|-----------------------------------|
| 1 | DCPM module orange locking button |
|---|-----------------------------------|

- Align the end of the DCPM module with the chassis opening, and then gently slide it into the chassis until it clicks into place.



The module and slot are keyed. Do not force the module into the opening. If the module does not go in easily, realign the module and slide it into the chassis.

The DCPM module LED lights when the module is fully seated into the chassis.

## Step 2: Dispose of batteries

You must dispose of batteries according to the local regulations regarding battery recycling or disposal. If you cannot properly dispose of batteries, you must return the batteries to NetApp, as described in the RMA instructions that are shipped with the kit.

[https://library.netapp.com/ecm/ecm\\_download\\_file/ECMP12475945](https://library.netapp.com/ecm/ecm_download_file/ECMP12475945)

## Step 3: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

## Replace a DIMM - AFF A700

You must replace a DIMM in the controller module when your system registers an increasing number of correctable error correction codes (ECC); failure to do so causes a system panic.

All other components in the system must be functioning properly; if not, you must contact technical support.

You must replace the failed component with a replacement FRU component you received from your provider.

**Step 1: Shut down the impaired controller**

You can shut down or take over the impaired controller using different procedures, depending on the storage system hardware configuration.

## Option 1: Most configurations

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

### About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced` mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

### Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message MAINT=<# of hours>h
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`



When you see *Do you want to disable auto-giveback?*, enter *y*.

3. Take the impaired controller to the LOADER prompt:

| If the impaired controller is displaying... | Then...                                                                                                                                                                                                                                                            |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                           | Go to the next step.                                                                                                                                                                                                                                               |
| Waiting for giveback...                     | Press Ctrl-C, and then respond <i>y</i> when prompted.                                                                                                                                                                                                             |
| System prompt or password prompt            | <p>Take over or halt the impaired controller from the healthy controller: <code>storage failover takeover -ofnode <i>impaired_node_name</i></code></p> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i>.</p> |

## Option 2: Controller is in a two-node MetroCluster

To shut down the impaired controller, you must determine the status of the controller and, if necessary,

switch over the controller so that the healthy controller continues to serve data from the impaired controller storage.

### About this task

- You must leave the power supplies turned on at the end of this procedure to provide power to the healthy controller.

### Steps

1. Check the MetroCluster status to determine whether the impaired controller has automatically switched over to the healthy controller: `metrocluster show`
2. Depending on whether an automatic switchover has occurred, proceed according to the following table:

| If the impaired controller...                                                                                                                      | Then...                                                                                                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Has automatically switched over                                                                                                                    | Proceed to the next step.                                                                                                                      |
| Has not automatically switched over                                                                                                                | Perform a planned switchover operation from the healthy controller: <code>metrocluster switchover</code>                                       |
| Has not automatically switched over, you attempted switchover with the <code>metrocluster switchover</code> command, and the switchover was vetoed | Review the veto messages and, if possible, resolve the issue and try again. If you are unable to resolve the issue, contact technical support. |

3. Resynchronize the data aggregates by running the `metrocluster heal -phase aggregates` command from the surviving cluster.

```
controller_A_1::> metrocluster heal -phase aggregates
[Job 130] Job succeeded: Heal Aggregates is successful.
```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

4. Verify that the operation has been completed by using the `metrocluster operation show` command.

```
controller_A_1::> metrocluster operation show
Operation: heal-aggregates
State: successful
Start Time: 7/25/2016 18:45:55
End Time: 7/25/2016 18:45:56
Errors: -
```

5. Check the state of the aggregates by using the `storage aggregate show` command.

```

controller_A_1::> storage aggregate show
Aggregate Size Available Used% State #Vols Nodes
RAID Status

...
aggr_b2 227.1GB 227.1GB 0% online 0 mcc1-a2
raid_dp, mirrored, normal...

```

6. Heal the root aggregates by using the `metrocluster heal -phase root-aggregates` command.

```

mcc1A::> metrocluster heal -phase root-aggregates
[Job 137] Job succeeded: Heal Root Aggregates is successful

```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

7. Verify that the heal operation is complete by using the `metrocluster operation show` command on the destination cluster:

```

mcc1A::> metrocluster operation show
Operation: heal-root-aggregates
State: successful
Start Time: 7/29/2016 20:54:41
End Time: 7/29/2016 20:54:42
Errors: -

```

8. On the impaired controller module, disconnect the power supplies.

## Step 2: Remove the controller module

To access components inside the controller, you must first remove the controller module from the system and then remove the cover on the controller module.

### Steps

1. If you are not already grounded, properly ground yourself.
2. Unplug the cables from the impaired controller module, and keep track of where the cables were connected.
3. Slide the orange button on the cam handle downward until it unlocks.



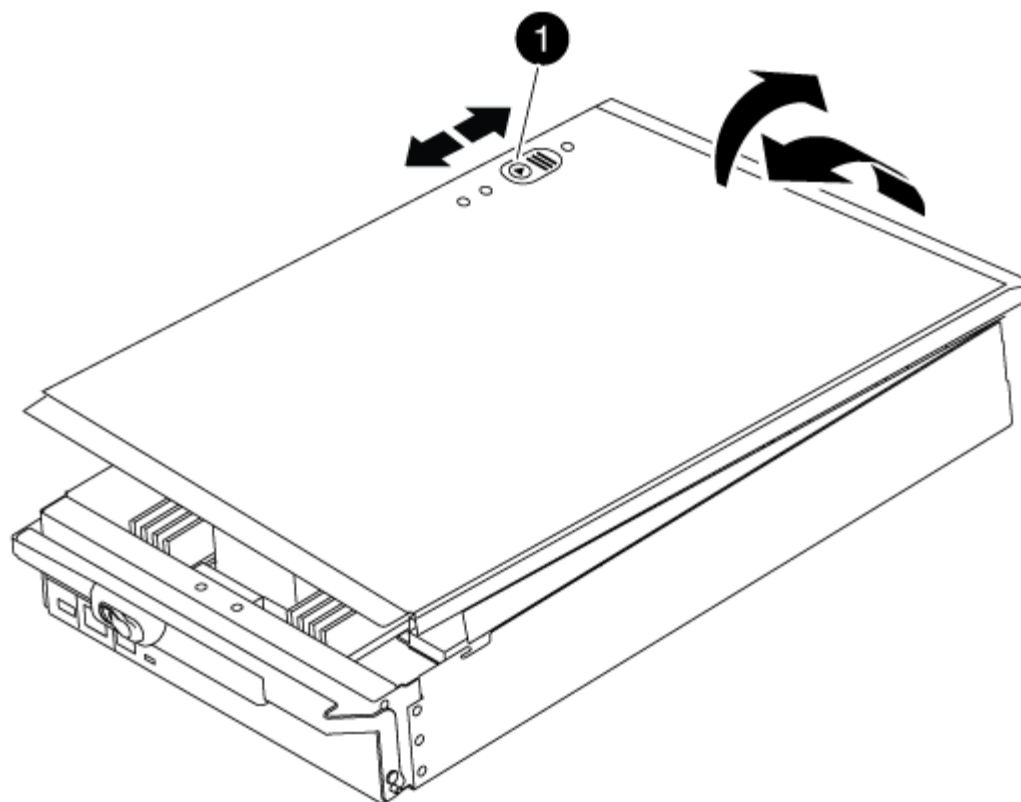


|   |                           |
|---|---------------------------|
| 1 | Cam handle release button |
| 2 | Cam handle                |

4. Rotate the cam handle so that it completely disengages the controller module from the chassis, and then slide the controller module out of the chassis.

Make sure that you support the bottom of the controller module as you slide it out of the chassis.

5. Place the controller module lid-side up on a stable, flat surface, press the blue button on the cover, slide the cover to the back of the controller module, and then swing the cover up and lift it off of the controller module.



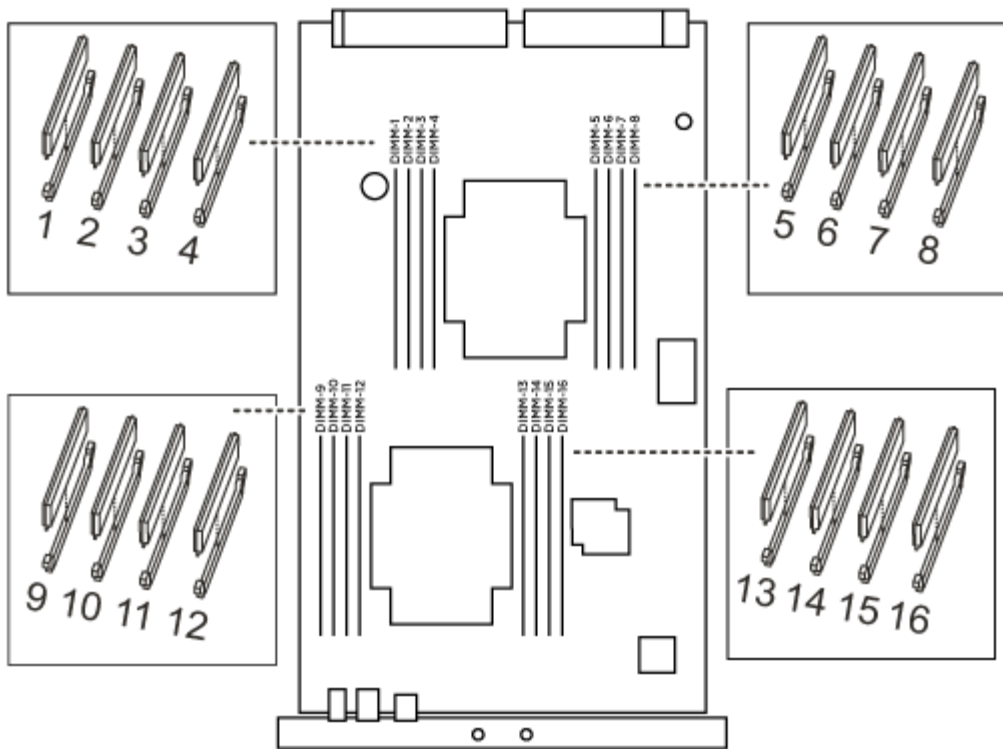
|   |                                        |
|---|----------------------------------------|
| 1 | Controller module cover locking button |
|---|----------------------------------------|

### Step 3: Replace the DIMMs

To replace the DIMMs, locate them inside the controller and follow the specific sequence of steps.

#### Steps

1. If you are not already grounded, properly ground yourself.
2. Locate the DIMMs on your controller module.



1. Eject the DIMM from its slot by slowly pushing apart the two DIMM ejector tabs on either side of the DIMM, and then slide the DIMM out of the slot.



Carefully hold the DIMM by the edges to avoid pressure on the components on the DIMM circuit board.



|   |                   |
|---|-------------------|
| 1 | DIMM ejector tabs |
| 2 | DIMM              |

2. Remove the replacement DIMM from the antistatic shipping bag, hold the DIMM by the corners, and align it to the slot.

The notch among the pins on the DIMM should line up with the tab in the socket.

3. Make sure that the DIMM ejector tabs on the connector are in the open position, and then insert the DIMM squarely into the slot.

The DIMM fits tightly in the slot, but should go in easily. If not, realign the DIMM with the slot and reinsert it.



Visually inspect the DIMM to verify that it is evenly aligned and fully inserted into the slot.

4. Push carefully, but firmly, on the top edge of the DIMM until the ejector tabs snap into place over the notches at the ends of the DIMM.
5. Close the controller module cover.

#### Step 4: Install the controller

After you install the components into the controller module, you must install the controller module back into the system chassis and boot the operating system.

For HA pairs with two controller modules in the same chassis, the sequence in which you install the controller module is especially important because it attempts to reboot as soon as you completely seat it in the chassis.

##### Steps

1. If you are not already grounded, properly ground yourself.
2. If you have not already done so, replace the cover on the controller module.
3. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.



Do not completely insert the controller module in the chassis until instructed to do so.

4. Cable the management and console ports only, so that you can access the system to perform the tasks in the following sections.



You will connect the rest of the cables to the controller module later in this procedure.

5. Complete the reinstallation of the controller module:
  - a. If you have not already done so, reinstall the cable management device.
  - b. Firmly push the controller module into the chassis until it meets the midplane and is fully seated.

The locking latches rise when the controller module is fully seated.



Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.

The controller module begins to boot as soon as it is fully seated in the chassis.

- c. Rotate the locking latches upward, tilting them so that they clear the locking pins, and then lower them into the locked position.

#### Step 5: Switch back aggregates in a two-node MetroCluster configuration

After you have completed the FRU replacement in a two-node MetroCluster configuration, you can perform the MetroCluster switchback operation. This returns the configuration to its normal operating state, with the sync-source storage virtual machines (SVMs) on the formerly impaired site now active and serving data from the local disk pools.

This task only applies to two-node MetroCluster configurations.

##### Steps

1. Verify that all nodes are in the `enabled` state: `metrocluster node show`

```
cluster_B::> metrocluster node show
```

| DR Group  | Cluster Node | Configuration State       | DR Mirroring Mode                       |
|-----------|--------------|---------------------------|-----------------------------------------|
| 1         | cluster_A    | controller_A_1 configured | enabled heal roots                      |
| completed | cluster_B    | controller_B_1 configured | enabled waiting for switchback recovery |

2 entries were displayed.

2. Verify that resynchronization is complete on all SVMs: `metrocluster vserver show`
3. Verify that any automatic LIF migrations being performed by the healing operations were completed successfully: `metrocluster check lif show`
4. Perform the switchback by using the `metrocluster switchback` command from any node in the surviving cluster.
5. Verify that the switchback operation has completed: `metrocluster show`

The switchback operation is still running when a cluster is in the **waiting-for-switchback** state:

```
cluster_B::> metrocluster show
```

| Cluster           | Configuration | State                  | Mode |
|-------------------|---------------|------------------------|------|
| Local: cluster_B  | configured    | switchover             |      |
| Remote: cluster_A | configured    | waiting-for-switchback |      |

The switchback operation is complete when the clusters are in the **normal** state.:

```
cluster_B::> metrocluster show
```

| Cluster           | Configuration | State  | Mode |
|-------------------|---------------|--------|------|
| Local: cluster_B  | configured    | normal |      |
| Remote: cluster_A | configured    | normal |      |

If a switchback is taking a long time to finish, you can check on the status of in-progress baselines by using the `metrocluster config-replication resync-status show` command.

6. Reestablish any SnapMirror or SnapVault configurations.

## Step 6: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

### Swap out a fan - AFF A700

To swap out a fan module without interrupting service, you must perform a specific sequence of tasks.



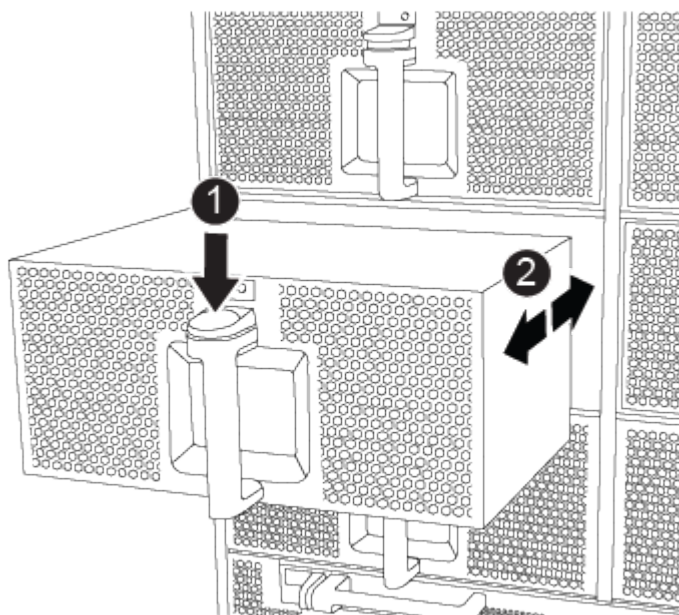
You must replace the fan module within two minutes of removing it from the chassis. System airflow is disrupted and the controller module or modules shut down after two minutes to avoid overheating.

#### Steps

1. If you are not already grounded, properly ground yourself.
2. Remove the bezel (if necessary) with two hands, by grasping the openings on each side of the bezel, and then pulling it toward you until the bezel releases from the ball studs on the chassis frame.
3. Identify the fan module that you must replace by checking the console error messages and looking at the Attention LED on each fan module.
4. Press the orange button on the fan module and pull the fan module straight out of the chassis, making sure that you support it with your free hand.



The fan modules are short. Always support the bottom of the fan module with your free hand so that it does not suddenly drop free from the chassis and injure you.



1

Orange release button

5. Set the fan module aside.
6. Align the edges of the replacement fan module with the opening in the chassis, and then slide it into the

chassis until it snaps into place.

When inserted into a live system, the amber Attention LED flashes four times when the fan module is successfully inserted into the chassis.

7. Align the bezel with the ball studs, and then gently push the bezel onto the ball studs.
8. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

### **Replace an I/O module - AFF A700 and FAS9000**

To replace an I/O module, you must perform a specific sequence of tasks.

- You can use this procedure with all versions of ONTAP supported by your system
- All other components in the system must be functioning properly; if not, you must contact technical support.

#### **Step 1: Shut down the impaired controller**

You can shut down or take over the impaired controller using different procedures, depending on the storage system hardware configuration.



## Option 1: Most configurations

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

### About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced` mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

### Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:  

```
system node autosupport invoke -node * -type all -message MAINT=<# of hours>h
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller: 

```
storage failover modify -node local -auto-giveback false
```



When you see *Do you want to disable auto-giveback?*, enter *y*.

3. Take the impaired controller to the LOADER prompt:

| If the impaired controller is displaying... | Then...                                                                                                                                                                                                                                                            |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                           | Go to the next step.                                                                                                                                                                                                                                               |
| Waiting for giveback...                     | Press Ctrl-C, and then respond <i>y</i> when prompted.                                                                                                                                                                                                             |
| System prompt or password prompt            | <p>Take over or halt the impaired controller from the healthy controller: <code>storage failover takeover -ofnode <i>impaired_node_name</i></code></p> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i>.</p> |

## Option 2: Controller is in a two-node MetroCluster

To shut down the impaired controller, you must determine the status of the controller and, if necessary,

switch over the controller so that the healthy controller continues to serve data from the impaired controller storage.

### About this task

- You must leave the power supplies turned on at the end of this procedure to provide power to the healthy controller.

### Steps

1. Check the MetroCluster status to determine whether the impaired controller has automatically switched over to the healthy controller: `metrocluster show`
2. Depending on whether an automatic switchover has occurred, proceed according to the following table:

| If the impaired controller...                                                                                                                      | Then...                                                                                                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Has automatically switched over                                                                                                                    | Proceed to the next step.                                                                                                                      |
| Has not automatically switched over                                                                                                                | Perform a planned switchover operation from the healthy controller: <code>metrocluster switchover</code>                                       |
| Has not automatically switched over, you attempted switchover with the <code>metrocluster switchover</code> command, and the switchover was vetoed | Review the veto messages and, if possible, resolve the issue and try again. If you are unable to resolve the issue, contact technical support. |

3. Resynchronize the data aggregates by running the `metrocluster heal -phase aggregates` command from the surviving cluster.

```
controller_A_1::> metrocluster heal -phase aggregates
[Job 130] Job succeeded: Heal Aggregates is successful.
```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

4. Verify that the operation has been completed by using the `metrocluster operation show` command.

```
controller_A_1::> metrocluster operation show
Operation: heal-aggregates
State: successful
Start Time: 7/25/2016 18:45:55
End Time: 7/25/2016 18:45:56
Errors: -
```

5. Check the state of the aggregates by using the `storage aggregate show` command.

```

controller_A_1::> storage aggregate show
Aggregate Size Available Used% State #Vols Nodes
RAID Status

...
aggr_b2 227.1GB 227.1GB 0% online 0 mcc1-a2
raid_dp, mirrored, normal...

```

6. Heal the root aggregates by using the `metrocluster heal -phase root-aggregates` command.

```

mcc1A::> metrocluster heal -phase root-aggregates
[Job 137] Job succeeded: Heal Root Aggregates is successful

```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

7. Verify that the heal operation is complete by using the `metrocluster operation show` command on the destination cluster:

```

mcc1A::> metrocluster operation show
Operation: heal-root-aggregates
State: successful
Start Time: 7/29/2016 20:54:41
End Time: 7/29/2016 20:54:42
Errors: -

```

8. On the impaired controller module, disconnect the power supplies.

## Step 2: Replace I/O modules

To replace an I/O module, locate it within the chassis and follow the specific sequence of steps.

### Steps

1. If you are not already grounded, properly ground yourself.
2. Unplug any cabling associated with the target I/O module.

Make sure that you label the cables so that you know where they came from.

3. Remove the target I/O module from the chassis:
  - a. Depress the lettered and numbered cam button.

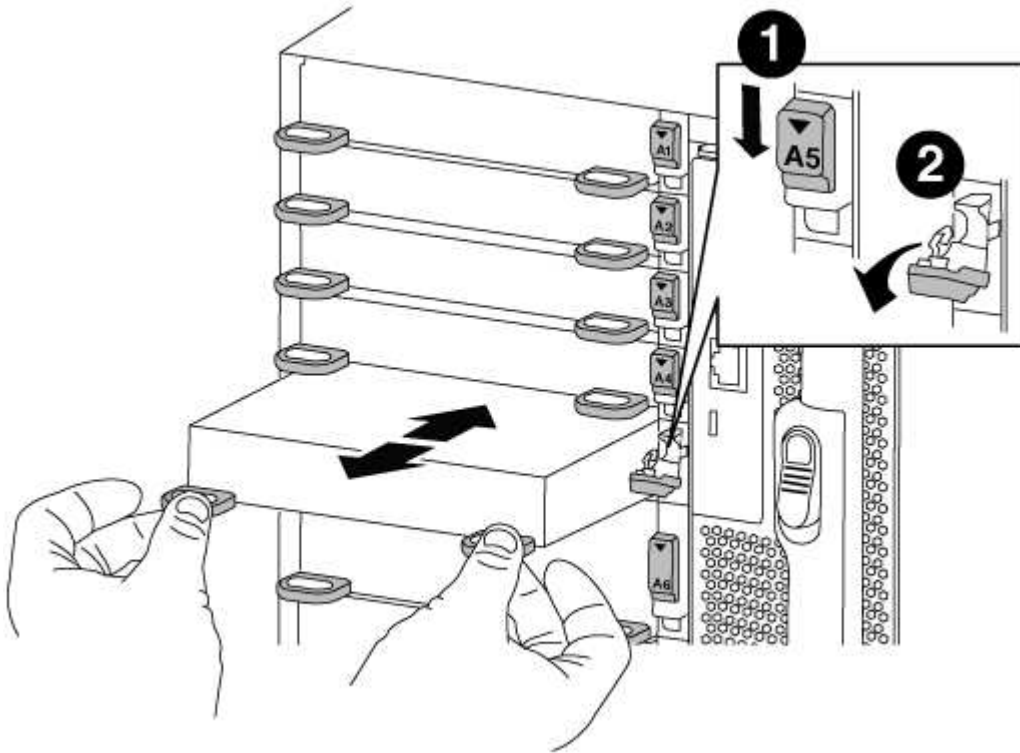
The cam button moves away from the chassis.

- b. Rotate the cam latch down until it is in a horizontal position.

The I/O module disengages from the chassis and moves about 1/2 inch out of the I/O slot.

- c. Remove the I/O module from the chassis by pulling on the pull tabs on the sides of the module face.

Make sure that you keep track of which slot the I/O module was in.



|   |                                     |
|---|-------------------------------------|
| 1 | Lettered and numbered I/O cam latch |
| 2 | I/O cam latch completely unlocked   |

4. Set the I/O module aside.
5. Install the replacement I/O module into the chassis by gently sliding the I/O module into the slot until the lettered and numbered I/O cam latch begins to engage with the I/O cam pin, and then push the I/O cam latch all the way up to lock the module in place.
6. Recable the I/O module, as needed.

### Step 3: Reboot the controller after I/O module replacement

After you replace an I/O module, you must reboot the controller module.



If the new I/O module is not the same model as the failed module, you must first reboot the BMC.

### Steps

1. Reboot the BMC if the replacement module is not the same model as the old module:
  - a. From the LOADER prompt, change to advanced privilege mode: `priv set advanced`
  - b. Reboot the BMC: `sp reboot`
2. From the LOADER prompt, reboot the node: `bye`



This reinitializes the PCIe cards and other components and reboots the node.

3. If your system is configured to support 10 GbE cluster interconnect and data connections on 40 GbE NICs or onboard ports, convert these ports to 10 GbE connections by using the `nicadmin convert` command from Maintenance mode.



Be sure to exit Maintenance mode after completing the conversion.

4. Return the node to normal operation:  
`storage failover giveback -ofnode impaired_node_name`
5. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`



If your system is in a two-node MetroCluster configuration, you must switch back the aggregates as described in the next step.

#### Step 4: Switch back aggregates in a two-node MetroCluster configuration

After you have completed the FRU replacement in a two-node MetroCluster configuration, you can perform the MetroCluster switchback operation. This returns the configuration to its normal operating state, with the sync-source storage virtual machines (SVMs) on the formerly impaired site now active and serving data from the local disk pools.

This task only applies to two-node MetroCluster configurations.

#### Steps

1. Verify that all nodes are in the `enabled` state: `metrocluster node show`

```
cluster_B::> metrocluster node show
```

| DR        |              | Configuration             | DR                  |
|-----------|--------------|---------------------------|---------------------|
| Group     | Cluster Node | State                     | Mirroring Mode      |
| 1         | cluster_A    | controller_A_1 configured | enabled heal roots  |
| completed | cluster_B    | controller_B_1 configured | enabled waiting for |
|           |              | switchback recovery       |                     |

2 entries were displayed.

2. Verify that resynchronization is complete on all SVMs: `metrocluster vserver show`
3. Verify that any automatic LIF migrations being performed by the healing operations were completed successfully: `metrocluster check lif show`
4. Perform the switchback by using the `metrocluster switchback` command from any node in the surviving cluster.
5. Verify that the switchback operation has completed: `metrocluster show`

The switchback operation is still running when a cluster is in the **waiting-for-switchback** state:

```
cluster_B::> metrocluster show
```

| Cluster           | Configuration | State                  | Mode |
|-------------------|---------------|------------------------|------|
| Local: cluster_B  | configured    | switchover             |      |
| Remote: cluster_A | configured    | waiting-for-switchback |      |

The switchback operation is complete when the clusters are in the **normal** state.:

```
cluster_B::> metrocluster show
```

| Cluster           | Configuration | State  | Mode |
|-------------------|---------------|--------|------|
| Local: cluster_B  | configured    | normal |      |
| Remote: cluster_A | configured    | normal |      |

If a switchback is taking a long time to finish, you can check on the status of in-progress baselines by using the `metrocluster config-replication resync-status show` command.

6. Reestablish any SnapMirror or SnapVault configurations.

### Step 5: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

### Replace an LED USB module - AFF A700

You can replace an LED USB module without interrupting service.

The FAS9000 or AFF A700 LED USB module provides connectivity to console ports and system status. Replacement of this module does not require tools.

#### Steps

1. Remove the old LED USB module:



- a. With the bezel removed, locate the LED USB module at the front of the chassis, on the bottom left side.
- b. Slide the latch to partially eject the module.
- c. Pull the module out of the bay to disconnect it from the midplane. Do not leave the slot empty.

2. Install the new LED USB module:



- a. Align the module to the bay with the notch in the corner of the module positioned near the slider latch on the chassis. The bay will prevent you from installing the module upside down.

- b. Push the module into the bay until it is fully seated flush with the chassis.

There is an audible click when the module is secure and connected to the midplane.

#### **Return the failed part to NetApp**

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

#### **Replace the NVRAM module or NVRAM DIMMs - AFF A700**

The NVRAM module consists of the NVRAM10 and DIMMs and up to two NVMe SSD Flash Cache modules (FlashCache or caching modules) per NVRAM module. You can replace a failed NVRAM module or the DIMMs inside the NVRAM module.

To replace a failed NVRAM module, you must remove it from the chassis, remove the FlashCache module or modules from the NVRAM module, move the DIMMs to the replacement module, reinstall the FlashCache module or modules, and install the replacement NVRAM module into the chassis.

Because the system ID is derived from the NVRAM module, if replacing the module, disks belonging to the system are reassigned to the new system ID.

#### **Before you begin**

- All disk shelves must be working properly.
- If your system is in an HA pair, the partner node must be able to take over the node associated with the NVRAM module that is being replaced.
- This procedure uses the following terminology:
  - The *impaired* node is the node on which you are performing maintenance.
  - The *healthy* node is the HA partner of the impaired node.
- This procedure includes steps for automatically or manually reassigning disks to the controller module associated with the new NVRAM module. You must reassign the disks when directed to in the procedure. Completing the disk reassignment before giveback can cause issues.
- You must replace the failed component with a replacement FRU component you received from your provider.
- You cannot change any disks or disk shelves as part of this procedure.

#### **Step 1: Shut down the impaired controller**

Shut down or take over the impaired controller using one of the following options.



## Option 1: Most systems

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

### About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced` mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

### Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message MAINT=<# of hours>h
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`



When you see *Do you want to disable auto-giveback?*, enter *y*.

3. Take the impaired controller to the LOADER prompt:

| If the impaired controller is displaying... | Then...                                                                                                                                                                                                                                                            |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                           | Go to the next step.                                                                                                                                                                                                                                               |
| Waiting for giveback...                     | Press Ctrl-C, and then respond <i>y</i> when prompted.                                                                                                                                                                                                             |
| System prompt or password prompt            | <p>Take over or halt the impaired controller from the healthy controller: <code>storage failover takeover -ofnode <i>impaired_node_name</i></code></p> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i>.</p> |

## Option 2: Controller is in a Two-node MetroCluster

To shut down the impaired controller, you must determine the status of the controller and, if necessary,

switch over the controller so that the healthy controller continues to serve data from the impaired controller storage.

#### About this task

- You must leave the power supplies turned on at the end of this procedure to provide power to the healthy controller.

#### Steps

1. Check the MetroCluster status to determine whether the impaired controller has automatically switched over to the healthy controller: `metrocluster show`
2. Depending on whether an automatic switchover has occurred, proceed according to the following table:

| If the impaired controller...                                                                                                                      | Then...                                                                                                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Has automatically switched over                                                                                                                    | Proceed to the next step.                                                                                                                      |
| Has not automatically switched over                                                                                                                | Perform a planned switchover operation from the healthy controller: <code>metrocluster switchover</code>                                       |
| Has not automatically switched over, you attempted switchover with the <code>metrocluster switchover</code> command, and the switchover was vetoed | Review the veto messages and, if possible, resolve the issue and try again. If you are unable to resolve the issue, contact technical support. |

3. Resynchronize the data aggregates by running the `metrocluster heal -phase aggregates` command from the surviving cluster.

```
controller_A_1::> metrocluster heal -phase aggregates
[Job 130] Job succeeded: Heal Aggregates is successful.
```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

4. Verify that the operation has been completed by using the `metrocluster operation show` command.

```
controller_A_1::> metrocluster operation show
Operation: heal-aggregates
State: successful
Start Time: 7/25/2016 18:45:55
End Time: 7/25/2016 18:45:56
Errors: -
```

5. Check the state of the aggregates by using the `storage aggregate show` command.

```

controller_A_1:> storage aggregate show
Aggregate Size Available Used% State #Vols Nodes
RAID Status

...
aggr_b2 227.1GB 227.1GB 0% online 0 mcc1-a2
raid_dp, mirrored, normal...

```

6. Heal the root aggregates by using the `metrocluster heal -phase root-aggregates` command.

```

mcc1A:> metrocluster heal -phase root-aggregates
[Job 137] Job succeeded: Heal Root Aggregates is successful

```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

7. Verify that the heal operation is complete by using the `metrocluster operation show` command on the destination cluster:

```

mcc1A:> metrocluster operation show
Operation: heal-root-aggregates
State: successful
Start Time: 7/29/2016 20:54:41
End Time: 7/29/2016 20:54:42
Errors: -

```

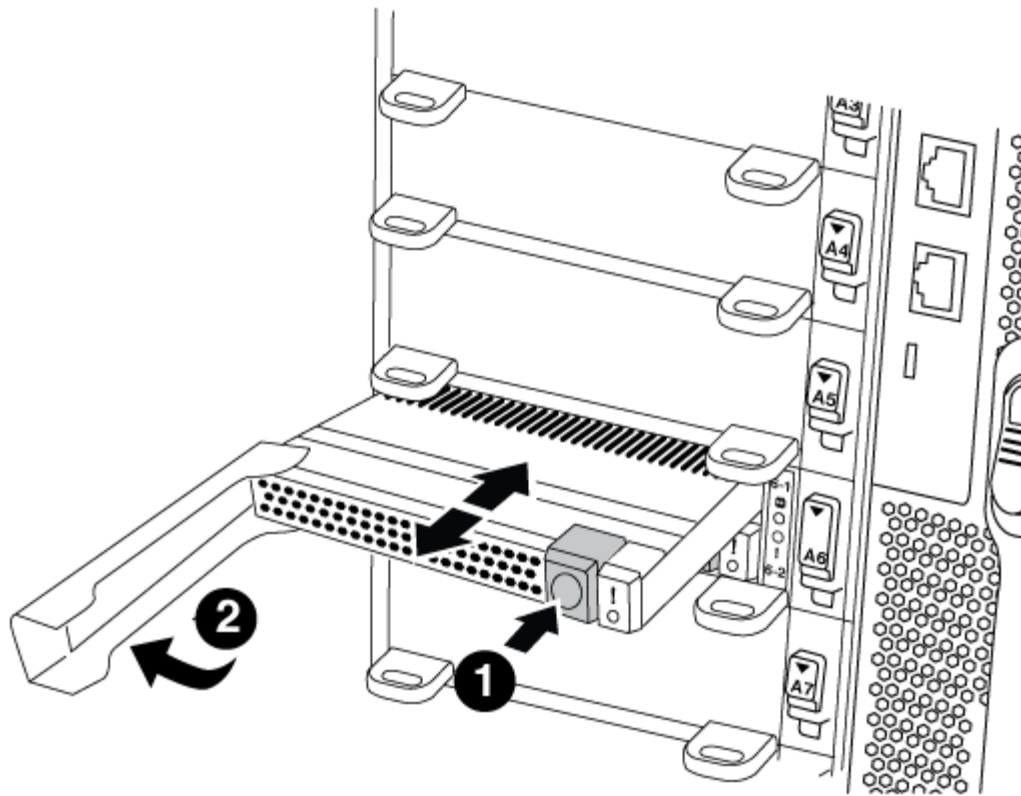
8. On the impaired controller module, disconnect the power supplies.

## Step 2: Replace the NVRAM module

To replace the NVRAM module, locate it in slot 6 in the chassis and follow the specific sequence of steps.

### Steps

1. If you are not already grounded, properly ground yourself.
2. Move the FlashCache module from the old NVRAM module to the new NVRAM module:



|   |                                                          |
|---|----------------------------------------------------------|
| 1 | Orange release button (gray on empty FlashCache modules) |
| 2 | FlashCache cam handle                                    |

a. Press the orange button on the front of the FlashCache module.



The release button on empty FlashCache modules is gray.

b. Swing the cam handle out until the module begins to slide out of the old NVRAM module.

c. Grasp the module cam handle and slide it out of the NVRAM module and insert it into the front of the new NVRAM module.

d. Gently push the FlashCache module all the way into the NVRAM module, and then swing the cam handle closed until it locks the module in place.

3. Remove the target NVRAM module from the chassis:

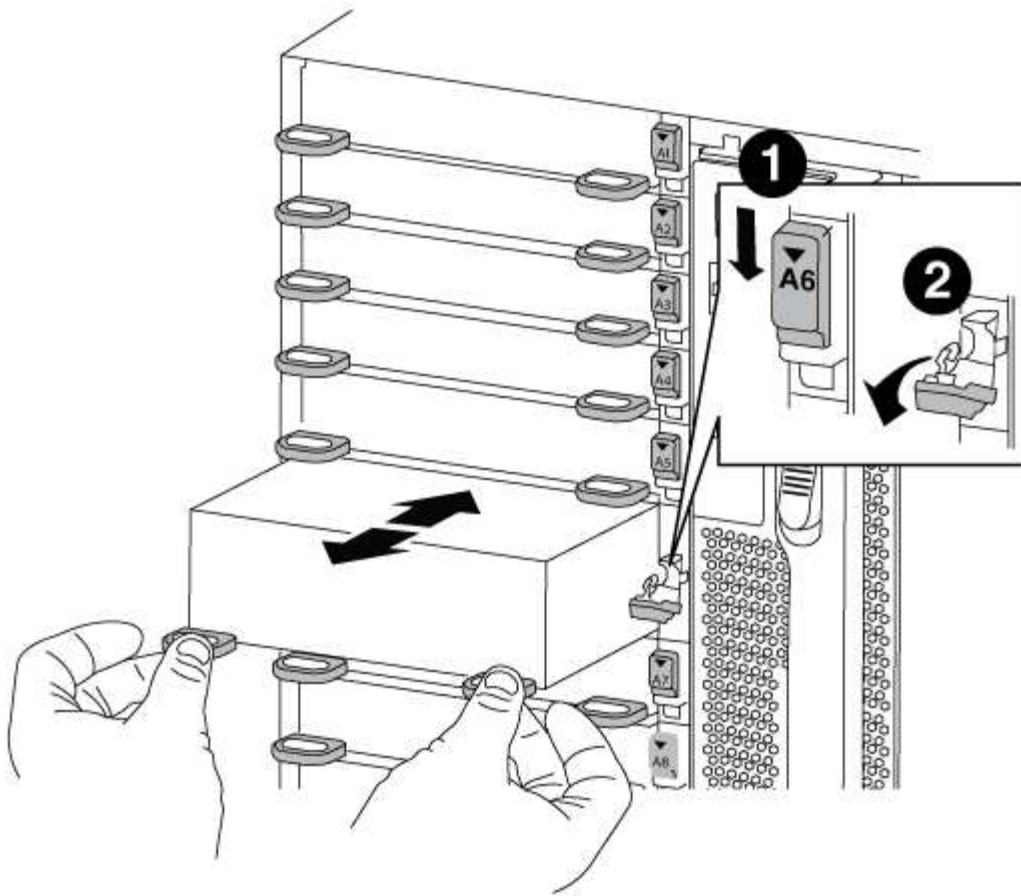
a. Depress the lettered and numbered cam button.

The cam button moves away from the chassis.

b. Rotate the cam latch down until it is in a horizontal position.

The NVRAM module disengages from the chassis and moves out a few inches.

c. Remove the NVRAM module from the chassis by pulling on the pull tabs on the sides of the module face.



|   |                                     |
|---|-------------------------------------|
| 1 | Lettered and numbered I/O cam latch |
| 2 | I/O latch completely unlocked       |

4. Set the NVRAM module on a stable surface and remove the cover from the NVRAM module by pushing down on the blue locking button on the cover, and then, while holding down the blue button, slide the lid off the NVRAM module.



|   |                            |
|---|----------------------------|
| 1 | Cover locking button       |
| 2 | DIMM and DIMM ejector tabs |

5. Remove the DIMMs, one at a time, from the old NVRAM module and install them in the replacement NVRAM module.
6. Close the cover on the module.
7. Install the replacement NVRAM module into the chassis:
  - a. Align the module with the edges of the chassis opening in slot 6.
  - b. Gently slide the module into the slot until the lettered and numbered I/O cam latch begins to engage with the I/O cam pin, and then push the I/O cam latch all the way up to lock the module in place.

### Step 3: Replace a NVRAM DIMM

To replace NVRAM DIMMs in the NVRAM module, you must remove the NVRAM module, open the module, and then replace the target DIMM.

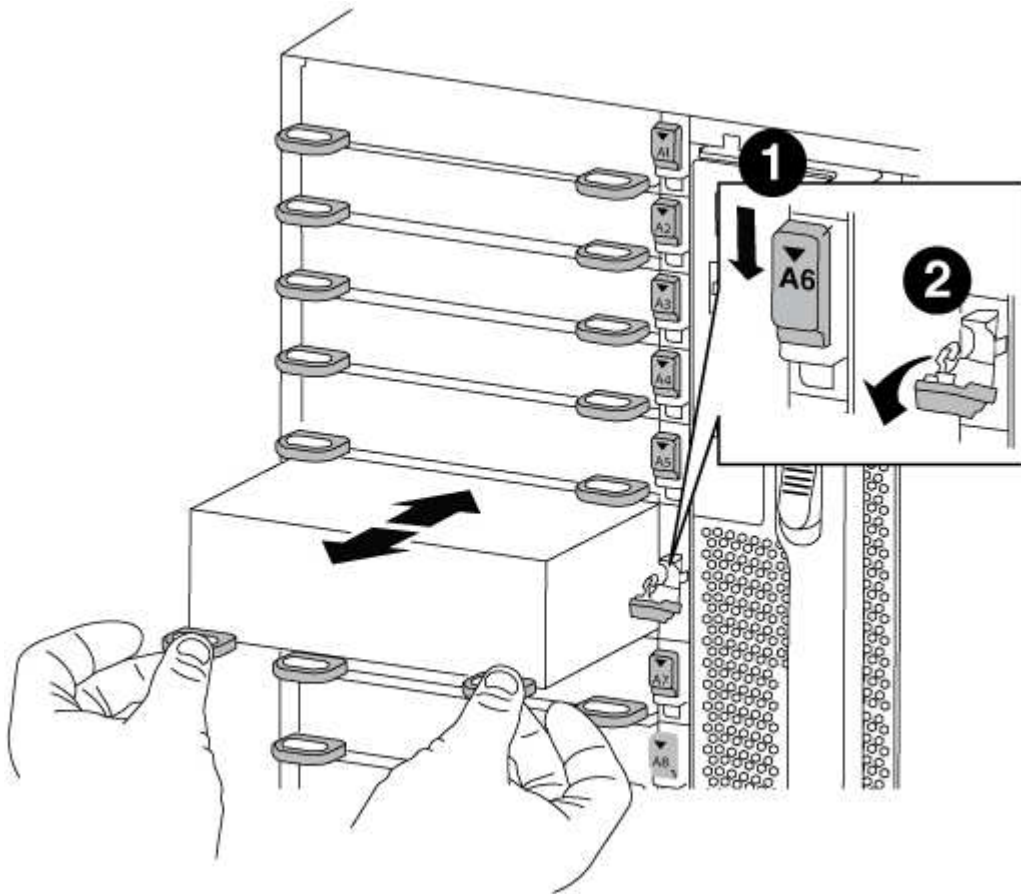
#### Steps

1. If you are not already grounded, properly ground yourself.
2. Remove the target NVRAM module from the chassis:
  - a. Depress the lettered and numbered cam button.
 

The cam button moves away from the chassis.
  - b. Rotate the cam latch down until it is in a horizontal position.
 

The NVRAM module disengages from the chassis and moves out a few inches.
  - c. Remove the NVRAM module from the chassis by pulling on the pull tabs on the sides of the module

face.



|   |                                     |
|---|-------------------------------------|
| 1 | Lettered and numbered I/O cam latch |
| 2 | I/O latch completely unlocked       |

3. Set the NVRAM module on a stable surface and remove the cover from the NVRAM module by pushing down on the blue locking button on the cover, and then, while holding down the blue button, slide the lid off the NVRAM module.



|   |                            |
|---|----------------------------|
| 1 | Cover locking button       |
| 2 | DIMM and DIMM ejector tabs |

4. Locate the DIMM to be replaced inside the NVRAM module, and then remove it by pressing down on the DIMM locking tabs and lifting the DIMM out of the socket.
5. Install the replacement DIMM by aligning the DIMM with the socket and gently pushing the DIMM into the socket until the locking tabs lock in place.
6. Close the cover on the module.
7. Install the replacement NVRAM module into the chassis:
  - a. Align the module with the edges of the chassis opening in slot 6.
  - b. Gently slide the module into the slot until the lettered and numbered I/O cam latch begins to engage with the I/O cam pin, and then push the I/O cam latch all the way up to lock the module in place.

#### Step 4: Reboot the controller after FRU replacement

After you replace the FRU, you must reboot the controller module.

#### Step

1. To boot ONTAP from the LOADER prompt, enter `bye`.

#### Step 5: Reassign disks

Depending on whether you have an HA pair or two-node MetroCluster configuration, you must either verify the reassignment of disks to the new controller module or manually reassign the disks.

Select one of the following options for instructions on how to reassign disks to the new controller.



## Option 1: Verify ID (HA pair)

### Verify the system ID change on an HA system

You must confirm the system ID change when you boot the *replacement* node and then verify that the change was implemented.



Disk reassignment is only needed when replacing the NVRAM module and does not apply to NVRAM DIMM replacement.

### Steps

1. If the replacement node is in Maintenance mode (showing the `*>` prompt, exit Maintenance mode and go to the LOADER prompt: `halt`
2. From the LOADER prompt on the replacement node, boot the node, entering `y` if you are prompted to override the system ID due to a system ID mismatch.

```
boot_ontap bye
```

The node will reboot, if autoboot is set.

3. Wait until the `Waiting for giveback...` message is displayed on the *replacement* node console and then, from the healthy node, verify that the new partner system ID has been automatically assigned: `storage failover show`

In the command output, you should see a message that the system ID has changed on the impaired node, showing the correct old and new IDs. In the following example, node2 has undergone replacement and has a new system ID of 151759706.

```
node1> `storage failover show`
```

| Node  | Partner | Takeover Possible | State Description                                          |
|-------|---------|-------------------|------------------------------------------------------------|
| node1 | node2   | false             | System ID changed on partner (Old: 151759706), In takeover |
| node2 | node1   | -                 | Waiting for giveback (HA mailboxes)                        |

4. From the healthy node, verify that any coredumps are saved:

- a. Change to the advanced privilege level: `set -privilege advanced`

You can respond `y` when prompted to continue into advanced mode. The advanced mode prompt appears (`*>`).

- b. Save any coredumps: `system node run -node local-node-name partner savecore`
- c. Wait for the `savecore` command to complete before issuing the giveback.

You can enter the following command to monitor the progress of the savecore command: `system node run -node local-node-name partner savecore -s`

d. Return to the admin privilege level: `set -privilege admin`

5. Give back the node:

a. From the healthy node, give back the replaced node's storage: `storage failover giveback -ofnode replacement_node_name`

The *replacement* node takes back its storage and completes booting.

If you are prompted to override the system ID due to a system ID mismatch, you should enter `y`.



If the giveback is vetoed, you can consider overriding the vetoes.

[Find the High-Availability Configuration Guide for your version of ONTAP 9](#)

b. After the giveback has been completed, confirm that the HA pair is healthy and that takeover is possible: `storage failover show`

The output from the `storage failover show` command should not include the System ID changed on partner message.

6. Verify that the disks were assigned correctly: `storage disk show -ownership`

The disks belonging to the *replacement* node should show the new system ID. In the following example, the disks owned by node1 now show the new system ID, 1873775277:

```
node1> `storage disk show -ownership`

Disk Aggregate Home Owner DR Home Home ID Owner ID DR Home
ID Reserver Pool

1.0.0 aggr0_1 node1 node1 - 1873775277 1873775277 -
1873775277 Pool0
1.0.1 aggr0_1 node1 node1 - 1873775277 1873775277 -
1873775277 Pool0
.
.
.
```

7. If the system is in a MetroCluster configuration, monitor the status of the node: `metrocluster node show`

The MetroCluster configuration takes a few minutes after the replacement to return to a normal state, at which time each node will show a configured state, with DR Mirroring enabled and a mode of normal. The `metrocluster node show -fields node-systemid` command output displays the old system ID until the MetroCluster configuration returns to a normal state.

8. If the node is in a MetroCluster configuration, depending on the MetroCluster state, verify that the DR home ID field shows the original owner of the disk if the original owner is a node on the disaster site.

This is required if both of the following are true:

- The MetroCluster configuration is in a switchover state.
- The *replacement* node is the current owner of the disks on the disaster site.

[Disk ownership changes during HA takeover and MetroCluster switchover in a four-node MetroCluster configuration](#)

9. If your system is in a MetroCluster configuration, verify that each node is configured: `metrocluster node show - fields configuration-state`

```
node1_siteA::> metrocluster node show -fields configuration-state

dr-group-id cluster node configuration-state

1 node1_siteA node1mcc-001 configured
1 node1_siteA node1mcc-002 configured
1 node1_siteB node1mcc-003 configured
1 node1_siteB node1mcc-004 configured

4 entries were displayed.
```

10. Verify that the expected volumes are present for each node: `vol show -node node-name`
11. If you disabled automatic takeover on reboot, enable it from the healthy node: `storage failover modify -node replacement-node-name -onreboot true`

## Option 2: Reassign ID (MetroCluster config)

### Reassign the system ID in a two-node MetroCluster configuration

In a two-node MetroCluster configuration running ONTAP, you must manually reassign disks to the new controller's system ID before you return the system to normal operating condition.

#### About this task

This procedure applies only to systems in a two-node MetroCluster configuration running ONTAP.

You must be sure to issue the commands in this procedure on the correct node:

- The *impaired* node is the node on which you are performing maintenance.
- The *replacement* node is the new node that replaced the impaired node as part of this procedure.
- The *healthy* node is the DR partner of the impaired node.

#### Steps

1. If you have not already done so, reboot the *replacement* node, interrupt the boot process by entering `Ctrl-C`, and then select the option to boot to Maintenance mode from the displayed menu.

You must enter `Y` when prompted to override the system ID due to a system ID mismatch.

2. View the old system IDs from the healthy node: ``metrocluster node show -fields node-systemid,dr-partner-systemid``

In this example, the `Node_B_1` is the old node, with the old system ID of 118073209:

```
dr-group-id cluster node node-systemid dr-
partner-systemid

1 Cluster_A Node_A_1 536872914
118073209
1 Cluster_B Node_B_1 118073209
536872914
2 entries were displayed.
```

3. View the new system ID at the Maintenance mode prompt on the impaired node: `disk show`

In this example, the new system ID is 118065481:

```
Local System ID: 118065481
...
...
```

4. Reassign disk ownership (for FAS systems) or LUN ownership (for FlexArray systems), by using the system ID information obtained from the `disk show` command: `disk reassign -s old system ID`

In the case of the preceding example, the command is: `disk reassign -s 118073209`

You can respond `Y` when prompted to continue.

5. Verify that the disks (or FlexArray LUNs) were assigned correctly: `disk show -a`

Verify that the disks belonging to the *replacement* node show the new system ID for the *replacement* node. In the following example, the disks owned by system-1 now show the new system ID, 118065481:

```
*> disk show -a
Local System ID: 118065481
```

| DISK                     | OWNER    |             | POOL  | SERIAL NUMBER | HOME     |
|--------------------------|----------|-------------|-------|---------------|----------|
| -----                    | -----    |             | ----- | -----         | -----    |
| disk_name<br>(118065481) | system-1 | (118065481) | Pool0 | J8Y0TDZC      | system-1 |
| disk_name<br>(118065481) | system-1 | (118065481) | Pool0 | J8Y09DXC      | system-1 |
| .                        |          |             |       |               |          |
| .                        |          |             |       |               |          |
| .                        |          |             |       |               |          |

6. From the healthy node, verify that any coredumps are saved:

a. Change to the advanced privilege level: `set -privilege advanced`

You can respond `Y` when prompted to continue into advanced mode. The advanced mode prompt appears (`*>`).

b. Verify that the coredumps are saved: `system node run -node local-node-name partner savecore`

If the command output indicates that savecore is in progress, wait for savecore to complete before issuing the giveback. You can monitor the progress of the savecore using the `system node run -node local-node-name partner savecore -s command.</info>`.

c. Return to the admin privilege level: `set -privilege admin`

7. If the *replacement* node is in Maintenance mode (showing the `*>` prompt), exit Maintenance mode and go to the LOADER prompt: `halt`

8. Boot the *replacement* node: `boot_ontap`

9. After the *replacement* node has fully booted, perform a switchback: `metrocluster switchback`

10. Verify the MetroCluster configuration: `metrocluster node show - fields configuration-state`

```
node1_siteA::> metrocluster node show -fields configuration-state
```

| dr-group-id   | cluster node | configuration-state |
|---------------|--------------|---------------------|
| -----         | -----        | -----               |
| 1 node1_siteA | node1mcc-001 | configured          |
| 1 node1_siteA | node1mcc-002 | configured          |
| 1 node1_siteB | node1mcc-003 | configured          |
| 1 node1_siteB | node1mcc-004 | configured          |

```
4 entries were displayed.
```

11. Verify the operation of the MetroCluster configuration in Data ONTAP:

- Check for any health alerts on both clusters: `system health alert show`
- Confirm that the MetroCluster is configured and in normal mode: `metrocluster show`
- Perform a MetroCluster check: `metrocluster check run`
- Display the results of the MetroCluster check: `metrocluster check show`
- Run Config Advisor. Go to the Config Advisor page on the NetApp Support Site at [support.netapp.com/NOW/download/tools/config\\_advisor/](https://support.netapp.com/NOW/download/tools/config_advisor/).

After running Config Advisor, review the tool's output and follow the recommendations in the output to address any issues discovered.

12. Simulate a switchover operation:

- From any node's prompt, change to the advanced privilege level: `set -privilege advanced`  
  
You need to respond with `y` when prompted to continue into advanced mode and see the advanced mode prompt (`*>`).
- Perform the switchback operation with the `-simulate` parameter: `metrocluster switchover -simulate`
- Return to the admin privilege level: `set -privilege admin`

## Step 6: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

## Swap out a power supply - AFF A700

Swapping out a power supply involves turning off, disconnecting, and removing the old power supply and installing, connecting, and turning on the replacement power supply.

All other components in the system must be functioning properly; if not, you must contact technical support.

- The power supplies are redundant and hot-swappable.
- This procedure is written for replacing one power supply at a time.



It is a best practice to replace the power supply within two minutes of removing it from the chassis. The system continues to function, but ONTAP sends messages to the console about the degraded power supply until the power supply is replaced.

- The number of power supplies in the system depends on the model.
- Power supplies are auto-ranging.



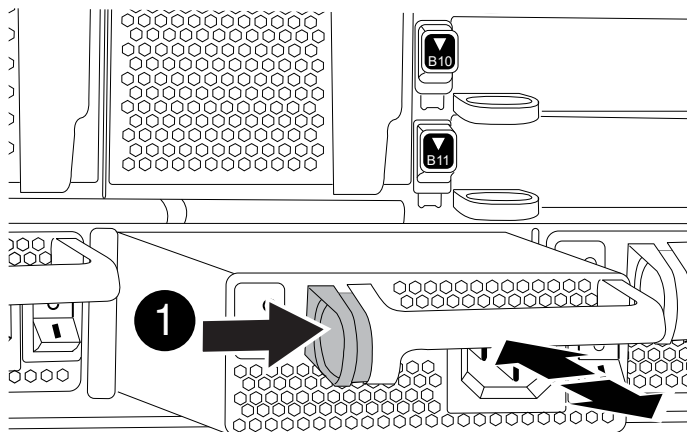
Do not mix PSUs with different efficiency ratings. Always replace like for like.

## Steps

1. Identify the power supply you want to replace, based on console error messages or through the LEDs on the power supplies.
2. If you are not already grounded, properly ground yourself.
3. Turn off the power supply and disconnect the power cables:
  - a. Turn off the power switch on the power supply.
  - b. Open the power cable retainer, and then unplug the power cable from the power supply.
  - c. Unplug the power cable from the power source.
4. Press and hold the orange button on the power supply handle, and then pull the power supply out of the chassis.



When removing a power supply, always use two hands to support its weight.



1

Locking button

5. Make sure that the on/off switch of the new power supply is in the Off position.

6. Using both hands, support and align the edges of the power supply with the opening in the system chassis, and then gently push the power supply into the chassis until it locks into place.

The power supplies are keyed and can only be installed one way.



Do not use excessive force when sliding the power supply into the system. You can damage the connector.

7. Reconnect the power supply cabling:
  - a. Reconnect the power cable to the power supply and the power source.
  - b. Secure the power cable to the power supply using the power cable retainer.

Once power is restored to the power supply, the status LED should be green.

8. Turn on the power to the new power supply, and then verify the operation of the power supply activity LEDs.

The green power LED lights when the PSU is fully inserted into the chassis and the amber attention LED flashes initially, but turns off after a few moments.

9. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

## Replace the real-time clock battery - AFF 700

You replace the real-time clock (RTC) battery in the controller module so that your system's services and applications that depend on accurate time synchronization continue to function.

- You can use this procedure with all versions of ONTAP supported by your system
- All other components in the system must be functioning properly; if not, you must contact technical support.

### Step 1: Shut down the impaired controller

You can shut down or take over the impaired controller using different procedures, depending on the storage system hardware configuration.



## Option 1: Most configurations

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

### About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced` mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

### Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message MAINT=<# of hours>h
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`



When you see *Do you want to disable auto-giveback?*, enter *y*.

3. Take the impaired controller to the LOADER prompt:

| If the impaired controller is displaying... | Then...                                                                                                                                                                                                                                                      |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                           | Go to the next step.                                                                                                                                                                                                                                         |
| Waiting for giveback...                     | Press Ctrl-C, and then respond <i>y</i> when prompted.                                                                                                                                                                                                       |
| System prompt or password prompt            | Take over or halt the impaired controller from the healthy controller: <code>storage failover takeover -ofnode <i>impaired_node_name</i></code><br><br>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i> . |

## Option 2: Controller is in a two-node MetroCluster

To shut down the impaired controller, you must determine the status of the controller and, if necessary,

switch over the controller so that the healthy controller continues to serve data from the impaired controller storage.

#### About this task

- You must leave the power supplies turned on at the end of this procedure to provide power to the healthy controller.

#### Steps

1. Check the MetroCluster status to determine whether the impaired controller has automatically switched over to the healthy controller: `metrocluster show`
2. Depending on whether an automatic switchover has occurred, proceed according to the following table:

| If the impaired controller...                                                                                                                      | Then...                                                                                                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Has automatically switched over                                                                                                                    | Proceed to the next step.                                                                                                                      |
| Has not automatically switched over                                                                                                                | Perform a planned switchover operation from the healthy controller: <code>metrocluster switchover</code>                                       |
| Has not automatically switched over, you attempted switchover with the <code>metrocluster switchover</code> command, and the switchover was vetoed | Review the veto messages and, if possible, resolve the issue and try again. If you are unable to resolve the issue, contact technical support. |

3. Resynchronize the data aggregates by running the `metrocluster heal -phase aggregates` command from the surviving cluster.

```
controller_A_1::> metrocluster heal -phase aggregates
[Job 130] Job succeeded: Heal Aggregates is successful.
```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

4. Verify that the operation has been completed by using the `metrocluster operation show` command.

```
controller_A_1::> metrocluster operation show
Operation: heal-aggregates
State: successful
Start Time: 7/25/2016 18:45:55
End Time: 7/25/2016 18:45:56
Errors: -
```

5. Check the state of the aggregates by using the `storage aggregate show` command.

```

controller_A_1::> storage aggregate show
Aggregate Size Available Used% State #Vols Nodes
RAID Status

...
aggr_b2 227.1GB 227.1GB 0% online 0 mcc1-a2
raid_dp, mirrored, normal...

```

6. Heal the root aggregates by using the `metrocluster heal -phase root-aggregates` command.

```

mcc1A::> metrocluster heal -phase root-aggregates
[Job 137] Job succeeded: Heal Root Aggregates is successful

```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

7. Verify that the heal operation is complete by using the `metrocluster operation show` command on the destination cluster:

```

mcc1A::> metrocluster operation show
Operation: heal-root-aggregates
State: successful
Start Time: 7/29/2016 20:54:41
End Time: 7/29/2016 20:54:42
Errors: -

```

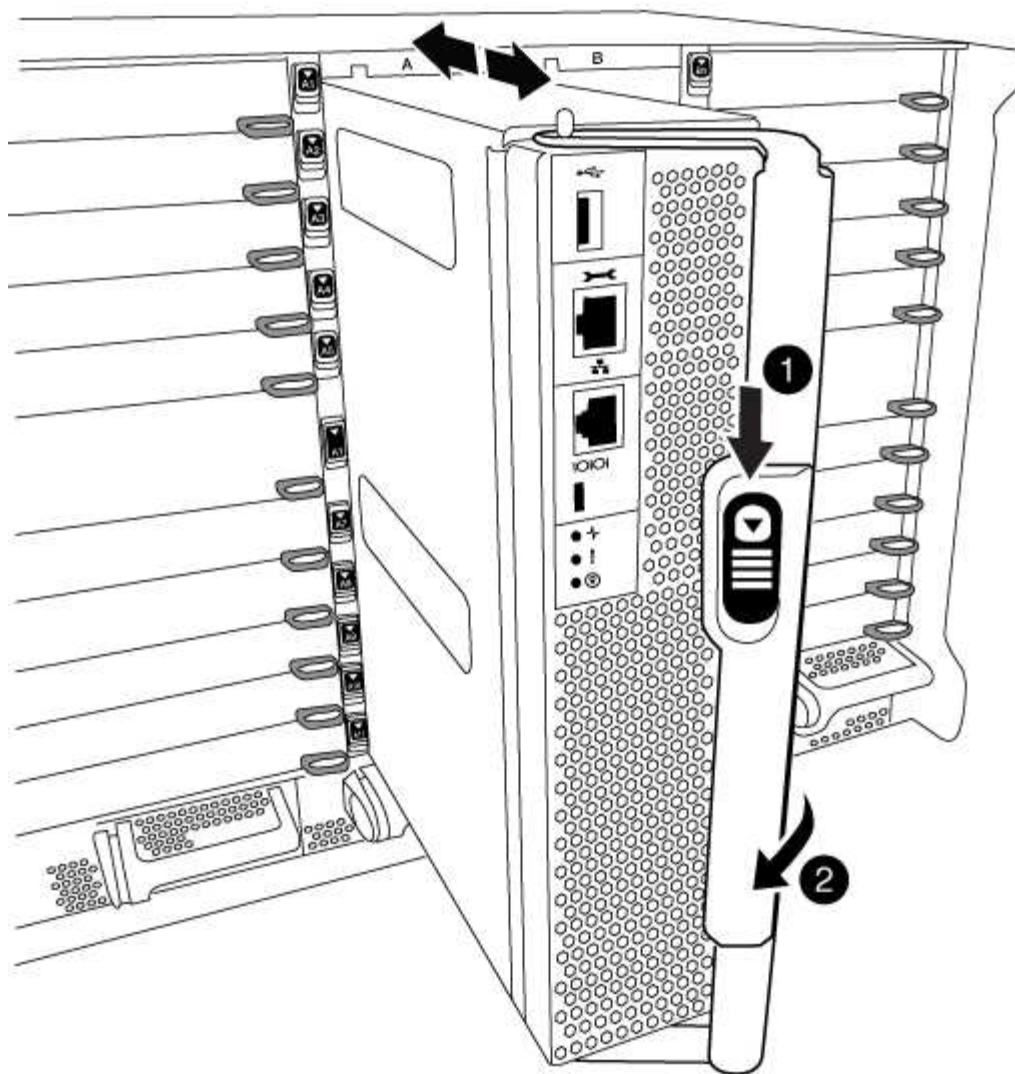
8. On the impaired controller module, disconnect the power supplies.

## Step 2: Remove the controller module

To access components inside the controller, you must first remove the controller module from the system and then remove the cover on the controller module.

### Steps

1. If you are not already grounded, properly ground yourself.
2. Unplug the cables from the impaired controller module, and keep track of where the cables were connected.
3. Slide the orange button on the cam handle downward until it unlocks.



|   |                           |
|---|---------------------------|
| 1 | Cam handle release button |
| 2 | Cam handle                |

4. Rotate the cam handle so that it completely disengages the controller module from the chassis, and then slide the controller module out of the chassis.

Make sure that you support the bottom of the controller module as you slide it out of the chassis.

5. Place the controller module lid-side up on a stable, flat surface, press the blue button on the cover, slide the cover to the back of the controller module, and then swing the cover up and lift it off of the controller module.



1

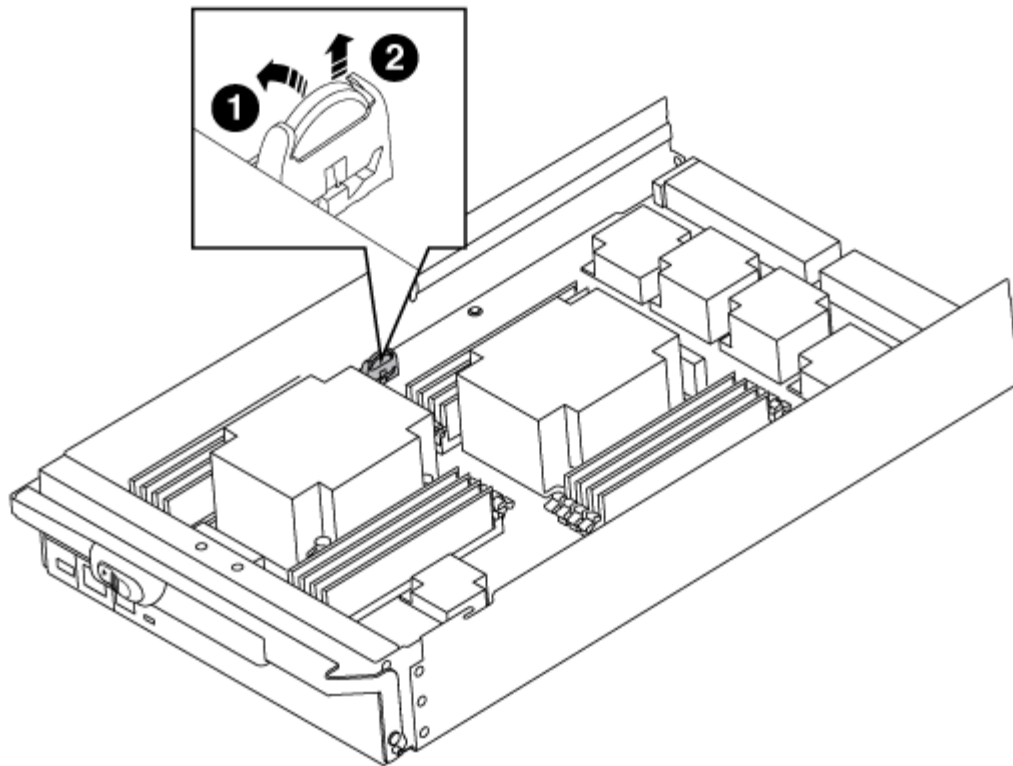
Controller module cover locking button

### Step 3: Replace the RTC battery

To replace the RTC battery, you must locate the failed battery in the controller module, remove it from the holder, and then install the replacement battery in the holder.

#### Steps

1. If you are not already grounded, properly ground yourself.
2. Locate the RTC battery.



|   |                     |
|---|---------------------|
| 1 | RTC battery         |
| 2 | RTC battery housing |

3. Gently push the battery away from the holder, rotate it away from the holder, and then lift it out of the holder.



Note the polarity of the battery as you remove it from the holder. The battery is marked with a plus sign and must be positioned in the holder correctly. A plus sign near the holder tells you how the battery should be positioned.

4. Remove the replacement battery from the antistatic shipping bag.
5. Locate the empty battery holder in the controller module.
6. Note the polarity of the RTC battery, and then insert it into the holder by tilting the battery at an angle and pushing down.
7. Visually inspect the battery to make sure that it is completely installed into the holder and that the polarity is correct.
8. Reinstall the controller module cover.

#### Step 4: Reinstall the controller module and set time/date

After you replace a component within the controller module, you must reinstall the controller module in the system chassis, reset the time and date on the controller, and then boot it.

#### Steps

1. If you have not already done so, close the air duct or controller module cover.
2. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.

Do not completely insert the controller module in the chassis until instructed to do so.

3. Recable the system, as needed.

If you removed the media converters (QSFPs or SFPs), remember to reinstall them if you are using fiber optic cables.

4. If the power supplies were unplugged, plug them back in and reinstall the power cable retainers.
5. Complete the reinstallation of the controller module:

- a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position.



Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.

- b. If you have not already done so, reinstall the cable management device.
  - c. Bind the cables to the cable management device with the hook and loop strap.
  - d. Reconnect the power cables to the power supplies and to the power sources, and then turn on the power to start the boot process.
  - e. Halt the controller at the LOADER prompt.
6. Reset the time and date on the controller:
    - a. Check the date and time on the healthy node with the `show date` command.
    - b. At the LOADER prompt on the target node, check the time and date.
    - c. If necessary, modify the date with the `set date mm/dd/yyyy` command.
    - d. If necessary, set the time, in GMT, using the `set time hh:mm:ss` command.
    - e. Confirm the date and time on the target node.
  7. At the LOADER prompt, enter `bye` to reinitialize the PCIe cards and other components and let the node reboot.
  8. Return the node to normal operation by giving back its storage: `storage failover giveback -ofnode impaired_node_name`
  9. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`

#### Step 5: Switch back aggregates in a two-node MetroCluster configuration

After you have completed the FRU replacement in a two-node MetroCluster configuration, you can perform the MetroCluster switchback operation. This returns the configuration to its normal operating state, with the sync-source storage virtual machines (SVMs) on the formerly impaired site now active and serving data from the local disk pools.

This task only applies to two-node MetroCluster configurations.

#### Steps

1. Verify that all nodes are in the enabled state: `metrocluster node show`

```
cluster_B::> metrocluster node show

DR Configuration DR
Group Cluster Node State Mirroring Mode

1 cluster_A
 controller_A_1 configured enabled heal roots
completed
 cluster_B
 controller_B_1 configured enabled waiting for
switchback recovery
2 entries were displayed.
```

2. Verify that resynchronization is complete on all SVMs: `metrocluster vserver show`
3. Verify that any automatic LIF migrations being performed by the healing operations were completed successfully: `metrocluster check lif show`
4. Perform the switchback by using the `metrocluster switchback` command from any node in the surviving cluster.
5. Verify that the switchback operation has completed: `metrocluster show`

The switchback operation is still running when a cluster is in the **waiting-for-switchback** state:

```
cluster_B::> metrocluster show

Cluster Configuration State Mode

Local: cluster_B configured switchover
Remote: cluster_A configured waiting-for-switchback
```

The switchback operation is complete when the clusters are in the **normal** state.:

```
cluster_B::> metrocluster show

Cluster Configuration State Mode

Local: cluster_B configured normal
Remote: cluster_A configured normal
```

If a switchback is taking a long time to finish, you can check on the status of in-progress baselines by using the `metrocluster config-replication resync-status show` command.

6. Reestablish any SnapMirror or SnapVault configurations.



## Step 6: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

## X91148A module

### Overview of adding an X91148A module - AFF A700

You can add an I/O module to your system by either replacing a NIC or storage adapter with a new one in a fully-populated system, or by adding a new NIC or storage adapter into an empty chassis slot in your system.

#### Before you begin

- Check the [NetApp Hardware Universe](#) to make sure that the new I/O module is compatible with your system and version of ONTAP you're running.
- If multiple slots are available, check the slot priorities in [NetApp Hardware Universe](#) and use the best one available for your I/O module.
- To non-disruptively add an I/O module, you must takeover the target controller, remove the slot blanking cover in the target slot or remove an existing I/O module, add the new or replacement I/O module, and then giveback the target controller.
- Make sure that all other components are functioning properly.

### Add an X91148A module in a system with open slots - A700

You can add an X91148A module into an empty module slot in your system as either a 100GbE NIC or a storage module for the NS224 storage shelves.

- Your system must be running ONTAP 9.8 and later.
- To non-disruptively add the X91148A module, you must takeover the target controller, remove the slot blanking cover in the target slot, add the module, and then giveback the target controller.
- There must be one or more open slots available on your system.
- If multiple slots are available, install the module according to the slot priority matrix for the X91148A module in the [NetApp Hardware Universe](#).
- If you are adding the X91148A module as a storage module, you must install the module slots 3 and/or 7.
- If you are adding the X91148A module as a 100GbE NIC, you can use any open slot. However, by default, slots 3 and 7 are set as storage slots. If you wish to use those slots as network slots and will not add NS224 shelves, you must modify the slots for networking use with the `storage port modify -node node name -port port name -mode network` command. See the [NetApp Hardware Universe](#) for other slots that can be used by the X91148A module for networking.
- All other components in the system must be functioning properly; if not, you must contact technical support.

### Option 1: Add an X91148A module as a NIC module

To add an X91148A module as a NIC module in a system with open slots, you must follow the specific sequence of steps.

#### Steps

1. Shutdown controller A:
  - a. Disable automatic giveback: `storage failover modify -node local -auto-giveback false`
  - b. Take over the target node: `storage failover takeover -ofnode target_node_name`  
  
The console connection shows that the node drops to the LOADER prompt when the takeover is complete.
2. If you are not already grounded, properly ground yourself.
3. Remove the target slot blanking cover:
  - a. Depress the lettered and numbered cam button.
  - b. Rotate the cam latch down until it is in a horizontal position.
  - c. Remove the blanking cover.
4. Install the X91148A module:
  - a. Align the X91148A module with the edges of the slot.
  - b. Slide the X91148A module into the slot until the lettered and numbered I/O cam latch begins to engage with the I/O cam pin.
  - c. Push the I/O cam latch all the way up to lock the module in place.
5. Cable the module to the data switches.
6. Reboot controller A from the LOADER prompt: `bye`



This reinitializes the PCIe cards and other components and reboots the node.

7. Giveback the node from the partner node: `storage failover giveback -ofnode target_node_name`
8. Enable automatic giveback if it was disabled: `storage failover modify -node local -auto-giveback true`
9. Repeat these steps for controller B.

### Option 2: Add an X91148A module as a storage module

To add an X91148A module as a storage module in a system with open slots, you must follow the specific sequence of steps.

- This procedure presumes slots 3 and/or 7 are open.

#### Steps

1. Shut down controller A:
  - a. Disable automatic giveback: `storage failover modify -node local -auto-giveback false`

b. Take over the target node: `storage failover takeover -ofnode target_node_name`

The console connection shows that the node drops to the LOADER prompt when the takeover is complete.

2. If you are not already grounded, properly ground yourself.
3. Remove the target slot blanking cover:
  - a. Depress the lettered and numbered cam button.
  - b. Rotate the cam latch down until it is in a horizontal position.
  - c. Remove the blanking cover.
4. Install the X91148A module into slot 3:
  - a. Align the X91148A module with the edges of the slot.
  - b. Slide the X91148A module into the slot until the lettered and numbered I/O cam latch begins to engage with the I/O cam pin.
  - c. Push the I/O cam latch all the way up to lock the module in place.
  - d. If you are installing a second X91148A module for storage, repeat this step for the module in slot 7.
5. Reboot controller A:
  - If the replacement module is not the same model as the old module, reboot the BMC :
    - a. From the LOADER prompt, change to advanced privilege mode: `set -privilege advanced`
    - b. Reboot the BMC: `sp reboot`
  - If the replacement module is the same as the old module, boot from the LOADER prompt: `bye`



This reinitializes the PCIe cards and other components and reboots the node.

6. Giveback the node from the partner node: `storage failover giveback -ofnode target_node_name`
7. Enable automatic giveback if it was disabled: `storage failover modify -node local -auto-giveback true`
8. Repeat these steps for controller B.
9. Install and cable your NS224 shelves, as described in [Hot-add - NS224 shelves](#).

#### Add an X91148A storage module in a system with no open slots - A700

You must remove one more or more existing NIC or storage modules in your system in order to install one or more X91148A storage modules into your fully-populated system.

- Your system must be running ONTAP 9.8 and later.
- To non-disruptively add the X91148A module, you must takeover the target controller, add the module, and then giveback the target controller.
- If you are adding the X91148A module as a storage adapter, you must install the module in slots 3 and/or 7.

- If you are adding the X91148A module as a 100GbE NIC, you can use any open slot. However, by default, slots 3 and 7 are set as storage slots. If you wish to use those slots as network slots and will not add NS224 shelves, you must modify the slots for networking use with the `storage port modify -node node name -port port name -mode network` command for each port. See the [NetApp Hardware Universe](#) for other slots that can be used by the X91148A module for networking.
- All other components in the system must be functioning properly; if not, you must contact technical support.

### Option 1: Add an X91148A module as a NIC module

You must remove one or more existing NIC or storage modules in your system in order to install one or more X91148A NIC modules into your fully-populated system.

#### Steps

1. If you are adding an X91148A module into a slot that contains a NIC module with the same number of ports as the X91148A module, the LIFs will automatically migrate when its controller module is shut down. If the NIC module being replaced has more ports than the X91148A module, you must permanently reassign the affected LIFs to a different home port. See [Migrating a LIF](#) for information about using System Manager to permanently move the LIFs

2. Shut down controller A:

- a. Disable automatic giveback: `storage failover modify -node local -auto-giveback false`

- b. Take over the target node: `storage failover takeover -ofnode target_node_name`

The console connection shows that the node drops to the LOADER prompt when the takeover is complete.

3. If you are not already grounded, properly ground yourself.

4. Unplug any cabling on the target I/O module.

5. Remove the target I/O module from the chassis:

- a. Depress the lettered and numbered cam button.

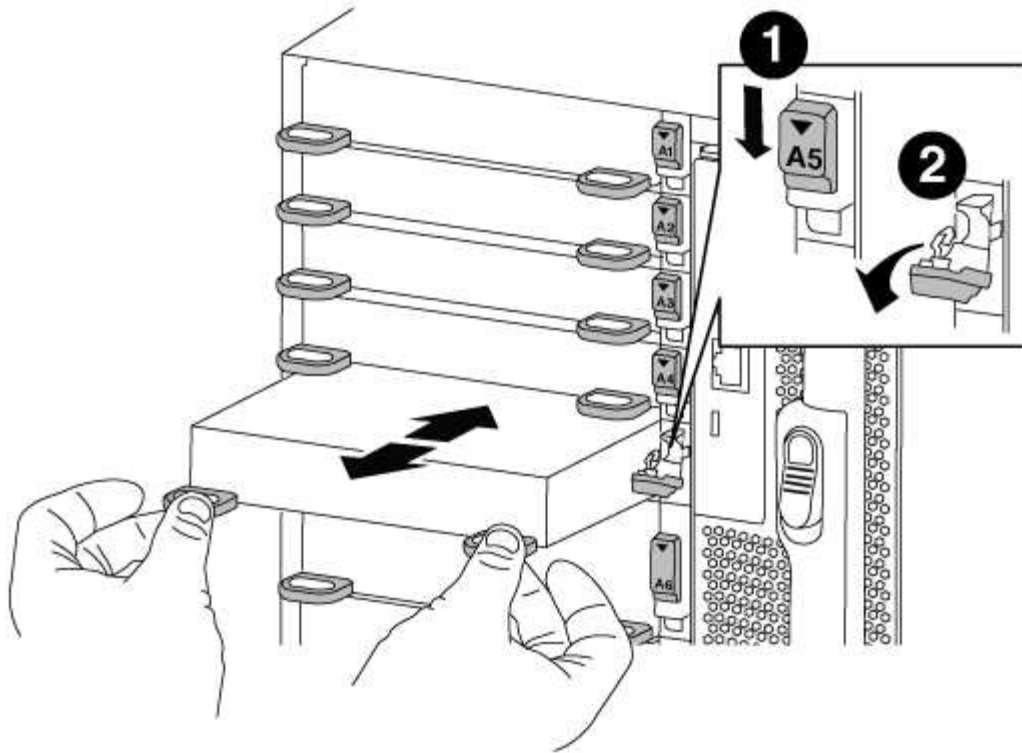
The cam button moves away from the chassis.

- b. Rotate the cam latch down until it is in a horizontal position.

The I/O module disengages from the chassis and moves about 1/2 inch out of the I/O slot.

- c. Remove the I/O module from the chassis by pulling on the pull tabs on the sides of the module face.

Make sure that you keep track of which slot the I/O module was in.



|   |                                     |
|---|-------------------------------------|
| 1 | Lettered and numbered I/O cam latch |
| 2 | I/O cam latch completely unlocked   |

6. Install the X91148A module into the target slot:
  - a. Align the X91148A module with the edges of the slot.
  - b. Slide the X91148A module into the slot until the lettered and numbered I/O cam latch begins to engage with the I/O cam pin.
  - c. Push the I/O cam latch all the way up to lock the module in place.
7. Repeat the remove and install steps to replace additional modules for controller A.
8. Cable the module or modules to the data switches.
9. Reboot controller A from the LOADER prompt: `bye`



This reinitializes the PCIe cards and other components and reboots the node.

10. Giveback the node from the partner node: `storage failover giveback -ofnode target_node_name`
11. Enable automatic giveback if it was disabled: `storage failover modify -node local -auto-giveback true`
12. If you added the X91148A module as a NIC module in slots 3 or 7, for networking, use the `storage port modify -node node name -port port name -mode network` command for each port.

13. Repeat these steps for controller B.

### Option 2: Adding an X91148A module as a storage module

You must remove one or more existing NIC or storage modules in your system in order to install one or more X91148A storage modules into your fully-populated system.

- This procedure presumes you re installing the X91148A module into slots 3 and/or 7.

#### Steps

1. If you are adding an X91148A module as a storage module in slots 3 and/or 7 into a slot that has an existing NIC module in it, use System Manager to permanently migrate the LIFs to different home ports, as described in [Migrating a LIF](#).

2. Shut down controller A:

a. Disable automatic giveback: `storage failover modify -node local -auto-giveback false`

b. Take over the target node: `storage failover takeover -ofnode target_node_name`

The console connection shows that the node drops to the LOADER prompt when the takeover is complete.

3. If you are not already grounded, properly ground yourself.

4. Unplug any cabling on the target I/O module.

5. Remove the target I/O module from the chassis:

a. Depress the lettered and numbered cam button.

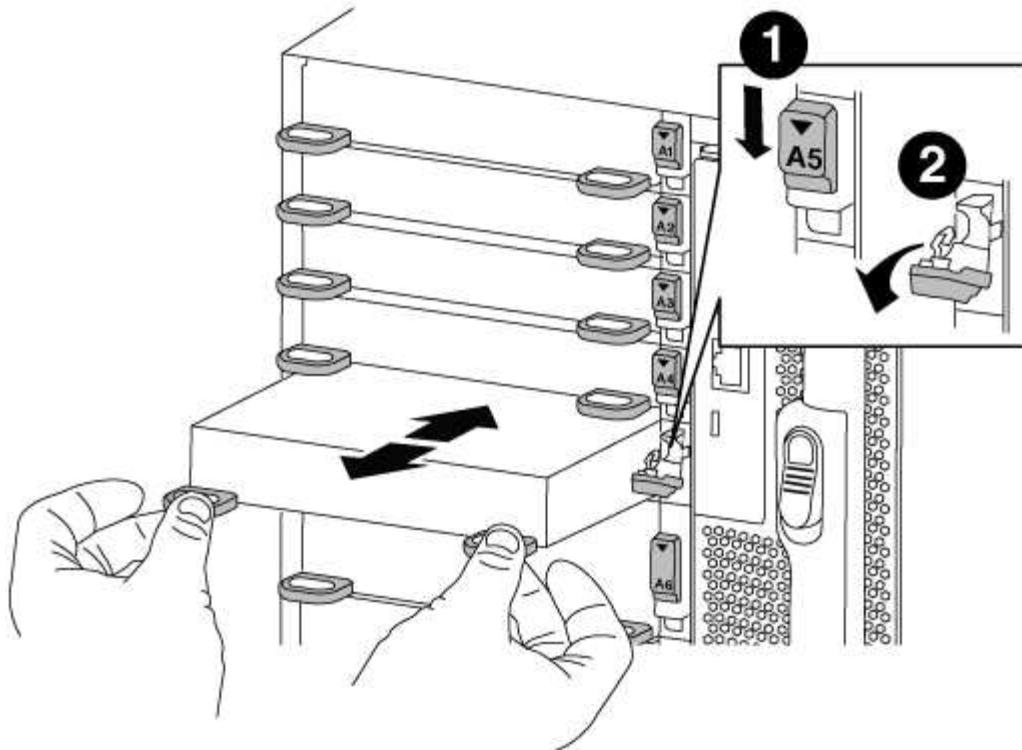
The cam button moves away from the chassis.

b. Rotate the cam latch down until it is in a horizontal position.

The I/O module disengages from the chassis and moves about 1/2 inch out of the I/O slot.

c. Remove the I/O module from the chassis by pulling on the pull tabs on the sides of the module face.

Make sure that you keep track of which slot the I/O module was in.



|          |                                     |
|----------|-------------------------------------|
| <b>1</b> | Lettered and numbered I/O cam latch |
| <b>2</b> | I/O cam latch completely unlocked   |

6. Install the X91148A module into slot 3:

- Align the X91148A module with the edges of the slot.
- Slide the X91148A module into the slot until the lettered and numbered I/O cam latch begins to engage with the I/O cam pin.
- Push the I/O cam latch all the way up to lock the module in place.
- If you are installing a second X91148A module for storage, repeat the remove and install steps for the module in slot 7.

7. Reboot controller A from the LOADER prompt: `bye`



This reinitializes the PCIe cards and other components and reboots the node.

8. Giveback the node from the partner node: `storage failover giveback -ofnode target_node_name`

9. Enable automatic giveback if it was disabled: `storage failover modify -node local -auto-giveback true`

10. Repeat these steps for controller B.

11. Install and cable your NS224 shelves, as described in [Hot-adding an NS224 drive shelf](#).



# AFF A700s systems

## Install and setup

### Cluster configuration worksheet - AFF A700s

You can use the worksheet to gather and record your site-specific IP addresses and other information required when configuring an ONTAP cluster.

[Cluster Configuration Worksheet](#)

### Start here: Choose your installation and setup experience

You can choose from different content formats to guide you through installing and setting up your new storage system.

- [Quick steps](#)

A printable PDF of step-by-step instructions with live links to additional content.

- [Video steps](#)

Video step-by-step instructions.

### Installation and setup PDF poster - AFF A700s

You can use the PDF poster to install and set up your new system. The PDF poster provides step-by-step instructions with live links to additional content.

[AFF A700s Installation and Setup Instructions](#)

### Installation and setup video - AFF A700s

The following video shows end-to-end software configuration for systems running ONTAP 9.2.

[AFF A700s Setup Video](#)

## Maintain

### Maintain AFF A700s hardware

For the AFF A700s storage system, you can perform maintenance procedures on the following components.

#### Boot media

The boot media stores a primary and secondary set of boot image files that the system uses when it boots.

## **Chassis**

The chassis is the physical enclosure housing all the controller components such as the controller/CPU unit, power supply, and I/O.

## **Controller**

A controller consists of a board, firmware, and software. It controls the drives and implements the ONTAP functions.

## **DIMM**

You must replace a DIMM (dual in-line memory module) when a memory mismatch is present, or you have a failed DIMM.

## **Drive**

A drive is a device that provides the physical storage media for data.

## **Fan**

The fan cools the controller.

## **NVRAM battery**

A battery is included with the controller and provides the backup power if the AC power fails.

## **NVRAM module**

The NVRAM module (non-volatile random-access memory) preserves cached data if the power fails.

## **PCIe card**

A PCIe (peripheral component interconnect express) card is an expansion card that plugs into the PCIe slot on the motherboard.

## **Power supply**

A power supply provides a redundant power source in a controller shelf.

## **Real-time clock battery**

A real time clock battery preserves system date and time information if the power is off.

## **Boot media**

### **Overview of boot media replacement - AFF A700s**

The primary boot media stores the ONTAP boot image that the system uses when it boots. You can restore the primary boot media image by using the ONTAP image on the secondary boot media, or if necessary, by using a USB flash drive.

If your secondary boot media has failed or is missing the image.tgz file, you must restore the primary boot media using a USB flash drive. The drive must be formatted to FAT32 and must have the appropriate amount of storage to hold the image\_XXX.tgz file.

- The replacement process restores the var file system from the secondary boot media or USB flash drive to the primary boot media.
- You must replace the failed component with a replacement FRU component you received from your provider.
- It is important that you apply the commands in these steps on the correct controller:
  - The *impaired* controller is the controller on which you are performing maintenance.
  - The *healthy* controller is the HA partner of the impaired controller.

#### Check onboard encryption keys - AFF A700s

Prior to shutting down the impaired controller and checking the status of the onboard encryption keys, you must check the status of the impaired controller, disable automatic giveback, and check which version of ONTAP is running on the system.

If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see the [Synchronize a node with the cluster](#).

#### Steps

1. Check the status of the impaired controller:
  - If the impaired controller is at the login prompt, log in as `admin`.
  - If the impaired controller is at the LOADER prompt and is part of HA configuration, log in as `admin` on the healthy controller.
  - If the impaired controller is in a standalone configuration and at LOADER prompt, contact [mysupport.netapp.com](https://mysupport.netapp.com).

2. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message
MAINT=number_of_hours_downh
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:*>`

```
system node autosupport invoke -node * -type all -message MAINT=2h
```

3. Check the version of ONTAP the system is running on the impaired controller if up, or on the partner controller if the impaired controller is down, using the `version -v` command:
  - If `<Ino-DARE>` or `<1Ono-DARE>` is displayed in the command output, the system does not support NVE, proceed to shut down the controller.
  - If `<Ino-DARE>` is not displayed in the command output, and the system is running ONTAP 9.5, go to [Option 1: Check NVE or NSE on systems running ONTAP 9.5 and earlier](#).
  - If `<Ino-DARE>` is not displayed in the command output, and the system is running ONTAP 9.6 or later, go to [Option 2: Check NVE or NSE on systems running ONTAP 9.6 and later](#).
4. If the impaired controller is part of an HA configuration, disable automatic giveback from the healthy controller: `storage failover modify -node local -auto-giveback false` or `storage failover modify -node local -auto-giveback-after-panic false`

#### Option 1: Check NVE or NSE on systems running ONTAP 9.5 and earlier

Before shutting down the impaired controller, you need to check whether the system has either NetApp Volume

Encryption (NVE) or NetApp Storage Encryption (NSE) enabled. If so, you need to verify the configuration.

### Steps

1. Connect the console cable to the impaired controller.
2. Check whether NVE is configured for any volumes in the cluster: `volume show -is-encrypted true`

If any volumes are listed in the output, NVE is configured and you need to verify the NVE configuration. If no volumes are listed, check whether NSE is configured.

3. Check whether NSE is configured: `storage encryption disk show`
  - If the command output lists the drive details with Mode & Key ID information, NSE is configured and you need to verify the NSE configuration.
  - If NVE and NSE are not configured, it's safe to shut down the impaired controller.

### Verify NVE configuration

#### Steps

1. Display the key IDs of the authentication keys that are stored on the key management servers: `security key-manager query`
  - If the `Restored` column displays `yes` and all key managers display `available`, it's safe to shut down the impaired controller.
  - If the `Restored` column displays anything other than `yes`, or if any key manager displays `unavailable`, you need to complete some additional steps.
  - If you see the message `This command is not supported when onboard key management is enabled`, you need to complete some other additional steps.
2. If the `Restored` column displayed anything other than `yes`, or if any key manager displayed `unavailable`:
  - a. Retrieve and restore all authentication keys and associated key IDs: `security key-manager restore -address *`  
  
If the command fails, contact NetApp Support.  
  
[mysupport.netapp.com](https://mysupport.netapp.com)
  - b. Verify that the `Restored` column displays `yes` for all authentication keys and that all key managers display `available`: `security key-manager query`
  - c. Shut down the impaired controller.
3. If you saw the message `This command is not supported when onboard key management is enabled`, display the keys stored in the onboard key manager: `security key-manager key show -detail`
  - a. If the `Restored` column displays `yes` manually back up the onboard key management information:
    - Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
    - Enter the command to display the OKM backup information: `security key-manager backup show`
    - Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.

- Return to admin mode: `set -priv admin`
- Shut down the impaired controller.

b. If the Restored column displays anything other than yes:

- Run the key-manager setup wizard: `security key-manager setup -node target/impaired node name`



Enter the customer's onboard key management passphrase at the prompt. If the passphrase cannot be provided, contact [mysupport.netapp.com](https://mysupport.netapp.com)

- Verify that the Restored column displays yes for all authentication key: `security key-manager key show -detail`
- Go to advanced privilege mode and enter y when prompted to continue: `set -priv advanced`
- Enter the command to display the OKM backup information: `security key-manager backup show`
- Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
- Return to admin mode: `set -priv admin`
- You can safely shutdown the controller.

## Verify NSE configuration

### Steps

1. Display the key IDs of the authentication keys that are stored on the key management servers: `security key-manager query`
  - If the Restored column displays yes and all key managers display available, it's safe to shut down the impaired controller.
  - If the Restored column displays anything other than yes, or if any key manager displays unavailable, you need to complete some additional steps.
  - If you see the message This command is not supported when onboard key management is enabled, you need to complete some other additional steps
2. If the Restored column displayed anything other than yes, or if any key manager displayed unavailable:
  - a. Retrieve and restore all authentication keys and associated key IDs: `security key-manager restore -address *`  
  
If the command fails, contact NetApp Support.  
  
[mysupport.netapp.com](https://mysupport.netapp.com)
  - b. Verify that the Restored column displays yes for all authentication keys and that all key managers display available: `security key-manager query`
  - c. Shut down the impaired controller.
3. If you saw the message This command is not supported when onboard key management is enabled, display the keys stored in the onboard key manager: `security key-manager key show -detail`

- a. If the `Restored` column displays `yes`, manually back up the onboard key management information:
  - Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
  - Enter the command to display the OKM backup information: `security key-manager backup show`
  - Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
  - Return to admin mode: `set -priv admin`
  - Shut down the impaired controller.
- b. If the `Restored` column displays anything other than `yes`:
  - Run the key-manager setup wizard: `security key-manager setup -node target/impaired node name`



Enter the customer's OKM passphrase at the prompt. If the passphrase cannot be provided, contact [mysupport.netapp.com](https://mysupport.netapp.com)

- Verify that the `Restored` column shows `yes` for all authentication keys: `security key-manager key show -detail`
- Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
- Enter the command to back up the OKM information: `security key-manager backup show`



Make sure that OKM information is saved in your log file. This information will be needed in disaster scenarios where OKM might need to be manually recovered.

- Copy the contents of the backup information to a separate file or your log. You'll need it in disaster scenarios where you might need to manually recover OKM.
- Return to admin mode: `set -priv admin`
- You can safely shut down the controller.

## Option 2: Check NVE or NSE on systems running ONTAP 9.6 and later

Before shutting down the impaired controller, you need to verify whether the system has either NetApp Volume Encryption (NVE) or NetApp Storage Encryption (NSE) enabled. If so, you need to verify the configuration.

1. Verify whether NVE is in use for any volumes in the cluster: `volume show -is-encrypted true`

If any volumes are listed in the output, NVE is configured and you need to verify the NVE configuration. If no volumes are listed, check whether NSE is configured and in use.

2. Verify whether NSE is configured and in use: `storage encryption disk show`
  - If the command output lists the drive details with Mode & Key ID information, NSE is configured and you need to verify the NSE configuration and in use.
  - If no disks are shown, NSE is not configured.
  - If NVE and NSE are not configured, no drives are protected with NSE keys, it's safe to shut down the impaired controller.

## Verify NVE configuration

1. Display the key IDs of the authentication keys that are stored on the key management servers: `security key-manager key query`



After the ONTAP 9.6 release, you may have additional key manager types. The types are KMIP, AKV, and GCP. The process for confirming these types is the same as confirming external or onboard key manager types.

- If the Key Manager type displays `external` and the Restored column displays `yes`, it's safe to shut down the impaired controller.
  - If the Key Manager type displays `onboard` and the Restored column displays `yes`, you need to complete some additional steps.
  - If the Key Manager type displays `external` and the Restored column displays anything other than `yes`, you need to complete some additional steps.
  - If the Key Manager type displays `onboard` and the Restored column displays anything other than `yes`, you need to complete some additional steps.
2. If the Key Manager type displays `onboard` and the Restored column displays `yes`, manually back up the OKM information:
    - a. Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
    - b. Enter the command to display the key management information: `security key-manager onboard show-backup`
    - c. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
    - d. Return to admin mode: `set -priv admin`
    - e. Shut down the impaired controller.
  3. If the Key Manager type displays `external` and the Restored column displays anything other than `yes`:
    - a. Restore the external key management authentication keys to all nodes in the cluster: `security key-manager external restore`  
  
If the command fails, contact NetApp Support.  
  
[mysupport.netapp.com](https://mysupport.netapp.com)
    - b. Verify that the Restored column equals `yes` for all authentication keys: `security key-manager key query`
    - c. Shut down the impaired controller.
  4. If the Key Manager type displays `onboard` and the Restored column displays anything other than `yes`:
    - a. Enter the onboard security key-manager sync command: `security key-manager onboard sync`



Enter the customer's 32 character, alphanumeric onboard key management passphrase at the prompt. If the passphrase cannot be provided, contact NetApp Support.  
[mysupport.netapp.com](https://mysupport.netapp.com)

- b. Verify the Restored column shows yes for all authentication keys: `security key-manager key query`
- c. Verify that the Key Manager type shows onboard, and then manually back up the OKM information.
- d. Go to advanced privilege mode and enter y when prompted to continue: `set -priv advanced`
- e. Enter the command to display the key management backup information: `security key-manager onboard show-backup`
- f. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
- g. Return to admin mode: `set -priv admin`
- h. You can safely shut down the controller.

## Verify NSE configuration

1. Display the key IDs of the authentication keys that are stored on the key management servers: `security key-manager key query -key-type NSE-AK`



After the ONTAP 9.6 release, you may have additional key manager types. The types are KMIP, AKV, and GCP. The process for confirming these types is the same as confirming external or onboard key manager types.

- If the Key Manager type displays external and the Restored column displays yes, it's safe to shut down the impaired controller.
  - If the Key Manager type displays onboard and the Restored column displays yes, you need to complete some additional steps.
  - If the Key Manager type displays external and the Restored column displays anything other than yes, you need to complete some additional steps.
  - If the Key Manager type displays external and the Restored column displays anything other than yes, you need to complete some additional steps.
2. If the Key Manager type displays onboard and the Restored column displays yes, manually back up the OKM information:
    - a. Go to advanced privilege mode and enter y when prompted to continue: `set -priv advanced`
    - b. Enter the command to display the key management information: `security key-manager onboard show-backup`
    - c. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
    - d. Return to admin mode: `set -priv admin`
    - e. You can safely shut down the controller.
  3. If the Key Manager type displays external and the Restored column displays anything other than yes:
    - a. Restore the external key management authentication keys to all nodes in the cluster: `security key-manager external restore`

If the command fails, contact NetApp Support.



- b. Verify that the Restored column equals yes for all authentication keys: `security key-manager key query`
  - c. You can safely shut down the controller.
4. If the Key Manager type displays onboard and the Restored column displays anything other than yes:
- a. Enter the onboard security key-manager sync command: `security key-manager onboard sync`
- Enter the customer's 32 character, alphanumeric onboard key management passphrase at the prompt. If the passphrase cannot be provided, contact NetApp Support.

- b. Verify the Restored column shows yes for all authentication keys: `security key-manager key query`
- c. Verify that the Key Manager type shows onboard, and then manually back up the OKM information.
- d. Go to advanced privilege mode and enter y when prompted to continue: `set -priv advanced`
- e. Enter the command to display the key management backup information: `security key-manager onboard show-backup`
- f. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
- g. Return to admin mode: `set -priv admin`
- h. You can safely shut down the controller.

#### Shut down the controller - AFF A700s

After completing the NVE or NSE tasks, you need to complete the shutdown of the impaired controller.

#### Steps

- a. Take the impaired controller to the LOADER prompt:

| If the impaired controller displays...                   | Then...                                                                                                                                                                                                                                                |
|----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                                        | Go to Remove controller module.                                                                                                                                                                                                                        |
| Waiting for giveback...                                  | Press Ctrl-C, and then respond y when prompted.                                                                                                                                                                                                        |
| System prompt or password prompt (enter system password) | <p>Take over or halt the impaired controller from the healthy controller:</p> <pre>storage failover takeover -ofnode<br/>impaired_node_name</pre> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond y.</p> |

- b. From the LOADER prompt, enter: `printenv` to capture all boot environmental variables. Save the output to your log file.



This command may not work if the boot device is corrupted or non-functional.

### Replace the boot media - AFF A700s

You must remove the controller module from the chassis, open it, and then replace the failed boot media.

#### Step 1: Remove the controller module

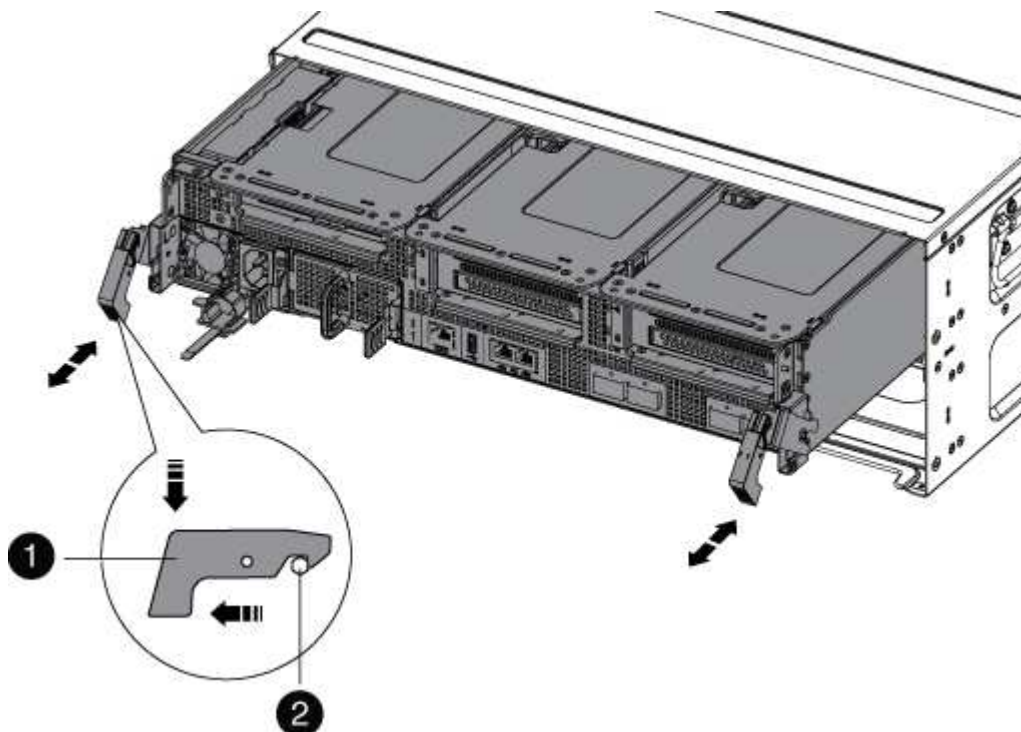
You must remove the controller module from the chassis when you replace the controller module or replace a component inside the controller module.

1. If you are not already grounded, properly ground yourself.
2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

3. Unplug the controller module power supply from the source, and then unplug the cable from the power supply.
4. Remove the cable management device from the controller module and set it aside.
5. Press down on both of the locking latches, and then rotate both latches downward at the same time.

The controller module moves slightly out of the chassis.

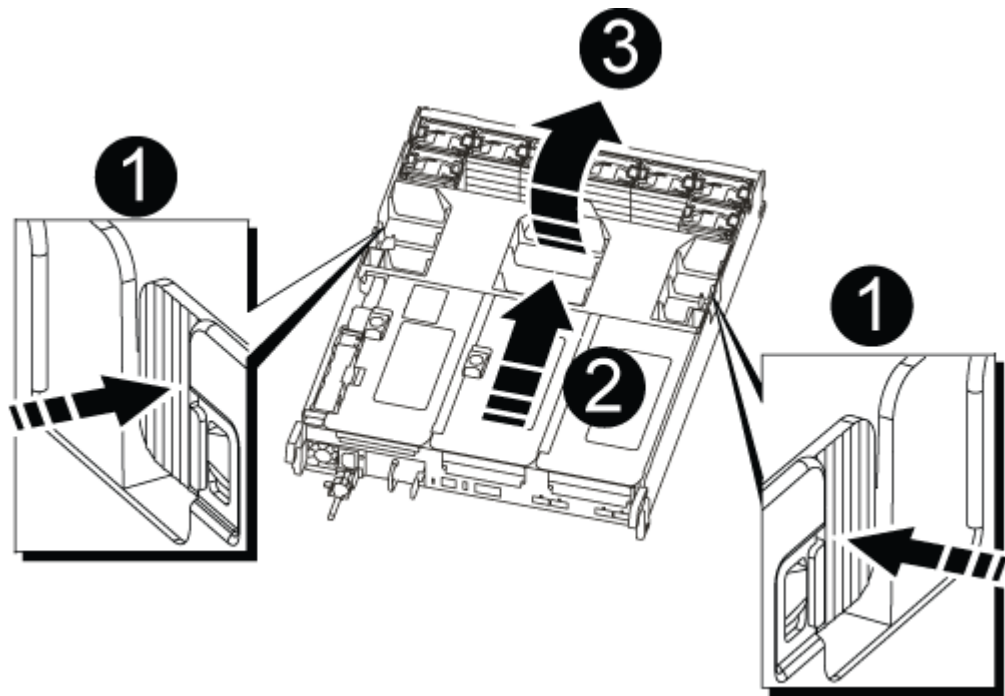


|   |               |
|---|---------------|
| 1 | Locking latch |
| 2 | Locking pin   |

1. Slide the controller module out of the chassis.

Make sure that you support the bottom of the controller module as you slide it out of the chassis.

2. Place the controller module on a stable, flat surface, and then open the air duct:
- Press in the locking tabs on the sides of the air duct toward the middle of the controller module.
  - Slide the air duct toward the fan modules, and then rotate it upward to its completely open position.



|   |                       |
|---|-----------------------|
| 1 | Air duct locking tabs |
| 2 | Risers                |
| 3 | Air duct              |

**Step 2: Replace the boot media - AFF A700s**

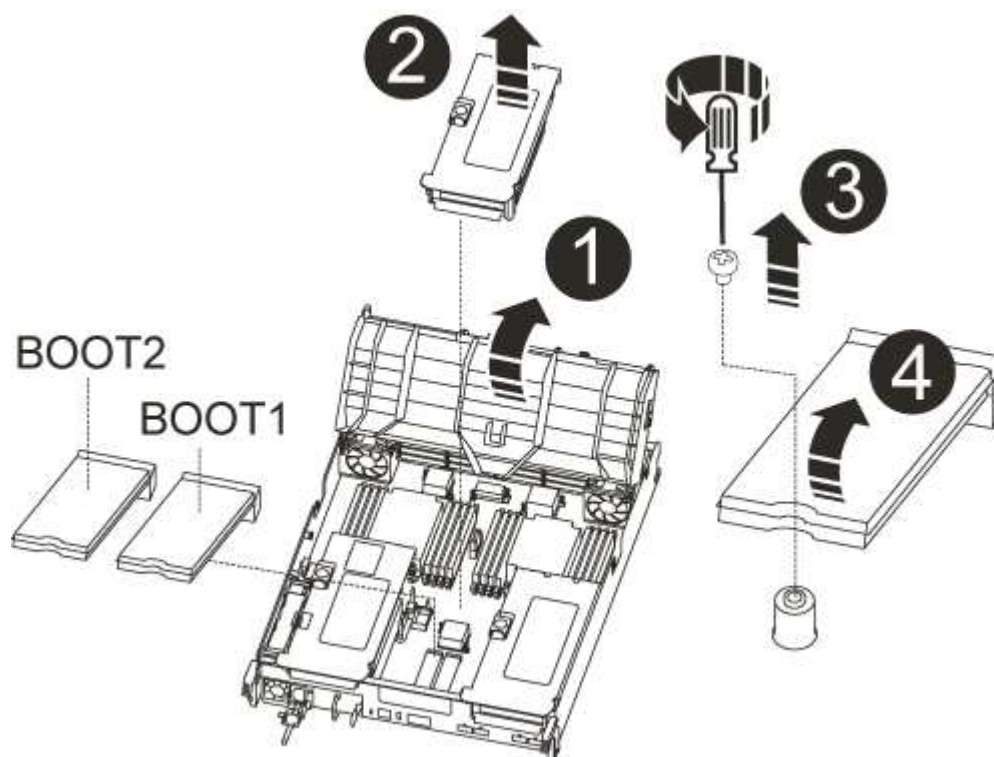
You must locate the failed boot media in the controller module by removing the middle PCIe module on the controller module, locate the failed boot media, and then replace the boot media.

You need a Phillips head screwdriver to remove the screw that holds the boot media in place.

- If you are not already grounded, properly ground yourself.

2. Locate the boot media:

- a. Open the air duct, if needed.
- b. If needed, remove Riser 2, the middle PCIe module, by unlocking the locking latch and then removing the riser from the controller module.



|   |                              |
|---|------------------------------|
| 1 | Air duct                     |
| 2 | Riser 2 (middle PCIe module) |
| 3 | Boot media screw             |
| 4 | Boot media                   |

3. Locate the failed boot media.

4. Remove the boot media from the controller module:

- a. Using a #1 Phillips head screwdriver, remove the screw holding down the boot media and set the screw aside in a safe place.
- b. Grasping the sides of the boot media, gently rotate the boot media up, and then pull the boot media straight out of the socket and set it aside.

5. Align the edges of the replacement boot media with the boot media socket, and then gently push it into the socket.

6. Check the boot media to make sure that it is seated squarely and completely in the socket.

If necessary, remove the boot media and reseal it into the socket.

7. Rotate the boot media down until it is flush with the motherboard.
8. Secure the boot media in place by using the screw.



Do not over-tighten the screw. Doing so might crack the boot media circuit board.

9. Reinstall the riser into the controller module.
10. Close the air duct:
  - a. Rotate the air duct downward.
  - b. Slide the air duct toward the risers until it clicks into place.

#### **Transfer the boot image to the boot media - AFF A700s**

You can install the system image to the replacement boot media using by using either the image on second boot media installed in the controller module, the primary method to restore the system image, or by transferring the boot image to the boot media using a USB flash drive when the secondary boot media restore failed or if the `image.tgz` file is not found on the secondary boot media.

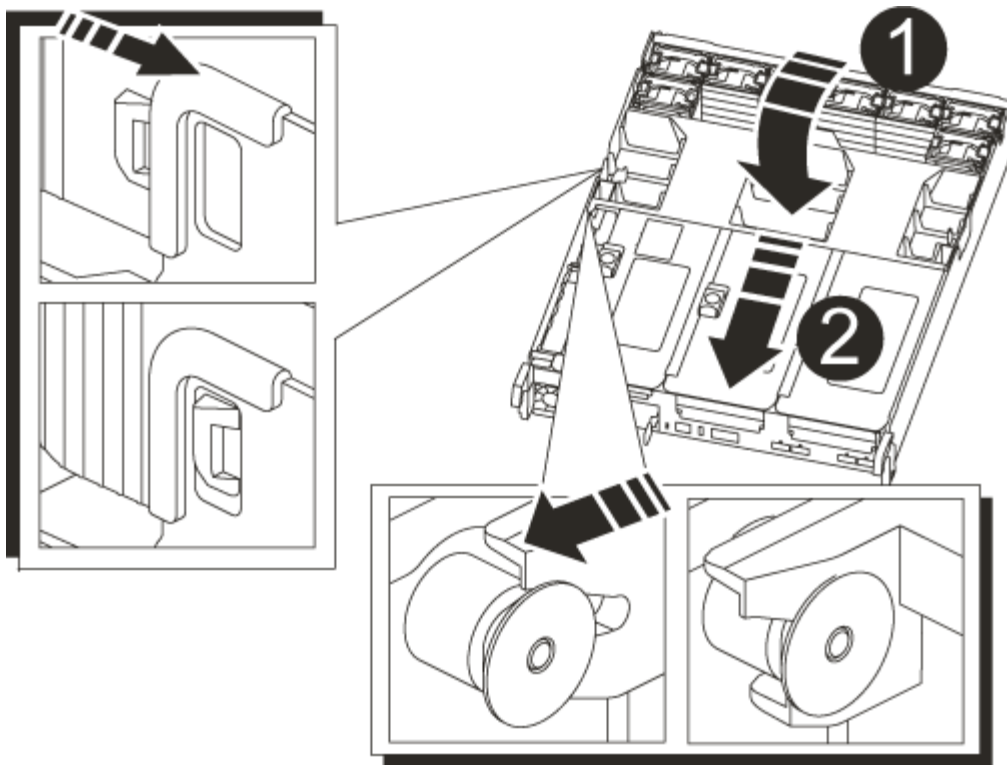
#### **Option 1: Transfer files to the boot media using backup recovery from the second boot media**

You can install the system image to the replacement boot media using the image on second boot media installed in the controller module. This is the primary method for transferring the boot media files to the replacement boot media in systems with two boot media in the controller module.

The image on the secondary boot media must contain an `image.tgz` file and must not be reporting failures. If `image.tgz` file is missing or the boot media reports failures, you cannot use this procedure. You must transfer the boot image to the replacement boot media using the USB flash drive replacement procedure.

#### **Steps**

1. If you are not already grounded, properly ground yourself.
2. If you have not already done so, close the air duct:
  - a. Swing the air duct all the way down to the controller module.
  - b. Slide the air duct toward the risers until the locking tabs click into place.
  - c. Inspect the air duct to make sure that it is properly seated and locked into place.



|   |          |
|---|----------|
| 1 | Air duct |
| 2 | Risers   |

- Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.
- Reinstall the cable management device and recable the system, as needed.

When recabling, remember to reinstall the media converters (SFPs) if they were removed.

- Recable the power supply, and then connect it to the power source.

Make sure that you reattach the power cable locking collar on the power cord.

- Gently push the controller module all the way into the system until the controller module locking hooks begin to rise, firmly push on the locking hooks to finish seating the controller module, and then swing the locking hooks into the locked position over the pins on the controller module.

The controller begins to boot as soon as it is completely installed into the chassis.

- Interrupt the boot process by pressing Ctrl-C to stop at the LOADER prompt.

If you miss this message, press Ctrl-C, select the option to boot to Maintenance mode, and then halt the controller to boot to LOADER.

- From the LOADER prompt, boot the recovery image from the secondary boot media: `boot_recovery`

The image is downloaded from the secondary boot media.

9. When prompted, either enter the name of the image or accept the default image displayed inside the brackets on your screen.
10. After the image is installed, start the restoration process:
  - a. Record the IP address of the impaired controller that is displayed on the screen.
  - b. Press `y` when prompted to restore the backup configuration.
  - c. Press `y` when prompted to confirm that the backup procedure was successful.
11. From the partner controller in advanced privilege level, start the configuration synchronization using the IP address recorded in the previous step: `system node restore-backup -node local -target -address impaired_node_IP_address`
12. After the configuration synchronization is complete without errors, press `y` when prompted to confirm that the backup procedure was successful.
13. Press `y` when prompted whether to use the restored copy, and then press `y` when prompted to reboot the controller.
14. Exit advanced privilege level on the healthy controller.

## Option 2: Transfer the boot image to the boot media using a USB flash drive

This procedure should only be used if the secondary boot media restore failed or if the image.tgz file is not found on the secondary boot media.

- You must have a USB flash drive, formatted to FAT32, with at least 4GB capacity.
- A copy of the same image version of ONTAP as what the impaired controller was running. You can download the appropriate image from the Downloads section on the NetApp Support Site
  - If NVE is enabled, download the image with NetApp Volume Encryption, as indicated in the download button.
  - If NVE is not enabled, download the image without NetApp Volume Encryption, as indicated in the download button.
- If your system is an HA pair, you must have a network connection.
- If your system is a stand-alone system you do not need a network connection, but you must perform an additional reboot when restoring the var file system.

## Steps

1. If you are not already grounded, properly ground yourself.
2. If you have not already done so, close the air duct:
  - a. Swing the air duct all the way down to the controller module.
  - b. Slide the air duct toward the risers until the locking tabs click into place.
  - c. Inspect the air duct to make sure that it is properly seated and locked into place.



|   |          |
|---|----------|
| 1 | Air duct |
| 2 | Risers   |

- Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.

- Reinstall the cable management device and recable the system, as needed.

When recabling, remember to reinstall the media converters (SFPs) if they were removed.

- Recable the power supply, and then connect it to the power source.

Make sure that you reattach the power cable locking collar on the power cord.

- Insert the USB flash drive into the USB slot on the controller module.

Make sure that you install the USB flash drive in the slot labeled for USB devices, and not in the USB console port.

- Gently push the controller module all the way into the system until the controller module locking hooks begin to rise, firmly push on the locking hooks to finish seating the controller module, and then swing the locking hooks into the locked position over the pins on the controller module.

The controller begins to boot as soon as it is completely installed into the chassis.

- Interrupt the boot process by pressing Ctrl-C to stop at the LOADER prompt.

If you miss this message, press Ctrl-C, select the option to boot to Maintenance mode, and then halt the controller to boot to LOADER.



9. Although the environment variables and bootargs are retained, you should check that all required boot environment variables and bootargs are properly set for your system type and configuration using the `printenv bootarg name` command and correct any errors using the `setenv variable-name <value>` command.

a. Check the boot environment variables:

- `bootarg.init.boot_clustered`
- `partner-sysid`
- `bootarg.init.flash_optimized` for AFF C190/AFF A220 (All Flash FAS)
- `bootarg.init.san_optimized` for AFF A220 and All-Flash SAN Array
- `bootarg.init.switchless_cluster.enable`

b. If External Key Manager is enabled, check the bootarg values, listed in the `kenv` ASUP output:

- `bootarg.storageencryption.support <value>`
- `bootarg.keymanager.support <value>`
- `kmip.init.interface <value>`
- `kmip.init.ipaddr <value>`
- `kmip.init.netmask <value>`
- `kmip.init.gateway <value>`

c. If Onboard Key Manager is enabled, check the bootarg values, listed in the `kenv` ASUP output:

- `bootarg.storageencryption.support <value>`
- `bootarg.keymanager.support <value>`
- `bootarg.onboard_keymanager <value>`

d. Save the environment variables you changed with the `savenv` command

e. Confirm your changes using the `printenv variable-name` command.

10. From the LOADER prompt, boot the recovery image from the USB flash drive: `boot_recovery`

The image is downloaded from the USB flash drive.

11. When prompted, either enter the name of the image or accept the default image displayed inside the brackets on your screen.


12. After the image is installed, start the restoration process:

- a. Record the IP address of the impaired controller that is displayed on the screen.
- b. Press `y` when prompted to restore the backup configuration.
- c. Press `y` when prompted to confirm that the backup procedure was successful.

13. Press `y` when prompted whether to use the restored copy, and then press `y` when prompted to reboot the controller.

14. From the partner controller in advanced privilege level, start the configuration synchronization using the IP address recorded in the previous step: `system node restore-backup -node local -target -address impaired_node_IP_address`

15. After the configuration synchronization is complete without errors, press `y` when prompted to confirm that the backup procedure was successful.
16. Press `y` when prompted whether to use the restored copy, and then press `y` when prompted to reboot the controller.
17. Verify that the environmental variables are set as expected.
  - a. Take the controller to the `LOADER` prompt.  
  
 From the `ONTAP` prompt, you can issue the command `'system node halt -skip-lif-migration-before -shutdown true -ignore-quorum-warnings true -inhibit-takeover true'`.
  - b. Check the environment variable settings with the `printenv` command.
  - c. If an environment variable is not set as expected, modify it with the `setenv environment-variable-name changed-value` command.
  - d. Save your changes using the `savenv` command.
  - e. Reboot the controller.
18. With the rebooted impaired controller displaying the `Waiting for giveback...` message, perform a giveback from the healthy controller:

| If your system is in... | Then...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| An HA pair              | <p>After the impaired controller is displaying the <code>Waiting for giveback...</code> message, perform a giveback from the healthy controller:</p> <ol style="list-style-type: none"> <li>a. From the healthy controller: <code>storage failover giveback -ofnode partner_node_name</code></li> </ol> <p>The impaired controller takes back its storage, finishes booting, and then reboots and is again taken over by the healthy controller.</p> <div style="display: flex; align-items: center;">  <p>If the giveback is vetoed, you can consider overriding the vetoes.</p> </div> <p><a href="#">HA pair management</a></p> <ol style="list-style-type: none"> <li>b. Monitor the progress of the giveback operation by using the <code>storage failover show-giveback</code> command.</li> <li>c. After the giveback operation is complete, confirm that the HA pair is healthy and that takeover is possible by using the <code>storage failover show</code> command.</li> <li>d. Restore automatic giveback if you disabled it using the <code>storage failover modify</code> command.</li> </ol> |

19. Exit advanced privilege level on the healthy controller.

#### Boot the recovery image - AFF A700s

You must boot the `ONTAP` image from the USB drive, restore the file system, and verify

the environmental variables.

1. From the LOADER prompt, boot the recovery image from the USB flash drive: `boot_recovery`

The image is downloaded from the USB flash drive.

2. When prompted, either enter the name of the image or accept the default image displayed inside the brackets on your screen.
3. Restore the var file system:

| If your system has... | Then...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A network connection  | <ol style="list-style-type: none"><li>a. Press <code>y</code> when prompted to restore the backup configuration.</li><li>b. Set the healthy controller to advanced privilege level: <code>set -privilege advanced</code></li><li>c. Run the restore backup command: <code>system node restore-backup -node local -target-address <i>impaired_node_IP_address</i></code></li><li>d. Return the controller to admin level: <code>set -privilege admin</code></li><li>e. Press <code>y</code> when prompted to use the restored configuration.</li><li>f. Press <code>y</code> when prompted to reboot the controller.</li></ol> |
| No network connection | <ol style="list-style-type: none"><li>a. Press <code>n</code> when prompted to restore the backup configuration.</li><li>b. Reboot the system when prompted by the system.</li><li>c. Select the <b>Update flash from backup config</b> (sync flash) option from the displayed menu.</li></ol> <p>If you are prompted to continue with the update, press <code>y</code>.</p>                                                                                                                                                                                                                                                  |

4. Ensure that the environmental variables are set as expected:
  - a. Take the controller to the LOADER prompt.
  - b. Check the environment variable settings with the `printenv` command.
  - c. If an environment variable is not set as expected, modify it with the `setenv environment-variable-name changed-value` command.
  - d. Save your changes using the `savenv` command.
5. The next depends on your system configuration:
  - If your system has onboard keymanager, NSE or NVE configured, go to [Restore OKM, NSE, and NVE as needed](#)
  - If your system does not have onboard keymanager, NSE or NVE configured, complete the steps in this section.
6. From the LOADER prompt, enter the `boot_ontap` command.

| If you see...           | Then...                                                                                                                                                                                              |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The login prompt        | Go to the next Step.                                                                                                                                                                                 |
| Waiting for giveback... | <ol style="list-style-type: none"> <li>Log into the partner controller.</li> <li>Confirm the target controller is ready for giveback with the <code>storage failover show</code> command.</li> </ol> |

- Connect the console cable to the partner controller.
- Give back the controller using the `storage failover giveback -fromnode local` command.
- At the cluster prompt, check the logical interfaces with the `net int -is-home false` command.

If any interfaces are listed as "false", revert those interfaces back to their home port using the `net int revert` command.

- Move the console cable to the repaired controller and run the `version -v` command to check the ONTAP versions.
- Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.

#### Restore OKM, NSE, and NVE as needed - AFF A700s

Once environment variables are checked, you must complete steps specific to systems that have Onboard Key Manager (OKM), NetApp Storage Encryption (NSE) or NetApp Volume Encryption (NVE) enabled.

Determine which section you should use to restore your OKM, NSE, or NVE configurations:

If NSE or NVE are enabled along with Onboard Key Manager you must restore settings you captured at the beginning of this procedure.

- If NSE or NVE are enabled and Onboard Key Manager is enabled, go to [Option 1: Restore NVE or NSE when Onboard Key Manager is enabled](#).
- If NSE or NVE are enabled for ONATP 9.5, go to [Option 2: Restore NSE/NVE on systems running ONTAP 9.5 and earlier](#).
- If NSE or NVE are enabled for ONTAP 9.6, go to [Option 3: Restore NSE/NVE on systems running ONTAP 9.6 and later](#).

#### Option 1: Restore NVE or NSE when Onboard Key Manager is enabled

##### Steps

- Connect the console cable to the target controller.
- Use the `boot_ontap` command at the LOADER prompt to boot the controller.
- Check the console output:

| If the console displays... | Then...                                                                                                                                                                                                                          |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt          | Boot the controller to the boot menu: <code>boot_ontap menu</code>                                                                                                                                                               |
| Waiting for giveback...    | a. Enter <code>Ctrl-C</code> at the prompt<br>b. At the message: Do you wish to halt this controller rather than wait [y/n]? , enter: <code>y</code><br>c. At the LOADER prompt, enter the <code>boot_ontap menu</code> command. |

- At the Boot Menu, enter the hidden command, `recover_onboard_keymanager` and reply `y` at the prompt.
- Enter the passphrase for the onboard key manager you obtained from the customer at the beginning of this procedure.
- When prompted to enter the backup data, paste the backup data you captured at the beginning of this procedure, when asked. Paste the output of `security key-manager backup show` OR `security key-manager onboard show-backup` command.



The data is output from either `security key-manager backup show` or `security key-manager onboard show-backup` command.

Example of backup data:

```

-----BEGIN BACKUP-----
TmV0QXBwIEtleSB0bG9iAAEAAAAEAAAAcAEAAAAAADuD+byAAAAACEAAAAAAAAA
QAAAAAAAAABvOIH0AAAAAMh7qDLRyH1DBz12piVdy9ATSFMT0C0TIYFss4PDjTaV
dzRYkLd1PhQLxAWJwOlyqSr8qY1SEBgm1IWgE5DLRqkiAAAAAAAAACgAAAAAAAA
3WTh7gAAAAAAAAAAAAAAAAAIAAAAAAAgAZJEIWvdeHr5RCAvHGclo+wAAAAAAAAA
lgAAAAAAAAAoAAAAAAAAAEOTcR0AAAAAAAAAAAAAAAAACAAAAAAAAJAGr3tJA/
LRzUQRHwv+1aWvAAAAAAAAAACQAAAAAAAAAgAAAAAAAAACdhTcvAAAAAJ1PXeBf
ml4NBsSyV1B4jc4A7cvWEFY6ILG6hc6tbKLAHZuvfQ4rlbYAAAAAAAAAAAAAAAA
AA
AA
.
.
.
.
H4nPQM0nrDRYRa9SCv8AA
AA
AAAAAAA
-----END BACKUP-----

```

- At the Boot Menu select the option for Normal Boot.

The system boots to `Waiting for giveback...` prompt.

- Move the console cable to the partner controller and login as admin.

9. Confirm the target controller is ready for giveback with the `storage failover show` command.
10. Give back only the CFO aggregates with the `storage failover giveback -fromnode local -only-cfo -aggregates true` command.
  - If the command fails because of a failed disk, physically disengage the failed disk, but leave the disk in the slot until a replacement is received.
  - If the command fails because of an open CIFS session, check with the customer on how to close out CIFS sessions.
11. Once the giveback completes, check the failover and giveback status with the `storage failover show` and ``storage failover show-giveback`` commands.



Terminating CIFS can cause loss of data.

- If the command fails because the partner is "not ready", wait 5 minutes for the NVMEMs to synchronize.
  - If the command fails because of an NDMP, SnapMirror, or SnapVault process, disable the process. See the appropriate Documentation Center for more information.
12. Move the console cable to the target controller.
  13. If you are running ONTAP 9.5 and earlier, run the key-manager setup wizard:
    - a. Start the wizard using the `security key-manager setup -nodenodename` command, and then enter the passphrase for onboard key management when prompted.
    - b. Enter the `security key-manager key show -detail` command to see a detailed view of all keys stored in the onboard key manager and verify that the `Restored` column = `yes` for all authentication keys.



If the `Restored` column = anything other than `yes`, contact Customer Support.

- c. Wait 10 minutes for the key to synchronize across the cluster.
14. If you are running ONTAP 9.6 or later:
  - a. Run the `security key-manager onboard sync` command and then enter the passphrase when prompted.
  - b. Enter the `security key-manager key query` command to see a detailed view of all keys stored in the onboard key manager and verify that the `Restored` column = `yes/true` for all authentication keys.



If the `Restored` column = anything other than `yes/true`, contact Customer Support.

- c. Wait 10 minutes for the key to synchronize across the cluster.
15. Move the console cable to the partner controller.
16. Give back the target controller using the `storage failover giveback -fromnode local` command.
17. Check the giveback status, 3 minutes after it reports complete, using the `storage failover show` command.

If giveback is not complete after 20 minutes, contact Customer Support.

18. At the clustershell prompt, enter the `net int show -is-home false` command to list the logical interfaces that are not on their home controller and port.

If any interfaces are listed as `false`, revert those interfaces back to their home port using the `net int revert -vserver Cluster -lif nodename` command.

19. Move the console cable to the target controller and run the `version -v` command to check the ONTAP versions.
20. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.

## Option 2: Restore NSE/NVE on systems running ONTAP 9.5 and earlier

### Steps

1. Connect the console cable to the target controller.
2. Use the `boot_ontap` command at the LOADER prompt to boot the controller.
3. Check the console output:

| If the console displays... | Then...                                                                                                                                                                                                 |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The login prompt           | Go to Step 7.                                                                                                                                                                                           |
| Waiting for giveback...    | <ol style="list-style-type: none"><li>a. Log into the partner controller.</li><li>b. Confirm the target controller is ready for giveback with the <code>storage failover show</code> command.</li></ol> |

4. Move the console cable to the partner controller and give back the target controller storage using the `storage failover giveback -fromnode local -only-cfo-aggregates true local` command.
  - If the command fails because of a failed disk, physically disengage the failed disk, but leave the disk in the slot until a replacement is received.
  - If the command fails because of an open CIFS sessions, check with customer how to close out CIFS sessions.



Terminating CIFS can cause loss of data.

- If the command fails because the partner "not ready", wait 5 minutes for the NVMEMs to synchronize.
  - If the command fails because of an NDMP, SnapMirror, or SnapVault process, disable the process. See the appropriate Documentation Center for more information.
5. Wait 3 minutes and check the failover status with the `storage failover show` command.
  6. At the clustershell prompt, enter the `net int show -is-home false` command to list the logical interfaces that are not on their home controller and port.

If any interfaces are listed as `false`, revert those interfaces back to their home port using the `net int`

```
revert -vserver Cluster -lif nodename command.
```

7. Move the console cable to the target controller and run the `version -v` command to check the ONTAP versions.
8. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.
9. Use the `storage encryption disk show` at the clustershell prompt, to review the output.



This command does not work if NVE (NetApp Volume Encryption) is configured

10. Use the security key-manager query to display the key IDs of the authentication keys that are stored on the key management servers.
  - If the `Restored` column = `yes` and all key managers report in an available state, go to *Complete the replacement process*.
  - If the `Restored` column = anything other than `yes`, and/or one or more key managers is not available, use the `security key-manager restore -address` command to retrieve and restore all authentication keys (AKs) and key IDs associated with all nodes from all available key management servers.

Check the output of the security key-manager query again to ensure that the `Restored` column = `yes` and all key managers report in an available state

11. If the Onboard Key Management is enabled:
  - a. Use the `security key-manager key show -detail` to see a detailed view of all keys stored in the onboard key manager.
  - b. Use the `security key-manager key show -detail` command and verify that the `Restored` column = `yes` for all authentication keys.

If the `Restored` column = anything other than `yes`, use the `security key-manager setup -node Repaired(Target)node` command to restore the Onboard Key Management settings. Rerun the `security key-manager key show -detail` command to verify `Restored` column = `yes` for all authentication keys.

12. Connect the console cable to the partner controller.
13. Give back the controller using the `storage failover giveback -fromnode local` command.
14. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.

### Option 3: Restore NSE/NVE on systems running ONTAP 9.6 and later

#### Steps

1. Connect the console cable to the target controller.
2. Use the `boot_ontap` command at the LOADER prompt to boot the controller.
3. Check the console output:



| If the console displays... | Then...                                                                                                                                                                                                    |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The login prompt           | Go to Step 7.                                                                                                                                                                                              |
| Waiting for giveback...    | <ul style="list-style-type: none"> <li>a. Log into the partner controller.</li> <li>b. Confirm the target controller is ready for giveback with the <code>storage failover show</code> command.</li> </ul> |

4. Move the console cable to the partner controller and give back the target controller storage using the `storage failover giveback -fromnode local -only-cfo-aggregates true local` command.
  - If the command fails because of a failed disk, physically disengage the failed disk, but leave the disk in the slot until a replacement is received.
  - If the command fails because of an open CIFS session, check with the customer on how to close out CIFS sessions.



Terminating CIFS can cause loss of data.

- If the command fails because the partner is "not ready", wait 5 minutes for the NVMEMs to synchronize.
  - If the command fails because of an NDMP, SnapMirror, or SnapVault process, disable the process. See the appropriate Documentation Center for more information.
5. Wait 3 minutes and check the failover status with the `storage failover show` command.
  6. At the clustershell prompt, enter the `net int show -is-home false` command to list the logical interfaces that are not on their home controller and port.

If any interfaces are listed as `false`, revert those interfaces back to their home port using the `net int revert -vserver Cluster -lif nodename` command.

7. Move the console cable to the target controller and run the `version -v` command to check the ONTAP versions.
8. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.
9. Use the `storage encryption disk show` at the clustershell prompt, to review the output.
10. Use the `security key-manager key query` command to display the key IDs of the authentication keys that are stored on the key management servers.
  - If the `Restored` column = `yes/true`, you are done and can proceed to complete the replacement process.
  - If the `Key Manager type` = `external` and the `Restored` column = anything other than `yes/true`, use the `security key-manager external restore` command to restore the key IDs of the authentication keys.



If the command fails, contact Customer Support.

- If the `Key Manager type = onboard` and the `Restored column = anything other than yes/true`, use the `security key-manager onboard sync` command to re-sync the Key Manager type.

Use the `security key-manager key query` to verify that the `Restored column = yes/true` for all authentication keys.

11. Connect the console cable to the partner controller.
12. Give back the controller using the `storage failover giveback -fromnode local` command.
13. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.
14. If AutoSupport is enabled, restore/unsuppress automatic case creation by using the `system node autosupport invoke -node * -type all -message MAINT=END`

### Return the failed part to NetApp - AFF A700s

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

## Chassis

### Overview of chassis replacement - AFF A700s

To replace the chassis, you must move the controller modules and SSD drives from the impaired chassis to the replacement chassis, and then remove the impaired chassis from the equipment rack or system cabinet and install the replacement chassis in its place.

All other components in the system must be functioning properly; if not, you must contact technical support.

- You can use this procedure with all versions of ONTAP supported by your system.
- This procedure is written with the assumption that you are moving the SSDs and controller modules to the new chassis, and that the replacement chassis is a new component from NetApp.
- This procedure is disruptive. For a two-node cluster, you will have a complete service outage and a partial outage in a multi-node cluster.

### Shut down the controllers - AFF A700s

This procedure is for 2-node, non-MetroCluster configurations only. If you have a system with more than two nodes, see [How to perform a graceful shutdown and power up of one HA pair in a 4-node cluster](#).

### Before you begin

You need:

- Local administrator credentials for ONTAP.
- NetApp onboard key management (OKM) cluster-wide passphrase if using storage encryption or NVE/NAE.
- BMC accessibility for each controller.
- Stop all clients/host from accessing data on the NetApp system.

- Suspend external backup jobs.
- Necessary tools and equipment for the replacement.



If the system is a NetApp StorageGRID or ONTAP S3 used as FabricPool cloud tier, refer to the [Gracefully shutdown and power up your storage system Resolution Guide](#) after performing this procedure.



If using SSDs, refer to [SU490: \(Impact: Critical\) SSD Best Practices: Avoid risk of drive failure and data loss if powered off for more than two months](#)

As a best practice before shutdown, you should:

- Perform additional [system health checks](#).
- Upgrade ONTAP to a recommended release for the system.
- Resolve any [Active IQ Wellness Alerts and Risks](#).  
Make note of any faults presently on the system, such as LEDs on the system components.

## Steps

1. Log into the cluster through SSH or log in from any node in the cluster using a local console cable and a laptop/console.
2. Turn off AutoSupport and indicate how long you expect the system to be offline:

```
system node autosupport invoke -node * -type all -message "MAINT=8h Power Maintenance"
```

3. Identify the SP/BMC address of all nodes:

```
system service-processor show -node * -fields address
```

4. Exit the cluster shell: `exit`
5. Log into SP/BMC over SSH using the IP address of any of the nodes listed in the output from the previous step.

If you're using a console/laptop, log into the controller using the same cluster administrator credentials.



Open an SSH session to every SP/BMC connection so that you can monitor progress.

6. Halt the 2 nodes located in the impaired chassis:

```
system node halt -node <node>,<node2> -skip-lif-migration-before-shutdown true -ignore-quorum-warnings true -inhibit-takeover true
```



For clusters using SnapMirror synchronous operating in StrictSync mode: `system node halt -node <node>,<node2> -skip-lif-migration-before-shutdown true -ignore-quorum-warnings true -inhibit-takeover true -ignore-strict-sync-warnings true`

7. Enter **y** for each controller in the cluster when you see *Warning: Are you sure you want to halt node "cluster <node-name> number"?*

$\{y|n\}$ :

8. Wait for each controller to halt and display the LOADER prompt.

#### Replace hardware - AFF A700s

Move the power supplies, hard drives, and controller module or modules from the impaired chassis to the new chassis, and swap out the impaired chassis from the equipment rack or system cabinet with the new chassis of the same model as the impaired chassis.

##### Step 1: Remove the controller modules

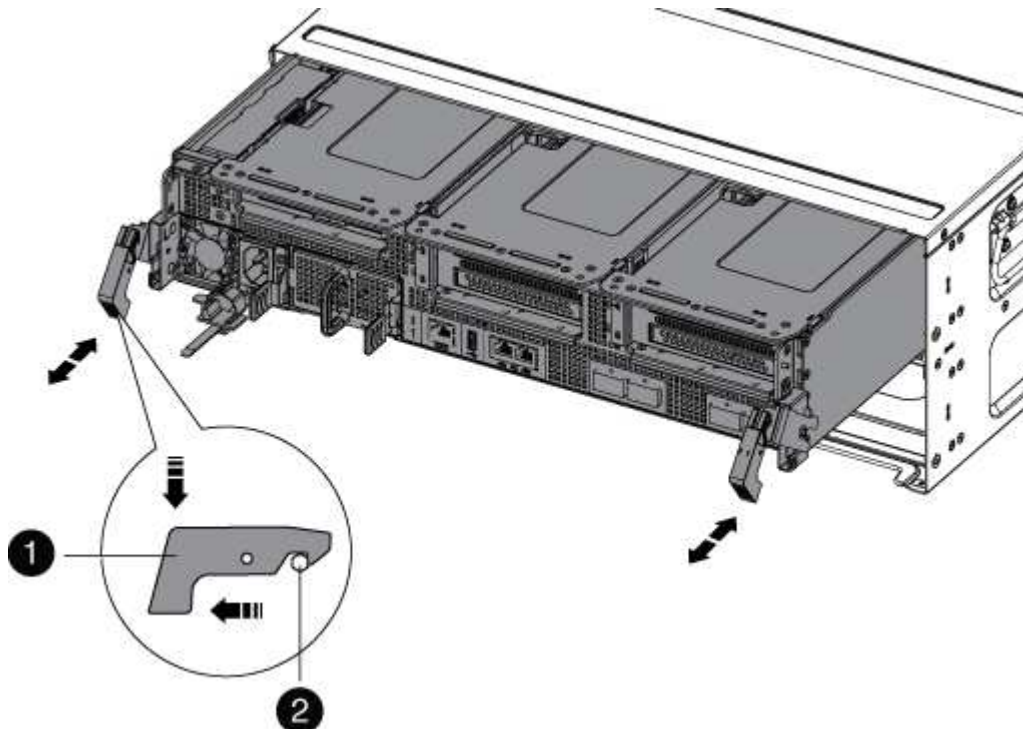
To replace the chassis, you must remove the controller modules from the old chassis.

1. If you are not already grounded, properly ground yourself.
2. Unplug the controller module power supply from the source, and then unplug the cable from the power supply.
3. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

4. Remove the cable management device from the controller module and set it aside.
5. Press down on both of the locking latches, and then rotate both latches downward at the same time.

The controller module moves slightly out of the chassis.



|          |               |
|----------|---------------|
| <b>1</b> | Locking latch |
| <b>2</b> | Locking pin   |

- Slide the controller module out of the chassis.

Make sure that you support the bottom of the controller module as you slide it out of the chassis.

- Set the controller module aside in a safe place, and repeat these steps for the other controller module in the chassis.

## Step 2: Move drives to the new chassis

You need to move the drives from each bay opening in the old chassis to the same bay opening in the new chassis.

- Gently remove the bezel from the front of the system.
- Remove the drives:
  - Press the release button at the top of the carrier face below the LEDs.
  - Pull the cam handle to its fully open position to unseat the drive from the midplane, and then gently slide the drive out of the chassis.

The drive should disengage from the chassis, allowing it to slide free of the chassis.



When removing a drive, always use two hands to support its weight.



Drives are fragile. Handle them as little as possible to prevent damage to them.

- Align the drive from the old chassis with the same bay opening in the new chassis.
- Gently push the drive into the chassis as far as it will go.

The cam handle engages and begins to rotate upward.

- Firmly push the drive the rest of the way into the chassis, and then lock the cam handle by pushing it up and against the drive holder.

Be sure to close the cam handle slowly so that it aligns correctly with the front of the drive carrier. It click when it is secure.

- Repeat the process for the remaining drives in the system.

## Step 3: Replace a chassis from within the equipment rack or system cabinet

You must remove the existing chassis from the equipment rack or system cabinet before you can install the replacement chassis.

- Remove the screws from the chassis mount points.
- With two people, slide the old chassis off the rack rails in a system cabinet or equipment rack, and then set it aside.

3. If you are not already grounded, properly ground yourself.
4. Using two people, install the replacement chassis into the equipment rack or system cabinet by guiding the chassis onto the rack rails in a system cabinet or equipment rack.
5. Slide the chassis all the way into the equipment rack or system cabinet.
6. Secure the front of the chassis to the equipment rack or system cabinet, using the screws you removed from the old chassis.
7. If you have not already done so, install the bezel.

#### Step 4: Install the controllers

After you install the controller module into the new chassis, boot it.

For HA pairs with two controller modules in the same chassis, the sequence in which you install the controller module is especially important because it attempts to reboot as soon as you completely seat it in the chassis.

1. If you are not already grounded, properly ground yourself.
2. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.



Do not completely insert the controller module in the chassis until instructed to do so.

3. Recable the console to the controller module, and then reconnect the management port.
4. Plug the power cord into the power supply, reinstall the power cable locking collar, and then connect the power supply to the power source.
5. Complete the reinstallation of the controller module:
  - a. If you have not already done so, reinstall the cable management device.
  - b. Firmly push the controller module into the chassis until it meets the midplane and is fully seated.

The locking latches rise when the controller module is fully seated.



Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.

The controller module begins to boot as soon as it is fully seated in the chassis. Be prepared to interrupt the boot process.

- c. Rotate the locking latches upward, tilting them so that they clear the locking pins, and then lower them into the locked position.
  - d. Interrupt the boot process by pressing `Ctrl-C` when you see `Press Ctrl-C for Boot Menu`.
  - e. Select the option to boot to Maintenance mode from the displayed menu.
6. Repeat the preceding steps to install the second controller into the new chassis.

#### Complete the restoration and replacement process - AFF A700s

You must verify the HA state of the chassis and return the failed part to NetApp, as described in the RMA instructions shipped with the kit.

## Step 1: Verify and set the HA state of the chassis

You must verify the HA state of the chassis, and, if necessary, update the state to match your system configuration.

1. In Maintenance mode, from either controller module, display the HA state of the local controller module and chassis: `ha-config show`

The HA state should be the same for all components.

2. If the displayed system state for the chassis does not match your system configuration:
  - a. Set the HA state for the chassis: `ha-config modify chassis HA-state`

The value for HA-state can be one of the following:

- `ha`
- `non-ha`

- b. Confirm that the setting has changed: `ha-config show`
3. If you have not already done so, recable the rest of your system.
  4. Reinstall the bezel on the front of the system.

## Step 2: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

### Controller

#### Overview of controller module replacement - AFF A700s

You must review the prerequisites for the replacement procedure and select the correct one for your version of the ONTAP operating system.

- All drive shelves must be working properly.
- The healthy controller must be able to take over the controller that is being replaced (referred to in this procedure as the “impaired controller”).
- You must replace the failed component with a replacement FRU component you received from your provider.
- You must be replacing a controller module with a controller module of the same model type. You cannot upgrade your system by just replacing the controller module.
- You cannot change any drives or drive shelves as part of this procedure.
- In this procedure, the boot device is moved from the impaired controller to the *replacement* controller so that the *replacement* controller will boot up in the same version of ONTAP as the old controller module.
- It is important that you apply the commands in these steps on the correct systems:
  - The *impaired* controller is the controller that is being replaced.
  - The *replacement* controller is the new controller that is replacing the impaired controller.
  - The *healthy* controller is the surviving controller.

- You must always capture the controller's console output to a text file.

This provides you a record of the procedure so that you can troubleshoot any issues that you might encounter during the replacement process.

#### Shut down the impaired controller - AFF A700s

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

#### Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message
MAINT=_number_of_hours_down_h
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:>`

```
system node autosupport invoke -node * -type all -message MAINT=2h
```

2. If the impaired controller is part of an HA pair, disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`
3. Take the impaired controller to the LOADER prompt:

| If the impaired controller is displaying...              | Then...                                                                                                                                                                                                                                                         |
|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                                        | Go to Remove controller module.                                                                                                                                                                                                                                 |
| Waiting for giveback...                                  | Press Ctrl-C, and then respond <code>y</code> .                                                                                                                                                                                                                 |
| System prompt or password prompt (enter system password) | <p>Take over or halt the impaired controller from the healthy controller:</p> <pre>storage failover takeover -ofnode impaired_node_name</pre> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <code>y</code>.</p> |

#### Replace the controller module hardware - AFF A700s

To replace the controller module hardware, you must remove the impaired controller, move FRU components to the replacement controller module, install the replacement controller module in the chassis, and then boot the system to Maintenance mode.



**Step 1: Remove the controller module**

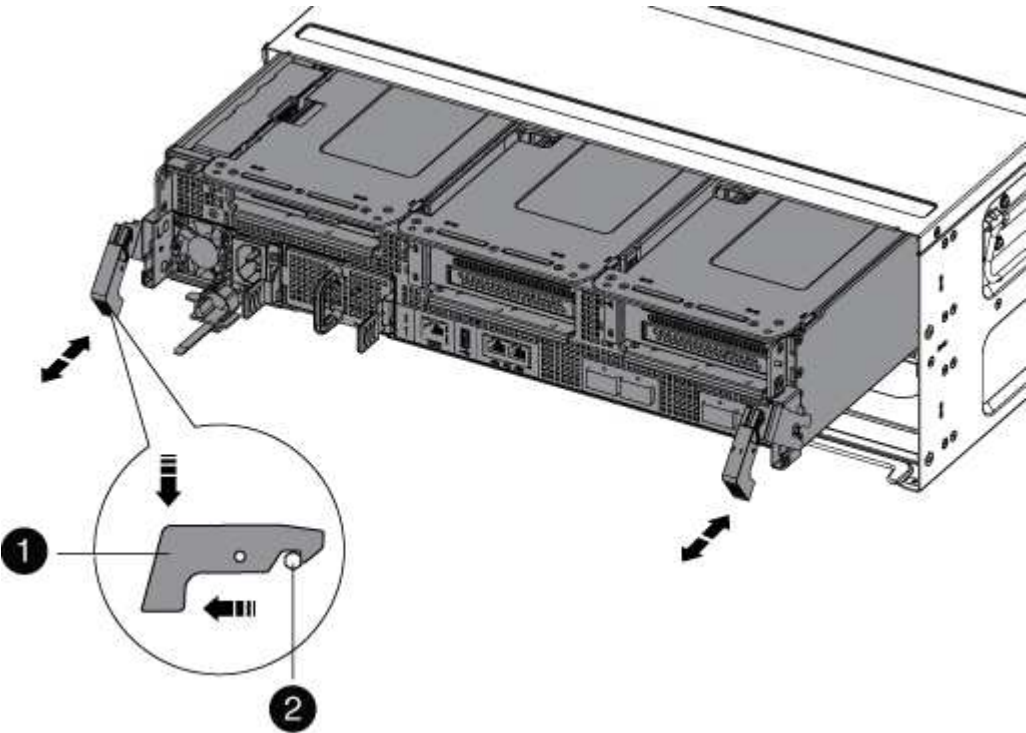
You must remove the controller module from the chassis when you replace the controller module or replace a component inside the controller module.

- 1. If you are not already grounded, properly ground yourself.
- 2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

- 3. Unplug the controller module power supply from the source, and then unplug the cable from the power supply.
- 4. Remove the cable management device from the controller module and set it aside.
- 5. Press down on both of the locking latches, and then rotate both latches downward at the same time.

The controller module moves slightly out of the chassis.

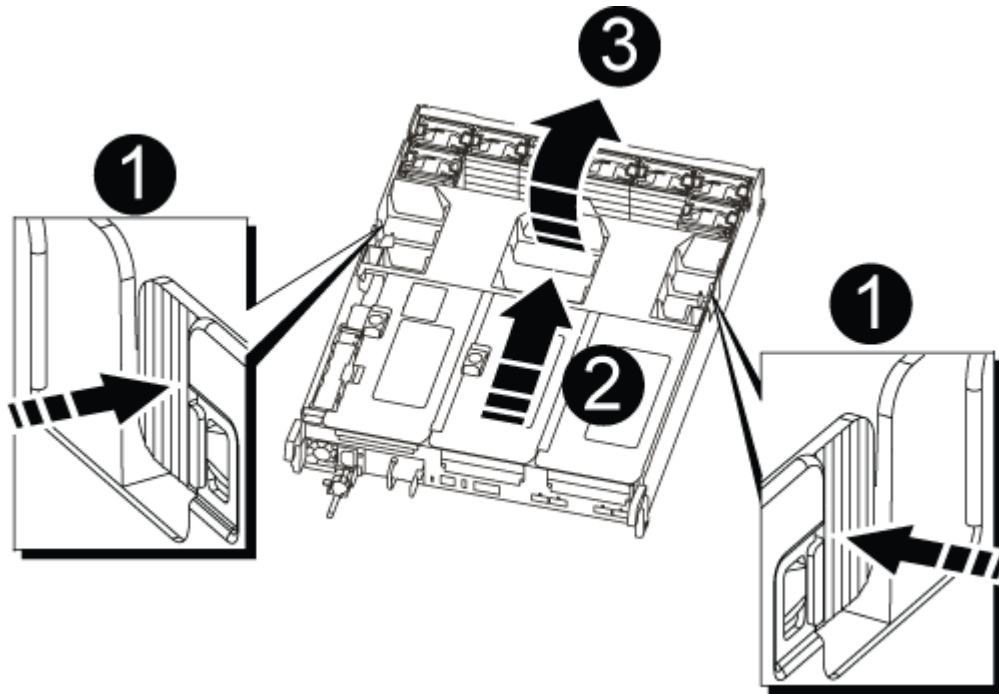


|   |               |
|---|---------------|
| 1 | Locking latch |
| 2 | Locking pin   |

- 6. Slide the controller module out of the chassis.

Make sure that you support the bottom of the controller module as you slide it out of the chassis.

7. Place the controller module on a stable, flat surface, and then open the air duct:
  - a. Press in the locking tabs on the sides of the air duct toward the middle of the controller module.
  - b. Slide the air duct toward the fan modules, and then rotate it upward to its completely open position.



|   |                       |
|---|-----------------------|
| 1 | Air duct locking tabs |
| 2 | Risers                |
| 3 | Air duct              |

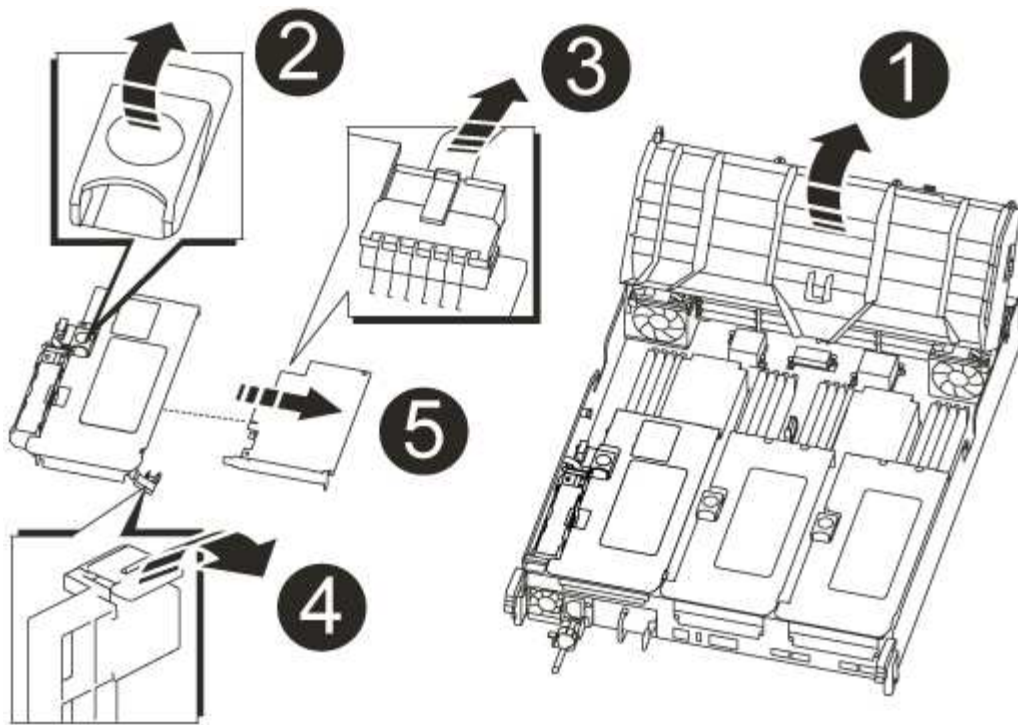
## Step 2: Move the NVRAM card

As part of the controller replacement process, you must remove the NVRAM card from Riser 1 in the impaired controller module and install the card into Riser 1 of the replacement controller module. You should only reinstall Riser 1 into the replacement controller module after you have moved the DIMMs from the impaired controller module to the replacement controller module.

1. Remove the NVRAM riser, Riser 1, from the controller module:
  - a. Rotate the riser locking latch on the left side of the riser up and toward the fans.

The NVRAM riser raises up slightly from the controller module.

- b. Lift the NVRAM riser up, shift it toward the fans so that the sheet metal lip on the riser clears the edge of the controller module, lift the riser straight up out of the controller module, and then place it on a stable, flat surface so that you can access the NVRAM card.



|   |                                                       |
|---|-------------------------------------------------------|
| 1 | Air duct                                              |
| 2 | Riser 1 locking latch                                 |
| 3 | NVRAM battery cable plug connecting to the NVRAM card |
| 4 | Card locking bracket                                  |
| 5 | NVRAM card                                            |

2. Remove the NVRAM card from the riser module:
  - a. Turn the riser module so that you can access the NVRAM card.
  - b. Unplug the NVRAM battery cable that is attached to the NVRAM card.
  - c. Press the locking bracket on the side of the NVRAM riser, and then rotate it to the open position.
  - d. Remove the NVRAM card from the riser module.
3. Remove the NVRAM riser from the replacement controller module.
4. Install the NVRAM card into the NVRAM riser:
  - a. Align the card with the card guide on the riser module and the card socket in the riser.
  - b. Slide the card squarely into the card socket.



Make sure that the card is completely and squarely seated into the riser socket.

- c. Connect the battery cable to the socket on the NVRAM card.
- d. Swing the locking latch into the locked position and make sure that it locks in place.

### Step 3: Move PCIe cards

As part of the controller replacement process, you must remove both PCIe riser modules, Riser 2 (the middle riser) and Riser 3 (riser on the far right) from the impaired controller module, remove the PCIe cards from the riser modules, and install the cards in the same riser modules in the replacement controller module. You will install the riser modules into the replacement controller module once the DIMMs have been moved to the replacement controller module.

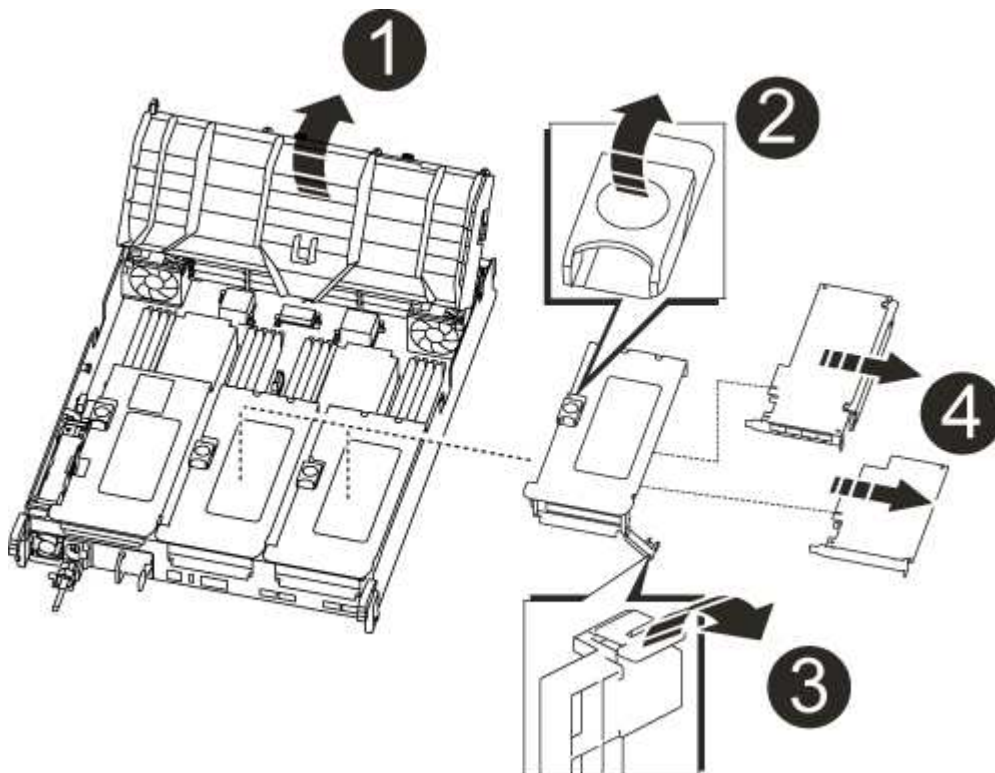


Do not install the risers from the impaired controller module into the replacement controller module.

1. Remove the PCIe riser from the controller module:
  - a. Remove any SFP modules that might be in the PCIe cards.
  - b. Rotate the module locking latch on the left side of the riser up and toward the fan modules.

The PCIe riser raises up slightly from the controller module.

- c. Lift the PCIe riser up, shift it toward the fans so that the sheet metal lip on the riser clears the edge of the controller module, lift the riser out of the controller module, and then place it on a stable, flat surface.



|   |          |
|---|----------|
| 1 | Air duct |
|---|----------|

|   |                                                              |
|---|--------------------------------------------------------------|
| 2 | Riser locking latch                                          |
| 3 | Card locking bracket                                         |
| 4 | Riser 2 (middle riser) and PCI cards in riser slots 2 and 3. |

2. Remove the PCIe card from the riser:
  - a. Turn the riser so that you can access the PCIe card.
  - b. Press the locking bracket on the side of the PCIe riser, and then rotate it to the open position.
  - c. Remove the PCIe card from the riser.
3. Remove the corresponding riser from the replacement controller module.
4. Install the PCIe card into the riser from the replacement controller and then reinstall the riser back into the replacement controller:
  - a. Align the card with the card guide on the riser and the card socket in the riser, and then slide it squarely into the socket in the riser.

Make sure that the card is completely and squarely seated into the riser socket.

  - b. Reinstall the riser into the replacement controller module.
  - c. Swing the locking latch into place until it clicks into the locked position.
5. Repeat the preceding steps for Riser 3 and PCIe cards in slots 4 and 5 in the impaired controller module.

#### Step 4: Move the boot media

There are two boot media devices in the AFF A700s, a primary and a secondary or backup boot media. You must move them from the impaired controller to the *replacement* controller and install them into their respective slots in the *replacement* controller.

The boot media are located under Riser 2, the middle PCIe riser module. This PCIe module must be removed to gain access to the boot media.

1. Locate the boot media:
  - a. Open the air duct, if needed.
  - b. If needed, remove Riser 2, the middle PCIe module, by unlocking the locking latch and then removing the riser from the controller module.



|   |                              |
|---|------------------------------|
| 1 | Air duct                     |
| 2 | Riser 2 (middle PCIe module) |
| 3 | Boot media screw             |
| 4 | Boot media                   |

2. Remove the boot media from the controller module:

- Using a #1 Phillips head screwdriver, remove the screw holding down the boot media and set the screw aside in a safe place.
- Grasping the sides of the boot media, gently rotate the boot media up, and then pull the boot media straight out of the socket and set it aside.

3. Move the boot media to the new controller module and install it:



Install the boot media into the same socket in the replacement controller module as it was installed in the impaired controller module; primary boot media socket (slot 1) to primary boot media socket, and secondary boot media socket (slot 2) to secondary boot media socket.

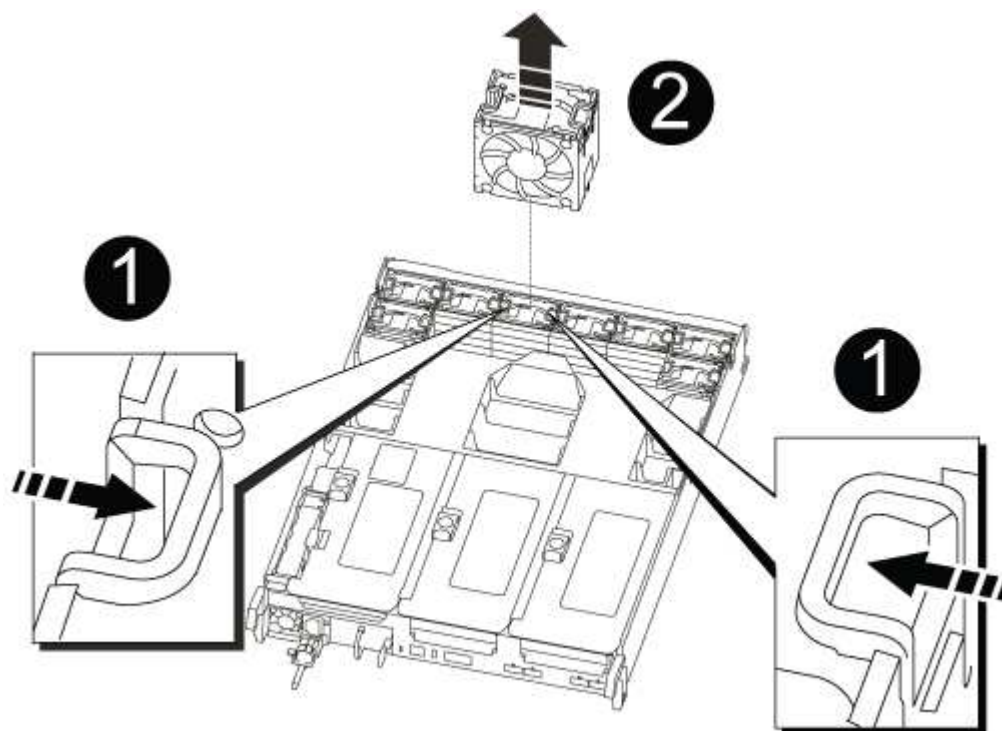
- Align the edges of the boot media with the socket housing, and then gently push it squarely into the socket.
- Rotate the boot media down toward the motherboard.
- Secure the boot media to the motherboard using the boot media screw.

Do not over-tighten the screw or you might damage the boot media.

### Step 5: Move the fans

You must move the fans from the impaired controller module to the replacement module when replacing a failed controller module.

1. Remove the fan module by pinching the locking tabs on the side of the fan module, and then lifting the fan module straight out of the controller module.



|   |                  |
|---|------------------|
| 1 | Fan locking tabs |
| 2 | Fan module       |

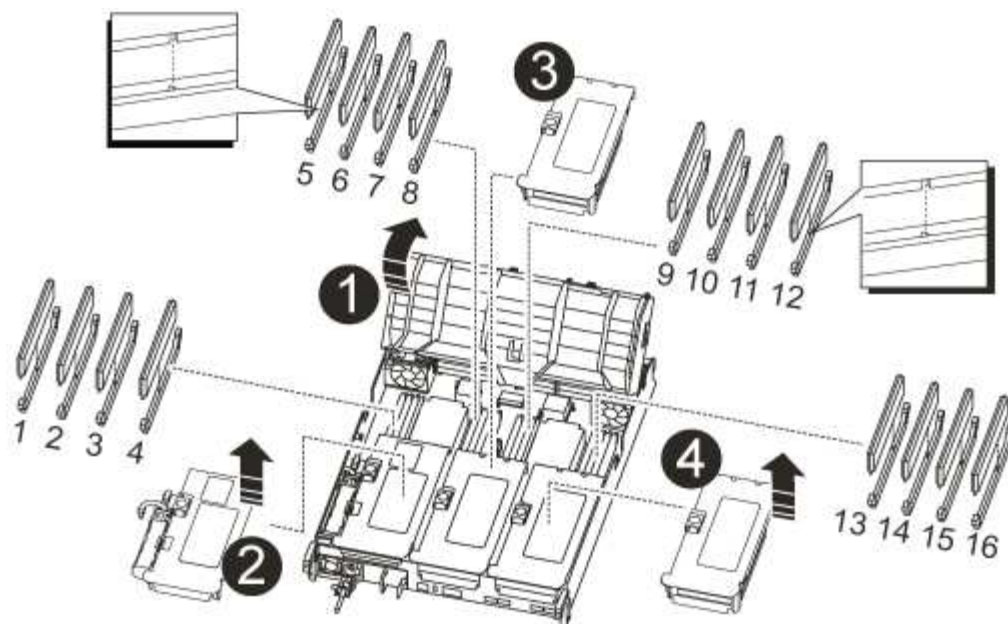
2. Move the fan module to the replacement controller module, and then install the fan module by aligning its edges with the opening in the controller module, and then sliding the fan module into the controller module until the locking latches click into place.
3. Repeat these steps for the remaining fan modules.

### Step 6: Move system DIMMs

To move the DIMMs, locate and move them from the impaired controller into the replacement controller and follow the specific sequence of steps.

1. Locate the DIMMs on your controller module.





|   |                                     |
|---|-------------------------------------|
| 1 | Air duct                            |
| 2 | Riser 1 and DIMM bank 1-4           |
| 3 | Riser 2 and DIMM banks 5-8 and 9-12 |
| 4 | Riser 3 and DIMM bank 13-16         |

- Note the orientation of the DIMM in the socket so that you can insert the DIMM in the replacement controller module in the proper orientation.
- Eject the DIMM from its slot by slowly pushing apart the two DIMM ejector tabs on either side of the DIMM, and then slide the DIMM out of the slot.



Carefully hold the DIMM by the edges to avoid pressure on the components on the DIMM circuit board.

- Locate the slot where you are installing the DIMM.
- Make sure that the DIMM ejector tabs on the connector are in the open position, and then insert the DIMM squarely into the slot.

The DIMM fits tightly in the slot, but should go in easily. If not, realign the DIMM with the slot and reinsert it.



Visually inspect the DIMM to verify that it is evenly aligned and fully inserted into the slot.

- Push carefully, but firmly, on the top edge of the DIMM until the ejector tabs snap into place over the notches at the ends of the DIMM.
- Repeat these steps for the remaining DIMMs.



**Step 7: Install the NVRAM module**

To install the NVRAM module, you must follow the specific sequence of steps.

- 1. Install the riser into the controller module:
  - a. Align the lip of the riser with the underside of the controller module sheet metal.
  - b. Guide the riser along the pins in the controller module, and then lower the riser into the controller module.
  - c. Swing the locking latch down and click it into the locked position.

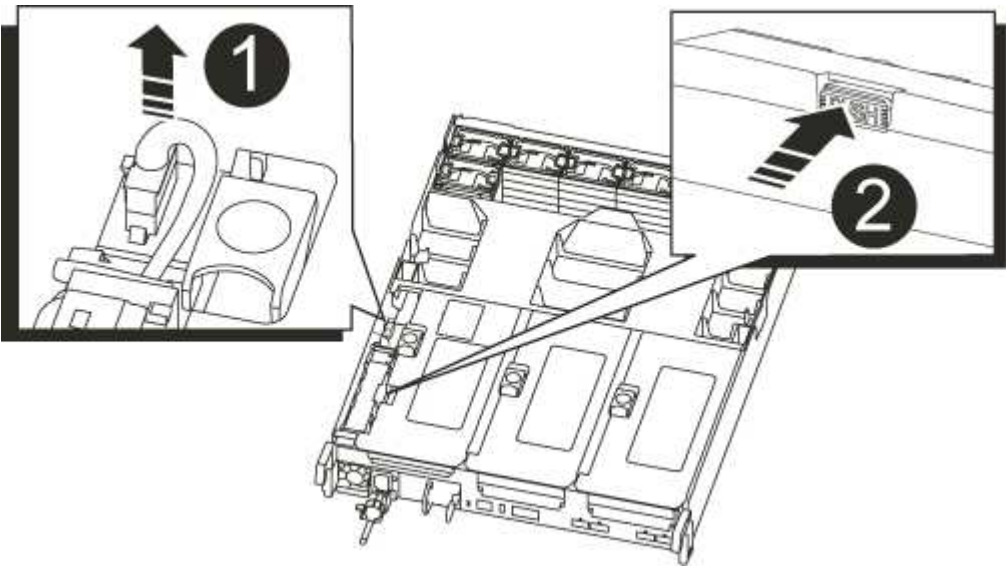
When locked, the locking latch is flush with the top of the riser and the riser sits squarely in the controller module.

- d. Reinsert any SFP modules that were removed from the PCIe cards.

**Step 8: Move the NVRAM battery**

When replacing the controller module, you must move the NVRAM battery from the impaired controller module to the replacement controller module

- 1. Locate the NVRAM battery on the left side of the riser module, Riser 1.



|   |                                |
|---|--------------------------------|
| 1 | NVRAM battery plug             |
| 2 | Blue NVRAM battery locking tab |

- 2. Locate the battery plug and squeeze the clip on the face of the battery plug to release the plug from the socket, and then unplug the battery cable from the socket.
- 3. Grasp the battery and press the blue locking tab marked PUSH, and then lift the battery out of the holder and controller module.
- 4. Move the battery pack to the replacement controller module, and then install it in the NVRAM riser:
  - a. Slide the battery pack down along the sheet metal side wall until the support tabs on the side wall hook

into the slots on the battery pack, and the battery pack latch engages and locks into place.

- b. Press firmly down on the battery pack to make sure that it is locked into place.
- c. Plug the battery plug into the riser socket and make sure that the plug locks into place.

### Step 9: Install a PCIe riser

To install a PCIe riser, you must follow a specific sequence of steps.

1. If you are not already grounded, properly ground yourself.
2. Install the riser into the controller module:
  - a. Align the lip of the riser with the underside of the controller module sheet metal.
  - b. Guide the riser along the pins in the controller module, and then lower the riser into the controller module.
  - c. Swing the locking latch down and click it into the locked position.

When locked, the locking latch is flush with the top of the riser and the riser sits squarely in the controller module.

- d. Reinsert any SFP modules that were removed from the PCIe cards.
3. Repeat the preceding steps for Riser 3 and PCIe cards in slots 4 and 5 in the impaired controller module.

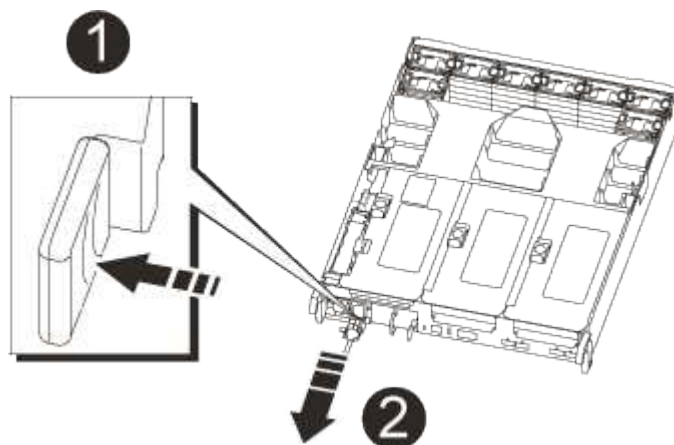
### Step 10: Move the power supply

You must move the power supply and power supply blank from the impaired controller module to the replacement controller module when you replace a controller module.

1. If you are not already grounded, properly ground yourself.
2. Rotate the cam handle such that it can be used to pull power supply out of the controller module while pressing the locking tab.



The power supply is short. Always use two hands to support it when removing it from the controller module so that it does not suddenly swing free from the controller module and injure you.



1

Blue power supply locking tab

2

## Power supply

3. Move the power supply to the new controller module, and then install it.
4. Using both hands, support and align the edges of the power supply with the opening in the controller module, and then gently push the power supply into the controller module until the locking tab clicks into place.

The power supplies will only properly engage with the internal connector and lock in place one way.



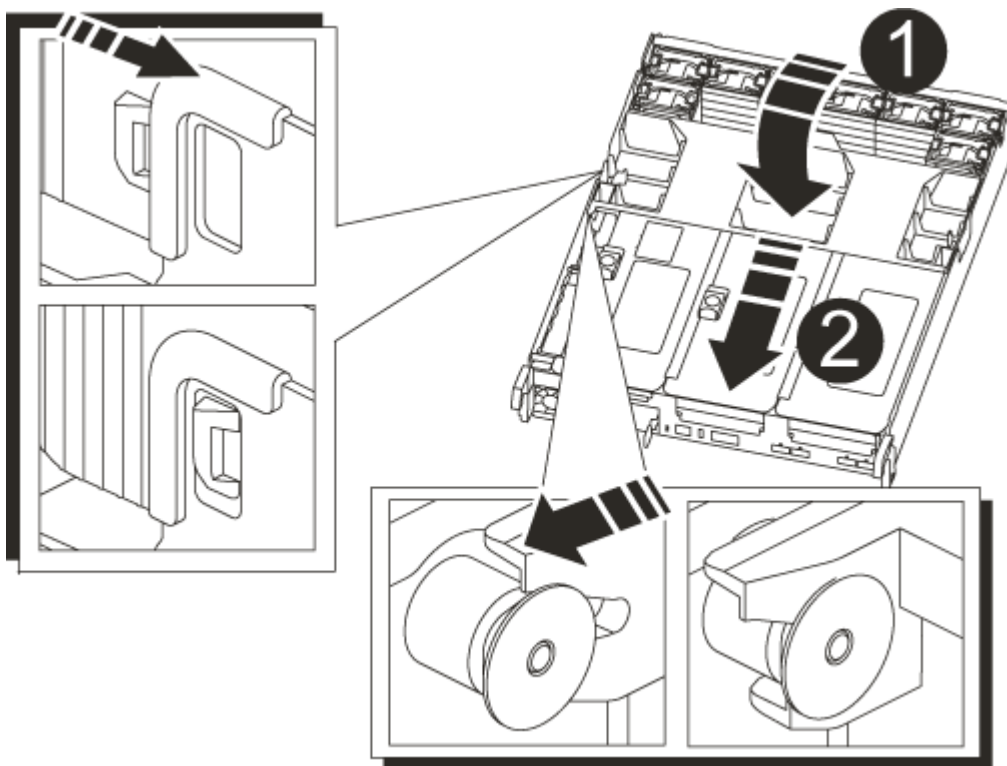
To avoid damaging the internal connector, do not use excessive force when sliding the power supply into the system.

5. Remove the PSU blanking panel from the impaired controller module, and then install it in the replacement controller module.

### Step 11: Install the controller module

After all the components have been moved from the impaired controller module to the replacement controller module, you must install the replacement controller module into the chassis and then boot it to Maintenance mode.

1. If you are not already grounded, properly ground yourself.
2. If you have not already done so, close the air duct:
  - a. Swing the air duct all the way down to the controller module.
  - b. Slide the air duct toward the risers until the locking tabs click into place.
  - c. Inspect the air duct to make sure that it is properly seated and locked into place.



|   |               |
|---|---------------|
| 1 | Locking tabs  |
| 2 | Slide plunger |

- Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.



Do not completely insert the controller module in the chassis until instructed to do so.

- Cable the management and console ports only, so that you can access the system to perform the tasks in the following sections.



You will connect the rest of the cables to the controller module later in this procedure.

- Complete the reinstallation of the controller module:
  - Firmly push the controller module into the chassis until it meets the midplane and is fully seated.

The locking latches rise when the controller module is fully seated.



Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.

The controller module begins to boot as soon as it is fully seated in the chassis. Be prepared to interrupt the boot process.

- Rotate the locking latches upward, tilting them so that they clear the locking pins, and then lower them into the locked position.
  - Interrupt the boot process by pressing `Ctrl-C`.
- Plug the system cables and transceiver modules into the controller module and reinstall the cable management device.
  - Plug the power cables into the power supplies and reinstall the power cable retainers.
  - If your system is configured to support 10 GbE cluster interconnect and data connections on 40 GbE NICs or onboard ports, convert these ports to 10 GbE connections by using the `nicadmin convert` command from Maintenance mode.



Be sure to exit Maintenance mode after completing the conversion.

### Restore and verify the system configuration - AFF A700s

After completing the hardware replacement and booting to Maintenance mode, you verify the low-level system configuration of the replacement controller and reconfigure system settings as necessary.

#### Step 1: Set and verify system time after replacing the controller

You should check the time and date on the replacement controller module against the healthy controller

module in an HA pair, or against a reliable time server in a stand-alone configuration. If the time and date do not match, you must reset them on the replacement controller module to prevent possible outages on clients due to time differences.

### About this task

It is important that you apply the commands in the steps on the correct systems:

- The *replacement* node is the new node that replaced the impaired node as part of this procedure.
- The *healthy* node is the HA partner of the *replacement* node.

### Steps

1. If the *replacement* node is not at the LOADER prompt, halt the system to the LOADER prompt.
2. On the *healthy* node, check the system time: `cluster date show`

The date and time are based on the configured timezone.

3. At the LOADER prompt, check the date and time on the *replacement* node: `show date`

The date and time are given in GMT.

4. If necessary, set the date in GMT on the replacement node: `set date mm/dd/yyyy`
5. If necessary, set the time in GMT on the replacement node: `set time hh:mm:ss`
6. At the LOADER prompt, confirm the date and time on the *replacement* node: `show date`

The date and time are given in GMT.

### Step 2: Verify and set the HA state of the chassis

You must verify the HA state of the controller module and, if necessary, update the state to match your system configuration.

1. In Maintenance mode from the new controller module, verify that all components display the same HA state: `ha-config show`

The HA state should be the same for all components.

2. If the displayed system state of the controller module does not match your system configuration, set the HA state for the controller module: `ha-config modify controller ha-state`

The value for HA-state can be one of the following:

- `ha`
- `non-ha`

3. If the displayed system state of the controller module does not match your system configuration, set the HA state for the controller module: `ha-config modify controller ha-state`
4. Confirm that the setting has changed: `ha-config show`

## Recable the system and reassign disks - AFF A700s

To complete the replacement procedure and restore your system to full operation, you must recable the storage, restore the NetApp Storage Encryption configuration (if necessary), and install licenses for the new controller. You must complete a series of tasks before restoring your system to full operation.

### Step 1: Recable the system

Recable the controller module's storage and network connections.

#### Steps

1. Recable the the controller module to storage and network connections.
2. Verify that the cabling is correct by using [Active IQ Config Advisor](#).
  - a. Download and install Config Advisor.
  - b. Enter the information for the target system, and then click Collect Data.
  - c. Click the Cabling tab, and then examine the output. Make sure that all disk shelves are displayed and all disks appear in the output, correcting any cabling issues you find.
  - d. Check other cabling by clicking the appropriate tab, and then examining the output from Config Advisor.

### Step 2: Reassign disks

If the storage system is in an HA pair, the system ID of the new controller module is automatically assigned to the disks when the giveback occurs at the end of the procedure. You must confirm the system ID change when you boot the *replacement* controller and then verify that the change was implemented.

This procedure applies only to systems running ONTAP in an HA pair.

1. If the *replacement* controller is in Maintenance mode (showing the `*>` prompt, exit Maintenance mode and go to the LOADER prompt: `halt`
2. From the LOADER prompt on the *replacement* controller, boot the controller, entering `y` if you are prompted to override the system ID due to a system ID mismatch: `boot_ontap`
3. Wait until the `Waiting for giveback...` message is displayed on the *replacement* controller console and then, from the healthy controller, verify that the new partner system ID has been automatically assigned:  
`storage failover show`

In the command output, you should see a message that the system ID has changed on the impaired controller, showing the correct old and new IDs. In the following example, node2 has undergone replacement and has a new system ID of 151759706.

```
node1> `storage failover show`
```

| Node  | Partner | Takeover<br>Possible | State Description                                          |
|-------|---------|----------------------|------------------------------------------------------------|
| ----- | -----   | -----                |                                                            |
| ----- |         |                      |                                                            |
| node1 | node2   | false                | System ID changed on partner (Old: 151759706), In takeover |
|       |         |                      | 151759755, New: 151759706)                                 |
| node2 | node1   | -                    | Waiting for giveback (HA mailboxes)                        |

4. From the healthy controller, verify that any coredumps are saved:

- a. Change to the advanced privilege level: `set -privilege advanced`

You can respond `y` when prompted to continue into advanced mode. The advanced mode prompt appears (`*>`).

- b. Save any coredumps: `system node run -node local-node-name partner savecore`

- c. Wait for the `savecore` command to complete before issuing the giveback.

You can enter the following command to monitor the progress of the `savecore` command: `system node run -node local-node-name partner savecore -s`

- d. Return to the admin privilege level: `set -privilege admin`

5. If your storage system has Storage or Volume Encryption configured, you must restore Storage or Volume Encryption functionality by using one of the following procedures, depending on whether you are using onboard or external key management:

- [Restore onboard key management encryption keys](#)
- [Restore external key management encryption keys](#)

6. Give back the controller:

- a. From the healthy controller, give back the replaced controller's storage: `storage failover giveback -ofnode replacement_node_name`

The *replacement* controller takes back its storage and completes booting.

If you are prompted to override the system ID due to a system ID mismatch, you should enter `y`.



If the giveback is vetoed, you can consider overriding the vetoes.

[Find the High-Availability Configuration content for your version of ONTAP 9](#)

- b. After the giveback has been completed, confirm that the HA pair is healthy and that takeover is possible: `storage failover show`

The output from the `storage failover show` command should not include the System ID changed

on partner message.

7. Verify that the disks were assigned correctly: `storage disk show -ownership`

The disks belonging to the *replacement* controller should show the new system ID. In the following example, the disks owned by node1 now show the new system ID, 1873775277:

```
node1> `storage disk show -ownership`

Disk Aggregate Home Owner DR Home Home ID Owner ID DR Home ID
Reserver Pool

1.0.0 aggr0_1 node1 node1 - 1873775277 1873775277 -
1873775277 Pool0
1.0.1 aggr0_1 node1 node1 - 1873775277 1873775277 -
1873775277 Pool0
.
.
.
```

#### Complete system restoration - AFF A700s

To restore your system to full operation, you must restore the NetApp Storage Encryption configuration (if necessary), and install licenses for the new controller, and return the failed part to NetApp, as described in the RMA instructions shipped with the kit.

#### Step 1: Install licenses for the replacement node in ONTAP

You must install new licenses for the *replacement* node if the impaired node was using ONTAP features that require a standard (node-locked) license. For features with standard licenses, each node in the cluster should have its own key for the feature.

##### About this task

Until you install license keys, features requiring standard licenses continue to be available to the *replacement* node. However, if the impaired node was the only node in the cluster with a license for the feature, no configuration changes to the feature are allowed. Also, using unlicensed features on the node might put you out of compliance with your license agreement, so you should install the replacement license key or keys on the *replacement* node as soon as possible.

##### Before you begin

The licenses keys must be in the 28-character format.

You have a 90-day grace period in which to install the license keys. After the grace period, all old licenses are invalidated. After a valid license key is installed, you have 24 hours to install all of the keys before the grace period ends.

##### Steps

1. If you need new license keys, obtain replacement license keys on the [NetApp Support Site](#) in the My



Support section under Software licenses.



The new license keys that you require are automatically generated and sent to the email address on file. If you fail to receive the email with the license keys within 30 days, you should contact technical support.

2. Install each license key: `system license add -license-code license-key, license-key...`
3. Remove the old licenses, if desired:
  - a. Check for unused licenses: `license clean-up -unused -simulate`
  - b. If the list looks correct, remove the unused licenses: `license clean-up -unused`

## Step 2: Verify LIFs and registering the serial number

Before returning the *replacement* node to service, you should verify that the LIFs are on their home ports, and register the serial number of the *replacement* node if AutoSupport is enabled, and reset automatic giveback.

### Steps

1. Verify that the logical interfaces are reporting to their home server and ports: `network interface show -is-home false`  
  
If any LIFs are listed as false, revert them to their home ports: `network interface revert -vserver * -lif *`
2. Register the system serial number with NetApp Support.
  - If AutoSupport is enabled, send an AutoSupport message to register the serial number.
  - If AutoSupport is not enabled, call [NetApp Support](#) to register the serial number.
3. If an AutoSupport maintenance window was triggered, end it by using the `system node autosupport invoke -node * -type all -message MAINT=END` command.
4. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`

## Step 3: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

### Replace a DIMM - AFF A700s

You must replace a DIMM in the controller module when your system registers an increasing number of correctable error correction codes (ECC); failure to do so causes a system panic.

All other components in the system must be functioning properly; if not, you must contact technical support.

You must replace the failed component with a replacement FRU component you received from your provider.

### Step 1: Shut down the impaired controller

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take

over the controller so that the healthy controller continues to serve data from the impaired controller storage.

If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller.

Synchronize a node with the cluster

Steps

- 1. If the impaired controller is part of an HA pair, disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`
- 2. Take the impaired controller to the LOADER prompt:

| If the impaired controller is displaying...              | Then...                                                                                                                                                                                                                                              |
|----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                                        | Go to the next step.                                                                                                                                                                                                                                 |
| Waiting for giveback...                                  | Press Ctrl-C, and then respond <code>y</code> .                                                                                                                                                                                                      |
| System prompt or password prompt (enter system password) | Take over or halt the impaired controller: <code>storage failover takeover -ofnode <i>impaired_node_name</i></code><br><br>When the impaired controller shows <code>Waiting for giveback...</code> , press Ctrl-C, and then respond <code>y</code> . |

Step 2: Remove the controller module

You must remove the controller module from the chassis when you replace the controller module or replace a component inside the controller module.

- 1. If you are not already grounded, properly ground yourself.
- 2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

- 3. Unplug the controller module power supply from the source, and then unplug the cable from the power supply.
- 4. Remove the cable management device from the controller module and set it aside.
- 5. Press down on both of the locking latches, and then rotate both latches downward at the same time.

The controller module moves slightly out of the chassis.



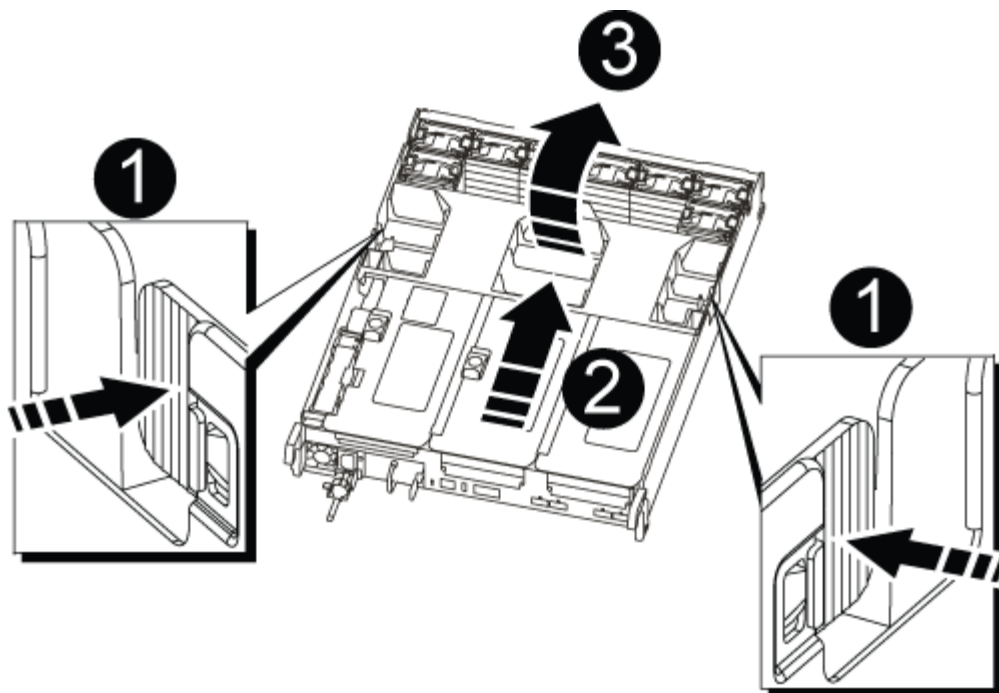
|   |               |
|---|---------------|
| 1 | Locking latch |
| 2 | Locking pin   |

6. Slide the controller module out of the chassis.

Make sure that you support the bottom of the controller module as you slide it out of the chassis.

7. Place the controller module on a stable, flat surface, and then open the air duct:

- Press in the locking tabs on the sides of the air duct toward the middle of the controller module.
- Slide the air duct toward the fan modules, and then rotate it upward to its completely open position.

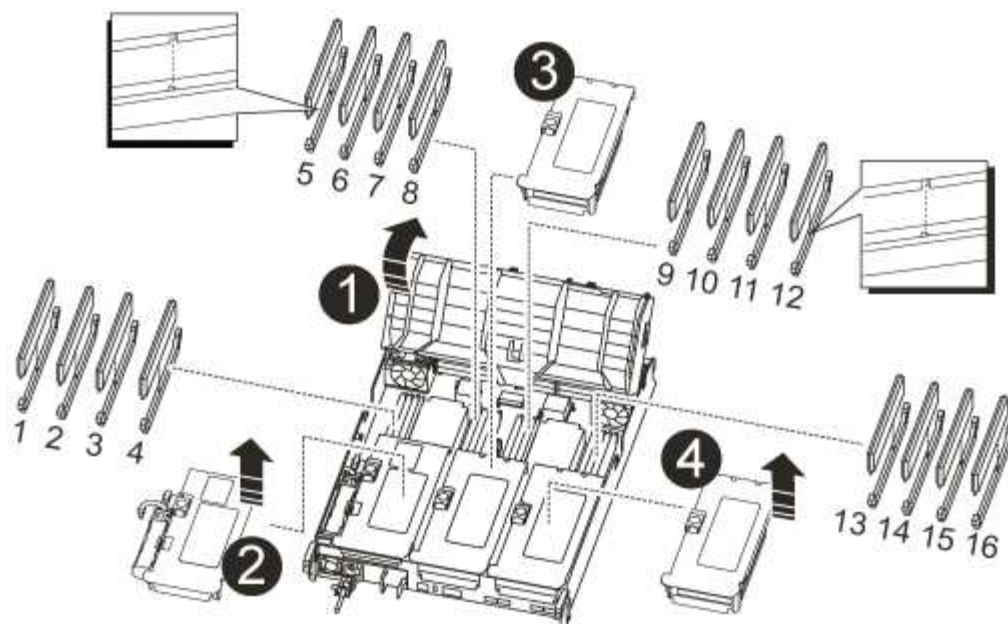


|   |                       |
|---|-----------------------|
| 1 | Air duct locking tabs |
| 2 | Risers                |
| 3 | Air duct              |

### Step 3: Replace a DIMM

To replace a DIMM, you must locate it in the controller module using the DIMM map on the inside of the controller module, and then replace it following the specific sequence of steps.

1. If you are not already grounded, properly ground yourself.
2. Remove the applicable riser.



|   |                                    |
|---|------------------------------------|
| 1 | Air duct cover                     |
| 2 | Riser 1 and DIMM bank 1-4          |
| 3 | Riser 2 and DIMM bank 5-8 and 9-12 |
| 4 | Riser 3 and DIMM 13-16             |

- If you are removing or moving a DIMM in bank 1-4, unplug the NVRAM battery, unlock the locking latch on Riser 1, and then remove the riser.
- If you are removing or moving a DIMM in bank 5-8 or 9-12, unlock the locking latch on Riser 2, and then remove the riser.
- If you are removing or moving a DIMM in bank 13-16, unlock the locking latch on Riser 3, and then remove the riser.

- Note the orientation of the DIMM in the socket so that you can insert the replacement DIMM in the proper orientation.
- Eject the DIMM from its slot by slowly pushing apart the two DIMM ejector tabs on either side of the DIMM, and then slide the DIMM out of the slot.



Carefully hold the DIMM by the edges to avoid pressure on the components on the DIMM circuit board.

- Remove the replacement DIMM from the antistatic shipping bag, hold the DIMM by the corners, and align it to the slot.

The notch among the pins on the DIMM should line up with the tab in the socket.

- Make sure that the DIMM ejector tabs on the connector are in the open position, and then insert the DIMM

squarely into the slot.

The DIMM fits tightly in the slot, but should go in easily. If not, realign the DIMM with the slot and reinsert it.



Visually inspect the DIMM to verify that it is evenly aligned and fully inserted into the slot.

7. Push carefully, but firmly, on the top edge of the DIMM until the ejector tabs snap into place over the notches at the ends of the DIMM.
8. Reinstall any risers that you removed from the controller module.

If you removed the NVRAM riser, Riser 1, make sure that you plug the NVRAM battery into the controller module.

9. Close the air duct.

#### **Step 4: Reinstall the controller module and boot the system**

After you replace a FRU in the controller module, you must reinstall the controller module and reboot it.

For HA pairs with two controller modules in the same chassis, the sequence in which you install the controller module is especially important because it attempts to reboot as soon as you completely seat it in the chassis.

1. If you are not already grounded, properly ground yourself.
2. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.



Do not completely insert the controller module in the chassis until instructed to do so.

3. Recable the system, as needed.

If you removed the media converters (QSFPs or SFPs), remember to reinstall them if you are using fiber optic cables.

4. Plug the power cord into the power supply, reinstall the power cable locking collar, and then connect the power supply to the power source.
5. Complete the reinstallation of the controller module:
  - a. If you have not already done so, reinstall the cable management device.
  - b. Firmly push the controller module into the chassis until it meets the midplane and is fully seated.

The locking latches rise when the controller module is fully seated.



Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.

The controller module begins to boot as soon as it is fully seated in the chassis.

- c. Rotate the locking latches upward, tilting them so that they clear the locking pins, and then lower them into the locked position.

## Step 5: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

### Replace SSD Drive or HDD Drive - AFF A700s

You can replace a failed drive nondisruptively while I/O is in progress. The procedure for replacing an SSD is meant for non-spinning drives and the procedure for replacing an HDD is meant for spinning drives.

When a drive fails, the platform logs a warning message to the system console indicating which drive has failed. In addition, both the fault LED on the operator display panel and the fault LED on the failed drive are illuminated.

#### Before you begin

- Follow best practice and install the current version of the Disk Qualification Package (DQP) before replacing a drive.
- Identify the failed drive by running the `storage disk show -broken` command from the system console.

The failed drive appears in the list of failed drives. If it does not, you should wait, and then run the command again.



Depending on the type and capacity, it can take up to several hours for the drive to appear in the list of failed drives.

- Determine whether SED authentication is enabled.

How you replace the drive depends on how the drive is being used. If SED authentication is enabled, you must use the SED replacement instructions in the [ONTAP 9 NetApp Encryption Power Guide](#). These Instructions describe additional steps you must perform before and after replacing an SED.

- Make sure the replacement drive is supported by your platform. See the [NetApp Hardware Universe](#).
- Make sure all other components in the system are functioning properly; if not, you must contact technical support.

#### About this task

- Drive firmware is automatically updated (nondisruptively) on new drives that have non current firmware versions.
- When replacing a drive, you must wait one minute between the removal of the failed drive and the insertion of the replacement drive to allow the storage system to recognize the existence of the new drive.

## Option 1: Replace SSD

### Steps

1. If you want to manually assign drive ownership for the replacement drive, you need to disable automatic drive assignment replacement drive, if it is enabled



You manually assign drive ownership and then reenable automatic drive assignment later in this procedure.

- a. Verify whether automatic drive assignment is enabled: `storage disk option show`

You can enter the command on either controller module.

If automatic drive assignment is enabled, the output shows `on` in the “Auto Assign” column (for each controller module).

- b. If automatic drive assignment is enabled, disable it: `storage disk option modify -node node_name -autoassign off`

You must disable automatic drive assignment on both controller modules.

2. Properly ground yourself.
3. Physically identify the failed drive.

When a drive fails, the system logs a warning message to the system console indicating which drive failed. Additionally, the attention (amber) LED on the drive shelf operator display panel and the failed drive illuminate.



The activity (green) LED on a failed drive can be illuminated (solid), which indicates that the drive has power, but should not be blinking, which indicates I/O activity. A failed drive has no I/O activity.

4. Remove the failed drive:
  - a. Press the release button on the drive face to open the cam handle.
  - b. Slide the drive out of the shelf using the cam handle and supporting the drive with your other hand.

5. Wait a minimum of 70 seconds before inserting the replacement drive.

This allows the system to recognize that a drive was removed.

6. Insert the replacement drive:
  - a. With the cam handle in the open position, use both hands to insert the replacement drive.
  - b. Push until the drive stops.
  - c. Close the cam handle so that the drive is fully seated into the midplane and the handle clicks into place.

Be sure to close the cam handle slowly so that it aligns correctly with the face of the drive.

7. Verify that the drive's activity (green) LED is illuminated.



When the drive's activity LED is solid, it means that the drive has power. When the drive's activity LED is blinking, it means that the drive has power and I/O is in progress. If the drive firmware is automatically updating, the LED blinks.

8. If you are replacing another drive, repeat Steps 3 through 7.
9. If you disabled automatic drive assignment in Step 1, then, manually assign drive ownership and then reenables automatic drive assignment if needed.

- a. Display all unowned drives: `storage disk show -container-type unassigned`

You can enter the command on either controller module.

- b. Assign each drive: `storage disk assign -disk disk_name -owner node_name`

You can enter the command on either controller module.

You can use the wildcard character to assign more than one drive at once.

- c. Reenable automatic drive assignment if needed: `storage disk option modify -node node_name -autoassign on`

You must reenables automatic drive assignment on both controller modules.

10. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit.

Contact technical support at [NetApp Support](#), 888-463-8277 (North America), 00-800-44-638277 (Europe), or +800-800-80-800 (Asia/Pacific) if you need the RMA number or additional help with the replacement procedure.

## Option 2: Replace HDD

1. If you want to manually assign drive ownership for the replacement drive, you need to disable automatic drive assignment replacement drive, if it is enabled



You manually assign drive ownership and then reenables automatic drive assignment later in this procedure.

- a. Verify whether automatic drive assignment is enabled: `storage disk option show`

You can enter the command on either controller module.

If automatic drive assignment is enabled, the output shows `on` in the "Auto Assign" column (for each controller module).

- b. If automatic drive assignment is enabled, disable it: `storage disk option modify -node node_name -autoassign off`

You must disable automatic drive assignment on both controller modules.

2. Properly ground yourself.
3. Gently remove the bezel from the front of the platform.
4. Identify the failed disk drive from the system console warning message and the illuminated fault LED on the disk drive

5. Press the release button on the disk drive face.

Depending on the storage system, the disk drives have the release button located at the top or on the left of the disk drive face.

For example, the following illustration shows a disk drive with the release button located on the top of the disk drive face:

The cam handle on the disk drive springs open partially and the disk drive releases from the midplane.

6. Pull the cam handle to its fully open position to unseat the disk drive from the midplane.

7. Slide out the disk drive slightly and allow the disk to safely spin down, which can take less than one minute, and then, using both hands, remove the disk drive from the disk shelf.

8. With the cam handle in the open position, insert the replacement disk drive into the drive bay, firmly pushing until the disk drive stops.



Wait a minimum of 10 seconds before inserting a new disk drive. This allows the system to recognize that a disk drive was removed.



If your platform drive bays are not fully loaded with drives, it is important to place the replacement drive into the same drive bay from which you removed the failed drive.



Use two hands when inserting the disk drive, but do not place hands on the disk drive boards that are exposed on the underside of the disk carrier.

9. Close the cam handle so that the disk drive is fully seated into the midplane and the handle clicks into place.

Be sure to close the cam handle slowly so that it aligns correctly with the face of the disk drive..

10. If you are replacing another disk drive, repeat Steps 4 through 9.

11. Reinstall the bezel.

12. If you disabled automatic drive assignment in Step 1, then, manually assign drive ownership and then reenale automatic drive assignment if needed.

- a. Display all unowned drives: `storage disk show -container-type unassigned`

You can enter the command on either controller module.

- b. Assign each drive: `storage disk assign -disk disk_name -owner owner_name`

You can enter the command on either controller module.

You can use the wildcard character to assign more than one drive at once.

- c. Reenable automatic drive assignment if needed: `storage disk option modify -node node_name -autoassign on`

You must reenable automatic drive assignment on both controller modules.

13. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit.

Contact technical support at [NetApp Support](#), 888-463-8277 (North America), 00-800-44-638277 (Europe), or +800-800-80-800 (Asia/Pacific) if you need the RMA number or additional help with the replacement procedure.

## Replace a fan - AFF A800

To replace a fan, remove the failed fan module and replace it with a new fan module.

### Step 1: Shut down the impaired controller - AFF A700s

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

### Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message
MAINT=_number_of_hours_down_h
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:*> system node autosupport invoke -node * -type all -message MAINT=2h`

2. If the impaired controller is part of an HA pair, disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`
3. Take the impaired controller to the LOADER prompt:

| If the impaired controller is displaying...              | Then...                                                                                                                                                                                                                                                             |
|----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                                        | Go to Remove controller module.                                                                                                                                                                                                                                     |
| Waiting for giveback...                                  | Press Ctrl-C, and then respond <code>y</code> .                                                                                                                                                                                                                     |
| System prompt or password prompt (enter system password) | <p>Take over or halt the impaired controller from the healthy controller:</p> <pre>storage failover takeover -ofnode<br/>impaired_node_name</pre> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <code>y</code>.</p> |

**Step 2: Remove the controller module - AFF A700s**

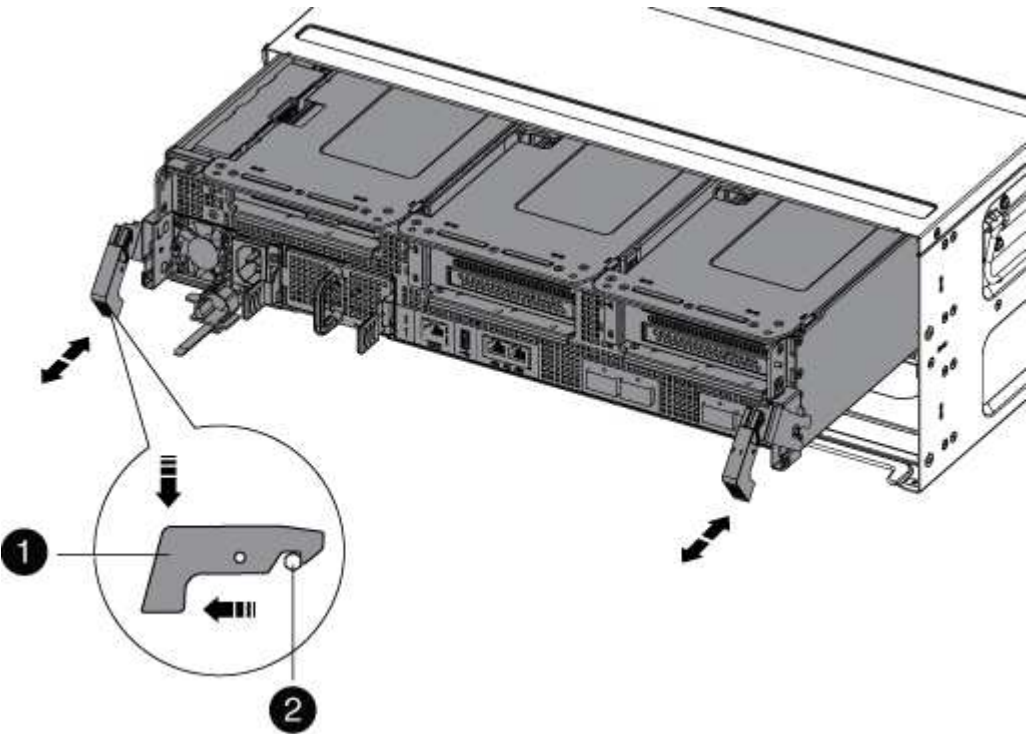
You must remove the controller module from the chassis when you replace the controller module or replace a component inside the controller module.

- 1. If you are not already grounded, properly ground yourself.
- 2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

- 3. Unplug the controller module power supply from the source, and then unplug the cable from the power supply.
- 4. Remove the cable management device from the controller module and set it aside.
- 5. Press down on both of the locking latches, and then rotate both latches downward at the same time.

The controller module moves slightly out of the chassis.



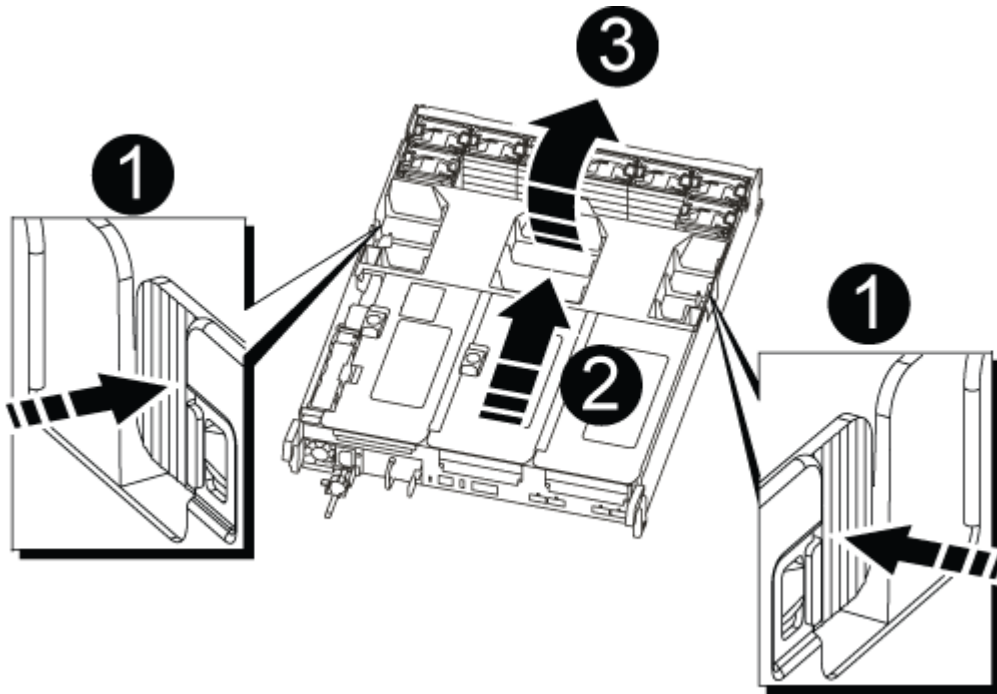
|   |               |
|---|---------------|
| 1 | Locking latch |
| 2 | Locking pin   |

- 6. Slide the controller module out of the chassis.

Make sure that you support the bottom of the controller module as you slide it out of the chassis.

- 7. Place the controller module on a stable, flat surface, and then open the air duct:

- a. Press in the locking tabs on the sides of the air duct toward the middle of the controller module.
- b. Slide the air duct toward the fan modules, and then rotate it upward to its completely open position.



|   |                       |
|---|-----------------------|
| 1 | Air duct locking tabs |
| 2 | Risers                |
| 3 | Air duct              |

### Step 3: Replace the fan - AFF A700s

To replace a fan, remove the failed fan module and replace it with a new fan module.

1. If you are not already grounded, properly ground yourself.
2. Identify the fan module that you must replace by checking the console error messages.
3. Remove the fan module by pinching the locking tabs on the side of the fan module, and then lifting the fan module straight out of the controller module.



|   |                  |
|---|------------------|
| 1 | Fan locking tabs |
| 2 | Fan module       |

4. Align the edges of the replacement fan module with the opening in the controller module, and then slide the replacement fan module into the controller module until the locking latches click into place.

#### Step 4: Reinstall the controller module - AFF A700s

After you replace a component within the controller module, you must reinstall the controller module in the system chassis and boot it.

1. If you are not already grounded, properly ground yourself.
2. If you have not already done so, close the air duct:
  - a. Swing the air duct all the way down to the controller module.
  - b. Slide the air duct toward the risers until the locking tabs click into place.
  - c. Inspect the air duct to make sure that it is properly seated and locked into place.



|   |               |
|---|---------------|
| 1 | Locking tabs  |
| 2 | Slide plunger |

3. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.



Do not completely insert the controller module in the chassis until instructed to do so.

4. Recable the system, as needed.

If you removed the media converters (QSFPs or SFPs), remember to reinstall them if you are using fiber optic cables.

5. Plug the power cord into the power supply, reinstall the power cable locking collar, and then connect the power supply to the power source.
6. Complete the reinstallation of the controller module:
  - a. If you have not already done so, reinstall the cable management device.
  - b. Firmly push the controller module into the chassis until it meets the midplane and is fully seated.

The locking latches rise when the controller module is fully seated.



Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.

The controller module begins to boot as soon as it is fully seated in the chassis.

- c. Rotate the locking latches upward, tilting them so that they clear the locking pins, and then lower them into the locked position.
7. If your system is configured to support 10 GbE cluster interconnect and data connections on 40 GbE NICs or onboard ports, convert these ports to 10 GbE connections by using the `nicadmin convert` command from Maintenance mode.



Be sure to exit Maintenance mode after completing the conversion.

8. Return the controller to normal operation by giving back its storage: `storage failover giveback -ofnode impaired_node_name`
9. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`

#### Step 5: Return the failed part to NetApp - AFF A700s

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

#### Replace the NVRAM battery - AFF A700s

To replace an NVRAM battery in the system, you must remove the controller module from the system, remove the battery, replace the battery, and then reinstall the controller module.

All other components in the system must be functioning properly; if not, you must contact technical support.

#### Step 1: Shut down the impaired controller

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

#### Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message
MAINT=_number_of_hours_down_h
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:*>`

```
system node autosupport invoke -node * -type all -message MAINT=2h
```

2. If the impaired controller is part of an HA pair, disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`
3. Take the impaired controller to the LOADER prompt:



| If the impaired controller is displaying...              | Then...                                                                                                                                                                                                                                                   |
|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                                        | Go to Remove controller module.                                                                                                                                                                                                                           |
| Waiting for giveback...                                  | Press Ctrl-C, and then respond <i>y</i> .                                                                                                                                                                                                                 |
| System prompt or password prompt (enter system password) | <p>Take over or halt the impaired controller from the healthy controller:</p> <pre>storage failover takeover -ofnode impaired_node_name</pre> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i>.</p> |

## Step 2: Remove the controller module

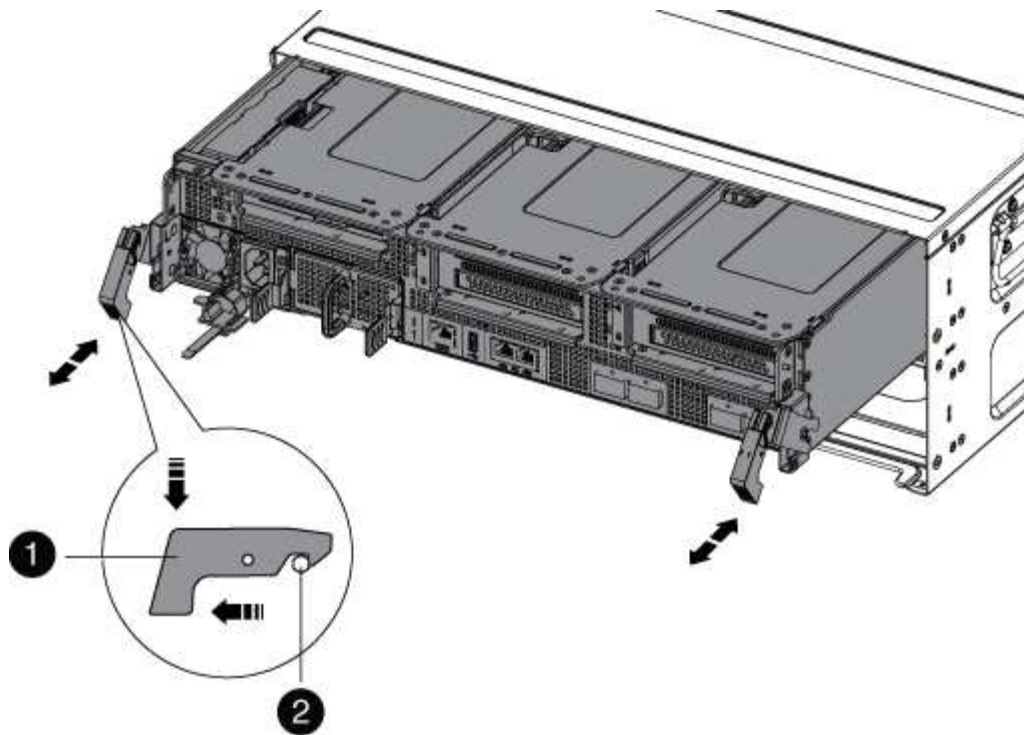
You must remove the controller module from the chassis when you replace the controller module or replace a component inside the controller module.

1. If you are not already grounded, properly ground yourself.
2. Unplug the controller module power supply from the source, and then unplug the cable from the power supply.
3. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

4. Remove the cable management device from the controller module and set it aside.
5. Press down on both of the locking latches, and then rotate both latches downward at the same time.

The controller module moves slightly out of the chassis.



|   |               |
|---|---------------|
| 1 | Locking latch |
| 2 | Locking pin   |

6. Slide the controller module out of the chassis.

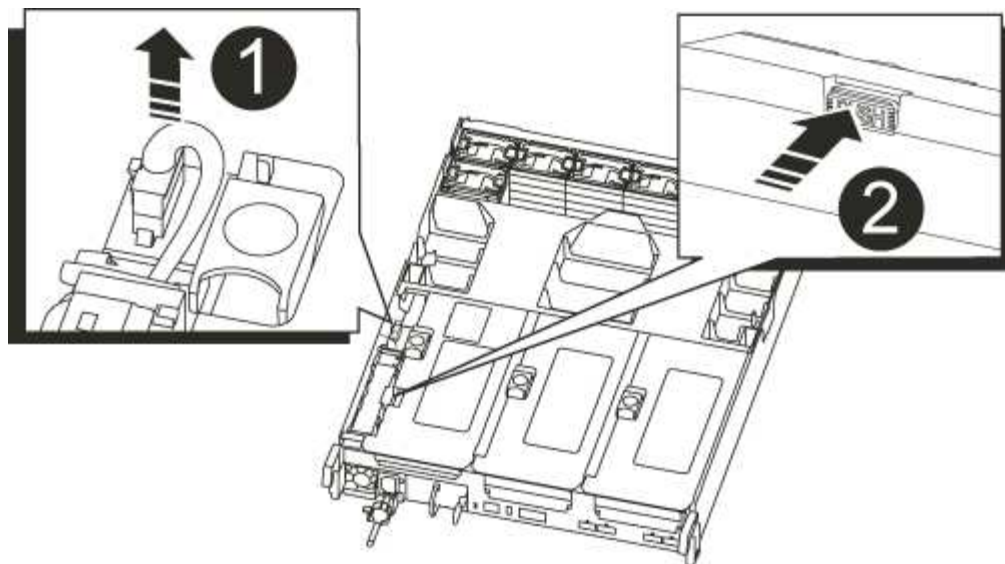
Make sure that you support the bottom of the controller module as you slide it out of the chassis.

7. Set the controller module aside in a safe place.

### Step 3: Replace the NVRAM battery

To replace the NVRAM battery, you must remove the failed NVRAM battery from the controller module and install the replacement NVRAM battery into the controller module.

1. If you are not already grounded, properly ground yourself.
2. Locate the NVRAM battery on the left side of the riser module, Riser 1.



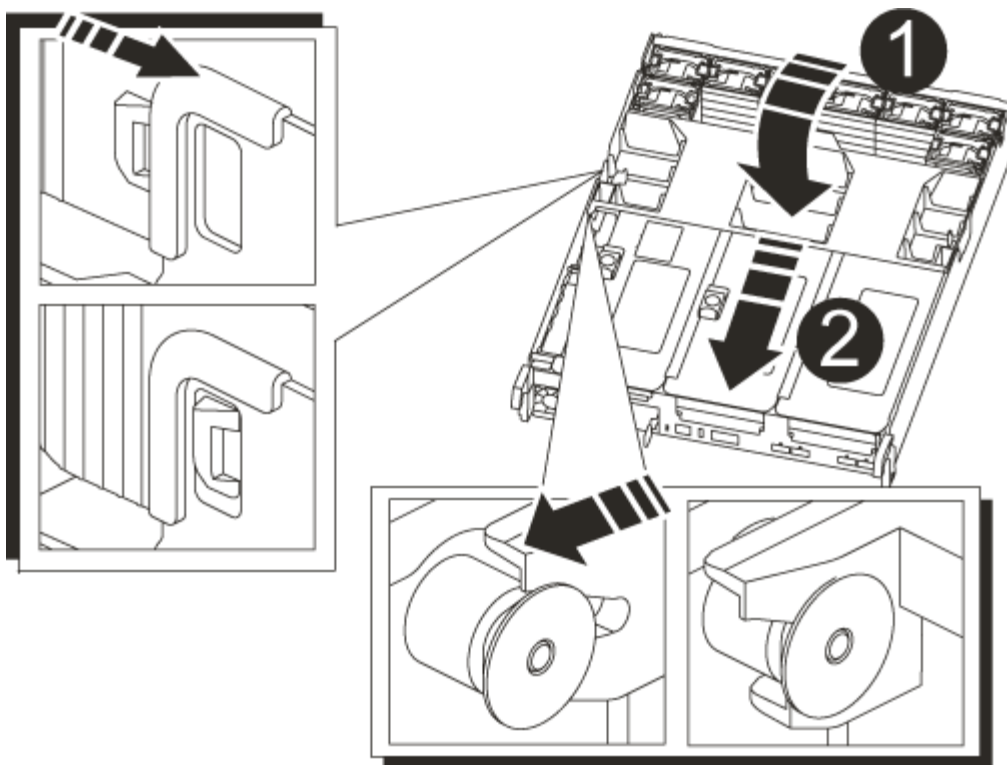
|          |                                |
|----------|--------------------------------|
| <b>1</b> | NVRAM battery plug             |
| <b>2</b> | Blue NVRAM battery locking tab |

3. Locate the battery plug and squeeze the clip on the face of the battery plug to release the plug from the socket, and then unplug the battery cable from the socket.
4. Push the blue locking tab on the battery holder, so that the latch releases from the holder.
5. Slide the battery down the riser bracket, lift the battery out of the controller, and then set it aside.
6. Slide the replacement battery pack down along the sheet metal side wall until the support tabs on the side wall hook into the slots on the battery pack, and the battery pack latch engages and locks into place.
7. Plug the battery plug into the riser socket and make sure that the plug locks into place.

#### Step 4: Reinstall the controller module

After you replace a component within the controller module, you must reinstall the controller module in the system chassis and boot it.

1. If you are not already grounded, properly ground yourself.
2. If you have not already done so, close the air duct:
  - a. Swing the air duct all the way down to the controller module.
  - b. Slide the air duct toward the risers until the locking tabs click into place.
  - c. Inspect the air duct to make sure that it is properly seated and locked into place.



|   |               |
|---|---------------|
| 1 | Locking tabs  |
| 2 | Slide plunger |

3. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.



Do not completely insert the controller module in the chassis until instructed to do so.

4. Recable the system, as needed.

If you removed the media converters (QSFPs or SFPs), remember to reinstall them if you are using fiber optic cables.

5. Plug the power cord into the power supply, reinstall the power cable locking collar, and then connect the power supply to the power source.
6. Complete the reinstallation of the controller module:
  - a. If you have not already done so, reinstall the cable management device.
  - b. Firmly push the controller module into the chassis until it meets the midplane and is fully seated.

The locking latches rise when the controller module is fully seated.



Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.

The controller module begins to boot as soon as it is fully seated in the chassis.

- c. Rotate the locking latches upward, tilting them so that they clear the locking pins, and then lower them into the locked position.
7. If your system is configured to support 10 GbE cluster interconnect and data connections on 40 GbE NICs or onboard ports, convert these ports to 10 GbE connections by using the `nicadmin convert` command from Maintenance mode.



Be sure to exit Maintenance mode after completing the conversion.

8. Return the controller to normal operation by giving back its storage: `storage failover giveback -ofnode impaired_node_name`
9. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`

#### Step 5: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

#### Replace the NVRAM module and NVRAM DIMMs - AFF A700s

To replace a failed NVRAM card, you must remove the NVRAM riser, Riser 1, from the controller module, remove the failed card from the riser, install the new NVRAM card in the riser, and then reinstall the riser in the controller module. Because the system ID is derived from the NVRAM card, if replacing the module, disks belonging to the system are reassigned to the new system ID.

#### Before you begin

- All disk shelves must be working properly.
- If your system is in an HA pair, the partner controller must be able to take over the controller associated with the NVRAM module that is being replaced.
- This procedure uses the following terminology:
  - The *impaired* controller is the controller on which you are performing maintenance.
  - The *healthy* controller is the HA partner of the impaired controller.
- This procedure includes steps for automatically or manually reassigning disks to the controller module associated with the new NVRAM module. You must reassign the disks when directed to in the procedure. Completing the disk reassignment before giveback can cause issues.
- You must replace the failed component with a replacement FRU component you received from your provider.
- You cannot change any disks or disk shelves as part of this procedure.

#### Step 1: Shut down the impaired controller

##### Steps

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired

controller; see [Synchronize a node with the cluster](#).

**Steps**

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:  
`system node autosupport invoke -node * -type all -message MAINT=_number_of_hours_down_h`  
  
The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h`
2. If the impaired controller is part of an HA pair, disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`
3. Take the impaired controller to the LOADER prompt:

| If the impaired controller is displaying...              | Then...                                                                                                                                                                                                                                                                      |
|----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                                        | Go to Remove controller module.                                                                                                                                                                                                                                              |
| Waiting for giveback...                                  | Press Ctrl-C, and then respond <code>y</code> .                                                                                                                                                                                                                              |
| System prompt or password prompt (enter system password) | <p>Take over or halt the impaired controller from the healthy controller:<br/><code>storage failover takeover -ofnode <i>impaired_node_name</i></code></p> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <code>y</code>.</p> |

- If you are using NetApp Storage Encryption, you must have reset the MSID using the instructions in the “Returning SEDs to unprotected mode” section of the *ONTAP 9 NetApp Encryption Power Guide*.

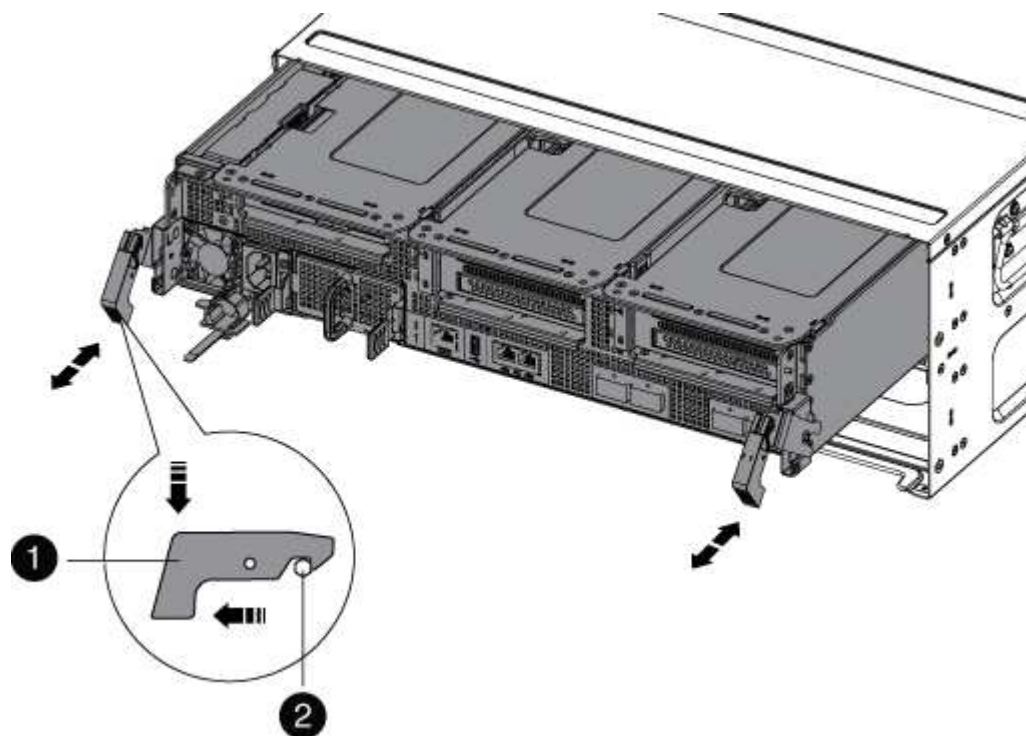
[ONTAP 9 NetApp Encryption Power Guide](#)

**Step 2: Remove the controller module**

You must remove the controller module from the chassis when you replace the controller module or replace a component inside the controller module.

1. If you are not already grounded, properly ground yourself.
2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.  
  
Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.
3. Unplug the controller module power supply from the source, and then unplug the cable from the power supply.
4. Remove the cable management device from the controller module and set it aside.
5. Press down on both of the locking latches, and then rotate both latches downward at the same time.

The controller module moves slightly out of the chassis.



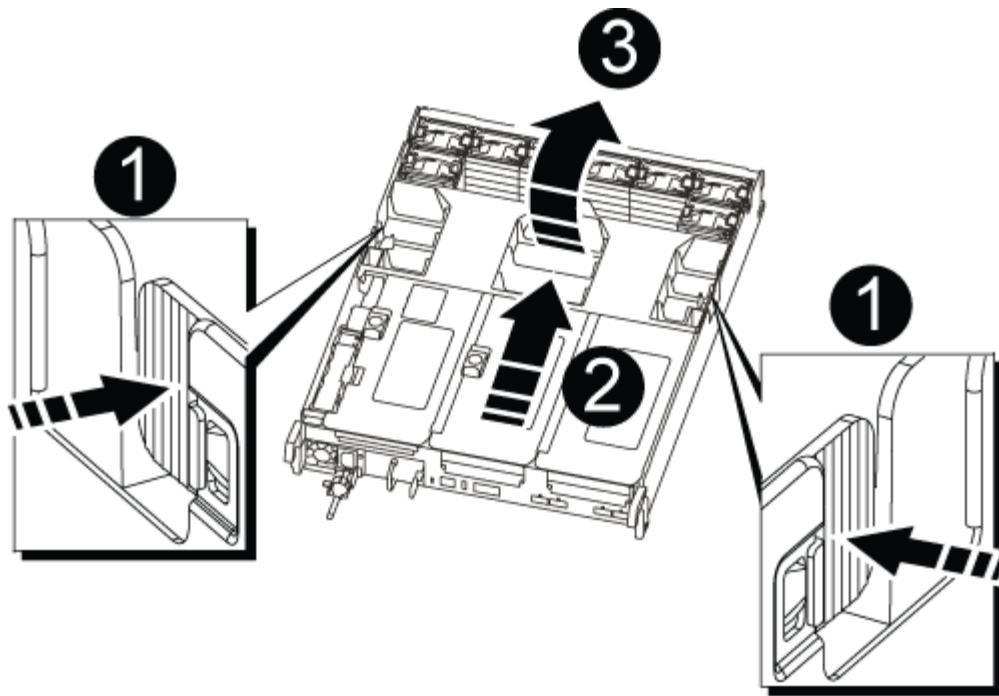
|   |               |
|---|---------------|
| 1 | Locking latch |
| 2 | Locking pin   |

6. Slide the controller module out of the chassis.

Make sure that you support the bottom of the controller module as you slide it out of the chassis.

7. Place the controller module on a stable, flat surface, and then open the air duct:

- Press in the locking tabs on the sides of the air duct toward the middle of the controller module.
- Slide the air duct toward the fan modules, and then rotate it upward to its completely open position.



|   |                       |
|---|-----------------------|
| 1 | Air duct locking tabs |
| 2 | Risers                |
| 3 | Air duct              |

### Step 3: Remove the NVRAM card

Replacing the NVRAM consist of removing the NVRAM riser, Riser 1, from the controller module, disconnecting the NVRAM battery from the NVRAM card, removing the failed NVRAM card and installing the replacement NVRAM card, and then reinstalling the NVRAM riser back into the controller module.

1. If you are not already grounded, properly ground yourself.
2. Remove the NVRAM riser, Riser 1, from the controller module:
  - a. Rotate the riser locking latch on the left side of the riser up and toward the fans.

The NVRAM riser raises up slightly from the controller module.

- b. Lift the NVRAM riser up, shift it toward the fans so that the sheet metal lip on the riser clears the edge of the controller module, lift the riser straight up out of the controller module, and then place it on a stable, flat surface so that you can access the NVRAM card.





|   |                                                       |
|---|-------------------------------------------------------|
| 1 | Air duct                                              |
| 2 | Riser 1 locking latch                                 |
| 3 | NVRAM battery cable plug connecting to the NVRAM card |
| 4 | Card locking bracket                                  |
| 5 | NVRAM card                                            |

3. Remove the NVRAM card from the riser module:

- Turn the riser module so that you can access the NVRAM card.
- Unplug the NVRAM battery cable that is attached to the NVRAM card.
- Press the locking bracket on the side of the NVRAM riser, and then rotate it to the open position.
- Remove the NVRAM card from the riser module.

4. Install the NVRAM card into the NVRAM riser:

- Align the card with the card guide on the riser module and the card socket in the riser.
- Slide the card squarely into the card socket.



Make sure that the card is completely and squarely seated into the riser socket.

- Connect the battery cable to the socket on the NVRAM card.

- d. Swing the locking latch into the locked position and make sure that it locks in place.
5. Install the riser into the controller module:
  - a. Align the lip of the riser with the underside of the controller module sheet metal.
  - b. Guide the riser along the pins in the controller module, and then lower the riser into the controller module.
  - c. Swing the locking latch down and click it into the locked position.

When locked, the locking latch is flush with the top of the riser and the riser sits squarely in the controller module.

- d. Reinsert any SFP modules that were removed from the PCIe cards.

#### Step 4: Reinstall the controller module and booting the system

After you replace a FRU in the controller module, you must reinstall the controller module and reboot it.

For HA pairs with two controller modules in the same chassis, the sequence in which you install the controller module is especially important because it attempts to reboot as soon as you completely seat it in the chassis.

1. If you are not already grounded, properly ground yourself.
2. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.



Do not completely insert the controller module in the chassis until instructed to do so.

3. Recable the system, as needed.

If you removed the media converters (QSFPs or SFPs), remember to reinstall them if you are using fiber optic cables.

4. Plug the power cord into the power supply, reinstall the power cable locking collar, and then connect the power supply to the power source.
5. Complete the reinstallation of the controller module:
  - a. If you have not already done so, reinstall the cable management device.
  - b. Firmly push the controller module into the chassis until it meets the midplane and is fully seated.

The locking latches rise when the controller module is fully seated.



Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.

The controller module begins to boot as soon as it is fully seated in the chassis. Be prepared to interrupt the boot process.

- c. Rotate the locking latches upward, tilting them so that they clear the locking pins, and then lower them into the locked position.
- d. Interrupt the boot process by pressing `Ctrl-C` when you see `Press Ctrl-C for Boot Menu`.
- e. Select the option to boot to Maintenance mode from the displayed menu.

### Step 5: Verify the system ID change on an HA system

You must confirm the system ID change when you boot the *replacement* controller and then verify that the change was implemented.

This procedure applies only to systems running ONTAP in an HA pair.

1. If the *replacement* controller is in Maintenance mode (showing the `*>` prompt, exit Maintenance mode and go to the LOADER prompt: `halt`
2. From the LOADER prompt on the *replacement* controller, boot the controller, entering `y` if you are prompted to override the system ID due to a system ID mismatch: `boot_ontap`
3. Wait until the `Waiting for giveback...` message is displayed on the *replacement* controller console and then, from the healthy controller, verify that the new partner system ID has been automatically assigned: `storage failover show`

In the command output, you should see a message that the system ID has changed on the impaired controller, showing the correct old and new IDs. In the following example, node2 has undergone replacement and has a new system ID of 151759706.

```
node1> `storage failover show`
```

| Node  | Partner | Takeover Possible | State Description                                                          |
|-------|---------|-------------------|----------------------------------------------------------------------------|
| ----- | -----   | -----             |                                                                            |
| ----- |         |                   |                                                                            |
| node1 | node2   | false             | System ID changed on partner (Old: 151759755, New: 151759706), In takeover |
| node2 | node1   | -                 | Waiting for giveback (HA mailboxes)                                        |

4. From the healthy controller, verify that any coredumps are saved:
  - a. Change to the advanced privilege level: `set -privilege advanced`  
  
You can respond `y` when prompted to continue into advanced mode. The advanced mode prompt appears (`*>`).
  - b. Save any coredumps: `system node run -node local-node-name partner savecore`
  - c. Wait for the `'savecore'` command to complete before issuing the giveback.  
  
You can enter the following command to monitor the progress of the `savecore` command: `system node run -node local-node-name partner savecore -s`
  - d. Return to the admin privilege level: `set -privilege admin`
5. Give back the controller:
  - a. From the healthy controller, give back the replaced controller's storage: `storage failover giveback -ofnode replacement_node_name`

The *replacement* controller takes back its storage and completes booting.

If you are prompted to override the system ID due to a system ID mismatch, you should enter *y*.



If the giveback is vetoed, you can consider overriding the vetoes.

[Find the High-Availability Configuration Guide for your version of ONTAP 9](#)

- b. After the giveback has been completed, confirm that the HA pair is healthy and that takeover is possible: `storage failover show`

The output from the `storage failover show` command should not include the System ID changed on partner message.

6. Verify that the disks were assigned correctly: `storage disk show -ownership`

The disks belonging to the *replacement* controller should show the new system ID. In the following example, the disks owned by node1 now show the new system ID, 1873775277:

```
node1> `storage disk show -ownership`

Disk Aggregate Home Owner DR Home Home ID Owner ID DR Home ID
Reserver Pool

1.0.0 aggr0_1 node1 node1 - 1873775277 1873775277 -
1873775277 Pool0
1.0.1 aggr0_1 node1 node1 1873775277 1873775277 -
1873775277 Pool0
.
.
.
```

7. Verify that the expected volumes are present for each controller: `vol show -node node-name`
8. If you disabled automatic takeover on reboot, enable it from the healthy controller: `storage failover modify -node replacement-node-name -onreboot true`

#### Step 6: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

#### Replace a PCIe card - AFF A700s

To replace a PCIe card, you must disconnect the cables from the cards in the riser, remove the riser, replace the riser, and then recable the cards in that riser.

- You can use this procedure with all versions of ONTAP supported by your system

- All other components in the system must be functioning properly; if not, you must contact technical support.

### Step 1: Shut down the impaired controller

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

#### Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message
MAINT=_number_of_hours_down_h
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:*>`

```
system node autosupport invoke -node * -type all -message MAINT=2h
```

2. If the impaired controller is part of an HA pair, disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`
3. Take the impaired controller to the LOADER prompt:

| If the impaired controller is displaying...              | Then...                                                                                                                                                                                                                                                         |
|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                                        | Go to Remove controller module.                                                                                                                                                                                                                                 |
| Waiting for giveback...                                  | Press Ctrl-C, and then respond <code>y</code> .                                                                                                                                                                                                                 |
| System prompt or password prompt (enter system password) | <p>Take over or halt the impaired controller from the healthy controller:</p> <pre>storage failover takeover -ofnode impaired_node_name</pre> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <code>y</code>.</p> |

### Step 2: Remove the controller module

You must remove the controller module from the chassis when you replace the controller module or replace a component inside the controller module.

1. If you are not already grounded, properly ground yourself.
2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

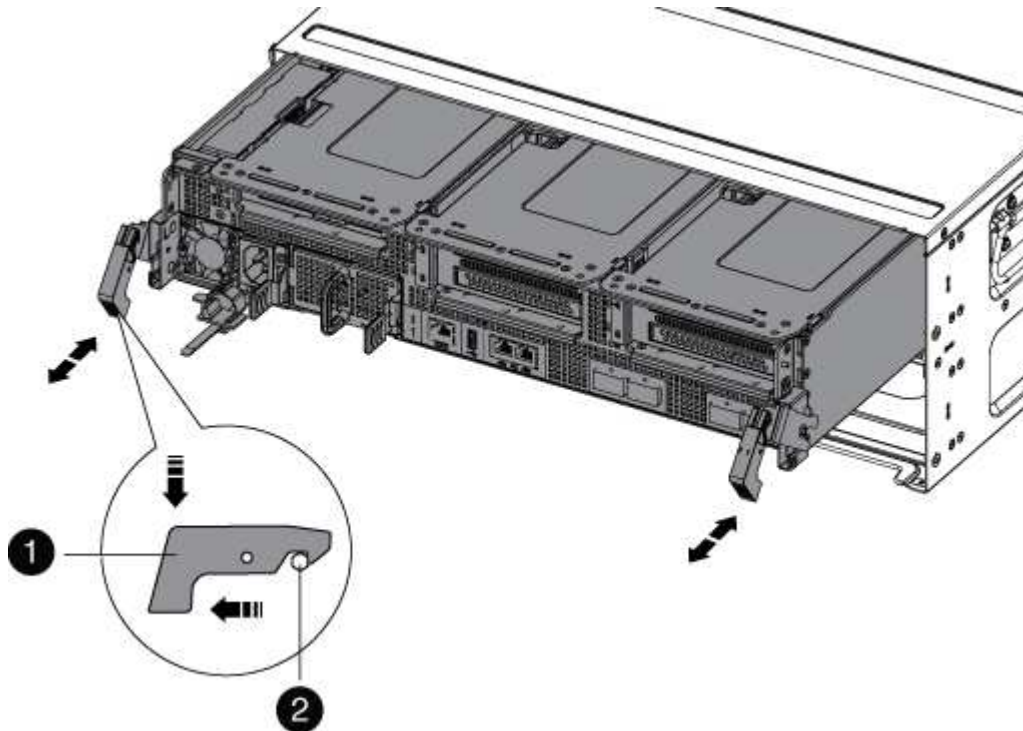
Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

3. Unplug the controller module power supply from the source, and then unplug the cable from the power

supply.

4. Remove the cable management device from the controller module and set it aside.
5. Press down on both of the locking latches, and then rotate both latches downward at the same time.

The controller module moves slightly out of the chassis.



|   |               |
|---|---------------|
| 1 | Locking latch |
| 2 | Locking pin   |

6. Slide the controller module out of the chassis.

Make sure that you support the bottom of the controller module as you slide it out of the chassis.

7. Place the controller module on a stable, flat surface, and then open the air duct:
  - a. Press in the locking tabs on the sides of the air duct toward the middle of the controller module.
  - b. Slide the air duct toward the fan modules, and then rotate it upward to its completely open position.



|   |                       |
|---|-----------------------|
| 1 | Air duct locking tabs |
| 2 | Risers                |
| 3 | Air duct              |

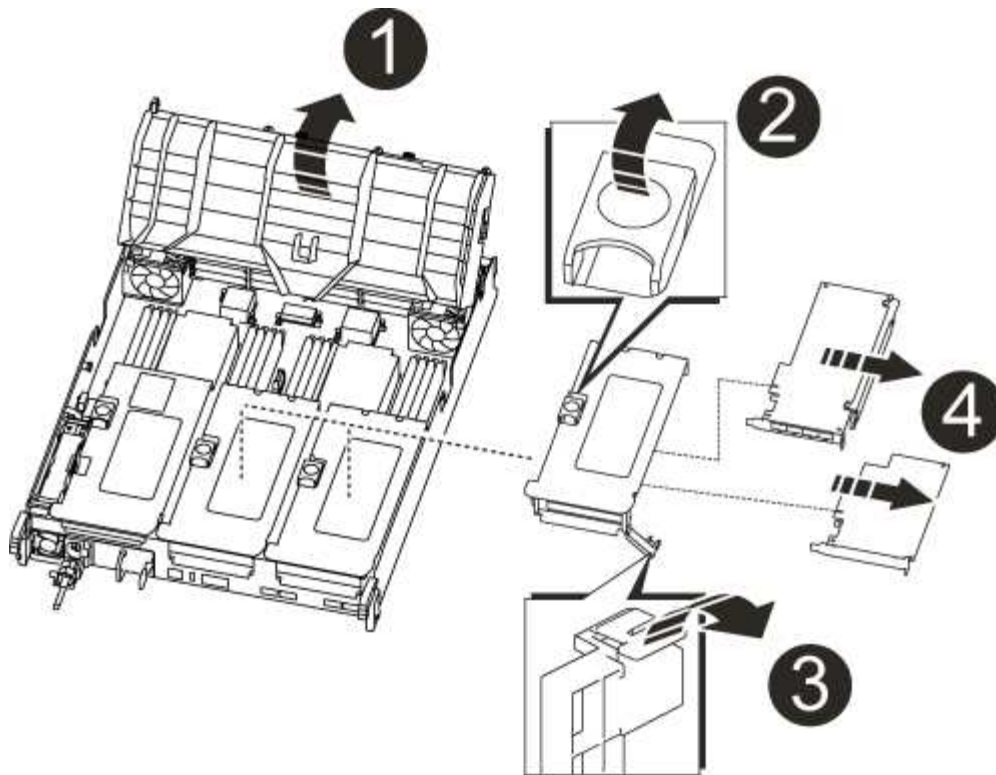
### Step 3: Replace a PCIe card

To replace a PCIe card, you must remove the cabling and any SFPs from the ports on the PCIe cards in the target riser, remove the riser from the controller module, remove and replace the PCIe card, reinstall the riser, and recable it.

1. If you are not already grounded, properly ground yourself.
2. Remove the PCIe riser from the controller module:
  - a. Remove any SFP modules that might be in the PCIe cards.
  - b. Rotate the module locking latch on the left side of the riser up and toward the fan modules.

The PCIe riser raises up slightly from the controller module.

- c. Lift the PCIe riser up, shift it toward the fans so that the sheet metal lip on the riser clears the edge of the controller module, lift the riser out of the controller module, and then place it on a stable, flat surface.



|   |                                                              |
|---|--------------------------------------------------------------|
| 1 | Air duct                                                     |
| 2 | Riser locking latch                                          |
| 3 | Card locking bracket                                         |
| 4 | Riser 2 (middle riser) and PCI cards in riser slots 2 and 3. |

3. Remove the PCIe card from the riser:

- Turn the riser so that you can access the PCIe card.
- Press the locking bracket on the side of the PCIe riser, and then rotate it to the open position.
- Remove the PCIe card from the riser.

4. Install the PCIe card into the same slot in PCIe riser:

- Align the card with the card guide on the riser and the card socket in the riser, and then slide it squarely into the socket in the riser.



Make sure that the card is completely and squarely seated into the riser socket.

- Swing the locking latch into place until it clicks into the locked position.

5. Install the riser into the controller module:

- Align the lip of the riser with the underside of the controller module sheet metal.
- Guide the riser along the pins in the controller module, and then lower the riser into the controller



module.

- c. Swing the locking latch down and click it into the locked position.

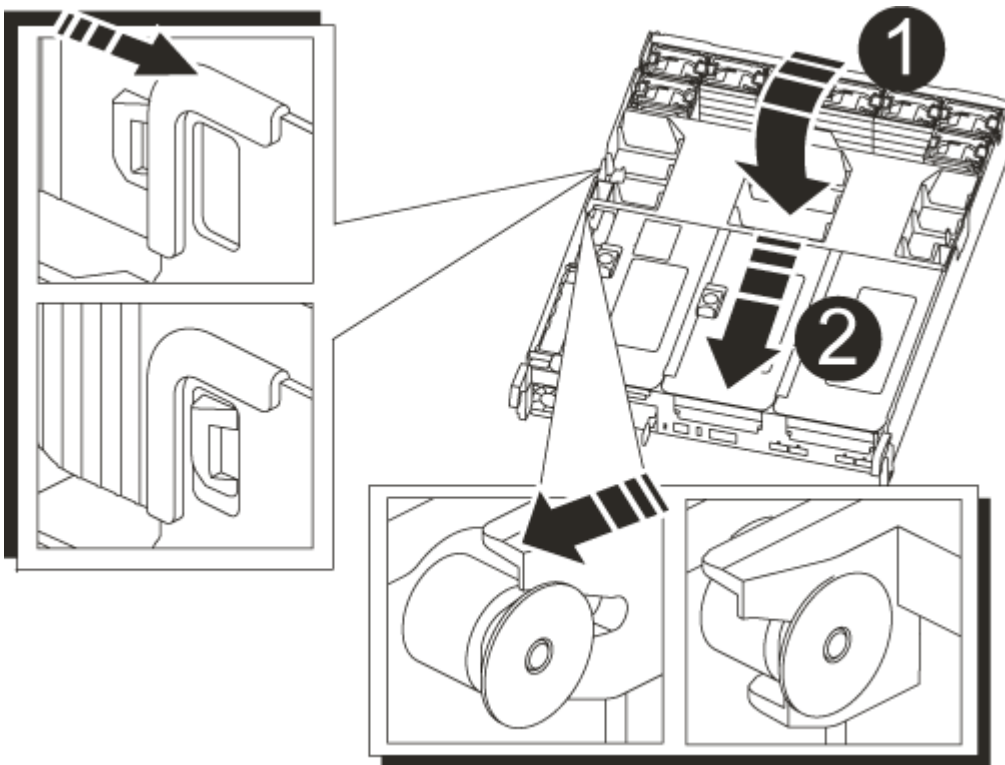
When locked, the locking latch is flush with the top of the riser and the riser sits squarely in the controller module.

- d. Reinsert any SFP modules that were removed from the PCIe cards.

#### Step 4: Reinstall the controller module

After you replace a component within the controller module, you must reinstall the controller module in the system chassis and boot it.

1. If you are not already grounded, properly ground yourself.
2. If you have not already done so, close the air duct:
  - a. Swing the air duct all the way down to the controller module.
  - b. Slide the air duct toward the risers until the locking tabs click into place.
  - c. Inspect the air duct to make sure that it is properly seated and locked into place.



|   |               |
|---|---------------|
| 1 | Locking tabs  |
| 2 | Slide plunger |

3. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.



Do not completely insert the controller module in the chassis until instructed to do so.

4. Recable the system, as needed.

If you removed the media converters (QSFPs or SFPs), remember to reinstall them if you are using fiber optic cables.

5. Plug the power cord into the power supply, reinstall the power cable locking collar, and then connect the power supply to the power source.
6. Complete the reinstallation of the controller module:
  - a. If you have not already done so, reinstall the cable management device.
  - b. Firmly push the controller module into the chassis until it meets the midplane and is fully seated.

The locking latches rise when the controller module is fully seated.



Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.

The controller module begins to boot as soon as it is fully seated in the chassis.

- c. Rotate the locking latches upward, tilting them so that they clear the locking pins, and then lower them into the locked position.
7. If your system is configured to support 10 GbE cluster interconnect and data connections on 40 GbE NICs or onboard ports, convert these ports to 10 GbE connections by using the `nicadmin convert` command from Maintenance mode.



Be sure to exit Maintenance mode after completing the conversion.

8. Return the controller to normal operation by giving back its storage: `storage failover giveback -ofnode impaired_node_name`
9. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`

#### Step 5: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

#### Swap out a power supply - AFF A700s

Swapping out a power supply involved disconnecting the target power supply (PSU) from the power source, unplugging the power cable, removing the old PSU and installing the replacement PSU, and then reconnecting it to the power source.

- The power supplies are redundant and hot-swappable.
- This procedure is written for replacing one power supply at a time.



It is a best practice to replace the power supply within two minutes of removing it from the chassis. The system continues to function, but ONTAP sends messages to the console about the degraded power supply until the power supply is replaced.

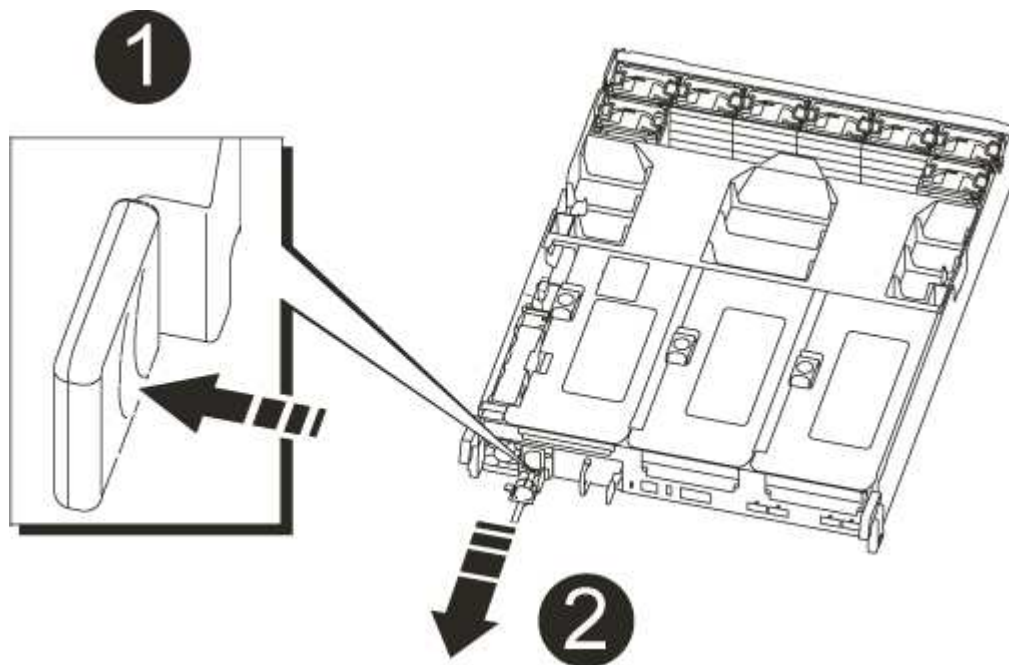
- The number of power supplies in the system depends on the model.
- Power supplies are auto-ranging.

### Steps

1. If you are not already grounded, properly ground yourself.
2. Identify the power supply you want to replace, based on console error messages or through the LEDs on the power supplies.
3. Disconnect the power supply:
  - a. Open the power cable retainer, and then unplug the power cable from the power supply.
  - b. Unplug the power cable from the power source.
4. Rotate the cam handle such that it can be used to pull power supply out of the controller module while pressing the locking tab.



The power supply is short. Always use two hands to support it when removing it from the controller module so that it does not suddenly swing free from the controller module and injure you.



|          |                               |
|----------|-------------------------------|
| <b>1</b> | Blue power supply locking tab |
| <b>2</b> | Power supply                  |

5. Using both hands, support and align the edges of the power supply with the opening in the controller module, and then gently push the power supply into the controller module until the locking tab clicks into

place.

The power supplies will only properly engage with the internal connector and lock in place one way.



To avoid damaging the internal connector, do not use excessive force when sliding the power supply into the system.

6. Close the cam handle by swinging it down as far as it will go.
7. Reconnect the power supply cabling:
  - a. Reconnect the power cable to the power supply and the power source.
  - b. Secure the power cable to the power supply using the power cable retainer.

Once power is restored to the power supply, the status LED should be green.

8. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

### Replace the real-time clock battery - AFF A700s

You replace the real-time clock (RTC) battery in the controller module so that your system's services and applications that depend on accurate time synchronization continue to function.

- You can use this procedure with all versions of ONTAP supported by your system
- All other components in the system must be functioning properly; if not, you must contact technical support.

#### Step 1: Shut down the impaired controller

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

#### Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message
MAINT=_number_of_hours_down_h
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:*>`

```
system node autosupport invoke -node * -type all -message MAINT=2h
```

2. If the impaired controller is part of an HA pair, disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`
3. Take the impaired controller to the LOADER prompt:

| If the impaired controller is displaying...              | Then...                                                                                                                                                                                                                                                               |
|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                                        | Go to Remove controller module.                                                                                                                                                                                                                                       |
| Waiting for giveback...                                  | Press Ctrl-C, and then respond <i>y</i> .                                                                                                                                                                                                                             |
| System prompt or password prompt (enter system password) | <p>Take over or halt the impaired controller from the healthy controller:<br/> <code>storage failover takeover -ofnode<br/> impaired_node_name</code></p> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i>.</p> |

## Step 2: Remove the controller module

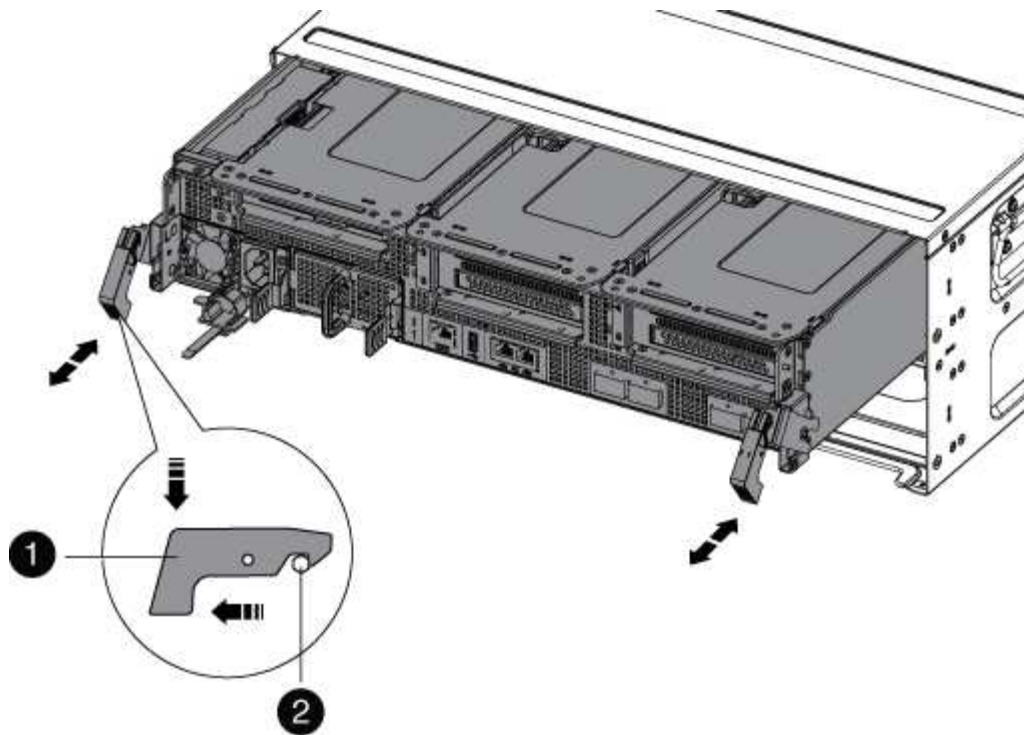
You must remove the controller module from the chassis when you replace the controller module or replace a component inside the controller module.

1. If you are not already grounded, properly ground yourself.
2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

3. Unplug the controller module power supply from the source, and then unplug the cable from the power supply.
4. Remove the cable management device from the controller module and set it aside.
5. Press down on both of the locking latches, and then rotate both latches downward at the same time.

The controller module moves slightly out of the chassis.



|   |               |
|---|---------------|
| 1 | Locking latch |
| 2 | Locking pin   |

6. Slide the controller module out of the chassis.

Make sure that you support the bottom of the controller module as you slide it out of the chassis.

7. Place the controller module on a stable, flat surface, and then open the air duct:

- Press in the locking tabs on the sides of the air duct toward the middle of the controller module.
- Slide the air duct toward the fan modules, and then rotate it upward to its completely open position.

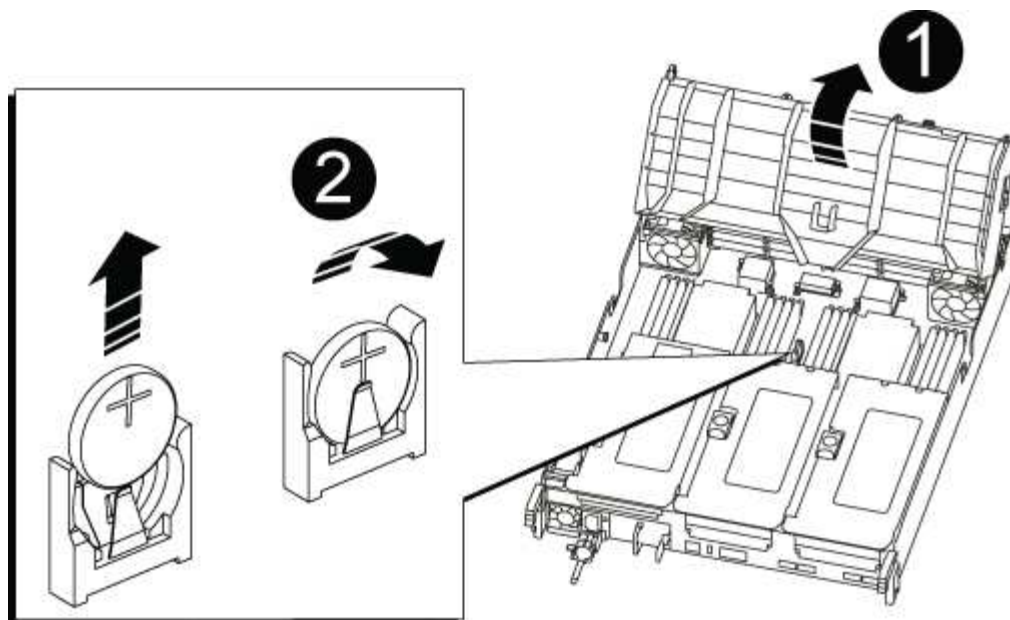


|   |                       |
|---|-----------------------|
| 1 | Air duct locking tabs |
| 2 | Risers                |
| 3 | Air duct              |

### Step 3: Replace the RTC battery

To replace the RTC battery, locate it inside the controller and follow the specific sequence of steps.

1. If you are not already grounded, properly ground yourself.
2. Locate the RTC battery.



|   |                         |
|---|-------------------------|
| 1 | Air duct                |
| 2 | RTC battery and housing |

3. Gently push the battery away from the holder, rotate it away from the holder, and then lift it out of the holder.



Note the polarity of the battery as you remove it from the holder. The battery is marked with a plus sign and must be positioned in the holder correctly. A plus sign near the holder tells you how the battery should be positioned.

4. Remove the replacement battery from the antistatic shipping bag.
5. Note the polarity of the RTC battery, and then insert it into the holder by tilting the battery at an angle and pushing down.
6. Visually inspect the battery to make sure that it is completely installed into the holder and that the polarity is correct.

#### Step 4: Reinstall the controller module and setting time/date after RTC battery replacement

After you replace a component within the controller module, you must reinstall the controller module in the system chassis, reset the time and date on the controller, and then boot it.

1. If you have not already done so, close the air duct or controller module cover.
2. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.

Do not completely insert the controller module in the chassis until instructed to do so.

3. Recable the system, as needed.

If you removed the media converters (QSFPs or SFPs), remember to reinstall them if you are using fiber



optic cables.

4. If the power supplies were unplugged, plug them back in and reinstall the power cable retainers.
5. Complete the reinstallation of the controller module:
  - a. Firmly push the controller module into the chassis until it meets the midplane and is fully seated.

The locking latches rise when the controller module is fully seated.



Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.

The controller module begins to boot as soon as it is fully seated in the chassis.

- b. Rotate the locking latches upward, tilting them so that they clear the locking pins, and then lower them into the locked position.
  - c. If you have not already done so, reinstall the cable management device.
  - d. Halt the controller at the `LOADER` prompt.
6. Reset the time and date on the controller:
  - a. Check the date and time on the healthy controller with the `show date` command.
  - b. At the `LOADER` prompt on the target controller, check the time and date.
  - c. If necessary, modify the date with the `set date mm/dd/yyyy` command.
  - d. If necessary, set the time, in GMT, using the `set time hh:mm:ss` command.
  - e. Confirm the date and time on the target controller.
7. At the `LOADER` prompt, enter `bye` to reinitialize the PCIe cards and other components and let the controller reboot.
8. Return the controller to normal operation by giving back its storage: `storage failover giveback -ofnode impaired_node_name`
9. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`

#### Step 5: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

## Install and setup

### Start here: Choose your installation and setup experience

You can choose from different content formats to guide you through installing and setting up your new storage system.

- [Quick steps](#)

A printable PDF of step-by-step instructions with live links to additional content.

- [Video steps](#)

Video step-by-step instructions.

- [Detailed steps](#)

Online step-by-step instructions with live links to additional content.

## Quick steps - AFF C190

Learn how to install your C190 system from racking and cabling, through initial system bring-up. Use the [AFF C190 Installation and Setup Instructions](#) if you are familiar with installing NetApp systems.

## Video steps - AFF C190

The following video shows how to install and cable your system.

[Animation - Install and Setup of an AFF C190](#)

## Detailed steps - AFF C190

This section gives detailed step-by-step instructions for installing a AFF C190 system.

### Step 1: Prepare for installation

To install your AFF C190 system, create an account and register the system. You also need to inventory the appropriate number and type of cables for your system and collect specific network information.

### Before you begin

- Make sure you have access to [NetApp Hardware Universe](#) (HWU) for information about site requirements as well as additional information on your configured system.
- Make sure you have access to the [Release Notes](#) for your version of ONTAP for more information about this system.
- Make sure you have the following items at your site:
  - Rack space for the storage system
  - Phillips #2 screwdriver
  - Additional networking cables to connect your system to your network switch and laptop or console with a Web browser
  - A laptop or console with an RJ-45 connection and access to a Web browser

### Steps


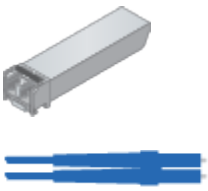



1. Unpack the contents of all boxes.
2. Record the system serial number from the controllers.



3. Set up your account:
  - a. Log in to your existing account or create an account.

- b. Register ([NetApp Product Registration](#)) your system.
4. Download and install [NetApp Downloads: Config Advisor](#) on your laptop.
5. Inventory and make a note of the number and types of cables you received.

The following table identifies the types of cables you might receive. If you receive a cable not listed in the table, see the [NetApp Hardware Universe](#) to locate the cable and identify its use.

| Type of cable...                         | Part number and length         | Connector type                                                                       | For...                                                                        |
|------------------------------------------|--------------------------------|--------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
| 10 GbE cable (order dependent)           | X6566B-05-R6 (112-00297), 0.5m |    | Cluster interconnect network                                                  |
|                                          | X6566B-2-R6 (112-00299), 2m    |                                                                                      |                                                                               |
|                                          | X6566B-2-R6 (112-00299), 2m    |                                                                                      | Data                                                                          |
|                                          | X6566B-3-R6 (112-00300), 3m    |                                                                                      |                                                                               |
|                                          | X6566B-5-R6 (112-00301), 5m    |                                                                                      |                                                                               |
| Optical network cables (order dependent) | X6553-R6 (112-00188), 2m       |    | SFP + FC host network                                                         |
|                                          | X6536-R6 (112-00090), 5m       |                                                                                      |                                                                               |
|                                          | X6554-R6(112-00189), 15m       |                                                                                      |                                                                               |
| Cat 6, RJ-45 (order dependent)           | X6585-R6 (112-00291), 3m       |   | Ethernet host and management network                                          |
|                                          | X6562-R6 (112-00196), 5m       |                                                                                      |                                                                               |
| Micro-USB console cable                  | Not applicable                 |  | Console connection during software setup on non-Windows or Mac laptop/console |
| Power cables                             | Not applicable                 |   | Powering up the system                                                        |

6. Download and complete the [Cluster Configuration Worksheet](#).

## Step 2: Install the hardware

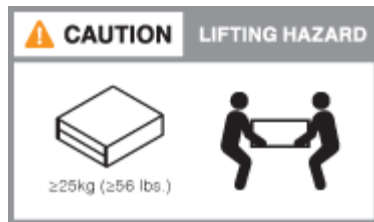
Install your system in a 4-post rack or NetApp system cabinet, as applicable.

### Steps

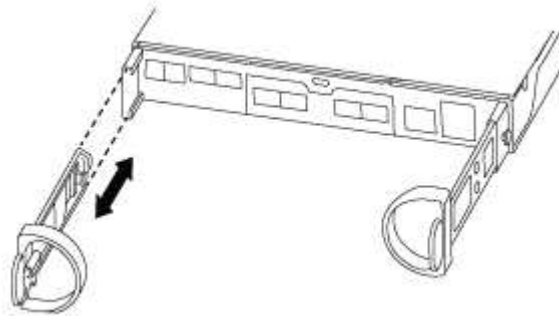
1. Install the rail kits, as needed.
2. Install and secure your system using the instructions included with the rail kit.



You need to be aware of the safety concerns associated with the weight of the system.



3. Attach cable management devices (as shown).



4. Place the bezel on the front of the system.

### Step 3: Cable controllers to your network

Cable the controllers to your network by using the two-node switchless cluster method or the cluster interconnect network method.

The following table identifies the cable type with the call out number and cable color in the illustrations for both two-node switchless cluster network cabling and switched cluster network cabling.

| Cabling | Connection type                           |
|---------|-------------------------------------------|
| 1       | Cluster interconnect                      |
| 2       | Controllers to host data network switches |
| 3       | Controllers to management network switch  |

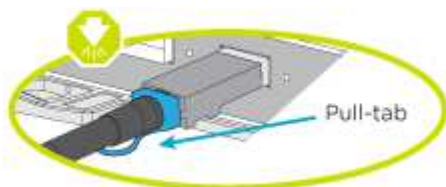
## Option 1: Two-node switchless cluster

Learn how to cable a two-node switchless cluster.

### Before you begin

Contact your network administrator for information about connecting the system to the switches.

Be sure to check the illustration arrow for the proper cable connector pull-tab orientation.



As you insert the connector, you should feel it click into place; if you do not feel it click, remove it, turn it around and try again.

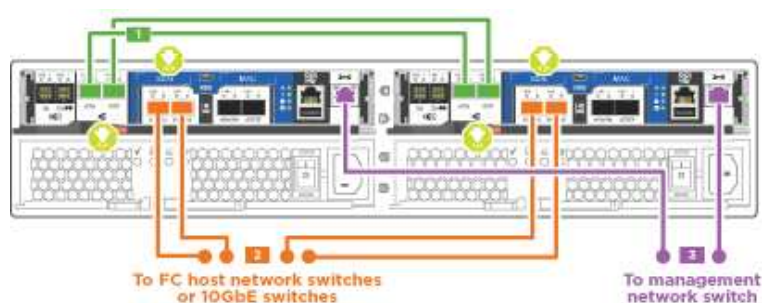


If connecting to an optical switch, insert the SFP into the controller port before cabling to the port.

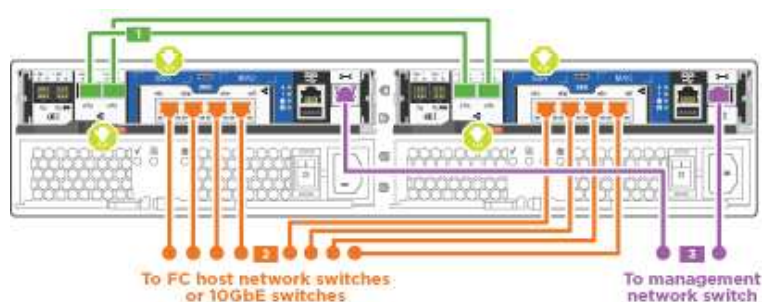
### About this task

Refer to the following cabling illustrations when cabling between the controllers and the switches.

#### UTA2 data network configurations



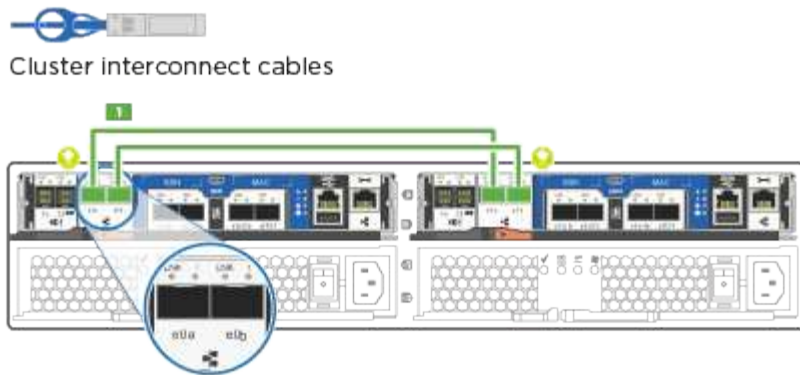
#### Ethernet network configurations



Perform the following steps on each controller module.

### Steps

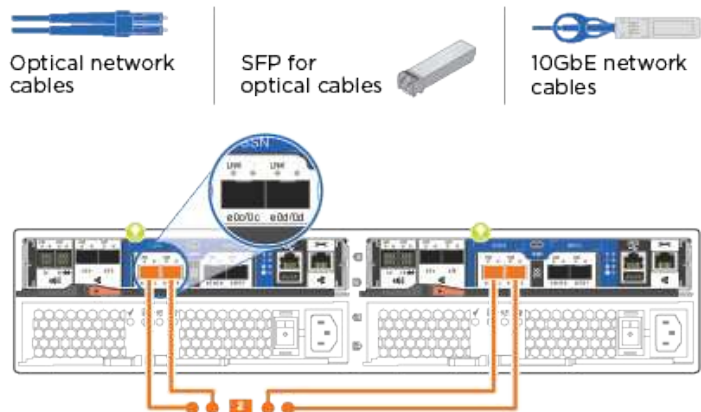
1. Cable the cluster interconnect ports e0a to e0a and e0b to e0b with the cluster interconnect cable.



2. Cable the controllers to either a UTA2 data network or an Ethernet network.

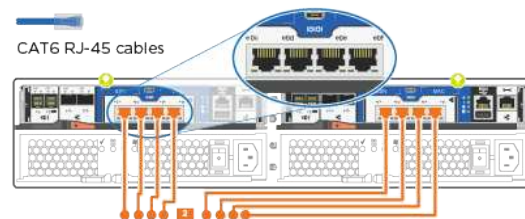
#### UTA2 data network configurations

Use one of the following cable types to cable the e0c/0c and e0d/0d or e0e/0e and e0f/0f data ports to your host network.

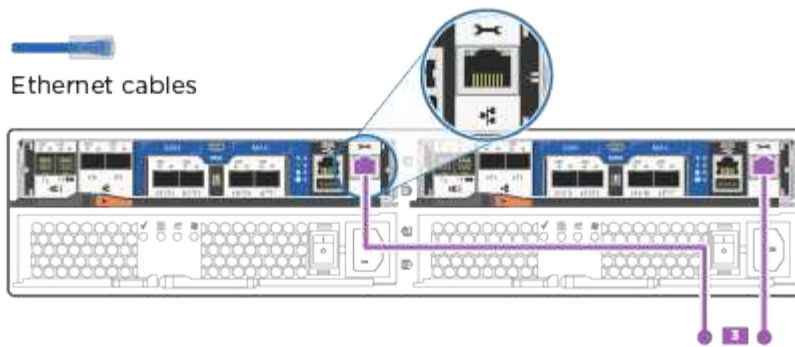


#### Ethernet network configurations

Use the Cat 6 RJ45 cable to cable the e0c through e0f ports to your host network. in the following illustration.



3. Cable the e0M ports to the management network switches with the RJ45 cables.



**i** DO NOT plug in the power cords at this point.

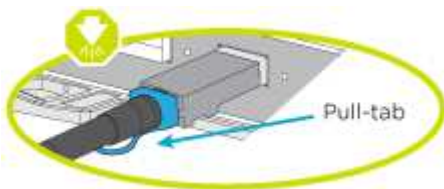
## Option 2: Switched cluster

Learn how to cable a switched cluster.

### Before you begin

Contact your network administrator for information about connecting the system to the switches.

Be sure to check the illustration arrow for the proper cable connector pull-tab orientation.



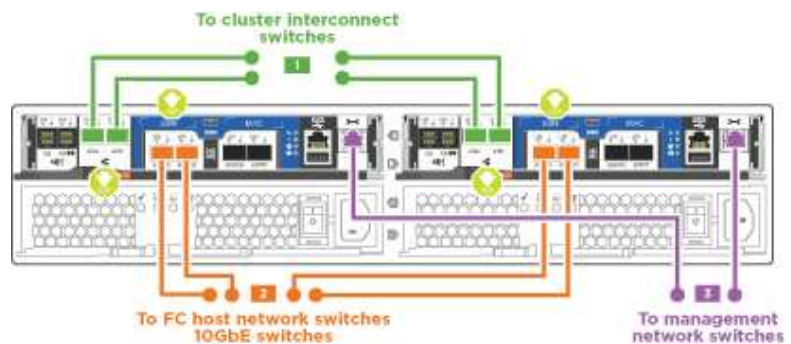
**i** As you insert the connector, you should feel it click into place; if you do not feel it click, remove it, turn it around and try again.

**i** If connecting to an optical switch, insert the SFP into the controller port before cabling to the port.

### About this task

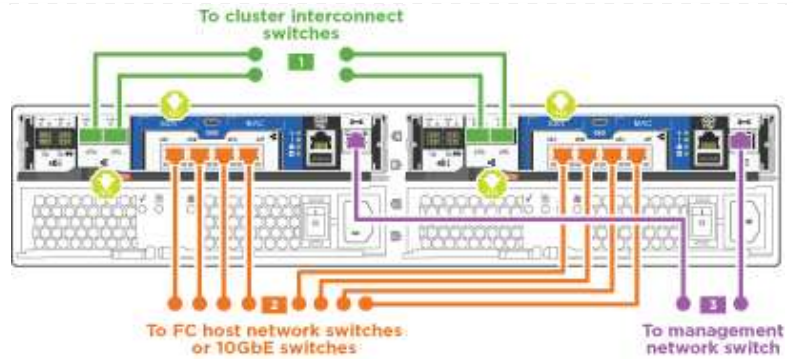
Refer to the following cabling illustrations when cabling between the controllers and the switches.

#### Unified network configurations





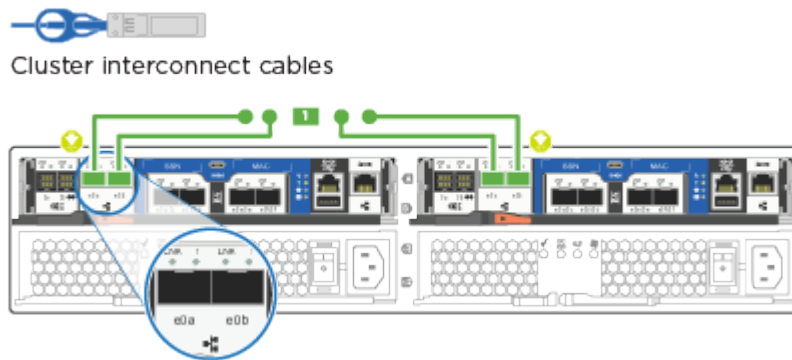
## Ethernet network configurations



Perform the following steps on each controller module.

### Steps

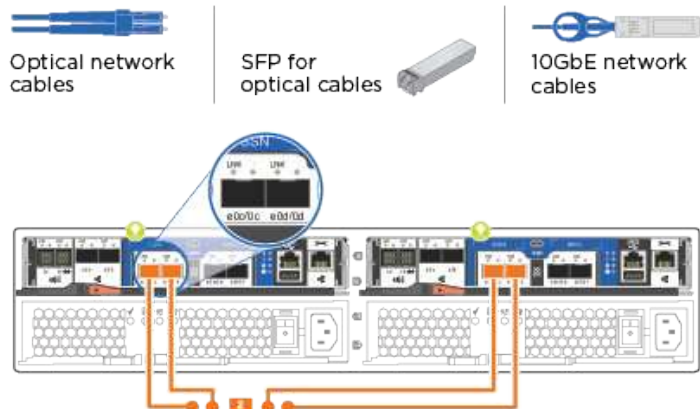
1. Cable e0a and e0b to the cluster interconnect switches with the cluster interconnect cable.



2. Cable the controllers to either a UTA2 data network or an Ethernet network.

### UTA2 data network configurations

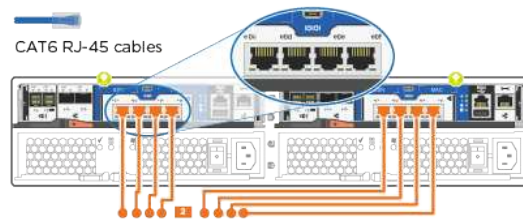
Use one of the following cable types to cable the e0c/0c and e0d/0d or e0e/0e and e0f/0f data ports to your host network.



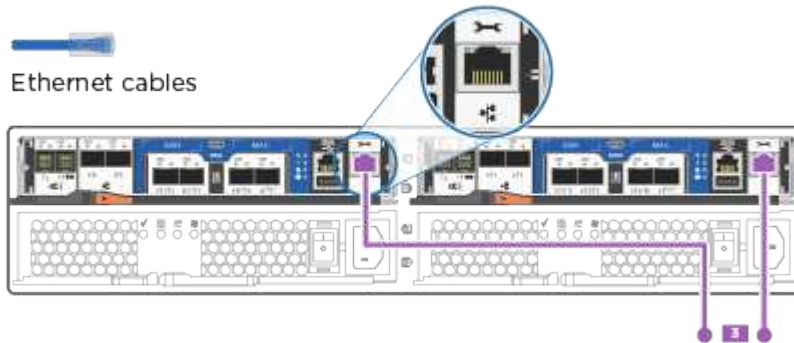


## Ethernet network configurations

Use the Cat 6 RJ45 cable to cable the e0c through e0f ports to your host network.



3. Cable the e0M ports to the management network switches with the RJ45 cables.



DO NOT plug in the power cords at this point.

### Step 4: Complete system setup

Complete the system setup and configuration using cluster discovery with only a connection to the switch and laptop, or by connecting directly to a controller in the system and then connecting to the management switch.

### Option 1: If network discovery is enabled

Learn how to complete system setup if you have network discovery enabled on your laptop.

#### Steps

1. Plug the power cords into the controller power supplies, and then connect them to power sources on different circuits.
2. Turn on the power switches to both nodes.



Initial booting may take up to eight minutes..

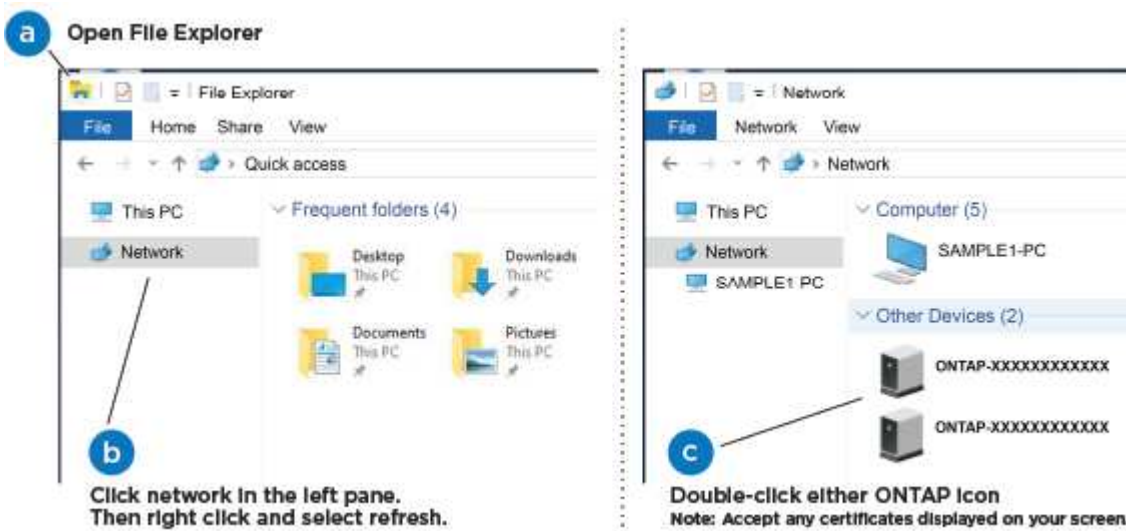
3. Make sure that your laptop has network discovery enabled.

See your laptop's online help for more information.

4. Connect your laptop to the Management switch:



1. Select an ONTAP icon listed to discover:



- a. Open File Explorer.

- b. Click **Network** in the left pane.
- c. Right-click and select **refresh**.
- d. Double-click either ONTAP icon and accept any certificates displayed on your screen.



XXXXX is the system serial number for the target node.

System Manager opens.

2. Use System Manager guided setup to configure your system using the data you collected in the [ONTAP Configuration Guide](#).
3. Verify the health of your system by running Config Advisor.
4. After you have completed the initial configuration, go to the [ONTAP documentation](#) site for information about configuring additional features in ONTAP.



The default port configuration for Unified configuration systems is CNA mode; if connecting to an FC host network, you have to modify the ports for FC mode.

### Option 2: If network discovery is not enabled

Learn how to complete the system setup if network discovery is not enabled on your laptop.

#### Steps

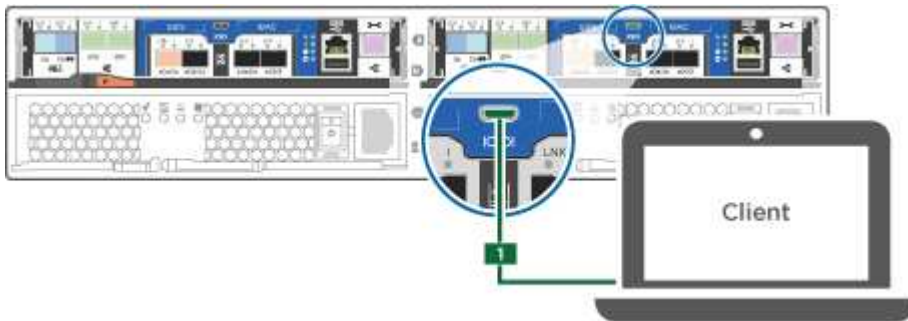
1. Cable and configure your laptop or console:

- a. Set the console port on the laptop or console to 115,200 baud with N-8-1.



See your laptop or console's online help for how to configure the console port.

- b. Connect the console cable to the laptop or console, and connect the console port on the controller using the console cable that came with your system.




- c. Connect the laptop or console to the switch on the management subnet.




- d. Assign a TCP/IP address to the laptop or console, using one that is on the management subnet.
2. Plug the power cords into the controller power supplies, and then connect them to power sources on different circuits.
3. Turn on the power switches to both nodes.




 Initial booting may take up to eight minutes..

4. Assign an initial node management IP address to one of the nodes.

| If the management network has DHCP... | Then...                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Configured                            | Record the IP address assigned to the new controllers.                                                                                                                                                                                                                                                                                                                                                                                                 |
| Not configured                        | <ol style="list-style-type: none"> <li>a. Open a console session using PuTTY, a terminal server, or the equivalent for your environment.</li> </ol> <p> Check your laptop or console's online help if you do not know how to configure PuTTY.</p> <ol style="list-style-type: none"> <li>b. Enter the management IP address when prompted by the script.</li> </ol> |

5. Using System Manager on your laptop or console, configure your cluster:
  - a. Point your browser to the node management IP address.

 The format for the address is https://x.x.x.x.

- b. Configure the system using the data you collected in the [ONTAP Configuration Guide](#).

6. Verify the health of your system by running Config Advisor.

7. After you have completed the initial configuration, go to the [ONTAP &documentation](#) site for information about configuring additional features in ONTAP.



The default port configuration for Unified configuration systems is CNA mode; if connecting to an FC host network, you have to modify the ports for FC mode.

## Maintain

### Maintain AFF C190 hardware

For the AFF C190 storage system, you can perform maintenance procedures on the following components.

#### Boot media

The boot media stores a primary and secondary set of boot image files that the system uses when it boots.

#### Chassis

The chassis is the physical enclosure housing all the controller components such as the controller/CPU unit, power supply, and I/O.

#### Controller

A controller consists of a board, firmware, and software. It controls the drives and implements the ONTAP functions.

#### DIMM

You must replace a DIMM (dual in-line memory module) when a memory mismatch is present, or you have a failed DIMM.

#### Drive

A drive is a device that provides the physical storage media for data.

#### Fan

The fan cools the controller.

#### NVMEM battery

A battery is included with the controller and provides the backup power if the AC power fails.

#### Power supply

A power supply provides a redundant power source in a controller shelf.

#### Real-time clock battery

A real time clock battery preserves system date and time information if the power is off.

## Boot media

### Overview of boot media replacement - AFF C190

The boot media stores a primary and secondary set of system (boot image) files that the system uses when it boots. Depending on your network configuration, you can perform either a nondisruptive or disruptive replacement.

You must have a USB flash drive, formatted to FAT32, with the appropriate amount of storage to hold the `image_XXX.tgz` file.

- The nondisruptive and disruptive methods for replacing a boot media both require you to restore the var file system:
  - For nondisruptive replacement, the HA pair must be connected to a network to restore the var file system.
  - For disruptive replacement, you do not need a network connection to restore the var file system, but the process requires two reboots.
- You must replace the failed component with a replacement FRU component you received from your provider.
- It is important that you apply the commands in these steps on the correct controller:
  - The *impaired* controller is the controller on which you are performing maintenance.
  - The *healthy* controller is the HA partner of the impaired controller.

### Check onboard encryption keys - AFF C190

Prior to shutting down the impaired controller and checking the status of the onboard encryption keys, you must check the status of the impaired controller, disable automatic giveback, and check what version of ONTAP the system is running.

Prior to shutting down the impaired controller and checking the status of the onboard encryption keys, you must check the status of the impaired controller, disable automatic giveback, and check which version of ONTAP is running on the system.

If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see the [Synchronize a node with the cluster](#).

## Steps

1. Check the status of the impaired controller:
  - If the impaired controller is at the login prompt, log in as `admin`.
  - If the impaired controller is at the LOADER prompt and is part of HA configuration, log in as `admin` on the healthy controller.
  - If the impaired controller is in a standalone configuration and at LOADER prompt, contact [mysupport.netapp.com](https://mysupport.netapp.com).
2. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message
MAINT=number_of_hours_downh
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h`

3. Check the version of ONTAP the system is running on the impaired controller if up, or on the partner controller if the impaired controller is down, using the `version -v` command:
  - If `<Ino-DARE>` or `<1Ono-DARE>` is displayed in the command output, the system does not support NVE, proceed to shut down the controller.
  - If `<Ino-DARE>` is not displayed in the command output, and the system is running ONTAP 9.6 or later, go to the next section.
4. If the impaired controller is part of an HA configuration, disable automatic giveback from the healthy controller: `storage failover modify -node local -auto-giveback false` or `storage failover modify -node local -auto-giveback-after-panic false`

### Check NVE or NSE on systems running ONTAP 9.6 and later

Before shutting down the impaired controller, you need to verify whether the system has either NetApp Volume Encryption (NVE) or NetApp Storage Encryption (NSE) enabled. If so, you need to verify the configuration.

1. Verify whether NVE is in use for any volumes in the cluster: `volume show -is-encrypted true`

If any volumes are listed in the output, NVE is configured and you need to verify the NVE configuration. If no volumes are listed, check whether NSE is configured and in use.

2. Verify whether NSE is configured and in use: `storage encryption disk show`
  - If the command output lists the drive details with Mode & Key ID information, NSE is configured and you need to verify the NSE configuration and in use.
  - If no disks are shown, NSE is not configured.
  - If NVE and NSE are not configured, no drives are protected with NSE keys, it's safe to shut down the impaired controller.

### Verify NVE configuration

1. Display the key IDs of the authentication keys that are stored on the key management servers: `security key-manager key query`



After the ONTAP 9.6 release, you may have additional key manager types. The types are KMIP, AKV, and GCP. The process for confirming these types is the same as confirming external or onboard key manager types.

- If the Key Manager type displays `external` and the Restored column displays `yes`, it's safe to shut down the impaired controller.
  - If the Key Manager type displays `onboard` and the Restored column displays `yes`, you need to complete some additional steps.
  - If the Key Manager type displays `external` and the Restored column displays anything other than `yes`, you need to complete some additional steps.
  - If the Key Manager type displays `onboard` and the Restored column displays anything other than `yes`, you need to complete some additional steps.
2. If the Key Manager type displays `onboard` and the Restored column displays `yes`, manually back up

the OKM information:

- a. Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
  - b. Enter the command to display the key management information: `security key-manager onboard show-backup`
  - c. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
  - d. Return to admin mode: `set -priv admin`
  - e. Shut down the impaired controller.
3. If the Key Manager type displays `external` and the Restored column displays anything other than `yes`:
- a. Restore the external key management authentication keys to all nodes in the cluster: `security key-manager external restore`
- If the command fails, contact NetApp Support.
- [mysupport.netapp.com](https://mysupport.netapp.com)
- b. Verify that the Restored column equals `yes` for all authentication keys: `security key-manager key query`
  - c. Shut down the impaired controller.
4. If the Key Manager type displays `onboard` and the Restored column displays anything other than `yes`:
- a. Enter the onboard security key-manager sync command: `security key-manager onboard sync`



Enter the customer's 32 character, alphanumeric onboard key management passphrase at the prompt. If the passphrase cannot be provided, contact NetApp Support.

[mysupport.netapp.com](https://mysupport.netapp.com)

- b. Verify the Restored column shows `yes` for all authentication keys: `security key-manager key query`
- c. Verify that the Key Manager type shows `onboard`, and then manually back up the OKM information.
- d. Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
- e. Enter the command to display the key management backup information: `security key-manager onboard show-backup`
- f. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
- g. Return to admin mode: `set -priv admin`
- h. You can safely shut down the controller.

## Verify NSE configuration

1. Display the key IDs of the authentication keys that are stored on the key management servers: `security key-manager key query -key-type NSE-AK`





After the ONTAP 9.6 release, you may have additional key manager types. The types are KMIP, AKV, and GCP. The process for confirming these types is the same as confirming external or onboard key manager types.

- If the Key Manager type displays `external` and the Restored column displays `yes`, it's safe to shut down the impaired controller.
  - If the Key Manager type displays `onboard` and the Restored column displays `yes`, you need to complete some additional steps.
  - If the Key Manager type displays `external` and the Restored column displays anything other than `yes`, you need to complete some additional steps.
  - If the Key Manager type displays `external` and the Restored column displays anything other than `yes`, you need to complete some additional steps.
2. If the Key Manager type displays `onboard` and the Restored column displays `yes`, manually back up the OKM information:
    - a. Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
    - b. Enter the command to display the key management information: `security key-manager onboard show-backup`
    - c. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
    - d. Return to admin mode: `set -priv admin`
    - e. You can safely shut down the controller.
  3. If the Key Manager type displays `external` and the Restored column displays anything other than `yes`:
    - a. Restore the external key management authentication keys to all nodes in the cluster: `security key-manager external restore`  
  
If the command fails, contact NetApp Support.  
  
[mysupport.netapp.com](https://mysupport.netapp.com)
    - b. Verify that the Restored column equals `yes` for all authentication keys: `security key-manager key query`
    - c. You can safely shut down the controller.
  4. If the Key Manager type displays `onboard` and the Restored column displays anything other than `yes`:
    - a. Enter the onboard security key-manager sync command: `security key-manager onboard sync`  
  
Enter the customer's 32 character, alphanumeric onboard key management passphrase at the prompt. If the passphrase cannot be provided, contact NetApp Support.  
  
[mysupport.netapp.com](https://mysupport.netapp.com)
    - b. Verify the Restored column shows `yes` for all authentication keys: `security key-manager key query`
    - c. Verify that the Key Manager type shows `onboard`, and then manually back up the OKM information.

- d. Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
- e. Enter the command to display the key management backup information: `security key-manager onboard show-backup`
- f. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
- g. Return to admin mode: `set -priv admin`
- h. You can safely shut down the controller.

#### Shut down the controller - AFF C190

After completing the NVE or NSE tasks, you need to complete the shutdown of the impaired controller.

After completing the NVE or NSE tasks, you need to complete the shutdown of the impaired controller.

#### Steps

- a. Take the impaired controller to the LOADER prompt:

| If the impaired controller displays...                   | Then...                                                                                                                                                                                                                                                         |
|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                                        | Go to Remove controller module.                                                                                                                                                                                                                                 |
| Waiting for giveback...                                  | Press Ctrl-C, and then respond <code>y</code> when prompted.                                                                                                                                                                                                    |
| System prompt or password prompt (enter system password) | <p>Take over or halt the impaired controller from the healthy controller:</p> <pre>storage failover takeover -ofnode impaired_node_name</pre> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <code>y</code>.</p> |

- b. From the LOADER prompt, enter: `printenv` to capture all boot environmental variables. Save the output to your log file.



This command may not work if the boot device is corrupted or non-functional.

#### Replace the boot media - AFF C190

To replace the boot media, you must remove the impaired controller module, install the replacement boot media, and transfer the boot image to a USB flash drive.

#### Step 1: Remove the controller

To access components inside the controller module, you must first remove the controller module from the system, and then remove the cover on the controller module.

#### Steps

1. If you are not already grounded, properly ground yourself.
2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

3. Remove and set aside the cable management devices from the left and right sides of the controller module.



4. Squeeze the latch on the cam handle until it releases, open the cam handle fully to release the controller module from the midplane, and then, using two hands, pull the controller module out of the chassis.



5. Turn the controller module over and place it on a flat, stable surface.
6. Open the cover by sliding in the blue tabs to release the cover, and then swing the cover up and open.



## Step 2: Replace the boot media

You must locate the boot media in the controller module, and then follow the directions to replace it.

1. Locate the boot media using the following illustration or the FRU map on the controller module:
2. Press the blue button on the boot media housing to release the boot media from its housing, and then gently pull it straight out of the boot media socket.



Do not twist or pull the boot media straight up, because this could damage the socket or the boot media.

3. Align the edges of the replacement boot media with the boot media socket, and then gently push it into the socket.
4. Check the boot media to make sure that it is seated squarely and completely in the socket.

If necessary, remove the boot media and reseal it into the socket.

5. Push the boot media down to engage the locking button on the boot media housing.
6. Close the controller module cover.

## Step 3: Transfer the boot image to the boot media

You can install the system image to the replacement boot media using a USB flash drive with the image installed on it. However, you must restore the `var` file system during this procedure.

- You must have a USB flash drive, formatted to FAT32, with at least 4GB capacity.
- A copy of the same image version of ONTAP as what the impaired controller was running. You can download the appropriate image from the **Downloads** section on the NetApp Support Site
  - If NVE is enabled, download the image with NetApp Volume Encryption, as indicated in the download button.
  - If NVE is not enabled, download the image without NetApp Volume Encryption, as indicated in the download button.
- If your system is an HA pair, you must have a network connection.
- If your system is a stand-alone system you do not need a network connection, but you must perform an additional reboot when restoring the var file system.

## Steps

1. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.
2. Reinstall the cable management device and recable the system, as needed.

When recabling, remember to reinstall the media converters (SFPs) if they were removed.

3. Insert the USB flash drive into the USB slot on the controller module.

Make sure that you install the USB flash drive in the slot labeled for USB devices, and not in the USB console port.

4. Push the controller module all the way into the system, making sure that the cam handle clears the USB flash drive, firmly push the cam handle to finish seating the controller module, push the cam handle to the closed position, and then tighten the thumbscrew.

The controller begins to boot as soon as it is completely installed into the chassis.

5. Interrupt the boot process to stop at the LOADER prompt by pressing Ctrl-C when you see `Starting AUTOBOOT press Ctrl-C to abort...`

If you miss this message, press Ctrl-C, select the option to boot to Maintenance mode, and then `halt` the controller to boot to LOADER.

6. Boot the recovery image:

**`boot_recovery ontap_image_name.tgz`**



If the `image.tgz` file is named something other than `image.tgz`, such as `boot_recovery_9_4.tgz`, you need to include the different file name in the `boot_recovery` command.

The system boots to the boot menu and prompts you for the boot image name.

7. Enter the boot image name that is on the USB flash drive:

**`image_name.tgz`**

After `image_name.tgz` is installed, the system prompts you to restore the backup configuration (the `var` file system) from the healthy controller.

8. Restore the `var` file system:

| If your system has... | Then...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A network connection  | <p>a. Press <b>y</b> when prompted to restore the backup configuration.</p> <p>b. Set the healthy controller to advanced privilege level:</p> <pre>set -privilege advanced</pre> <p>c. Run the restore backup command:</p> <pre>system node restore-backup -node local -target -address impaired_node_IP_address</pre> <p>d. Return the controller to admin level:</p> <pre>set -privilege admin</pre> <p>e. Press <b>y</b> when prompted to use the restored configuration.</p> <p>f. Press <b>y</b> when prompted to reboot the controller.</p> |
| No network connection | <p>a. Press <b>n</b> when prompted to restore the backup configuration.</p> <p>b. Reboot the system when prompted by the system.</p> <p>c. Select the <b>Update flash from backup config</b> (sync flash) option from the displayed menu.</p> <p>If you are prompted to continue with the update, press <b>y</b>.</p>                                                                                                                                                                                                                             |

9. Verify that the environmental variables are set as expected.


- a. Take the controller to the `LOADER` prompt.

From the `ONTAP` prompt, you can issue the command `system node halt -skip-lif -migration-before-shutdown true -ignore-quorum-warnings true -inhibit -takeover true`.

- b. Check the environment variable settings with the `printenv` command.
- c. If an environment variable is not set as expected, modify it with the `setenv environment_variable_name changed_value` command.
- d. Save your changes using the `saveenv` command.
- e. Reboot the controller.

10. The next step depends on your system configuration:

| If your system is in...     | Then...                                                       |
|-----------------------------|---------------------------------------------------------------|
| A stand-alone configuration | You can begin using your system after the controller reboots. |

| If your system is in... | Then...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| An HA pair              | <p>After the impaired controller is displaying the <code>Waiting for Giveback...</code> message, perform a giveback from the healthy controller:</p> <p>a. Perform a giveback from the healthy controller:</p> <pre><b>storage failover giveback -ofnode<br/>partner_node_name</b></pre> <p>This initiates the process of returning ownership of the impaired controller's aggregates and volumes from the healthy controller back to the impaired controller.</p> <div>  <p>If the giveback is vetoed, you can consider overriding the vetoes.</p> <p><a href="#">HA pair management</a></p> </div> <p>b. Monitor the progress of the giveback operation by using the <code>`storage failover show-giveback`</code> command.</p> <p>c. After the giveback operation is complete, confirm that the HA pair is healthy and that takeover is possible by using the <code>storage failover show</code> command.</p> <p>d. Restore automatic giveback if you disabled it by using the <code>storage failover modify</code> command.</p> |

#### Boot the recovery image - AFF C190

You must boot the ONTAP image from the USB drive, restore the file system, and verify the environmental variables.

#### Steps

1. From the LOADER prompt, boot the recovery image from the USB flash drive:

```
boot_recovery
```

The image is downloaded from the USB flash drive.

2. When prompted, either enter the name of the image or accept the default image displayed inside the brackets on your screen.
3. Restore the `var` file system:

| If your system has... | Then...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A network connection  | <p>a. Press <b>y</b> when prompted to restore the backup configuration.</p> <p>b. Set the healthy controller to advanced privilege level:</p> <pre>set -privilege advanced</pre> <p>c. Run the restore backup command:</p> <pre>system node restore-backup -node local -target -address <i>impaired_node_IP_address</i></pre> <p>d. Return the controller to admin level:</p> <pre>set -privilege admin</pre> <p>e. Press <b>y</b> when prompted to use the restored configuration.</p> <p>f. Press <b>y</b> when prompted to reboot the controller.</p> |
| No network connection | <p>a. Press <b>n</b> when prompted to restore the backup configuration.</p> <p>b. Reboot the system when prompted by the system.</p> <p>c. Select the <b>Update flash from backup config</b> (sync flash) option from the displayed menu.</p> <p>If you are prompted to continue with the update, press <b>y</b>.</p>                                                                                                                                                                                                                                    |

4. Ensure that the environmental variables are set as expected:
  - a. Take the controller to the LOADER prompt.
  - b. Check the environment variable settings with the `printenv` command.
  - c. If an environment variable is not set as expected, modify it with the `setenv environment_variable_name changed_value` command.
  - d. Save your changes using the `saveenv` command.
5. The next depends on your system configuration:
  - If your system has onboard keymanager, NSE or NVE configured, go to [Restore OKM, NSE, and NVE as needed](#)
  - If your system does not have onboard keymanager, NSE or NVE configured, complete the steps in this section.
6. From the LOADER prompt, enter the `boot_ontap` command.

| If you see...    | Then...              |
|------------------|----------------------|
| The login prompt | Go to the next Step. |



| If you see...           | Then...                                                                                                                                                                                              |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Waiting for giveback... | <ol style="list-style-type: none"> <li>Log into the partner controller.</li> <li>Confirm the target controller is ready for giveback with the <code>storage failover show</code> command.</li> </ol> |

- Connect the console cable to the partner controller.
- Give back the controller using the `storage failover giveback -fromnode local` command.
- At the cluster prompt, check the logical interfaces with the `net int -is-home false` command.

If any interfaces are listed as "false", revert those interfaces back to their home port using the `net int revert` command.

- Move the console cable to the repaired controller and run the `version -v` command to check the ONTAP versions.
- Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.

#### Restore OKM, NSE, and NVE as needed - AFF C190

Once environment variables are checked, you must complete steps specific to systems that have Onboard Key Manager (OKM), NetApp Storage Encryption (NSE) or NetApp Volume Encryption (NVE) enabled.

- Determine which section you should use to restore your OKM, NSE, or NVE configurations: If NSE or NVE are enabled along with Onboard Key Manager you must restore settings you captured at the beginning of this procedure.
  - If NSE or NVE are enabled and Onboard Key Manager is enabled, go to [Restore NVE or NSE when Onboard Key Manager is enabled](#).
  - If NSE or NVE are enabled for ONTAP 9.6, go to [Restore NSE/NVE on systems running ONTAP 9.6 and later](#).

#### Restore NVE or NSE when Onboard Key Manager is enabled

##### Steps

- Connect the console cable to the target controller.
- Use the `boot_ontap` command at the LOADER prompt to boot the controller.
- Check the console output:

| If the console displays... | Then...                                                            |
|----------------------------|--------------------------------------------------------------------|
| The LOADER prompt          | Boot the controller to the boot menu: <code>boot_ontap menu</code> |

| If the console displays... | Then...                                                                                                                                                                                                                    |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Waiting for giveback....   | a. Enter <code>Ctrl-C</code> at the prompt<br>b. At the message: Do you wish to halt this node rather than wait [y/n]? , enter: <code>y</code><br>c. At the LOADER prompt, enter the <code>boot_ontap</code> menu command. |

- At the Boot Menu, enter the hidden command, `recover_onboard_keymanager` and reply `y` at the prompt
- Enter the passphrase for the onboard key manager you obtained from the customer at the beginning of this procedure.
- When prompted to enter the backup data, paste the backup data you captured at the beginning of this procedure, when asked. Paste the output of `security key-manager backup show` OR `security key-manager onboard show-backup` command



The data is output from either `security key-manager backup show` or `security key-manager onboard show-backup` command.

Example of backup data:

```

-----BEGIN BACKUP-----
TmV0QXBwIEtleSBCbG9iAAEAAAAEAAAAcAEAAAAAADuD+byAAAAACEAAAAAAAAA
QAAAAAAAAABvOIH0AAAAAMh7qDLRyH1DBz12piVdy9ATSFMT0C0TIYFss4PDjTaV
dzRYkLd1PhQLxAWJwOlyqSr8qY1SEBgm1IWgE5DLRqkiAAAAAAAAACgAAAAAAAA
3WTh7gAAAAAAAAAAAAAAAAAIAAAAAAgAZJEIWvdeHr5RCAvHGclo+wAAAAAAAAA
lgAAAAAAAAoAAAAAAAAAEOTcR0AAAAAAAAAAAAAAAACAAAAAAJAGr3tJA/
LRzUQRHwv+1aWvAAAAAAAAAACQAAAAAAAAAgAAAAAAAAACdhTcvAAAAAJ1PXeBf
ml4NBsSyV1B4jc4A7cvWEFY6ILG6hc6tbKLAHZuvfQ4rlbYAAAAAAAAAAAAAAAA
AA
AA
.
.
.
.
H4nPQM0nrDRYRa9SCv8AAA
AA
AAAAAAA
-----END BACKUP-----

```

- At the Boot Menu select the option for Normal Boot.

The system boots to Waiting for giveback... prompt.

- Confirm the target controller is ready for giveback with the `storage failover show` command.
- Giveback only the CFO aggregates with the `storage failover giveback -fromnode local -only-cfo-aggregates true` command.

- If the command fails because of a failed disk, physically disengage the failed disk, but leave the disk in the slot until a replacement is received.
- If the command fails because of an open CIFS sessions, check with customer how to close out CIFS sessions.



Terminating CIFS can cause loss of data.

- If the command fails because the partner "not ready", wait 5 minutes for the NVMEMs to synchronize.
- If the command fails because of an NDMP, SnapMirror, or SnapVault process, disable the process. See the appropriate Documentation Center for more information.

10. Once the giveback completes, check the failover and giveback status with the `storage failover show` and ``storage failover show-giveback`` commands.

Only the CFO aggregates (root aggregate and CFO style data aggregates) will be shown.

11. Move the console cable to the target controller.

- a. If you are running ONTAP 9.6 or later, run the security key-manager onboard sync:
- b. Run the `security key-manager onboard sync` command and then enter the passphrase when prompted.
- c. Enter the `security key-manager key query` command to see a detailed view of all keys stored in the onboard key manager and verify that the `Restored` column = `yes/true` for all authentication keys.



If the `Restored` column = anything other than `yes/true`, contact Customer Support.

- d. Wait 10 minutes for the key to synchronize across the cluster.

12. Move the console cable to the partner controller.

13. Give back the target controller using the `storage failover giveback -fromnode local` command.

14. Check the giveback status, 3 minutes after it reports complete, using the `storage failover show` command.

If giveback is not complete after 20 minutes, contact Customer Support.

15. At the clustershell prompt, enter the `net int show -is-home false` command to list the logical interfaces that are not on their home controller and port.

If any interfaces are listed as `false`, revert those interfaces back to their home port using the `net int revert -vserver Cluster -lif nodename` command.

16. Move the console cable to the target controller and run the `version -v` command to check the ONTAP versions.

17. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.

## Restore NSE/NVE on systems running ONTAP 9.6 and later

### Steps

1. Connect the console cable to the target controller.
2. Use the `boot_ontap` command at the LOADER prompt to boot the controller.
3. Check the console output:

| If the console displays... | Then...                                                                                                                                                                                                 |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The login prompt           | Go to Step 7.                                                                                                                                                                                           |
| Waiting for giveback...    | <ol style="list-style-type: none"><li>a. Log into the partner controller.</li><li>b. Confirm the target controller is ready for giveback with the <code>storage failover show</code> command.</li></ol> |

4. Move the console cable to the partner controller and give back the target controller storage using the `storage failover giveback -fromnode local -only-cfo-aggregates true local` command.
  - If the command fails because of a failed disk, physically disengage the failed disk, but leave the disk in the slot until a replacement is received.
  - If the command fails because of an open CIFS sessions, check with customer how to close out CIFS sessions.



Terminating CIFS can cause loss of data.

- If the command fails because the partner "not ready", wait 5 minutes for the NVMEMs to synchronize.
  - If the command fails because of an NDMP, SnapMirror, or SnapVault process, disable the process. See the appropriate Documentation Center for more information.
5. Wait 3 minutes and check the failover status with the `storage failover show` command.
  6. At the clustershell prompt, enter the `net int show -is-home false` command to list the logical interfaces that are not on their home controller and port.

If any interfaces are listed as `false`, revert those interfaces back to their home port using the `net int revert -vserver Cluster -lif nodename` command.
  7. Move the console cable to the target controller and run the `version -v` command to check the ONTAP versions.
  8. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.
  9. Use the `storage encryption disk show` at the clustershell prompt, to review the output.
  10. Use the `security key-manager key query` command to display the key IDs of the authentication keys that are stored on the key management servers.
    - If the `Restored` column = `yes/true`, you are done and can proceed to complete the replacement process.

- If the `Key Manager type = external` and the `Restored` column = anything other than `yes/true`, use the `security key-manager external restore` command to restore the key IDs of the authentication keys.



If the command fails, contact Customer Support.

- If the `Key Manager type = onboard` and the `Restored` column = anything other than `yes/true`, use the `security key-manager onboard sync` command to re-sync the Key Manager type.

Use the `security key-manager key query` command to verify that the `Restored` column = `yes/true` for all authentication keys.

11. Connect the console cable to the partner controller.
12. Give back the controller using the `storage failover giveback -fromnode local` command.
13. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.

#### Return the failed part to NetApp - AFF C190

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

## Chassis

#### Overview of chassis replacement - AFF C190

To replace the chassis, you must move the power supplies, hard drives, and controller module or modules from the impaired chassis to the new chassis, and swap out the impaired chassis from the equipment rack or system cabinet with the new chassis of the same model as the impaired chassis.

All other components in the system must be functioning properly; if not, you must contact technical support.

- You can use this procedure with all versions of ONTAP supported by your system.
- This procedure is written with the assumption that you are moving all drives and controller module or modules to the new chassis, and that the chassis is a new component from NetApp.
- This procedure is disruptive. For a two-node cluster, you will have a complete service outage and a partial outage in a multi-node cluster.

#### Shut down the controllers - AFF C190

This procedure is for 2-node, non-MetroCluster configurations only. If you have a system with more than two nodes, see [How to perform a graceful shutdown and power up of one HA pair in a 4-node cluster](#).

#### Before you begin

You need:

- Local administrator credentials for ONTAP.

- NetApp onboard key management (OKM) cluster-wide passphrase if using storage encryption or NVE/NAE.
- BMC accessibility for each controller.
- Stop all clients/host from accessing data on the NetApp system.
- Suspend external backup jobs.
- Necessary tools and equipment for the replacement.



If the system is a NetApp StorageGRID or ONTAP S3 used as FabricPool cloud tier, refer to the [Gracefully shutdown and power up your storage system Resolution Guide](#) after performing this procedure.



If using SSDs, refer to [SU490: \(Impact: Critical\) SSD Best Practices: Avoid risk of drive failure and data loss if powered off for more than two months](#)

As a best practice before shutdown, you should:

- Perform additional [system health checks](#).
- Upgrade ONTAP to a recommended release for the system.
- Resolve any [Active IQ Wellness Alerts and Risks](#).  
Make note of any faults presently on the system, such as LEDs on the system components.

## Steps

1. Log into the cluster through SSH or log in from any node in the cluster using a local console cable and a laptop/console.
2. Turn off AutoSupport and indicate how long you expect the system to be offline:

```
system node autosupport invoke -node * -type all -message "MAINT=8h Power Maintenance"
```

3. Identify the SP/BMC address of all nodes:

```
system service-processor show -node * -fields address
```

4. Exit the cluster shell: `exit`
5. Log into SP/BMC over SSH using the IP address of any of the nodes listed in the output from the previous step.

If you're using a console/laptop, log into the controller using the same cluster administrator credentials.



Open an SSH session to every SP/BMC connection so that you can monitor progress.

6. Halt the 2 nodes located in the impaired chassis:

```
system node halt -node <node>,<node2> -skip-lif-migration-before-shutdown true -ignore-quorum-warnings true -inhibit-takeover true
```



For clusters using SnapMirror synchronous operating in StrictSync mode: `system node halt -node <node>,<node2> -skip-lif-migration-before-shutdown true -ignore-quorum-warnings true -inhibit-takeover true -ignore-strict-sync-warnings true`

7. Enter **y** for each controller in the cluster when you see *Warning: Are you sure you want to halt node "cluster <node-name> number"?*  
`{y|n}:`
8. Wait for each controller to halt and display the LOADER prompt.

#### Move and replace hardware - AFF C190

Move the power supplies, hard drives, and controller module or modules from the impaired chassis to the new chassis, and swap out the impaired chassis from the equipment rack or system cabinet with the new chassis of the same model as the impaired chassis.

#### Step 1: Move the power supply

Moving out a power supply when replacing a chassis involves turning off, disconnecting, and removing the power supply from the old chassis and installing and connecting it on the replacement chassis.

1. If you are not already grounded, properly ground yourself.
2. Turn off the power supply and disconnect the power cables:
  - a. Turn off the power switch on the power supply.
  - b. Open the power cable retainer, and then unplug the power cable from the power supply.
  - c. Unplug the power cable from the power source.
3. Squeeze the latch on the power supply cam handle, and then open the cam handle to fully release the power supply from the mid plane.
4. Use the cam handle to slide the power supply out of the system.



When removing a power supply, always use two hands to support its weight.

5. Repeat the preceding steps for any remaining power supplies.
6. Using both hands, support and align the edges of the power supply with the opening in the system chassis, and then gently push the power supply into the chassis using the cam handle.

The power supplies are keyed and can only be installed one way.



Do not use excessive force when sliding the power supply into the system. You can damage the connector.

7. Close the cam handle so that the latch clicks into the locked position and the power supply is fully seated.
8. Reconnect the power cable and secure it to the power supply using the power cable locking mechanism.

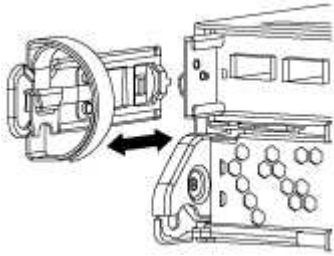
## Step 2: Remove the controller module

To replace the chassis, you must remove the controller module or modules from the old chassis.

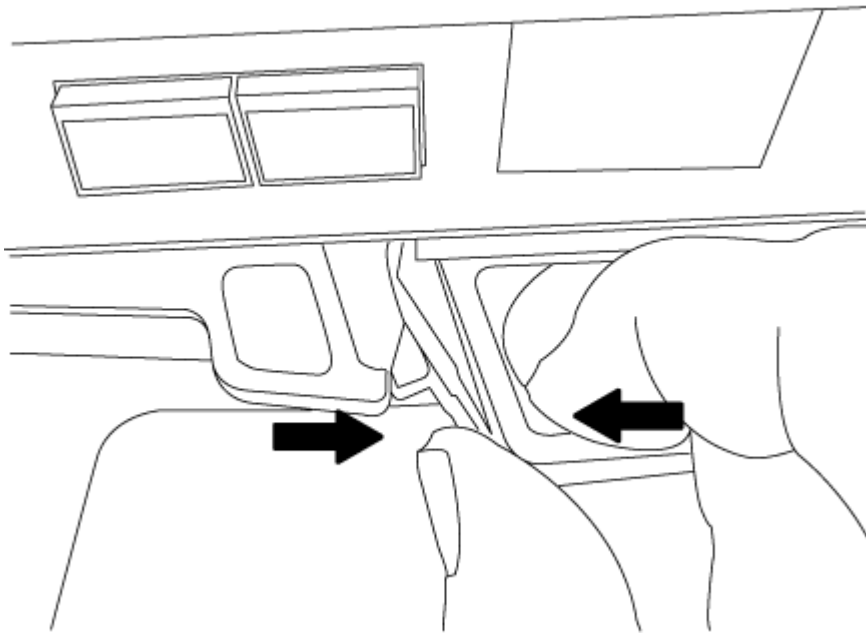
1. If you are not already grounded, properly ground yourself.
2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

3. Remove and set aside the cable management devices from the left and right sides of the controller module.



4. Squeeze the latch on the cam handle until it releases, open the cam handle fully to release the controller module from the midplane, and then, using two hands, pull the controller module out of the chassis.



5. Set the controller module aside in a safe place, and repeat these steps if you have another controller module in the chassis.

## Step 3: Move drives to the new chassis

You need to move the drives from each bay opening in the old chassis to the same bay opening in the new chassis.

1. Gently remove the bezel from the front of the system.



## 2. Remove the drives:

- a. Press the release button at the top of the carrier face below the LEDs.
- b. Pull the cam handle to its fully open position to unseat the drive from the midplane, and then gently slide the drive out of the chassis.

The drive should disengage from the chassis, allowing it to slide free of the chassis.



When removing a drive, always use two hands to support its weight.



Drives are fragile. Handle them as little as possible to prevent damage to them.

3. Align the drive from the old chassis with the same bay opening in the new chassis.
4. Gently push the drive into the chassis as far as it will go.

The cam handle engages and begins to rotate upward.

5. Firmly push the drive the rest of the way into the chassis, and then lock the cam handle by pushing it up and against the drive holder.

Be sure to close the cam handle slowly so that it aligns correctly with the front of the drive carrier. It clicks when it is secure.

6. Repeat the process for the remaining drives in the system.

## Step 4: Replace a chassis from within the equipment rack or system cabinet

You must remove the existing chassis from the equipment rack or system cabinet before you can install the replacement chassis.

1. Remove the screws from the chassis mount points.
2. With the help of two or three people, slide the old chassis off the rack rails in a system cabinet or L brackets in an equipment rack, and then set it aside.
3. If you are not already grounded, properly ground yourself.
4. Using two or three people, install the replacement chassis into the equipment rack or system cabinet by guiding the chassis onto the rack rails in a system cabinet or L brackets in an equipment rack.
5. Slide the chassis all the way into the equipment rack or system cabinet.
6. Secure the front of the chassis to the equipment rack or system cabinet, using the screws you removed from the old chassis.
7. If you have not already done so, install the bezel.

## Step 5: Install the controller module

After you install the controller module and any other components into the new chassis, you need to boot it.

For HA pairs with two controller modules in the same chassis, the sequence in which you install the controller module is especially important because it attempts to reboot as soon as you completely seat it in the chassis.

1. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.



Do not completely insert the controller module in the chassis until instructed to do so.

2. Recable the console to the controller module, and then reconnect the management port.
3. Repeat the preceding steps if there is a second controller to install in the new chassis.
4. Complete the installation of the controller module
  - a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position.



Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.

- b. If you have not already done so, reinstall the cable management device.
  - c. Bind the cables to the cable management device with the hook and loop strap.
  - d. Repeat the preceding steps for the second controller module in the new chassis.
5. Connect the power supplies to different power sources, and then turn them on.
6. Boot each controller to Maintenance mode:
  - a. As each controller starts the booting, press `Ctrl-C` to interrupt the boot process when you see the message `Press Ctrl-C for Boot Menu`.



If you miss the prompt and the controller modules boot to ONTAP, enter `halt`, and then at the `LOADER` prompt enter `boot_ontap`, press `Ctrl-C` when prompted, and then repeat this step.

- b. From the boot menu, select the option for Maintenance mode.

## Restore and verify the configuration - AFF C190

You must verify the HA state of the chassis.

### Step 1: Verify and setting the HA state of the chassis

You must verify the HA state of the chassis, and, if necessary, update the state to match your system configuration.

1. In Maintenance mode, from either controller module, display the HA state of the local controller module and chassis:

```
ha-config show
```

The HA state should be the same for all components.

2. If the displayed system state for the chassis does not match your system configuration:
  - a. Set the HA state for the chassis:

```
ha-config modify chassis HA-state
```

The value for `HA-state` can be one of the following:

- ha
- non-ha

b. Confirm that the setting has changed:

**ha-config show**

3. If you have not already done so, recable the rest of your system.
4. Reboot the system.

## Step 2: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

## Controller

### Overview of controller module replacement - AFF C190

You must review the prerequisites for the replacement procedure and select the correct one for your version of the ONTAP operating system.

- All drive shelves must be working properly.
- If your system is in an HA pair, the healthy controller must be able to take over the controller that is being replaced (referred to in this procedure as the “impaired controller”).
- This procedure includes steps for automatically or manually reassigning drives to the *replacement* controller, depending on your system’s configuration.
- You should perform the drive reassignment as directed in the procedure.
- You must replace the failed component with a replacement FRU component you received from your provider.
- You must be replacing a controller module with a controller module of the same model type. You cannot upgrade your system by just replacing the controller module.
- You cannot change any drives or drive shelves as part of this procedure.
- In this procedure, the boot device is moved from the impaired controller to the *replacement* controller so that the *replacement* controller will boot up in the same version of ONTAP as the old controller module.
- It is important that you apply the commands in these steps on the correct systems:
  - The *impaired* controller is the controller that is being replaced.
  - The *replacement* controller is the new controller that is replacing the impaired controller.
  - The *healthy* controller is the surviving controller.
- You must always capture the controller’s console output to a text file.

This provides you a record of the procedure so that you can troubleshoot any issues that you might encounter during the replacement process.

### Shut down the controller - AFF C190

To shut down the impaired controller, you must determine the status of the controller and,

if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

**Steps**

- 1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:  
`system node autosupport invoke -node * -type all -message MAINT=_number_of_hours_down_h`

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:*> system node autosupport invoke -node * -type all -message MAINT=2h`

- 2. If the impaired controller is part of an HA pair, disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`
- 3. Take the impaired controller to the LOADER prompt:

| If the impaired controller is displaying...              | Then...                                                                                                                                                                                                                                                                      |
|----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                                        | Go to Remove controller module.                                                                                                                                                                                                                                              |
| Waiting for giveback...                                  | Press Ctrl-C, and then respond <code>y</code> .                                                                                                                                                                                                                              |
| System prompt or password prompt (enter system password) | <p>Take over or halt the impaired controller from the healthy controller:<br/><code>storage failover takeover -ofnode <i>impaired_node_name</i></code></p> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <code>y</code>.</p> |

**Replace the controller module hardware - AFF C190**

To replace the controller module, you must remove the impaired controller, move FRU components to the replacement controller module, install the replacement controller module in the chassis, and then boot the system to Maintenance mode.

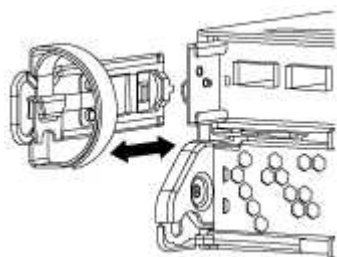
**Step 1: Remove controller module**

To replace the controller module, you must first remove the old controller module from the chassis.

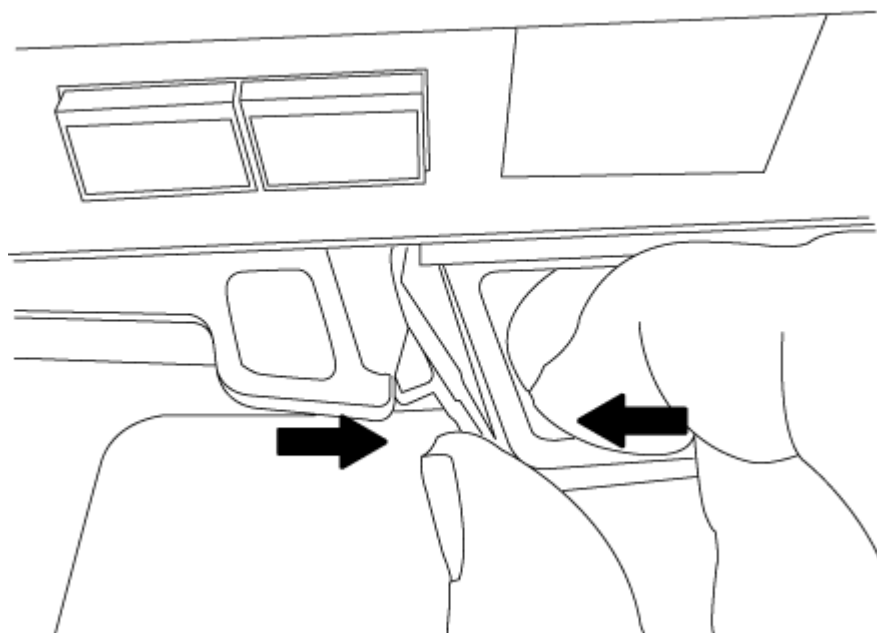
- 1. If you are not already grounded, properly ground yourself.
- 2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

3. Remove and set aside the cable management devices from the left and right sides of the controller module.



4. If you left the SFP modules in the system after removing the cables, move them to the new controller module.
5. Squeeze the latch on the cam handle until it releases, open the cam handle fully to release the controller module from the midplane, and then, using two hands, pull the controller module out of the chassis.



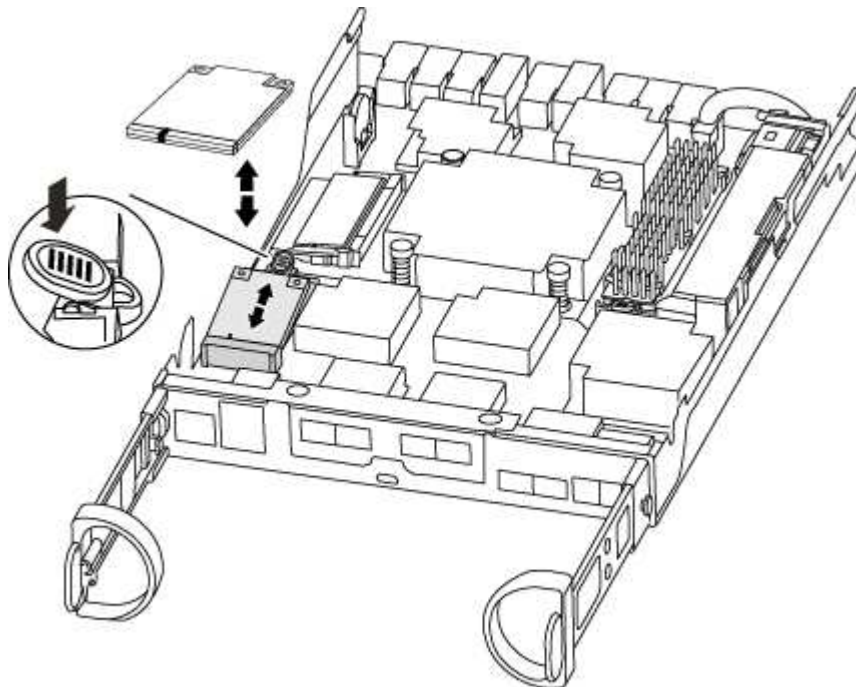
6. Turn the controller module over and place it on a flat, stable surface.
7. Open the cover by sliding in the blue tabs to release the cover, and then swing the cover up and open.



## Step 2: Move the boot media

You must locate the boot media and follow the directions to remove it from the old controller module and insert it in the new controller module.

1. Locate the boot media using the following illustration or the FRU map on the controller module:



2. Press the blue button on the boot media housing to release the boot media from its housing, and then gently pull it straight out of the boot media socket.



Do not twist or pull the boot media straight up, because this could damage the socket or the boot media.

3. Move the boot media to the new controller module, align the edges of the boot media with the socket housing, and then gently push it into the socket.
4. Check the boot media to make sure that it is seated squarely and completely in the socket.

If necessary, remove the boot media and reseal it into the socket.

5. Push the boot media down to engage the locking button on the boot media housing.

### Step 3: Move the NVMEM battery

To move the NVMEM battery from the old controller module to the new controller module, you must perform a specific sequence of steps.

1. Check the NVMEM LED:
  - If your system is in an HA configuration, go to the next step.
  - If your system is in a stand-alone configuration, cleanly shut down the controller module, and then check the NVRAM LED identified by the NV icon.

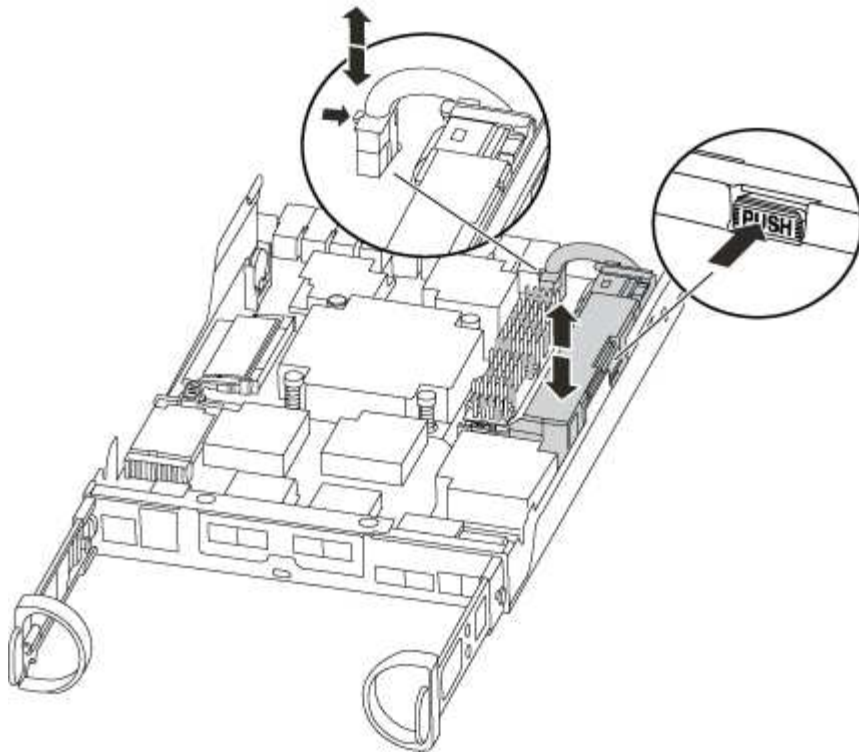


The NVRAM LED blinks while destaging contents to the flash memory when you halt the system. After the destage is complete, the LED turns off.

- If power is lost without a clean shutdown, the NVMEM LED flashes until the destage is complete, and then the LED turns off.
- If the LED is on and power is on, unwritten data is stored on NVMEM.

This typically occurs during an uncontrolled shutdown after ONTAP has successfully booted.

2. Locate the NVMEM battery in the controller module.



3. Locate the battery plug and squeeze the clip on the face of the battery plug to release the plug from the socket, and then unplug the battery cable from the socket.
4. Grasp the battery and press the blue locking tab marked PUSH, and then lift the battery out of the holder and controller module.
5. Move the battery to the replacement controller module.
6. Loop the battery cable around the cable channel on the side of the battery holder.
7. Position the battery pack by aligning the battery holder key ribs to the “V” notches on the sheet metal side wall.
8. Slide the battery pack down along the sheet metal side wall until the support tabs on the side wall hook into the slots on the battery pack, and the battery pack latch engages and clicks into the opening on the side wall.

#### **Step 4: Move the DIMMs**

To move the DIMMs, you must follow the directions to locate and move them from the old controller module into the replacement controller module.

You must have the new controller module ready so that you can move the DIMMs directly from the impaired controller module to the corresponding slots in the replacement controller module.

1. Locate the DIMMs on your controller module.
2. Note the orientation of the DIMM in the socket so that you can insert the DIMM in the replacement controller module in the proper orientation.
3. Eject the DIMM from its slot by slowly pushing apart the two DIMM ejector tabs on either side of the DIMM, and then slide the DIMM out of the slot.

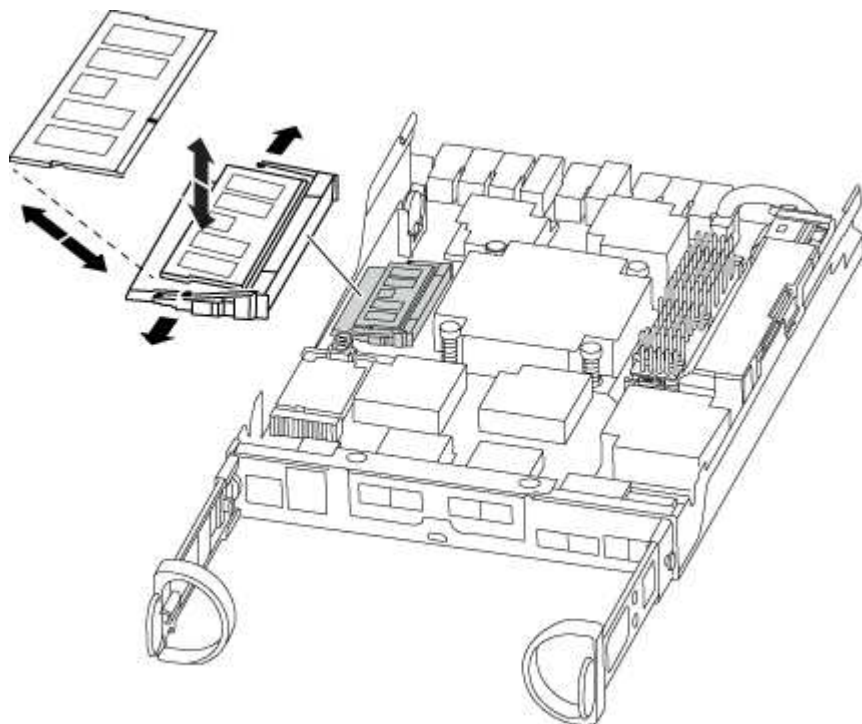




Carefully hold the DIMM by the edges to avoid pressure on the components on the DIMM circuit board.

The number and placement of system DIMMs depends on the model of your system.

The following illustration shows the location of system DIMMs:



4. Repeat these steps to remove additional DIMMs as needed.
5. Verify that the NVMEM battery is not plugged into the new controller module.
6. Locate the slot where you are installing the DIMM.
7. Make sure that the DIMM ejector tabs on the connector are in the open position, and then insert the DIMM squarely into the slot.

The DIMM fits tightly in the slot, but should go in easily. If not, realign the DIMM with the slot and reinsert it.



Visually inspect the DIMM to verify that it is evenly aligned and fully inserted into the slot.

8. Repeat these steps for the remaining DIMMs.
9. Locate the NVMEM battery plug socket, and then squeeze the clip on the face of the battery cable plug to insert it into the socket.

Make sure that the plug locks down onto the controller module.

### Step 5: Install the controller module

After you install the components from the old controller module into the new controller module, you must install the new controller module into the system chassis and boot the operating system.

For HA pairs with two controller modules in the same chassis, the sequence in which you install the controller module is especially important because it attempts to reboot as soon as you completely seat it in the chassis.



The system might update system firmware when it boots. Do not abort this process. The procedure requires you to interrupt the boot process, which you can typically do at any time after prompted to do so. However, if the system updates the system firmware when it boots, you must wait until after the update is complete before interrupting the boot process.

1. If you have not already done so, replace the cover on the controller module.
2. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.



Do not completely insert the controller module in the chassis until instructed to do so.

3. Cable the management and console ports only, so that you can access the system to perform the tasks in the following sections.



You will connect the rest of the cables to the controller module later in this procedure.

4. Complete the reinstallation of the controller module. The controller module begins to boot as soon as it is fully seated in the chassis. Be prepared to interrupt the boot process.
  - a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position.



Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.

The controller begins to boot as soon as it is seated in the chassis.

- b. If you have not already done so, reinstall the cable management device.
- c. Bind the cables to the cable management device with the hook and loop strap.
- d. Interrupt the boot process **only** after determining the correct timing:

You must look for an Automatic firmware update console message. If the update message appears, do not press `Ctrl-C` to interrupt the boot process until after you see a message confirming that the update is complete.

Only press `Ctrl-C` when you see the message `Press Ctrl-C for Boot Menu`.



If the firmware update is aborted, the boot process exits to the LOADER prompt. You must run the `update_flash` command and then exit LOADER and boot to Maintenance mode by pressing `Ctrl-C` when you see `Starting AUTOBOOT press Ctrl-C to abort`.

If you miss the prompt and the controller module boots to ONTAP, enter `halt`, and then at the LOADER prompt enter `boot_ontap`, press `Ctrl-C` when prompted, and then boot to Maintenance mode.



During the boot process, you might see the following prompts:

- A prompt warning of a system ID mismatch and asking to override the system ID.
- A prompt warning that when entering Maintenance mode in an HA configuration you must ensure that the healthy controller remains down.

You can safely respond *y* to these prompts.

- e. Select the option to boot to Maintenance mode from the displayed menu.

### Restore and verify the system configuration - AFF C190

After completing the hardware replacement and booting to Maintenance mode, you verify the low-level system configuration of the replacement controller and reconfigure system settings as necessary.

#### Step 1: Set and verify system time after replacing the controller

You should check the time and date on the replacement controller module against the healthy controller module in an HA pair, or against a reliable time server in a stand-alone configuration. If the time and date do not match, you must reset them on the replacement controller module to prevent possible outages on clients due to time differences.

##### About this task

It is important that you apply the commands in the steps on the correct systems:

- The *replacement* node is the new node that replaced the impaired node as part of this procedure.
- The *healthy* node is the HA partner of the *replacement* node.

##### Steps

1. If the *replacement* node is not at the LOADER prompt, halt the system to the LOADER prompt.
2. On the *healthy* node, check the system time: `cluster date show`

The date and time are based on the configured timezone.

3. At the LOADER prompt, check the date and time on the *replacement* node: `show date`

The date and time are given in GMT.

4. If necessary, set the date in GMT on the replacement node: `set date mm/dd/yyyy`
5. If necessary, set the time in GMT on the replacement node: `set time hh:mm:ss`
6. At the LOADER prompt, confirm the date and time on the *replacement* node: `show date`

The date and time are given in GMT.

#### Step 2: Verify and set the HA state of the controller module

You must verify the HA state of the controller module and, if necessary, update the state to match your system configuration.

1. In Maintenance mode from the new controller module, verify that all components display the same HA state: `ha-config show`

The HA state should be the same for all components.

2. If the displayed system state of the controller module does not match your system configuration, set the HA state for the controller module: `ha-config modify controller ha-state`

The value for HA-state can be one of the following:

- ha
- mcc
- mcc-2n
- mccip
- non-ha

3. If the displayed system state of the controller module does not match your system configuration, set the HA state for the controller module: `ha-config modify controller ha-state`
4. Confirm that the setting has changed: `ha-config show`

#### Recable the system and reassign disks - AFF C190

Continue the replacement procedure by recabling the storage and confirming disk reassignment.

#### Step 1: Recable the system

Recable the controller module's storage and network connections.

##### Steps

1. Recable the the controller module to storage and network connections.
2. Verify that the cabling is correct by using [Active IQ Config Advisor](#).
  - a. Download and install Config Advisor.
  - b. Enter the information for the target system, and then click Collect Data.
  - c. Click the Cabling tab, and then examine the output. Make sure that all disk shelves are displayed and all disks appear in the output, correcting any cabling issues you find.
  - d. Check other cabling by clicking the appropriate tab, and then examining the output from Config Advisor.

#### Step 2: Verifying the system ID change on an HA system

If the storage system is in an HA pair, the system ID of the new controller module is automatically assigned to the disks when the giveback occurs at the end of the procedure. You must confirm the system ID change when you boot the *replacement* controller and then verify that the change was implemented.

This procedure applies only to systems running ONTAP in an HA pair.

1. If the *replacement* controller is in Maintenance mode (showing the `*>` prompt, exit Maintenance mode and go to the LOADER prompt: `halt`
2. From the LOADER prompt on the *replacement* controller, boot the controller, entering **y** if you are prompted to override the system ID due to a system ID mismatch.
3. Wait until the `Waiting for giveback...` message is displayed on the *replacement* controller console and then, from the healthy controller, verify that the new partner system ID has been automatically assigned:  
`storage failover show`

In the command output, you should see a message that the system ID has changed on the impaired controller, showing the correct old and new IDs. In the following example, node2 has undergone

replacement and has a new system ID of 151759706.

```
node1> `storage failover show`
```

| Node  | Partner | Takeover Possible | State Description                                          |
|-------|---------|-------------------|------------------------------------------------------------|
| node1 | node2   | false             | System ID changed on partner (Old: 151759706), In takeover |
| node2 | node1   | -                 | Waiting for giveback (HA mailboxes)                        |

4. From the healthy controller, verify that any coredumps are saved:

- a. Change to the advanced privilege level: `set -privilege advanced`

You can respond **y** when prompted to continue into advanced mode. The advanced mode prompt appears (\*>).

- b. Save any coredumps: `system node run -node local-node-name partner savecore`

- c. Wait for the `'savecore'` command to complete before issuing the giveback.

You can enter the following command to monitor the progress of the `savecore` command: `system node run -node local-node-name partner savecore -s`

- d. Return to the admin privilege level: `set -privilege admin`

5. If your storage system has Storage or Volume Encryption configured, you must restore Storage or Volume Encryption functionality by using one of the following procedures, depending on whether you are using onboard or external key management:

- [Restore onboard key management encryption keys](#)
- [Restore external key management encryption keys](#)

6. Give back the controller:

- a. From the healthy controller, give back the replaced controller's storage: `storage failover giveback -ofnode replacement_node_name`

The *replacement* controller takes back its storage and completes booting.

If you are prompted to override the system ID due to a system ID mismatch, you should enter **y**.



If the giveback is vetoed, you can consider overriding the vetoes.

[Find the High-Availability Configuration content for your version of ONTAP 9](#)

- b. After the giveback has been completed, confirm that the HA pair is healthy and that takeover is possible: `storage failover show`

The output from the `storage failover show` command should not include the System ID changed on partner message.

7. Verify that the disks were assigned correctly: `storage disk show -ownership`

The disks belonging to the *replacement* controller should show the new system ID. In the following example, the disks owned by node1 now show the new system ID, 1873775277:

```
node1> `storage disk show -ownership`

Disk Aggregate Home Owner DR Home Home ID Owner ID DR Home ID
Reserver Pool

1.0.0 aggr0_1 node1 node1 - 1873775277 1873775277 -
1873775277 Pool10
1.0.1 aggr0_1 node1 node1 1873775277 1873775277 -
1873775277 Pool10
.
.
.
```

8. Verify that the expected volumes are present for each controller: `vol show -node node-name`
9. If you disabled automatic takeover on reboot, enable it from the healthy controller: `storage failover modify -node replacement-node-name -onreboot true`

### Complete system restoration - AFF C190

To restore your system to full operation, you must restore the NetApp Storage Encryption configuration (if necessary), and install licenses for the new controller, and return the failed part to NetApp, as described in the RMA instructions shipped with the kit.

#### Step 1: Installing licenses for the *replacement* controller in ONTAP

You must install new licenses for the *replacement* node if the impaired node was using ONTAP features that require a standard (node-locked) license. For features with standard licenses, each node in the cluster should have its own key for the feature.

##### About this task

Until you install license keys, features requiring standard licenses continue to be available to the *replacement* node. However, if the impaired node was the only node in the cluster with a license for the feature, no configuration changes to the feature are allowed. Also, using unlicensed features on the node might put you out of compliance with your license agreement, so you should install the replacement license key or keys on the *replacement* node as soon as possible.

##### Before you begin

The licenses keys must be in the 28-character format.

You have a 90-day grace period in which to install the license keys. After the grace period, all old licenses are

invalidated. After a valid license key is installed, you have 24 hours to install all of the keys before the grace period ends.

### Steps

1. If you need new license keys, obtain replacement license keys on the [NetApp Support Site](#) in the My Support section under Software licenses.



The new license keys that you require are automatically generated and sent to the email address on file. If you fail to receive the email with the license keys within 30 days, you should contact technical support.

2. Install each license key: `system license add -license-code license-key, license-key...`
3. Remove the old licenses, if desired:
  - a. Check for unused licenses: `license clean-up -unused -simulate`
  - b. If the list looks correct, remove the unused licenses: `license clean-up -unused`

### Step 2: Verifying LIFs and registering the serial number

Before returning the *replacement* node to service, you should verify that the LIFs are on their home ports, and register the serial number of the *replacement* node if AutoSupport is enabled, and reset automatic giveback.

#### Steps

1. Verify that the logical interfaces are reporting to their home server and ports: `network interface show -is-home false`

If any LIFs are listed as false, revert them to their home ports: `network interface revert -vserver * -lif *`

2. Register the system serial number with NetApp Support.
  - If AutoSupport is enabled, send an AutoSupport message to register the serial number.
  - If AutoSupport is not enabled, call [NetApp Support](#) to register the serial number.
3. If an AutoSupport maintenance window was triggered, end it by using the `system node autosupport invoke -node * -type all -message MAINT=END` command.
4. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`

### Step 3: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

### Replace a DIMM - AFF C190

You must replace a DIMM in the controller module when your system registers an increasing number of correctable error correction codes (ECC); failure to do so causes a system panic.

All other components in the system must be functioning properly; if not, you must contact technical support.

You must replace the failed component with a replacement FRU component you received from your provider.

**Step 1: Shut down the impaired controller**

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

**Steps**

- 1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:  
`system node autosupport invoke -node * -type all -message MAINT=_number_of_hours_down_h`  
  
The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:*> system node autosupport invoke -node * -type all -message MAINT=2h`
- 2. If the impaired controller is part of an HA pair, disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`
- 3. Take the impaired controller to the LOADER prompt:

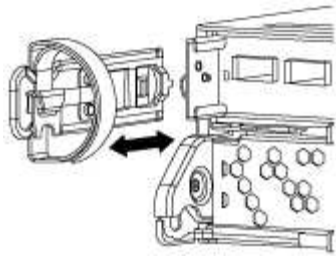
| If the impaired controller is displaying...              | Then...                                                                                                                                                                                                                                                         |
|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                                        | Go to Remove controller module.                                                                                                                                                                                                                                 |
| Waiting for giveback...                                  | Press Ctrl-C, and then respond <i>y</i> .                                                                                                                                                                                                                       |
| System prompt or password prompt (enter system password) | Take over or halt the impaired controller from the healthy controller:<br><code>storage failover takeover -ofnode <i>impaired_node_name</i></code><br><br>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i> . |

**Step 2: Remove controller module**

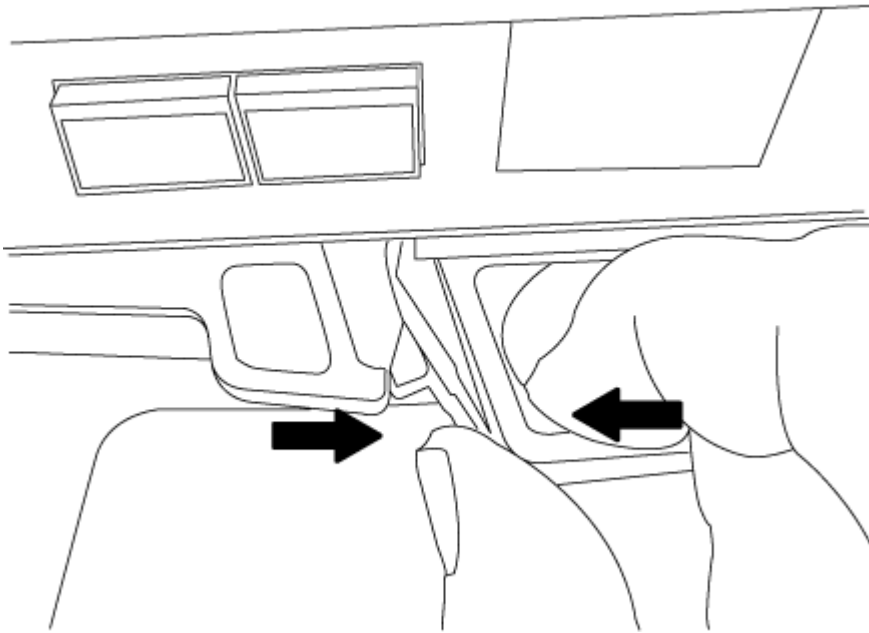
To access components inside the controller module, you must first remove the controller module from the system, and then remove the cover on the controller module.

- 1. If you are not already grounded, properly ground yourself.
- 2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.  
  
Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.
- 3. Remove and set aside the cable management devices from the left and right sides of the controller module.





4. Squeeze the latch on the cam handle until it releases, open the cam handle fully to release the controller module from the midplane, and then, using two hands, pull the controller module out of the chassis.



5. Turn the controller module over and place it on a flat, stable surface.
6. Open the cover by sliding in the blue tabs to release the cover, and then swing the cover up and open.



### Step 3: Replace the DIMMs

To replace the DIMMs, you need to locate them inside the controller module, and then follow the specific sequence of steps.

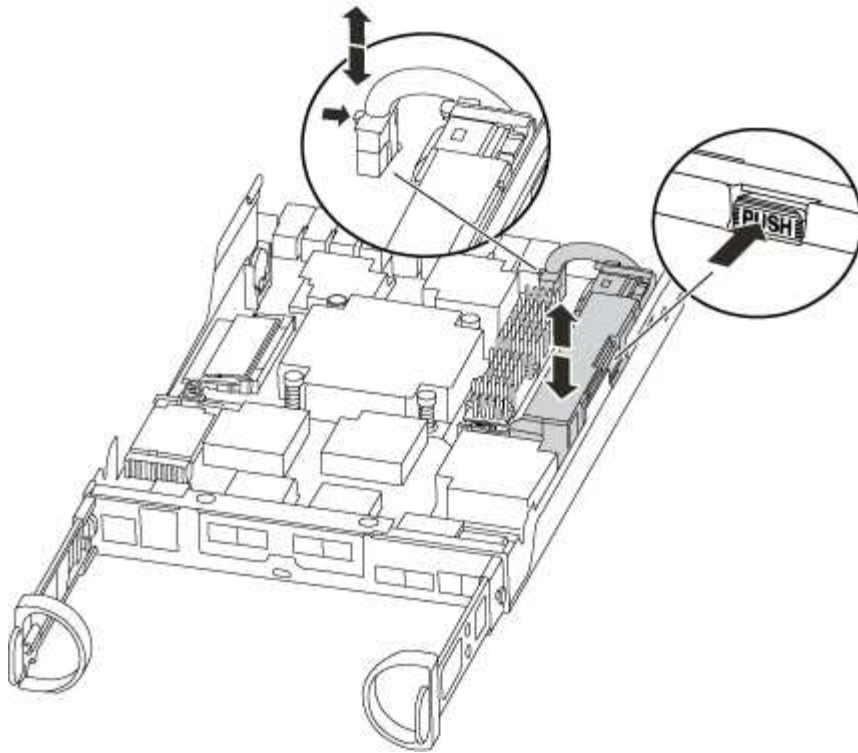
If you are replacing a DIMM, you need to remove it after you have unplugged the NVMEM battery from the controller module.

1. Check the NVMEM LED on the controller module.

You must perform a clean system shutdown before replacing system components to avoid losing unwritten data in the nonvolatile memory (NVMEM). The LED is located on the back of the controller module. Look for the following icon:



2. If the NVMEM LED is not flashing, there is no content in the NVMEM; you can skip the following steps and proceed to the next task in this procedure.
3. If the NVMEM LED is flashing, there is data in the NVMEM and you must disconnect the battery to clear the memory:
  - a. Locate the battery, press the clip on the face of the battery plug to release the lock clip from the plug socket, and then unplug the battery cable from the socket.



- b. Confirm that the NVMEM LED is no longer lit.
- c. Reconnect the battery connector.
4. Return to [Step 3: Replace the DIMMs](#) in this procedure to recheck the NVMEM LED.
5. Locate the DIMMs on your controller module.
6. Note the orientation of the DIMM in the socket so that you can insert the replacement DIMM in the proper orientation.
7. Eject the DIMM from its slot by slowly pushing apart the two DIMM ejector tabs on either side of the DIMM, and then slide the DIMM out of the slot.



Carefully hold the DIMM by the edges to avoid pressure on the components on the DIMM circuit board.

The number and placement of system DIMMs depends on the model of your system.

The following illustration shows the location of system DIMMs:



8. Remove the replacement DIMM from the antistatic shipping bag, hold the DIMM by the corners, and align it to the slot.

The notch among the pins on the DIMM should line up with the tab in the socket.

9. Make sure that the DIMM ejector tabs on the connector are in the open position, and then insert the DIMM squarely into the slot.

The DIMM fits tightly in the slot, but should go in easily. If not, realign the DIMM with the slot and reinsert it.



Visually inspect the DIMM to verify that it is evenly aligned and fully inserted into the slot.

10. Push carefully, but firmly, on the top edge of the DIMM until the ejector tabs snap into place over the notches at the ends of the DIMM.
11. Locate the NVMEM battery plug socket, and then squeeze the clip on the face of the battery cable plug to insert it into the socket.

Make sure that the plug locks down onto the controller module.

12. Close the controller module cover.

#### Step 4: Reinstall the controller module

After you replace components in the controller module, you must reinstall it into the chassis.

1. If you have not already done so, replace the cover on the controller module.
2. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.



Do not completely insert the controller module in the chassis until instructed to do so.

### 3. Recable the system, as needed.

If you removed the media converters (QSFPs or SFPs), remember to reinstall them if you are using fiber optic cables.

### 4. Complete the reinstallation of the controller module. The controller module begins to boot as soon as it is fully seated in the chassis. Be prepared to interrupt the boot process.

- a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position.



Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.

The controller begins to boot as soon as it is seated in the chassis.

- b. If you have not already done so, reinstall the cable management device.
- c. Bind the cables to the cable management device with the hook and loop strap.

### Step 5: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

### Replace SSD Drive or HDD Drive - AFF C190

You can replace a failed drive nondisruptively while I/O is in progress. The procedure for replacing an SSD is meant for non-spinning drives and the procedure for replacing an HDD is meant for spinning drives.

When a drive fails, the platform logs a warning message to the system console indicating which drive has failed. In addition, both the fault LED on the operator display panel and the fault LED on the failed drive are illuminated.

#### Before you begin

- Follow best practice and install the current version of the Disk Qualification Package (DQP) before replacing a drive.
- Identify the failed drive by running the `storage disk show -broken` command from the system console.

The failed drive appears in the list of failed drives. If it does not, you should wait, and then run the command again.



Depending on the type and capacity, it can take up to several hours for the drive to appear in the list of failed drives.

- Determine whether SED authentication is enabled.

How you replace the drive depends on how the drive is being used. If SED authentication is enabled, you must use the SED replacement instructions in the [ONTAP 9 NetApp Encryption Power Guide](#). These Instructions describe additional steps you must perform before and after replacing an SED.

- Make sure the replacement drive is supported by your platform. See the [NetApp Hardware Universe](#).
- Make sure all other components in the system are functioning properly; if not, you must contact technical support.

**About this task**

- Drive firmware is automatically updated (nondisruptively) on new drives that have non current firmware versions.
- When replacing a drive, you must wait one minute between the removal of the failed drive and the insertion of the replacement drive to allow the storage system to recognize the existence of the new drive.

## Option 1: Replace SSD

### Steps

1. If you want to manually assign drive ownership for the replacement drive, you need to disable automatic drive assignment replacement drive, if it is enabled



You manually assign drive ownership and then reenable automatic drive assignment later in this procedure.

- a. Verify whether automatic drive assignment is enabled: `storage disk option show`

You can enter the command on either controller module.

If automatic drive assignment is enabled, the output shows `on` in the “Auto Assign” column (for each controller module).

- b. If automatic drive assignment is enabled, disable it: `storage disk option modify -node node_name -autoassign off`

You must disable automatic drive assignment on both controller modules.

2. Properly ground yourself.
3. Physically identify the failed drive.

When a drive fails, the system logs a warning message to the system console indicating which drive failed. Additionally, the attention (amber) LED on the drive shelf operator display panel and the failed drive illuminate.



The activity (green) LED on a failed drive can be illuminated (solid), which indicates that the drive has power, but should not be blinking, which indicates I/O activity. A failed drive has no I/O activity.

4. Remove the failed drive:
  - a. Press the release button on the drive face to open the cam handle.
  - b. Slide the drive out of the shelf using the cam handle and supporting the drive with your other hand.

5. Wait a minimum of 70 seconds before inserting the replacement drive.

This allows the system to recognize that a drive was removed.

6. Insert the replacement drive:
  - a. With the cam handle in the open position, use both hands to insert the replacement drive.
  - b. Push until the drive stops.
  - c. Close the cam handle so that the drive is fully seated into the midplane and the handle clicks into place.

Be sure to close the cam handle slowly so that it aligns correctly with the face of the drive.

7. Verify that the drive's activity (green) LED is illuminated.

When the drive's activity LED is solid, it means that the drive has power. When the drive's activity LED is blinking, it means that the drive has power and I/O is in progress. If the drive firmware is automatically updating, the LED blinks.

8. If you are replacing another drive, repeat Steps 3 through 7.
9. If you disabled automatic drive assignment in Step 1, then, manually assign drive ownership and then reenables automatic drive assignment if needed.

- a. Display all unowned drives: `storage disk show -container-type unassigned`

You can enter the command on either controller module.

- b. Assign each drive: `storage disk assign -disk disk_name -owner node_name`

You can enter the command on either controller module.

You can use the wildcard character to assign more than one drive at once.

- c. Reenable automatic drive assignment if needed: `storage disk option modify -node node_name -autoassign on`

You must reenables automatic drive assignment on both controller modules.

10. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit.

Contact technical support at [NetApp Support](#), 888-463-8277 (North America), 00-800-44-638277 (Europe), or +800-800-80-800 (Asia/Pacific) if you need the RMA number or additional help with the replacement procedure.

## Option 2: Replace HDD

1. If you want to manually assign drive ownership for the replacement drive, you need to disable automatic drive assignment replacement drive, if it is enabled



You manually assign drive ownership and then reenables automatic drive assignment later in this procedure.

- a. Verify whether automatic drive assignment is enabled: `storage disk option show`

You can enter the command on either controller module.

If automatic drive assignment is enabled, the output shows `on` in the "Auto Assign" column (for each controller module).

- b. If automatic drive assignment is enabled, disable it: `storage disk option modify -node node_name -autoassign off`

You must disable automatic drive assignment on both controller modules.

2. Properly ground yourself.
3. Gently remove the bezel from the front of the platform.
4. Identify the failed disk drive from the system console warning message and the illuminated fault LED on the disk drive



5. Press the release button on the disk drive face.

Depending on the storage system, the disk drives have the release button located at the top or on the left of the disk drive face.

For example, the following illustration shows a disk drive with the release button located on the top of the disk drive face:

The cam handle on the disk drive springs open partially and the disk drive releases from the midplane.

6. Pull the cam handle to its fully open position to unseat the disk drive from the midplane.

7. Slide out the disk drive slightly and allow the disk to safely spin down, which can take less than one minute, and then, using both hands, remove the disk drive from the disk shelf.

8. With the cam handle in the open position, insert the replacement disk drive into the drive bay, firmly pushing until the disk drive stops.



Wait a minimum of 10 seconds before inserting a new disk drive. This allows the system to recognize that a disk drive was removed.



If your platform drive bays are not fully loaded with drives, it is important to place the replacement drive into the same drive bay from which you removed the failed drive.



Use two hands when inserting the disk drive, but do not place hands on the disk drive boards that are exposed on the underside of the disk carrier.

9. Close the cam handle so that the disk drive is fully seated into the midplane and the handle clicks into place.

Be sure to close the cam handle slowly so that it aligns correctly with the face of the disk drive..

10. If you are replacing another disk drive, repeat Steps 4 through 9.

11. Reinstall the bezel.

12. If you disabled automatic drive assignment in Step 1, then, manually assign drive ownership and then reenale automatic drive assignment if needed.

- a. Display all unowned drives: `storage disk show -container-type unassigned`

You can enter the command on either controller module.

- b. Assign each drive: `storage disk assign -disk disk_name -owner owner_name`

You can enter the command on either controller module.

You can use the wildcard character to assign more than one drive at once.

- c. Reenable automatic drive assignment if needed: `storage disk option modify -node node_name -autoassign on`

You must reenable automatic drive assignment on both controller modules.

13. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit.

Contact technical support at [NetApp Support](#), 888-463-8277 (North America), 00-800-44-638277 (Europe), or +800-800-80-800 (Asia/Pacific) if you need the RMA number or additional help with the replacement procedure.

## Replace the NVMEM battery - AFF C190

To replace an NVMEM battery in the system, you must remove the controller module from the system, open it, replace the battery, and close and replace the controller module.

All other components in the system must be functioning properly; if not, you must contact technical support.

### Step 1: Shut down the impaired controller

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

### Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message
MAINT=_number_of_hours_down_h
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:*>`

```
system node autosupport invoke -node * -type all -message MAINT=2h
```

2. If the impaired controller is part of an HA pair, disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`
3. Take the impaired controller to the LOADER prompt:

| If the impaired controller is displaying...              | Then...                                                                                                                                                                                                                                                             |
|----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                                        | Go to Remove controller module.                                                                                                                                                                                                                                     |
| Waiting for giveback...                                  | Press Ctrl-C, and then respond <code>y</code> .                                                                                                                                                                                                                     |
| System prompt or password prompt (enter system password) | <p>Take over or halt the impaired controller from the healthy controller:</p> <pre>storage failover takeover -ofnode<br/>impaired_node_name</pre> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <code>y</code>.</p> |

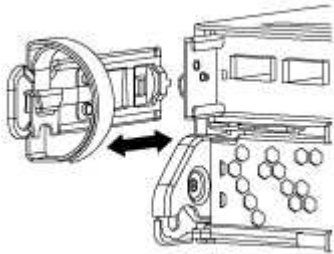
## Step 2: Remove controller module

To access components inside the controller module, you must first remove the controller module from the system, and then remove the cover on the controller module.

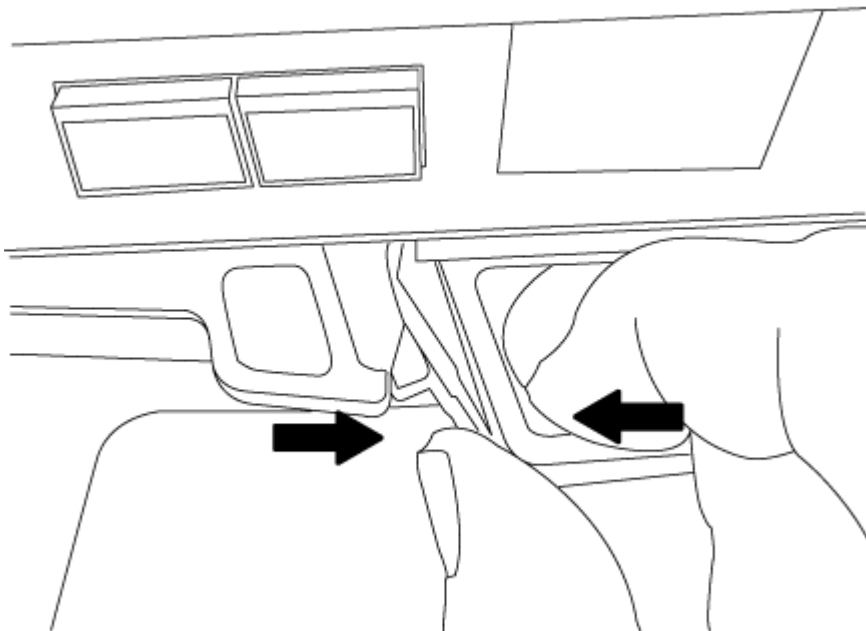
1. If you are not already grounded, properly ground yourself.
2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

3. Remove and set aside the cable management devices from the left and right sides of the controller module.



4. Squeeze the latch on the cam handle until it releases, open the cam handle fully to release the controller module from the midplane, and then, using two hands, pull the controller module out of the chassis.



5. Turn the controller module over and place it on a flat, stable surface.
6. Open the cover by sliding in the blue tabs to release the cover, and then swing the cover up and open.



### Step 3: Replace the NVMEM battery

To replace the NVMEM battery in your system, you must remove the failed NVMEM battery from the system and replace it with a new NVMEM battery.

#### 1. Check the NVMEM LED:

- If your system is in an HA configuration, go to the next step.
- If your system is in a stand-alone configuration, cleanly shut down the controller module, and then check the NVRAM LED identified by the NV icon.



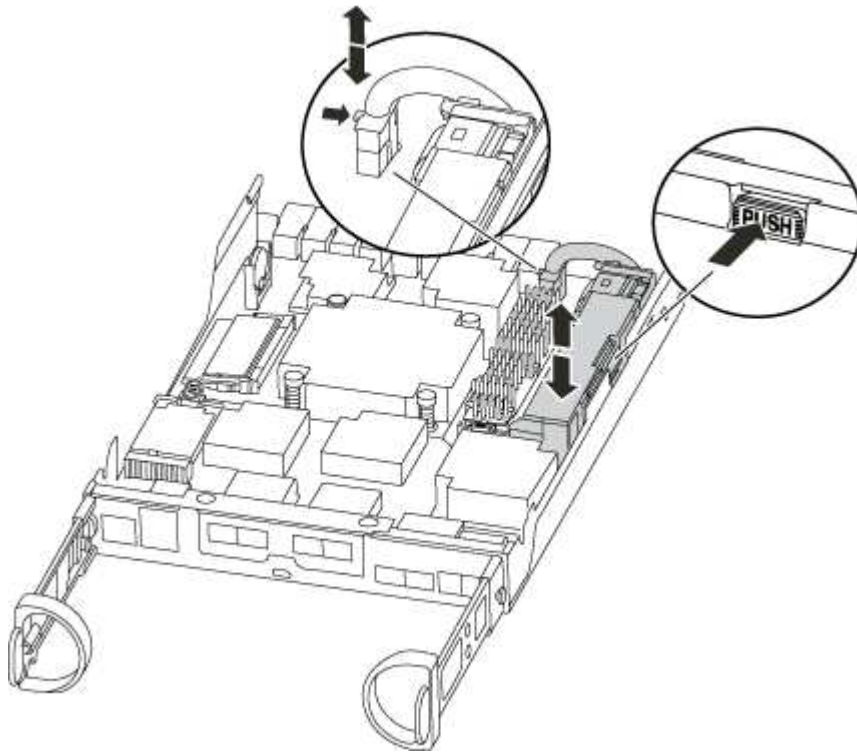
The NVRAM LED blinks while destaging contents to the flash memory when you halt the system. After the destage is complete, the LED turns off.



- If power is lost without a clean shutdown, the NVMEM LED flashes until the destage is complete, and then the LED turns off.
- If the LED is on and power is on, unwritten data is stored on NVMEM.

This typically occurs during an uncontrolled shutdown after ONTAP has successfully booted.

2. Locate the NVMEM battery in the controller module.



3. Locate the battery plug and squeeze the clip on the face of the battery plug to release the plug from the socket, and then unplug the battery cable from the socket.
4. Remove the battery from the controller module and set it aside.
5. Remove the replacement battery from its package.
6. Loop the battery cable around the cable channel on the side of the battery holder.
7. Position the battery pack by aligning the battery holder key ribs to the “V” notches on the sheet metal side wall.
8. Slide the battery pack down along the sheet metal side wall until the support tabs on the side wall hook into the slots on the battery pack, and the battery pack latch engages and clicks into the opening on the side wall.
9. Plug the battery plug back into the controller module.

#### Step 4: Reinstall the controller module

After you replace components in the controller module, you must reinstall it into the chassis.

1. If you have not already done so, replace the cover on the controller module.
2. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.



Do not completely insert the controller module in the chassis until instructed to do so.

3. Recable the system, as needed.

If you removed the media converters (QSFPs or SFPs), remember to reinstall them if you are using fiber optic cables.

4. Complete the reinstallation of the controller module. The controller module begins to boot as soon as it is fully seated in the chassis.
  - a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position.



Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.

The controller begins to boot as soon as it is seated in the chassis.

- b. If you have not already done so, reinstall the cable management device.
- c. Bind the cables to the cable management device with the hook and loop strap.

#### Step 5: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

#### Swap out a power supply - AFF C190

Swapping out a power supply involves turning off, disconnecting, and removing the old power supply and installing, connecting, and turning on the replacement power supply.

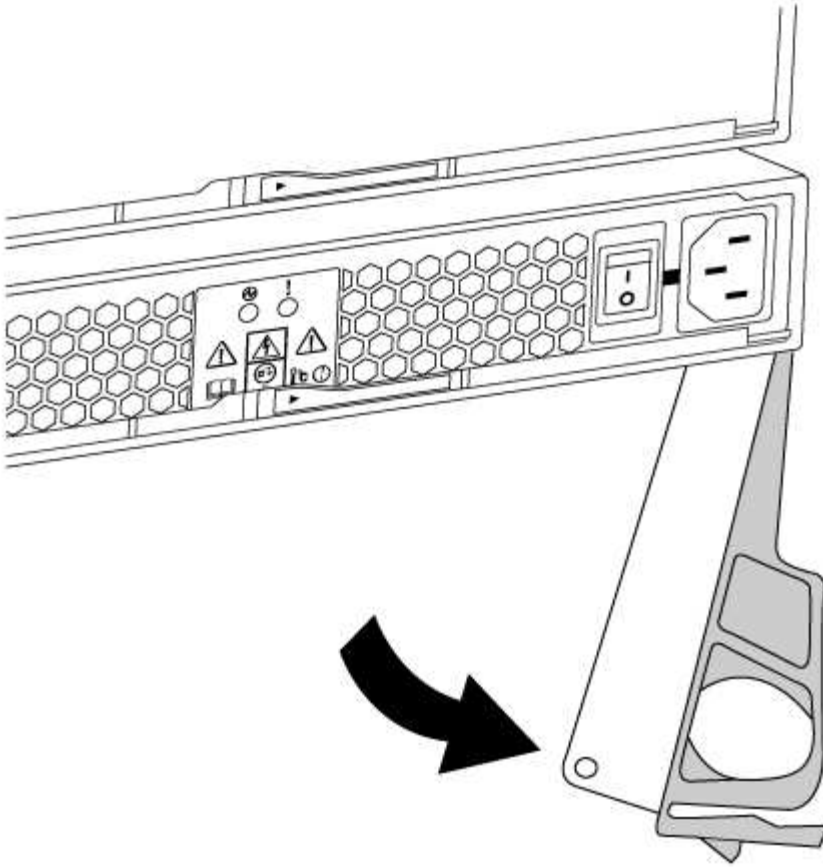
All other components in the system must be functioning properly; if not, you must contact technical support.

- The power supplies are redundant and hot-swappable.
- This procedure is written for replacing one power supply at a time.



Cooling is integrated with the power supply, so you must replace the power supply within two minutes of removal to prevent overheating due to reduced airflow. Because the chassis provides a shared cooling configuration for the two HA nodes, a delay longer than two minutes will shut down all controller modules in the chassis. If both controller modules do shut down, make sure that both power supplies are inserted, turn both off for 30 seconds, and then turn both on.

- Power supplies are auto-ranging.
  1. Identify the power supply you want to replace, based on console error messages or through the LEDs on the power supplies.
  2. If you are not already grounded, properly ground yourself.
  3. Turn off the power supply and disconnect the power cables:
    - a. Turn off the power switch on the power supply.
    - b. Open the power cable retainer, and then unplug the power cable from the power supply.
    - c. Unplug the power cable from the power source.
  4. Squeeze the latch on the power supply cam handle, and then open the cam handle to fully release the power supply from the mid plane.



5. Use the cam handle to slide the power supply out of the system.



When removing a power supply, always use two hands to support its weight.

6. Make sure that the on/off switch of the new power supply is in the Off position.
7. Using both hands, support and align the edges of the power supply with the opening in the system chassis, and then gently push the power supply into the chassis using the cam handle.

The power supplies are keyed and can only be installed one way.



Do not use excessive force when sliding the power supply into the system. You can damage the connector.

8. Close the cam handle so that the latch clicks into the locked position and the power supply is fully seated.
9. Reconnect the power supply cabling:
  - a. Reconnect the power cable to the power supply and the power source.
  - b. Secure the power cable to the power supply using the power cable retainer.

Once power is restored to the power supply, the status LED should be green.

1. Turn on the power to the new power supply, and then verify the operation of the power supply activity LEDs.

The power supply LEDs are lit when the power supply comes online.

2. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

## Replace the real-time clock battery

You replace the real-time clock (RTC) battery in the controller module so that your system's services and applications that depend on accurate time synchronization continue to function.

- You can use this procedure with all versions of ONTAP supported by your system
- All other components in the system must be functioning properly; if not, you must contact technical support.

### Step 1: Shut down the impaired controller

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

### Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message
MAINT=_number_of_hours_down_h
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:*>`

```
system node autosupport invoke -node * -type all -message MAINT=2h
```

2. If the impaired controller is part of an HA pair, disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`
3. Take the impaired controller to the LOADER prompt:

| If the impaired controller is displaying...              | Then...                                                                                                                                                                                                                                                             |
|----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                                        | Go to Remove controller module.                                                                                                                                                                                                                                     |
| Waiting for giveback...                                  | Press Ctrl-C, and then respond <code>y</code> .                                                                                                                                                                                                                     |
| System prompt or password prompt (enter system password) | <p>Take over or halt the impaired controller from the healthy controller:</p> <pre>storage failover takeover -ofnode<br/>impaired_node_name</pre> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <code>y</code>.</p> |

### Step 2: Remove controller module

To access components inside the controller module, you must first remove the controller module from the

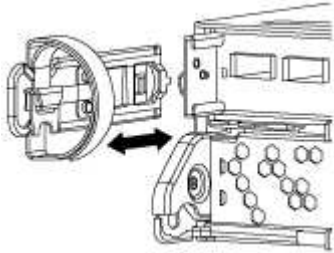


system, and then remove the cover on the controller module.

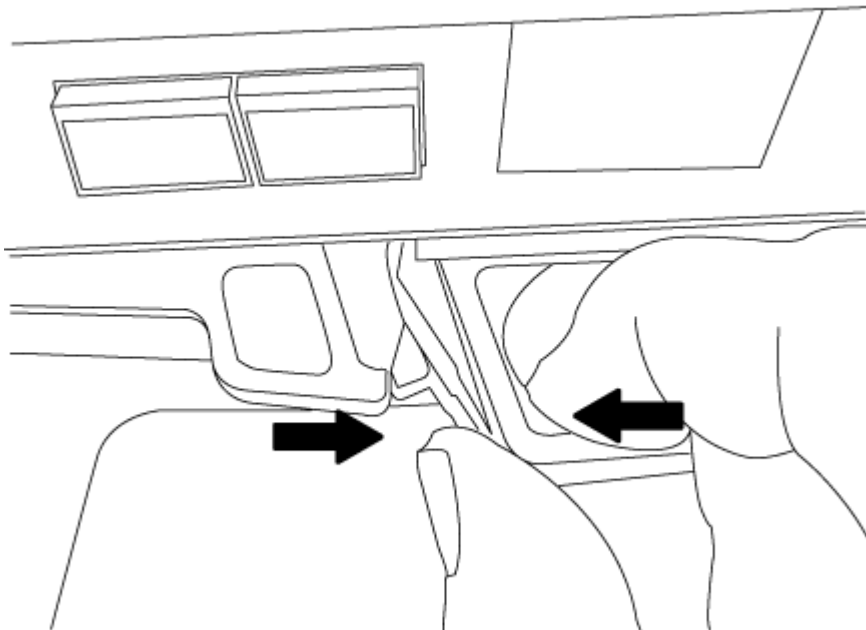
1. If you are not already grounded, properly ground yourself.
2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

3. Remove and set aside the cable management devices from the left and right sides of the controller module.



4. Squeeze the latch on the cam handle until it releases, open the cam handle fully to release the controller module from the midplane, and then, using two hands, pull the controller module out of the chassis.



5. Turn the controller module over and place it on a flat, stable surface.
6. Open the cover by sliding in the blue tabs to release the cover, and then swing the cover up and open.



### Step 3: Replace the RTC battery

To replace the RTC battery, you need to locate it inside the controller module, and then follow the specific sequence of steps.

1. Locate the RTC battery.
2. Gently push the battery away from the holder, rotate it away from the holder, and then lift it out of the holder.



Note the polarity of the battery as you remove it from the holder. The battery is marked with a plus sign and must be positioned in the holder correctly. A plus sign near the holder tells you how the battery should be positioned.

3. Remove the replacement battery from the antistatic shipping bag.
4. Locate the empty battery holder in the controller module.
5. Note the polarity of the RTC battery, and then insert it into the holder by tilting the battery at an angle and pushing down.
6. Visually inspect the battery to make sure that it is completely installed into the holder and that the polarity is correct.

### Step 4: Reinstall the controller module and set time/date after RTC battery replacement

After you replace a component within the controller module, you must reinstall the controller module in the system chassis, reset the time and date on the controller, and then boot it.

1. If you have not already done so, close the air duct or controller module cover.
2. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.

Do not completely insert the controller module in the chassis until instructed to do so.

3. Recable the system, as needed.

If you removed the media converters (QSFPs or SFPs), remember to reinstall them if you are using fiber optic cables.

4. If the power supplies were unplugged, plug them back in and reinstall the power cable retainers.
5. Complete the reinstallation of the controller module. The controller module begins to boot as soon as it is fully seated in the chassis.
  - a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position.



Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.

- b. If you have not already done so, reinstall the cable management device.
  - c. Bind the cables to the cable management device with the hook and loop strap.
  - d. Halt the controller at the LOADER prompt.
6. Reset the time and date on the controller:
    - a. Check the date and time on the healthy controller with the `show date` command.
    - b. At the LOADER prompt on the target controller, check the time and date.
    - c. If necessary, modify the date with the `set date mm/dd/yyyy` command.
    - d. If necessary, set the time, in GMT, using the `set time hh:mm:ss` command.
    - e. Confirm the date and time on the target controller.
  7. At the LOADER prompt, enter `bye` to reinitialize the PCIe cards and other components and let the controller reboot.
  8. Return the controller to normal operation by giving back its storage: `storage failover giveback -ofnode impaired_node_name`
  9. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`

#### Step 5: Complete the replacement process

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

## FAS2600 systems

## Install and setup

### Cluster configuration worksheet - FAS2600

You can use the worksheet to gather and record your site-specific IP addresses and other information required when configuring an ONTAP cluster.

[Cluster Configuration Worksheet](#)

### Start here: Choose your installation and setup experience

You can choose from different content formats to guide you through installing and setting up your new storage system.

- [Quick steps](#)

A printable PDF of step-by-step instructions with live links to additional content.

- [Video steps](#)

Video step-by-step instructions.

### Installation and setup PDF poster - FAS2600

You can use the PDF poster to install and set up your new system. The [FAS2600 Installation and Setup Instructions](#) provides step-by-step instructions with live links to additional content.

### Installation and setup video - FAS2600

The following video shows end-to-end software configuration for systems running ONTAP 9.2.

[AFF FAS2600 Setup Video](#)

## Maintain

### Maintain FAS2600 hardware

For the FAS2600 storage system, you can perform maintenance procedures on the following components.

#### Boot media

The boot media stores a primary and secondary set of boot image files that the system uses when it boots.

#### Caching module

You must replace the controller's caching module when your system registers a single AutoSupport (ASUP) message that the module has gone offline.

## Chassis

The chassis is the physical enclosure housing all the controller components such as the controller/CPU unit, power supply, and I/O.

## Controller

A controller consists of a board, firmware, and software. It controls the drives and implements the ONTAP functions.

## DIMM

You must replace a DIMM (dual in-line memory module) when a memory mismatch is present, or you have a failed DIMM.

## Drive

A drive is a device that provides the physical storage media for data.

## NVEM Battery

A battery is included with a controller and preserves cached data if the AC power fails.

## Power supply

A power supply provides a redundant power source in a controller shelf.

## Real time clock battery

A real time clock battery preserves system date and time information if the power is off.

## Boot media

### Overview of boot media replacement - FAS2600

The boot media stores a primary and secondary set of system (boot image) files that the system uses when it boots. Depending on your network configuration, you can perform either a nondisruptive or disruptive replacement.

You must have a USB flash drive, formatted to FAT32, with the appropriate amount of storage to hold the `image_XXX.tgz` file.

You also must copy the `image_XXX.tgz` file to the USB flash drive for later use in this procedure.

- The nondisruptive and disruptive methods for replacing a boot media both require you to restore the `var` file system:
  - For nondisruptive replacement, the HA pair must be connected to a network to restore the `var` file system.
  - For disruptive replacement, you do not need a network connection to restore the `var` file system, but the process requires two reboots.
- You must replace the failed component with a replacement FRU component you received from your provider.

- It is important that you apply the commands in these steps on the correct node:
  - The *impaired* node is the node on which you are performing maintenance.
  - The *healthy node* is the HA partner of the impaired node.

### Check onboard encryption keys - FAS2600

Prior to shutting down the impaired controller and checking the status of the onboard encryption keys, you must check the status of the impaired controller, disable automatic giveback, and check what version of ONTAP the system is running.

Prior to shutting down the impaired controller and checking the status of the onboard encryption keys, you must check the status of the impaired controller, disable automatic giveback, and check which version of ONTAP is running on the system.

If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see the [Synchronize a node with the cluster](#).

### Steps

1. Check the status of the impaired controller:
  - If the impaired controller is at the login prompt, log in as `admin`.
  - If the impaired controller is at the LOADER prompt and is part of HA configuration, log in as `admin` on the healthy controller.
  - If the impaired controller is in a standalone configuration and at LOADER prompt, contact [mysupport.netapp.com](https://mysupport.netapp.com).
2. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:
 

```
system node autosupport invoke -node * -type all -message
MAINT=number_of_hours_downh
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:*>`

```
system node autosupport invoke -node * -type all -message MAINT=2h
```
3. Check the version of ONTAP the system is running on the impaired controller if up, or on the partner controller if the impaired controller is down, using the `version -v` command:
  - If `<Ino-DARE>` or `<1Ono-DARE>` is displayed in the command output, the system does not support NVE, proceed to shut down the controller.
  - If `<Ino-DARE>` is not displayed in the command output, and the system is running ONTAP 9.5, go to [Option 1: Check NVE or NSE on systems running ONTAP 9.5 and earlier](#).
  - If `<Ino-DARE>` is not displayed in the command output, and the system is running ONTAP 9.6 or later, go to [Option 2: Check NVE or NSE on systems running ONTAP 9.6 and later](#).
4. If the impaired controller is part of an HA configuration, disable automatic giveback from the healthy controller:
 

```
storage failover modify -node local -auto-giveback false or storage
failover modify -node local -auto-giveback-after-panic false
```

### Option 1: Check NVE or NSE on systems running ONTAP 9.5 and earlier

Before shutting down the impaired controller, you need to check whether the system has either NetApp Volume Encryption (NVE) or NetApp Storage Encryption (NSE) enabled. If so, you need to verify the configuration.

## Steps

1. Connect the console cable to the impaired controller.
2. Check whether NVE is configured for any volumes in the cluster: `volume show -is-encrypted true`

If any volumes are listed in the output, NVE is configured and you need to verify the NVE configuration. If no volumes are listed, check whether NSE is configured.

3. Check whether NSE is configured: `storage encryption disk show`
  - If the command output lists the drive details with Mode & Key ID information, NSE is configured and you need to verify the NSE configuration.
  - If NVE and NSE are not configured, it's safe to shut down the impaired controller.

## Verify NVE configuration

### Steps

1. Display the key IDs of the authentication keys that are stored on the key management servers: `security key-manager query`
  - If the `Restored` column displays `yes` and all key managers display `available`, it's safe to shut down the impaired controller.
  - If the `Restored` column displays anything other than `yes`, or if any key manager displays `unavailable`, you need to complete some additional steps.
  - If you see the message `This command is not supported when onboard key management is enabled`, you need to complete some other additional steps.
2. If the `Restored` column displayed anything other than `yes`, or if any key manager displayed `unavailable`:
  - a. Retrieve and restore all authentication keys and associated key IDs: `security key-manager restore -address *`

If the command fails, contact NetApp Support.

[mysupport.netapp.com](https://mysupport.netapp.com)
  - b. Verify that the `Restored` column displays `yes` for all authentication keys and that all key managers display `available`: `security key-manager query`
  - c. Shut down the impaired controller.
3. If you saw the message `This command is not supported when onboard key management is enabled`, display the keys stored in the onboard key manager: `security key-manager key show -detail`
  - a. If the `Restored` column displays `yes` manually back up the onboard key management information:
    - Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
    - Enter the command to display the OKM backup information: `security key-manager backup show`
    - Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
    - Return to admin mode: `set -priv admin`

- Shut down the impaired controller.
- b. If the `Restored` column displays anything other than `yes`:
- Run the key-manager setup wizard: `security key-manager setup -node target/impaired node name`



Enter the customer's onboard key management passphrase at the prompt. If the passphrase cannot be provided, contact [mysupport.netapp.com](https://mysupport.netapp.com)

- Verify that the `Restored` column displays `yes` for all authentication key: `security key-manager key show -detail`
- Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
- Enter the command to display the OKM backup information: `security key-manager backup show`
- Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
- Return to admin mode: `set -priv admin`
- You can safely shutdown the controller.

## Verify NSE configuration

### Steps

1. Display the key IDs of the authentication keys that are stored on the key management servers: `security key-manager query`
  - If the `Restored` column displays `yes` and all key managers display `available`, it's safe to shut down the impaired controller.
  - If the `Restored` column displays anything other than `yes`, or if any key manager displays `unavailable`, you need to complete some additional steps.
  - If you see the message `This command is not supported when onboard key management is enabled`, you need to complete some other additional steps
2. If the `Restored` column displayed anything other than `yes`, or if any key manager displayed `unavailable`:
  - a. Retrieve and restore all authentication keys and associated key IDs: `security key-manager restore -address *`

If the command fails, contact NetApp Support.

[mysupport.netapp.com](https://mysupport.netapp.com)
  - b. Verify that the `Restored` column displays `yes` for all authentication keys and that all key managers display `available`: `security key-manager query`
  - c. Shut down the impaired controller.
3. If you saw the message `This command is not supported when onboard key management is enabled`, display the keys stored in the onboard key manager: `security key-manager key show -detail`
  - a. If the `Restored` column displays `yes`, manually back up the onboard key management information:



- Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
- Enter the command to display the OKM backup information: `security key-manager backup show`
- Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
- Return to admin mode: `set -priv admin`
- Shut down the impaired controller.

b. If the `Restored` column displays anything other than `yes`:

- Run the key-manager setup wizard: `security key-manager setup -node target/impaired node name`



Enter the customer's OKM passphrase at the prompt. If the passphrase cannot be provided, contact [mysupport.netapp.com](https://mysupport.netapp.com)

- Verify that the `Restored` column shows `yes` for all authentication keys: `security key-manager key show -detail`
- Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
- Enter the command to back up the OKM information: `security key-manager backup show`



Make sure that OKM information is saved in your log file. This information will be needed in disaster scenarios where OKM might need to be manually recovered.

- Copy the contents of the backup information to a separate file or your log. You'll need it in disaster scenarios where you might need to manually recover OKM.
- Return to admin mode: `set -priv admin`
- You can safely shut down the controller.

## Option 2: Check NVE or NSE on systems running ONTAP 9.6 and later

Before shutting down the impaired controller, you need to verify whether the system has either NetApp Volume Encryption (NVE) or NetApp Storage Encryption (NSE) enabled. If so, you need to verify the configuration.

1. Verify whether NVE is in use for any volumes in the cluster: `volume show -is-encrypted true`

If any volumes are listed in the output, NVE is configured and you need to verify the NVE configuration. If no volumes are listed, check whether NSE is configured and in use.

2. Verify whether NSE is configured and in use: `storage encryption disk show`
  - If the command output lists the drive details with Mode & Key ID information, NSE is configured and you need to verify the NSE configuration and in use.
  - If no disks are shown, NSE is not configured.
  - If NVE and NSE are not configured, no drives are protected with NSE keys, it's safe to shut down the impaired controller.

## Verify NVE configuration

1. Display the key IDs of the authentication keys that are stored on the key management servers: `security key-manager key query`



After the ONTAP 9.6 release, you may have additional key manager types. The types are KMIP, AKV, and GCP. The process for confirming these types is the same as confirming external or onboard key manager types.

- If the Key Manager type displays `external` and the Restored column displays `yes`, it's safe to shut down the impaired controller.
  - If the Key Manager type displays `onboard` and the Restored column displays `yes`, you need to complete some additional steps.
  - If the Key Manager type displays `external` and the Restored column displays anything other than `yes`, you need to complete some additional steps.
  - If the Key Manager type displays `onboard` and the Restored column displays anything other than `yes`, you need to complete some additional steps.
2. If the Key Manager type displays `onboard` and the Restored column displays `yes`, manually back up the OKM information:
    - a. Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
    - b. Enter the command to display the key management information: `security key-manager onboard show-backup`
    - c. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
    - d. Return to admin mode: `set -priv admin`
    - e. Shut down the impaired controller.
  3. If the Key Manager type displays `external` and the Restored column displays anything other than `yes`:
    - a. Restore the external key management authentication keys to all nodes in the cluster: `security key-manager external restore`  
  
If the command fails, contact NetApp Support.  
  
[mysupport.netapp.com](https://mysupport.netapp.com)
    - b. Verify that the Restored column equals `yes` for all authentication keys: `security key-manager key query`
    - c. Shut down the impaired controller.
  4. If the Key Manager type displays `onboard` and the Restored column displays anything other than `yes`:
    - a. Enter the onboard security key-manager sync command: `security key-manager onboard sync`



Enter the customer's 32 character, alphanumeric onboard key management passphrase at the prompt. If the passphrase cannot be provided, contact NetApp Support.  
[mysupport.netapp.com](https://mysupport.netapp.com)

- b. Verify the Restored column shows yes for all authentication keys: `security key-manager key query`
- c. Verify that the Key Manager type shows onboard, and then manually back up the OKM information.
- d. Go to advanced privilege mode and enter y when prompted to continue: `set -priv advanced`
- e. Enter the command to display the key management backup information: `security key-manager onboard show-backup`
- f. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
- g. Return to admin mode: `set -priv admin`
- h. You can safely shut down the controller.

## Verify NSE configuration

1. Display the key IDs of the authentication keys that are stored on the key management servers: `security key-manager key query -key-type NSE-AK`



After the ONTAP 9.6 release, you may have additional key manager types. The types are KMIP, AKV, and GCP. The process for confirming these types is the same as confirming external or onboard key manager types.

- If the Key Manager type displays external and the Restored column displays yes, it's safe to shut down the impaired controller.
  - If the Key Manager type displays onboard and the Restored column displays yes, you need to complete some additional steps.
  - If the Key Manager type displays external and the Restored column displays anything other than yes, you need to complete some additional steps.
  - If the Key Manager type displays external and the Restored column displays anything other than yes, you need to complete some additional steps.
2. If the Key Manager type displays onboard and the Restored column displays yes, manually back up the OKM information:
    - a. Go to advanced privilege mode and enter y when prompted to continue: `set -priv advanced`
    - b. Enter the command to display the key management information: `security key-manager onboard show-backup`
    - c. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
    - d. Return to admin mode: `set -priv admin`
    - e. You can safely shut down the controller.
  3. If the Key Manager type displays external and the Restored column displays anything other than yes:
    - a. Restore the external key management authentication keys to all nodes in the cluster: `security key-manager external restore`

If the command fails, contact NetApp Support.

- b. Verify that the Restored column equals `yes` for all authentication keys: `security key-manager key query`
  - c. You can safely shut down the controller.
4. If the Key Manager type displays `onboard` and the Restored column displays anything other than `yes`:
  - a. Enter the onboard security key-manager sync command: `security key-manager onboard sync`  
  
Enter the customer's 32 character, alphanumeric onboard key management passphrase at the prompt. If the passphrase cannot be provided, contact NetApp Support.

- b. Verify the Restored column shows `yes` for all authentication keys: `security key-manager key query`
  - c. Verify that the Key Manager type shows `onboard`, and then manually back up the OKM information.
  - d. Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
  - e. Enter the command to display the key management backup information: `security key-manager onboard show-backup`
  - f. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
  - g. Return to admin mode: `set -priv admin`
  - h. You can safely shut down the controller.

#### Shut down the impaired controller - FAS2600

After completing the NVE or NSE tasks, you need to complete the shutdown of the impaired controller.

#### Steps

- a. Take the impaired controller to the LOADER prompt:

| If the impaired controller displays...                   | Then...                                                                                                                                                                                                                                                                   |
|----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                                        | Go to Remove controller module.                                                                                                                                                                                                                                           |
| Waiting for giveback...                                  | Press Ctrl-C, and then respond <code>y</code> when prompted.                                                                                                                                                                                                              |
| System prompt or password prompt (enter system password) | <p>Take over or halt the impaired controller from the healthy controller:<br/><code>storage failover takeover -ofnode<br/>impaired_node_name</code></p> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <code>y</code>.</p> |

- b. From the LOADER prompt, enter: `printenv` to capture all boot environmental variables. Save the output to your log file.



This command may not work if the boot device is corrupted or non-functional.

### Replace the boot media - FAS2600

To replace the boot media, you must remove the impaired controller module, install the replacement boot media, and transfer the boot image to a USB flash drive.

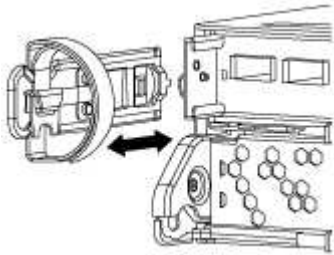
#### Step 1: Remove the controller module

To access components inside the controller, you must first remove the controller module from the system and then remove the cover on the controller module.

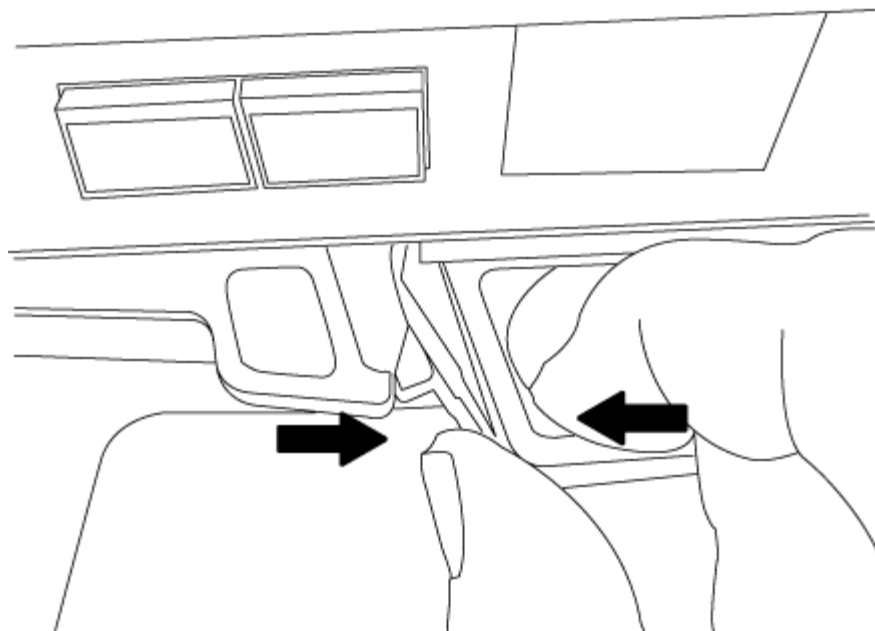
1. If you are not already grounded, properly ground yourself.
2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

3. Remove and set aside the cable management devices from the left and right sides of the controller module.



4. Squeeze the latch on the cam handle until it releases, open the cam handle fully to release the controller module from the midplane, and then, using two hands, pull the controller module out of the chassis.



5. Turn the controller module over and place it on a flat, stable surface.
6. Open the cover by sliding in the blue tabs to release the cover, and then swing the cover up and open.



## Step 2: Replace the boot media

1. If you are not already grounded, properly ground yourself.
2. Locate the boot media using the following illustration or the FRU map on the controller module:



3. Press the blue button on the boot media housing to release the boot media from its housing, and then gently pull it straight out of the boot media socket.



Do not twist or pull the boot media straight up, because this could damage the socket or the boot media.

4. Align the edges of the replacement boot media with the boot media socket, and then gently push it into the socket.
5. Check the boot media to make sure that it is seated squarely and completely in the socket.

If necessary, remove the boot media and reseal it into the socket.

6. Push the boot media down to engage the locking button on the boot media housing.
7. Close the controller module cover.

### Step 3: Transfer the boot image to the boot media

You can install the system image to the replacement boot media using a USB flash drive with the image installed on it. However, you must restore the var file system during this procedure.

- You must have a USB flash drive, formatted to FAT32, with at least 4GB capacity.
- A copy of the same image version of ONTAP as what the impaired controller was running. You can download the appropriate image from the Downloads section on the NetApp Support Site
  - If NVE is enabled, download the image with NetApp Volume Encryption, as indicated in the download button.
  - If NVE is not enabled, download the image without NetApp Volume Encryption, as indicated in the download button.
- If your system is an HA pair, you must have a network connection.
- If your system is a stand-alone system you do not need a network connection, but you must perform an additional reboot when restoring the var file system.

## Steps

1. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.
2. Reinstall the cable management device and recable the system, as needed.

When recabling, remember to reinstall the media converters (SFPs) if they were removed.

3. Insert the USB flash drive into the USB slot on the controller module.

Make sure that you install the USB flash drive in the slot labeled for USB devices, and not in the USB console port.

4. Push the controller module all the way into the system, making sure that the cam handle clears the USB flash drive, firmly push the cam handle to finish seating the controller module, push the cam handle to the closed position, and then tighten the thumbscrew.

The controller begins to boot as soon as it is completely installed into the chassis.

5. Interrupt the boot process to stop at the LOADER prompt by pressing Ctrl-C when you see Starting AUTOBOOT press Ctrl-C to abort....

If you miss this message, press Ctrl-C, select the option to boot to Maintenance mode, and then halt the controller to boot to LOADER.

6. For systems with one controller in the chassis, reconnect the power and turn on the power supplies.

The system begins to boot and stops at the LOADER prompt.

7. Set your network connection type at the LOADER prompt:

- If you are configuring DHCP: `ifconfig e0a -auto`



The target port you configure is the target port you use to communicate with the impaired controller from the healthy controller during var file system restore with a network connection. You can also use the e0M port in this command.

- If you are configuring manual connections: `ifconfig e0a -addr=filer_addr -mask=netmask -gw=gateway-dns=dns_addr-domain=dns_domain`

- `filer_addr` is the IP address of the storage system.
- `netmask` is the network mask of the management network that is connected to the HA partner.
- `gateway` is the gateway for the network.
- `dns_addr` is the IP address of a name server on your network.
- `dns_domain` is the Domain Name System (DNS) domain name.

If you use this optional parameter, you do not need a fully qualified domain name in the netboot server URL. You need only the server's host name.



Other parameters might be necessary for your interface. You can enter `help ifconfig` at the firmware prompt for details.



You must boot the ONTAP image from the USB drive, restore the file system, and verify the environmental variables.

### Steps

1. From the LOADER prompt, boot the recovery image from the USB flash drive: `boot_recovery`

The image is downloaded from the USB flash drive.

2. When prompted, either enter the name of the image or accept the default image displayed inside the brackets on your screen.
3. Restore the var file system:

| If your system has... | Then...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A network connection  | <ol style="list-style-type: none"> <li>a. Press <code>y</code> when prompted to restore the backup configuration.</li> <li>b. Set the healthy controller to advanced privilege level: <code>set -privilege advanced</code></li> <li>c. Run the restore backup command: <code>system node restore-backup -node local -target-address <i>impaired_node_IP_address</i></code></li> <li>d. Return the controller to admin level: <code>set -privilege admin</code></li> <li>e. Press <code>y</code> when prompted to use the restored configuration.</li> <li>f. Press <code>y</code> when prompted to reboot the controller.</li> </ol> |
| No network connection | <ol style="list-style-type: none"> <li>a. Press <code>n</code> when prompted to restore the backup configuration.</li> <li>b. Reboot the system when prompted by the system.</li> <li>c. Select the <b>Update flash from backup config</b> (sync flash) option from the displayed menu.</li> </ol> <p>If you are prompted to continue with the update, press <code>y</code>.</p>                                                                                                                                                                                                                                                     |

4. Ensure that the environmental variables are set as expected:
  - a. Take the controller to the LOADER prompt.
  - b. Check the environment variable settings with the `printenv` command.
  - c. If an environment variable is not set as expected, modify it with the `setenv environment_variable_name changed_value` command.
  - d. Save your changes using the `saveenv` command.
5. The next depends on your system configuration:
  - If your system has onboard keymanager, NSE or NVE configured, go to [Restore OKM, NSE, and NVE as needed](#)
  - If your system does not have onboard keymanager, NSE or NVE configured, complete the steps in this section.

6. From the LOADER prompt, enter the `boot_ontap` command.

| If you see...           | Then...                                                                                                                                                                                           |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The login prompt        | Go to the next Step.                                                                                                                                                                              |
| Waiting for giveback... | <ol style="list-style-type: none"><li>Log into the partner controller.</li><li>Confirm the target controller is ready for giveback with the <code>storage failover show</code> command.</li></ol> |

7. Connect the console cable to the partner controller.

8. Give back the controller using the `storage failover giveback -fromnode local` command.

9. At the cluster prompt, check the logical interfaces with the `net int -is-home false` command.

If any interfaces are listed as "false", revert those interfaces back to their home port using the `net int revert` command.

10. Move the console cable to the repaired controller and run the `version -v` command to check the ONTAP versions.

11. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.

#### Restore OKM, NSE, and NVE as needed - FAS2600

Once environment variables are checked, you must complete steps specific to systems that have Onboard Key Manager (OKM), NetApp Storage Encryption (NSE) or NetApp Volume Encryption (NVE) enabled.

Determine which section you should use to restore your OKM, NSE, or NVE configurations:

If NSE or NVE are enabled along with Onboard Key Manager you must restore settings you captured at the beginning of this procedure.

- If NSE or NVE are enabled and Onboard Key Manager is enabled, go to [Option 1: Restore NVE or NSE when Onboard Key Manager is enabled](#).
- If NSE or NVE are enabled for ONATP 9.5, go to [Option 2: Restore NSE/NVE on systems running ONTAP 9.5 and earlier](#).
- If NSE or NVE are enabled for ONTAP 9.6, go to [Option 3: Restore NSE/NVE on systems running ONTAP 9.6 and later](#).

#### Option 1: Restore NVE or NSE when Onboard Key Manager is enabled

##### Steps

1. Connect the console cable to the target controller.

2. Use the `boot_ontap` command at the LOADER prompt to boot the controller.

3. Check the console output:

| If the console displays... | Then...                                                                                                                                                                                                                          |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt          | Boot the controller to the boot menu: <code>boot_ontap menu</code>                                                                                                                                                               |
| Waiting for giveback...    | a. Enter <code>Ctrl-C</code> at the prompt<br>b. At the message: Do you wish to halt this controller rather than wait [y/n]? , enter: <code>y</code><br>c. At the LOADER prompt, enter the <code>boot_ontap menu</code> command. |

- At the Boot Menu, enter the hidden command, `recover_onboard_keymanager` and reply `y` at the prompt.
- Enter the passphrase for the onboard key manager you obtained from the customer at the beginning of this procedure.
- When prompted to enter the backup data, paste the backup data you captured at the beginning of this procedure, when asked. Paste the output of `security key-manager backup show` OR `security key-manager onboard show-backup` command.



The data is output from either `security key-manager backup show` or `security key-manager onboard show-backup` command.

Example of backup data:

```

-----BEGIN BACKUP-----
TmV0QXBwIEtleSB0bG9iAAEAAAAEAAAAcAEAAAAAADuD+byAAAAACEAAAAAAAAA
QAAAAAAAAABvOIH0AAAAAMh7qDLRyH1DBz12piVdy9ATSFMT0C0TIYFss4PDjTaV
dzRYkLd1PhQLxAWJwOlyqSr8qY1SEBgm1IWgE5DLRqkiAAAAAAAAACgAAAAAAAA
3WTh7gAAAAAAAAAAAAAAAAAIAAAAAAAgAZJEIWvdeHr5RCAvHGclo+wAAAAAAAAA
lgAAAAAAAAAoAAAAAAAAAEOTcR0AAAAAAAAAAAAAAAAACAAAAAAAAJAGr3tJA/
LRzUQRHwv+1aWvAAAAAAAAAACQAAAAAAAAAgAAAAAAAAACdhTcvAAAAAJ1PXeBf
ml4NBsSyV1B4jc4A7cvWEFY6ILG6hc6tbKLAHZuvfQ4rlbYAAAAAAAAAAAAAAAA
AA
AA
.
.
.
.
H4nPQM0nrDRYRa9SCv8AA
AA
AAAAAAA
-----END BACKUP-----

```

- At the Boot Menu select the option for Normal Boot.

The system boots to `Waiting for giveback...` prompt.

- Move the console cable to the partner controller and login as admin.

9. Confirm the target controller is ready for giveback with the `storage failover show` command.
10. Give back only the CFO aggregates with the `storage failover giveback -fromnode local -only-cfo -aggregates true` command.
  - If the command fails because of a failed disk, physically disengage the failed disk, but leave the disk in the slot until a replacement is received.
  - If the command fails because of an open CIFS session, check with the customer on how to close out CIFS sessions.
11. Once the giveback completes, check the failover and giveback status with the `storage failover show` and ``storage failover show-giveback`` commands.



Terminating CIFS can cause loss of data.

- If the command fails because the partner is "not ready", wait 5 minutes for the NVMEMs to synchronize.
  - If the command fails because of an NDMP, SnapMirror, or SnapVault process, disable the process. See the appropriate Documentation Center for more information.
12. Move the console cable to the target controller.
  13. If you are running ONTAP 9.5 and earlier, run the key-manager setup wizard:
    - a. Start the wizard using the `security key-manager setup -nodenodename` command, and then enter the passphrase for onboard key management when prompted.
    - b. Enter the `security key-manager key show -detail` command to see a detailed view of all keys stored in the onboard key manager and verify that the `Restored` column = `yes` for all authentication keys.



If the `Restored` column = anything other than `yes`, contact Customer Support.

- c. Wait 10 minutes for the key to synchronize across the cluster.
14. If you are running ONTAP 9.6 or later:
  - a. Run the `security key-manager onboard sync` command and then enter the passphrase when prompted.
  - b. Enter the `security key-manager key query` command to see a detailed view of all keys stored in the onboard key manager and verify that the `Restored` column = `yes/true` for all authentication keys.



If the `Restored` column = anything other than `yes/true`, contact Customer Support.

- c. Wait 10 minutes for the key to synchronize across the cluster.
15. Move the console cable to the partner controller.
16. Give back the target controller using the `storage failover giveback -fromnode local` command.
17. Check the giveback status, 3 minutes after it reports complete, using the `storage failover show` command.

If giveback is not complete after 20 minutes, contact Customer Support.

18. At the clustershell prompt, enter the `net int show -is-home false` command to list the logical interfaces that are not on their home controller and port.

If any interfaces are listed as `false`, revert those interfaces back to their home port using the `net int revert -vserver Cluster -lif nodename` command.

19. Move the console cable to the target controller and run the `version -v` command to check the ONTAP versions.
20. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.

## Option 2: Restore NSE/NVE on systems running ONTAP 9.5 and earlier

### Steps

1. Connect the console cable to the target controller.
2. Use the `boot_ontap` command at the LOADER prompt to boot the controller.
3. Check the console output:

| If the console displays... | Then...                                                                                                                                                                                                 |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The login prompt           | Go to Step 7.                                                                                                                                                                                           |
| Waiting for giveback...    | <ol style="list-style-type: none"><li>a. Log into the partner controller.</li><li>b. Confirm the target controller is ready for giveback with the <code>storage failover show</code> command.</li></ol> |

4. Move the console cable to the partner controller and give back the target controller storage using the `storage failover giveback -fromnode local -only-cfo-aggregates true local` command.
  - If the command fails because of a failed disk, physically disengage the failed disk, but leave the disk in the slot until a replacement is received.
  - If the command fails because of an open CIFS sessions, check with customer how to close out CIFS sessions.



Terminating CIFS can cause loss of data.

- If the command fails because the partner "not ready", wait 5 minutes for the NVMEMs to synchronize.
  - If the command fails because of an NDMP, SnapMirror, or SnapVault process, disable the process. See the appropriate Documentation Center for more information.
5. Wait 3 minutes and check the failover status with the `storage failover show` command.
  6. At the clustershell prompt, enter the `net int show -is-home false` command to list the logical interfaces that are not on their home controller and port.

If any interfaces are listed as `false`, revert those interfaces back to their home port using the `net int`

```
revert -vserver Cluster -lif nodename command.
```

7. Move the console cable to the target controller and run the `version -v` command to check the ONTAP versions.
8. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.
9. Use the `storage encryption disk show` at the cluster shell prompt, to review the output.



This command does not work if NVE (NetApp Volume Encryption) is configured

10. Use the security key-manager query to display the key IDs of the authentication keys that are stored on the key management servers.
  - If the `Restored` column = `yes` and all key managers report in an available state, go to *Complete the replacement process*.
  - If the `Restored` column = anything other than `yes`, and/or one or more key managers is not available, use the `security key-manager restore -address` command to retrieve and restore all authentication keys (AKs) and key IDs associated with all nodes from all available key management servers.

Check the output of the security key-manager query again to ensure that the `Restored` column = `yes` and all key managers report in an available state

11. If the Onboard Key Management is enabled:
  - a. Use the `security key-manager key show -detail` to see a detailed view of all keys stored in the onboard key manager.
  - b. Use the `security key-manager key show -detail` command and verify that the `Restored` column = `yes` for all authentication keys.

If the `Restored` column = anything other than `yes`, use the `security key-manager setup -node Repaired(Target)node` command to restore the Onboard Key Management settings. Rerun the `security key-manager key show -detail` command to verify `Restored` column = `yes` for all authentication keys.

12. Connect the console cable to the partner controller.
13. Give back the controller using the `storage failover giveback -fromnode local` command.
14. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.

### Option 3: Restore NSE/NVE on systems running ONTAP 9.6 and later

#### Steps

1. Connect the console cable to the target controller.
2. Use the `boot_ontap` command at the `LOADER` prompt to boot the controller.
3. Check the console output:

| If the console displays... | Then...                                                                                                                                                                                                    |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The login prompt           | Go to Step 7.                                                                                                                                                                                              |
| Waiting for giveback...    | <ul style="list-style-type: none"> <li>a. Log into the partner controller.</li> <li>b. Confirm the target controller is ready for giveback with the <code>storage failover show</code> command.</li> </ul> |

4. Move the console cable to the partner controller and give back the target controller storage using the `storage failover giveback -fromnode local -only-cfo-aggregates true local` command.
  - If the command fails because of a failed disk, physically disengage the failed disk, but leave the disk in the slot until a replacement is received.
  - If the command fails because of an open CIFS session, check with the customer on how to close out CIFS sessions.



Terminating CIFS can cause loss of data.

- If the command fails because the partner is "not ready", wait 5 minutes for the NVMEMs to synchronize.
  - If the command fails because of an NDMP, SnapMirror, or SnapVault process, disable the process. See the appropriate Documentation Center for more information.
5. Wait 3 minutes and check the failover status with the `storage failover show` command.
  6. At the clustershell prompt, enter the `net int show -is-home false` command to list the logical interfaces that are not on their home controller and port.

If any interfaces are listed as `false`, revert those interfaces back to their home port using the `net int revert -vserver Cluster -lif nodename` command.

7. Move the console cable to the target controller and run the `version -v` command to check the ONTAP versions.
8. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.
9. Use the `storage encryption disk show` at the clustershell prompt, to review the output.
10. Use the `security key-manager key query` command to display the key IDs of the authentication keys that are stored on the key management servers.
  - If the `Restored` column = `yes/true`, you are done and can proceed to complete the replacement process.
  - If the `Key Manager type` = `external` and the `Restored` column = anything other than `yes/true`, use the `security key-manager external restore` command to restore the key IDs of the authentication keys.



If the command fails, contact Customer Support.

- If the `Key Manager type = onboard` and the `Restored column = anything other than yes/true`, use the `security key-manager onboard sync` command to re-sync the Key Manager type.

Use the `security key-manager key query` to verify that the `Restored column = yes/true` for all authentication keys.

11. Connect the console cable to the partner controller.
12. Give back the controller using the `storage failover giveback -fromnode local` command.
13. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.
14. If AutoSupport is enabled, restore/unsuppress automatic case creation by using the `system node autosupport invoke -node * -type all -message MAINT=END`

### Return the failed part to NetApp - FAS2600

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

### Replace the caching module - FAS2600

You must replace the caching module in the controller module when your system registers a single AutoSupport (ASUP) message that the module has gone offline; failure to do so results in performance degradation.

- You must replace the failed component with a replacement FRU component you received from your provider.

### [AFF FAS2600 caching module replacement video](#)

#### Step 1: Shut down the impaired controller

You can shut down or take over the impaired controller using different procedures, depending on the storage system hardware configuration.

#### About this task

If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller.

### [Synchronize a node with the cluster](#)

You might want to erase the contents of your caching module before replacing it.

1. Although data on the caching module is encrypted, you might want to erase any data from the impaired caching module and verify that the caching module has no data:
  - a. Erase the data on the caching module: `system controller flash-cache secure-erase run -node node_name localhost -device-id device_number`



Run the `system controller flash-cache show` command if you don't know the flashcache device ID.



- b. Verify that the data has been erased from the caching module: `system controller flash-cache secure-erase show`
2. If the impaired controller is part of an HA pair, disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`
3. Take the impaired controller to the LOADER prompt:

| If the impaired controller is displaying...              | Then...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                                        | Go to the next step.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Waiting for giveback...                                  | Press Ctrl-C, and then respond <code>y</code> when prompted.                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| System prompt or password prompt (enter system password) | <p>Take over or halt the impaired controller:</p> <ul style="list-style-type: none"> <li>• For an HA pair, take over the impaired controller from the healthy controller: <code>storage failover takeover -ofnode <i>impaired_node_name</i></code></li> </ul> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <code>y</code>.</p> <ul style="list-style-type: none"> <li>• For a stand-alone system: <code>system node halt <i>impaired_node_name</i></code></li> </ul> |

4. If the system has only one controller module in the chassis, turn off the power supplies, and then unplug the impaired controller's power cords from the power source.

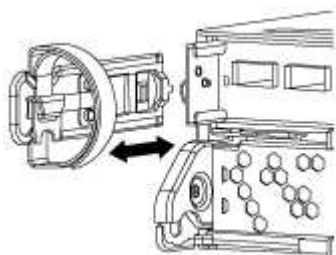
## Step 2: Remove controller module

To access components inside the controller, you must first remove the controller module from the system and then remove the cover on the controller module.

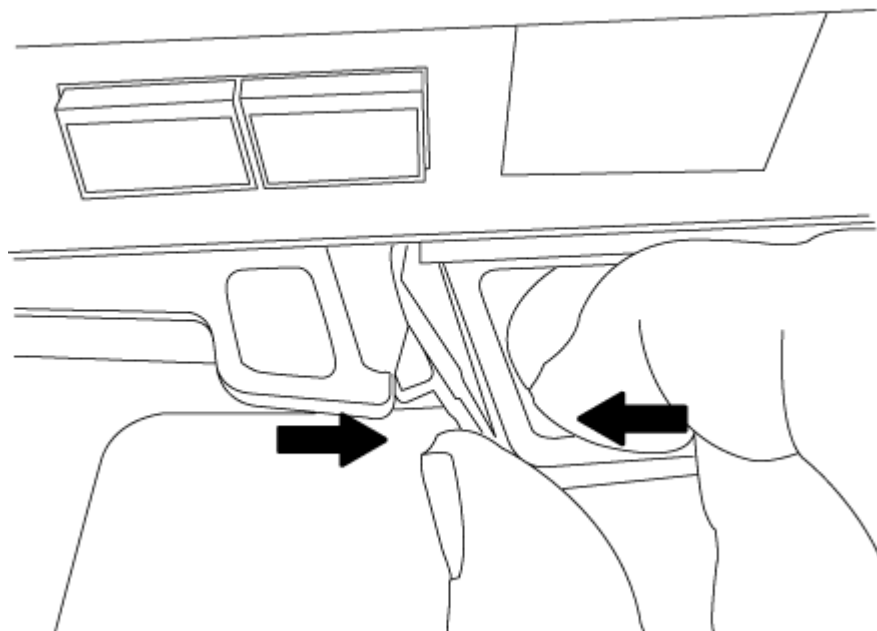
1. If you are not already grounded, properly ground yourself.
2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

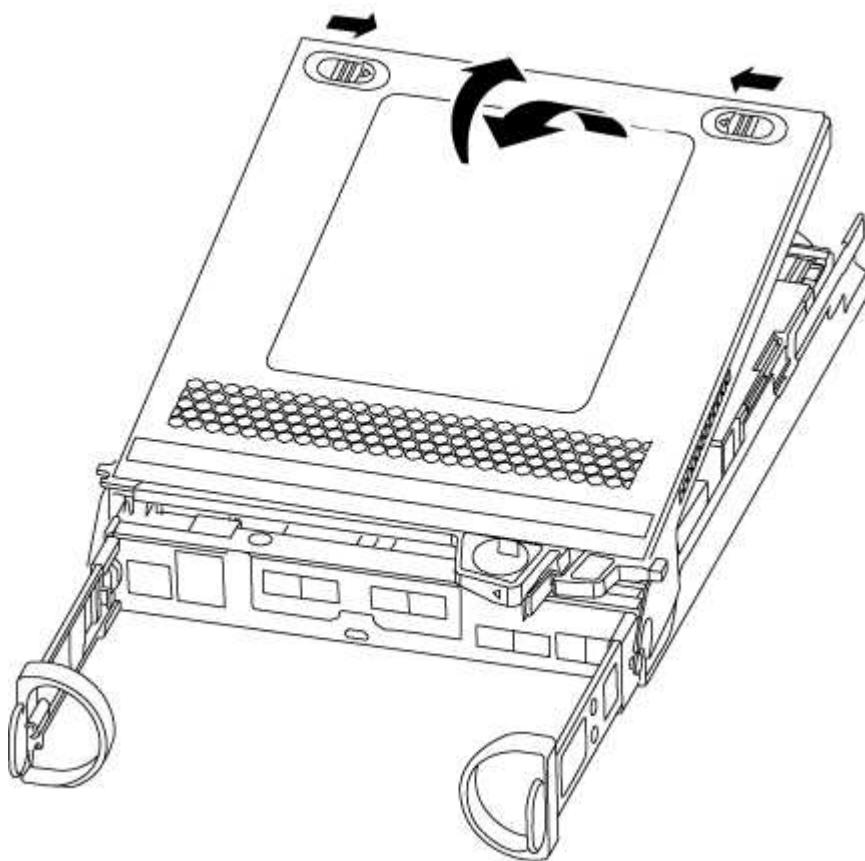
3. Remove and set aside the cable management devices from the left and right sides of the controller module.



4. Squeeze the latch on the cam handle until it releases, open the cam handle fully to release the controller module from the midplane, and then, using two hands, pull the controller module out of the chassis.



5. Turn the controller module over and place it on a flat, stable surface.
6. Open the cover by sliding in the blue tabs to release the cover, and then swing the cover up and open.



### Step 3: Replace a caching module

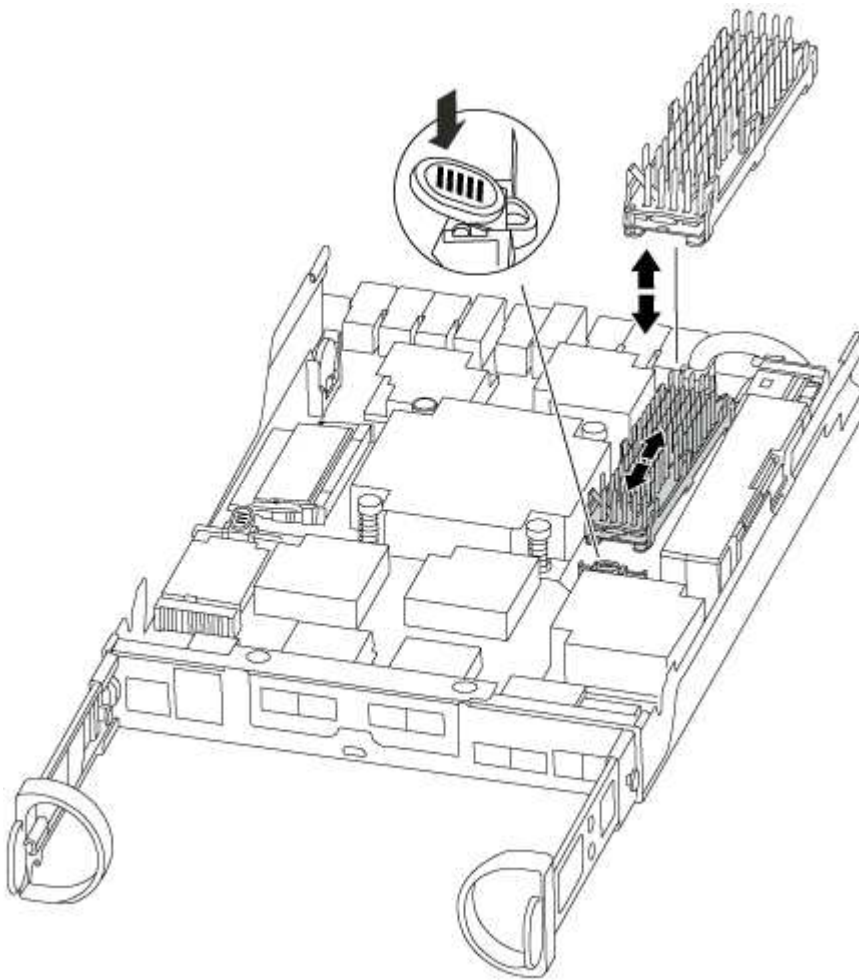
To replace a caching module referred to as the M.2 PCIe card on the label on your controller, locate the slot inside the controller and follow the specific sequence of steps.

Your storage system must meet certain criteria depending on your situation:

- It must have the appropriate operating system for the caching module you are installing.
- It must support the caching capacity.
- All other components in the storage system must be functioning properly; if not, you must contact technical support.

1. Locate the caching module at the rear of the controller module and remove it.

- a. Press the release tab.
- b. Remove the heatsink.



1. Gently pull the caching module straight out of the housing.
2. Align the edges of the caching module with the socket in the housing, and then gently push it into the socket.
3. Verify that the caching module is seated squarely and completely in the socket.

If necessary, remove the caching module and reseal it into the socket.

4. Reseat and push the heatsink down to engage the locking button on the caching module housing.
5. Close the controller module cover, as needed.

**Step 4: Reinstall the controller module**

After you replace components in the controller module, reinstall it into the chassis.

1. If you have not already done so, replace the cover on the controller module.
2. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.





Do not completely insert the controller module in the chassis until instructed to do so.

3. Recable the system, as needed.

If you removed the media converters (QSFPs or SFPs), remember to reinstall them if you are using fiber optic cables.

4. Complete the reinstallation of the controller module:

| If your system is in... | Then perform these steps...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| An HA pair              | <p>The controller module begins to boot as soon as it is fully seated in the chassis.</p> <ol style="list-style-type: none"> <li>a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position.</li> </ol> <div>  <p>Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.</p> </div> <p>The controller begins to boot as soon as it is seated in the chassis.</p> <ol style="list-style-type: none"> <li>b. If you have not already done so, reinstall the cable management device.</li> <li>c. Bind the cables to the cable management device with the hook and loop strap.</li> </ol> |

| If your system is in...     | Then perform these steps...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A stand-alone configuration | <p>a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position.</p> <div>  <p>Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.</p> </div> <p>The controller begins to boot as soon as it is seated in the chassis.</p> <p>b. If you have not already done so, reinstall the cable management device.</p> <p>c. Bind the cables to the cable management device with the hook and loop strap.</p> <p>d. Reconnect the power cables to the power supplies and to the power sources, then turn on the power to start the boot process.</p> |

#### Step 5: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

## Chassis

### Overview of chassis replacement - FAS2600

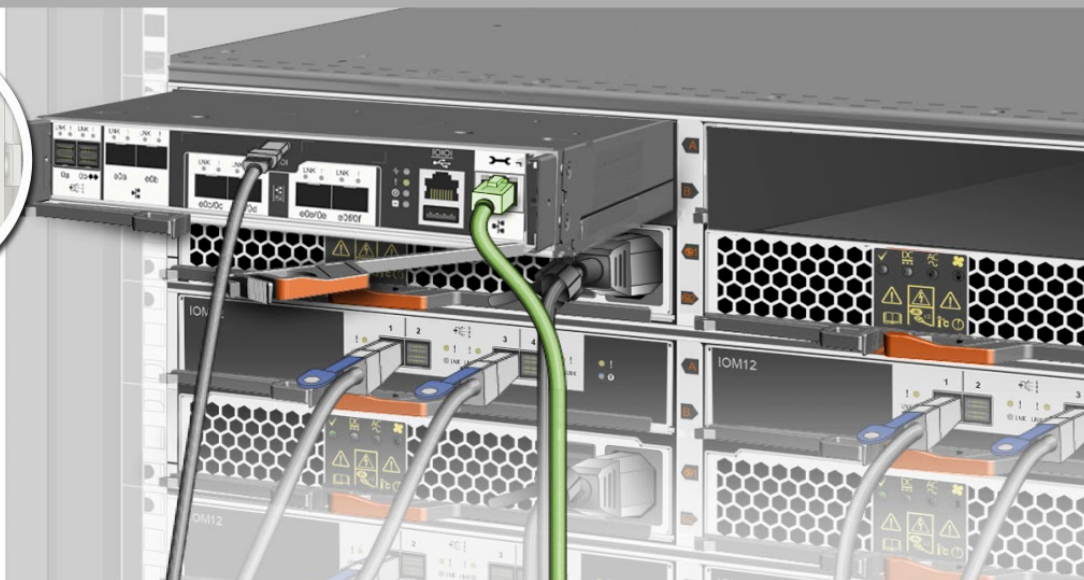
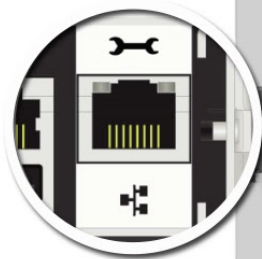
To replace the chassis, you must move the power supplies, hard drives, and controller module or modules from the impaired chassis to the new chassis, and swap out the impaired chassis from the equipment rack or system cabinet with the new chassis of the same model as the impaired chassis.

All other components in the system must be functioning properly; if not, you must contact technical support.

- You can use this procedure with all versions of ONTAP supported by your system.
- This procedure is written with the assumption that you are moving all drives and controller module or modules to the new chassis, and that the chassis is a new component from NetApp.
- This procedure is disruptive. For a two-node cluster, you will have a complete service outage and a partial outage in a multi-node cluster.

# Moving components to the new chassis

## Installing the controller modules



### Shut down the controllers - FAS2600

This procedure is for 2-node, non-MetroCluster configurations only. If you have a system with more than two nodes, see [How to perform a graceful shutdown and power up of one HA pair in a 4-node cluster](#).

#### Before you begin

You need:

- Local administrator credentials for ONTAP.
- NetApp onboard key management (OKM) cluster-wide passphrase if using storage encryption or NVE/NAE.
- BMC accessibility for each controller.
- Stop all clients/host from accessing data on the NetApp system.
- Suspend external backup jobs.
- Necessary tools and equipment for the replacement.



If the system is a NetApp StorageGRID or ONTAP S3 used as FabricPool cloud tier, refer to the [Gracefully shutdown and power up your storage system Resolution Guide](#) after performing this procedure.



If using SSDs, refer to [SU490: \(Impact: Critical\) SSD Best Practices: Avoid risk of drive failure and data loss if powered off for more than two months](#)

As a best practice before shutdown, you should:

- Perform additional [system health checks](#).

- Upgrade ONTAP to a recommended release for the system.
- Resolve any [Active IQ Wellness Alerts and Risks](#).  
Make note of any faults presently on the system, such as LEDs on the system components.

## Steps

1. Log into the cluster through SSH or log in from any node in the cluster using a local console cable and a laptop/console.
2. Turn off AutoSupport and indicate how long you expect the system to be offline:

```
system node autosupport invoke -node * -type all -message "MAINT=8h Power Maintenance"
```

3. Identify the SP/BMC address of all nodes:

```
system service-processor show -node * -fields address
```

4. Exit the cluster shell: `exit`
5. Log into SP/BMC over SSH using the IP address of any of the nodes listed in the output from the previous step.

If you're using a console/laptop, log into the controller using the same cluster administrator credentials.



Open an SSH session to every SP/BMC connection so that you can monitor progress.

6. Halt the 2 nodes located in the impaired chassis:

```
system node halt -node <node>,<node2> -skip-lif-migration-before-shutdown true -ignore-quorum-warnings true -inhibit-takeover true
```



For clusters using SnapMirror synchronous operating in StrictSync mode: `system node halt -node <node>,<node2> -skip-lif-migration-before-shutdown true -ignore-quorum-warnings true -inhibit-takeover true -ignore-strict-sync-warnings true`

7. Enter **y** for each controller in the cluster when you see *Warning: Are you sure you want to halt node "cluster <node-name> number"?*  
{y|n}:
8. Wait for each controller to halt and display the LOADER prompt.

## Move and replace hardware - FAS2600

Move the power supplies, hard drives, and controller module or modules from the impaired chassis to the new chassis, and swap out the impaired chassis from the equipment rack or system cabinet with the new chassis of the same model as the impaired chassis.

### Step 1: Move the power supply

Moving out a power supply when replacing a chassis involves turning off, disconnecting, and removing the power supply from the old chassis and installing and connecting it on the replacement chassis.

1. If you are not already grounded, properly ground yourself.
2. Turn off the power supply and disconnect the power cables:
  - a. Turn off the power switch on the power supply.
  - b. Open the power cable retainer, and then unplug the power cable from the power supply.
  - c. Unplug the power cable from the power source.
3. Squeeze the latch on the power supply cam handle, and then open the cam handle to fully release the power supply from the mid plane.
4. Use the cam handle to slide the power supply out of the system.



When removing a power supply, always use two hands to support its weight.

5. Repeat the preceding steps for any remaining power supplies.
6. Using both hands, support and align the edges of the power supply with the opening in the system chassis, and then gently push the power supply into the chassis using the cam handle.

The power supplies are keyed and can only be installed one way.



Do not use excessive force when sliding the power supply into the system. You can damage the connector.

7. Close the cam handle so that the latch clicks into the locked position and the power supply is fully seated.
8. Reconnect the power cable and secure it to the power supply using the power cable locking mechanism.



Only connect the power cable to the power supply. Do not connect the power cable to a power source at this time.

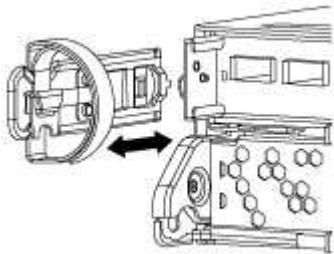
## Step 2: Remove the controller module

Remove the controller module or modules from the old chassis.

1. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

2. Remove and set aside the cable management devices from the left and right sides of the controller module.



3. Squeeze the latch on the cam handle until it releases, open the cam handle fully to release the controller module from the midplane, and then, using two hands, pull the controller module out of the chassis.





4. Set the controller module aside in a safe place, and repeat these steps if you have another controller module in the chassis.

### Step 3: Move drives to the new chassis

Move the drives from each bay opening in the old chassis to the same bay opening in the new chassis.

1. Gently remove the bezel from the front of the system.
2. Remove the drives:
  - a. Press the release button at the top of the carrier face below the LEDs.
  - b. Pull the cam handle to its fully open position to unseat the drive from the midplane, and then gently slide the drive out of the chassis.

The drive should disengage from the chassis, allowing it to slide free of the chassis.



When removing a drive, always use two hands to support its weight.



Drives are fragile. Handle them as little as possible to prevent damage to them.

3. Align the drive from the old chassis with the same bay opening in the new chassis.
4. Gently push the drive into the chassis as far as it will go.

The cam handle engages and begins to rotate upward.

5. Firmly push the drive the rest of the way into the chassis, and then lock the cam handle by pushing it up and against the drive holder.

Be sure to close the cam handle slowly so that it aligns correctly with the front of the drive carrier. It clicks when it is secure.

6. Repeat the process for the remaining drives in the system.

#### Step 4: Replace a chassis from within the equipment rack or system cabinet

Remove the existing chassis from the equipment rack or system cabinet before you can install the replacement chassis.

1. Remove the screws from the chassis mount points.
2. With the help of two or three people, slide the old chassis off the rack rails in a system cabinet or *L* brackets in an equipment rack, and then set it aside.
3. If you are not already grounded, properly ground yourself.
4. Using two or three people, install the replacement chassis into the equipment rack or system cabinet by guiding the chassis onto the rack rails in a system cabinet or *L* brackets in an equipment rack.
5. Slide the chassis all the way into the equipment rack or system cabinet.
6. Secure the front of the chassis to the equipment rack or system cabinet, using the screws you removed from the old chassis.
7. If you have not already done so, install the bezel.

## Step 5: Install the controller

After you install the controller module and any other components into the new chassis, boot it.


For HA pairs with two controller modules in the same chassis, the sequence in which you install the controller module is especially important because it attempts to reboot as soon as you completely seat it in the chassis.

1. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.



Do not completely insert the controller module in the chassis until instructed to do so.

2. Recable the console to the controller module, and then reconnect the management port.
3. Repeat the preceding steps if there is a second controller to install in the new chassis.
4. Complete the installation of the controller module:

| If your system is in... | Then perform these steps...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>An HA pair</p>       | <ol style="list-style-type: none"> <li data-bbox="631 1375 1476 1482">a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position.</li> </ol> <div data-bbox="691 1507 1362 1627">  <p>Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.</p> </div> <ol style="list-style-type: none"> <li data-bbox="631 1665 1476 1734">b. If you have not already done so, reinstall the cable management device.</li> <li data-bbox="631 1753 1476 1822">c. Bind the cables to the cable management device with the hook and loop strap.</li> <li data-bbox="631 1841 1476 1890">d. Repeat the preceding steps for the second controller module in the new chassis.</li> </ol> |

| If your system is in...     | Then perform these steps...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A stand-alone configuration | <p>a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position.</p> <div>  <p>Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.</p> </div> <p>b. If you have not already done so, reinstall the cable management device.</p> <p>c. Bind the cables to the cable management device with the hook and loop strap.</p> <p>d. Reinstall the blanking panel and then go to the next step.</p> |

5. Connect the power supplies to different power sources, and then turn them on.

6. Boot each controller to Maintenance mode:

- a. As each controller starts the booting, press `Ctrl-C` to interrupt the boot process when you see the message `Press Ctrl-C for Boot Menu`.



If you miss the prompt and the controller modules boot to ONTAP, enter `halt`, and then at the `LOADER` prompt enter `boot_ontap`, press `Ctrl-C` when prompted, and then repeat this step.

- b. From the boot menu, select the option for Maintenance mode.

#### Restore and verify the configuration - FAS2600

You must verify the HA state of the chassis and return the failed part to NetApp, as described in the RMA instructions shipped with the kit.

#### Step 1: Verify and set the HA state of the chassis

You must verify the HA state of the chassis, and, if necessary, update the state to match your system configuration.

1. In Maintenance mode, from either controller module, display the HA state of the local controller module and chassis: `ha-config show`

The HA state should be the same for all components.

2. If the displayed system state for the chassis does not match your system configuration:

- a. Set the HA state for the chassis: `ha-config modify chassis HA-state`

The value for HA-state can be one of the following:

- `ha`
- `non-ha`

- b. Confirm that the setting has changed: `ha-config show`
3. If you have not already done so, recable the rest of your system.
4. The next step depends on your system configuration.

| If your system is in...                    | Then...                                                                                                                                                          |
|--------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A stand-alone configuration                | <ol style="list-style-type: none"><li>a. Exit Maintenance mode: <code>halt</code></li><li>b. Go to <a href="#">Completing the replacement process</a>.</li></ol> |
| An HA pair with a second controller module | <p>Exit Maintenance mode: <code>halt</code></p> <p>The LOADER prompt appears.</p>                                                                                |

## Step 2: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

### Controller module

#### Overview of controller module replacement - FAS2600

You must review the prerequisites for the replacement procedure and select the correct one for your version of the ONTAP operating system.

- All drive shelves must be working properly.
- If your system is in an HA pair, the healthy controller must be able to take over the controller that is being replaced (referred to in this procedure as the “impaired controller”).
- This procedure includes steps for automatically or manually reassigning drives to the *replacement* controller, depending on your system’s configuration.

You should perform the drive reassignment as directed in the procedure.

- You must replace the failed component with a replacement FRU component you received from your provider.
- You must be replacing a controller module with a controller module of the same model type. You cannot upgrade your system by just replacing the controller module.
- You cannot change any drives or drive shelves as part of this procedure.
- In this procedure, the boot device is moved from the impaired controller to the *replacement* controller so that the *replacement* controller will boot up in the same version of ONTAP as the old controller module.
- It is important that you apply the commands in these steps on the correct systems:
  - The *impaired* controller is the controller that is being replaced.
  - The *replacement* controller is the new controller that is replacing the impaired controller.
  - The *healthy* controller is the surviving controller.
- You must always capture the controller’s console output to a text file.

This provides you a record of the procedure so that you can troubleshoot any issues that you might encounter during the replacement process.

**Shut down the controller - FAS2600**

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

**Steps**

- 1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message
MAINT=_number_of_hours_down_h
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:*> system node autosupport invoke -node * -type all -message MAINT=2h`

- 2. If the impaired controller is part of an HA pair, disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`
- 3. Take the impaired controller to the LOADER prompt:

| If the impaired controller is displaying...              | Then...                                                                                                                                                                                                                                                                           |
|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                                        | Go to Remove controller module.                                                                                                                                                                                                                                                   |
| Waiting for giveback...                                  | Press Ctrl-C, and then respond <code>y</code> .                                                                                                                                                                                                                                   |
| System prompt or password prompt (enter system password) | <div>Take over or halt the impaired controller from the healthy controller:<br/><code>storage failover takeover -ofnode<br/>impaired_node_name</code></div> <div>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <code>y</code>.</div> |

- 4. If the system has only one controller module in the chassis, turn off the power supplies, and then unplug the impaired controller’s power cords from the power source.

**Replace the controller module hardware - FAS2600**

To replace the controller module, you must remove the impaired controller, move FRU components to the replacement controller module, install the replacement controller module in the chassis, and then boot the system to Maintenance mode.

[AFF FAS2600 controller replacement video](#)

## Step 1: Remove controller module

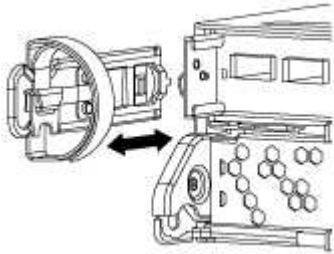
To replace the controller module, you must first remove the old controller module from the chassis.

### Steps

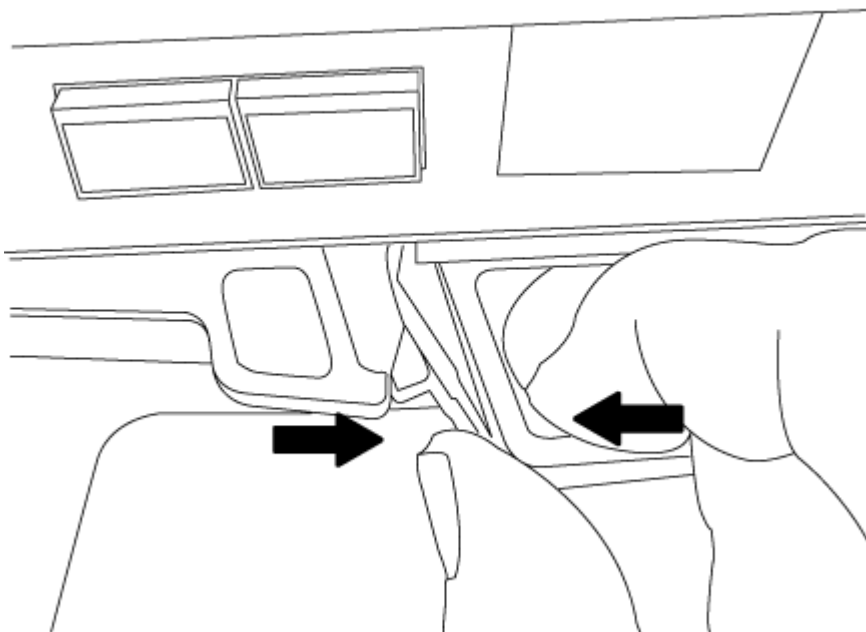
1. If you are not already grounded, properly ground yourself.
2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

3. Remove and set aside the cable management devices from the left and right sides of the controller module.



4. If you left the SFP modules in the system after removing the cables, move them to the new controller module.
5. Squeeze the latch on the cam handle until it releases, open the cam handle fully to release the controller module from the midplane, and then, using two hands, pull the controller module out of the chassis.



6. Turn the controller module over and place it on a flat, stable surface.
7. Open the cover by sliding in the blue tabs to release the cover, and then swing the cover up and open.

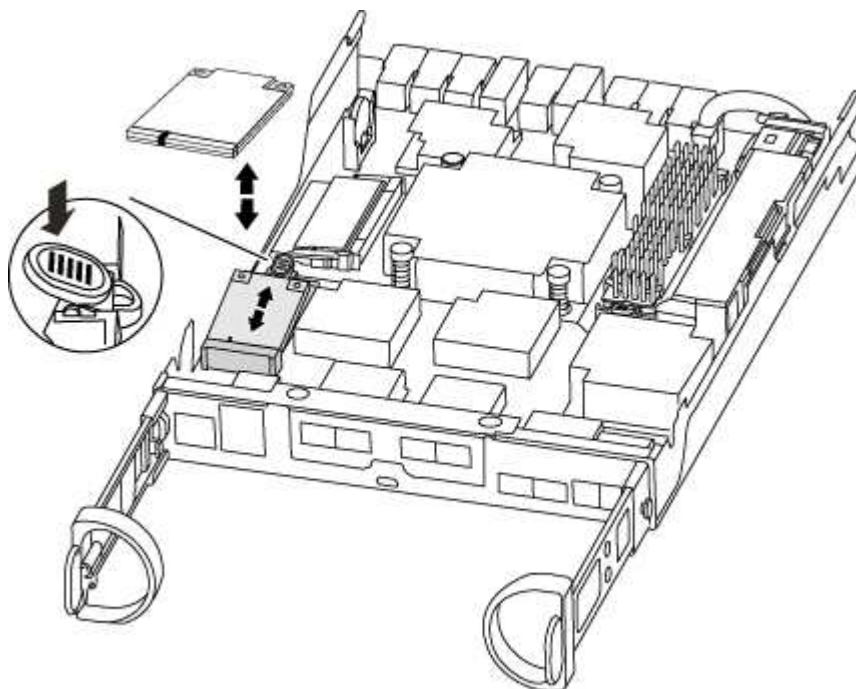


## Step 2: Move the boot media

You must locate the boot media and follow the directions to remove it from the old controller module and insert it in the new controller module.

### Steps

1. Locate the boot media using the following illustration or the FRU map on the controller module:



2. Press the blue button on the boot media housing to release the boot media from its housing, and then gently pull it straight out of the boot media socket.



Do not twist or pull the boot media straight up, because this could damage the socket or the boot media.

3. Move the boot media to the new controller module, align the edges of the boot media with the socket housing, and then gently push it into the socket.
4. Check the boot media to make sure that it is seated squarely and completely in the socket.

If necessary, remove the boot media and reseal it into the socket.

5. Push the boot media down to engage the locking button on the boot media housing.

### Step 3: Move the NVMEM battery

To move the NVMEM battery from the old controller module to the new controller module, you must perform a specific sequence of steps.

#### Steps

1. Check the NVMEM LED:
  - If your system is in an HA configuration, go to the next step.
  - If your system is in a stand-alone configuration, cleanly shut down the controller module, and then check the NVRAM LED identified by the NV icon.



The NVRAM LED blinks while destaging contents to the flash memory when you halt the system. After the destage is complete, the LED turns off.

- If power is lost without a clean shutdown, the NVMEM LED flashes until the destage is complete, and then the LED turns off.
- If the LED is on and power is on, unwritten data is stored on NVMEM.

This typically occurs during an uncontrolled shutdown after ONTAP has successfully booted.

2. Locate the NVMEM battery in the controller module.





3. Locate the battery plug and squeeze the clip on the face of the battery plug to release the plug from the socket, and then unplug the battery cable from the socket.
4. Grasp the battery and press the blue locking tab marked PUSH, and then lift the battery out of the holder and controller module.
5. Move the battery to the replacement controller module.
6. Loop the battery cable around the cable channel on the side of the battery holder.
7. Position the battery pack by aligning the battery holder key ribs to the “V” notches on the sheet metal side wall.
8. Slide the battery pack down along the sheet metal side wall until the support tabs on the side wall hook into the slots on the battery pack, and the battery pack latch engages and clicks into the opening on the side wall.

#### Step 4: Move the DIMMs

To move the DIMMs, you must follow the directions to locate and move them from the old controller module into the replacement controller module.

You must have the new controller module ready so that you can move the DIMMs directly from the impaired controller module to the corresponding slots in the replacement controller module.

##### Steps

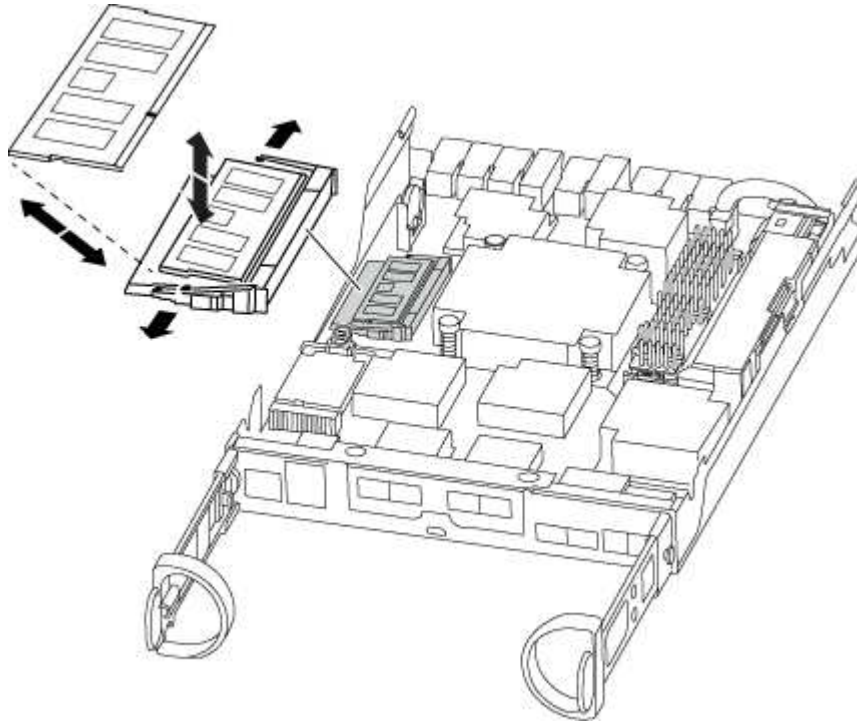
1. Locate the DIMMs on your controller module.
2. Note the orientation of the DIMM in the socket so that you can insert the DIMM in the replacement controller module in the proper orientation.
3. Eject the DIMM from its slot by slowly pushing apart the two DIMM ejector tabs on either side of the DIMM, and then slide the DIMM out of the slot.



Carefully hold the DIMM by the edges to avoid pressure on the components on the DIMM circuit board.

The number and placement of system DIMMs depends on the model of your system.

The following illustration shows the location of system DIMMs:



4. Repeat these steps to remove additional DIMMs as needed.
5. Verify that the NVMEM battery is not plugged into the new controller module.
6. Locate the slot where you are installing the DIMM.
7. Make sure that the DIMM ejector tabs on the connector are in the open position, and then insert the DIMM squarely into the slot.

The DIMM fits tightly in the slot, but should go in easily. If not, realign the DIMM with the slot and reinsert it.



Visually inspect the DIMM to verify that it is evenly aligned and fully inserted into the slot.

8. Repeat these steps for the remaining DIMMs.
9. Locate the NVMEM battery plug socket, and then squeeze the clip on the face of the battery cable plug to insert it into the socket.

Make sure that the plug locks down onto the controller module.

### Step 5: Move the caching module

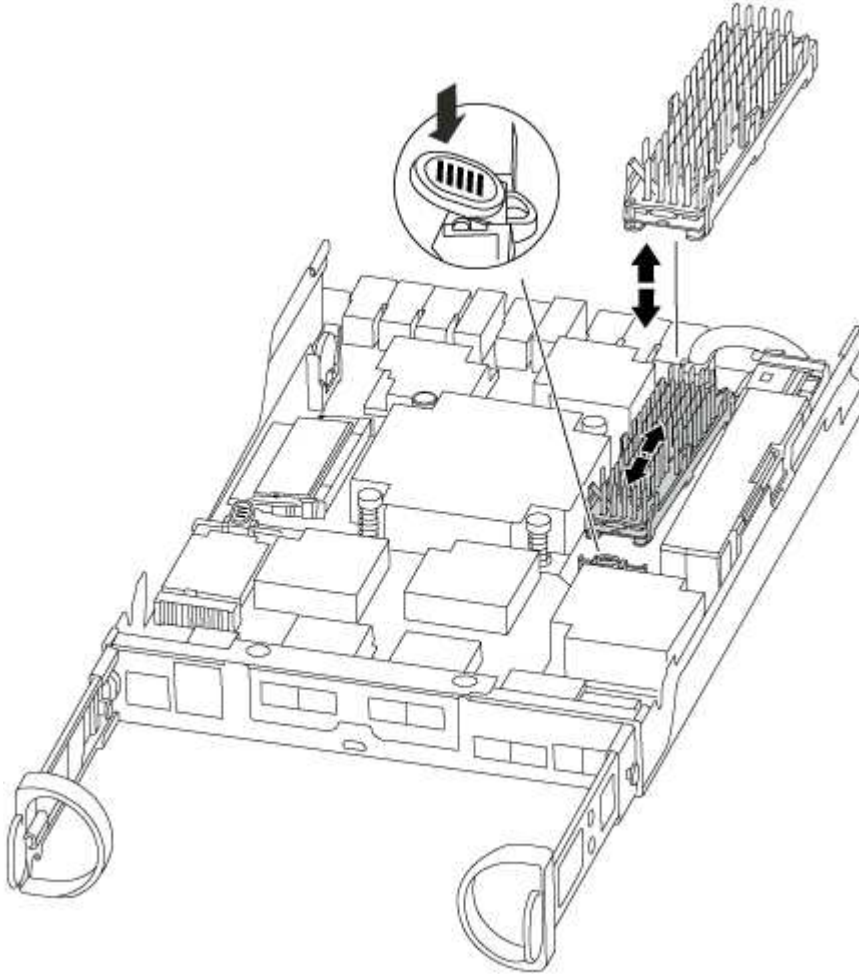
To move a caching module referred to as the M.2 PCIe card on the label on your controller, locate and move it from the old controller into the replacement controller and follow the specific sequence of steps.

You must have the new controller module ready so that you can move the caching module directly from the old controller module to the corresponding slot in the new one. All other components in the storage system must

be functioning properly; if not, you must contact technical support.

### Steps

1. Locate the caching module at the rear of the controller module and remove it.
  - a. Press the release tab.
  - b. Remove the heatsink.



2. Gently pull the caching module straight out of the housing.
3. Move the caching module to the new controller module, and then align the edges of the caching module with the socket housing and gently push it into the socket.
4. Verify that the caching module is seated squarely and completely in the socket.

If necessary, remove the caching module and reseat it into the socket.

5. Reseat and push the heatsink down to engage the locking button on the caching module housing.
6. Close the controller module cover, as needed.

### Step 6: Install the controller

After you install the components from the old controller module into the new controller module, you must install the new controller module into the system chassis and boot the operating system.

For HA pairs with two controller modules in the same chassis, the sequence in which you install the controller

module is especially important because it attempts to reboot as soon as you completely seat it in the chassis.



The system might update system firmware when it boots. Do not abort this process. The procedure requires you to interrupt the boot process, which you can typically do at any time after prompted to do so. However, if the system updates the system firmware when it boots, you must wait until after the update is complete before interrupting the boot process.

### Steps

1. If you are not already grounded, properly ground yourself.
2. If you have not already done so, replace the cover on the controller module.
3. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.



Do not completely insert the controller module in the chassis until instructed to do so.

4. Cable the management and console ports only, so that you can access the system to perform the tasks in the following sections.



You will connect the rest of the cables to the controller module later in this procedure.

5. Complete the reinstallation of the controller module:

| If your system is in... | Then perform these steps...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| An HA pair              | <p>The controller module begins to boot as soon as it is fully seated in the chassis. Be prepared to interrupt the boot process.</p> <ol style="list-style-type: none"> <li>With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position.</li> </ol> <div data-bbox="699 426 756 483">  </div> <div data-bbox="818 405 1364 506"> <p>Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.</p> </div> <p>The controller begins to boot as soon as it is seated in the chassis.</p> <ol style="list-style-type: none"> <li>If you have not already done so, reinstall the cable management device.</li> <li>Bind the cables to the cable management device with the hook and loop strap.</li> <li>When you see the message <code>Press Ctrl-C for Boot Menu</code>, press <code>Ctrl-C</code> to interrupt the boot process.</li> </ol> <div data-bbox="699 993 756 1050">  </div> <div data-bbox="818 936 1450 1106"> <p>If you miss the prompt and the controller module boots to ONTAP, enter <code>halt</code>, and then at the <code>LOADER</code> prompt enter <code>boot_ontap</code>, press <code>Ctrl-C</code> when prompted, and then boot to Maintenance mode.</p> </div> <ol style="list-style-type: none"> <li>Select the option to boot to Maintenance mode from the displayed menu.</li> </ol> |

| If your system is in...     | Then perform these steps...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A stand-alone configuration | <p>a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position.</p> <div>  <p>Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.</p> </div> <p>b. If you have not already done so, reinstall the cable management device.</p> <p>c. Bind the cables to the cable management device with the hook and loop strap.</p> <p>d. Reconnect the power cables to the power supplies and to the power sources, turn on the power to start the boot process, and then press <code>Ctrl-C</code> after you see the <code>Press Ctrl-C for Boot Menu</code> message.</p> <div>  <p>If you miss the prompt and the controller module boots to <code>ONTAP</code>, enter <code>halt</code>, and then at the <code>LOADER</code> prompt enter <code>boot_ontap</code>, press <code>Ctrl-C</code> when prompted, and then boot to Maintenance mode.</p> </div> <p>e. From the boot menu, select the option for Maintenance mode.</p> |

**Important:** During the boot process, you might see the following prompts:

- A prompt warning of a system ID mismatch and asking to override the system ID.
- A prompt warning that when entering Maintenance mode in an HA configuration you must ensure that the healthy controller remains down.  
You can safely respond `y` to these prompts.

#### Restore and verify the system configuration - FAS2600

After completing the hardware replacement and booting to Maintenance mode, you verify the low-level system configuration of the replacement controller and reconfigure system settings as necessary.

#### Step 1: Set and verify system time after replacing the controller

You should check the time and date on the replacement controller module against the healthy controller module in an HA pair, or against a reliable time server in a stand-alone configuration. If the time and date do not match, you must reset them on the replacement controller module to prevent possible outages on clients due to time differences.

#### About this task

It is important that you apply the commands in the steps on the correct systems:

- The *replacement* node is the new node that replaced the impaired node as part of this procedure.
- The *healthy* node is the HA partner of the *replacement* node.

### Steps

1. If the *replacement* node is not at the LOADER prompt, halt the system to the LOADER prompt.
2. On the *healthy* node, check the system time: `cluster date show`

The date and time are based on the configured timezone.

3. At the LOADER prompt, check the date and time on the *replacement* node: `show date`

The date and time are given in GMT.

4. If necessary, set the date in GMT on the replacement node: `set date mm/dd/yyyy`
5. If necessary, set the time in GMT on the replacement node: `set time hh:mm:ss`
6. At the LOADER prompt, confirm the date and time on the *replacement* node: `show date`

The date and time are given in GMT.

### Step 2: Verify and set the HA state of the controller module

You must verify the HA state of the controller module and, if necessary, update the state to match your system configuration.

1. In Maintenance mode from the new controller module, verify that all components display the same HA state: `ha-config show`

The HA state should be the same for all components.

2. If the displayed system state of the controller module does not match your system configuration, set the HA state for the controller module: `ha-config modify controller ha-state`

The value for HA-state can be one of the following:

- `ha`
- `non-ha`

3. If the displayed system state of the controller module does not match your system configuration, set the HA state for the controller module: `ha-config modify controller ha-state`
4. Confirm that the setting has changed: `ha-config show`

### Recable the system and reassign disks - FAS2600

Continue the replacement procedure by recabling the storage and confirming disk reassignment.

### Step 1: Recable the system

Recable the controller module's storage and network connections.

Steps

- 1. Recable the the controller module to storage and network connctctions.
- 2. Verify that the cabling is correct by using [Active IQ Config Advisor](#).
  - a. Download and install Config Advisor.
  - b. Enter the information for the target system, and then click Collect Data.
  - c. Click the Cabling tab, and then examine the output. Make sure that all disk shelves are displayed and all disks appear in the output, correcting any cabling issues you find.
  - d. Check other cabling by clicking the appropriate tab, and then examining the output from Config Advisor.

Step 2: Reassign disks

If the storage system is in an HA pair, the system ID of the new controller module is automatically assigned to the disks when the giveback occurs at the end of the procedure. In a stand-alone system, you must manually reassign the ID to the disks.  
You must use the correct procedure for your configuration.

Option 1: Verify the system ID change on an HA system

You must confirm the system ID change when you boot the *replacement* controller and then verify that the change was implemented.

This procedure applies only to systems running ONTAP in an HA pair.

- 1. If the *replacement* controller is in Maintenance mode (showing the `*>` prompt, exit Maintenance mode and go to the LOADER prompt: `halt`
- 2. From the LOADER prompt on the *replacement* controller, boot the controller, entering `y` if you are prompted to override the system ID due to a system ID mismatch: `boot_ontap`
- 3. Wait until the `Waiting for giveback...` message is displayed on the *replacement* controller console and then, from the healthy controller, verify that the new partner system ID has been automatically assigned:  
`storage failover show`

In the command output, you should see a message that the system ID has changed on the impaired controller, showing the correct old and new IDs. In the following example, node2 has undergone replacement and has a new system ID of 151759706.

```
node1> `storage failover show`
```

| Node  | Partner | Takeover Possible | State Description                                          |
|-------|---------|-------------------|------------------------------------------------------------|
| node1 | node2   | false             | System ID changed on partner (Old: 151759706), In takeover |
| node2 | node1   | -                 | Waiting for giveback (HA mailboxes)                        |



4. From the healthy controller, verify that any coredumps are saved:

- a. Change to the advanced privilege level: `set -privilege advanced`

You can respond `y` when prompted to continue into advanced mode. The advanced mode prompt appears (`*>`).

- b. Save any coredumps: `system node run -node local-node-name partner savecore`
- c. Wait for the `savecore` command to complete before issuing the giveback.

You can enter the following command to monitor the progress of the `savecore` command: `system node run -node local-node-name partner savecore -s`

- d. Return to the admin privilege level: `set -privilege admin`

5. If your storage system has Storage or Volume Encryption configured, you must restore Storage or Volume Encryption functionality by using one of the following procedures, depending on whether you are using onboard or external key management:

- [Restore onboard key management encryption keys](#)
- [Restore external key management encryption keys](#)

6. Give back the controller:

- a. From the healthy controller, give back the replaced controller's storage: `storage failover giveback -ofnode replacement_node_name`

The *replacement* controller takes back its storage and completes booting.

If you are prompted to override the system ID due to a system ID mismatch, you should enter `y`.



If the giveback is vetoed, you can consider overriding the vetoes.

[Find the High-Availability Configuration content for your version of ONTAP 9](#)

- b. After the giveback has been completed, confirm that the HA pair is healthy and that takeover is possible: `storage failover show`

The output from the `storage failover show` command should not include the System ID changed on partner message.

7. Verify that the disks were assigned correctly: `storage disk show -ownership`

The disks belonging to the *replacement* controller should show the new system ID. In the following example, the disks owned by node1 now show the new system ID, 1873775277:

```
node1> `storage disk show -ownership`
```

| Disk Reserver | Aggregate Pool | Home  | Owner | DR | Home | Home ID    | Owner ID   | DR | Home | ID |
|---------------|----------------|-------|-------|----|------|------------|------------|----|------|----|
| 1.0.0         | aggr0_1        | node1 | node1 | -  |      | 1873775277 | 1873775277 | -  |      |    |
| 1873775277    | Pool0          |       |       |    |      |            |            |    |      |    |
| 1.0.1         | aggr0_1        | node1 | node1 |    |      | 1873775277 | 1873775277 | -  |      |    |
| 1873775277    | Pool0          |       |       |    |      |            |            |    |      |    |
| .             |                |       |       |    |      |            |            |    |      |    |
| .             |                |       |       |    |      |            |            |    |      |    |
| .             |                |       |       |    |      |            |            |    |      |    |

8. Verify that the expected volumes are present for each controller: `vol show -node node-name`
9. If you disabled automatic takeover on reboot, enable it from the healthy controller: `storage failover modify -node replacement-node-name -onreboot true`

## Option 2: Manually reassign the system ID on a stand-alone system in ONTAP

In a stand-alone system, you must manually reassign disks to the new controller's system ID before you return the system to normal operating condition.



### About this task

This procedure applies only to systems that are in a stand-alone configuration.

### Steps

1. If you have not already done so, reboot the *replacement* node, interrupt the boot process by pressing Ctrl-C, and then select the option to boot to Maintenance mode from the displayed menu.
2. You must enter `Y` when prompted to override the system ID due to a system ID mismatch.
3. View the system IDs: `disk show -a`
4. You should make a note of the old system ID, which is displayed as part of the disk owner column.

The following example shows the old system ID of 118073209:

```
*> disk show -a
Local System ID: 118065481
```

| DISK                     | OWNER    |             | POOL  | SERIAL NUMBER | HOME     |
|--------------------------|----------|-------------|-------|---------------|----------|
| -----                    | -----    |             | ----- | -----         | -----    |
| disk_name<br>(118073209) | system-1 | (118073209) | Pool0 | J8XJE9LC      | system-1 |
| disk_name<br>(118073209) | system-1 | (118073209) | Pool0 | J8Y478RC      | system-1 |
| .                        |          |             |       |               |          |
| .                        |          |             |       |               |          |
| .                        |          |             |       |               |          |

5. Reassign disk ownership by using the system ID information obtained from the disk show command: `disk reassign -s old system ID disk reassign -s 118073209`

6. Verify that the disks were assigned correctly: `disk show -a`

The disks belonging to the replacement node should show the new system ID. The following example now show the disks owned by system-1 the new system ID, 118065481:

```
*> disk show -a
Local System ID: 118065481
```

| DISK                     | OWNER    |             | POOL  | SERIAL NUMBER | HOME     |
|--------------------------|----------|-------------|-------|---------------|----------|
| -----                    | -----    |             | ----- | -----         | -----    |
| disk_name<br>(118065481) | system-1 | (118065481) | Pool0 | J8Y0TDZC      | system-1 |
| disk_name<br>(118065481) | system-1 | (118065481) | Pool0 | J8Y0TDZC      | system-1 |
| .                        |          |             |       |               |          |
| .                        |          |             |       |               |          |
| .                        |          |             |       |               |          |

7. If your storage system has Storage or Volume Encryption configured, you must restore Storage or Volume Encryption functionality by using one of the following procedures, depending on whether you are using onboard or external key management:

- [Restore onboard key management encryption keys](#)
- [Restore external key management encryption keys](#)

8. Boot the node: `boot_ontap`

#### Complete system restoration - FAS2600

To restore your system to full operation, you must restore the NetApp Storage Encryption configuration (if necessary), and install licenses for the new controller, and return the

failed part to NetApp, as described in the RMA instructions shipped with the kit.

## Step 1: Install licenses for the replacement controller in ONTAP

You must install new licenses for the *replacement* node if the impaired node was using ONTAP features that require a standard (node-locked) license. For features with standard licenses, each node in the cluster should have its own key for the feature.

### About this task

Until you install license keys, features requiring standard licenses continue to be available to the *replacement* node. However, if the impaired node was the only node in the cluster with a license for the feature, no configuration changes to the feature are allowed. Also, using unlicensed features on the node might put you out of compliance with your license agreement, so you should install the replacement license key or keys on the *replacement* node as soon as possible.

### Before you begin

The licenses keys must be in the 28-character format.

You have a 90-day grace period in which to install the license keys. After the grace period, all old licenses are invalidated. After a valid license key is installed, you have 24 hours to install all of the keys before the grace period ends.

### Steps

1. If you need new license keys, obtain replacement license keys on the [NetApp Support Site](#) in the My Support section under Software licenses.



The new license keys that you require are automatically generated and sent to the email address on file. If you fail to receive the email with the license keys within 30 days, you should contact technical support.

2. Install each license key: `system license add -license-code license-key, license-key...`
3. Remove the old licenses, if desired:
  - a. Check for unused licenses: `license clean-up -unused -simulate`
  - b. If the list looks correct, remove the unused licenses: `license clean-up -unused`

## Step 2: Verify LIFs and register the serial number

Before returning the *replacement* node to service, you should verify that the LIFs are on their home ports, and register the serial number of the *replacement* node if AutoSupport is enabled, and reset automatic giveback.

### Steps

1. Verify that the logical interfaces are reporting to their home server and ports: `network interface show -is-home false`

If any LIFs are listed as false, revert them to their home ports: `network interface revert -vserver * -lif *`

2. Register the system serial number with NetApp Support.
  - If AutoSupport is enabled, send an AutoSupport message to register the serial number.
  - If AutoSupport is not enabled, call [NetApp Support](#) to register the serial number.

3. If an AutoSupport maintenance window was triggered, end it by using the `system node autosupport invoke -node * -type all -message MAINT=END` command.
4. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`

### Step 3: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

### Replace a DIMM - FAS2600

You must replace a DIMM in the controller module when your system registers an increasing number of correctable error correction codes (ECC); failure to do so causes a system panic.

All other components in the system must be functioning properly; if not, you must contact technical support.

You must replace the failed component with a replacement FRU component you received from your provider.

[AFF FAS2600 DIMM replacement video](#)

#### Step 1: Shut down the impaired controller

Shut down or take over the impaired controller using different procedures, depending on the storage system hardware configuration.

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

#### Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message
MAINT=_number_of_hours_down_h
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:*> system node autosupport invoke -node * -type all -message MAINT=2h`

2. If the impaired controller is part of an HA pair, disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`
3. Take the impaired controller to the LOADER prompt:

| If the impaired controller is displaying... | Then...                         |
|---------------------------------------------|---------------------------------|
| The LOADER prompt                           | Go to Remove controller module. |

| If the impaired controller is displaying...              | Then...                                                                                                                                                                                                                                                   |
|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Waiting for giveback...                                  | Press Ctrl-C, and then respond <i>y</i> .                                                                                                                                                                                                                 |
| System prompt or password prompt (enter system password) | <p>Take over or halt the impaired controller from the healthy controller:</p> <pre>storage failover takeover -ofnode impaired_node_name</pre> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i>.</p> |

4. If the system has only one controller module in the chassis, turn off the power supplies, and then unplug the impaired controller's power cords from the power source.

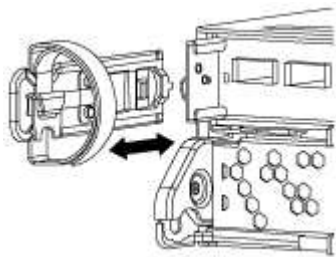
## Step 2: Remove controller module

To access components inside the controller, you must first remove the controller module from the system and then remove the cover on the controller module.

1. If you are not already grounded, properly ground yourself.
2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

3. Remove and set aside the cable management devices from the left and right sides of the controller module.



4. Squeeze the latch on the cam handle until it releases, open the cam handle fully to release the controller module from the midplane, and then, using two hands, pull the controller module out of the chassis.



5. Turn the controller module over and place it on a flat, stable surface.
6. Open the cover by sliding in the blue tabs to release the cover, and then swing the cover up and open.



### Step 3: Replace the DIMMs

To replace the DIMMs, locate them inside the controller and follow the specific sequence of steps.

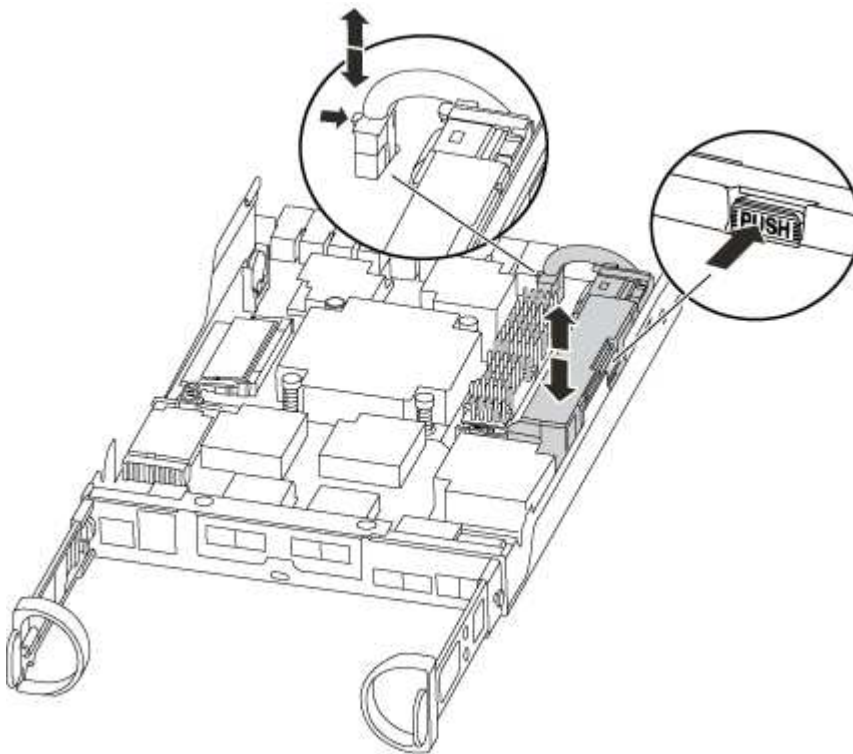
If you are replacing a DIMM, you need to remove it after you have unplugged the NVMEM battery from the controller module.

1. Check the NVMEM LED on the controller module.

You must perform a clean system shutdown before replacing system components to avoid losing unwritten data in the nonvolatile memory (NVMEM). The LED is located on the back of the controller module. Look for the following icon:



2. If the NVMEM LED is not flashing, there is no content in the NVMEM; you can skip the following steps and proceed to the next task in this procedure.
3. If the NVMEM LED is flashing, there is data in the NVMEM and you must disconnect the battery to clear the memory:
  - a. Locate the battery, press the clip on the face of the battery plug to release the lock clip from the plug socket, and then unplug the battery cable from the socket.



- b. Confirm that the NVMEM LED is no longer lit.
  - c. Reconnect the battery connector.
4. Recheck the NVMEM LED.
  5. Locate the DIMMs on your controller module.
  6. Note the orientation of the DIMM in the socket so that you can insert the replacement DIMM in the proper orientation.
  7. Eject the DIMM from its slot by slowly pushing apart the two DIMM ejector tabs on either side of the DIMM, and then slide the DIMM out of the slot.

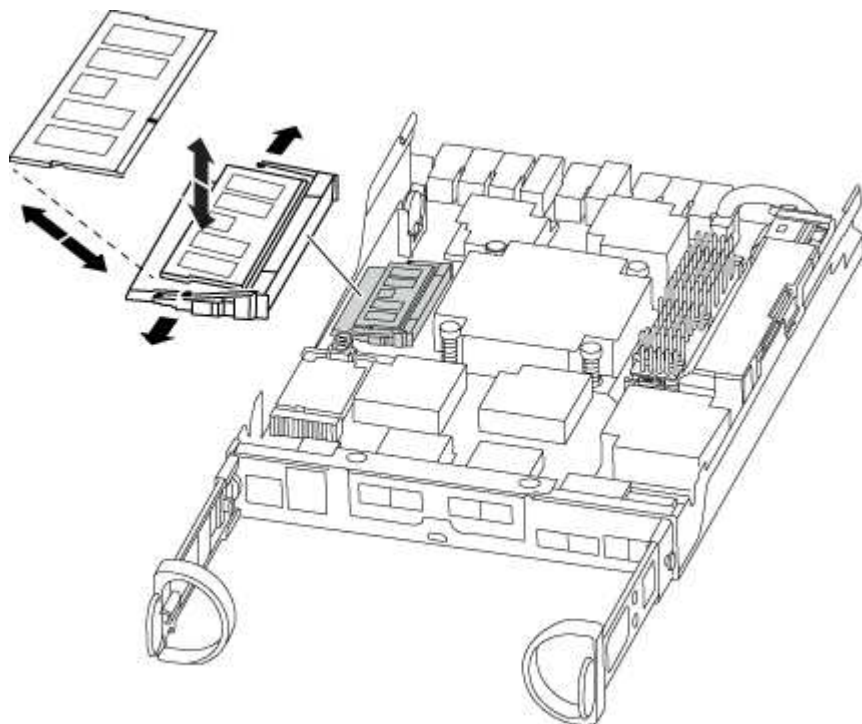




Carefully hold the DIMM by the edges to avoid pressure on the components on the DIMM circuit board.

The number and placement of system DIMMs depends on the model of your system.

The following illustration shows the location of system DIMMs:



8. Remove the replacement DIMM from the antistatic shipping bag, hold the DIMM by the corners, and align it to the slot.

The notch among the pins on the DIMM should line up with the tab in the socket.

9. Make sure that the DIMM ejector tabs on the connector are in the open position, and then insert the DIMM squarely into the slot.

The DIMM fits tightly in the slot, but should go in easily. If not, realign the DIMM with the slot and reinsert it.



Visually inspect the DIMM to verify that it is evenly aligned and fully inserted into the slot.

10. Push carefully, but firmly, on the top edge of the DIMM until the ejector tabs snap into place over the notches at the ends of the DIMM.
11. Locate the NVMEM battery plug socket, and then squeeze the clip on the face of the battery cable plug to insert it into the socket.

Make sure that the plug locks down onto the controller module.

12. Close the controller module cover.

#### **Step 4: Reinstall the controller module**

After you replace components in the controller module, reinstall it into the chassis.

1. If you have not already done so, replace the cover on the controller module.
2. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.





Do not completely insert the controller module in the chassis until instructed to do so.

3. Recable the system, as needed.

If you removed the media converters (QSFPs or SFPs), remember to reinstall them if you are using fiber optic cables.

4. Complete the reinstallation of the controller module:

| If your system is in...     | Then perform these steps...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| An HA pair                  | <p>The controller module begins to boot as soon as it is fully seated in the chassis.</p> <ol style="list-style-type: none"> <li>a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position.</li> </ol> <div>  <p>Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.</p> </div> <p>The controller begins to boot as soon as it is seated in the chassis.</p> <ol style="list-style-type: none"> <li>b. If you have not already done so, reinstall the cable management device.</li> <li>c. Bind the cables to the cable management device with the hook and loop strap.</li> </ol> |
| A stand-alone configuration | <ol style="list-style-type: none"> <li>a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position.</li> </ol> <div>  <p>Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.</p> </div> <ol style="list-style-type: none"> <li>b. If you have not already done so, reinstall the cable management device.</li> <li>c. Bind the cables to the cable management device with the hook and loop strap.</li> <li>d. Reconnect the power cables to the power supplies and to the power sources, then turn on the power to start the boot process.</li> </ol>                             |

## Step 5: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

### Replace SSD Drive or HDD Drive - FAS2600

You can replace a failed drive nondisruptively while I/O is in progress. The procedure for replacing an SSD is meant for non-spinning drives and the procedure for replacing an HDD is meant for spinning drives.

When a drive fails, the platform logs a warning message to the system console indicating which drive has failed. In addition, both the fault LED on the operator display panel and the fault LED on the failed drive are illuminated.

#### Before you begin

- Follow best practice and install the current version of the Disk Qualification Package (DQP) before replacing a drive.
- Identify the failed drive by running the `storage disk show -broken` command from the system console.

The failed drive appears in the list of failed drives. If it does not, you should wait, and then run the command again.



Depending on the type and capacity, it can take up to several hours for the drive to appear in the list of failed drives.

- Determine whether SED authentication is enabled.

How you replace the drive depends on how the drive is being used. If SED authentication is enabled, you must use the SED replacement instructions in the [ONTAP 9 NetApp Encryption Power Guide](#). These Instructions describe additional steps you must perform before and after replacing an SED.

- Make sure the replacement drive is supported by your platform. See the [NetApp Hardware Universe](#).
- Make sure all other components in the system are functioning properly; if not, you must contact technical support.

#### About this task

- Drive firmware is automatically updated (nondisruptively) on new drives that have non current firmware versions.
- When replacing a drive, you must wait one minute between the removal of the failed drive and the insertion of the replacement drive to allow the storage system to recognize the existence of the new drive.

## Option 1: Replace SSD

### Steps

1. If you want to manually assign drive ownership for the replacement drive, you need to disable automatic drive assignment replacement drive, if it is enabled



You manually assign drive ownership and then reenable automatic drive assignment later in this procedure.

- a. Verify whether automatic drive assignment is enabled: `storage disk option show`

You can enter the command on either controller module.

If automatic drive assignment is enabled, the output shows `on` in the “Auto Assign” column (for each controller module).

- b. If automatic drive assignment is enabled, disable it: `storage disk option modify -node node_name -autoassign off`

You must disable automatic drive assignment on both controller modules.

2. Properly ground yourself.
3. Physically identify the failed drive.

When a drive fails, the system logs a warning message to the system console indicating which drive failed. Additionally, the attention (amber) LED on the drive shelf operator display panel and the failed drive illuminate.



The activity (green) LED on a failed drive can be illuminated (solid), which indicates that the drive has power, but should not be blinking, which indicates I/O activity. A failed drive has no I/O activity.

4. Remove the failed drive:
  - a. Press the release button on the drive face to open the cam handle.
  - b. Slide the drive out of the shelf using the cam handle and supporting the drive with your other hand.

5. Wait a minimum of 70 seconds before inserting the replacement drive.

This allows the system to recognize that a drive was removed.

6. Insert the replacement drive:
  - a. With the cam handle in the open position, use both hands to insert the replacement drive.
  - b. Push until the drive stops.
  - c. Close the cam handle so that the drive is fully seated into the midplane and the handle clicks into place.

Be sure to close the cam handle slowly so that it aligns correctly with the face of the drive.

7. Verify that the drive's activity (green) LED is illuminated.

When the drive's activity LED is solid, it means that the drive has power. When the drive's activity LED is blinking, it means that the drive has power and I/O is in progress. If the drive firmware is automatically updating, the LED blinks.

8. If you are replacing another drive, repeat Steps 3 through 7.
9. If you disabled automatic drive assignment in Step 1, then, manually assign drive ownership and then reenables automatic drive assignment if needed.

- a. Display all unowned drives: `storage disk show -container-type unassigned`

You can enter the command on either controller module.

- b. Assign each drive: `storage disk assign -disk disk_name -owner node_name`

You can enter the command on either controller module.

You can use the wildcard character to assign more than one drive at once.

- c. Reenable automatic drive assignment if needed: `storage disk option modify -node node_name -autoassign on`

You must reenables automatic drive assignment on both controller modules.

10. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit.

Contact technical support at [NetApp Support](#), 888-463-8277 (North America), 00-800-44-638277 (Europe), or +800-800-80-800 (Asia/Pacific) if you need the RMA number or additional help with the replacement procedure.

## Option 2: Replace HDD

1. If you want to manually assign drive ownership for the replacement drive, you need to disable automatic drive assignment replacement drive, if it is enabled



You manually assign drive ownership and then reenables automatic drive assignment later in this procedure.

- a. Verify whether automatic drive assignment is enabled: `storage disk option show`

You can enter the command on either controller module.

If automatic drive assignment is enabled, the output shows `on` in the “Auto Assign” column (for each controller module).

- b. If automatic drive assignment is enabled, disable it: `storage disk option modify -node node_name -autoassign off`

You must disable automatic drive assignment on both controller modules.

2. Properly ground yourself.
3. Gently remove the bezel from the front of the platform.
4. Identify the failed disk drive from the system console warning message and the illuminated fault LED on the disk drive

5. Press the release button on the disk drive face.

Depending on the storage system, the disk drives have the release button located at the top or on the left of the disk drive face.

For example, the following illustration shows a disk drive with the release button located on the top of the disk drive face:

The cam handle on the disk drive springs open partially and the disk drive releases from the midplane.

6. Pull the cam handle to its fully open position to unseat the disk drive from the midplane.

7. Slide out the disk drive slightly and allow the disk to safely spin down, which can take less than one minute, and then, using both hands, remove the disk drive from the disk shelf.

8. With the cam handle in the open position, insert the replacement disk drive into the drive bay, firmly pushing until the disk drive stops.



Wait a minimum of 10 seconds before inserting a new disk drive. This allows the system to recognize that a disk drive was removed.



If your platform drive bays are not fully loaded with drives, it is important to place the replacement drive into the same drive bay from which you removed the failed drive.



Use two hands when inserting the disk drive, but do not place hands on the disk drive boards that are exposed on the underside of the disk carrier.

9. Close the cam handle so that the disk drive is fully seated into the midplane and the handle clicks into place.

Be sure to close the cam handle slowly so that it aligns correctly with the face of the disk drive..

10. If you are replacing another disk drive, repeat Steps 4 through 9.

11. Reinstall the bezel.

12. If you disabled automatic drive assignment in Step 1, then, manually assign drive ownership and then reenale automatic drive assignment if needed.

- a. Display all unowned drives: `storage disk show -container-type unassigned`

You can enter the command on either controller module.

- b. Assign each drive: `storage disk assign -disk disk_name -owner owner_name`

You can enter the command on either controller module.

You can use the wildcard character to assign more than one drive at once.

- c. Reenable automatic drive assignment if needed: `storage disk option modify -node node_name -autoassign on`

You must reenable automatic drive assignment on both controller modules.

13. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit.

Contact technical support at [NetApp Support](#), 888-463-8277 (North America), 00-800-44-638277 (Europe), or +800-800-80-800 (Asia/Pacific) if you need the RMA number or additional help with the replacement procedure.

## Replace the NVMEM battery - FAS2600

To replace an NVMEM battery in the system, you must remove the controller module from the system, open it, replace the battery, and close and replace the controller module.

All other components in the system must be functioning properly; if not, you must contact technical support.

[AFF FAS2600 NVMEM battery replacement video](#)

### Step 1: Shut down the impaired controller

You can shut down or take over the impaired controller using different procedures, depending on the storage system hardware configuration.

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

### Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message
MAINT=_number_of_hours_down_h
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:*>`  
`system node autosupport invoke -node * -type all -message MAINT=2h`

2. If the impaired controller is part of an HA pair, disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`
3. Take the impaired controller to the LOADER prompt:

| If the impaired controller is displaying... | Then...                                         |
|---------------------------------------------|-------------------------------------------------|
| The LOADER prompt                           | Go to Remove controller module.                 |
| Waiting for giveback...                     | Press Ctrl-C, and then respond <code>y</code> . |

| If the impaired controller is displaying...              | Then...                                                                                                                                                                                                                                                   |
|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| System prompt or password prompt (enter system password) | <p>Take over or halt the impaired controller from the healthy controller:</p> <pre>storage failover takeover -ofnode impaired_node_name</pre> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i>.</p> |

4. If the system has only one controller module in the chassis, turn off the power supplies, and then unplug the impaired controller's power cords from the power source.

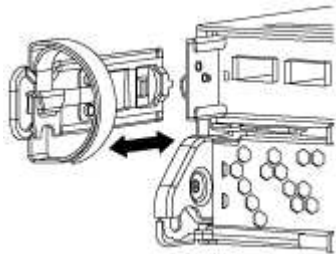
## Step 2: Remove controller module

To access components inside the controller, you must first remove the controller module from the system and then remove the cover on the controller module.

1. If you are not already grounded, properly ground yourself.
2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

3. Remove and set aside the cable management devices from the left and right sides of the controller module.



4. Squeeze the latch on the cam handle until it releases, open the cam handle fully to release the controller module from the midplane, and then, using two hands, pull the controller module out of the chassis.





5. Turn the controller module over and place it on a flat, stable surface.
6. Open the cover by sliding in the blue tabs to release the cover, and then swing the cover up and open.



### Step 3: Replace the NVMEM battery

To replace the NVMEM battery in your system, you must remove the failed NVMEM battery from the system and replace it with a new NVMEM battery.

1. Check the NVMEM LED:

- If your system is in an HA configuration, go to the next step.
- If your system is in a stand-alone configuration, cleanly shut down the controller module, and then check the NVRAM LED identified by the NV icon.

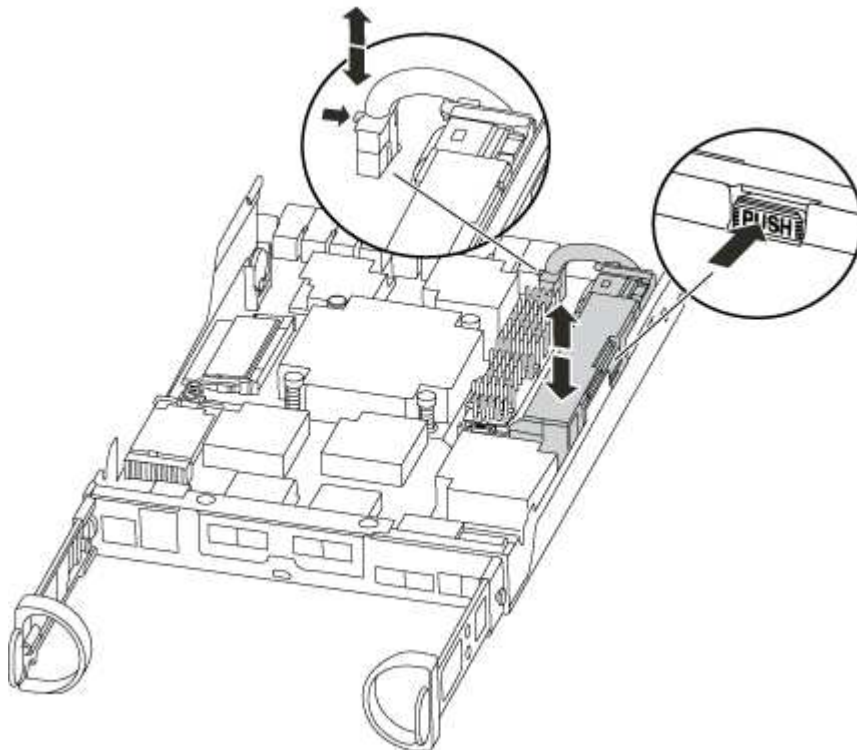


The NVRAM LED blinks while destaging contents to the flash memory when you halt the system. After the destage is complete, the LED turns off.

- If power is lost without a clean shutdown, the NVMEM LED flashes until the destage is complete, and then the LED turns off.
- If the LED is on and power is on, unwritten data is stored on NVMEM.

This typically occurs during an uncontrolled shutdown after ONTAP has successfully booted.

2. Locate the NVMEM battery in the controller module.



3. Locate the battery plug and squeeze the clip on the face of the battery plug to release the plug from the socket, and then unplug the battery cable from the socket.
4. Remove the battery from the controller module and set it aside.
5. Remove the replacement battery from its package.
6. Loop the battery cable around the cable channel on the side of the battery holder.
7. Position the battery pack by aligning the battery holder key ribs to the "V" notches on the sheet metal side wall.

8. Slide the battery pack down along the sheet metal side wall until the support tabs on the side wall hook into the slots on the battery pack, and the battery pack latch engages and clicks into the opening on the side wall.
9. Plug the battery plug back into the controller module.

#### Step 4: Reinstall the controller module

After you replace components in the controller module, reinstall it into the chassis.

1. If you have not already done so, replace the cover on the controller module.
2. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.





Do not completely insert the controller module in the chassis until instructed to do so.

3. Recable the system, as needed.

If you removed the media converters (QSFPs or SFPs), remember to reinstall them if you are using fiber optic cables.

4. Complete the reinstallation of the controller module:

| If your system is in... | Then perform these steps...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| An HA pair              | <p>The controller module begins to boot as soon as it is fully seated in the chassis.</p> <ol style="list-style-type: none"> <li>a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position.</li> </ol> <div>  <p>Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.</p> </div> <p>The controller begins to boot as soon as it is seated in the chassis.</p> <ol style="list-style-type: none"> <li>b. If you have not already done so, reinstall the cable management device.</li> <li>c. Bind the cables to the cable management device with the hook and loop strap.</li> </ol> |

| If your system is in...     | Then perform these steps...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A stand-alone configuration | <p>a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position.</p> <div>  <p>Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.</p> </div> <p>b. If you have not already done so, reinstall the cable management device.</p> <p>c. Bind the cables to the cable management device with the hook and loop strap.</p> <p>d. Reconnect the power cables to the power supplies and to the power sources, and turn on the power to start the boot process.</p> |

#### Step 5: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

#### Swap out a power supply - FAS2600

Swapping out a power supply involves turning off, disconnecting, and removing the old power supply and installing, connecting, and turning on the replacement power supply.

All other components in the system must be functioning properly; if not, you must contact technical support.

- The power supplies are redundant and hot-swappable.
- This procedure is written for replacing one power supply at a time.



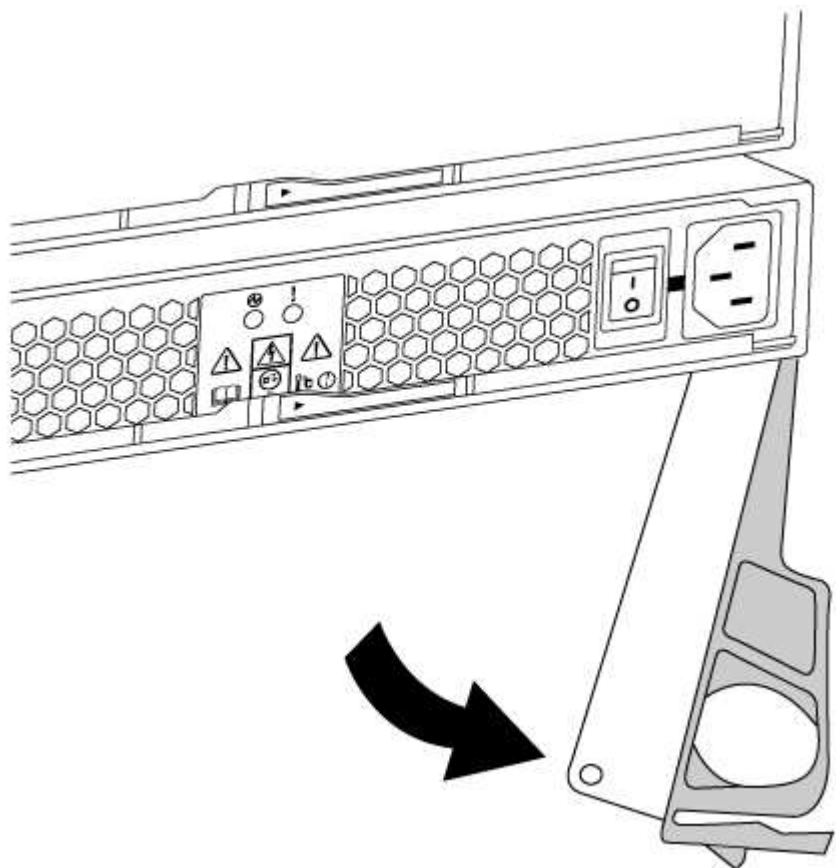
Cooling is integrated with the power supply, so you must replace the power supply within two minutes of removal to prevent overheating due to reduced airflow. Because the chassis provides a shared cooling configuration for the two HA nodes, a delay longer than two minutes will shut down all controller modules in the chassis. If both controller modules do shut down, make sure that both power supplies are inserted, turn both off for 30 seconds, and then turn both on.

- The number of power supplies in the system depends on the model.
- Power supplies are auto-ranging.

#### [AFF FAS2600 power supply replacement video](#)

1. Identify the power supply you want to replace, based on console error messages or through the LEDs on the power supplies.
2. If you are not already grounded, properly ground yourself.
3. Turn off the power supply and disconnect the power cables:

- a. Turn off the power switch on the power supply.
  - b. Open the power cable retainer, and then unplug the power cable from the power supply.
  - c. Unplug the power cable from the power source.
4. Squeeze the latch on the power supply cam handle, and then open the cam handle to fully release the power supply from the mid plane.



5. Use the cam handle to slide the power supply out of the system.



When removing a power supply, always use two hands to support its weight.

6. Make sure that the on/off switch of the new power supply is in the Off position.
7. Using both hands, support and align the edges of the power supply with the opening in the system chassis, and then gently push the power supply into the chassis using the cam handle.

The power supplies are keyed and can only be installed one way.



Do not use excessive force when sliding the power supply into the system. You can damage the connector.

8. Close the cam handle so that the latch clicks into the locked position and the power supply is fully seated.
9. Reconnect the power supply cabling:
  - a. Reconnect the power cable to the power supply and the power source.

b. Secure the power cable to the power supply using the power cable retainer.

Once power is restored to the power supply, the status LED should be green.

10. Turn on the power to the new power supply, and then verify the operation of the power supply activity LEDs.

The power supply LEDs are lit when the power supply comes online.

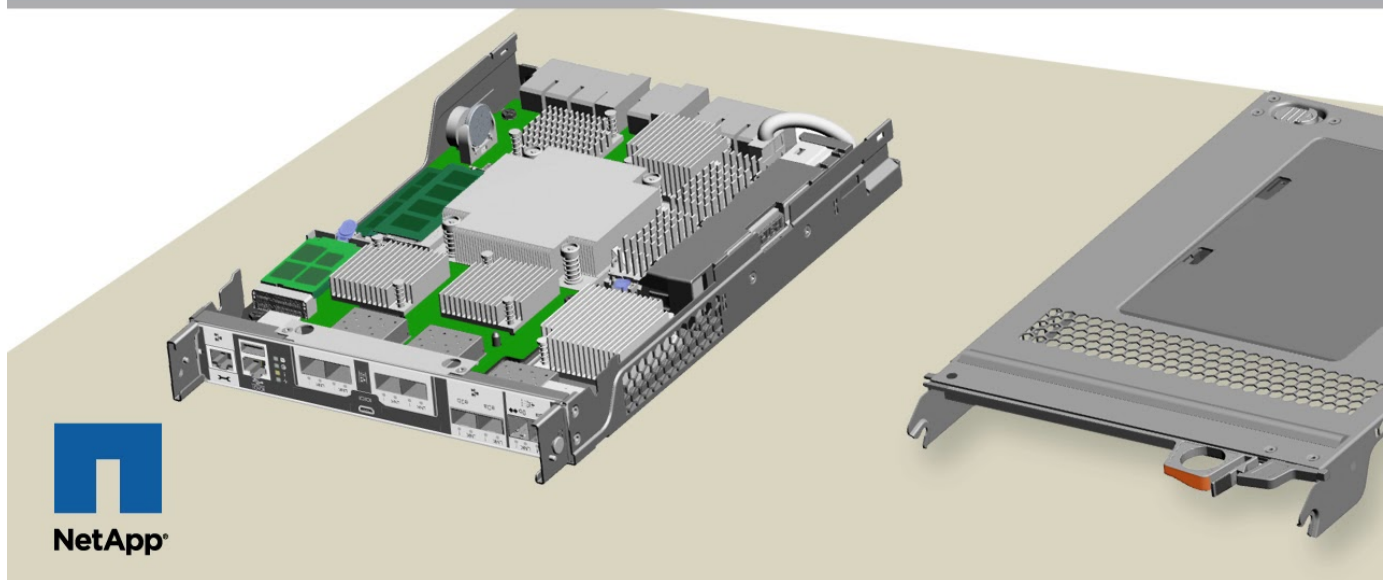
11. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

## Replace the real-time clock battery

You replace the real-time clock (RTC) battery in the controller module so that your system's services and applications that depend on accurate time synchronization continue to function.

- You can use this procedure with all versions of ONTAP supported by your system
- All other components in the system must be functioning properly; if not, you must contact technical support.

## Replacing the RTC battery



### Step 1: Shut down the impaired controller

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

### Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message
MAINT=_number_of_hours_down_h
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:>`

```
system node autosupport invoke -node * -type all -message MAINT=2h
```

2. If the impaired controller is part of an HA pair, disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`
3. Take the impaired controller to the LOADER prompt:

| If the impaired controller is displaying...              | Then...                                                                                                                                                                                                                                                     |
|----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                                        | Go to Remove controller module.                                                                                                                                                                                                                             |
| Waiting for giveback...                                  | Press Ctrl-C, and then respond <code>y</code> .                                                                                                                                                                                                             |
| System prompt or password prompt (enter system password) | Take over or halt the impaired controller from the healthy controller:<br><pre>storage failover takeover -ofnode impaired_node_name</pre> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <code>y</code>.</p> |

4. If the system has only one controller module in the chassis, turn off the power supplies, and then unplug the impaired controller's power cords from the power source.

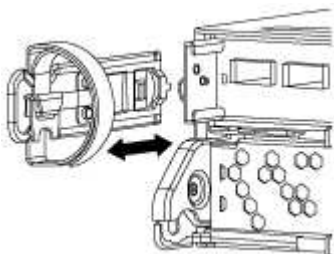
## Step 2: Remove controller module

To access components inside the controller, you must first remove the controller module from the system and then remove the cover on the controller module.

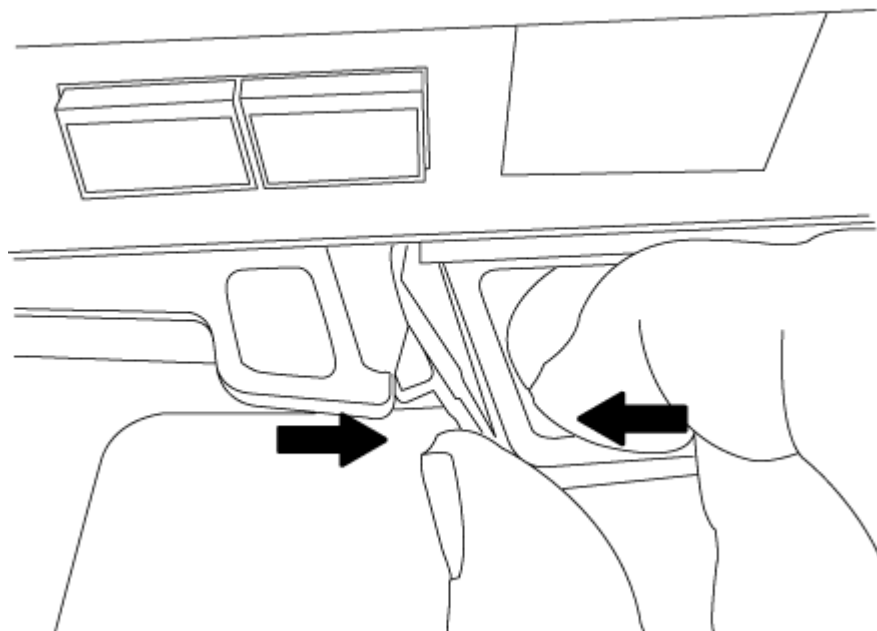
1. If you are not already grounded, properly ground yourself.
2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

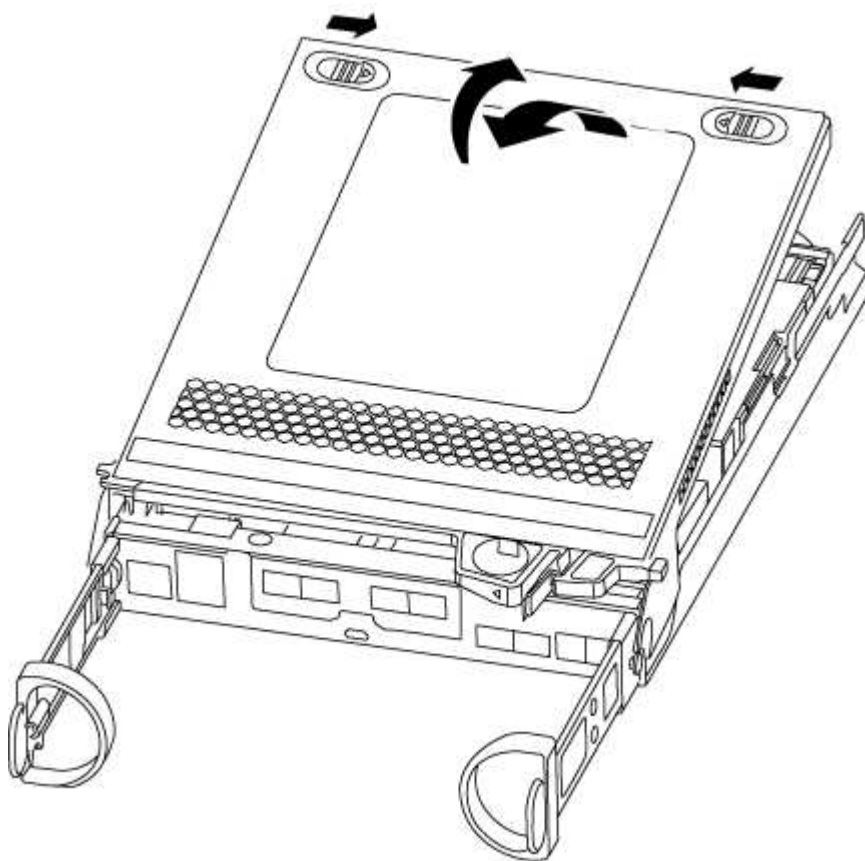
3. Remove and set aside the cable management devices from the left and right sides of the controller module.



4. Squeeze the latch on the cam handle until it releases, open the cam handle fully to release the controller module from the midplane, and then, using two hands, pull the controller module out of the chassis.



5. Turn the controller module over and place it on a flat, stable surface.
6. Open the cover by sliding in the blue tabs to release the cover, and then swing the cover up and open.

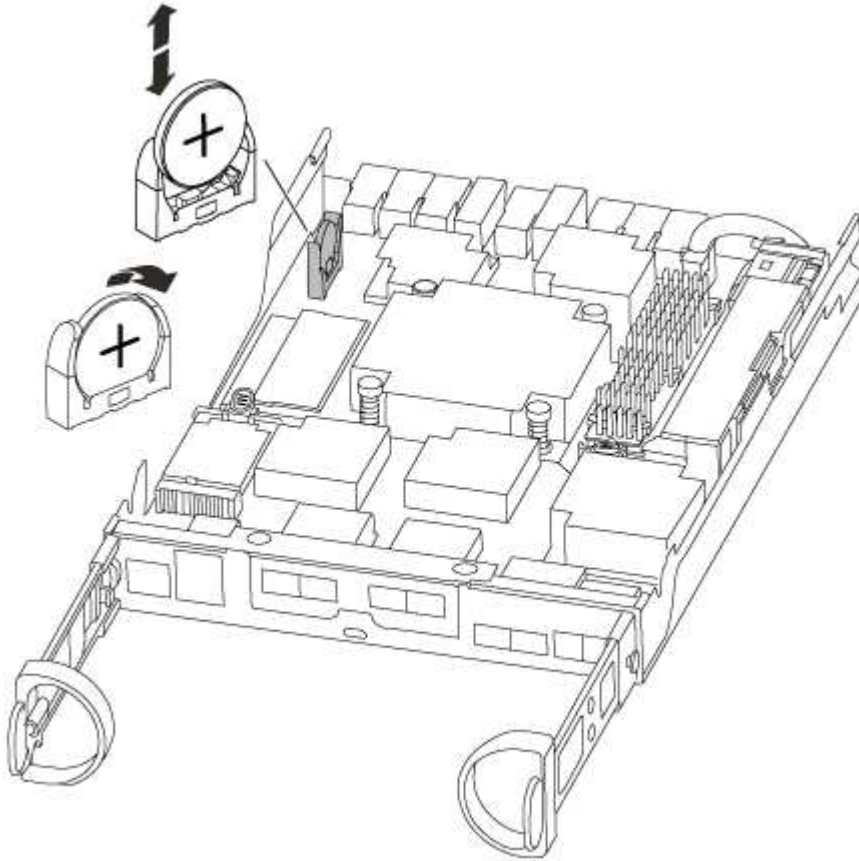




### Step 3: Replace the RTC battery

To replace the RTC battery, locate it inside the controller and follow the specific sequence of steps.

1. Locate the RTC battery.



2. Gently push the battery away from the holder, rotate it away from the holder, and then lift it out of the holder.



Note the polarity of the battery as you remove it from the holder. The battery is marked with a plus sign and must be positioned in the holder correctly. A plus sign near the holder tells you how the battery should be positioned.

3. Remove the replacement battery from the antistatic shipping bag.
4. Locate the empty battery holder in the controller module.
5. Note the polarity of the RTC battery, and then insert it into the holder by tilting the battery at an angle and pushing down.
6. Visually inspect the battery to make sure that it is completely installed into the holder and that the polarity is correct.

### Step 4: Reinstall the controller module and set time/date after RTC battery replacement

After you replace a component within the controller module, you must reinstall the controller module in the system chassis, reset the time and date on the controller, and then boot it.

1. If you have not already done so, close the air duct or controller module cover.

2. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.

Do not completely insert the controller module in the chassis until instructed to do so.

3. Recable the system, as needed.

If you removed the media converters (QSFPs or SFPs), remember to reinstall them if you are using fiber optic cables.

4. If the power supplies were unplugged, plug them back in and reinstall the power cable retainers.
5. Complete the reinstallation of the controller module:

- a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position.



Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.

- b. If you have not already done so, reinstall the cable management device.
  - c. Bind the cables to the cable management device with the hook and loop strap.
  - d. Reconnect the power cables to the power supplies and to the power sources, and then turn on the power to start the boot process.
  - e. Halt the controller at the LOADER prompt.
6. Reset the time and date on the controller:
    - a. Check the date and time on the healthy controller with the `show date` command.
    - b. At the LOADER prompt on the target controller, check the time and date.
    - c. If necessary, modify the date with the `set date mm/dd/yyyy` command.
    - d. If necessary, set the time, in GMT, using the `set time hh:mm:ss` command.
    - e. Confirm the date and time on the target controller.
  7. At the LOADER prompt, enter `bye` to reinitialize the PCIe cards and other components and let the controller reboot.
  8. Return the controller to normal operation by giving back its storage: `storage failover giveback -ofnode impaired_node_name`
  9. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`

#### Step 5: Complete the replacement process

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

## FAS500f systems

## Install and setup

### Start here: Choose your installation and setup experience

For most configurations, you can choose from different content formats.

- [Quick steps](#)

A printable PDF of step-by-step instructions with live links to additional content.

- [Video steps](#)

Video step-by-step instructions.

- [Detailed steps](#)

Online step-by-step instructions with live links to additional content.

If your system is in a MetroCluster IP configuration, see the [Install MetroCluster IP Configuration](#) instructions.

### Quick steps - FAS500f

This section gives graphic instructions for a typical installation of your system from racking and cabling, through initial system bring-up. Use this guide if you are familiar with installing NetApp systems.

Access the *Installation and Setup Instructions* PDF poster:

- English: [FAS500f Installation and Setup Instructions](#)
- Japanese: [FAS500f Systems Installation and Setup Instructions](#)
- Chinese: [FAS500f Systems Installation and Setup Instructions](#)

### Video steps - FAS500f

The following video shows how to install and cable your new system.

[Animation - Install and Setup of a FAS500f](#)

### Detailed steps - FAS500f

This section gives detailed step-by-step instructions for installing a FAS500f system.

#### Step 1: Prepare for installation

To install your FAS500f system, you need to create an account and register the system. You also need to inventory the appropriate number and type of cables for your system and collect specific network information.

You need to have access to the [NetApp Hardware Universe](#) (HWU) for information about site requirements as well as additional information on your configured system. You might also want to have access to the [Release Notes for your version of ONTAP](#) for more information about this system.

### What you need

You need to provide the following at your site:

- Rack space for the storage system
- Phillips #2 screwdriver
- Additional networking cables to connect your system to your network switch and laptop or console with a Web browser



### Steps




1. Unpack the contents of all boxes.
2. Record the system serial number from the controllers.



3. Set up your account:
  - a. Log in to your existing account or create an account.
  - b. Register ([NetApp Product Registration](#)) your system.
4. Download and install [NetApp Downloads: Config Advisor](#) on your laptop.
5. Inventory and make a note of the number and types of cables you received.

The following table identifies the types of cables you might receive. If you receive a cable not listed in the table, see the [NetApp Hardware Universe](#) to locate the cable and identify its use.

| Type of cable...        | Part number and length                                        | Connector type                                                                       | For...                                                                   |
|-------------------------|---------------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| 25 GbE cable            | X66240A-05 (112-00595),<br>0.5m;                              |  | Cluster interconnect network                                             |
|                         | X66240-2 (112-00573),<br>2m                                   |                                                                                      |                                                                          |
|                         | X66240A-2 (112-00598),<br>2m;<br>X66240A-5 (112-00600),<br>5m |                                                                                      | Data                                                                     |
| 100 GbE cable           | X66211-2 (112-00574),<br>2m;<br>X66211-5 (112-00576),<br>5m   |                                                                                      | Storage                                                                  |
| RJ-45 (order dependent) | Not applicable                                                |   | Management network (BMC and wrench port) and Ethernet data (e0a and e0b) |

|                         |                                                                                                                                         |                                                                                    |                                          |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|------------------------------------------|
| Fibre Channel           | X66250-2 (112-00342)<br>2m;<br><br>X66250-5 (112-00344)<br>5m;<br><br>X66250-15 (112-00346)<br>15m;<br><br>X66250-30 (112-00347)<br>30m |  |                                          |
| Micro-USB console cable | Not applicable                                                                                                                          |  | Console connection during software setup |
| Power cables            | Not applicable                                                                                                                          |   | Powering up the system                   |

1. Review the [ONTAP Configuration Guide](#) and collect the required information listed in that guide.

## Step 2: Install the hardware

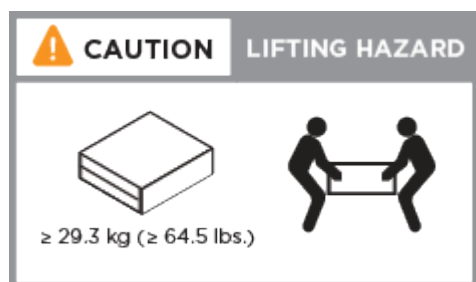
You need to install your system in a 4-post rack or NetApp system cabinet, as applicable.

### Steps

1. Install the rail kits, as needed.
2. Install and secure your system using the instructions included with the rail kit.



You need to be aware of the safety concerns associated with the weight of the system.



3. Identify and manage cables because this system does not have a cable management device.
4. Place the bezel on the front of the system.

## Step 3: Cable controllers

There is required cabling for your platform's cluster using the two-node switchless cluster method or the cluster interconnect network method. There is optional cabling to the Fibre Channel or iSCSI host networks or direct-attached storage. This cabling is not exclusive; you can have cable to a host network and storage.

### Required cabling: Cable controllers to a cluster

Cable the controllers to a cluster by using the two-node switchless cluster method or by using the cluster interconnect network.

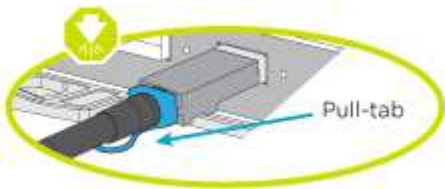
Option 1: Cable a two-node switchless cluster

The management, Fibre Channel, and data or host network ports on the controller modules are connected to switches. The cluster interconnect ports are cabled on both controller modules.

Before you begin

Contact your network administrator for information about connecting the system to the switches.


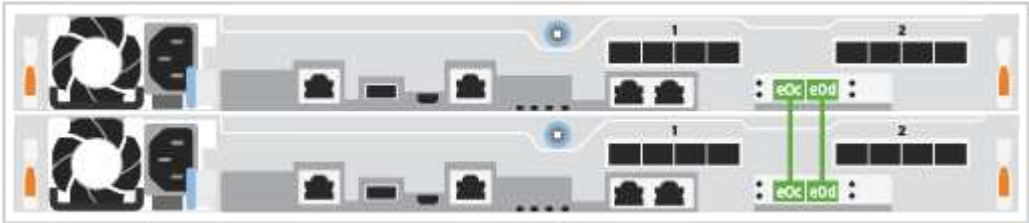
Be sure to check the illustration arrow for the proper cable connector pull-tab orientation.

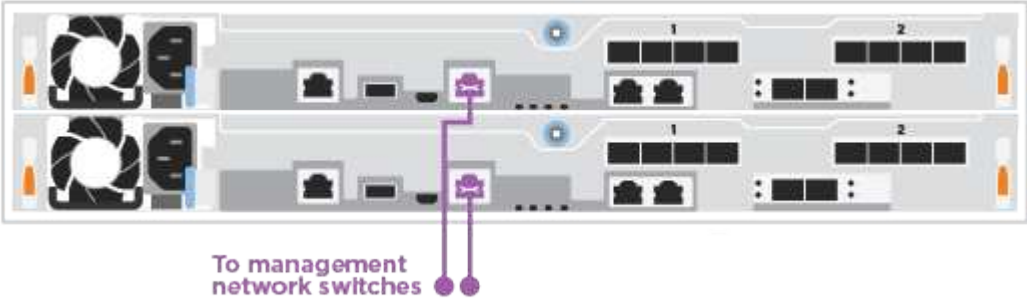


As you insert the connector, you should feel it click into place; if you do not feel it click, remove it, turn it around and try again.

Use the animation or the tabulated steps to complete the cabling between the controllers and the switches:

Animation - Cable a two-node switchless cluster

| Step | Perform on each controller                                                                                                                                                                                                                                                                                                                                                                          |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | <div>Cable the cluster interconnect ports to each other with the 25GbE cluster interconnect cable</div> <div></div> <div><ul style="list-style-type: none"><li>• e0c to e0c</li><li>• e0d to e0d</li></ul></div> <div></div> |

| Step                                     | Perform on each controller                                                                                                                                                                                                                       |
|------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div data-bbox="131 149 203 199">2</div> | <p data-bbox="272 159 1299 191">Cable the wrench ports to the management network switches with the RJ45 cables.</p> <div data-bbox="300 260 1321 558">  </div> |
| <div data-bbox="131 611 203 695">!</div> | <p data-bbox="272 621 833 653">DO NOT plug in the power cords at this point.</p>                                                                                                                                                                 |

To complete setting up your system, see [Step 4: Complete system setup and configuration](#).

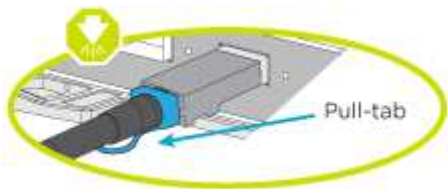
### Option 2: Cable a switched cluster

All ports on the controllers are connected to switches; cluster interconnect, management, Fibre Channel, and data or host network switches.

#### Before you begin

Contact your network administrator for information about connecting the system to the switches.

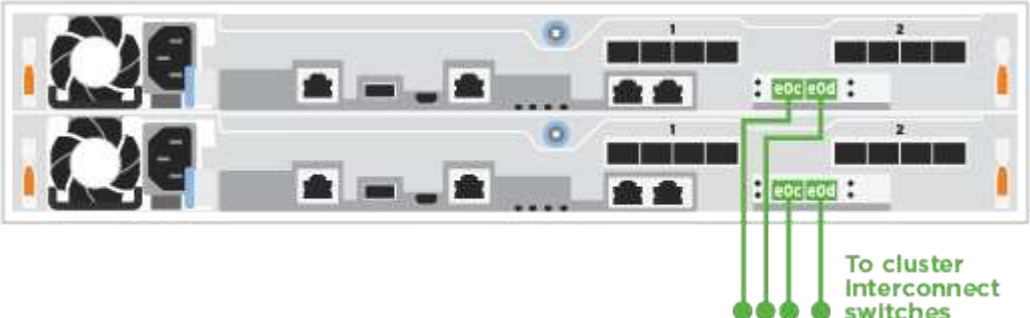
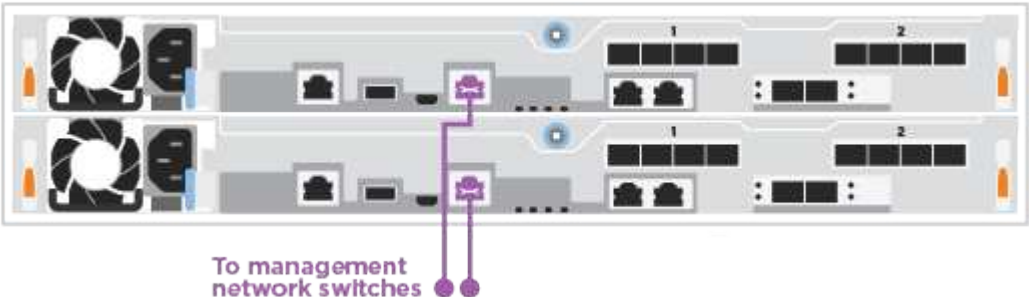

Be sure to check the illustration arrow for the proper cable connector pull-tab orientation.



As you insert the connector, you should feel it click into place; if you do not feel it click, remove it, turn it around and try again.

Use the animation or the tabulated steps to complete the cabling between the controllers and the switches:

[Animation - Cable a switched cluster](#)

| Step                                                                                | Perform on each controller                                                                                                                                                                                                                         |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b>                                                                            | <p>Cable the cluster interconnect ports to the 25 GbE cluster interconnect switches.</p> <ul style="list-style-type: none"> <li>• e0c</li> <li>• e0d</li> </ul>  |
| <b>2</b>                                                                            | <p>Cable the wrench ports to the management network switches with the RJ45 cables.</p>                                                                          |
|  | <p>DO NOT plug in the power cords at this point.</p>                                                                                                                                                                                               |

To complete setting up your system, see [Step 4: Complete system setup and configuration](#).

### Optional cabling: Cable configuration-dependent options

You have configuration-dependent optional cabling to the Fibre Channel or iSCSI host networks or direct-attached storage. This cabling is not exclusive; you can have cabling to a host network and storage.

#### Option 1: Cable to a Fibre Channel host network

Fibre Channel ports on the controllers are connected to Fibre Channel host network switches.

#### Before you begin

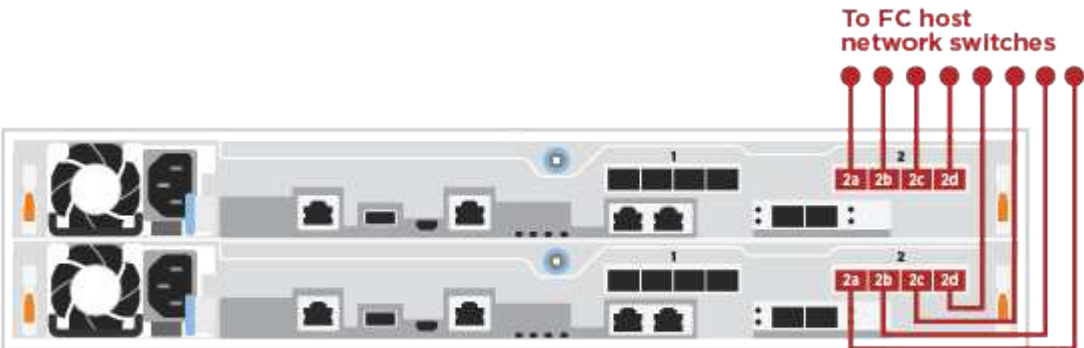
Contact your network administrator for information about connecting the system to the switches.

Be sure to check the illustration arrow for the proper cable connector pull-tab orientation.





As you insert the connector, you should feel it click into place; if you do not feel it click, remove it, turn it around and try again.

| Step | Perform on each controller module                                                                                                                                                                                                                             |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | <p>Cable ports 2a through 2d to the FC host switches.</p>                                                                                                                   |
| 2    | <p>To perform other optional cabling, choose from:</p> <ul style="list-style-type: none"> <li>• <a href="#">Option 2: Cable to a 25GbE data or host network</a></li> <li>• <a href="#">Option 3: Cable the controllers to a single drive shelf</a></li> </ul> |
| 3    | <p>To complete setting up your system, see <a href="#">Step 4: Complete system setup and configuration</a>.</p>                                                                                                                                               |

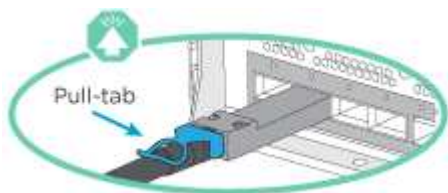
## Option 2: Cable to a 25GbE data or host network

25GbE ports on the controllers are connected to 25GbE data or host network switches.

### Before you begin

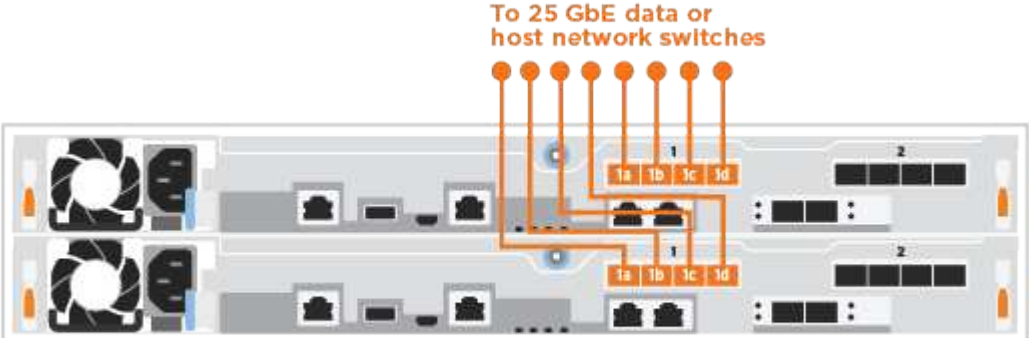
Contact your network administrator for information about connecting the system to the switches.

Be sure to check the illustration arrow for the proper cable connector pull-tab orientation.





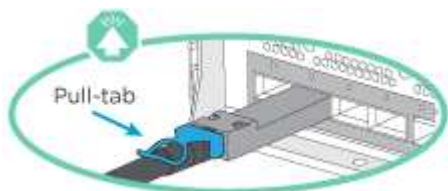
As you insert the connector, you should feel it click into place; if you do not feel it click, remove it, turn it around and try again.

| Step | Perform on each controller module                                                                                                                                                                                                                          |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | <p>Cable ports e4a through e4d to the 10GbE host network switches.</p>                                                                                                   |
| 2    | <p>To perform other optional cabling, choose from:</p> <ul style="list-style-type: none"><li>• <a href="#">Option 1: Cable to a Fibre Channel host network</a></li><li>• <a href="#">Option 3: Cable the controllers to a single drive shelf</a></li></ul> |
| 3    | <p>To complete setting up your system, see <a href="#">Step 4: Complete system setup and configuration</a>.</p>                                                                                                                                            |

### Option 3: Cable the controllers to a single drive shelf

You must cable each controller to the NSM modules on the NS224 drive shelf.

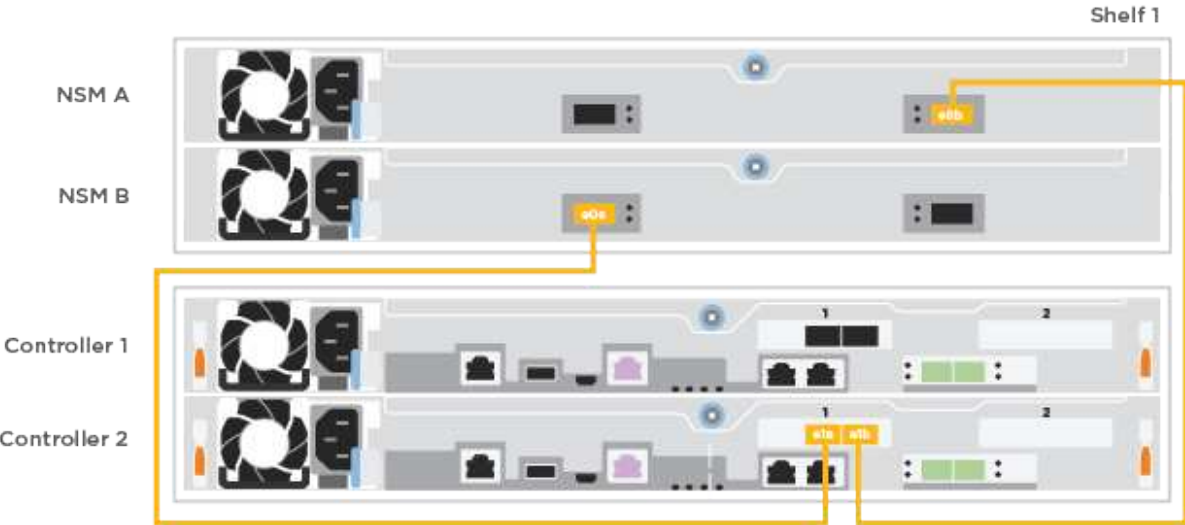
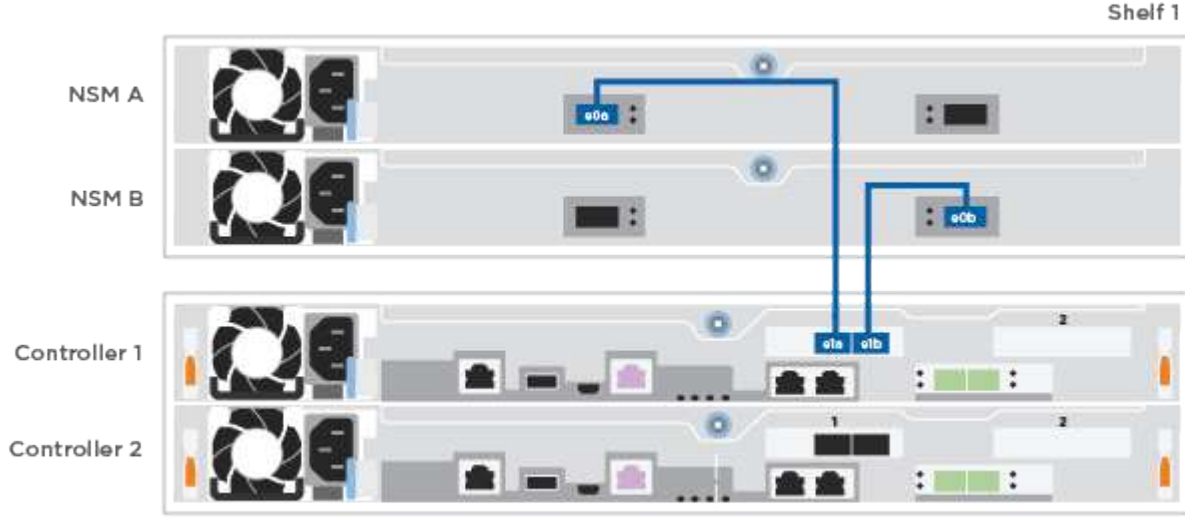
Be sure to check the illustration arrow for the proper cable connector pull-tab orientation.



As you insert the connector, you should feel it click into place; if you do not feel it click, remove it, turn it around and try again.

Use the animation or the tabulated steps to complete the cabling between the controllers and the single shelf:

[Animation - Cable the controllers to a single NS224](#)

| Step                                     | Perform on each controller module                                                                                                                       |
|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div data-bbox="131 149 199 197">1</div> | <p data-bbox="272 159 643 191">Cable controller A to the shelf:</p>   |
| <div data-bbox="131 821 199 869">2</div> | <p data-bbox="272 831 643 863">Cable controller B to the shelf:</p>  |

To complete setting up your system, see [Step 4: Complete system setup and configuration](#).

#### Step 4: Complete system setup and configuration

Complete the system setup and configuration using cluster discovery with only a connection to the switch and laptop, or by connecting directly to a controller in the system and then connecting to the management switch.

#### Option 1: Complete system setup and configuration if network discovery is enabled

If you have network discovery enabled on your laptop, you can complete system setup and configuration using automatic cluster discovery.

#### Steps

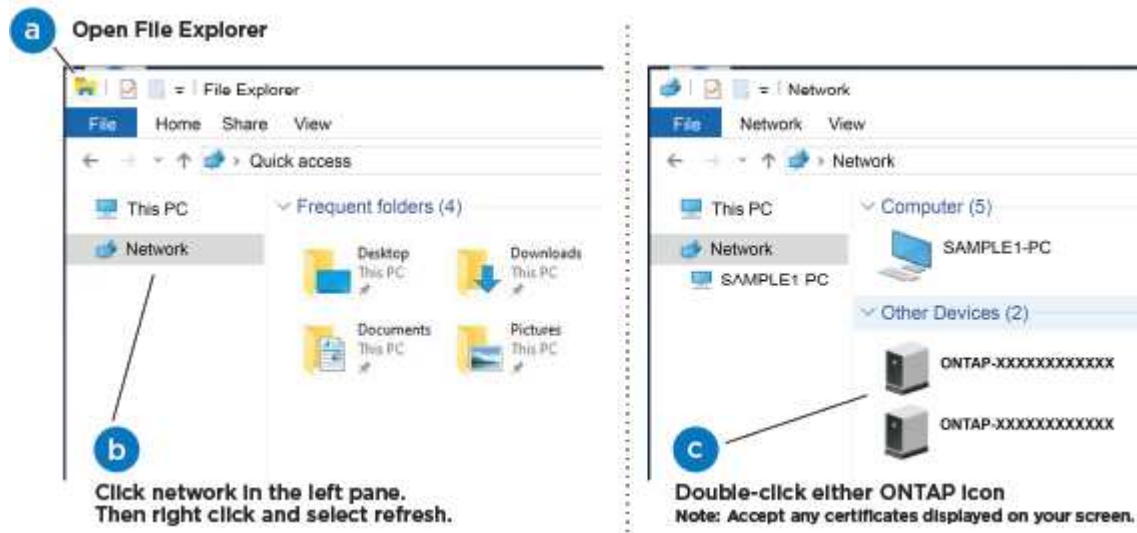
1. Plug the power cords into the controller power supplies, and then connect them to power sources on different circuits.
2. Make sure that your laptop has network discovery enabled.

See your laptop's online help for more information.


3. Use the animation to connect your laptop to the Management switch:

[Animation - Connect your laptop to the Management switch](#)

4. Select an ONTAP icon listed to discover:



- a. Open File Explorer.
- b. Click **Network** in the left pane.
- c. Right-click and select **refresh**.
- d. Double-click either ONTAP icon and accept any certificates displayed on your screen.

 XXXXX is the system serial number for the target node.

System Manager opens.

5. Use System Manager guided setup to configure your system using the data you collected in the [ONTAP Configuration Guide](#).
6. Verify the health of your system by running Config Advisor.
7. After you have completed the initial configuration, go to the [ONTAP & ONTAP System Manager Documentation Resources](#) page for information about configuring additional features in ONTAP.

## Option 2: Complete system setup and configuration if network discovery is not enabled

If network discovery is not enabled on your laptop, you must complete the configuration and setup using this task.

### Steps

1. Cable and configure your laptop or console:

- a. Set the console port on the laptop or console to 115,200 baud with N-8-1.



See your laptop or console's online help for how to configure the console port.

- b. Connect the laptop or console to the switch on the management subnet.



- c. Assign a TCP/IP address to the laptop or console, using one that is on the management subnet.
2. Plug the power cords into the controller power supplies, and then connect them to power sources on different circuits.
3. Assign an initial node management IP address to one of the nodes.

| If the management network has DHCP... | Then...                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Configured                            | Record the IP address assigned to the new controllers.                                                                                                                                                                                                                                                                                                                                                                                      |
| Not configured                        | <ol style="list-style-type: none"> <li>a. Open a console session using PuTTY, a terminal server, or the equivalent for your environment.</li> </ol> <div style="display: flex; align-items: center; margin: 10px 0;"> <p>Check your laptop or console's online help if you do not know how to configure PuTTY.</p> </div> <ol style="list-style-type: none"> <li>b. Enter the management IP address when prompted by the script.</li> </ol> |

4. Using System Manager on your laptop or console, configure your cluster:
  - a. Point your browser to the node management IP address.



The format for the address is https://x.x.x.x.

- b. Configure the system using the data you collected in the [ONTAP Configuration Guide](#).
5. Verify the health of your system by running Config Advisor.
6. After you have completed the initial configuration, go to the [ONTAP & ONTAP System Manager Documentation Resources](#) page for information about configuring additional features in ONTAP.

## Maintain

### Maintain FAS500f hardware

For the FAS500f storage system, you can perform maintenance procedures on the

following components.

#### **Boot media**

The boot media stores a primary and secondary set of boot image files that the system uses when it boots.

#### **Chassis**

The chassis is the physical enclosure housing all the controller components such as the controller/CPU unit, power supply, and I/O.

#### **Controller**

A controller consists of a board, firmware, and software. It controls the drives and implements the ONTAP functions.

#### **DIMM**

You must replace a DIMM (dual in-line memory module) when a memory mismatch is present, or you have a failed DIMM.

#### **Drive**

A drive is a device that provides the physical storage media for data.

#### **Fan**

The fan cools the controller.

#### **Mezzanine card**

A Mezzanine card is a printed circuit board that plugs directly into another plug-in card.

#### **NVMEM battery**

A battery is included with the controller and preserves cached data if the AC power fails.

#### **Power supply**

A power supply provides a redundant power source in a controller shelf.

#### **Real-time clock battery**

A real time clock battery preserves system date and time information if the power is off.

#### **Boot media**

##### **Overview of boot media replacement - FAS500f**

The boot media stores a primary and secondary set of system (boot image) files that the system uses when it boots.

You must have a USB flash drive, formatted to MBR/FAT32, with the appropriate amount of storage to hold the `image_xxx.tgz` file.

- You must replace the failed component with a replacement FRU component you received from your provider.
- It is important that you apply the commands in these steps on the correct controller:
  - The *impaired* controller is the controller on which you are performing maintenance.
  - The *healthy* controller is the HA partner of the impaired controller.

### Check onboard encryption keys - FAS500f

Prior to shutting down the impaired controller and checking the status of the onboard encryption keys, you must check the status of the impaired controller, disable automatic giveback, and check what version of ONTAP the system is running.

Prior to shutting down the impaired controller and checking the status of the onboard encryption keys, you must check the status of the impaired controller, disable automatic giveback, and check which version of ONTAP is running on the system.

If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see the [Synchronize a node with the cluster](#).

### Steps

#### 1. Check the status of the impaired controller:

- If the impaired controller is at the login prompt, log in as `admin`.
- If the impaired controller is at the LOADER prompt and is part of HA configuration, log in as `admin` on the healthy controller.
- If the impaired controller is in a standalone configuration and at LOADER prompt, contact [mysupport.netapp.com](http://mysupport.netapp.com).

#### 2. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message
MAINT=number_of_hours_downh
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:*>`

```
system node autosupport invoke -node * -type all -message MAINT=2h
```

#### 3. Check the version of ONTAP the system is running on the impaired controller if up, or on the partner controller if the impaired controller is down, using the `version -v` command:

- If `<Ino-DARE>` or `<IOno-DARE>` is displayed in the command output, the system does not support NVE, proceed to shut down the controller.
- If `<Ino-DARE>` is not displayed in the command output, and the system is running ONTAP 9.6 or later, go to the next section.

#### 4. If the impaired controller is part of an HA configuration, disable automatic giveback from the healthy controller: `storage failover modify -node local -auto-giveback false` or `storage failover modify -node local -auto-giveback-after-panic false`

### Check NVE or NSE on systems running ONTAP 9.6 and later

Before shutting down the impaired controller, you need to verify whether the system has either NetApp Volume Encryption (NVE) or NetApp Storage Encryption (NSE) enabled. If so, you need to verify the configuration.

1. Verify whether NVE is in use for any volumes in the cluster: `volume show -is-encrypted true`

If any volumes are listed in the output, NVE is configured and you need to verify the NVE configuration. If no volumes are listed, check whether NSE is configured and in use.

2. Verify whether NSE is configured and in use: `storage encryption disk show`

- If the command output lists the drive details with Mode & Key ID information, NSE is configured and you need to verify the NSE configuration and in use.
- If no disks are shown, NSE is not configured.
- If NVE and NSE are not configured, no drives are protected with NSE keys, it's safe to shut down the impaired controller.

## Verify NVE configuration

1. Display the key IDs of the authentication keys that are stored on the key management servers: `security key-manager key query`



After the ONTAP 9.6 release, you may have additional key manager types. The types are KMIP, AKV, and GCP. The process for confirming these types is the same as confirming external or onboard key manager types.

- If the Key Manager type displays `external` and the Restored column displays `yes`, it's safe to shut down the impaired controller.
  - If the Key Manager type displays `onboard` and the Restored column displays `yes`, you need to complete some additional steps.
  - If the Key Manager type displays `external` and the Restored column displays anything other than `yes`, you need to complete some additional steps.
  - If the Key Manager type displays `onboard` and the Restored column displays anything other than `yes`, you need to complete some additional steps.
2. If the Key Manager type displays `onboard` and the Restored column displays `yes`, manually back up the OKM information:
    - a. Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
    - b. Enter the command to display the key management information: `security key-manager onboard show-backup`
    - c. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
    - d. Return to admin mode: `set -priv admin`
    - e. Shut down the impaired controller.
  3. If the Key Manager type displays `external` and the Restored column displays anything other than `yes`:
    - a. Restore the external key management authentication keys to all nodes in the cluster: `security key-manager external restore`

If the command fails, contact NetApp Support.



- b. Verify that the Restored column equals yes for all authentication keys: `security key-manager key query`
  - c. Shut down the impaired controller.
4. If the Key Manager type displays onboard and the Restored column displays anything other than yes:
- a. Enter the onboard security key-manager sync command: `security key-manager onboard sync`



Enter the customer's 32 character, alphanumeric onboard key management passphrase at the prompt. If the passphrase cannot be provided, contact NetApp Support.  
[mysupport.netapp.com](https://mysupport.netapp.com)

- b. Verify the Restored column shows yes for all authentication keys: `security key-manager key query`
- c. Verify that the Key Manager type shows onboard, and then manually back up the OKM information.
- d. Go to advanced privilege mode and enter y when prompted to continue: `set -priv advanced`
- e. Enter the command to display the key management backup information: `security key-manager onboard show-backup`
- f. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
- g. Return to admin mode: `set -priv admin`
- h. You can safely shut down the controller.

## Verify NSE configuration

1. Display the key IDs of the authentication keys that are stored on the key management servers: `security key-manager key query -key-type NSE-AK`



After the ONTAP 9.6 release, you may have additional key manager types. The types are KMIP, AKV, and GCP. The process for confirming these types is the same as confirming external or onboard key manager types.

- If the Key Manager type displays external and the Restored column displays yes, it's safe to shut down the impaired controller.
  - If the Key Manager type displays onboard and the Restored column displays yes, you need to complete some additional steps.
  - If the Key Manager type displays external and the Restored column displays anything other than yes, you need to complete some additional steps.
  - If the Key Manager type displays external and the Restored column displays anything other than yes, you need to complete some additional steps.
2. If the Key Manager type displays onboard and the Restored column displays yes, manually back up the OKM information:
- a. Go to advanced privilege mode and enter y when prompted to continue: `set -priv advanced`
  - b. Enter the command to display the key management information: `security key-manager onboard`

`show-backup`

- c. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
  - d. Return to admin mode: `set -priv admin`
  - e. You can safely shut down the controller.
3. If the Key Manager type displays `external` and the Restored column displays anything other than `yes`:
- a. Restore the external key management authentication keys to all nodes in the cluster: `security key-manager external restore`
- If the command fails, contact NetApp Support.
- [mysupport.netapp.com](https://mysupport.netapp.com)
- b. Verify that the Restored column equals `yes` for all authentication keys: `security key-manager key query`
  - c. You can safely shut down the controller.
4. If the Key Manager type displays `onboard` and the Restored column displays anything other than `yes`:
- a. Enter the onboard security key-manager sync command: `security key-manager onboard sync`
- Enter the customer's 32 character, alphanumeric onboard key management passphrase at the prompt. If the passphrase cannot be provided, contact NetApp Support.
- [mysupport.netapp.com](https://mysupport.netapp.com)
- b. Verify the Restored column shows `yes` for all authentication keys: `security key-manager key query`
  - c. Verify that the Key Manager type shows `onboard`, and then manually back up the OKM information.
  - d. Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
  - e. Enter the command to display the key management backup information: `security key-manager onboard show-backup`
  - f. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
  - g. Return to admin mode: `set -priv admin`
  - h. You can safely shut down the controller.

#### Shut down the controller - FAS500f

After completing the NVE or NSE tasks, you need to complete the shutdown of the impaired controller. Shut down or take over the impaired controller using the appropriate procedure for your configuration.

#### Option 1: Most configurations

After completing the NVE or NSE tasks, you need to complete the shutdown of the impaired controller.

## Steps

- a. Take the impaired controller to the LOADER prompt:

| If the impaired controller displays...                   | Then...                                                                                                                                                                                                                                                             |
|----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                                        | Go to Remove controller module.                                                                                                                                                                                                                                     |
| Waiting for giveback...                                  | Press Ctrl-C, and then respond <code>y</code> when prompted.                                                                                                                                                                                                        |
| System prompt or password prompt (enter system password) | <p>Take over or halt the impaired controller from the healthy controller:</p> <pre>storage failover takeover -ofnode<br/>impaired_node_name</pre> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <code>y</code>.</p> |

- b. From the LOADER prompt, enter: `printenv` to capture all boot environmental variables. Save the output to your log file.



This command may not work if the boot device is corrupted or non-functional.

## Option 2: Controller is in a MetroCluster



Do not use this procedure if your system is in a two-node MetroCluster configuration.

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).
- If you have a MetroCluster configuration, you must have confirmed that the MetroCluster Configuration State is configured and that the nodes are in an enabled and normal state (`metrocluster node show`).

## Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message
MAINT=number_of_hours_downh
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:>`

```
system node autosupport invoke -node * -type all -message MAINT=2h
```

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`
3. Take the impaired controller to the LOADER prompt:

| If the impaired controller is displaying...              | Then...                                                                                                                                                                                                                                                         |
|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                                        | Go to the next step.                                                                                                                                                                                                                                            |
| Waiting for giveback...                                  | Press Ctrl-C, and then respond <code>y</code> when prompted.                                                                                                                                                                                                    |
| System prompt or password prompt (enter system password) | <p>Take over or halt the impaired controller from the healthy controller:</p> <pre>storage failover takeover -ofnode impaired_node_name</pre> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <code>y</code>.</p> |

### Replace the boot media - FAS500f

To replace the boot media, you must remove the impaired controller module, install the replacement boot media, and transfer the boot image to a USB flash drive.

#### Step 1: Remove the controller module

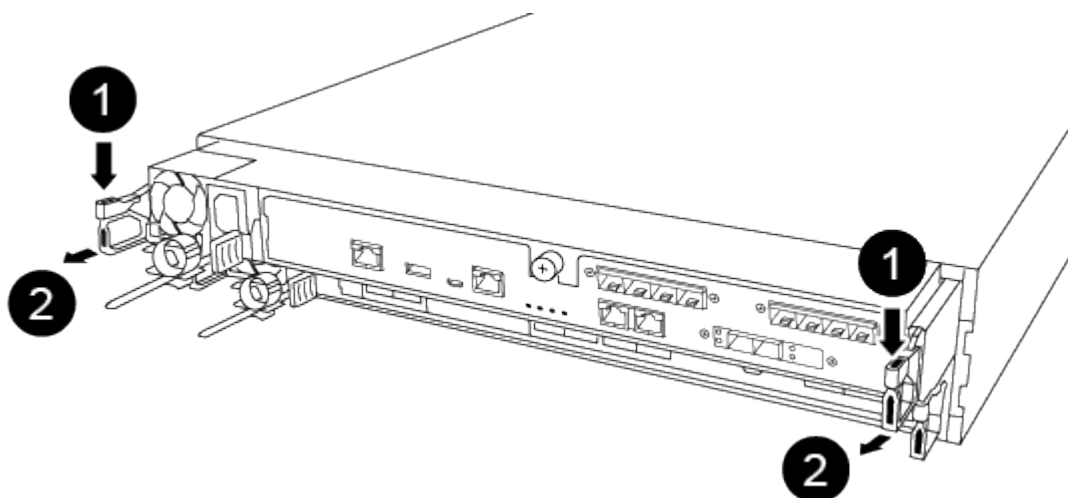
You must remove the controller module from the chassis when you replace a component inside the controller module.

Make sure that you label the cables so that you know where they came from.

1. If you are not already grounded, properly ground yourself.
2. Unplug the controller module power supplies from the source.
3. Release the power cable retainers, and then unplug the cables from the power supplies.
4. Insert your forefinger into the latching mechanism on either side of the controller module, press the lever with your thumb, and gently pull the controller a few inches out of the chassis.

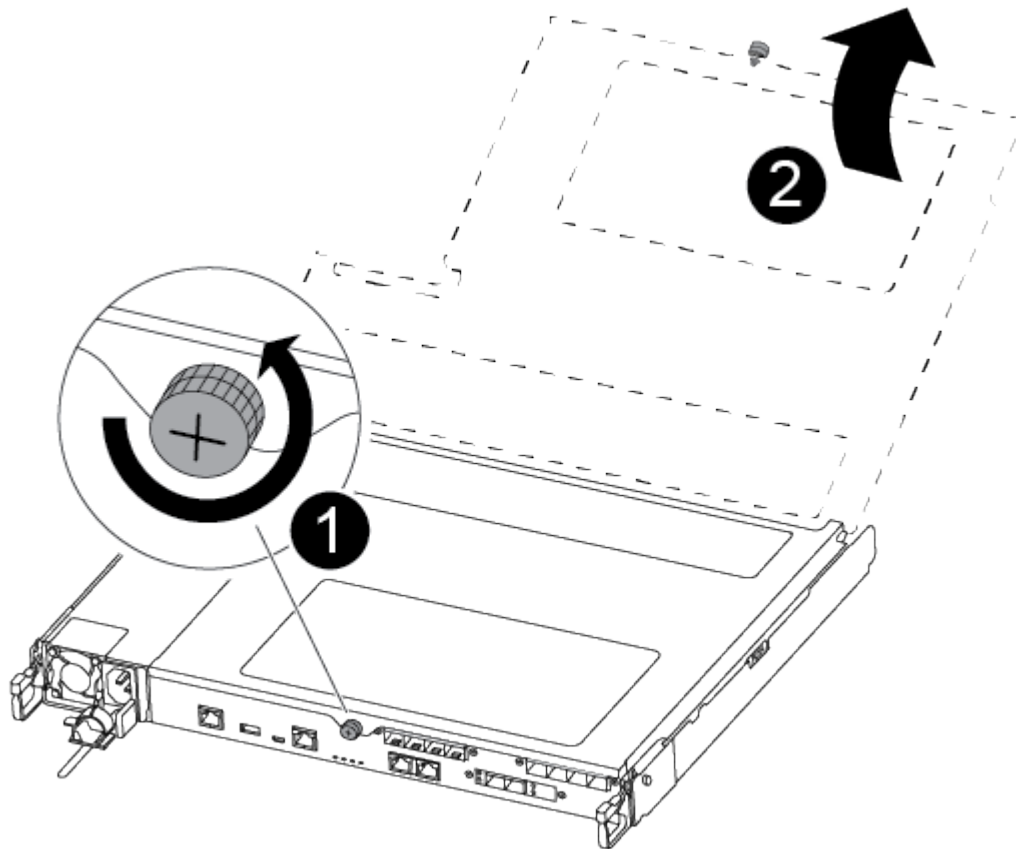


If you have difficulty removing the controller module, place your index fingers through the finger holes from the inside (by crossing your arms).



|   |                    |
|---|--------------------|
| 1 | Lever              |
| 2 | Latching mechanism |

5. Using both hands, grasp the controller module sides and gently pull it out of the chassis and set it on a flat, stable surface.
6. Turn the thumbscrew on the front of the controller module anti-clockwise and open the controller module cover.



|   |                          |
|---|--------------------------|
| 1 | Thumbscrew               |
| 2 | Controller module cover. |

7. Lift out the air duct cover.



## Step 2: Replace the boot media

You locate the failed boot media in the controller module by removing the air duct on the controller module before you can replace the boot media.

You need a #1 magnetic Phillips head screwdriver to remove the screw that holds the boot media in place. Due to the space constraints within the controller module, you should also have a magnet to transfer the screw on to so that you do not lose it.

You can use the following video or the tabulated steps to replace the boot media:

[Animation - Replace the boot media](#)

1. Locate and replace the impaired boot media from the controller module.



|   |                                                                                       |
|---|---------------------------------------------------------------------------------------|
| 1 | Remove the screw securing the boot media to the motherboard in the controller module. |
| 2 | Lift the boot media out of the controller module.                                     |

- a. Using the #1 magnetic screwdriver, remove the screw from the impaired boot media, and set it aside safely on the magnet.
- b. Gently lift the impaired boot media directly out of the socket and set it aside.
- c. Remove the replacement boot media from the antistatic shipping bag and align it into place on the controller module.
- d. Using the #1 magnetic screwdriver, insert and tighten the screw on the boot media.



Do not apply force when tightening the screw on the boot media; you might crack it.

### Step 3: Transfer the boot image to the boot media

The replacement boot media that you installed is without a boot image so you need to transfer a boot image using a USB flash drive.

- You must have a USB flash drive, formatted to MBR/FAT32, with at least 4GB capacity
- A copy of the same image version of ONTAP as what the impaired controller was running. You can download the appropriate image from the **Downloads** section on the NetApp Support Site
  - If NVE is enabled, download the image with NetApp Volume Encryption, as indicated in the download

button.

- If NVE is not enabled, download the image without NetApp Volume Encryption, as indicated in the download button.
- If your system is an HA pair, you must have a network connection.
- If your system is a stand-alone system you do not need a network connection, but you must perform an additional reboot when restoring the var file system.

## Steps

1. Download and copy the appropriate service image from the NetApp Support Site to the USB flash drive.
2. Download the service image to your work space on your laptop.
3. Unzip the service image.



If you are extracting the contents using Windows, do not use WinZip to extract the netboot image. Use another extraction tool, such as 7-Zip or WinRAR.

There are two folders in the unzipped service image file:

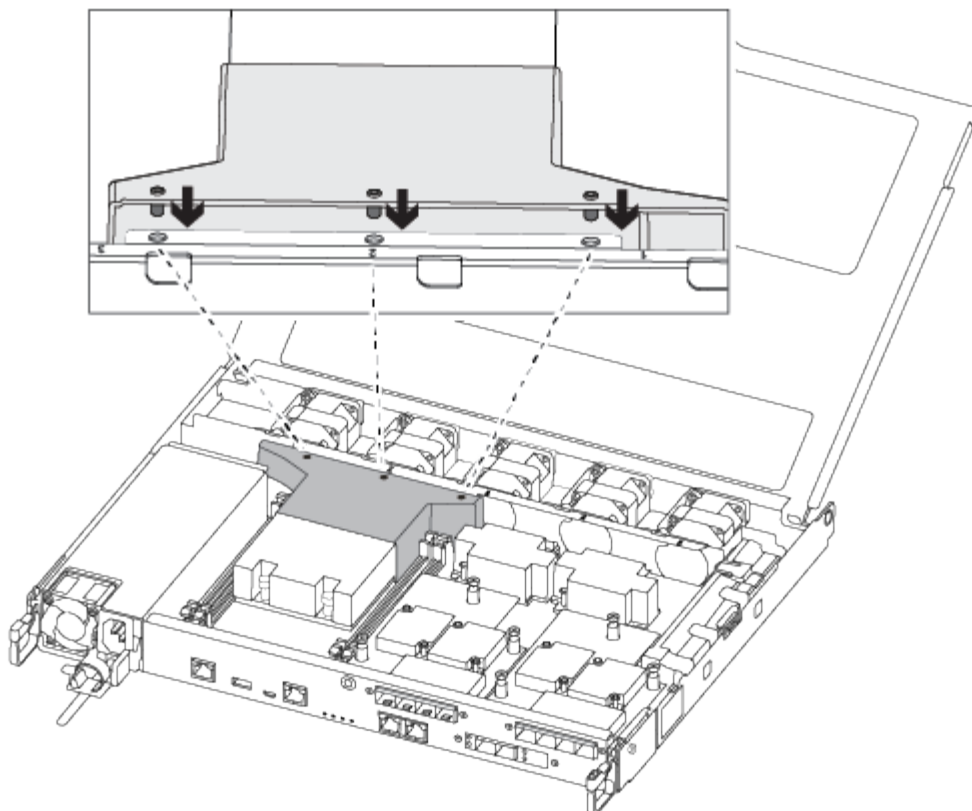
- `boot`
- `efi`

4. Copy the `efi` folder to the top directory on the USB flash drive.

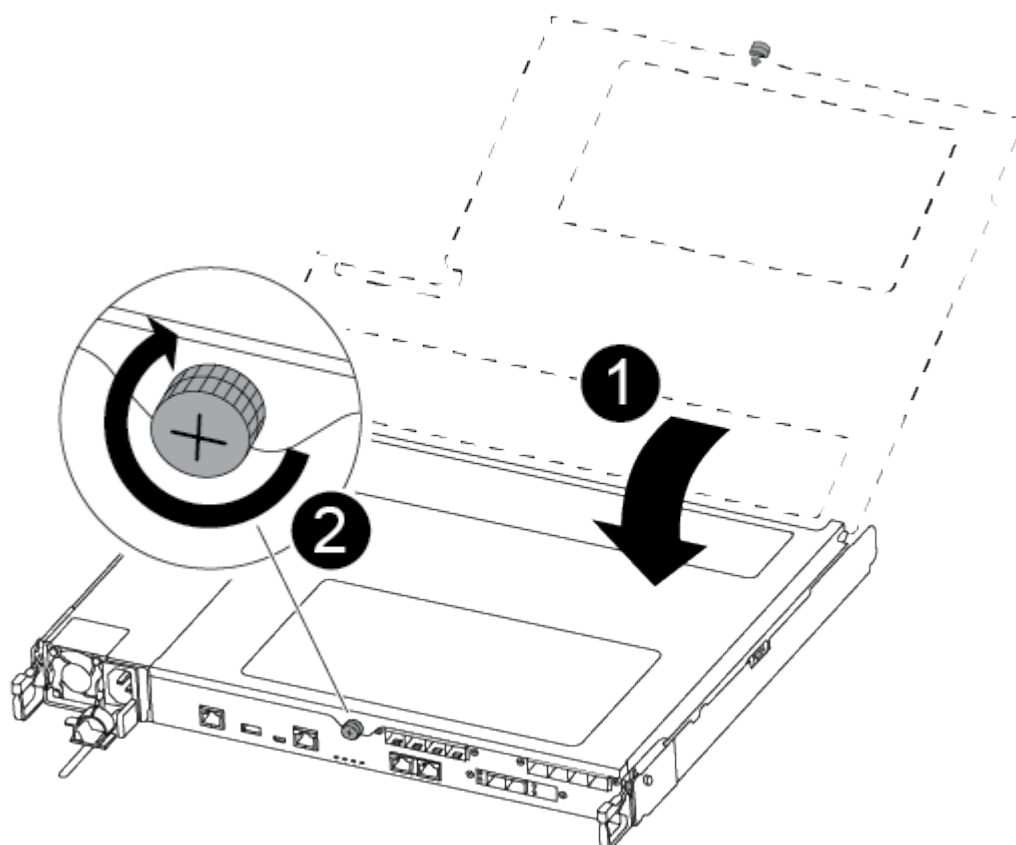
The USB flash drive should have the `efi` folder and the same Service Image (BIOS) version of what the impaired controller is running.

5. Remove the USB flash drive from your laptop.
6. If you have not already done so, install the air duct.





7. Close the controller module cover and tighten the thumbscrew.



|   |                         |
|---|-------------------------|
| 1 | Controller module cover |
| 2 | Thumbscrew              |

8. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.
9. Plug the power cable into the power supply and reinstall the power cable retainer.
10. Insert the USB flash drive into the USB slot on the controller module.

Make sure that you install the USB flash drive in the slot labeled for USB devices, and not in the USB console port.

11. Push the controller module all the way into the chassis:
12. Place your index fingers through the finger holes from the inside of the latching mechanism.
13. Press your thumbs down on the orange tabs on top of the latching mechanism and gently push the controller module over the stop.
14. Release your thumbs from the top of the latching mechanisms and continue pushing until the latching mechanisms snap into place.

The controller module begins to boot as soon as it is fully seated in the chassis. Be prepared to interrupt the boot process.

The controller module should be fully inserted and flush with the edges of the chassis.

#### Boot the recovery image - FAS500f

You must boot the ONTAP image from the USB drive, restore the file system, and verify the environmental variables.

#### Steps

1. From the LOADER prompt, boot the recovery image from the USB flash drive:

```
boot_recovery
```

The image is downloaded from the USB flash drive.

2. When prompted, either enter the name of the image or accept the default image displayed inside the brackets on your screen.
3. Restore the var file system:

| If your system has... | Then...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A network connection  | <ul style="list-style-type: none"> <li>a. Press <code>y</code> when prompted to restore the backup configuration.</li> <li>b. Set the healthy controller to advanced privilege level: <code>set -privilege advanced</code></li> <li>c. Run the restore backup command: <code>system node restore-backup -node local -target-address <i>impaired_node_IP_address</i></code></li> <li>d. Return the controller to admin level: <code>set -privilege admin</code></li> <li>e. Press <code>y</code> when prompted to use the restored configuration.</li> <li>f. Press <code>y</code> when prompted to reboot the controller.</li> </ul> |
| No network connection | <ul style="list-style-type: none"> <li>a. Press <code>n</code> when prompted to restore the backup configuration.</li> <li>b. Reboot the system when prompted by the system.</li> <li>c. Select the <b>Update flash from backup config</b> (sync flash) option from the displayed menu.</li> </ul> <p>If you are prompted to continue with the update, press <code>y</code>.</p>                                                                                                                                                                                                                                                     |

| If your system has...                                           | Then...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No network connection and is in a MetroCluster IP configuration | <p>a. Press <b>n</b> when prompted to restore the backup configuration.</p> <p>b. Reboot the system when prompted by the system.</p> <p>c. Wait for the iSCSI storage connections to connect.</p> <p>You can proceed after you see the following messages:</p> <pre> date-and-time [node- name:iscsi.session.stateChanged:notice]: iSCSI session state is changed to Connected for the target iSCSI-target (type: dr_auxiliary, address: ip-address). date-and-time [node- name:iscsi.session.stateChanged:notice]: iSCSI session state is changed to Connected for the target iSCSI-target (type: dr_partner, address: ip-address). date-and-time [node- name:iscsi.session.stateChanged:notice]: iSCSI session state is changed to Connected for the target iSCSI-target (type: dr_auxiliary, address: ip-address). date-and-time [node- name:iscsi.session.stateChanged:notice]: iSCSI session state is changed to Connected for the target iSCSI-target (type: dr_partner, address: ip-address).</pre> <p>d. Select the <b>Update flash from backup config</b> (sync flash) option from the displayed menu.</p> <p>If you are prompted to continue with the update, press <b>y</b>.</p> |

4. Ensure that the environmental variables are set as expected:
  - a. Take the controller to the **LOADER** prompt.
  - b. Check the environment variable settings with the `printenv` command.
  - c. If an environment variable is not set as expected, modify it with the `setenv environment-variable-name changed-value` command.
  - d. Save your changes using the `savenv` command.
5. The next depends on your system configuration:
  - If your system has onboard keymanager, NSE or NVE configured, go to [Restore OKM, NSE, and NVE as needed](#)

- If your system does not have onboard keymanager, NSE or NVE configured, complete the steps in this section.

6. From the LOADER prompt, enter the `boot_ontap` command.

| If you see...           | Then...                                                                                                                                            |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| The login prompt        | Go to the next Step.                                                                                                                               |
| Waiting for giveback... | a. Log into the partner controller.<br>b. Confirm the target controller is ready for giveback with the <code>storage failover show</code> command. |

7. Connect the console cable to the partner controller.

8. Give back the controller using the `storage failover giveback -fromnode local` command.

9. At the cluster prompt, check the logical interfaces with the `net int -is-home false` command.

If any interfaces are listed as "false", revert those interfaces back to their home port using the `net int revert` command.

10. Move the console cable to the repaired controller and run the `version -v` command to check the ONTAP versions.

11. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.

#### Restore OKM, NSE, and NVE as needed - FAS500f

Once environment variables are checked, you must complete steps specific to systems that have Onboard Key Manager (OKM), NetApp Storage Encryption (NSE) or NetApp Volume Encryption (NVE) enabled.

- Determine which section you should use to restore your OKM, NSE, or NVE configurations: If NSE or NVE are enabled along with Onboard Key Manager you must restore settings you captured at the beginning of this procedure.
  - If NSE or NVE are enabled and Onboard Key Manager is enabled, go to [Restore NVE or NSE when Onboard Key Manager is enabled](#).
  - If NSE or NVE are enabled for ONTAP 9.6, go to [Restore NSE/NVE on systems running ONTAP 9.6 and later](#).

#### Restore NVE or NSE when Onboard Key Manager is enabled

##### Steps

- Connect the console cable to the target controller.
- Use the `boot_ontap` command at the LOADER prompt to boot the controller.
- Check the console output:

| If the console displays... | Then...                                                                                                                                                                                                                    |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt          | Boot the controller to the boot menu: <code>boot_ontap menu</code>                                                                                                                                                         |
| Waiting for giveback....   | a. Enter <code>Ctrl-C</code> at the prompt<br>b. At the message: Do you wish to halt this node rather than wait [y/n]? , enter: <code>y</code><br>c. At the LOADER prompt, enter the <code>boot_ontap menu</code> command. |

- At the Boot Menu, enter the hidden command, `recover_onboard_keymanager` and reply `y` at the prompt
- Enter the passphrase for the onboard key manager you obtained from the customer at the beginning of this procedure.
- When prompted to enter the backup data, paste the backup data you captured at the beginning of this procedure, when asked. Paste the output of `security key-manager backup show` OR `security key-manager onboard show-backup` command



The data is output from either `security key-manager backup show` or `security key-manager onboard show-backup` command.

Example of backup data:

```

-----BEGIN BACKUP-----
TmV0QXBwIEtleSBGbG9iAAEAAAAEAAAAcAEAAAAAADuD+byAAAAACEAAAAAAAAA
QAAAAAAAAABvOIH0AAAAAMh7qDLRyH1DBz12piVdy9ATSFMT0C0TIYFss4PDjTaV
dzRYkLd1PhQLxAWJwOlyqSr8qY1SEBgm1IWgE5DLRqkiAAAAAAAACgAAAAAAAA
3WTh7gAAAAAAAAAAAAAAAAAIAAAAAAAgAZJEIWvdeHr5RCAvHGclo+wAAAAAAAA
lgAAAAAAAAAoAAAAAAAAAEOTcR0AAAAAAAAAAAAAAAAACAAAAAAJAGr3tJA/
LRzUQRHwv+1aWvAAAAAAAAAACQAAAAAAAAAgAAAAAAAAACdhTcvAAAAAJ1PXeBf
ml4NBsSyV1B4jc4A7cvWEFY6ILG6hc6tbKLAHZuvfQ4rlbYAAAAAAAAAAAAAAAA
AA
AA
.
.
.
.
H4nPQM0nrDRYRa9SCv8AAA
AA
AAAAAAA
-----END BACKUP-----

```

- At the Boot Menu select the option for Normal Boot.  
  
The system boots to Waiting for giveback... prompt.
- Confirm the target controller is ready for giveback with the `storage failover show` command.

9. Giveback only the CFO aggregates with the `storage failover giveback -fromnode local -only-cfo-aggregates true` command.
- If the command fails because of a failed disk, physically disengage the failed disk, but leave the disk in the slot until a replacement is received.
  - If the command fails because of an open CIFS sessions, check with customer how to close out CIFS sessions.



Terminating CIFS can cause loss of data.

- If the command fails because the partner "not ready", wait 5 minutes for the NVMEMs to synchronize.
  - If the command fails because of an NDMP, SnapMirror, or SnapVault process, disable the process. See the appropriate Documentation Center for more information.
10. Once the giveback completes, check the failover and giveback status with the `storage failover show` and ``storage failover show-giveback`` commands.

Only the CFO aggregates (root aggregate and CFO style data aggregates) will be shown.

11. Move the console cable to the target controller.
- a. If you are running ONTAP 9.6 or later, run the security key-manager onboard sync:
  - b. Run the `security key-manager onboard sync` command and then enter the passphrase when prompted.
  - c. Enter the `security key-manager key query` command to see a detailed view of all keys stored in the onboard key manager and verify that the `Restored` column = `yes/true` for all authentication keys.



If the `Restored` column = anything other than `yes/true`, contact Customer Support.

- d. Wait 10 minutes for the key to synchronize across the cluster.
12. Move the console cable to the partner controller.
13. Give back the target controller using the `storage failover giveback -fromnode local` command.
14. Check the giveback status, 3 minutes after it reports complete, using the `storage failover show` command.

If giveback is not complete after 20 minutes, contact Customer Support.

15. At the clustershell prompt, enter the `net int show -is-home false` command to list the logical interfaces that are not on their home controller and port.

If any interfaces are listed as `false`, revert those interfaces back to their home port using the `net int revert -vserver Cluster -lif nodename` command.

16. Move the console cable to the target controller and run the `version -v` command to check the ONTAP versions.
17. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.

## Restore NSE/NVE on systems running ONTAP 9.6 and later

### Steps

1. Connect the console cable to the target controller.
2. Use the `boot_ontap` command at the LOADER prompt to boot the controller.
3. Check the console output:

| If the console displays... | Then...                                                                                                                                                                                                 |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The login prompt           | Go to Step 7.                                                                                                                                                                                           |
| Waiting for giveback...    | <ol style="list-style-type: none"><li>a. Log into the partner controller.</li><li>b. Confirm the target controller is ready for giveback with the <code>storage failover show</code> command.</li></ol> |

4. Move the console cable to the partner controller and give back the target controller storage using the `storage failover giveback -fromnode local -only-cfo-aggregates true local` command.
  - If the command fails because of a failed disk, physically disengage the failed disk, but leave the disk in the slot until a replacement is received.
  - If the command fails because of an open CIFS sessions, check with customer how to close out CIFS sessions.



Terminating CIFS can cause loss of data.

- If the command fails because the partner "not ready", wait 5 minutes for the NVMEMs to synchronize.
  - If the command fails because of an NDMP, SnapMirror, or SnapVault process, disable the process. See the appropriate Documentation Center for more information.
5. Wait 3 minutes and check the failover status with the `storage failover show` command.
  6. At the clustershell prompt, enter the `net int show -is-home false` command to list the logical interfaces that are not on their home controller and port.

If any interfaces are listed as `false`, revert those interfaces back to their home port using the `net int revert -vserver Cluster -lif nodename` command.

7. Move the console cable to the target controller and run the `version -v` command to check the ONTAP versions.
8. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.
9. Use the `storage encryption disk show` at the clustershell prompt, to review the output.
10. Use the `security key-manager key query` command to display the key IDs of the authentication keys that are stored on the key management servers.
  - If the `Restored` column = `yes/true`, you are done and can proceed to complete the replacement process.



- If the `Key Manager type = external` and the `Restored` column = anything other than `yes/true`, use the `security key-manager external restore` command to restore the key IDs of the authentication keys.



If the command fails, contact Customer Support.

- If the `Key Manager type = onboard` and the `Restored` column = anything other than `yes/true`, use the `security key-manager onboard sync` command to re-sync the Key Manager type.

Use the `security key-manager key query` command to verify that the `Restored` column = `yes/true` for all authentication keys.

11. Connect the console cable to the partner controller.
12. Give back the controller using the `storage failover giveback -fromnode local` command.
13. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.

#### Return the failed part to NetApp - FAS500f

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

## Chassis

#### Overview of chassis replacement - FAS500f

To replace the chassis, you must move the bezel, controller modules, and NVMe drives from the impaired chassis to the replacement chassis, and then remove the impaired chassis from the equipment rack or system cabinet and install the replacement chassis in its place.

All other components in the system must be functioning properly; if not, you must contact technical support.

- You can use this procedure with all versions of ONTAP supported by your system.
- This procedure is written with the assumption that you are moving the bezel, NVMe drives, and controller modules to the new chassis, and that the replacement chassis is a new component from NetApp.
- This procedure is disruptive. For a two-node cluster, you will have a complete service outage and a partial outage in a multi-node cluster.

#### Shut down the controllers - FAS500f

This procedure is for 2-node, non-MetroCluster configurations only. If you have a system with more than two nodes, see [How to perform a graceful shutdown and power up of one HA pair in a 4-node cluster](#).

#### Before you begin

You need:

- Local administrator credentials for ONTAP.

- NetApp onboard key management (OKM) cluster-wide passphrase if using storage encryption or NVE/NAE.
- BMC accessibility for each controller.
- Stop all clients/host from accessing data on the NetApp system.
- Suspend external backup jobs.
- Necessary tools and equipment for the replacement.



If the system is a NetApp StorageGRID or ONTAP S3 used as FabricPool cloud tier, refer to the [Gracefully shutdown and power up your storage system Resolution Guide](#) after performing this procedure.



If using SSDs, refer to [SU490: \(Impact: Critical\) SSD Best Practices: Avoid risk of drive failure and data loss if powered off for more than two months](#)

As a best practice before shutdown, you should:

- Perform additional [system health checks](#).
- Upgrade ONTAP to a recommended release for the system.
- Resolve any [Active IQ Wellness Alerts and Risks](#).  
Make note of any faults presently on the system, such as LEDs on the system components.

## Steps

1. Log into the cluster through SSH or log in from any node in the cluster using a local console cable and a laptop/console.
2. Turn off AutoSupport and indicate how long you expect the system to be offline:

```
system node autosupport invoke -node * -type all -message "MAINT=8h Power Maintenance"
```

3. Identify the SP/BMC address of all nodes:

```
system service-processor show -node * -fields address
```

4. Exit the cluster shell: `exit`
5. Log into SP/BMC over SSH using the IP address of any of the nodes listed in the output from the previous step.

If you're using a console/laptop, log into the controller using the same cluster administrator credentials.



Open an SSH session to every SP/BMC connection so that you can monitor progress.

6. Halt the 2 nodes located in the impaired chassis:

```
system node halt -node <node>,<node2> -skip-lif-migration-before-shutdown true -ignore-quorum-warnings true -inhibit-takeover true
```



For clusters using SnapMirror synchronous operating in StrictSync mode: `system node halt -node <node>,<node2> -skip-lif-migration-before-shutdown true -ignore-quorum-warnings true -inhibit-takeover true -ignore-strict-sync-warnings true`

7. Enter **y** for each controller in the cluster when you see *Warning: Are you sure you want to halt node "cluster <node-name> number"?*  
`{y|n}:`
8. Wait for each controller to halt and display the LOADER prompt.

#### Move and replace hardware - FAS500f

Move the power supplies, hard drives, and controller module or modules from the impaired chassis to the new chassis, and swap out the impaired chassis from the equipment rack or system cabinet with the new chassis of the same model as the impaired chassis.

#### Step 1: Remove the controller modules

To replace the chassis, you must remove the controller modules from the old chassis.

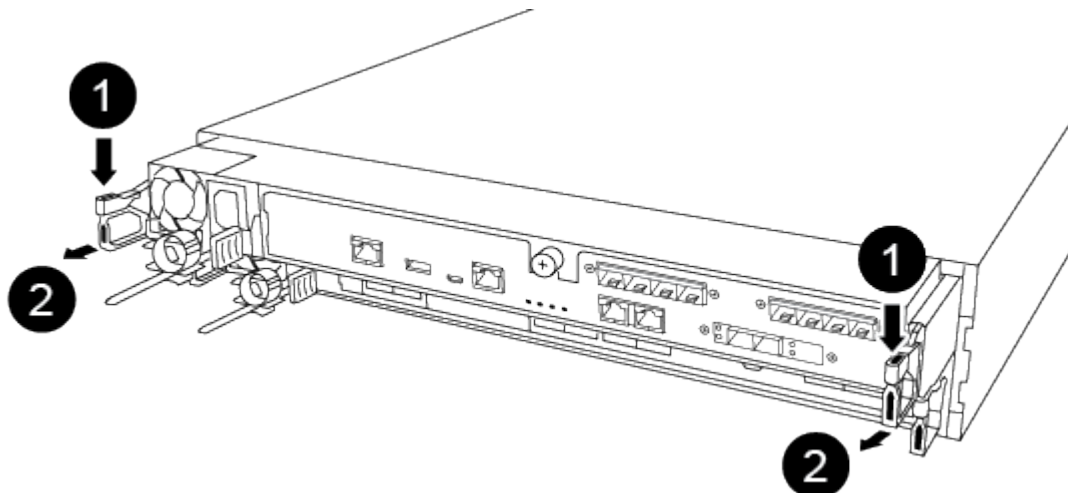
You can use the following video or the tabulated steps to replace the chassis; it assumes the removal and replacement of the bezel:

#### [Animation - Replace the chassis](#)

1. If you are not already grounded, properly ground yourself.
2. Unplug the controller module power supplies from the source.
3. Release the power cable retainers, and then unplug the cables from the power supplies.
4. Insert your forefinger into the latching mechanism on either side of the controller module, press the lever with your thumb, and gently pull the controller a few inches out of the chassis.



If you have difficulty removing the controller module, place your index fingers through the finger holes from the inside (by crossing your arms).



|   |                    |
|---|--------------------|
| 1 | Lever              |
| 2 | Latching mechanism |

5. Using both hands, grasp the controller module sides and gently pull it out of the chassis and set it on a flat, stable surface.
6. Set the controller module aside in a safe place, and repeat these steps for the other controller module in the chassis.

## Step 2: Move drives to the new chassis

You need to move the drives from each bay opening in the old chassis to the same bay opening in the new chassis.

1. Gently remove the bezel from the front of the system.
2. Remove the drives:
  - a. Press the release button at the top of the carrier face below the LEDs.
  - b. Pull the cam handle to its fully open position to unseat the drive from the midplane, and then gently slide the drive out of the chassis.

The drive should disengage from the chassis, allowing it to slide free of the chassis.



When removing a drive, always use two hands to support its weight.



Drives are fragile. Handle them as little as possible to prevent damage to them.

3. Align the drive from the old chassis with the same bay opening in the new chassis.
4. Gently push the drive into the chassis as far as it will go.

The cam handle engages and begins to rotate upward.

5. Firmly push the drive the rest of the way into the chassis, and then lock the cam handle by pushing it up and against the drive holder.

Be sure to close the cam handle slowly so that it aligns correctly with the front of the drive carrier. It clicks when it is secure.

6. Repeat the process for the remaining drives in the system.

## Step 3: Replace a chassis from within the equipment rack or system cabinet

You must remove the existing chassis from the equipment rack or system cabinet before you can install the replacement chassis.

1. Remove the screws from the chassis mount points.
2. With two people, slide the old chassis off the rack rails in a system cabinet or equipment rack, and then set it aside.

3. If you are not already grounded, properly ground yourself.
4. Using two people, install the replacement chassis into the equipment rack or system cabinet by guiding the chassis onto the rack rails in a system cabinet or equipment rack.
5. Slide the chassis all the way into the equipment rack or system cabinet.
6. Secure the front of the chassis to the equipment rack or system cabinet, using the screws you removed from the old chassis.
7. If you have not already done so, install the bezel.

#### Step 4: Install the controller modules

After you install the controller modules into the new chassis, you need to boot it.

For HA pairs with two controller modules in the same chassis, the sequence in which you install the controller module is especially important because it attempts to reboot as soon as you completely seat it in the chassis.

1. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.



Do not completely insert the controller module in the chassis until instructed to do so.

2. Recable the console to the controller module, and then reconnect the management port.
3. Plug the power cables into the power supplies and reinstall the power cable retainers.
4. Insert the controller module into the chassis:
  - a. Ensure the latching mechanism arms are locked in the fully extended position.
  - b. Using both hands, align and gently slide the controller module into the latching mechanism arms until it stops.
  - c. Place your index fingers through the finger holes from the inside of the latching mechanism.
  - d. Press your thumbs down on the orange tabs on top of the latching mechanism and gently push the controller module over the stop.
  - e. Release your thumbs from the top of the latching mechanisms and continue pushing until the latching mechanisms snap into place.

The controller module begins to boot as soon as it is fully seated in the chassis. Be prepared to interrupt the boot process.

The controller module should be fully inserted and flush with the edges of the chassis.

5. Repeat the preceding steps to install the second controller into the new chassis.

#### Complete the restoration and replacement process - FAS500f

You must verify the HA state of the chassis and return the failed part to NetApp, as described in the RMA instructions shipped with the kit.

#### Step 1: Verify and set the HA state of the chassis

You must verify the HA state of the chassis, and, if necessary, update the state to match your system configuration.

1. In Maintenance mode, from either controller module, display the HA state of the local controller module and chassis: `ha-config show`

The HA state should be the same for all components.

2. If the displayed system state for the chassis does not match your system configuration:
  - a. Set the HA state for the chassis: `ha-config modify chassis HA-state`

The value for HA-state can be one of the following:

- `ha`
- `mcc`
- `mccip`
- `non-ha`

- b. Confirm that the setting has changed: `ha-config show`

3. If you have not already done so, recable the rest of your system.
4. Reinstall the bezel on the front of the system.

## Step 2: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

## Controller

### Overview of controller module replacement - FAS500f

You must review the prerequisites for the replacement procedure and select the correct one for your version of the ONTAP operating system.

- All drive shelves must be working properly.
- If your system is in a MetroCluster configuration, you must review the section [Choosing the correct recovery procedure](#) to determine whether you should use this procedure.
- You must replace the failed component with a replacement FRU component you received from your provider.
- You must be replacing a controller module with a controller module of the same model type. You cannot upgrade your system by just replacing the controller module.
- You cannot change any drives or drive shelves as part of this procedure.
- In this procedure, the boot device is moved from the impaired controller to the *replacement* controller so that the *replacement* controller will boot up in the same version of ONTAP as the old controller module.
- It is important that you apply the commands in these steps on the correct systems:
  - The *impaired* controller is the controller that is being replaced.
  - The *replacement* controller is the new controller that is replacing the impaired controller.
  - The *healthy* controller is the surviving controller.
- You must always capture the controller's console output to a text file.

This provides you a record of the procedure so that you can troubleshoot any issues that you might encounter during the replacement process.

## Shut down the impaired controller - FAS500f

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

### About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced mode`) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

### Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:  

```
system node autosupport invoke -node * -type all -message MAINT=<# of hours>h
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:>`  

```
system node autosupport invoke -node * -type all -message MAINT=2h
```

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`



When you see *Do you want to disable auto-giveback?*, enter *y*.

3. Take the impaired controller to the LOADER prompt:

| If the impaired controller is displaying... | Then...                                                                                                                                                                                                                                                            |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                           | Go to the next step.                                                                                                                                                                                                                                               |
| Waiting for giveback...                     | Press Ctrl-C, and then respond <i>y</i> when prompted.                                                                                                                                                                                                             |
| System prompt or password prompt            | <p>Take over or halt the impaired controller from the healthy controller:<br/> <pre>storage failover takeover -ofnode<br/>impaired_node_name</pre></p> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i>.</p> |

To replace the controller module hardware, you must remove the impaired controller, move FRU components to the replacement controller module, install the replacement controller module in the chassis, and then boot the system to Maintenance mode.

Step 1: Remove the controller module

You must remove the controller module from the chassis when you replace a component inside the controller module.

Make sure that you label the cables so that you know where they came from.

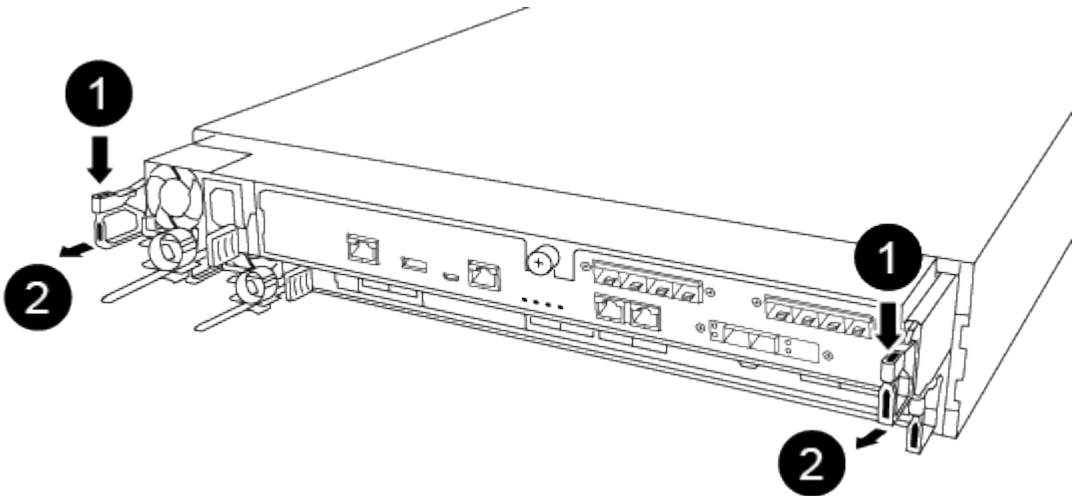
You can use the following video or the tabulated steps to replace a controller module:

Animation - Replace a controller module

- 1. If you are not already grounded, properly ground yourself.
- 2. Unplug the controller module power supplies from the source.
- 3. Release the power cable retainers, and then unplug the cables from the power supplies.
- 4. Insert your forefinger into the latching mechanism on either side of the controller module, press the lever with your thumb, and gently pull the controller a few inches out of the chassis.



If you have difficulty removing the controller module, place your index fingers through the finger holes from the inside (by crossing your arms).

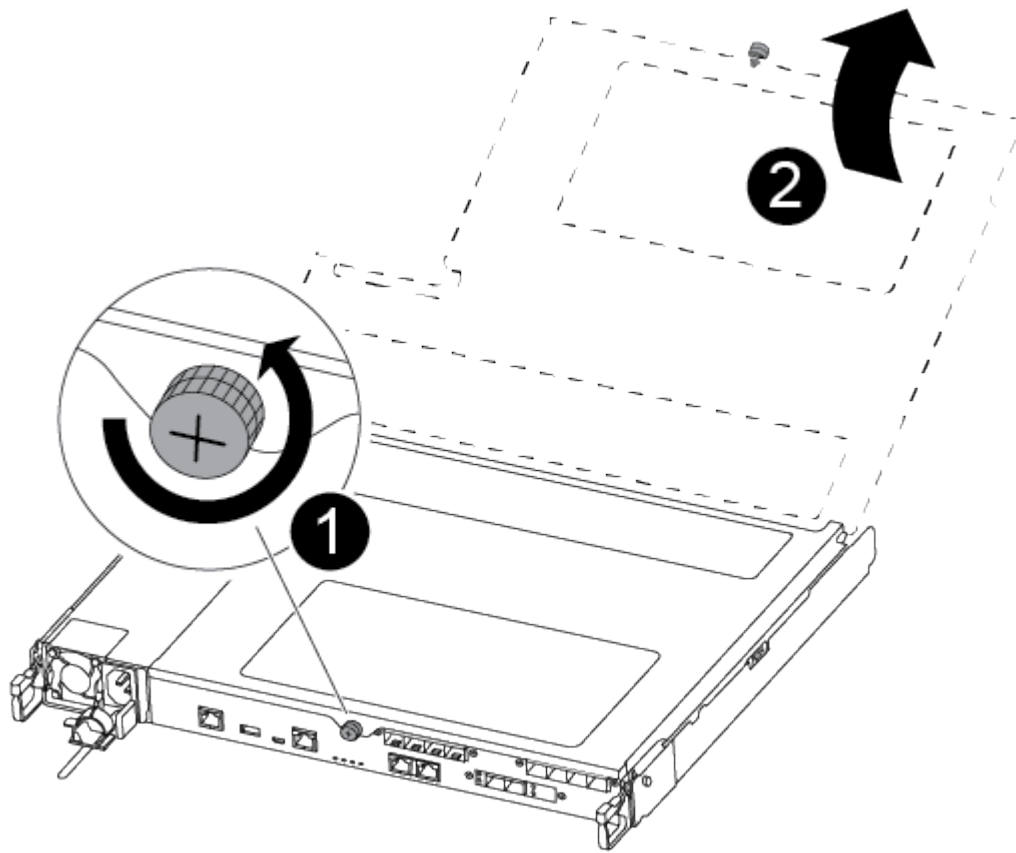


|   |                    |
|---|--------------------|
| 1 | Lever              |
| 2 | Latching mechanism |

- 5. Using both hands, grasp the controller module sides and gently pull it out of the chassis and set it on a flat, stable surface.
- 6. Turn the thumbscrew on the front of the controller module anti-clockwise and open the controller module

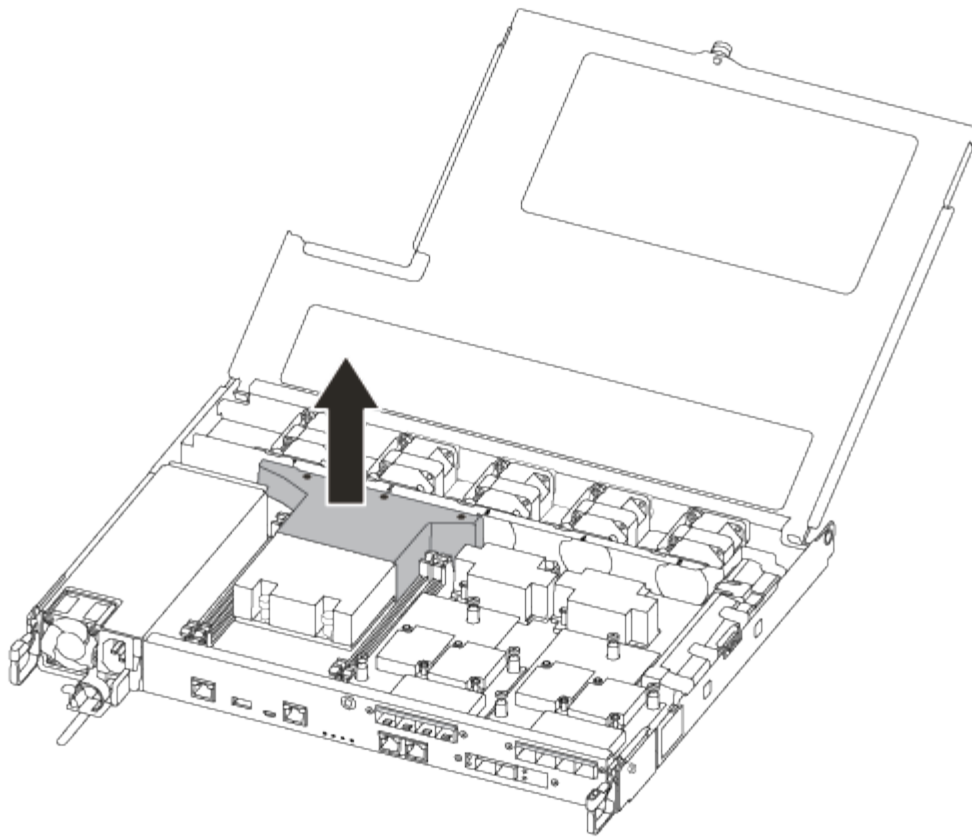


cover.



|   |                          |
|---|--------------------------|
| 1 | Thumbscrew               |
| 2 | Controller module cover. |

7. Lift out the air duct cover.



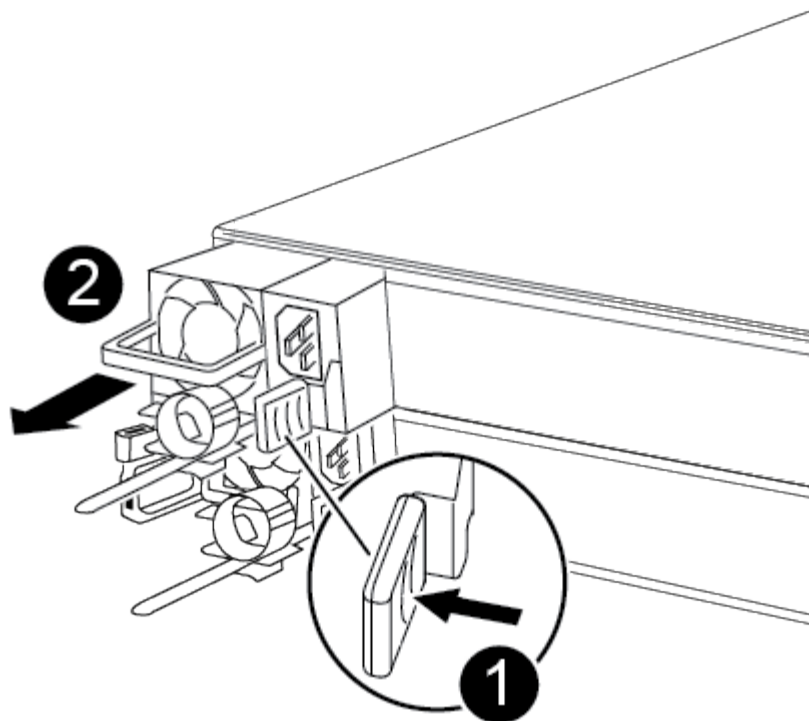
## Step 2: Move the power supply

You must move the power supply from the impaired controller module to the replacement controller module when you replace a controller module.

1. Disconnect the power supply.
2. Open the power cable retainer, and then unplug the power cable from the power supply.
3. Unplug the power cable from the power source.
4. Rotate the cam handle such that it can be used to pull power supply out of the controller module while pressing the locking tab.



Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.



|   |                               |
|---|-------------------------------|
| 1 | Blue power supply locking tab |
| 2 | Power supply                  |

5. Move the power supply to the new controller module, and then install it.
6. Using both hands, support and align the edges of the power supply with the opening in the controller module, and then gently push the power supply into the controller module until the locking tab clicks into place.

The power supplies will only properly engage with the internal connector and lock in place one way.



To avoid damaging the internal connector, do not use excessive force when sliding the power supply into the system.

### Step 3: Move the fans

You must move the fans from the impaired controller module to the replacement module when replacing a failed controller module.

1. Remove the fan module by pinching the side of the fan module, and then lifting the fan module straight out of the controller module.



1

Fan module

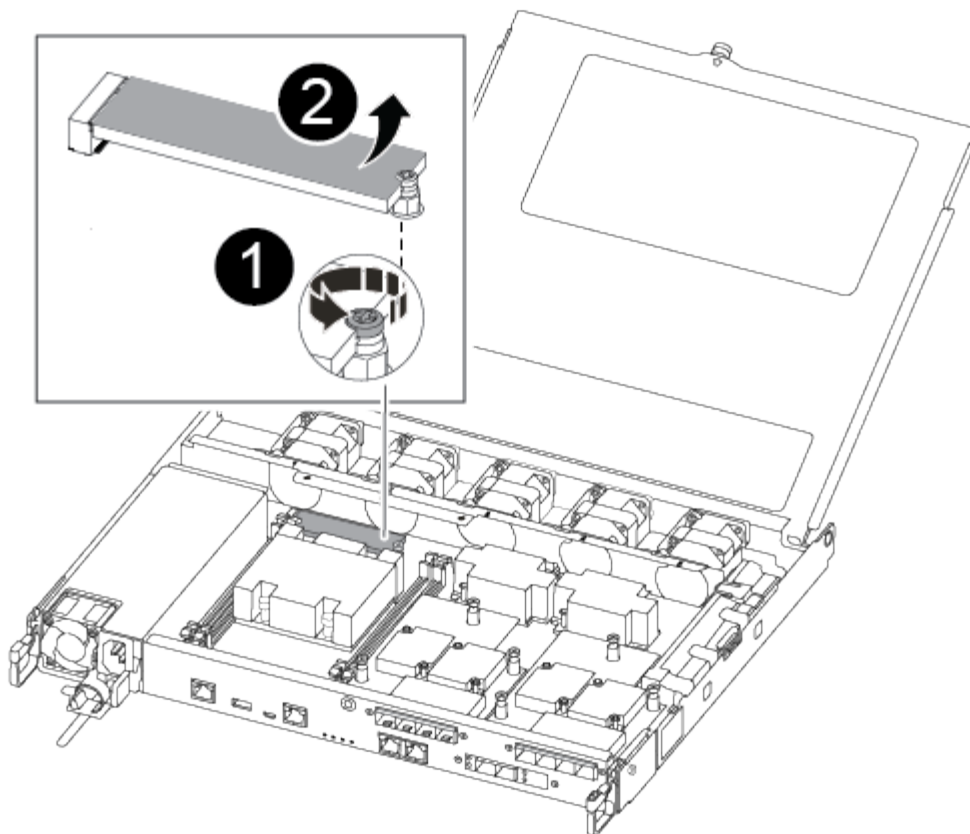
2. Move the fan module to the replacement controller module, and align the edges of the fan module with the opening in the controller module, and then slide the fan module in.
3. Repeat these steps for the remaining fan modules.

#### Step 4: Move the boot media

There is one boot media device in the AFF A250 under the air duct in the controller module. You must move it from the impaired controller module to the replacement controller module.

You need a #1 magnetic Phillips head screwdriver to remove the screw that holds the boot media in place. Due to the space constraints within the controller module, you should also have a magnet to transfer the screw on to so that you do not lose it.

1. Locate and move the boot media from the impaired controller module to the replacement controller module.



|   |                                                                                                |
|---|------------------------------------------------------------------------------------------------|
| 1 | Remove the screw securing the boot media to the motherboard in the impaired controller module. |
| 2 | Lift the boot media out of the impaired controller module.                                     |

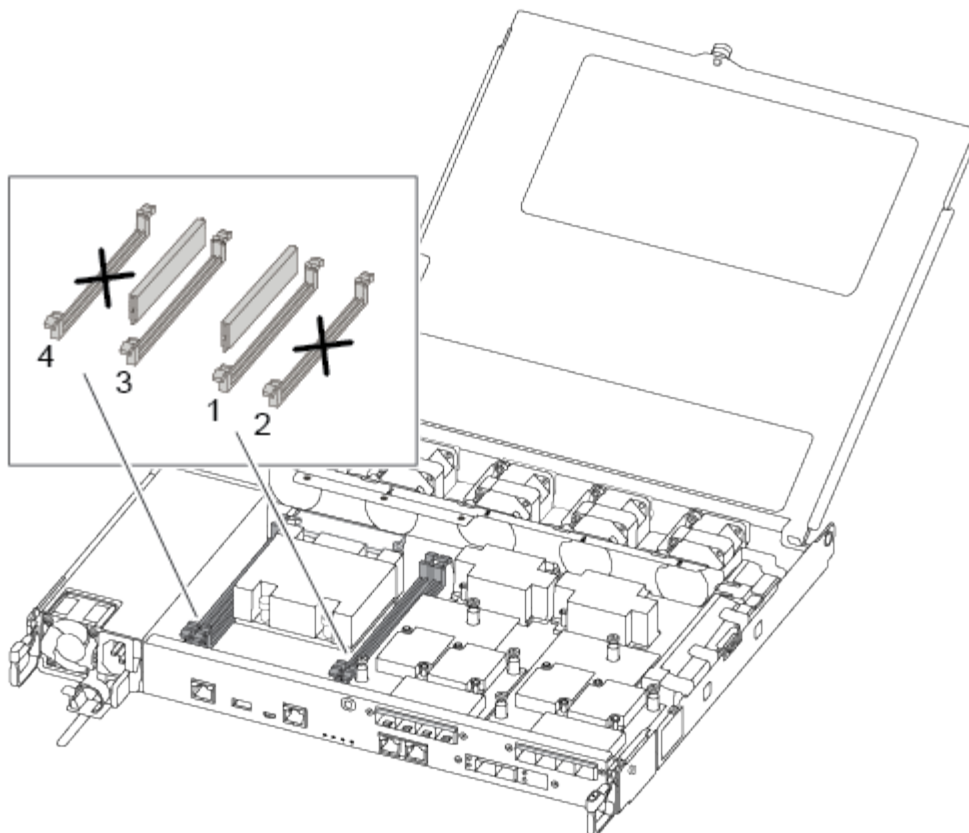
- Using the #1 magnetic screwdriver, remove the screw from the boot media, and set it aside safely on the magnet.
- Gently lift the boot media directly out of the socket and align it into place in the replacement controller module.
- Using the #1 magnetic screwdriver, insert and tighten the screw on the boot media.



Do not apply force when tightening the screw on the boot media; you might crack it.

### Step 5: Move the DIMMs

To move the DIMMs, locate and move them from the impaired controller into the replacement controller and follow the specific sequence of steps.



Install each DIMM into the same slot it occupied in the impaired controller module.

1. Slowly push apart the DIMM ejector tabs on either side of the DIMM, and slide the DIMM out of the slot.



Hold the DIMM by the edges to avoid pressure on the components on the DIMM circuit board.

2. Locate the corresponding DIMM slot on the replacement controller module.
3. Make sure that the DIMM ejector tabs on the DIMM socket are in the open position, and then insert the DIMM squarely into the socket.

The DIMMs fit tightly in the socket. If not, reinsert the DIMM to realign it with the socket.

4. Visually inspect the DIMM to verify that it is evenly aligned and fully inserted into the socket.
5. Repeat these steps for the remaining DIMM.

### Step 6: Move a mezzanine card

To move a mezzanine card, you must remove the cabling and any QSFPs and SFPs from the ports, move the mezzanine card to the replacement controller, reinstall any QSFPs and SFPs onto the ports, and cable the ports.

1. Locate and move the mezzanine cards from your impaired controller module.



|   |                                                     |
|---|-----------------------------------------------------|
| 1 | Remove screws on the face of the controller module. |
| 2 | Loosen the screw in the controller module.          |
| 3 | Move the mezzanine card.                            |

## 2. Unplug any cabling associated with the mezzanine card.

Make sure that you label the cables so that you know where they came from.

- Remove any SFP or QSFP modules that might be in the mezzanine card and set it aside.
- Using the #1 magnetic screwdriver, remove the screws from the face of the impaired controller module and from the mezzanine card, and set them aside safely on the magnet.
- Gently lift the mezzanine card out of the socket and move it to the same position in the replacement controller.
- Gently align the mezzanine card into place in the replacement controller.
- Using the #1 magnetic screwdriver, insert and tighten the screws on the face of the replacement controller module and on the mezzanine card.



Do not apply force when tightening the screw on the mezzanine card; you might crack it.

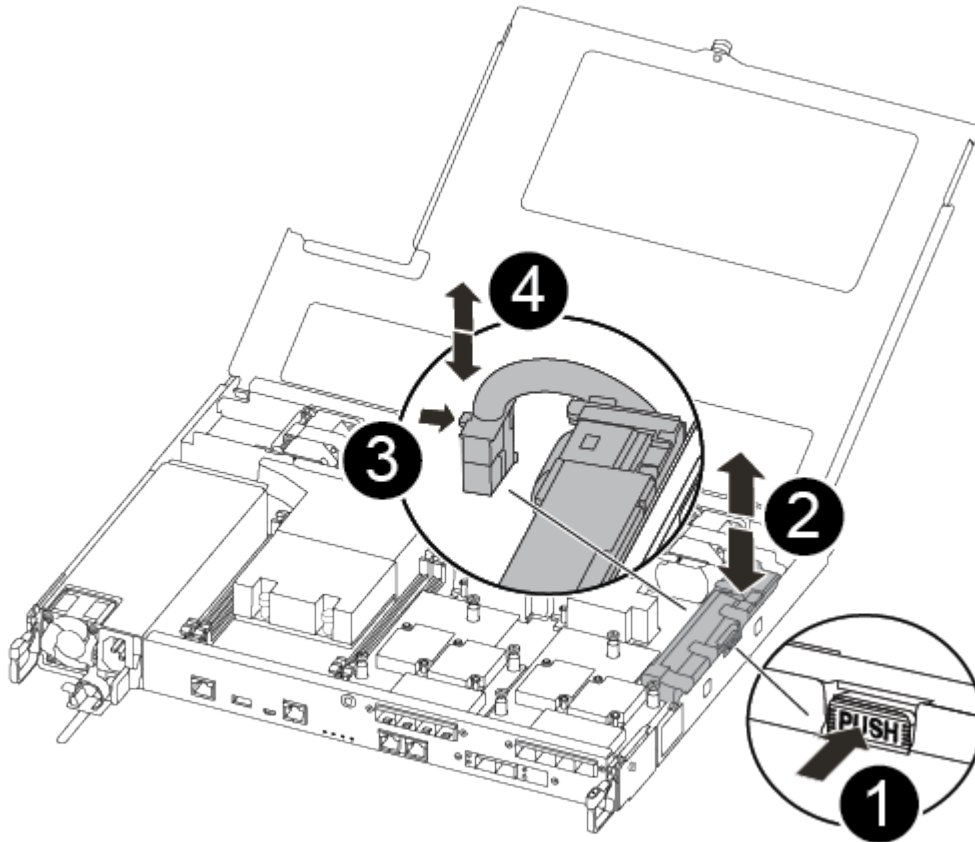
## 3. Repeat these steps if there is another mezzanine card in the impaired controller module.

4. Insert the SFP or QSFP modules that were removed onto the mezzanine card.

### Step 7: Move the NV battery

When replacing the controller module, you must move the NV battery from the impaired controller module to the replacement controller module.

1. Locate and move the NVMEM battery from your impaired controller module to the replacement controller module.



|   |                                                               |
|---|---------------------------------------------------------------|
| 1 | Squeeze the clip on the face of the battery plug.             |
| 2 | Unplug the battery cable from the socket.                     |
| 3 | Grasp the battery and press the blue locking tab marked PUSH. |
| 4 | Lift the battery out of the holder and controller module.     |

2. Locate the battery plug and squeeze the clip on the face of the battery plug to release the plug from the socket.
3. Grasp the battery and press the blue locking tab marked PUSH, and then lift the battery out of the holder and controller module.



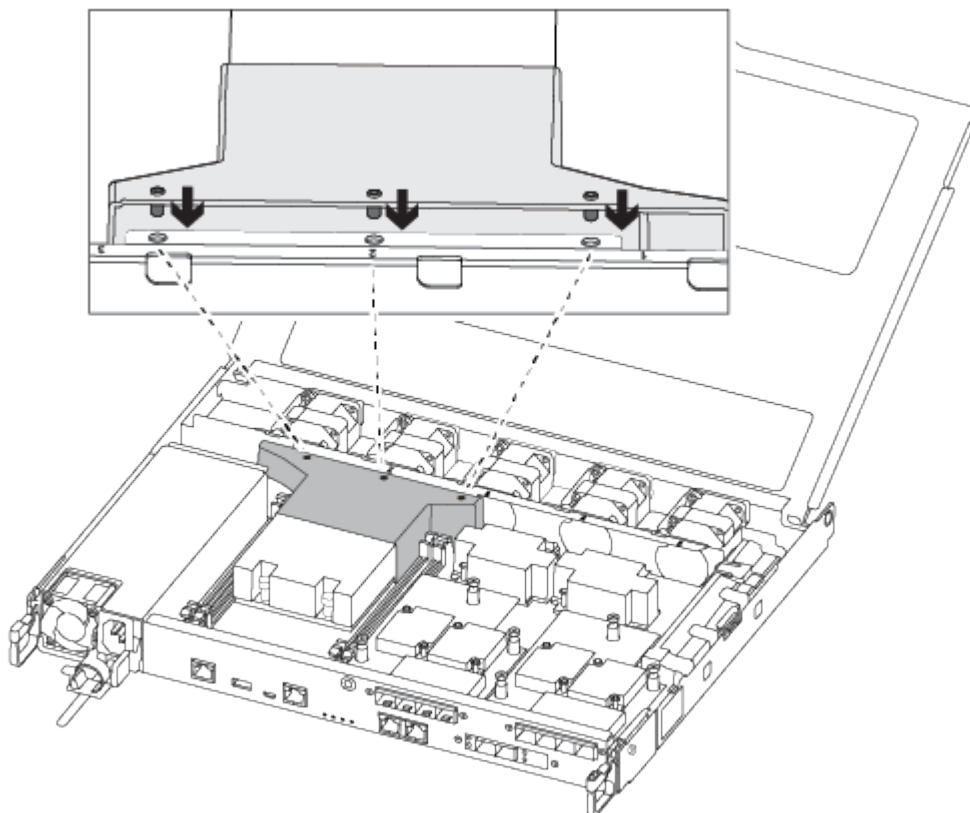
4. Locate the corresponding NV battery holder on the replacement controller module and align the NV battery to the battery holder.
5. Insert the NV battery plug into the socket.
6. Slide the battery pack down along the sheet metal side wall until the support tabs on the side wall hook into the slots on the battery pack, and the battery pack latch engages and clicks into the opening on the side wall.
7. Press firmly down on the battery pack to make sure that it is locked into place.

### Step 8: Install the controller module

After all of the components have been moved from the impaired controller module to the replacement controller module, you must install the replacement controller module into the chassis, and then boot it to Maintenance mode.

You can use the following illustration or the written steps to install the replacement controller module in the chassis.

1. If you have not already done so, install the air duct.



2. Close the controller module cover and tighten the thumbscrew.



|   |                         |
|---|-------------------------|
| 1 | Controller module cover |
| 2 | Thumbscrew              |

- Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.



Do not completely insert the controller module in the chassis until instructed to do so.

- Cable the management and console ports only, so that you can access the system to perform the tasks in the following sections.



You will connect the rest of the cables to the controller module later in this procedure.

- Insert the controller module into the chassis.
- Ensure the latching mechanism arms are locked in the fully extended position.
- Using both hands, align and gently slide the controller module into the latching mechanism arms until it stops.
- Place your index fingers through the finger holes from the inside of the latching mechanism.
- Press your thumbs down on the orange tabs on top of the latching mechanism and gently push the controller module over the stop.
- Release your thumbs from the top of the latching mechanisms and continue pushing until the latching

mechanisms snap into place.

The controller module begins to boot as soon as it is fully seated in the chassis. Be prepared to interrupt the boot process.

The controller module should be fully inserted and flush with the edges of the chassis.

## Restore and verify the system configuration - FAS500f

After completing the hardware replacement and booting to Maintenance mode, you verify the low-level system configuration of the replacement controller and reconfigure system settings as necessary.

### Step 1: Set and verify system time after replacing the controller

You should check the time and date on the replacement controller module against the healthy controller module in an HA pair, or against a reliable time server in a stand-alone configuration. If the time and date do not match, you must reset them on the replacement controller module to prevent possible outages on clients due to time differences.

#### About this task

It is important that you apply the commands in the steps on the correct systems:

- The *replacement* node is the new node that replaced the impaired node as part of this procedure.
- The *healthy* node is the HA partner of the *replacement* node.

#### Steps

1. If the *replacement* node is not at the LOADER prompt, halt the system to the LOADER prompt.
2. On the *healthy* node, check the system time: `cluster date show`

The date and time are based on the configured timezone.

3. At the LOADER prompt, check the date and time on the *replacement* node: `show date`

The date and time are given in GMT.

4. If necessary, set the date in GMT on the replacement node: `set date mm/dd/yyyy`
5. If necessary, set the time in GMT on the replacement node: `set time hh:mm:ss`
6. At the LOADER prompt, confirm the date and time on the *replacement* node: `show date`

The date and time are given in GMT.

### Step 2: Verify and set the HA state of the chassis

You must verify the HA state of the controller module and, if necessary, update the state to match your system configuration.

1. In Maintenance mode from the new controller module, verify that all components display the same HA state: `ha-config show`

The HA state should be the same for all components.

2. If the displayed system state of the controller module does not match your system configuration, set the HA state for the controller module: `ha-config modify controller ha-state`

The value for HA-state can be one of the following:

- ha
  - mcc
  - mccip
  - non-ha
3. If the displayed system state of the controller module does not match your system configuration, set the HA state for the controller module: `ha-config modify controller ha-state`
  4. Confirm that the setting has changed: `ha-config show`

### Recable the system and reassign disks - FAS500f

Continue the replacement procedure by recabling the storage and confirming disk reassignment.

#### Step 1: Recable the system

Recable the controller module's storage and network connections.

##### Steps

1. Recable the the controller module to storage and network connections.
2. Verify that the cabling is correct by using [Active IQ Config Advisor](#).
  - a. Download and install Config Advisor.
  - b. Enter the information for the target system, and then click Collect Data.
  - c. Click the Cabling tab, and then examine the output. Make sure that all disk shelves are displayed and all disks appear in the output, correcting any cabling issues you find.
  - d. Check other cabling by clicking the appropriate tab, and then examining the output from Config Advisor.

#### Step 2: Reassign disks

If the storage system is in an HA pair, the system ID of the new controller module is automatically assigned to the disks when the giveback occurs at the end of the procedure. You must confirm the system ID change when you boot the *replacement* controller and then verify that the change was implemented.

This procedure applies only to systems running ONTAP in an HA pair.

1. If the *replacement* controller is in Maintenance mode (showing the `*>` prompt, exit Maintenance mode and go to the LOADER prompt: `halt`
2. From the LOADER prompt on the *replacement* controller, boot the controller, entering `y` if you are prompted to override the system ID due to a system ID mismatch:
3. Wait until the `Waiting for giveback...` message is displayed on the *replacement* controller console and then, from the healthy controller, verify that the new partner system ID has been automatically assigned:  
`storage failover show`

In the command output, you should see a message that the system ID has changed on the impaired controller, showing the correct old and new IDs. In the following example, node2 has undergone replacement and has a new system ID of 151759706.

```
node1> `storage failover show`
```

| Node  | Partner | Takeover<br>Possible | State Description                                               |
|-------|---------|----------------------|-----------------------------------------------------------------|
| ----- | -----   | -----                |                                                                 |
| node1 | node2   | false                | System ID changed on partner (Old: 151759706), In takeover      |
| node2 | node1   | -                    | 151759755, New: 151759706), Waiting for giveback (HA mailboxes) |

4. From the healthy controller, verify that any coredumps are saved:

- a. Change to the advanced privilege level: `set -privilege advanced`

You can respond `y` when prompted to continue into advanced mode. The advanced mode prompt appears (`*>`).

- b. Save any coredumps: `system node run -node local-node-name partner savecore`

- c. Wait for the `savecore` command to complete before issuing the giveback.

You can enter the following command to monitor the progress of the `savecore` command: `system node run -node local-node-name partner savecore -s`

- d. Return to the admin privilege level: `set -privilege admin`

5. If your storage system has Storage or Volume Encryption configured, you must restore Storage or Volume Encryption functionality by using one of the following procedures, depending on whether you are using onboard or external key management:

- [Restore onboard key management encryption keys](#)
- [Restore external key management encryption keys](#)

6. Give back the controller:

- a. From the healthy controller, give back the replaced controller's storage: `storage failover giveback -ofnode replacement_node_name`

The *replacement* controller takes back its storage and completes booting.

If you are prompted to override the system ID due to a system ID mismatch, you should enter `y`.



If the giveback is vetoed, you can consider overriding the vetoes.

[Find the High-Availability Configuration content for your version of ONTAP 9](#)

- b. After the giveback has been completed, confirm that the HA pair is healthy and that takeover is possible: `storage failover show`

The output from the `storage failover show` command should not include the System ID changed on partner message.

7. Verify that the disks were assigned correctly: `storage disk show -ownership`

The disks belonging to the *replacement* controller should show the new system ID. In the following example, the disks owned by node1 now show the new system ID, 1873775277:

```
node1> `storage disk show -ownership`

Disk Aggregate Home Owner DR Home Home ID Owner ID DR Home ID
Reserver Pool

1.0.0 aggr0_1 node1 node1 - 1873775277 1873775277 -
1873775277 Pool0
1.0.1 aggr0_1 node1 node1 1873775277 1873775277 -
1873775277 Pool0
.
.
.
```

8. If the system is in a MetroCluster configuration, monitor the status of the controller: `metrocluster node show`

The MetroCluster configuration takes a few minutes after the replacement to return to a normal state, at which time each controller will show a configured state, with DR Mirroring enabled and a mode of normal. The `metrocluster node show -fields node-systemid` command output displays the old system ID until the MetroCluster configuration returns to a normal state.

9. If the controller is in a MetroCluster configuration, depending on the MetroCluster state, verify that the DR home ID field shows the original owner of the disk if the original owner is a controller on the disaster site.

This is required if both of the following are true:

- The MetroCluster configuration is in a switchover state.
- The *replacement* controller is the current owner of the disks on the disaster site.

[Disk ownership changes during HA takeover and MetroCluster switchover in a four-node MetroCluster configuration](#)

10. If your system is in a MetroCluster configuration, verify that each controller is configured: `metrocluster node show - fields configuration-state`

```
node1_siteA::> metrocluster node show -fields configuration-state
```

| dr-group-id   | cluster node | configuration-state |
|---------------|--------------|---------------------|
| -----         | -----        | -----               |
| 1 node1_siteA | node1mcc-001 | configured          |
| 1 node1_siteA | node1mcc-002 | configured          |
| 1 node1_siteB | node1mcc-003 | configured          |
| 1 node1_siteB | node1mcc-004 | configured          |

4 entries were displayed.

11. Verify that the expected volumes are present for each controller: `vol show -node node-name`
12. If you disabled automatic takeover on reboot, enable it from the healthy controller: `storage failover modify -node replacement-node-name -onreboot true`

### Complete system restoration - FAS500f

To restore your system to full operation, you must restore the NetApp Storage Encryption configuration (if necessary), and install licenses for the new controller, and return the failed part to NetApp, as described in the RMA instructions shipped with the kit.

### Step 1: Install licenses for the replacement controller in ONTAP

You must install new licenses for the *replacement* node if the impaired node was using ONTAP features that require a standard (node-locked) license. For features with standard licenses, each node in the cluster should have its own key for the feature.

#### About this task

Until you install license keys, features requiring standard licenses continue to be available to the *replacement* node. However, if the impaired node was the only node in the cluster with a license for the feature, no configuration changes to the feature are allowed. Also, using unlicensed features on the node might put you out of compliance with your license agreement, so you should install the replacement license key or keys on the *replacement* node as soon as possible.

#### Before you begin

The licenses keys must be in the 28-character format.

You have a 90-day grace period in which to install the license keys. After the grace period, all old licenses are invalidated. After a valid license key is installed, you have 24 hours to install all of the keys before the grace period ends.

#### Steps

1. If you need new license keys, obtain replacement license keys on the [NetApp Support Site](#) in the My Support section under Software licenses.



The new license keys that you require are automatically generated and sent to the email address on file. If you fail to receive the email with the license keys within 30 days, you should contact technical support.

2. Install each license key: `system license add -license-code license-key, license-key...`
3. Remove the old licenses, if desired:
  - a. Check for unused licenses: `license clean-up -unused -simulate`
  - b. If the list looks correct, remove the unused licenses: `license clean-up -unused`

## Step 2: Verify LIFs and registering the serial number

Before returning the *replacement* node to service, you should verify that the LIFs are on their home ports, and register the serial number of the *replacement* node if AutoSupport is enabled, and reset automatic giveback.

### Steps

1. Verify that the logical interfaces are reporting to their home server and ports: `network interface show -is-home false`  
  
If any LIFs are listed as false, revert them to their home ports: `network interface revert -vserver * -lif *`
2. Register the system serial number with NetApp Support.
  - If AutoSupport is enabled, send an AutoSupport message to register the serial number.
  - If AutoSupport is not enabled, call [NetApp Support](#) to register the serial number.
3. If an AutoSupport maintenance window was triggered, end it by using the `system node autosupport invoke -node * -type all -message MAINT=END` command.
4. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`

## Step 3: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

### Replace a DIMM - FAS500f

You must replace a DIMM in the controller module when your system registers an increasing number of correctable error correction codes (ECC); failure to do so causes a system panic.

All other components in the system must be functioning properly; if not, you must contact technical support.

You must replace the failed component with a replacement FRU component you received from your provider.

### Step 1: Shut down the impaired controller

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.



About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced mode`) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:  
`system node autosupport invoke -node * -type all -message MAINT=<# of hours>h`

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`



When you see *Do you want to disable auto-giveback?*, enter *y*.

3. Take the impaired controller to the LOADER prompt:

| If the impaired controller is displaying... | Then...                                                                                                                                                                                                                                                      |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                           | Go to the next step.                                                                                                                                                                                                                                         |
| Waiting for giveback...                     | Press Ctrl-C, and then respond <i>y</i> when prompted.                                                                                                                                                                                                       |
| System prompt or password prompt            | Take over or halt the impaired controller from the healthy controller:<br><code>storage failover takeover -ofnode<br/>impaired_node_name</code><br><br>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i> . |

Step 2: Remove the controller module

You must remove the controller module from the chassis when you replace a component inside the controller module.

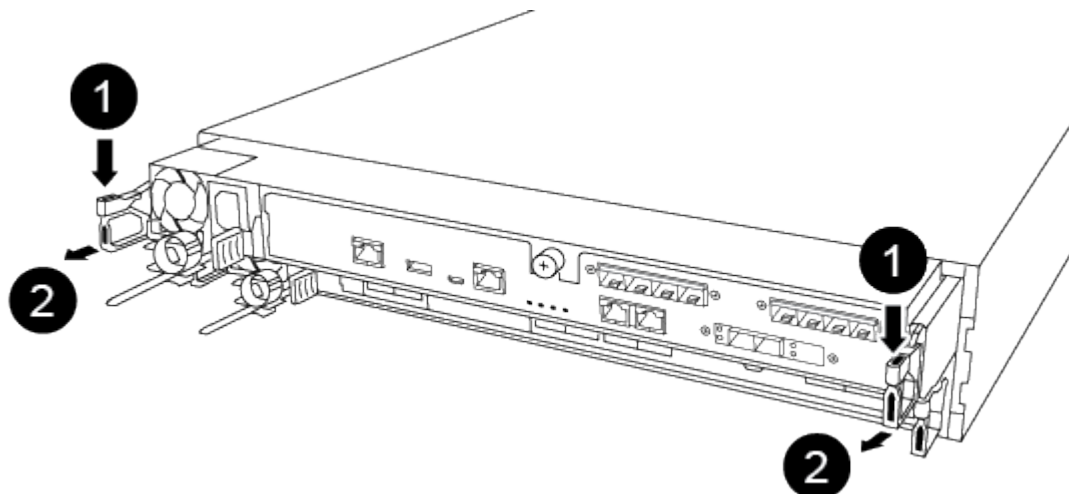
Make sure that you label the cables so that you know where they came from.

1. If you are not already grounded, properly ground yourself.
2. Unplug the controller module power supplies from the source.

3. Release the power cable retainers, and then unplug the cables from the power supplies.
4. Insert your forefinger into the latching mechanism on either side of the controller module, press the lever with your thumb, and gently pull the controller a few inches out of the chassis.

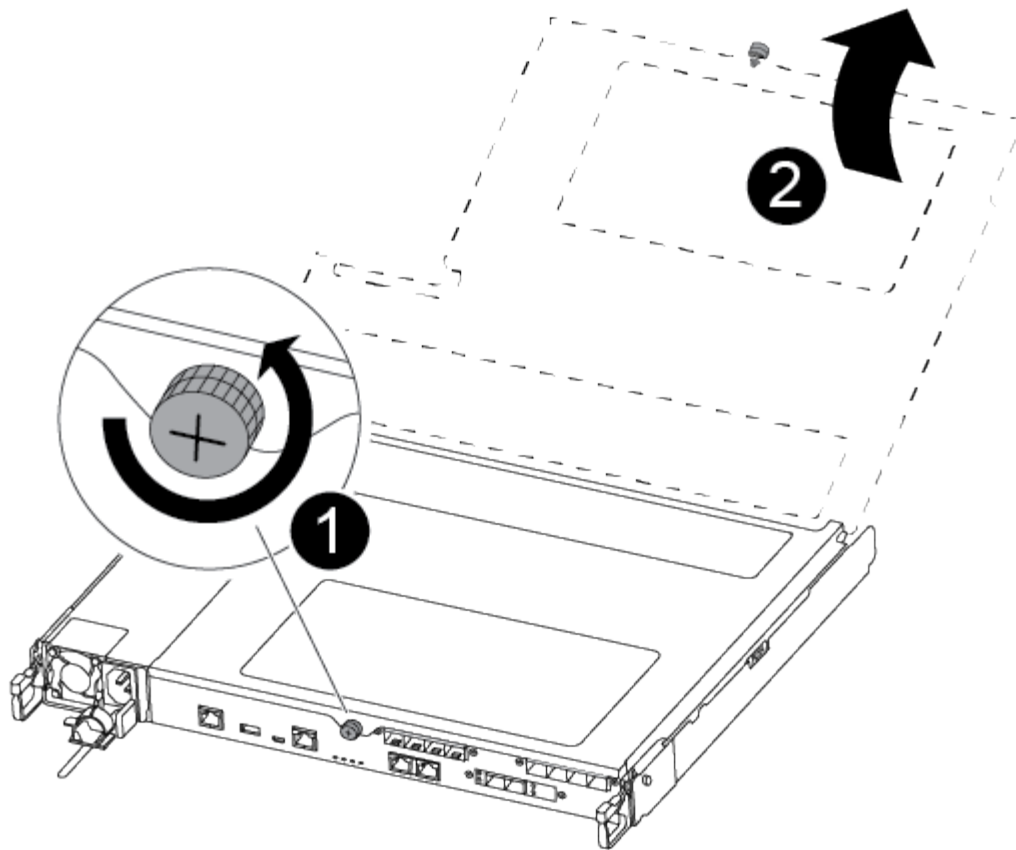


If you have difficulty removing the controller module, place your index fingers through the finger holes from the inside (by crossing your arms).



|   |                    |
|---|--------------------|
| 1 | Lever              |
| 2 | Latching mechanism |

5. Using both hands, grasp the controller module sides and gently pull it out of the chassis and set it on a flat, stable surface.
6. Turn the thumbscrew on the front of the controller module anti-clockwise and open the controller module cover.



|   |                          |
|---|--------------------------|
| 1 | Thumbscrew               |
| 2 | Controller module cover. |

7. Lift out the air duct cover.



### Step 3: Replace a DIMM

To replace a DIMM, you must locate it in the controller module using the DIMM map label on top of the air duct and then replace it following the specific sequence of steps.

You can use the following video or the tabulated steps to replace a DIMM:

#### [Animation - Replace a DIMM](#)

1. Replace the impaired DIMM on your controller module.

The DIMMs are in slot 3 or 1 on the motherboard. Slot 2 and 4 are left empty. Do not attempt to install DIMMs into these slots.



2. Note the orientation of the DIMM in the socket so that you can insert the replacement DIMM in the proper orientation.
3. Slowly push apart the DIMM ejector tabs on either side of the DIMM, and slide the DIMM out of the slot.
4. Leave DIMM ejector tabs on the connector in the open position.
5. Remove the replacement DIMM from the antistatic shipping bag, hold the DIMM by the corners, and align it to the slot.



Hold the DIMM by the edges to avoid pressure on the components on the DIMM circuit board.

6. Insert the replacement DIMM squarely into the slot.

The DIMMs fit tightly in the socket. If not, reinsert the DIMM to realign it with the socket.

7. Visually inspect the DIMM to verify that it is evenly aligned and fully inserted into the socket.

#### Step 4: Install the controller module

After you have replaced the component in the controller module, you must reinstall the controller module into the chassis.

You can use the following illustration or the written steps to install the replacement controller module in the chassis.

1. If you have not already done so, install the air duct.



2. Close the controller module cover and tighten the thumbscrew.



|   |                         |
|---|-------------------------|
| 1 | Controller module cover |
| 2 | Thumbscrew              |

3. Insert the controller module into the chassis:

- a. Ensure the latching mechanism arms are locked in the fully extended position.
- b. Using both hands, align and gently slide the controller module into the latching mechanism arms until it stops.
- c. Place your index fingers through the finger holes from the inside of the latching mechanism.
- d. Press your thumbs down on the orange tabs on top of the latching mechanism and gently push the controller module over the stop.
- e. Release your thumbs from the top of the latching mechanisms and continue pushing until the latching mechanisms snap into place.

The controller module begins to boot as soon as it is fully seated in the chassis.

The controller module should be fully inserted and flush with the edges of the chassis.

4. Cable the management and console ports only, so that you can access the system to perform the tasks in the following sections.



You will connect the rest of the cables to the controller module later in this procedure.

#### Step 5: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

#### Replace SSD Drive or HDD Drive - AFF C190

You can replace a failed drive nondisruptively while I/O is in progress. The procedure for replacing an SSD is meant for non-spinning drives and the procedure for replacing an HDD is meant for spinning drives.

When a drive fails, the platform logs a warning message to the system console indicating which drive has failed. In addition, both the fault LED on the operator display panel and the fault LED on the failed drive are illuminated.

#### Before you begin

- Follow best practice and install the current version of the Disk Qualification Package (DQP) before replacing a drive.
- Identify the failed drive by running the `storage disk show -broken` command from the system console.

The failed drive appears in the list of failed drives. If it does not, you should wait, and then run the command again.



Depending on the type and capacity, it can take up to several hours for the drive to appear in the list of failed drives.

- Determine whether SED authentication is enabled.

How you replace the drive depends on how the drive is being used. If SED authentication is enabled, you must use the SED replacement instructions in the [ONTAP 9 NetApp Encryption Power Guide](#). These Instructions describe additional steps you must perform before and after replacing an SED.

- Make sure the replacement drive is supported by your platform. See the [NetApp Hardware Universe](#).
- Make sure all other components in the system are functioning properly; if not, you must contact technical support.

#### **About this task**

- Drive firmware is automatically updated (nondisruptively) on new drives that have non current firmware versions.
- When replacing a drive, you must wait one minute between the removal of the failed drive and the insertion of the replacement drive to allow the storage system to recognize the existence of the new drive.



## Option 1: Replace SSD

### Steps

1. If you want to manually assign drive ownership for the replacement drive, you need to disable automatic drive assignment replacement drive, if it is enabled



You manually assign drive ownership and then reenable automatic drive assignment later in this procedure.

- a. Verify whether automatic drive assignment is enabled: `storage disk option show`

You can enter the command on either controller module.

If automatic drive assignment is enabled, the output shows `on` in the “Auto Assign” column (for each controller module).

- b. If automatic drive assignment is enabled, disable it: `storage disk option modify -node node_name -autoassign off`

You must disable automatic drive assignment on both controller modules.

2. Properly ground yourself.
3. Physically identify the failed drive.

When a drive fails, the system logs a warning message to the system console indicating which drive failed. Additionally, the attention (amber) LED on the drive shelf operator display panel and the failed drive illuminate.



The activity (green) LED on a failed drive can be illuminated (solid), which indicates that the drive has power, but should not be blinking, which indicates I/O activity. A failed drive has no I/O activity.

4. Remove the failed drive:
  - a. Press the release button on the drive face to open the cam handle.
  - b. Slide the drive out of the shelf using the cam handle and supporting the drive with your other hand.

5. Wait a minimum of 70 seconds before inserting the replacement drive.

This allows the system to recognize that a drive was removed.

6. Insert the replacement drive:
  - a. With the cam handle in the open position, use both hands to insert the replacement drive.
  - b. Push until the drive stops.
  - c. Close the cam handle so that the drive is fully seated into the midplane and the handle clicks into place.

Be sure to close the cam handle slowly so that it aligns correctly with the face of the drive.

7. Verify that the drive's activity (green) LED is illuminated.

When the drive's activity LED is solid, it means that the drive has power. When the drive's activity LED is blinking, it means that the drive has power and I/O is in progress. If the drive firmware is automatically updating, the LED blinks.

8. If you are replacing another drive, repeat Steps 3 through 7.
9. If you disabled automatic drive assignment in Step 1, then, manually assign drive ownership and then reenables automatic drive assignment if needed.

- a. Display all unowned drives: `storage disk show -container-type unassigned`

You can enter the command on either controller module.

- b. Assign each drive: `storage disk assign -disk disk_name -owner node_name`

You can enter the command on either controller module.

You can use the wildcard character to assign more than one drive at once.

- c. Reenable automatic drive assignment if needed: `storage disk option modify -node node_name -autoassign on`

You must reenables automatic drive assignment on both controller modules.

10. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit.

Contact technical support at [NetApp Support](#), 888-463-8277 (North America), 00-800-44-638277 (Europe), or +800-800-80-800 (Asia/Pacific) if you need the RMA number or additional help with the replacement procedure.

## Option 2: Replace HDD

1. If you want to manually assign drive ownership for the replacement drive, you need to disable automatic drive assignment replacement drive, if it is enabled



You manually assign drive ownership and then reenables automatic drive assignment later in this procedure.

- a. Verify whether automatic drive assignment is enabled: `storage disk option show`

You can enter the command on either controller module.

If automatic drive assignment is enabled, the output shows `on` in the "Auto Assign" column (for each controller module).

- b. If automatic drive assignment is enabled, disable it: `storage disk option modify -node node_name -autoassign off`

You must disable automatic drive assignment on both controller modules.

2. Properly ground yourself.
3. Gently remove the bezel from the front of the platform.
4. Identify the failed disk drive from the system console warning message and the illuminated fault LED on the disk drive

5. Press the release button on the disk drive face.

Depending on the storage system, the disk drives have the release button located at the top or on the left of the disk drive face.

For example, the following illustration shows a disk drive with the release button located on the top of the disk drive face:

The cam handle on the disk drive springs open partially and the disk drive releases from the midplane.

6. Pull the cam handle to its fully open position to unseat the disk drive from the midplane.

7. Slide out the disk drive slightly and allow the disk to safely spin down, which can take less than one minute, and then, using both hands, remove the disk drive from the disk shelf.

8. With the cam handle in the open position, insert the replacement disk drive into the drive bay, firmly pushing until the disk drive stops.



Wait a minimum of 10 seconds before inserting a new disk drive. This allows the system to recognize that a disk drive was removed.



If your platform drive bays are not fully loaded with drives, it is important to place the replacement drive into the same drive bay from which you removed the failed drive.



Use two hands when inserting the disk drive, but do not place hands on the disk drive boards that are exposed on the underside of the disk carrier.

9. Close the cam handle so that the disk drive is fully seated into the midplane and the handle clicks into place.

Be sure to close the cam handle slowly so that it aligns correctly with the face of the disk drive..

10. If you are replacing another disk drive, repeat Steps 4 through 9.

11. Reinstall the bezel.

12. If you disabled automatic drive assignment in Step 1, then, manually assign drive ownership and then reenale automatic drive assignment if needed.

- a. Display all unowned drives: `storage disk show -container-type unassigned`

You can enter the command on either controller module.

- b. Assign each drive: `storage disk assign -disk disk_name -owner owner_name`

You can enter the command on either controller module.

You can use the wildcard character to assign more than one drive at once.

- c. Reenable automatic drive assignment if needed: `storage disk option modify -node node_name -autoassign on`

You must reenable automatic drive assignment on both controller modules.

13. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit.

Contact technical support at [NetApp Support](#), 888-463-8277 (North America), 00-800-44-638277 (Europe), or +800-800-80-800 (Asia/Pacific) if you need the RMA number or additional help with the replacement procedure.

## Replace a fan — FAS500f

You replace a fan with a new fan module when it fails.

### Step 1: Shut down the impaired controller

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

#### About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced` mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

### Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:  
`system node autosupport invoke -node * -type all -message MAINT=<# of hours>h`

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:>`  
`system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`



When you see *Do you want to disable auto-giveback?*, enter `y`.

3. Take the impaired controller to the LOADER prompt:

| If the impaired controller is displaying... | Then...                                                      |
|---------------------------------------------|--------------------------------------------------------------|
| The LOADER prompt                           | Go to the next step.                                         |
| Waiting for giveback...                     | Press Ctrl-C, and then respond <code>y</code> when prompted. |

| If the impaired controller is displaying... | Then...                                                                                                                                                                                                                                                            |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| System prompt or password prompt            | Take over or halt the impaired controller from the healthy controller:<br><code>storage failover takeover -ofnode<br/>impaired_node_name</code><br><br>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <code>y</code> . |

**Step 2: Remove the controller module**

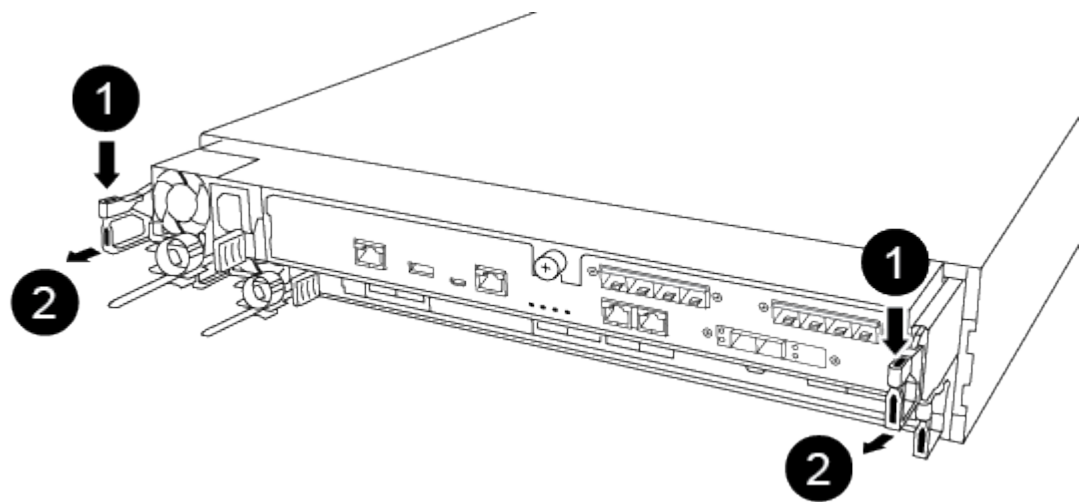
You must remove the controller module from the chassis when you replace a fan module.

Make sure that you label the cables so that you know where they came from.

1. If you are not already grounded, properly ground yourself.
2. Unplug the controller module power supplies from the source.
3. Release the power cable retainers, and then unplug the cables from the power supplies.
4. Insert your forefinger into the latching mechanism on either side of the controller module, press the lever with your thumb, and gently pull the controller a few inches out of the chassis.



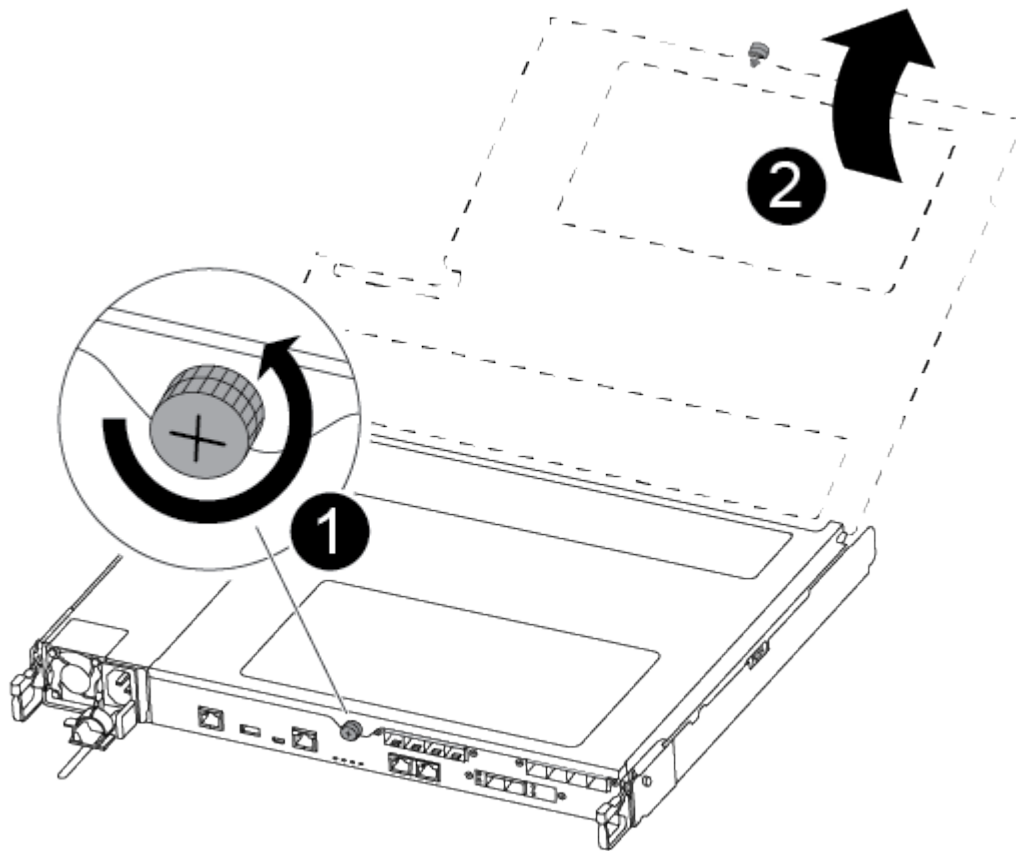
If you have difficulty removing the controller module, place your index fingers through the finger holes from the inside (by crossing your arms).



|   |                    |
|---|--------------------|
| 1 | Lever              |
| 2 | Latching mechanism |

5. Using both hands, grasp the controller module sides and gently pull it out of the chassis and set it on a flat, stable surface.
6. Turn the thumbscrew on the front of the controller module anti-clockwise and open the controller module

cover.



|   |                         |
|---|-------------------------|
| 1 | Thumbscrew              |
| 2 | Controller module cover |

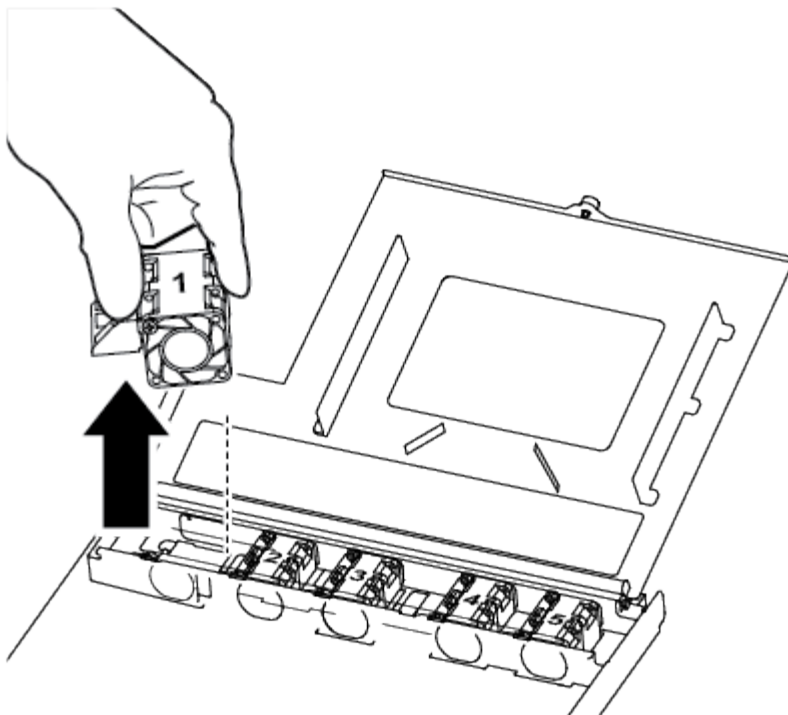
### Step 3: Replace a fan

To replace a fan, remove the failed fan module and replace it with a new fan module.

You can use the following video or the tabulated steps to replace a fan:

[Animation - Replace a fan](#)

1. Identify the fan module that you must replace by checking the console error messages or by locating the lit LED for the fan module on the motherboard.
2. Remove the fan module by pinching the side of the fan module, and then lifting the fan module straight out of the controller module.



|   |            |
|---|------------|
| 1 | Fan module |
|---|------------|

3. Align the edges of the replacement fan module with the opening in the controller module, and then slide the replacement fan module into the controller module.

#### **Step 4: Reinstall the controller module**

After you replace a component within the controller module, you must reinstall the controller module in the system chassis and boot it.

1. Close the controller module cover and tighten the thumbscrew.



|   |                         |
|---|-------------------------|
| 1 | Controller module cover |
| 2 | Thumbscrew              |

2. Insert the controller module into the chassis:

- a. Ensure the latching mechanism arms are locked in the fully extended position.
- b. Using both hands, align and gently slide the controller module into the latching mechanism arms until it stops.
- c. Place your index fingers through the finger holes from the inside of the latching mechanism.
- d. Press your thumbs down on the orange tabs on top of the latching mechanism and gently push the controller module over the stop.
- e. Release your thumbs from the top of the latching mechanisms and continue pushing until the latching mechanisms snap into place.

The controller module begins to boot as soon as it is fully seated in the chassis. Be prepared to interrupt the boot process.

The controller module should be fully inserted and flush with the edges of the chassis.

3. Recable the system, as needed.

4. Return the controller to normal operation by giving back its storage: `storage failover giveback -ofnode impaired_node_name`



5. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`

### Step 5: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

### Replace or install a mezzanine card - FAS500f

To replace a failed mezzanine card, you must remove the cables and any SFP or QSFP modules, replace the card, reinstall the SFP or QSFP modules and recable the cards. To install a new mezzanine card, you must have the appropriate cables and SFP or QSFP modules.

- You can use this procedure with all versions of ONTAP supported by your system
- All other components in the system must be functioning properly; if not, you must contact technical support.

### Step 1: Shut down the impaired controller

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

#### About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced` mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

### Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:  

```
system node autosupport invoke -node * -type all -message MAINT=<# of hours>h
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:>`

```
system node autosupport invoke -node * -type all -message MAINT=2h
```
2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`



When you see *Do you want to disable auto-giveback?*, enter *y*.

3. Take the impaired controller to the LOADER prompt:

| If the impaired controller is displaying... | Then...                                                                                                                                                                                                                                                         |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LOADER prompt                           | Go to the next step.                                                                                                                                                                                                                                            |
| Waiting for giveback...                     | Press Ctrl-C, and then respond <code>y</code> when prompted.                                                                                                                                                                                                    |
| System prompt or password prompt            | <p>Take over or halt the impaired controller from the healthy controller:</p> <pre>storage failover takeover -ofnode impaired_node_name</pre> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <code>y</code>.</p> |

**Step 2: Remove the controller module**

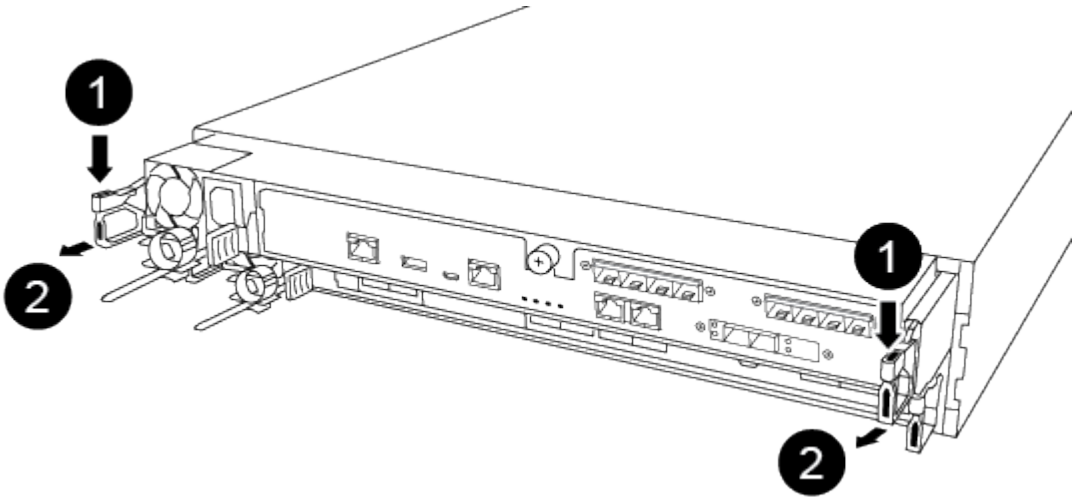
You must remove the controller module from the chassis when you replace a component inside the controller module.

Make sure that you label the cables so that you know where they came from.

1. If you are not already grounded, properly ground yourself.
2. Unplug the controller module power supplies from the source.
3. Release the power cable retainers, and then unplug the cables from the power supplies.
4. Insert your forefinger into the latching mechanism on either side of the controller module, press the lever with your thumb, and gently pull the controller a few inches out of the chassis.



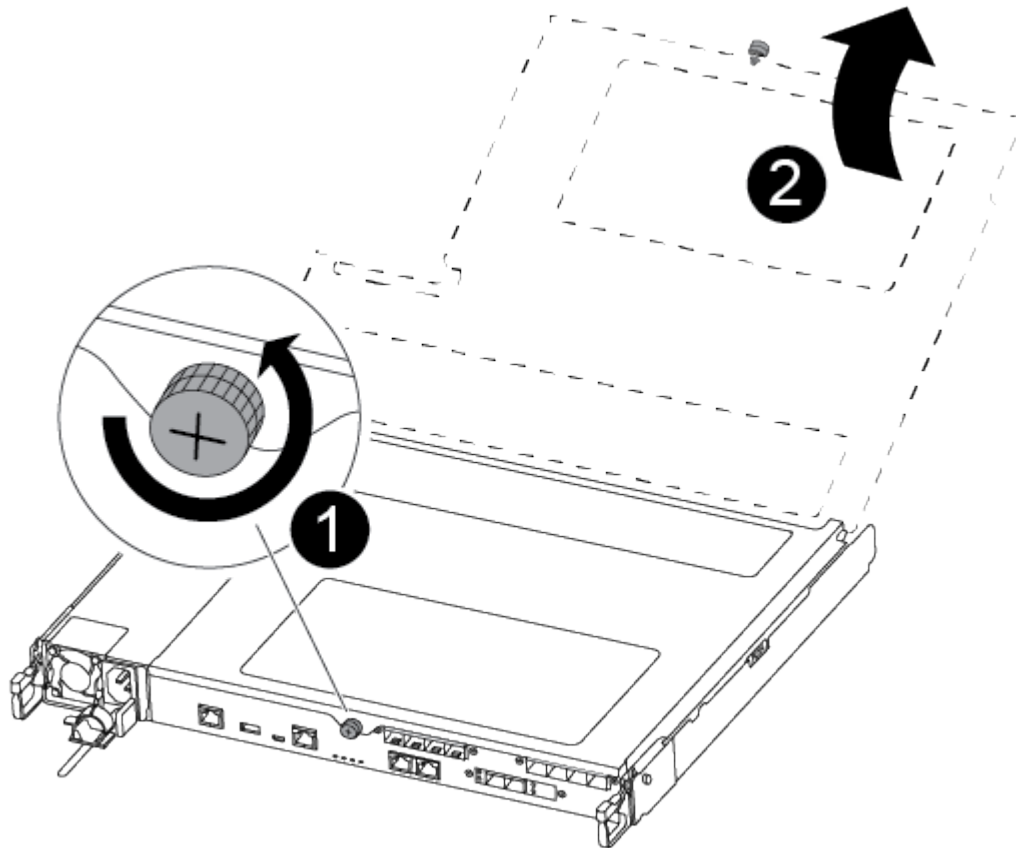
If you have difficulty removing the controller module, place your index fingers through the finger holes from the inside (by crossing your arms).



|   |       |
|---|-------|
| 1 | Lever |
|---|-------|

|   |                    |
|---|--------------------|
| 2 | Latching mechanism |
|---|--------------------|

5. Using both hands, grasp the controller module sides and gently pull it out of the chassis and set it on a flat, stable surface.
6. Turn the thumbscrew on the front of the controller module anti-clockwise and open the controller module cover.



|   |                          |
|---|--------------------------|
| 1 | Thumbscrew               |
| 2 | Controller module cover. |

### Step 3: Replace or install a mezzanine card

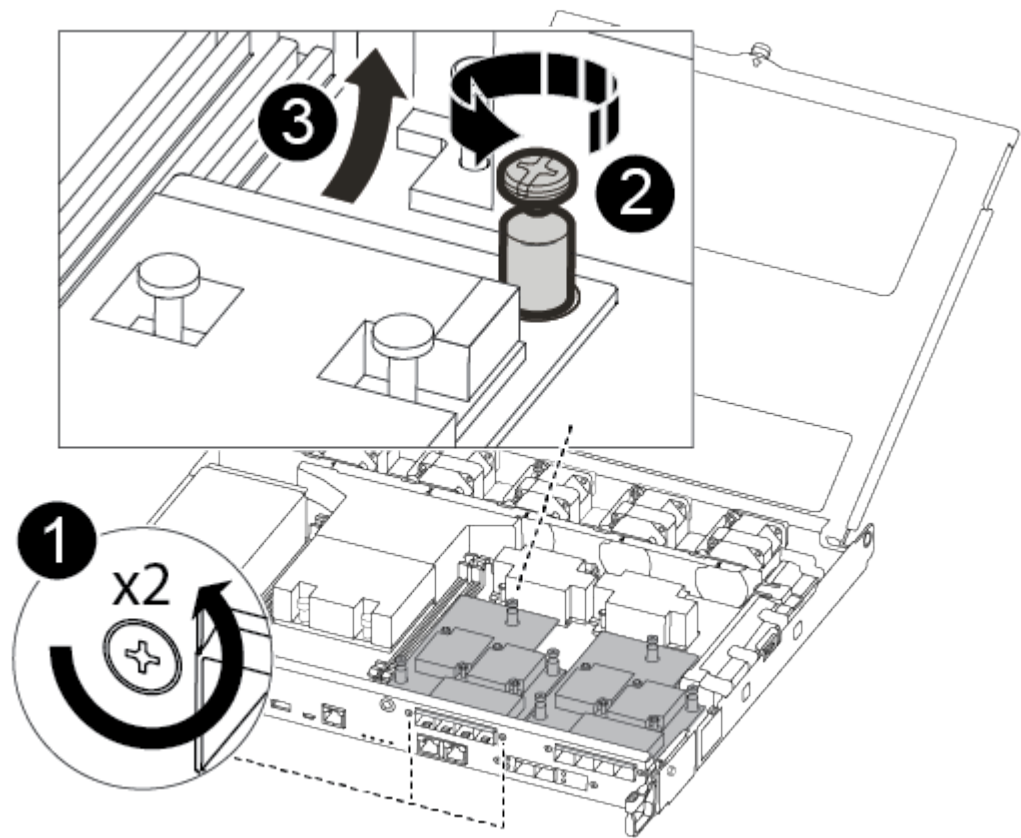
To replace a mezzanine card, you must remove the impaired card and install the replacement card; to install a mezzanine card, you must remove the faceplate and install the new card.

You can use the following video or the tabulated steps to replace a mezzanine card:

[Animation - Replace a mezzanine card](#)

**Option 1: Replace a mezzanine card:**

- 1. Locate and replace the impaired mezzanine card on your controller module.



|   |                                                     |
|---|-----------------------------------------------------|
| 1 | Remove screws on the face of the controller module. |
| 2 | Loosen the screw in the controller module.          |
| 3 | Remove the mezzanine card.                          |

- 2. Unplug any cabling associated with the impaired mezzanine card.  
Make sure that you label the cables so that you know where they came from.
- 3. Remove any SFP or QSFP modules that might be in the impaired mezzanine card and set it aside.
- 4. Using the #1 magnetic screwdriver, remove the screws from the face of the controller module and set them aside safely on the magnet.
- 5. Using the #1 magnetic screwdriver, loosen the screw on the impaired mezzanine card.
- 6. Using the #1 magnetic screwdriver, gently lift the impaired mezzanine card directly out of the socket and set it aside.
- 7. Remove the replacement mezzanine card from the antistatic shipping bag and align it to the inside face of the controller module.
- 8. Gently align the replacement mezzanine card into place.

9. Using the #1 magnetic screwdriver, insert and tighten the screws on the face of the controller module and on the mezzanine card.



Do not apply force when tightening the screw on the mezzanine card; you might crack it.

10. Insert any SFP or QSFP modules that were removed from the impaired mezzanine card to the replacement mezzanine card.

#### **Option 2: Install a mezzanine card:**

You install a new mezzanine card if your system does not have one.

1. Using the #1 magnetic screwdriver, remove the screws from the face of the controller module and the faceplate covering the mezzanine card slot, and set them aside safely on the magnet.
2. Remove the mezzanine card from the antistatic shipping bag and align it to the inside face of the controller module.
3. Gently align the mezzanine card into place.
4. Using the #1 magnetic screwdriver, insert and tighten the screws on the face of the controller module and on the mezzanine card.



Do not apply force when tightening the screw on the mezzanine card; you might crack it.

#### **Step 4: Reinstall the controller module**

After you replace a component within the controller module, you must reinstall the controller module in the system chassis and boot it.

1. Close the controller module cover and tighten the thumbscrew.



|   |                         |
|---|-------------------------|
| 1 | Controller module cover |
| 2 | Thumbscrew              |

## 2. Insert the controller module into the chassis

- Ensure the latching mechanism arms are locked in the fully extended position.
- Using both hands, align and gently slide the controller module into the latching mechanism arms until it stops.
- Place your index fingers through the finger holes from the inside of the latching mechanism.
- Press your thumbs down on the orange tabs on top of the latching mechanism and gently push the controller module over the stop.
- Release your thumbs from the top of the latching mechanisms and continue pushing until the latching mechanisms snap into place.

The controller module begins to boot as soon as it is fully seated in the chassis. Be prepared to interrupt the boot process.

The controller module should be fully inserted and flush with the edges of the chassis.

## 3. Recable the system, as needed.

- Return the controller to normal operation by giving back its storage: `storage failover giveback -ofnode impaired_node_name`

5. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`

#### Step 5: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

### Replace the NVMEM battery - FAS500f

To replace an NVMEM battery in the system, you must remove the controller module from the system, open it, replace the battery, and close and replace the controller module.

All other components in the system must be functioning properly; if not, you must contact technical support.

#### Step 1: Shut down the impaired controller

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

#### About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced` mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

#### Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:  
`system node autosupport invoke -node * -type all -message MAINT=<# of hours>h`

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`



When you see *Do you want to disable auto-giveback?*, enter *y*.

3. Take the impaired controller to the LOADER prompt:

| If the impaired controller is displaying... | Then...              |
|---------------------------------------------|----------------------|
| The LOADER prompt                           | Go to the next step. |


| If the impaired controller is displaying... | Then...                                                                                                                                                                                                                                                             |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Waiting for giveback...                     | Press Ctrl-C, and then respond <code>y</code> when prompted.                                                                                                                                                                                                        |
| System prompt or password prompt            | <p>Take over or halt the impaired controller from the healthy controller:</p> <pre>storage failover takeover -ofnode<br/>impaired_node_name</pre> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <code>y</code>.</p> |

**Step 2: Remove the controller module**

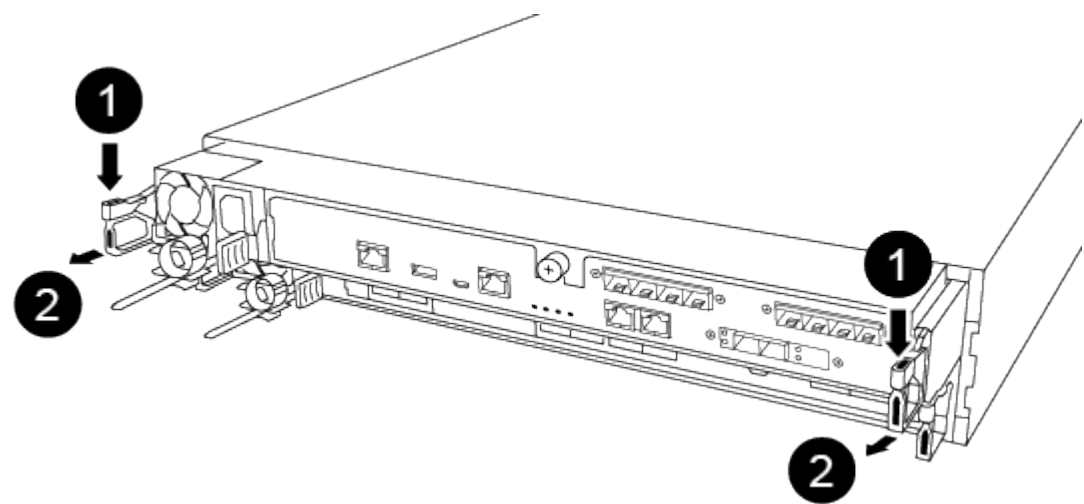
You must remove the controller module from the chassis when you replace a component inside the controller module.

Make sure that you label the cables so that you know where they came from.

1. If you are not already grounded, properly ground yourself.
2. Unplug the controller module power supplies from the source.
3. Release the power cable retainers, and then unplug the cables from the power supplies.
4. Insert your forefinger into the latching mechanism on either side of the controller module, press the lever with your thumb, and gently pull the controller a few inches out of the chassis.



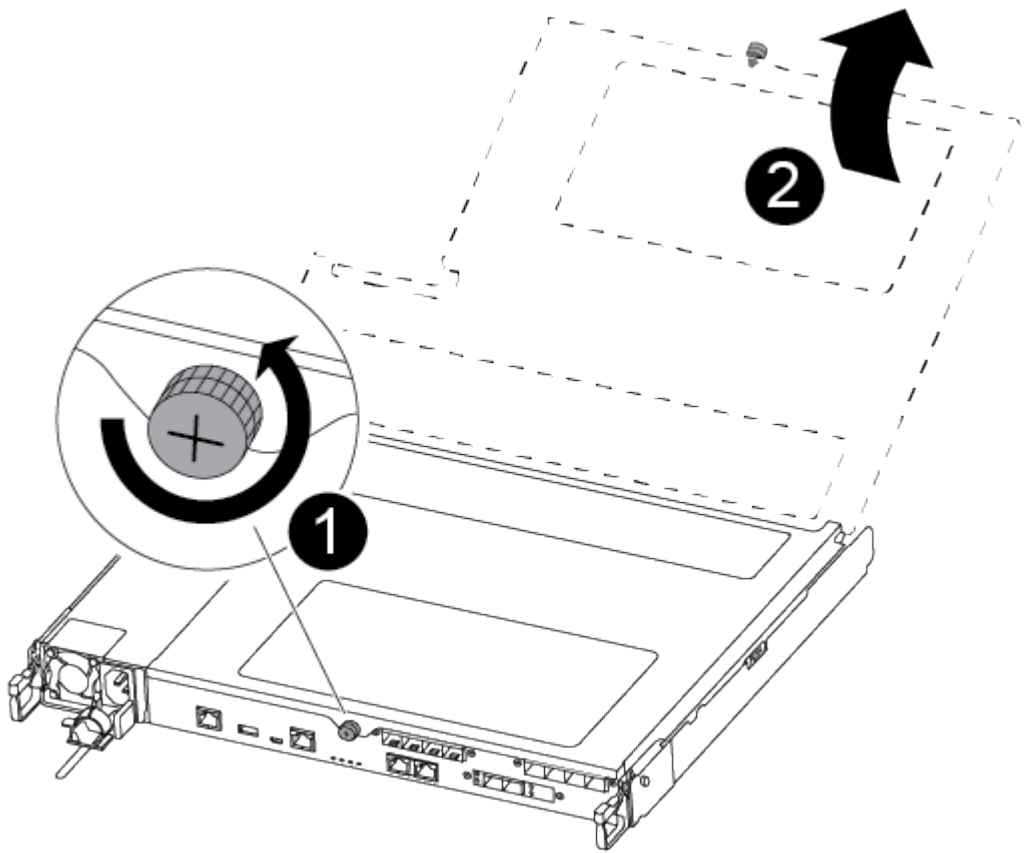
If you have difficulty removing the controller module, place your index fingers through the finger holes from the inside (by crossing your arms).



|                                                                                     |                    |
|-------------------------------------------------------------------------------------|--------------------|
|  | Lever              |
|  | Latching mechanism |



- 5. Using both hands, grasp the controller module sides and gently pull it out of the chassis and set it on a flat, stable surface.
- 6. Turn the thumbscrew on the front of the controller module anti-clockwise and open the controller module cover.



|   |                          |
|---|--------------------------|
| 1 | Thumbscrew               |
| 2 | Controller module cover. |

**Step 3: Replace the NVMEM battery**

To replace the NVMEM battery, you must remove the failed battery from the controller module and install the replacement battery into the controller module.

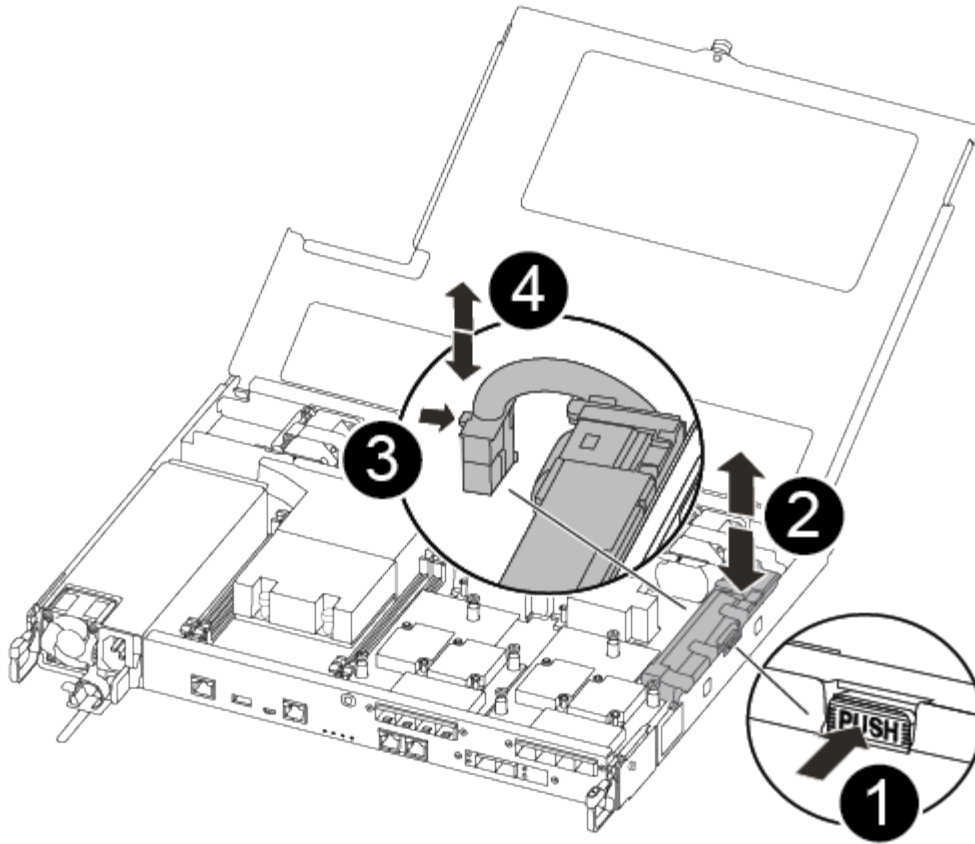
You can use the following video or the tabulated steps to replace the NVMEM battery:

[Animation - Replace the NVMEM battery](#)

- 1. Locate and replace the impaired NVMEM battery on your controller module.



It is recommended that you follow the illustrated instructions in the order listed.



|   |                                                               |
|---|---------------------------------------------------------------|
| 1 | Squeeze the clip on the face of the battery plug.             |
| 2 | Unplug the battery cable from the socket.                     |
| 3 | Grasp the battery and press the blue locking tab marked PUSH. |
| 4 | Lift the battery out of the holder and controller module.     |

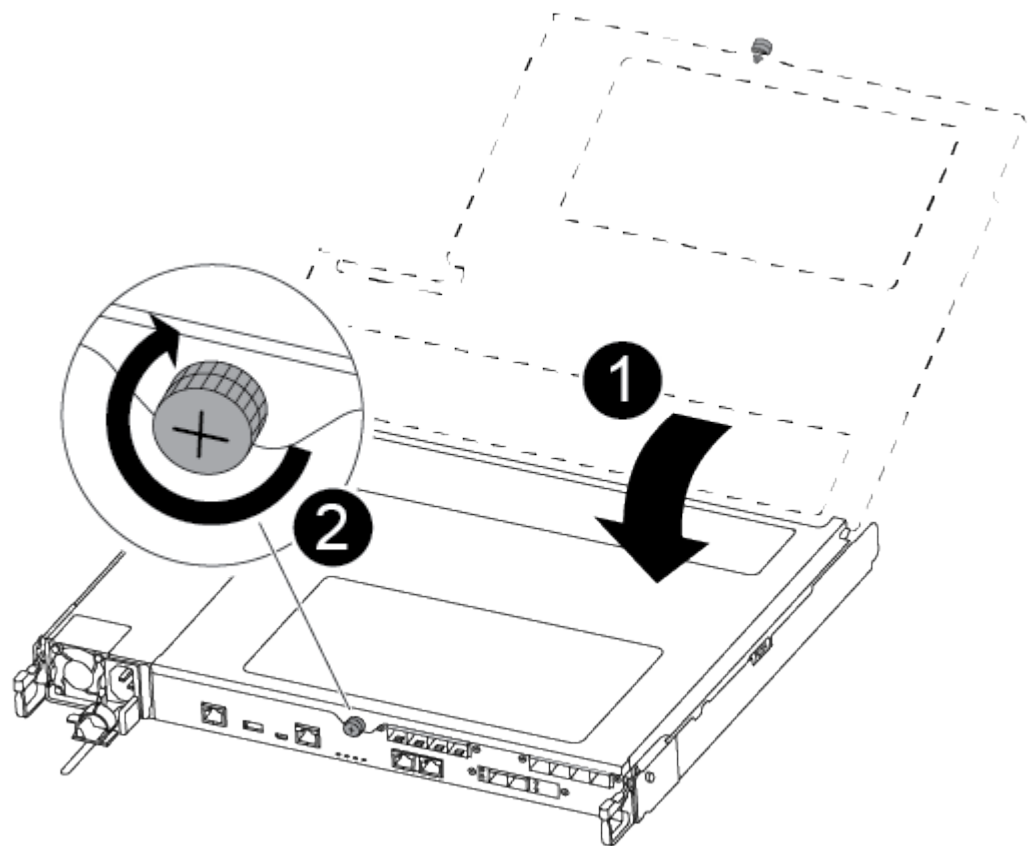
2. Locate the battery plug and squeeze the clip on the face of the battery plug to release the plug from the socket.
3. Grasp the battery and press the blue locking tab marked PUSH, and then lift the battery out of the holder and controller module and set it aside.
4. Remove the replacement NV battery from the antistatic shipping bag and align it to the battery holder.
5. Insert the replacement NV battery plug into the socket.
6. Slide the battery pack down along the sheet metal side wall until the support tabs on the side wall hook into the slots on the battery pack, and the battery pack latch engages and clicks into the opening on the side wall.
7. Press firmly down on the battery pack to make sure that it is locked into place.

**Step 4: Install the controller module**

After you have replaced the component in the controller module, you must reinstall the controller module into the chassis, and then boot it.

You can use the following illustration or the written steps to install the replacement controller module in the chassis.

- 1. Close the controller module cover and tighten the thumbscrew.



|   |                         |
|---|-------------------------|
| 1 | Controller module cover |
| 2 | Thumbscrew              |

- 2. Insert the controller module into the chassis:
  - a. Ensure the latching mechanism arms are locked in the fully extended position.
  - b. Using both hands, align and gently slide the controller module into the latching mechanism arms until it stops.
  - c. Place your index fingers through the finger holes from the inside of the latching mechanism.
  - d. Press your thumbs down on the orange tabs on top of the latching mechanism and gently push the controller module over the stop.
  - e. Release your thumbs from the top of the latching mechanisms and continue pushing until the latching mechanisms snap into place.

The controller module begins to boot as soon as it is fully seated in the chassis.

The controller module should be fully inserted and flush with the edges of the chassis.

3. Cable the management and console ports only, so that you can access the system to perform the tasks in the following sections.



You will connect the rest of the cables to the controller module later in this procedure.

#### Step 5: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

#### Replace a power supply - FAS500f

Replacing a power supply involves disconnecting the target power supply (PSU) from the power source, unplugging the power cable, removing the old PSU and installing the replacement PSU, and then reconnecting it to the power source.

- The power supplies are redundant and hot-swappable.
- This procedure is written for replacing one power supply at a time.



It is a best practice to replace the power supply within two minutes of removing it from the chassis. The system continues to function, but ONTAP sends messages to the console about the degraded power supply until the power supply is replaced.

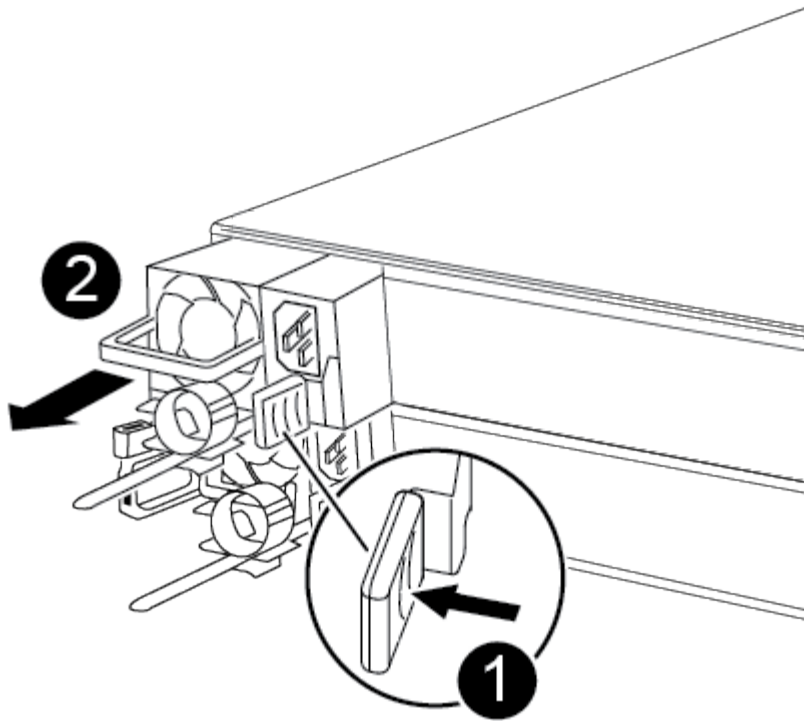
You can use the following video or the tabulated steps to replace the power supply:

#### [Animation - Replace the power supply](#)

1. If you are not already grounded, properly ground yourself.
2. Identify the power supply you want to replace, based on console error messages or through the red Fault LED on the power supply.
3. Disconnect the power supply:
  - a. Open the power cable retainer, and then unplug the power cable from the power supply.
  - b. Unplug the power cable from the power source.
4. Rotate the cam handle such that it can be used to pull power supply out of the controller module while pressing the locking tab.



The power supply is short. Always use two hands to support it when removing it from the controller module so that it does not suddenly swing free from the controller module and injure you.



|   |                               |
|---|-------------------------------|
| 1 | Blue power supply locking tab |
| 2 | Power supply                  |

5. Using both hands, support and align the edges of the power supply with the opening in the controller module, and then gently push the power supply into the controller module until the locking tab clicks into place.

The power supplies will only properly engage with the internal connector and lock in place one way.



To avoid damaging the internal connector, do not use excessive force when sliding the power supply into the system.

6. Reconnect the power supply cabling:
  - a. Reconnect the power cable to the power supply and the power source.
  - b. Secure the power cable to the power supply using the power cable retainer.

Once power is restored to the power supply, the status LED should be green.

7. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

### Replace the real-time clock battery

You replace the real-time clock (RTC) battery in the controller module so that your system's services and applications that depend on accurate time synchronization

continue to function.

- You can use this procedure with all versions of ONTAP supported by your system
- All other components in the system must be functioning properly; if not, you must contact technical support.

**Step 1: Shut down the impaired controller**

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

**About this task**

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced` mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

**Steps**

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:
- ```
system node autosupport invoke -node * -type all -message MAINT=<# of hours>h
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:>`

```
system node autosupport invoke -node * -type all -message MAINT=2h
```

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`



When you see *Do you want to disable auto-giveback?*, enter *y*.

3. Take the impaired controller to the LOADER prompt:


If the impaired controller is displaying...	Then...
The LOADER prompt	Go to the next step.
Waiting for giveback...	Press Ctrl-C, and then respond <i>y</i> when prompted.
System prompt or password prompt	<p>Take over or halt the impaired controller from the healthy controller:</p> <pre>storage failover takeover -ofnode impaired_node_name</pre> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i>.</p>

Step 2: Remove the controller module

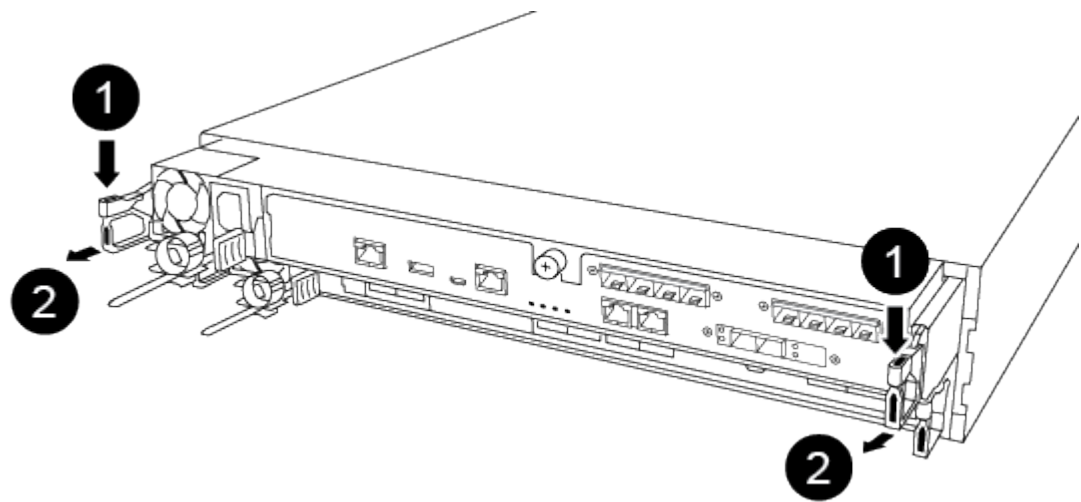
You must remove the controller module from the chassis when you replace a component inside the controller module.

Make sure that you label the cables so that you know where they came from.

- 1. If you are not already grounded, properly ground yourself.
- 2. Unplug the controller module power supplies from the source.
- 3. Release the power cable retainers, and then unplug the cables from the power supplies.
- 4. Insert your forefinger into the latching mechanism on either side of the controller module, press the lever with your thumb, and gently pull the controller a few inches out of the chassis.



If you have difficulty removing the controller module, place your index fingers through the finger holes from the inside (by crossing your arms).



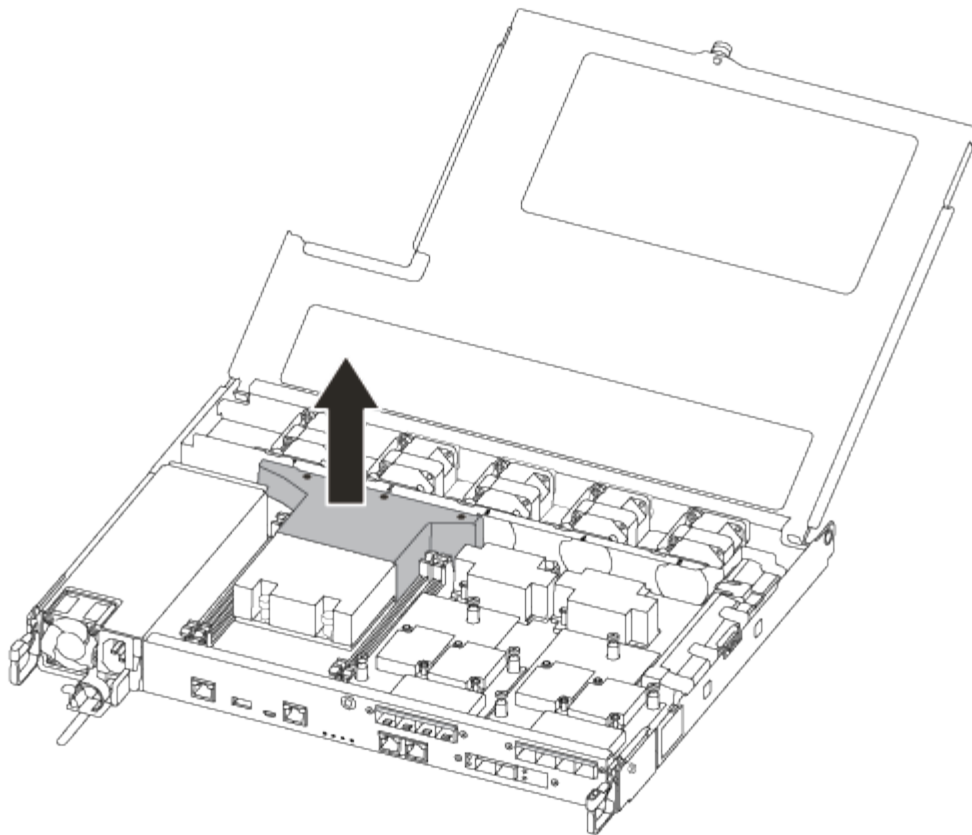
1	Lever
2	Latching mechanism

- 5. Using both hands, grasp the controller module sides and gently pull it out of the chassis and set it on a flat, stable surface.
- 6. Turn the thumbscrew on the front of the controller module anti-clockwise and open the controller module cover.



1	Thumbscrew
2	Controller module cover.

7. Lift out the air duct cover.



Step 3: Replace the RTC battery

To replace the RTC battery, locate it inside the controller and follow the specific sequence of steps.

You can use the following video or the tabulated steps to replace the RTC battery:

[Animation - Replace the RTC battery](#)

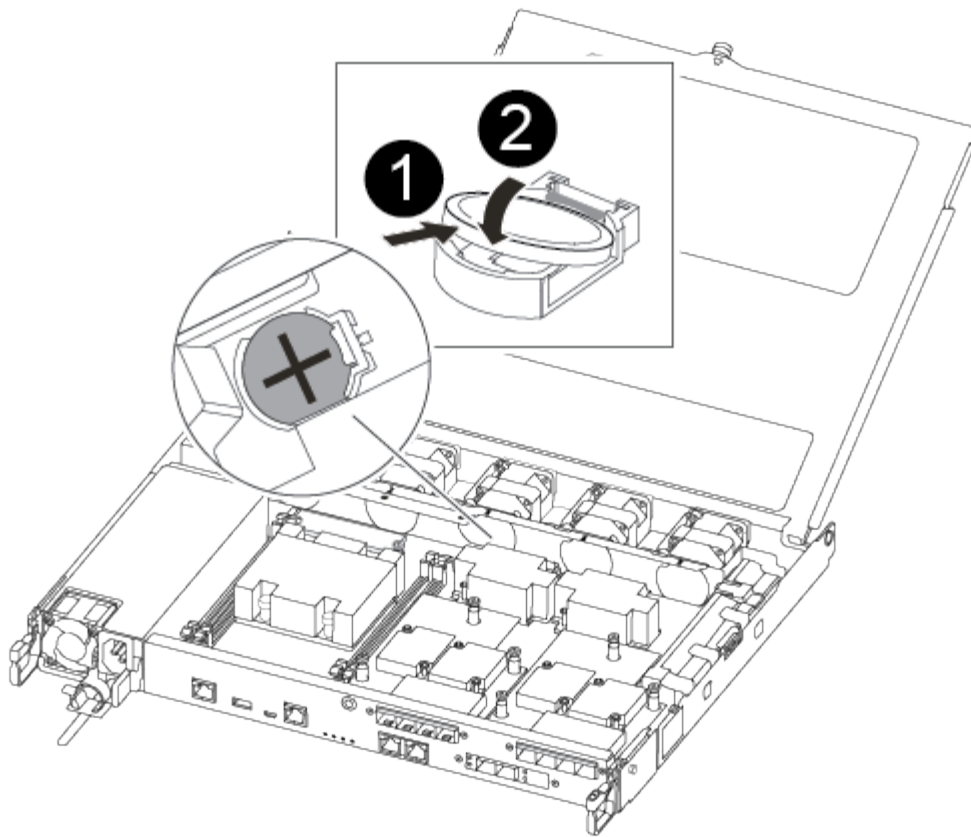
1. Locate the RTC battery between the heatsink and the midplane and remove it exactly as shown in the graphic.




1	<p>Gently pull tab away from the battery housing.</p> <p>NOTE: Pulling it away aggressively might displace the tab.</p>
2	<p>Lift the battery up.</p> <div data-bbox="873 1255 928 1318"> <p>i</p> </div> <p>Make a note of the polarity of the battery.</p>
3	<p>The battery should eject out.</p>

The battery will be ejected out.

2. Remove the replacement battery from the antistatic shipping bag.
3. Locate the RTC battery holder between the heatsink and the midplane and insert it exactly as shown in the graphic.



1	With positive polarity face up, slide the battery under the tab of the battery housing.
2	Push the battery gently into place and make sure the tab secures it to the housing.  Pushing it in aggressively might cause the battery to eject out again.

4. Visually inspect the battery to make sure that it is completely installed into the holder and that the polarity is correct.

Step 4: Reinstall the controller module and set time/date after RTC battery replacement

After you replace a component within the controller module, you must reinstall the controller module in the system chassis, reset the time and date on the controller, and then boot it.

Steps

1. If you have not already done so, close the air duct or controller module cover.
2. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.

Do not completely insert the controller module in the chassis until instructed to do so.

3. Recable the system, as needed.

If you removed the media converters (QSFPs or SFPs), remember to reinstall them if you are using fiber optic cables.

4. If the power supplies were unplugged, plug them back in and reinstall the power cable retainers.
5. Insert the controller module into the chassis:
 - a. Ensure the latching mechanism arms are locked in the fully extended position.
 - b. Using both hands, align and gently slide the controller module into the latching mechanism arms until it stops.
 - c. Place your index fingers through the finger holes from the inside of the latching mechanism.
 - d. Press your thumbs down on the orange tabs on top of the latching mechanism and gently push the controller module over the stop.
 - e. Release your thumbs from the top of the latching mechanisms and continue pushing until the latching mechanisms snap into place.

The controller module begins to boot as soon as it is fully seated in the chassis. Be prepared to interrupt the boot process.

- f. Halt the controller at the `LOADER` prompt.

The controller module should be fully inserted and flush with the edges of the chassis.

6. Reset the time and date on the controller:
 - a. Check the date and time on the healthy controller with the `show date` command.
 - b. At the `LOADER` prompt on the target controller, check the time and date.
 - c. If necessary, modify the date with the `set date mm/dd/yyyy` command.
 - d. If necessary, set the time, in GMT, using the `set time hh:mm:ss` command.
 - e. Confirm the date and time on the target controller.
7. At the `LOADER` prompt, enter `bye` to reinitialize the PCIe cards and other components and let the controller reboot.
8. Return the controller to normal operation by giving back its storage: `storage failover giveback -ofnode impaired_node_name`
9. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`

Step 5: Complete the replacement process

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

FAS8200 systems

Install and setup

Cluster configuration worksheet - FAS8200

You can use the [Cluster Configuration Worksheet](#) to gather and record your site-specific

IP addresses and other information required when configuring an ONTAP cluster.

Start here: Choose your installation and setup experience

For most configurations, you can choose from different content formats.

- [Quick steps](#)

A printable PDF of step-by-step instructions with live links to additional content.

- [Video steps](#)

Video step-by-step instructions.

For MetroCluster configurations, see either:

- [Install MetroCluster IP configuration](#)
- [Install MetroCluster Fabric-Attached configuration](#)

Installation and setup PDF poster - FAS8200

You can use the PDF poster to install and set up your new system. The [AFF FAS8200 Installation and Setup Instructions](#) provides step-by-step instructions with live links to additional content.

Maintain

Maintain FAS8200 hardware

For the FAS8200 storage system, you can perform maintenance procedures on the following components.

Boot media

The boot media stores a primary and secondary set of boot image files that the system uses when it boots.

Caching module

You must replace the controller's caching module when your system registers a single AutoSupport (ASUP) message that the module has gone offline.

Chassis

The chassis is the physical enclosure housing all the controller components such as the controller/CPU unit, power supply, and I/O.

Controller

A controller consists of a board, firmware, and software. It controls the drives and implements the ONTAP functions.

DIMM

You must replace a DIMM (dual in-line memory module) when a memory mismatch is present, or you have a failed DIMM.

Drive

A drive is a device that provides the physical storage media for data.

NVEM Battery

A battery is included with a controller and preserves cached data if the AC power fails.

PCIe card

A PCIe (peripheral component interconnect express) card is an expansion card that plugs into the PCIe slot on the motherboard.

Power supply

A power supply provides a redundant power source in a controller shelf.

Real time clock battery

A real time clock battery preserves system date and time information if the power is off.

Boot media

Overview of boot media replacement - FAS8200

The boot media stores a primary and secondary set of system (boot image) files that the system uses when it boots. Depending on your network configuration, you can perform either a nondisruptive or disruptive replacement.

You must have a USB flash drive, formatted to FAT32, with the appropriate amount of storage to hold the `image_XXX.tgz` file.

You also must copy the `image_XXX.tgz` file to the USB flash drive for later use in this procedure.

- The nondisruptive and disruptive methods for replacing a boot media both require you to restore the `var` file system:
 - For nondisruptive replacement, the HA pair must be connected to a network to restore the `var` file system.
 - For disruptive replacement, you do not need a network connection to restore the `var` file system, but the process requires two reboots.
- You must replace the failed component with a replacement FRU component you received from your provider.
- It is important that you apply the commands in these steps on the correct node:
 - The *impaired* node is the node on which you are performing maintenance.
 - The *healthy node* is the HA partner of the impaired node.

Prior to shutting down the impaired controller and checking the status of the onboard encryption keys, you must check the status of the impaired controller, disable automatic giveback, and check what version of ONTAP the system is running.

Prior to shutting down the impaired controller and checking the status of the onboard encryption keys, you must check the status of the impaired controller, disable automatic giveback, and check which version of ONTAP is running on the system.

If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see the [Synchronize a node with the cluster](#).

Steps

1. Check the status of the impaired controller:

- If the impaired controller is at the login prompt, log in as `admin`.
- If the impaired controller is at the `LOADER` prompt and is part of HA configuration, log in as `admin` on the healthy controller.
- If the impaired controller is in a standalone configuration and at `LOADER` prompt, contact mysupport.netapp.com.

2. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message  
MAINT=number_of_hours_downh
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:*>`
`system node autosupport invoke -node * -type all -message MAINT=2h`

3. Check the version of ONTAP the system is running on the impaired controller if up, or on the partner controller if the impaired controller is down, using the `version -v` command:

- If `<Ino-DARE>` or `<1Ono-DARE>` is displayed in the command output, the system does not support NVE, proceed to shut down the controller.
- If `<Ino-DARE>` is not displayed in the command output, and the system is running ONTAP 9.5, go to [Option 1: Check NVE or NSE on systems running ONTAP 9.5 and earlier](#).
- If `<Ino-DARE>` is not displayed in the command output, and the system is running ONTAP 9.6 or later, go to [Option 2: Check NVE or NSE on systems running ONTAP 9.6 and later](#).

4. If the impaired controller is part of an HA configuration, disable automatic giveback from the healthy controller: `storage failover modify -node local -auto-giveback false` or `storage failover modify -node local -auto-giveback-after-panic false`

Option 1: Check NVE or NSE on systems running ONTAP 9.5 and earlier

Before shutting down the impaired controller, you need to check whether the system has either NetApp Volume Encryption (NVE) or NetApp Storage Encryption (NSE) enabled. If so, you need to verify the configuration.

Steps

1. Connect the console cable to the impaired controller.
2. Check whether NVE is configured for any volumes in the cluster: `volume show -is-encrypted true`

If any volumes are listed in the output, NVE is configured and you need to verify the NVE configuration. If no volumes are listed, check whether NSE is configured.

3. Check whether NSE is configured: `storage encryption disk show`

- If the command output lists the drive details with Mode & Key ID information, NSE is configured and you need to verify the NSE configuration.
- If NVE and NSE are not configured, it's safe to shut down the impaired controller.

Verify NVE configuration

Steps

1. Display the key IDs of the authentication keys that are stored on the key management servers: `security key-manager query`
 - If the `Restored` column displays `yes` and all key managers display `available`, it's safe to shut down the impaired controller.
 - If the `Restored` column displays anything other than `yes`, or if any key manager displays `unavailable`, you need to complete some additional steps.
 - If you see the message `This command is not supported when onboard key management is enabled`, you need to complete some other additional steps.
2. If the `Restored` column displayed anything other than `yes`, or if any key manager displayed `unavailable`:
 - a. Retrieve and restore all authentication keys and associated key IDs: `security key-manager restore -address *`

If the command fails, contact NetApp Support.

mysupport.netapp.com
 - b. Verify that the `Restored` column displays `yes` for all authentication keys and that all key managers display `available`: `security key-manager query`
 - c. Shut down the impaired controller.
3. If you saw the message `This command is not supported when onboard key management is enabled`, display the keys stored in the onboard key manager: `security key-manager key show -detail`
 - a. If the `Restored` column displays `yes` manually back up the onboard key management information:
 - Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
 - Enter the command to display the OKM backup information: `security key-manager backup show`
 - Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
 - Return to admin mode: `set -priv admin`
 - Shut down the impaired controller.
 - b. If the `Restored` column displays anything other than `yes`:
 - Run the key-manager setup wizard: `security key-manager setup -node target/impaired node name`



Enter the customer's onboard key management passphrase at the prompt. If the passphrase cannot be provided, contact mysupport.netapp.com

- Verify that the `Restored` column displays `yes` for all authentication keys: `security key-manager key show -detail`
- Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
- Enter the command to display the OKM backup information: `security key-manager backup show`
- Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
- Return to admin mode: `set -priv admin`
- You can safely shutdown the controller.

Verify NSE configuration

Steps

1. Display the key IDs of the authentication keys that are stored on the key management servers: `security key-manager query`
 - If the `Restored` column displays `yes` and all key managers display `available`, it's safe to shut down the impaired controller.
 - If the `Restored` column displays anything other than `yes`, or if any key manager displays `unavailable`, you need to complete some additional steps.
 - If you see the message `This command is not supported when onboard key management is enabled`, you need to complete some other additional steps
2. If the `Restored` column displayed anything other than `yes`, or if any key manager displayed `unavailable`:
 - a. Retrieve and restore all authentication keys and associated key IDs: `security key-manager restore -address *`

If the command fails, contact NetApp Support.

mysupport.netapp.com
 - b. Verify that the `Restored` column displays `yes` for all authentication keys and that all key managers display `available`: `security key-manager query`
 - c. Shut down the impaired controller.
3. If you saw the message `This command is not supported when onboard key management is enabled`, display the keys stored in the onboard key manager: `security key-manager key show -detail`
 - a. If the `Restored` column displays `yes`, manually back up the onboard key management information:
 - Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
 - Enter the command to display the OKM backup information: `security key-manager backup show`
 - Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.

- Return to admin mode: `set -priv admin`
- Shut down the impaired controller.

b. If the `Restored` column displays anything other than `yes`:

- Run the key-manager setup wizard: `security key-manager setup -node target/impaired node name`



Enter the customer's OKM passphrase at the prompt. If the passphrase cannot be provided, contact mysupport.netapp.com

- Verify that the `Restored` column shows `yes` for all authentication keys: `security key-manager key show -detail`
- Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
- Enter the command to back up the OKM information: `security key-manager backup show`



Make sure that OKM information is saved in your log file. This information will be needed in disaster scenarios where OKM might need to be manually recovered.

- Copy the contents of the backup information to a separate file or your log. You'll need it in disaster scenarios where you might need to manually recover OKM.
- Return to admin mode: `set -priv admin`
- You can safely shut down the controller.

Option 2: Check NVE or NSE on systems running ONTAP 9.6 and later

Before shutting down the impaired controller, you need to verify whether the system has either NetApp Volume Encryption (NVE) or NetApp Storage Encryption (NSE) enabled. If so, you need to verify the configuration.

1. Verify whether NVE is in use for any volumes in the cluster: `volume show -is-encrypted true`

If any volumes are listed in the output, NVE is configured and you need to verify the NVE configuration. If no volumes are listed, check whether NSE is configured and in use.

2. Verify whether NSE is configured and in use: `storage encryption disk show`
 - If the command output lists the drive details with Mode & Key ID information, NSE is configured and you need to verify the NSE configuration and in use.
 - If no disks are shown, NSE is not configured.
 - If NVE and NSE are not configured, no drives are protected with NSE keys, it's safe to shut down the impaired controller.

Verify NVE configuration

1. Display the key IDs of the authentication keys that are stored on the key management servers: `security key-manager key query`



After the ONTAP 9.6 release, you may have additional key manager types. The types are KMIP, AKV, and GCP. The process for confirming these types is the same as confirming external or onboard key manager types.

- If the Key Manager type displays `external` and the Restored column displays `yes`, it's safe to shut down the impaired controller.
 - If the Key Manager type displays `onboard` and the Restored column displays `yes`, you need to complete some additional steps.
 - If the Key Manager type displays `external` and the Restored column displays anything other than `yes`, you need to complete some additional steps.
 - If the Key Manager type displays `onboard` and the Restored column displays anything other than `yes`, you need to complete some additional steps.
2. If the Key Manager type displays `onboard` and the Restored column displays `yes`, manually back up the OKM information:
 - a. Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
 - b. Enter the command to display the key management information: `security key-manager onboard show-backup`
 - c. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
 - d. Return to admin mode: `set -priv admin`
 - e. Shut down the impaired controller.
 3. If the Key Manager type displays `external` and the Restored column displays anything other than `yes`:
 - a. Restore the external key management authentication keys to all nodes in the cluster: `security key-manager external restore`

If the command fails, contact NetApp Support.

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 - b. Verify that the Restored column equals `yes` for all authentication keys: `security key-manager key query`
 - c. Shut down the impaired controller.
 4. If the Key Manager type displays `onboard` and the Restored column displays anything other than `yes`:
 - a. Enter the onboard security key-manager sync command: `security key-manager onboard sync`



Enter the customer's 32 character, alphanumeric onboard key management passphrase at the prompt. If the passphrase cannot be provided, contact NetApp Support.

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- b. Verify the Restored column shows `yes` for all authentication keys: `security key-manager key query`
- c. Verify that the Key Manager type shows `onboard`, and then manually back up the OKM information.

- d. Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
- e. Enter the command to display the key management backup information: `security key-manager onboard show-backup`
- f. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
- g. Return to admin mode: `set -priv admin`
- h. You can safely shut down the controller.

Verify NSE configuration

1. Display the key IDs of the authentication keys that are stored on the key management servers: `security key-manager key query -key-type NSE-AK`



After the ONTAP 9.6 release, you may have additional key manager types. The types are KMIP, AKV, and GCP. The process for confirming these types is the same as confirming external or onboard key manager types.

- If the Key Manager type displays `external` and the Restored column displays `yes`, it's safe to shut down the impaired controller.
 - If the Key Manager type displays `onboard` and the Restored column displays `yes`, you need to complete some additional steps.
 - If the Key Manager type displays `external` and the Restored column displays anything other than `yes`, you need to complete some additional steps.
 - If the Key Manager type displays `external` and the Restored column displays anything other than `yes`, you need to complete some additional steps.
2. If the Key Manager type displays `onboard` and the Restored column displays `yes`, manually back up the OKM information:
 - a. Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
 - b. Enter the command to display the key management information: `security key-manager onboard show-backup`
 - c. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
 - d. Return to admin mode: `set -priv admin`
 - e. You can safely shut down the controller.
 3. If the Key Manager type displays `external` and the Restored column displays anything other than `yes`:
 - a. Restore the external key management authentication keys to all nodes in the cluster: `security key-manager external restore`

If the command fails, contact NetApp Support.

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 - b. Verify that the Restored column equals `yes` for all authentication keys: `security key-manager key query`

- c. You can safely shut down the controller.
- 4. If the `Key Manager` type displays `onboard` and the `Restored` column displays anything other than `yes`:
 - a. Enter the onboard security key-manager sync command: `security key-manager onboard sync`

Enter the customer's 32 character, alphanumeric onboard key management passphrase at the prompt. If the passphrase cannot be provided, contact NetApp Support.

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 - b. Verify the `Restored` column shows `yes` for all authentication keys: `security key-manager key query`
 - c. Verify that the `Key Manager` type shows `onboard`, and then manually back up the OKM information.
 - d. Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
 - e. Enter the command to display the key management backup information: `security key-manager onboard show-backup`
 - f. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
 - g. Return to admin mode: `set -priv admin`
 - h. You can safely shut down the controller.

Shut down the impaired controller - FAS8200

Option 1: Most systems

After completing the NVE or NSE tasks, you need to complete the shutdown of the impaired controller.

After completing the NVE or NSE tasks, you need to complete the shutdown of the impaired controller.

Steps

- a. Take the impaired controller to the `LOADER` prompt:

If the impaired controller displays...	Then...
The <code>LOADER</code> prompt	Go to Remove controller module.
Waiting for giveback...	Press <code>Ctrl-C</code> , and then respond <code>y</code> when prompted.
System prompt or password prompt (enter system password)	<p>Take over or halt the impaired controller from the healthy controller: <code>storage failover takeover -ofnode impaired_node_name</code></p> <p>When the impaired controller shows <code>Waiting for giveback...</code>, press <code>Ctrl-C</code>, and then respond <code>y</code>.</p>

- b. From the LOADER prompt, enter: `printenv` to capture all boot environmental variables. Save the output to your log file.



This command may not work if the boot device is corrupted or non-functional.

Option 2: Controller is in a MetroCluster configuration



Do not use this procedure if your system is in a two-node MetroCluster configuration.

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).
- If you have a MetroCluster configuration, you must have confirmed that the MetroCluster Configuration State is configured and that the nodes are in an enabled and normal state (`metrocluster node show`).

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message  
MAINT=number_of_hours_downh
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:*>`

```
system node autosupport invoke -node * -type all -message MAINT=2h
```

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`
3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying...	Then...
The LOADER prompt	Go to the next step.
Waiting for giveback...	Press Ctrl-C, and then respond <code>y</code> when prompted.
System prompt or password prompt (enter system password)	<p>Take over or halt the impaired controller from the healthy controller:</p> <pre>storage failover takeover -ofnode impaired_node_name</pre> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <code>y</code>.</p>

Option 3: Controller is in a two-node Metrocluster

To shut down the impaired controller, you must determine the status of the controller and, if necessary, switch over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- You must leave the power supplies turned on at the end of this procedure to provide power to the healthy controller.

Steps

1. Check the MetroCluster status to determine whether the impaired controller has automatically switched over to the healthy controller: `metrocluster show`
2. Depending on whether an automatic switchover has occurred, proceed according to the following table:

If the impaired controller...	Then...
Has automatically switched over	Proceed to the next step.
Has not automatically switched over	Perform a planned switchover operation from the healthy controller: <code>metrocluster switchover</code>
Has not automatically switched over, you attempted switchover with the <code>metrocluster switchover</code> command, and the switchover was vetoed	Review the veto messages and, if possible, resolve the issue and try again. If you are unable to resolve the issue, contact technical support.

3. Resynchronize the data aggregates by running the `metrocluster heal -phase aggregates` command from the surviving cluster.

```
controller_A_1::> metrocluster heal -phase aggregates
[Job 130] Job succeeded: Heal Aggregates is successful.
```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

4. Verify that the operation has been completed by using the `metrocluster operation show` command.

```
controller_A_1::> metrocluster operation show
Operation: heal-aggregates
State: successful
Start Time: 7/25/2016 18:45:55
End Time: 7/25/2016 18:45:56
Errors: -
```

5. Check the state of the aggregates by using the `storage aggregate show` command.

```

controller_A_1::> storage aggregate show
Aggregate      Size Available Used% State    #Vols  Nodes           RAID
Status
-----
...
aggr_b2      227.1GB   227.1GB    0% online      0 mcc1-a2
raid_dp, mirrored, normal...

```

6. Heal the root aggregates by using the `metrocluster heal -phase root-aggregates` command.

```

mcc1A::> metrocluster heal -phase root-aggregates
[Job 137] Job succeeded: Heal Root Aggregates is successful

```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

7. Verify that the heal operation is complete by using the `metrocluster operation show` command on the destination cluster:

```

mcc1A::> metrocluster operation show
Operation: heal-root-aggregates
State: successful
Start Time: 7/29/2016 20:54:41
End Time: 7/29/2016 20:54:42
Errors: -

```

8. On the impaired controller module, disconnect the power supplies.

Replace the boot media - FAS8200

To replace the boot media, you must remove the impaired controller module, install the replacement boot media, and transfer the boot image to a USB flash drive.

Step 1: Remove the controller

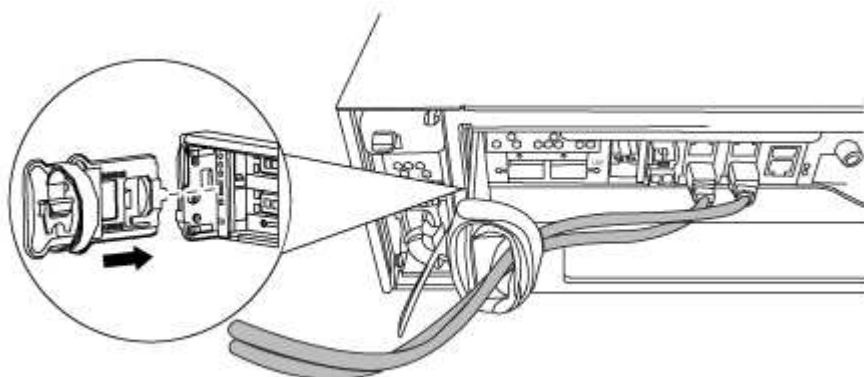
To access components inside the controller, you must first remove the controller module from the system and then remove the cover on the controller module.

1. If you are not already grounded, properly ground yourself.
2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

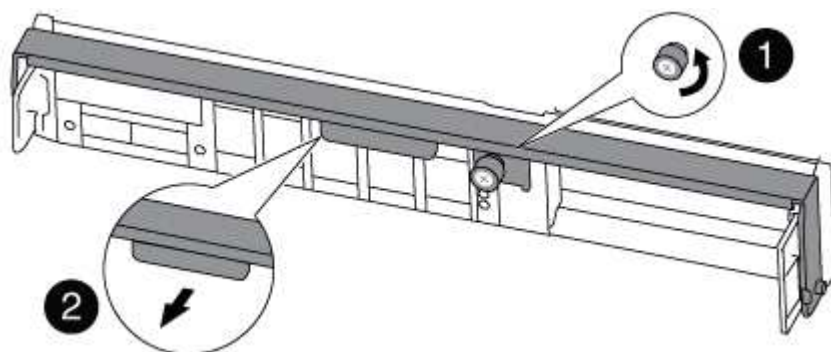
Leave the cables in the cable management device so that when you reinstall the cable management

device, the cables are organized.

3. Remove and set aside the cable management devices from the left and right sides of the controller module.



4. Loosen the thumbscrew on the cam handle on the controller module.



1

Thumbscrew

2

Cam handle

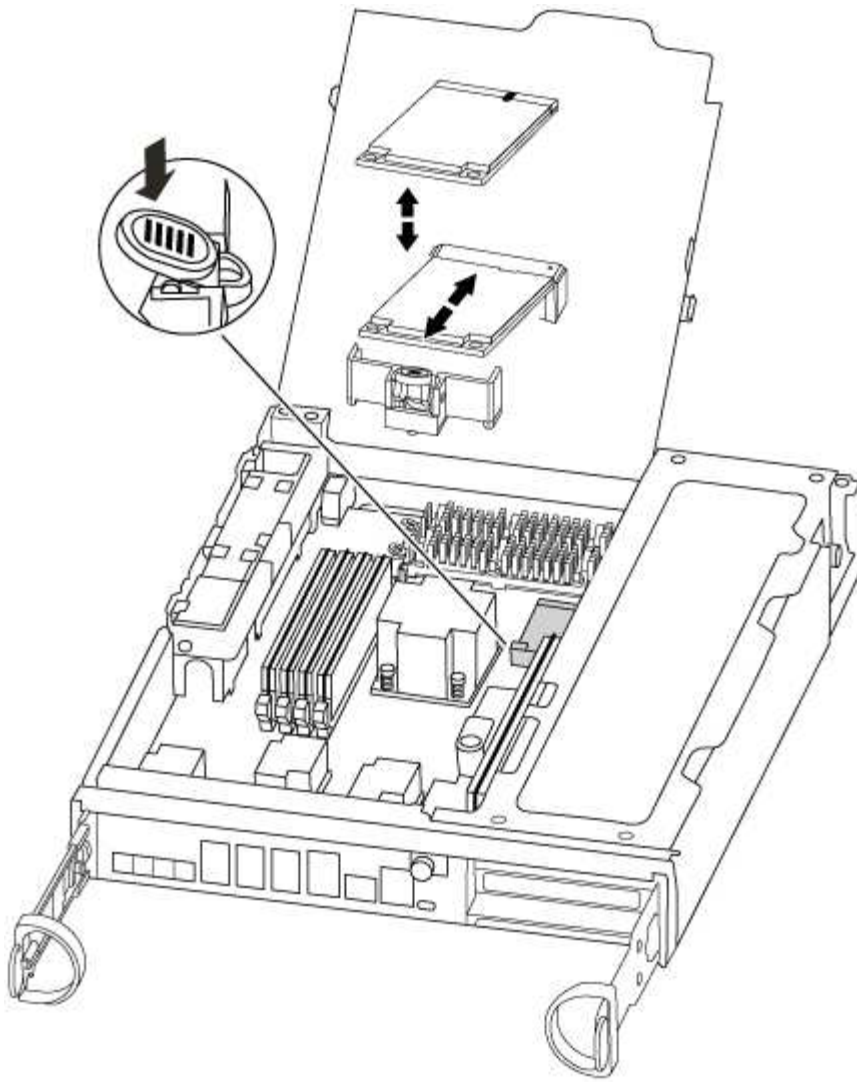
5. Pull the cam handle downward and begin to slide the controller module out of the chassis.

Make sure that you support the bottom of the controller module as you slide it out of the chassis.

Step 2: Replace the boot media

You must locate the boot media in the controller and follow the directions to replace it.

1. If you are not already grounded, properly ground yourself.
2. Locate the boot media using the following illustration or the FRU map on the controller module:



3. Press the blue button on the boot media housing to release the boot media from its housing, and then gently pull it straight out of the boot media socket.



Do not twist or pull the boot media straight up, because this could damage the socket or the boot media.

4. Align the edges of the replacement boot media with the boot media socket, and then gently push it into the socket.
5. Check the boot media to make sure that it is seated squarely and completely in the socket.

If necessary, remove the boot media and reseal it into the socket.

6. Push the boot media down to engage the locking button on the boot media housing.
7. Close the controller module cover.

Step 3: Transfer the boot image to the boot media

You can install the system image to the replacement boot media using a USB flash drive with the image installed on it. However, you must restore the var file system during this procedure.

- You must have a USB flash drive, formatted to FAT32, with at least 4GB capacity.



The tar.gz file must be placed on a FAT32 formatted partition that is a minimum of 4GB. While FAT32 partitions can be as large as 2TB, Windows built-in tools (e.g. DiskPart) cannot format FAT32 partitions larger than 32GB.

- A copy of the same image version of ONTAP as what the impaired controller was running. You can download the appropriate image from the Downloads section on the NetApp Support Site
 - If NVE is enabled, download the image with NetApp Volume Encryption, as indicated in the download button.
 - If NVE is not enabled, download the image without NetApp Volume Encryption, as indicated in the download button.
- If your system is an HA pair, you must have a network connection.
- If your system is a stand-alone system you do not need a network connection, but you must perform an additional reboot when restoring the var file system.

1. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.
2. Reinstall the cable management device and recable the system, as needed.

When recabling, remember to reinstall the media converters (SFPs) if they were removed.

3. Insert the USB flash drive into the USB slot on the controller module.

Make sure that you install the USB flash drive in the slot labeled for USB devices, and not in the USB console port.

4. Push the controller module all the way into the system, making sure that the cam handle clears the USB flash drive, firmly push the cam handle to finish seating the controller module, push the cam handle to the closed position, and then tighten the thumbscrew.

The controller begins to boot as soon as it is completely installed into the chassis.

5. Interrupt the boot process to stop at the LOADER prompt by pressing Ctrl-C when you see Starting AUTOBOOT press Ctrl-C to abort....

If you miss this message, press Ctrl-C, select the option to boot to Maintenance mode, and then halt the controller to boot to LOADER.

6. For systems with one controller in the chassis, reconnect the power and turn on the power supplies.

The system begins to boot and stops at the LOADER prompt.

7. Set your network connection type at the LOADER prompt:

- If you are configuring DHCP: `ifconfig e0a -auto`



The target port you configure is the target port you use to communicate with the impaired controller from the healthy controller during var file system restore with a network connection. You can also use the e0M port in this command.

- If you are configuring manual connections: `ifconfig e0a -addr=filer_addr -mask=netmask -gw=gateway-dns=dns_addr-domain=dns_domain`

- `filer_addr` is the IP address of the storage system.
- `netmask` is the network mask of the management network that is connected to the HA partner.
- `gateway` is the gateway for the network.
- `dns_addr` is the IP address of a name server on your network.
- `dns_domain` is the Domain Name System (DNS) domain name.

If you use this optional parameter, you do not need a fully qualified domain name in the netboot server URL. You need only the server's host name.



Other parameters might be necessary for your interface. You can enter `help ifconfig` at the firmware prompt for details.

8. If the controller is in a stretch or fabric-attached MetroCluster, you must restore the FC adapter configuration:

- Boot to Maintenance mode: `boot_ontap maint`
- Set the MetroCluster ports as initiators: `ucadmin modify -m fc -t initiator adapter_name`
- Halt to return to Maintenance mode: `halt`

The changes will be implemented when the system is booted.

Boot the recovery image - FAS8200

The procedure for booting the impaired controller from the recovery image depends on whether the system is in a two-node MetroCluster configuration.

Option 1: Most systems

:

You must boot the ONTAP image from the USB drive, restore the file system, and verify the environmental variables.

This procedure applies to systems that are not in a two-node MetroCluster configuration.

Steps

1. From the LOADER prompt, boot the recovery image from the USB flash drive: `boot_recovery`

The image is downloaded from the USB flash drive.

2. When prompted, either enter the name of the image or accept the default image displayed inside the brackets on your screen.
3. Restore the var file system:

If your system has...	Then...
A network connection	<ol style="list-style-type: none"> Press <code>y</code> when prompted to restore the backup configuration. Set the healthy controller to advanced privilege level: <code>set -privilege advanced</code> Run the restore backup command: <code>system node restore-backup -node local -target-address <i>impaired_node_IP_address</i></code> Return the controller to admin level: <code>set -privilege admin</code> Press <code>y</code> when prompted to use the restored configuration. Press <code>y</code> when prompted to reboot the controller.
No network connection	<ol style="list-style-type: none"> Press <code>n</code> when prompted to restore the backup configuration. Reboot the system when prompted by the system. Select the Update flash from backup config (sync flash) option from the displayed menu. <p>If you are prompted to continue with the update, press <code>y</code>.</p>

- Ensure that the environmental variables are set as expected:
 - Take the controller to the LOADER prompt.
 - Check the environment variable settings with the `printenv` command.
 - If an environment variable is not set as expected, modify it with the `setenv environment-variable-name changed-value` command.
 - Save your changes using the `savenv` command.
- The next depends on your system configuration:
 - If your system has onboard keymanager, NSE or NVE configured, go to [Restore OKM, NSE, and NVE as needed](#)
 - If your system does not have onboard keymanager, NSE or NVE configured, complete the steps in this section.
- From the LOADER prompt, enter the `boot_ontap` command.

If you see...	Then...
The login prompt	Go to the next Step.
Waiting for giveback...	<ol style="list-style-type: none"> Log into the partner controller. Confirm the target controller is ready for giveback with the <code>storage failover show</code> command.

- Connect the console cable to the partner controller.

8. Give back the controller using the `storage failover giveback -fromnode local` command.
9. At the cluster prompt, check the logical interfaces with the `net int -is-home false` command.

If any interfaces are listed as "false", revert those interfaces back to their home port using the `net int revert` command.

10. Move the console cable to the repaired controller and run the `version -v` command to check the ONTAP versions.
11. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.

Option 2: Controller is in a two-node MetroCluster

You must boot the ONTAP image from the USB drive and verify the environmental variables.

This procedure applies to systems in a two-node MetroCluster configuration.

Steps

1. From the LOADER prompt, boot the recovery image from the USB flash drive: `boot_recovery`

The image is downloaded from the USB flash drive.

2. When prompted, either enter the name of the image or accept the default image displayed inside the brackets on your screen.
3. After the image is installed, start the restoration process:
 - a. Press `n` when prompted to restore the backup configuration.
 - b. Press `y` when prompted to reboot to start using the newly installed software.

You should be prepared to interrupt the boot process when prompted.

4. As the system boots, press `Ctrl-C` after you see the `Press Ctrl-C for Boot Menu message.`, and when the Boot Menu is displayed select option 6.
5. Verify that the environmental variables are set as expected.
 - a. Take the node to the LOADER prompt.
 - b. Check the environment variable settings with the `printenv` command.
 - c. If an environment variable is not set as expected, modify it with the `setenv environment-variable-name changed-value` command.
 - d. Save your changes using the `savenv` command.
 - e. Reboot the node.

Switch back aggregates in a two-node MetroCluster configuration - FAS8200

After you have completed the FRU replacement in a two-node MetroCluster configuration, you can perform the MetroCluster switchback operation. This returns the configuration to its normal operating state, with the sync-source storage virtual machines (SVMs) on the formerly impaired site now active and serving data from the local disk pools.

This task only applies to two-node MetroCluster configurations.

Steps

1. Verify that all nodes are in the enabled state: `metrocluster node show`

```
cluster_B::> metrocluster node show

DR                               Configuration  DR
Group Cluster Node              State          Mirroring Mode
-----
1      cluster_A
      controller_A_1 configured      enabled    heal roots
completed
      cluster_B
      controller_B_1 configured      enabled    waiting for
switchback recovery
2 entries were displayed.
```

2. Verify that resynchronization is complete on all SVMs: `metrocluster vserver show`
3. Verify that any automatic LIF migrations being performed by the healing operations were completed successfully: `metrocluster check lif show`
4. Perform the switchback by using the `metrocluster switchback` command from any node in the surviving cluster.
5. Verify that the switchback operation has completed: `metrocluster show`

The switchback operation is still running when a cluster is in the `waiting-for-switchback` state:

```
cluster_B::> metrocluster show

Cluster              Configuration State      Mode
-----
Local: cluster_B configured      switchover
Remote: cluster_A configured      waiting-for-switchback
```

The switchback operation is complete when the clusters are in the `normal` state.:

```
cluster_B::> metrocluster show

Cluster              Configuration State      Mode
-----
Local: cluster_B configured      normal
Remote: cluster_A configured      normal
```

If a switchback is taking a long time to finish, you can check on the status of in-progress baselines by using

the `metrocluster config-replication resync-status show` command.

6. Reestablish any SnapMirror or SnapVault configurations.

Restore OKM, NSE, and NVE as needed - FAS8200

Once environment variables are checked, you must complete steps specific to systems that have Onboard Key Manager (OKM), NetApp Storage Encryption (NSE) or NetApp Volume Encryption (NVE) enabled.

Determine which section you should use to restore your OKM, NSE, or NVE configurations:

If NSE or NVE are enabled along with Onboard Key Manager you must restore settings you captured at the beginning of this procedure.

- If NSE or NVE are enabled and Onboard Key Manager is enabled, go to [Option 1: Restore NVE or NSE when Onboard Key Manager is enabled](#).
- If NSE or NVE are enabled for ONATP 9.5, go to [Option 2: Restore NSE/NVE on systems running ONTAP 9.5 and earlier](#).
- If NSE or NVE are enabled for ONTAP 9.6, go to [Option 3: Restore NSE/NVE on systems running ONTAP 9.6 and later](#).

Option 1: Restore NVE or NSE when Onboard Key Manager is enabled

Steps

1. Connect the console cable to the target controller.
2. Use the `boot_ontap` command at the LOADER prompt to boot the controller.
3. Check the console output:

If the console displays...	Then...
The LOADER prompt	Boot the controller to the boot menu: <code>boot_ontap menu</code>
Waiting for giveback...	<ol style="list-style-type: none">a. Enter <code>Ctrl-C</code> at the promptb. At the message: Do you wish to halt this controller rather than wait [y/n]? , enter: <code>y</code>c. At the LOADER prompt, enter the <code>boot_ontap menu</code> command.

4. At the Boot Menu, enter the hidden command, `recover_onboard_keymanager` and reply `y` at the prompt.
5. Enter the passphrase for the onboard key manager you obtained from the customer at the beginning of this procedure.
6. When prompted to enter the backup data, paste the backup data you captured at the beginning of this procedure, when asked. Paste the output of `security key-manager backup show` OR `security key-manager onboard show-backup` command.



The data is output from either `security key-manager backup show` or `security key-manager onboard show-backup` command.

Example of backup data:

```
-----BEGIN BACKUP-----
TmV0QXBwIEtleSBGbG9iAAEAAAAEAAAAcAEAAAAAADuD+byAAAAACEAAAAAAAA
QAAAAAAAAABvOIH0AAAAAMh7qDLRyH1DBz12piVdy9ATSFMT0C0TIYFss4PDjTaV
dzRYkLd1PhQLxAWJwOlyqSr8qY1SEBgm1IWgE5DLRqkiAAAAAAAAACgAAAAAAAA
3WTh7gAAAAAAAAAAAAAAAAIAAAAAAgAZJEIWvdeHr5RCAvHGclo+wAAAAAAAA
lgAAAAAAAAAoAAAAAAAAEOTcR0AAAAAAAAAAAAAAAACAAAAAAJAGr3tJA/
LRzUQRHwv+1aWvAAAAAAAAACQAAAAAAAAAgAAAAAAAAACdhTcvAAAAAJ1PXeBf
ml4NBsSyV1B4jc4A7cvWEFY6ILG6hc6tbKLAHZuvfQ4rlbYAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
.
.
.
.
H4nPQM0nrDRYRa9SCv8AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAA
-----END BACKUP-----
```

7. At the Boot Menu select the option for Normal Boot.

The system boots to `Waiting for giveback...` prompt.

8. Move the console cable to the partner controller and login as admin.

9. Confirm the target controller is ready for giveback with the `storage failover show` command.

10. Give back only the CFO aggregates with the `storage failover giveback -fromnode local -only-cfo -aggregates true` command.

- If the command fails because of a failed disk, physically disengage the failed disk, but leave the disk in the slot until a replacement is received.
- If the command fails because of an open CIFS session, check with the customer on how to close out CIFS sessions.



Terminating CIFS can cause loss of data.

- If the command fails because the partner is "not ready", wait 5 minutes for the NVMEMs to synchronize.
- If the command fails because of an NDMP, SnapMirror, or SnapVault process, disable the process. See the appropriate Documentation Center for more information.

11. Once the giveback completes, check the failover and giveback status with the `storage failover show` and ``storage failover show-giveback`` commands.

Only the CFO aggregates (root aggregate and CFO style data aggregates) will be shown.

12. Move the console cable to the target controller.
13. If you are running ONTAP 9.5 and earlier, run the key-manager setup wizard:
 - a. Start the wizard using the `security key-manager setup -nodenodename` command, and then enter the passphrase for onboard key management when prompted.
 - b. Enter the `key-manager key show -detail` command to see a detailed view of all keys stored in the onboard key manager and verify that the `Restored` column = `yes` for all authentication keys.



If the `Restored` column = anything other than `yes`, contact Customer Support.

- c. Wait 10 minutes for the key to synchronize across the cluster.
14. If you are running ONTAP 9.6 or later:
 - a. Run the `security key-manager onboard sync` command and then enter the passphrase when prompted.
 - b. Enter the `security key-manager key query` command to see a detailed view of all keys stored in the onboard key manager and verify that the `Restored` column = `yes/true` for all authentication keys.



If the `Restored` column = anything other than `yes/true`, contact Customer Support.

- c. Wait 10 minutes for the key to synchronize across the cluster.
15. Move the console cable to the partner controller.
16. Give back the target controller using the `storage failover giveback -fromnode local` command.
17. Check the giveback status, 3 minutes after it reports complete, using the `storage failover show` command.

If giveback is not complete after 20 minutes, contact Customer Support.
18. At the clustershell prompt, enter the `net int show -is-home false` command to list the logical interfaces that are not on their home controller and port.

If any interfaces are listed as `false`, revert those interfaces back to their home port using the `net int revert -vserver Cluster -lif nodename` command.
19. Move the console cable to the target controller and run the `version -v` command to check the ONTAP versions.
20. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.

Option 2: Restore NSE/NVE on systems running ONTAP 9.5 and earlier

Steps

1. Connect the console cable to the target controller.
2. Use the `boot_ontap` command at the LOADER prompt to boot the controller.
3. Check the console output:

If the console displays...	Then...
The login prompt	Go to Step 7.
Waiting for giveback...	<ul style="list-style-type: none"> a. Log into the partner controller. b. Confirm the target controller is ready for giveback with the <code>storage failover show</code> command.

4. Move the console cable to the partner controller and give back the target controller storage using the `storage failover giveback -fromnode local -only-cfo-aggregates true local` command.
 - If the command fails because of a failed disk, physically disengage the failed disk, but leave the disk in the slot until a replacement is received.
 - If the command fails because of an open CIFS sessions, check with customer how to close out CIFS sessions.



Terminating CIFS can cause loss of data.

- If the command fails because the partner "not ready", wait 5 minutes for the NVMEMs to synchronize.
 - If the command fails because of an NDMP, SnapMirror, or SnapVault process, disable the process. See the appropriate Documentation Center for more information.
5. Wait 3 minutes and check the failover status with the `storage failover show` command.
 6. At the clustershell prompt, enter the `net int show -is-home false` command to list the logical interfaces that are not on their home controller and port.

If any interfaces are listed as `false`, revert those interfaces back to their home port using the `net int revert -vserver Cluster -lif nodename` command.
 7. Move the console cable to the target controller and run the `version -v` command to check the ONTAP versions.
 8. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.
 9. Use the `storage encryption disk show` at the clustershell prompt, to review the output.



This command does not work if NVE (NetApp Volume Encryption) is configured

10. Use the security key-manager query to display the key IDs of the authentication keys that are stored on the key management servers.
 - If the `Restored` column = `yes` and all key managers report in an available state, go to *Complete the replacement process*.
 - If the `Restored` column = anything other than `yes`, and/or one or more key managers is not available, use the `security key-manager restore -address` command to retrieve and restore all authentication keys (AKs) and key IDs associated with all nodes from all available key management servers.

Check the output of the security key-manager query again to ensure that the Restored column = yes and all key managers report in an available state

11. If the Onboard Key Management is enabled:

- a. Use the `security key-manager key show -detail` to see a detailed view of all keys stored in the onboard key manager.
- b. Use the `security key-manager key show -detail` command and verify that the Restored column = yes for all authentication keys.

If the Restored column = anything other than yes, use the `security key-manager setup -node Repaired(Target)node` command to restore the Onboard Key Management settings. Rerun the `security key-manager key show -detail` command to verify Restored column = yes for all authentication keys.

12. Connect the console cable to the partner controller.

13. Give back the controller using the `storage failover giveback -fromnode local` command.

14. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.

Option 3: Restore NSE/NVE on systems running ONTAP 9.6 and later

Steps

1. Connect the console cable to the target controller.
2. Use the `boot_ontap` command at the LOADER prompt to boot the controller.
3. Check the console output:

If the console displays...	Then...
The login prompt	Go to Step 7.
Waiting for giveback...	<ol style="list-style-type: none">a. Log into the partner controller.b. Confirm the target controller is ready for giveback with the <code>storage failover show</code> command.

4. Move the console cable to the partner controller and give back the target controller storage using the `storage failover giveback -fromnode local -only-cfo-aggregates true local` command.
 - If the command fails because of a failed disk, physically disengage the failed disk, but leave the disk in the slot until a replacement is received.
 - If the command fails because of an open CIFS session, check with the customer on how to close out CIFS sessions.



Terminating CIFS can cause loss of data.

- If the command fails because the partner is "not ready", wait 5 minutes for the NVMEMs to synchronize.

- If the command fails because of an NDMP, SnapMirror, or SnapVault process, disable the process. See the appropriate Documentation Center for more information.

- Wait 3 minutes and check the failover status with the `storage failover show` command.
- At the clustershell prompt, enter the `net int show -is-home false` command to list the logical interfaces that are not on their home controller and port.

If any interfaces are listed as `false`, revert those interfaces back to their home port using the `net int revert -vserver Cluster -lif nodename` command.

- Move the console cable to the target controller and run the `version -v` command to check the ONTAP versions.
- Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.
- Use the `storage encryption disk show` at the clustershell prompt, to review the output.
- Use the `security key-manager key query` command to display the key IDs of the authentication keys that are stored on the key management servers.
 - If the `Restored` column = `yes/true`, you are done and can proceed to complete the replacement process.
 - If the `Key Manager type` = `external` and the `Restored` column = anything other than `yes/true`, use the `security key-manager external restore` command to restore the key IDs of the authentication keys.



If the command fails, contact Customer Support.

- If the `Key Manager type` = `onboard` and the `Restored` column = anything other than `yes/true`, use the `security key-manager onboard sync` command to re-sync the Key Manager type.

Use the `security key-manager key query` to verify that the `Restored` column = `yes/true` for all authentication keys.

- Connect the console cable to the partner controller.
- Give back the controller using the `storage failover giveback -fromnode local` command.
- Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.
- If AutoSupport is enabled, restore/unsuppress automatic case creation by using the `system node autosupport invoke -node * -type all -message MAINT=END`

Return the failed part to NetApp - FAS8200

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

Replace the caching module - FAS8200

You must replace the caching module in the controller module when your system registers a single AutoSupport (ASUP) message that the module has gone offline; failure

to do so results in performance degradation.

You might want to erase the contents of your caching module before replacing it.

- Although data on the caching module is encrypted, you might want to erase any data from the impaired caching module and verify that the caching module has no data:
 - Erase the data on the caching module: `system controller flash-cache secure-erase run -node node name localhost -device-id device_number`



Run the `system controller flash-cache show` command if you don't know the flashcache device ID.

- Verify that the data has been erased from the caching module: `system controller flash-cache secure-erase show`
- You must replace the failed component with a replacement FRU component you received from your provider.

Step 1: Shut down the impaired controller

You can shut down or take over the impaired controller using different procedures, depending on the storage system hardware configuration.

Option 1: Most configurations

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced` mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message MAINT=<# of hours>h
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller:

```
storage failover modify -node local -auto-giveback false
```



When you see *Do you want to disable auto-giveback?*, enter *y*.

3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying...	Then...
The LOADER prompt	Go to the next step.
Waiting for giveback...	Press Ctrl-C, and then respond <i>y</i> when prompted.
System prompt or password prompt	<p>Take over or halt the impaired controller from the healthy controller: <code>storage failover takeover -ofnode <i>impaired_node_name</i></code></p> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i>.</p>

Option 2: Controller is in a two-node MetroCluster

To shut down the impaired controller, you must determine the status of the controller and, if necessary,

switch over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- You must leave the power supplies turned on at the end of this procedure to provide power to the healthy controller.

Steps

1. Check the MetroCluster status to determine whether the impaired controller has automatically switched over to the healthy controller: `metrocluster show`
2. Depending on whether an automatic switchover has occurred, proceed according to the following table:

If the impaired controller...	Then...
Has automatically switched over	Proceed to the next step.
Has not automatically switched over	Perform a planned switchover operation from the healthy controller: <code>metrocluster switchover</code>
Has not automatically switched over, you attempted switchover with the <code>metrocluster switchover</code> command, and the switchover was vetoed	Review the veto messages and, if possible, resolve the issue and try again. If you are unable to resolve the issue, contact technical support.

3. Resynchronize the data aggregates by running the `metrocluster heal -phase aggregates` command from the surviving cluster.

```
controller_A_1::> metrocluster heal -phase aggregates
[Job 130] Job succeeded: Heal Aggregates is successful.
```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

4. Verify that the operation has been completed by using the `metrocluster operation show` command.

```
controller_A_1::> metrocluster operation show
Operation: heal-aggregates
State: successful
Start Time: 7/25/2016 18:45:55
End Time: 7/25/2016 18:45:56
Errors: -
```

5. Check the state of the aggregates by using the `storage aggregate show` command.


```

controller_A_1:> storage aggregate show
Aggregate      Size Available Used% State    #Vols  Nodes
RAID Status
-----
...
aggr_b2        227.1GB    227.1GB    0% online      0 mcc1-a2
raid_dp, mirrored, normal...

```

6. Heal the root aggregates by using the `metrocluster heal -phase root-aggregates` command.

```

mcc1A:> metrocluster heal -phase root-aggregates
[Job 137] Job succeeded: Heal Root Aggregates is successful

```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

7. Verify that the heal operation is complete by using the `metrocluster operation show` command on the destination cluster:

```

mcc1A:> metrocluster operation show
Operation: heal-root-aggregates
State: successful
Start Time: 7/29/2016 20:54:41
End Time: 7/29/2016 20:54:42
Errors: -

```

8. On the impaired controller module, disconnect the power supplies.

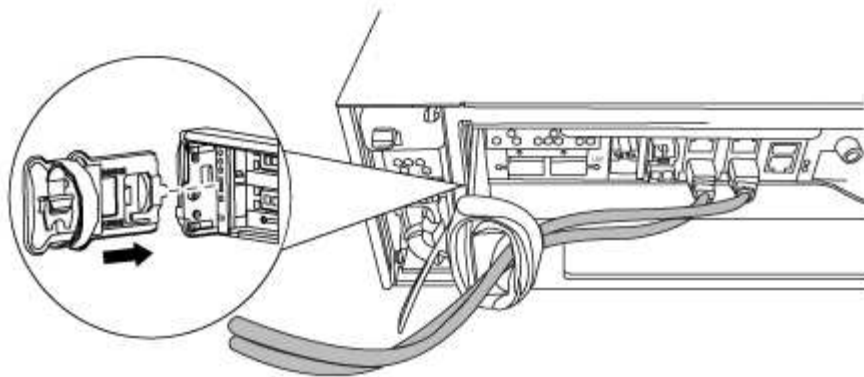
Step 2: Open the controller module

To access components inside the controller, you must first remove the controller module from the system and then remove the cover on the controller module.

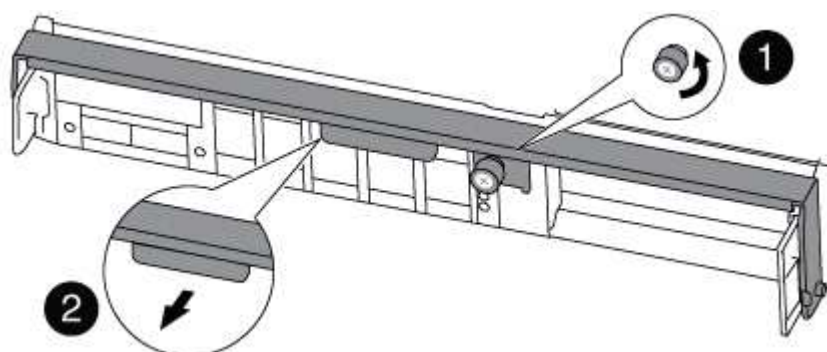
1. If you are not already grounded, properly ground yourself.
2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

3. Remove and set aside the cable management devices from the left and right sides of the controller module.



4. Loosen the thumbscrew on the cam handle on the controller module.



1	Thumbscrew
2	Cam handle

5. Pull the cam handle downward and begin to slide the controller module out of the chassis.

Make sure that you support the bottom of the controller module as you slide it out of the chassis.

Step 3: Replace or add a caching module

To replace or add a caching module referred to as the M.2 PCIe card on the label on your controller, locate the slots inside the controller and follow the specific sequence of steps.

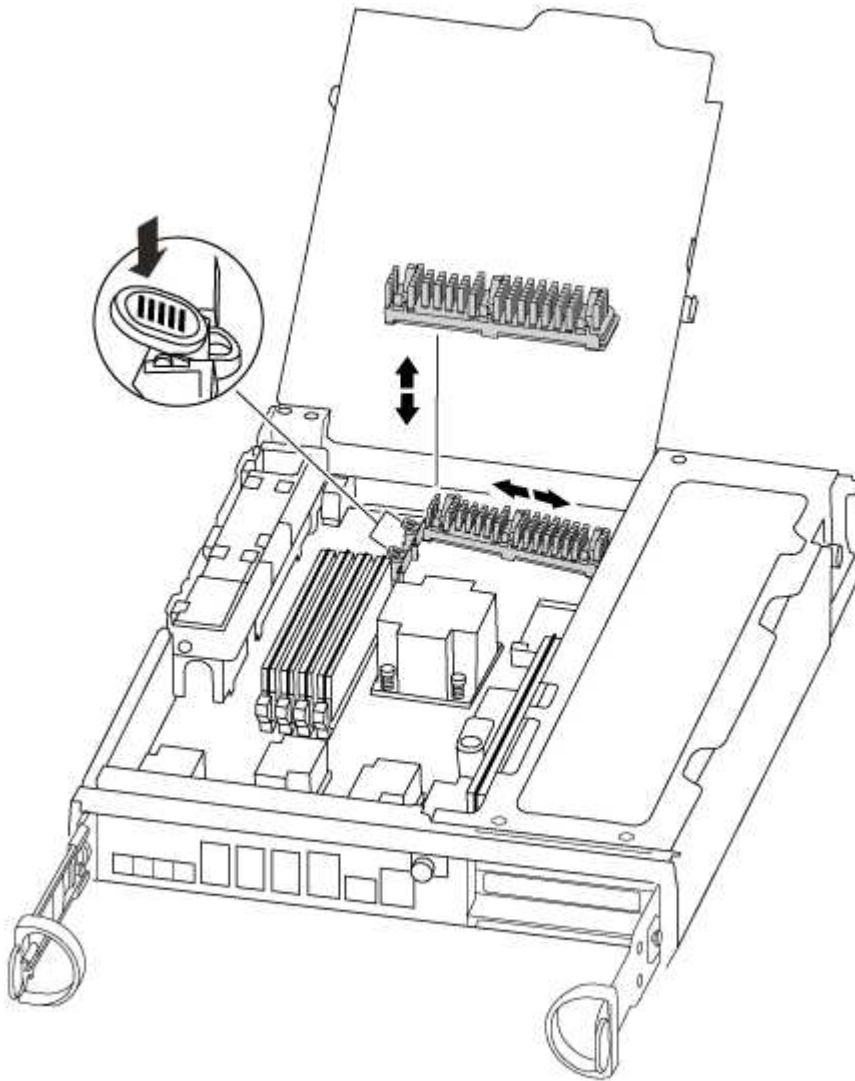
Your storage system must meet certain criteria depending on your situation:

- It must have the appropriate operating system for the caching module you are installing.
- It must support the caching capacity.
- All other components in the storage system must be functioning properly; if not, you must contact technical support.

1. Locate the caching module at the rear of the controller module and remove it.

- a. Press the release tab.
- b. Remove the heatsink.

The storage system comes with two slots available for the caching module and only one slot is occupied, by default.



2. If you are adding a caching module, go to the next step; if you are replacing the caching module, gently pull it straight out of the housing.
3. Align the edges of the caching module with the socket in the housing, and then gently push it into the socket.
4. Verify that the caching module is seated squarely and completely in the socket.

If necessary, remove the caching module and reseal it into the socket.

5. Reseat and push the heatsink down to engage the locking button on the caching module housing.
6. Repeat the steps if you have a second caching module. Close the controller module cover, as needed.

Step 4: Reinstall the controller

After you replace a component within the controller module, you must reinstall the controller module in the system chassis.

1. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.



Do not completely insert the controller module in the chassis until instructed to do so.

2. Recable the system, as needed.

If you removed the media converters (QSFPs or SFPs), remember to reinstall them if you are using fiber optic cables.

3. Complete the reinstallation of the controller module:

The controller module begins to boot as soon as it is fully seated in the chassis

- a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position.



Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.

- b. Tighten the thumbscrew on the cam handle on back of the controller module.
- c. If you have not already done so, reinstall the cable management device.
- d. Bind the cables to the cable management device with the hook and loop strap.

Step 5: Switch back aggregates in a two-node MetroCluster configuration

After you have completed the FRU replacement in a two-node MetroCluster configuration, you can perform the MetroCluster switchback operation. This returns the configuration to its normal operating state, with the sync-source storage virtual machines (SVMs) on the formerly impaired site now active and serving data from the local disk pools.

This task only applies to two-node MetroCluster configurations.

Steps

1. Verify that all nodes are in the enabled state: `metrocluster node show`

```
cluster_B::> metrocluster node show

DR                               Configuration  DR
Group Cluster Node              State          Mirroring Mode
-----
1      cluster_A
      controller_A_1 configured    enabled    heal roots
completed
      cluster_B
      controller_B_1 configured    enabled    waiting for
switchback recovery
2 entries were displayed.
```

2. Verify that resynchronization is complete on all SVMs: `metrocluster vserver show`

3. Verify that any automatic LIF migrations being performed by the healing operations were completed successfully: `metrocluster check lif show`
4. Perform the switchback by using the `metrocluster switchback` command from any node in the surviving cluster.
5. Verify that the switchback operation has completed: `metrocluster show`

The switchback operation is still running when a cluster is in the `waiting-for-switchback` state:

```
cluster_B::> metrocluster show
Cluster           Configuration State      Mode
-----
Local: cluster_B configured          switchover
Remote: cluster_A configured          waiting-for-switchback
```

The switchback operation is complete when the clusters are in the `normal` state.:

```
cluster_B::> metrocluster show
Cluster           Configuration State      Mode
-----
Local: cluster_B configured          normal
Remote: cluster_A configured          normal
```

If a switchback is taking a long time to finish, you can check on the status of in-progress baselines by using the `metrocluster config-replication resync-status show` command.

6. Reestablish any SnapMirror or SnapVault configurations.

Step 6: Complete the replacement process

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

Chassis

Overview of chassis replacement - FAS8200

To replace the chassis, you must move the power supplies, fans, and controller modules from the impaired chassis to the new chassis, and swap out the impaired chassis from the equipment rack or system cabinet with the new chassis of the same model as the impaired chassis.

All other components in the system must be functioning properly; if not, you must contact technical support.

- You can use this procedure with all versions of ONTAP supported by your system.
- This procedure is written with the assumption that you are moving the controller module or modules to the new chassis, and that the chassis is a new component from NetApp.

- This procedure is disruptive. For a two-controller cluster, you will have a complete service outage and a partial outage in a multi-node cluster.

Shut down the controllers - FAS8200

To replace the chassis, you must shutdown the controllers.

Option 1: Most configurations

This procedure is for 2-node, non-MetroCluster configurations only. If you have a system with more than two nodes, see [How to perform a graceful shutdown and power up of one HA pair in a 4-node cluster](#).

Before you begin

You need:

- Local administrator credentials for ONTAP.
- NetApp onboard key management (OKM) cluster-wide passphrase if using storage encryption or NVE/NAE.
- BMC accessibility for each controller.
- Stop all clients/host from accessing data on the NetApp system.
- Suspend external backup jobs.
- Necessary tools and equipment for the replacement.



If the system is a NetApp StorageGRID or ONTAP S3 used as FabricPool cloud tier, refer to the [Gracefully shutdown and power up your storage system Resolution Guide](#) after performing this procedure.



If using SSDs, refer to [SU490: \(Impact: Critical\) SSD Best Practices: Avoid risk of drive failure and data loss if powered off for more than two months](#)

As a best practice before shutdown, you should:

- Perform additional [system health checks](#).
- Upgrade ONTAP to a recommended release for the system.
- Resolve any [Active IQ Wellness Alerts and Risks](#).
Make note of any faults presently on the system, such as LEDs on the system components.

Steps

1. Log into the cluster through SSH or log in from any node in the cluster using a local console cable and a laptop/console.
2. Turn off AutoSupport and indicate how long you expect the system to be offline:

```
system node autosupport invoke -node * -type all -message "MAINT=8h Power Maintenance"
```

3. Identify the SP/BMC address of all nodes:

```
system service-processor show -node * -fields address
```

4. Exit the cluster shell: `exit`
5. Log into SP/BMC over SSH using the IP address of any of the nodes listed in the output from the previous step.

If you're using a console/laptop, log into the controller using the same cluster administrator credentials.



Open an SSH session to every SP/BMC connection so that you can monitor progress.

6. Halt the 2 nodes located in the impaired chassis:

```
system node halt -node <node>,<node2> -skip-lif-migration-before-shutdown true
-ignore-quorum-warnings true -inhibit-takeover true
```



For clusters using SnapMirror synchronous operating in StrictSync mode: `system node halt -node <node>,<node2> -skip-lif-migration-before-shutdown true -ignore-quorum-warnings true -inhibit-takeover true -ignore-strict-sync-warnings true`

7. Enter **y** for each controller in the cluster when you see *Warning: Are you sure you want to halt node "cluster <node-name> number"?*
`{y|n}:`
8. Wait for each controller to halt and display the LOADER prompt.

Option 2: Controller is in a two-node MetroCluster configuration

To shut down the impaired controller, you must determine the status of the controller and, if necessary, switch over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- You must leave the power supplies turned on at the end of this procedure to provide power to the healthy controller.

Steps

1. Check the MetroCluster status to determine whether the impaired controller has automatically switched over to the healthy controller: `metrocluster show`
2. Depending on whether an automatic switchover has occurred, proceed according to the following table:

If the impaired controller...	Then...
Has automatically switched over	Proceed to the next step.
Has not automatically switched over	Perform a planned switchover operation from the healthy controller: <code>metrocluster switchover</code>
Has not automatically switched over, you attempted switchover with the <code>metrocluster switchover</code> command, and the switchover was vetoed	Review the veto messages and, if possible, resolve the issue and try again. If you are unable to resolve the issue, contact technical support.

3. Resynchronize the data aggregates by running the `metrocluster heal -phase aggregates` command from the surviving cluster.

```
controller_A_1::> metrocluster heal -phase aggregates
[Job 130] Job succeeded: Heal Aggregates is successful.
```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

4. Verify that the operation has been completed by using the `metrocluster operation show` command.

```
controller_A_1::> metrocluster operation show
Operation: heal-aggregates
State: successful
Start Time: 7/25/2016 18:45:55
End Time: 7/25/2016 18:45:56
Errors: -
```

5. Check the state of the aggregates by using the `storage aggregate show` command.

```
controller_A_1::> storage aggregate show
Aggregate      Size Available Used% State   #Vols  Nodes      RAID
Status
-----
...
aggr_b2        227.1GB   227.1GB    0% online      0 mcc1-a2
raid_dp, mirrored, normal...
```

6. Heal the root aggregates by using the `metrocluster heal -phase root-aggregates` command.

```
mcc1A::> metrocluster heal -phase root-aggregates
[Job 137] Job succeeded: Heal Root Aggregates is successful
```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

7. Verify that the heal operation is complete by using the `metrocluster operation show` command on the destination cluster:


```
mcc1A::> metrocluster operation show
  Operation: heal-root-aggregates
    State: successful
  Start Time: 7/29/2016 20:54:41
    End Time: 7/29/2016 20:54:42
    Errors: -
```

8. On the impaired controller module, disconnect the power supplies.

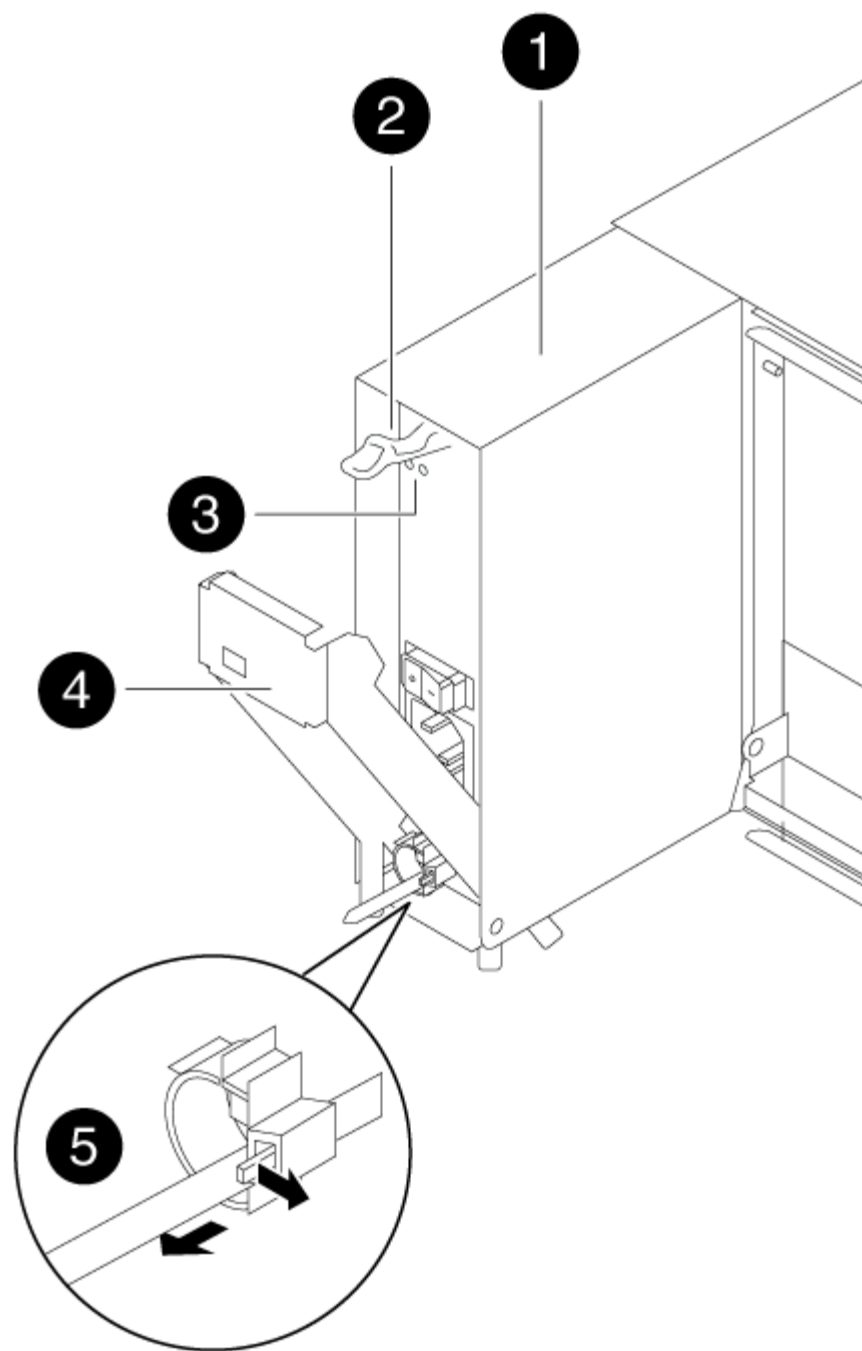
Replace hardware - FAS8200

Move the power supplies, fans, and controller modules from the impaired chassis to the new chassis, and swap out the impaired chassis from the equipment rack or system cabinet with the new chassis of the same model as the impaired chassis.

Step 1: Move a power supply

Moving out a power supply when replacing a chassis involves turning off, disconnecting, and removing the power supply from the old chassis and installing and connecting it on the replacement chassis.

1. If you are not already grounded, properly ground yourself.
2. Turn off the power supply and disconnect the power cables:
 - a. Turn off the power switch on the power supply.
 - b. Open the power cable retainer, and then unplug the power cable from the power supply.
 - c. Unplug the power cable from the power source.
3. Press down the release latch on the power supply cam handle, and then lower the cam handle to the fully open position to release the power supply from the mid plane.



1	Power supply
2	Cam handle release latch
3	Power and Fault LEDs
4	Cam handle

4. Use the cam handle to slide the power supply out of the system.



When removing a power supply, always use two hands to support its weight.

5. Repeat the preceding steps for any remaining power supplies.
6. Using both hands, support and align the edges of the power supply with the opening in the system chassis, and then gently push the power supply into the chassis using the cam handle.

The power supplies are keyed and can only be installed one way.



Do not use excessive force when sliding the power supply into the system. You can damage the connector.

7. Push firmly on the power supply cam handle to seat it all the way into the chassis, and then push the cam handle to the closed position, making sure that the cam handle release latch clicks into its locked position.
8. Reconnect the power cable and secure it to the power supply using the power cable locking mechanism.



Only connect the power cable to the power supply. Do not connect the power cable to a power source at this time.

Step 2: Move a fan

Moving out a fan module when replacing the chassis involves a specific sequence of tasks.

1. Remove the bezel (if necessary) with two hands, by grasping the openings on each side of the bezel, and then pulling it toward you until the bezel releases from the ball studs on the chassis frame.
2. Press down the release latch on the fan module cam handle, and then pull the cam handle downward.

The fan module moves a little bit away from the chassis.



1	Cam handle
2	Fan module
3	Cam handle release latch
4	Fan module Attention LED

3. Pull the fan module straight out from the chassis, making sure that you support it with your free hand so that it does not swing out of the chassis.



The fan modules are short. Always support the bottom of the fan module with your free hand so that it does not suddenly drop free from the chassis and injure you.

4. Set the fan module aside.
5. Repeat the preceding steps for any remaining fan modules.
6. Insert the fan module into the replacement chassis by aligning it with the opening, and then sliding it into the chassis.
7. Push firmly on the fan module cam handle so that it is seated all the way into the chassis.

The cam handle raises slightly when the fan module is completely seated.

8. Swing the cam handle up to its closed position, making sure that the cam handle release latch clicks into the locked position.

The fan LED should be green after the fan is seated and has spun up to operational speed.

9. Repeat these steps for the remaining fan modules.

10. Align the bezel with the ball studs, and then gently push the bezel onto the ball studs.

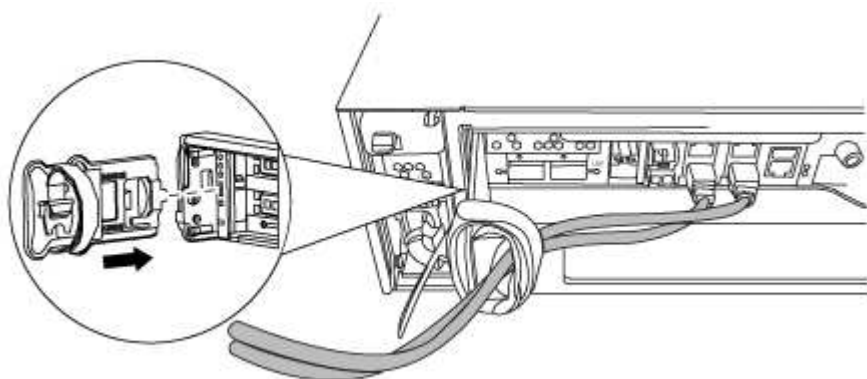
Step 3: Remove the controller module

To replace the chassis, you must remove the controller module or modules from the old chassis.

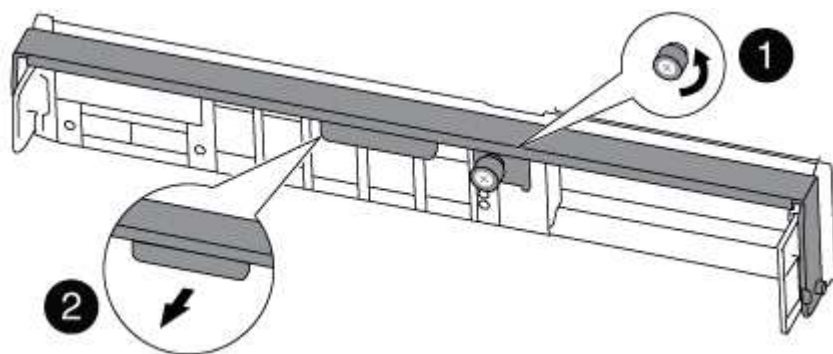
1. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

2. Remove and set aside the cable management devices from the left and right sides of the controller module.



3. Loosen the thumbscrew on the cam handle on the controller module.



1	Thumbscrew
2	Cam handle

4. Pull the cam handle downward and begin to slide the controller module out of the chassis.

Make sure that you support the bottom of the controller module as you slide it out of the chassis.

5. Set the controller module aside in a safe place, and repeat these steps if you have another controller module in the chassis.

Step 4: Replace a chassis from within the equipment rack or system cabinet

You must remove the existing chassis from the equipment rack or system cabinet before you can install the replacement chassis.

1. Remove the screws from the chassis mount points.



If the system is in a system cabinet, you might need to remove the rear tie-down bracket.

2. With the help of two or three people, slide the old chassis off the rack rails in a system cabinet or *L* brackets in an equipment rack, and then set it aside.
3. If you are not already grounded, properly ground yourself.
4. Using two or three people, install the replacement chassis into the equipment rack or system cabinet by guiding the chassis onto the rack rails in a system cabinet or *L* brackets in an equipment rack.
5. Slide the chassis all the way into the equipment rack or system cabinet.
6. Secure the front of the chassis to the equipment rack or system cabinet, using the screws you removed from the old chassis.
7. If you have not already done so, install the bezel.

Step 5: Install the controller

After you install the controller module and any other components into the new chassis, boot it.

For HA pairs with two controller modules in the same chassis, the sequence in which you install the controller module is especially important because it attempts to reboot as soon as you completely seat it in the chassis.

1. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.



Do not completely insert the controller module in the chassis until instructed to do so.

2. Recable the console to the controller module, and then reconnect the management port.
3. Repeat the preceding steps if there is a second controller to install in the new chassis.
4. Complete the installation of the controller module:

If your system is in...	Then perform these steps...
An HA pair	<p>a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position. Tighten the thumbscrew on the cam handle on back of the controller module.</p> <div>  <p>Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.</p> </div> <p>b. If you have not already done so, reinstall the cable management device.</p> <p>c. Bind the cables to the cable management device with the hook and loop strap.</p> <p>d. Repeat the preceding steps for the second controller module in the new chassis.</p>
A stand-alone configuration	<p>a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position. Tighten the thumbscrew on the cam handle on back of the controller module.</p> <div>  <p>Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.</p> </div> <p>b. If you have not already done so, reinstall the cable management device.</p> <p>c. Bind the cables to the cable management device with the hook and loop strap.</p> <p>d. Reinstall the blanking panel and then go to the next step.</p>

5. Connect the power supplies to different power sources, and then turn them on.

6. Boot each controller to Maintenance mode:

- a. As each controller starts the booting, press `Ctrl-C` to interrupt the boot process when you see the message `Press Ctrl-C for Boot Menu`.



If you miss the prompt and the controller modules boot to ONTAP, enter `halt`, and then at the `LOADER` prompt enter `boot_ontap`, press `Ctrl-C` when prompted, and then repeat this step.

- b. From the boot menu, select the option for Maintenance mode.

Restore and verify the configuration - FAS8200

You must verify the HA state of the chassis, switch back aggregates, and return the failed part to NetApp, as described in the RMA instructions shipped with the kit.

Step 1: Verify and set the HA state of the chassis

You must verify the HA state of the chassis, and, if necessary, update the state to match your system configuration.

- 1. In Maintenance mode, from either controller module, display the HA state of the local controller module and chassis: `ha-config show`

The HA state should be the same for all components.

- 2. If the displayed system state for the chassis does not match your system configuration:
 - a. Set the HA state for the chassis: `ha-config modify chassis HA-state`

The value for HA-state can be one of the following:

- * **ha**
- * `mcc`
- * **mcc-2n**
- * `mccip`
- * `non-ha`

- b. Confirm that the setting has changed: `ha-config show`

- 3. If you have not already done so, recable the rest of your system.
- 4. The next step depends on your system configuration.

If your system is in...	Then...
A stand-alone configuration	<ul style="list-style-type: none">a. Exit Maintenance mode: <code>halt</code>b. Go to Completing the replacement process.
An HA pair with a second controller module	Exit Maintenance mode: <code>halt</code> The LOADER prompt appears.

Step 2: Switch back aggregates in a two-node MetroCluster configuration

After you have completed the FRU replacement in a two-node MetroCluster configuration, you can perform the MetroCluster switchback operation. This returns the configuration to its normal operating state, with the sync-source storage virtual machines (SVMs) on the formerly impaired site now active and serving data from the local disk pools.

This task only applies to two-node MetroCluster configurations.

Steps

- 1. Verify that all nodes are in the enabled state: `metrocluster node show`


```
cluster_B::> metrocluster node show
```

DR		Configuration	DR
Group	Cluster Node	State	Mirroring Mode
1	cluster_A	controller_A_1 configured	enabled
completed	cluster_B	controller_B_1 configured	enabled
		switchback recovery	waiting for

2 entries were displayed.

2. Verify that resynchronization is complete on all SVMs: `metrocluster vserver show`
3. Verify that any automatic LIF migrations being performed by the healing operations were completed successfully: `metrocluster check lif show`
4. Perform the switchback by using the `metrocluster switchback` command from any node in the surviving cluster.
5. Verify that the switchback operation has completed: `metrocluster show`

The switchback operation is still running when a cluster is in the **waiting-for-switchback** state:

```
cluster_B::> metrocluster show
```

Cluster	Configuration	State	Mode
Local: cluster_B	configured	switchover	
Remote: cluster_A	configured	waiting-for-switchback	

The switchback operation is complete when the clusters are in the **normal** state.:

```
cluster_B::> metrocluster show
```

Cluster	Configuration	State	Mode
Local: cluster_B	configured	normal	
Remote: cluster_A	configured	normal	

If a switchback is taking a long time to finish, you can check on the status of in-progress baselines by using the `metrocluster config-replication resync-status show` command.

6. Reestablish any SnapMirror or SnapVault configurations.

Step 3: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

Controller

Overview of controller module replacement - FAS8200

You must review the prerequisites for the replacement procedure and select the correct one for your version of the ONTAP operating system.

- All drive shelves must be working properly.
- If your system is a FlexArray system or has a V_StorageAttach license, you must refer to the additional required steps before performing this procedure.
- If your system is in an HA pair, the healthy controller must be able to take over the controller that is being replaced (referred to in this procedure as the “impaired controller”).
- If your system is in a MetroCluster configuration, you must review the section [Choosing the correct recovery procedure](#) to determine whether you should use this procedure.

If this is the procedure you should use, note that the controller replacement procedure for a controller in a four or eight controller MetroCluster configuration is the same as that in an HA pair. No MetroCluster-specific steps are required because the failure is restricted to an HA pair and storage failover commands can be used to provide nondisruptive operation during the replacement.

- This procedure includes steps for automatically or manually reassigning drives to the *replacement* controller, depending on your system’s configuration.

You should perform the drive reassignment as directed in the procedure.

- You must replace the failed component with a replacement FRU component you received from your provider.
- You must be replacing a controller module with a controller module of the same model type. You cannot upgrade your system by just replacing the controller module.
- You cannot change any drives or drive shelves as part of this procedure.
- In this procedure, the boot device is moved from the impaired controller to the *replacement* controller so that the *replacement* controller will boot up in the same version of ONTAP as the old controller module.
- Any PCIe cards moved from the old controller module to the new controller module or added from existing customer site inventory must be supported by the replacement controller module.

NetApp Hardware Universe

- It is important that you apply the commands in these steps on the correct systems:
 - The *impaired* controller is the controller that is being replaced.
 - The *replacement* controller is the new controller that is replacing the impaired controller.
 - The *healthy* controller is the surviving controller.
- You must always capture the controller’s console output to a text file.

This provides you a record of the procedure so that you can troubleshoot any issues that you might encounter during the replacement process.

Shut down the impaired controller - FAS8200

You can shut down or take over the impaired controller using different procedures, depending on the storage system hardware configuration.

Option 1: Most systems

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced` mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message MAINT=<# of hours>h
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`



When you see *Do you want to disable auto-giveback?*, enter *y*.

3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying...	Then...
The LOADER prompt	Go to the next step.
Waiting for giveback...	Press Ctrl-C, and then respond <i>y</i> when prompted.
System prompt or password prompt	<p>Take over or halt the impaired controller from the healthy controller: <code>storage failover takeover -ofnode <i>impaired_node_name</i></code></p> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i>.</p>

Option 2: Controller is in a two-node MetroCluster

To shut down the impaired controller, you must determine the status of the controller and, if necessary,

switch over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- You must leave the power supplies turned on at the end of this procedure to provide power to the healthy controller.

Steps

1. Check the MetroCluster status to determine whether the impaired controller has automatically switched over to the healthy controller: `metrocluster show`
2. Depending on whether an automatic switchover has occurred, proceed according to the following table:

If the impaired controller...	Then...
Has automatically switched over	Proceed to the next step.
Has not automatically switched over	Perform a planned switchover operation from the healthy controller: <code>metrocluster switchover</code>
Has not automatically switched over, you attempted switchover with the <code>metrocluster switchover</code> command, and the switchover was vetoed	Review the veto messages and, if possible, resolve the issue and try again. If you are unable to resolve the issue, contact technical support.

3. Resynchronize the data aggregates by running the `metrocluster heal -phase aggregates` command from the surviving cluster.

```
controller_A_1::> metrocluster heal -phase aggregates
[Job 130] Job succeeded: Heal Aggregates is successful.
```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

4. Verify that the operation has been completed by using the `metrocluster operation show` command.

```
controller_A_1::> metrocluster operation show
Operation: heal-aggregates
State: successful
Start Time: 7/25/2016 18:45:55
End Time: 7/25/2016 18:45:56
Errors: -
```

5. Check the state of the aggregates by using the `storage aggregate show` command.

```

controller_A_1::> storage aggregate show
Aggregate      Size Available Used% State    #Vols  Nodes
RAID Status
-----
...
aggr_b2        227.1GB    227.1GB    0% online      0 mcc1-a2
raid_dp, mirrored, normal...

```

6. Heal the root aggregates by using the `metrocluster heal -phase root-aggregates` command.

```

mcc1A::> metrocluster heal -phase root-aggregates
[Job 137] Job succeeded: Heal Root Aggregates is successful

```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

7. Verify that the heal operation is complete by using the `metrocluster operation show` command on the destination cluster:

```

mcc1A::> metrocluster operation show
Operation: heal-root-aggregates
State: successful
Start Time: 7/29/2016 20:54:41
End Time: 7/29/2016 20:54:42
Errors: -

```

8. On the impaired controller module, disconnect the power supplies.

Replace the controller module hardware - FAS8200

To replace the controller module hardware, you must remove the impaired controller, move FRU components to the replacement controller module, install the replacement controller module in the chassis, and then boot the system to Maintenance mode.

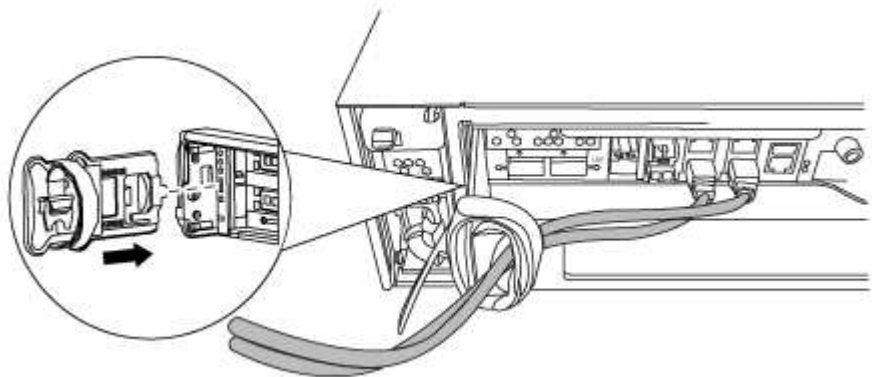
Step 1: Open the controller module

To replace the controller module, you must first remove the old controller module from the chassis.

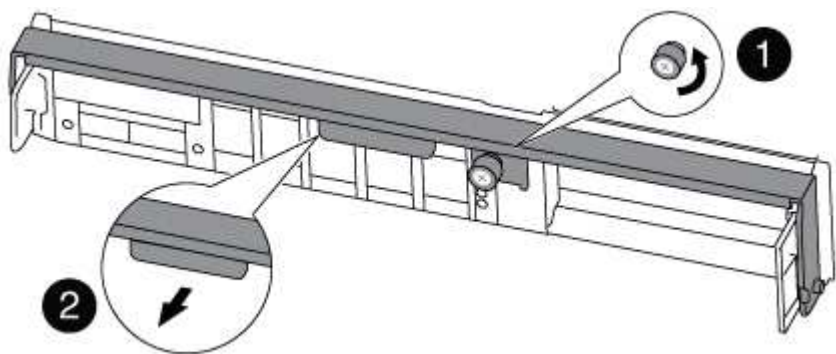
1. If you are not already grounded, properly ground yourself.
2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

- 3. Remove and set aside the cable management devices from the left and right sides of the controller module.



- 4. If you left the SFP modules in the system after removing the cables, move them to the new controller module.
- 5. Loosen the thumbscrew on the cam handle on the controller module.



1	Thumbscrew
2	Cam handle

- 6. Pull the cam handle downward and begin to slide the controller module out of the chassis.
- Make sure that you support the bottom of the controller module as you slide it out of the chassis.

Step 2: Move the boot device

You must locate the boot media and follow the directions to remove it from the old controller and insert it in the new controller.

- 1. Locate the boot media using the following illustration or the FRU map on the controller module:



2. Press the blue button on the boot media housing to release the boot media from its housing, and then gently pull it straight out of the boot media socket.



Do not twist or pull the boot media straight up, because this could damage the socket or the boot media.

3. Move the boot media to the new controller module, align the edges of the boot media with the socket housing, and then gently push it into the socket.
4. Check the boot media to make sure that it is seated squarely and completely in the socket.

If necessary, remove the boot media and reseal it into the socket.

5. Push the boot media down to engage the locking button on the boot media housing.

Step 3: Move the NVMEM battery

To move the NVMEM battery from the old controller module to the new controller module, you must perform a specific sequence of steps.

1. Check the NVMEM LED:
 - If your system is in an HA configuration, go to the next step.

- If your system is in a stand-alone configuration, cleanly shut down the controller module, and then check the NVRAM LED identified by the NV icon.

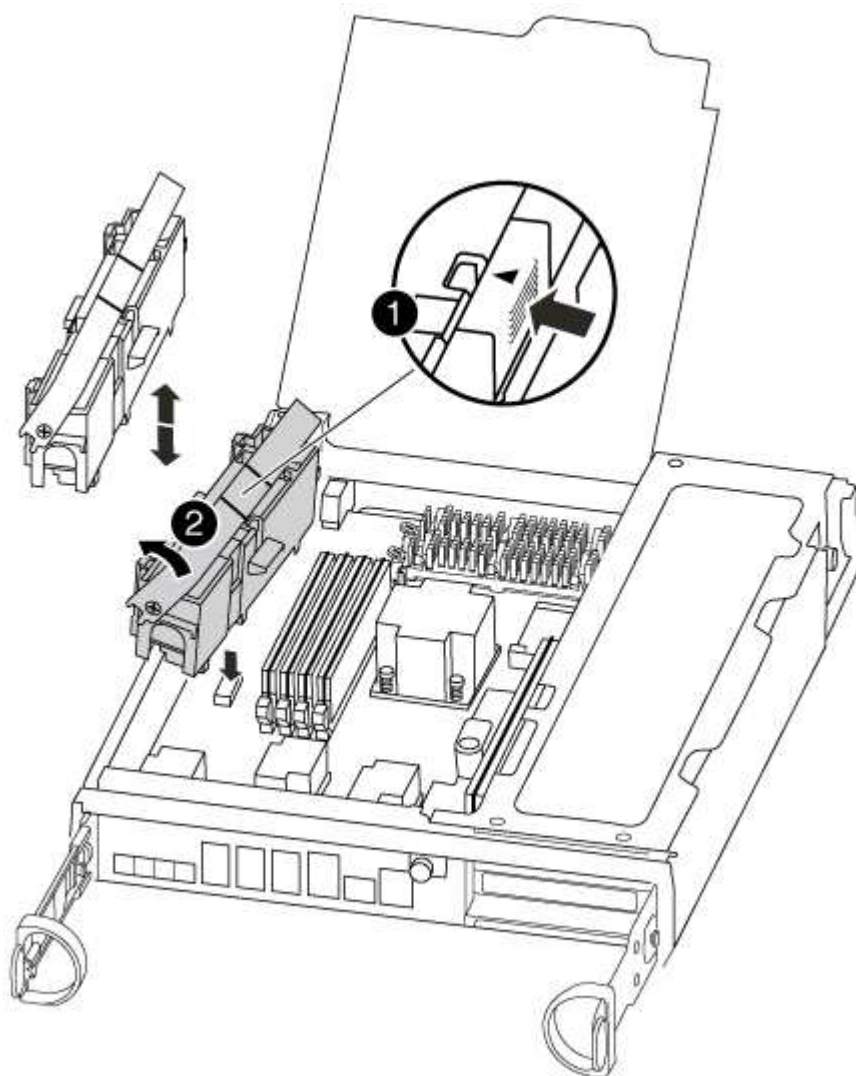


The NVRAM LED blinks while destaging contents to the flash memory when you halt the system. After the destage is complete, the LED turns off.

- If power is lost without a clean shutdown, the NVMEM LED flashes until the destage is complete, and then the LED turns off.
- If the LED is on and power is on, unwritten data is stored on NVMEM.

This typically occurs during an uncontrolled shutdown after ONTAP has successfully booted.

2. Open the CPU air duct and locate the NVMEM battery.



1	Battery lock tab
2	NVMEM battery pack

3. Grasp the battery and press the blue locking tab marked PUSH, and then lift the battery out of the holder and controller module.
4. Remove the battery from the controller module and set it aside.

Step 4: Move the DIMMs

To move the DIMMs, locate and move them from the old controller into the replacement controller and follow the specific sequence of steps.

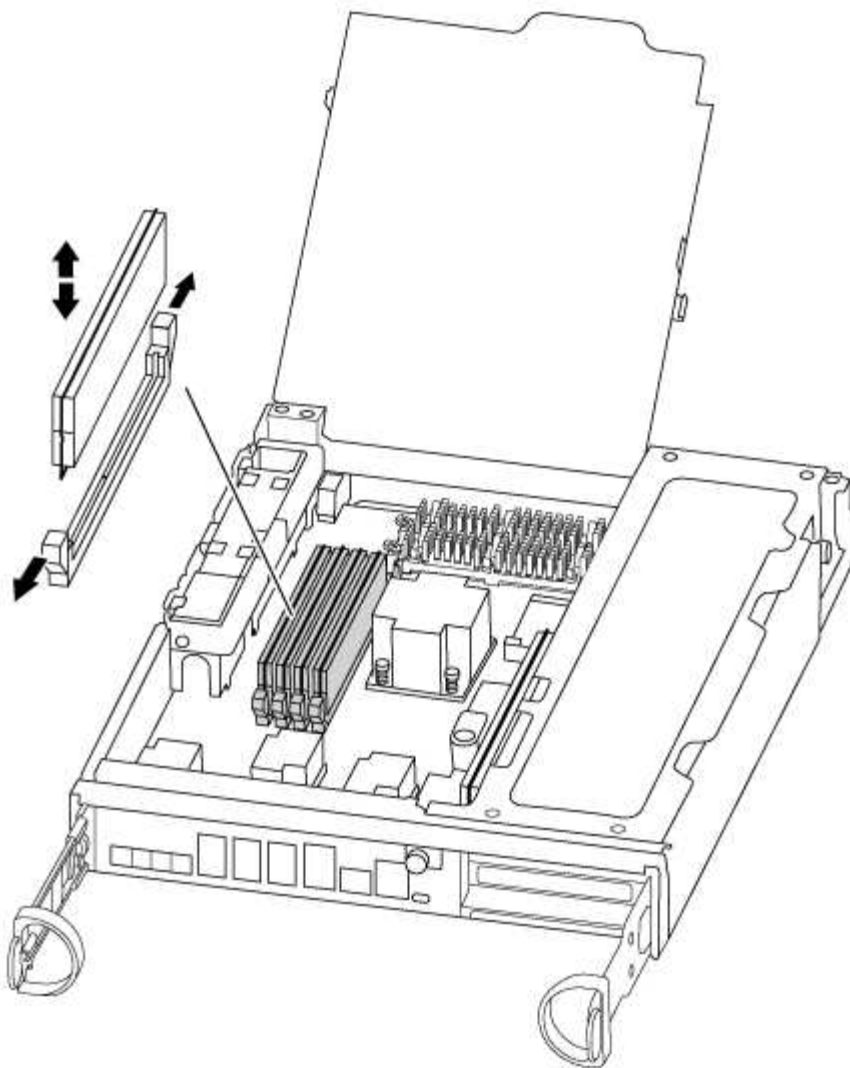
1. Locate the DIMMs on your controller module.
2. Note the orientation of the DIMM in the socket so that you can insert the DIMM in the replacement controller module in the proper orientation.
3. Eject the DIMM from its slot by slowly pushing apart the two DIMM ejector tabs on either side of the DIMM, and then slide the DIMM out of the slot.



Carefully hold the DIMM by the edges to avoid pressure on the components on the DIMM circuit board.

The number and placement of system DIMMs depends on the model of your system.

The following illustration shows the location of system DIMMs:



4. Locate the slot where you are installing the DIMM.
5. Make sure that the DIMM ejector tabs on the connector are in the open position, and then insert the DIMM squarely into the slot.

The DIMM fits tightly in the slot, but should go in easily. If not, realign the DIMM with the slot and reinsert it.



Visually inspect the DIMM to verify that it is evenly aligned and fully inserted into the slot.

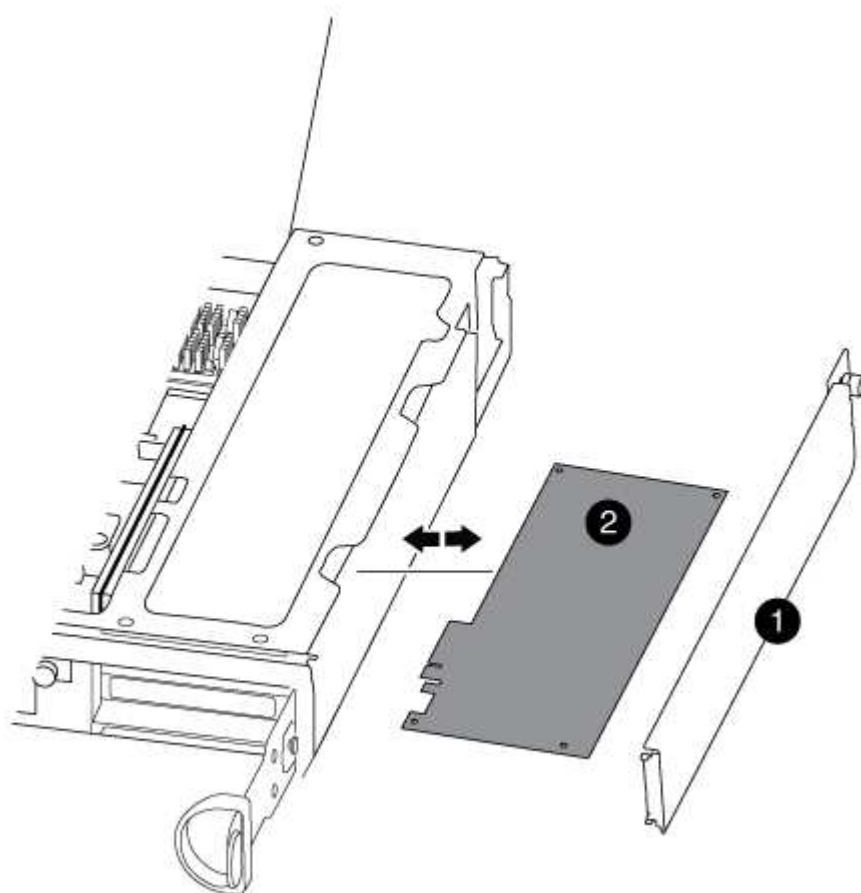
6. Repeat these steps for the remaining DIMMs.
7. Move the NVMEM battery to the replacement controller module.
8. Align the tab or tabs on the battery holder with the notches in the controller module side, and then gently push down on the battery housing until the battery housing clicks into place.

Step 5: Move a PCIe card

To move PCIe cards, locate and move them from the old controller into the replacement controller and follow the specific sequence of steps.

You must have the new controller module ready so that you can move the PCIe cards directly from the old controller module to the corresponding slots in the new one.

1. Loosen the thumbscrew on the controller module side panel.
2. Swing the side panel off the controller module.



1	Side panel
2	PCIe card

3. Remove the PCIe card from the old controller module and set it aside.

Make sure that you keep track of which slot the PCIe card was in.

4. Repeat the preceding step for the remaining PCIe cards in the old controller module.
5. Open the new controller module side panel, if necessary, slide off the PCIe card filler plate, as needed, and carefully install the PCIe card.

Be sure that you properly align the card in the slot and exert even pressure on the card when seating it in the socket. The card must be fully and evenly seated in the slot.

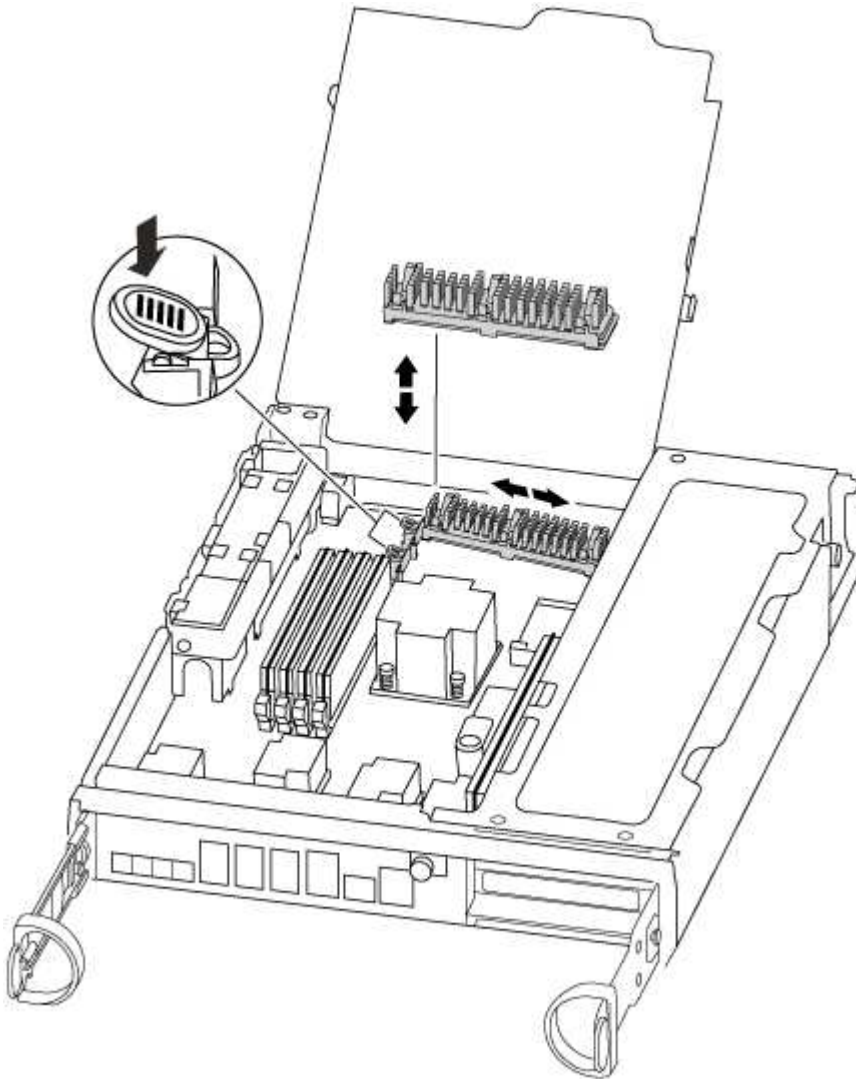
6. Repeat the preceding step for the remaining PCIe cards that you set aside.
7. Close the side panel and tighten the thumbscrew.

Step 6: Move a caching module

You must move the caching modules from the impaired controller modules to the replacement controller module when replacing a controller module.

1. Locate the caching module at the rear of the controller module and remove it:
 - a. Press the release tab.
 - b. Remove the heatsink.

The storage system comes with two slots available for the caching module and only one slot is occupied, by default.



2. Move the caching module to the new controller module, and then align the edges of the caching module with the socket housing and gently push it into the socket.
3. Verify that the caching module is seated squarely and completely in the socket. If necessary, remove the caching module and reseal it into the socket.
4. Reseat and push the heatsink down to engage the locking button on the caching module housing.
5. Repeat the steps if you have a second caching module. Close the controller module cover.

Step 7: Install the controller

After you install the components from the old controller module into the new controller module, you must install the new controller module into the system chassis and boot the operating system.

For HA pairs with two controller modules in the same chassis, the sequence in which you install the controller module is especially important because it attempts to reboot as soon as you completely seat it in the chassis.



The system might update system firmware when it boots. Do not abort this process. The procedure requires you to interrupt the boot process, which you can typically do at any time after prompted to do so. However, if the system updates the system firmware when it boots, you must wait until after the update is complete before interrupting the boot process.

1. If you are not already grounded, properly ground yourself.
2. If you have not already done so, close the CPU air duct.
3. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.



Do not completely insert the controller module in the chassis until instructed to do so.

4. Cable the management and console ports only, so that you can access the system to perform the tasks in the following sections.



You will connect the rest of the cables to the controller module later in this procedure.

5. Complete the reinstallation of the controller module:

If your system is in...	Then perform these steps...
An HA pair	<div data-bbox="646 184 1429 304"> <p>The controller module begins to boot as soon as it is fully seated in the chassis. Be prepared to interrupt the boot process.</p> </div> <p data-bbox="634 369 1484 504">a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position. Tighten the thumbscrew on the cam handle on back of the controller module.</p> <div data-bbox="699 569 756 625">  </div> <div data-bbox="818 548 1364 651"> <p>Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.</p> </div> <p data-bbox="670 693 1385 758">The controller begins to boot as soon as it is seated in the chassis.</p> <p data-bbox="634 793 1463 858">b. If you have not already done so, reinstall the cable management device.</p> <p data-bbox="634 877 1446 942">c. Bind the cables to the cable management device with the hook and loop strap.</p> <p data-bbox="634 961 1468 1033">d. When you see the message <code>Press Ctrl-C for Boot Menu</code>, press <code>Ctrl-C</code> to interrupt the boot process.</p> <div data-bbox="699 1136 756 1192">  </div> <div data-bbox="818 1079 1451 1251"> <p>If you miss the prompt and the controller module boots to ONTAP, enter <code>halt</code>, and then at the <code>LOADER</code> prompt enter <code>boot_ontap</code>, press <code>Ctrl-C</code> when prompted, and then boot to Maintenance mode.</p> </div> <p data-bbox="634 1295 1484 1360">e. Select the option to boot to Maintenance mode from the displayed menu.</p>

If your system is in...	Then perform these steps...
A stand-alone configuration	<p>a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position. Tighten the thumbscrew on the cam handle on back of the controller module.</p> <div>  <p>Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.</p> </div> <p>b. If you have not already done so, reinstall the cable management device.</p> <p>c. Bind the cables to the cable management device with the hook and loop strap.</p> <p>d. Reconnect the power cables to the power supplies and to the power sources, turn on the power to start the boot process, and then press <code>Ctrl-C</code> after you see the <code>Press Ctrl-C for Boot Menu</code> message.</p> <div>  <p>If you miss the prompt and the controller module boots to ONTAP, enter <code>halt</code>, and then at the <code>LOADER</code> prompt enter <code>boot_ontap</code>, press <code>Ctrl-C</code> when prompted, and then boot to Maintenance mode.</p> </div> <p>e. From the boot menu, select the option for Maintenance mode.</p>

Important: During the boot process, you might see the following prompts:

- A prompt warning of a system ID mismatch and asking to override the system ID.
 - A prompt warning that when entering Maintenance mode in an HA configuration you must ensure that the healthy controller remains down.
- You can safely respond `y` to these prompts.

Restore and verify the system configuration - FAS8200

After completing the hardware replacement and booting to Maintenance mode, you verify the low-level system configuration of the replacement controller and reconfigure system settings as necessary.

Step 1: Set and verify system time after replacing the controller

You should check the time and date on the replacement controller module against the healthy controller module in an HA pair, or against a reliable time server in a stand-alone configuration. If the time and date do not match, you must reset them on the replacement controller module to prevent possible outages on clients due to time differences.

About this task

It is important that you apply the commands in the steps on the correct systems:

- The *replacement* node is the new node that replaced the impaired node as part of this procedure.
- The *healthy* node is the HA partner of the *replacement* node.

Steps

1. If the *replacement* node is not at the LOADER prompt, halt the system to the LOADER prompt.
2. On the *healthy* node, check the system time: `cluster date show`

The date and time are based on the configured timezone.

3. At the LOADER prompt, check the date and time on the *replacement* node: `show date`

The date and time are given in GMT.

4. If necessary, set the date in GMT on the replacement node: `set date mm/dd/yyyy`
5. If necessary, set the time in GMT on the replacement node: `set time hh:mm:ss`
6. At the LOADER prompt, confirm the date and time on the *replacement* node: `show date`

The date and time are given in GMT.

Step 2: Verify and set the HA state of the controller module

You must verify the HA state of the controller module and, if necessary, update the state to match your system configuration.

1. In Maintenance mode from the new controller module, verify that all components display the same HA state: `ha-config show`

The HA state should be the same for all components.

2. If the displayed system state of the controller module does not match your system configuration, set the HA state for the controller module: `ha-config modify controller ha-state`

The value for HA-state can be one of the following:

- `ha`
- `mcc`
- `mcc-2n`
- `mccip`
- `non-ha`

3. If the displayed system state of the controller module does not match your system configuration, set the HA state for the controller module: `ha-config modify controller ha-state`
4. Confirm that the setting has changed: `ha-config show`

Recable the system and reassign disks - FAS8200

Continue the replacement procedure by recabling the storage and confirming disk reassignment.

Step 1: Recable the system

Recable the controller module's storage and network connections.

Steps

1. Recable the the controller module to storage and network connnections.
2. Verify that the cabling is correct by using [Active IQ Config Advisor](#).
 - a. Download and install Config Advisor.
 - b. Enter the information for the target system, and then click Collect Data.
 - c. Click the Cabling tab, and then examine the output. Make sure that all disk shelves are displayed and all disks appear in the output, correcting any cabling issues you find.
 - d. Check other cabling by clicking the appropriate tab, and then examining the output from Config Advisor.

Step 2: Reassign disks

If the storage system is in an HA pair, the system ID of the new controller module is automatically assigned to the disks when the giveback occurs at the end of the procedure. You must use the correct procedure for your configuration.

Option 1: Verify the system ID change on an HA system

You must confirm the system ID change when you boot the *replacement* controller and then verify that the change was implemented.

This procedure applies only to systems running ONTAP in an HA pair.

1. If the *replacement* controller is in Maintenance mode (showing the `*>` prompt, exit Maintenance mode and go to the LOADER prompt: `halt`
2. From the LOADER prompt on the *replacement* controller, boot the controller, entering `y` if you are prompted to override the system ID due to a system ID mismatch. `boot_ontap`
3. Wait until the `Waiting for giveback...` message is displayed on the *replacement* controller console and then, from the healthy controller, verify that the new partner system ID has been automatically assigned:
`storage failover show`

In the command output, you should see a message that the system ID has changed on the impaired controller, showing the correct old and new IDs. In the following example, node2 has undergone replacement and has a new system ID of 151759706.

```
node1> `storage failover show`
```

Node	Partner	Takeover Possible	State Description
-----	-----	-----	

node1	node2	false	System ID changed on partner (Old:
			151759706), In takeover
			151759755, New:
node2	node1	-	Waiting for giveback
(HA mailboxes)			

4. From the healthy controller, verify that any coredumps are saved:

a. Change to the advanced privilege level: `set -privilege advanced`

5. If your storage system has Storage or Volume Encryption configured, you must restore Storage or Volume Encryption functionality by using one of the following procedures, depending on whether you are using onboard or external key management:

- [Restore onboard key management encryption keys](#)
- [Restore external key management encryption keys](#)

You can respond `y` when prompted to continue into advanced mode. The advanced mode prompt appears (`*>`).

- a. Save any coredumps: `system node run -node local-node-name partner savecore`
- b. Wait for `savecore` command to complete before issuing the giveback.

You can enter the following command to monitor the progress of the `savecore` command: `system node run -node local-node-name partner savecore -s`

- c. Return to the admin privilege level: `set -privilege admin`

6. Give back the controller:

- a. From the healthy controller, give back the replaced controller's storage: `storage failover giveback -ofnode replacement_node_name`

The *replacement* controller takes back its storage and completes booting.

If you are prompted to override the system ID due to a system ID mismatch, you should enter `y`.



If the giveback is vetoed, you can consider overriding the vetoes.

[Find the High-Availability Configuration content for your version of ONTAP 9](#)

- b. After the giveback has been completed, confirm that the HA pair is healthy and that takeover is possible: `storage failover show`

The output from the `storage failover show` command should not include the System ID changed

on partner message.

7. Verify that the disks were assigned correctly: `storage disk show -ownership`

The disks belonging to the *replacement* controller should show the new system ID. In the following example, the disks owned by node1 now show the new system ID, 1873775277:

```
node1> `storage disk show -ownership`

Disk   Aggregate Home   Owner   DR Home   Home ID   Owner ID   DR Home ID
Reserver Pool
-----
-----
-----
1.0.0   aggr0_1   node1   node1   -         1873775277 1873775277 -
1873775277 Pool0
1.0.1   aggr0_1   node1   node1         1873775277 1873775277 -
1873775277 Pool0
.
.
.
```

Option 2: Manually reassign the system ID on systems in a two-node MetroCluster configuration

In a two-node MetroCluster configuration running ONTAP, you must manually reassign disks to the new controller's system ID before you return the system to normal operating condition.

About this task

This procedure applies only to systems in a two-node MetroCluster configuration running ONTAP.

You must be sure to issue the commands in this procedure on the correct node:

- The *impaired* node is the node on which you are performing maintenance.
- The *replacement* node is the new node that replaced the impaired node as part of this procedure.
- The *healthy* node is the DR partner of the impaired node.

Steps

1. If you have not already done so, reboot the *replacement* node, interrupt the boot process by entering `Ctrl-C`, and then select the option to boot to Maintenance mode from the displayed menu.

You must enter `Y` when prompted to override the system ID due to a system ID mismatch.

2. View the old system IDs from the healthy node: ``metrocluster node show -fields node-systemid,dr-partner-systemid``

In this example, the `Node_B_1` is the old node, with the old system ID of 118073209:

```

dr-group-id cluster          node          node-systemid dr-
partner-systemid
-----
1            Cluster_A      Node_A_1      536872914
118073209
1            Cluster_B      Node_B_1      118073209
536872914
2 entries were displayed.

```

3. View the new system ID at the Maintenance mode prompt on the impaired node: `disk show`

In this example, the new system ID is 118065481:

```

Local System ID: 118065481
...
...

```

4. Reassign disk ownership (for FAS systems) or LUN ownership (for FlexArray systems), by using the system ID information obtained from the `disk show` command: `disk reassign -s old system ID`

In the case of the preceding example, the command is: `disk reassign -s 118073209`

You can respond `Y` when prompted to continue.

5. Verify that the disks (or FlexArray LUNs) were assigned correctly: `disk show -a`

Verify that the disks belonging to the *replacement* node show the new system ID for the *replacement* node. In the following example, the disks owned by system-1 now show the new system ID, 118065481:

```

*> disk show -a
Local System ID: 118065481

  DISK          OWNER          POOL  SERIAL NUMBER  HOME
-----
disk_name      system-1 (118065481) Pool0  J8Y0TDZC      system-1
(118065481)
disk_name      system-1 (118065481) Pool0  J8Y09DXC      system-1
(118065481)
.
.
.

```

6. From the healthy node, verify that any coredumps are saved:

- a. Change to the advanced privilege level: `set -privilege advanced`

You can respond `Y` when prompted to continue into advanced mode. The advanced mode prompt appears (`*>`).

- b. Verify that the coredumps are saved: `system node run -node local-node-name partner savecore`

If the command output indicates that `savecore` is in progress, wait for `savecore` to complete before issuing the giveback. You can monitor the progress of the `savecore` using the `system node run -node local-node-name partner savecore -s command.</info>`.

- c. Return to the admin privilege level: `set -privilege admin`

7. If the *replacement* node is in Maintenance mode (showing the `*>` prompt), exit Maintenance mode and go to the LOADER prompt: `halt`
8. Boot the *replacement* node: `boot_ontap`
9. After the *replacement* node has fully booted, perform a switchback: `metrocluster switchback`
10. Verify the MetroCluster configuration: `metrocluster node show - fields configuration-state`

```
node1_siteA::> metrocluster node show -fields configuration-state
```

dr-group-id	cluster node	configuration-state
-----	-----	-----
1 node1_siteA	node1mcc-001	configured
1 node1_siteA	node1mcc-002	configured
1 node1_siteB	node1mcc-003	configured
1 node1_siteB	node1mcc-004	configured

4 entries were displayed.

11. Verify the operation of the MetroCluster configuration in Data ONTAP:
 - a. Check for any health alerts on both clusters: `system health alert show`
 - b. Confirm that the MetroCluster is configured and in normal mode: `metrocluster show`
 - c. Perform a MetroCluster check: `metrocluster check run`
 - d. Display the results of the MetroCluster check: `metrocluster check show`
 - e. Run Config Advisor. Go to the Config Advisor page on the NetApp Support Site at support.netapp.com/NOW/download/tools/config_advisor/.

After running Config Advisor, review the tool's output and follow the recommendations in the output to address any issues discovered.

12. Simulate a switchover operation:
 - a. From any node's prompt, change to the advanced privilege level: `set -privilege advanced`

You need to respond with `y` when prompted to continue into advanced mode and see the advanced mode prompt (`*>`).

- b. Perform the switchback operation with the `-simulate` parameter: `metrocluster switchover -simulate`
- c. Return to the admin privilege level: `set -privilege admin`

Complete system restoration - FAS8200

To restore your system to full operation, you must restore the NetApp Storage Encryption configuration (if necessary), and install licenses for the new controller, and return the failed part to NetApp, as described in the RMA instructions shipped with the kit.

Step 1: Install licenses for the replacement controller in ONTAP

You must install new licenses for the *replacement* node if the impaired node was using ONTAP features that require a standard (node-locked) license. For features with standard licenses, each node in the cluster should have its own key for the feature.

About this task

Until you install license keys, features requiring standard licenses continue to be available to the *replacement* node. However, if the impaired node was the only node in the cluster with a license for the feature, no configuration changes to the feature are allowed. Also, using unlicensed features on the node might put you out of compliance with your license agreement, so you should install the replacement license key or keys on the *replacement* node as soon as possible.

Before you begin

The licenses keys must be in the 28-character format.

You have a 90-day grace period in which to install the license keys. After the grace period, all old licenses are invalidated. After a valid license key is installed, you have 24 hours to install all of the keys before the grace period ends.

Steps

1. If you need new license keys, obtain replacement license keys on the [NetApp Support Site](#) in the My Support section under Software licenses.



The new license keys that you require are automatically generated and sent to the email address on file. If you fail to receive the email with the license keys within 30 days, you should contact technical support.

2. Install each license key: `system license add -license-code license-key, license-key...`
3. Remove the old licenses, if desired:
 - a. Check for unused licenses: `license clean-up -unused -simulate`
 - b. If the list looks correct, remove the unused licenses: `license clean-up -unused`

Step 2: Verify LIFs and register the serial number

Before returning the *replacement* node to service, you should verify that the LIFs are on their home ports, and register the serial number of the *replacement* node if AutoSupport is enabled, and reset automatic giveback.

Steps

1. Verify that the logical interfaces are reporting to their home server and ports: `network interface show -is-home false`

If any LIFs are listed as false, revert them to their home ports: `network interface revert -vserver * -lif *`
2. Register the system serial number with NetApp Support.
 - If AutoSupport is enabled, send an AutoSupport message to register the serial number.
 - If AutoSupport is not enabled, call [NetApp Support](#) to register the serial number.
3. If an AutoSupport maintenance window was triggered, end it by using the `system node autosupport invoke -node * -type all -message MAINT=END` command.
4. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`

Step 3: Switch back aggregates in a two-node MetroCluster configuration

After you have completed the FRU replacement in a two-node MetroCluster configuration, you can perform the MetroCluster switchback operation. This returns the configuration to its normal operating state, with the sync-source storage virtual machines (SVMs) on the formerly impaired site now active and serving data from the local disk pools.

This task only applies to two-node MetroCluster configurations.

Steps

1. Verify that all nodes are in the enabled state: `metrocluster node show`

```
cluster_B::> metrocluster node show
```

DR	Configuration	DR
Group Cluster Node	State	Mirroring Mode

1	cluster_A	
	controller_A_1 configured	enabled heal roots
completed		
	cluster_B	
	controller_B_1 configured	enabled waiting for
switchback recovery		

2 entries were displayed.

2. Verify that resynchronization is complete on all SVMs: `metrocluster vserver show`
3. Verify that any automatic LIF migrations being performed by the healing operations were completed successfully: `metrocluster check lif show`
4. Perform the switchback by using the `metrocluster switchback` command from any node in the surviving cluster.

5. Verify that the switchback operation has completed: `metrocluster show`

The switchback operation is still running when a cluster is in the `waiting-for-switchback` state:

```
cluster_B::> metrocluster show
Cluster           Configuration State      Mode
-----
Local: cluster_B configured          switchover
Remote: cluster_A configured          waiting-for-switchback
```

The switchback operation is complete when the clusters are in the `normal` state.:

```
cluster_B::> metrocluster show
Cluster           Configuration State      Mode
-----
Local: cluster_B configured          normal
Remote: cluster_A configured          normal
```

If a switchback is taking a long time to finish, you can check on the status of in-progress baselines by using the `metrocluster config-replication resync-status show` command.

6. Reestablish any SnapMirror or SnapVault configurations.

Step 4: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

Replace a DIMM - FAS8200

You must replace a DIMM in the controller module when your system registers an increasing number of correctable error correction codes (ECC); failure to do so causes a system panic.

All other components in the system must be functioning properly; if not, you must contact technical support.

You must replace the failed component with a replacement FRU component you received from your provider.

Step 1: Shut down the impaired controller

You can shut down or take over the impaired controller using different procedures, depending on the storage system hardware configuration.

Option 1: Most configurations

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced` mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message MAINT=<# of hours>h
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`



When you see *Do you want to disable auto-giveback?*, enter *y*.

3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying...	Then...
The LOADER prompt	Go to the next step.
Waiting for giveback...	Press Ctrl-C, and then respond <i>y</i> when prompted.
System prompt or password prompt	<p>Take over or halt the impaired controller from the healthy controller: <code>storage failover takeover -ofnode <i>impaired_node_name</i></code></p> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i>.</p>

Option 2: Controller is in a two-node MetroCluster

To shut down the impaired controller, you must determine the status of the controller and, if necessary,

switch over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- You must leave the power supplies turned on at the end of this procedure to provide power to the healthy controller.

Steps

1. Check the MetroCluster status to determine whether the impaired controller has automatically switched over to the healthy controller: `metrocluster show`
2. Depending on whether an automatic switchover has occurred, proceed according to the following table:

If the impaired controller...	Then...
Has automatically switched over	Proceed to the next step.
Has not automatically switched over	Perform a planned switchover operation from the healthy controller: <code>metrocluster switchover</code>
Has not automatically switched over, you attempted switchover with the <code>metrocluster switchover</code> command, and the switchover was vetoed	Review the veto messages and, if possible, resolve the issue and try again. If you are unable to resolve the issue, contact technical support.

3. Resynchronize the data aggregates by running the `metrocluster heal -phase aggregates` command from the surviving cluster.

```
controller_A_1::> metrocluster heal -phase aggregates
[Job 130] Job succeeded: Heal Aggregates is successful.
```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

4. Verify that the operation has been completed by using the `metrocluster operation show` command.

```
controller_A_1::> metrocluster operation show
Operation: heal-aggregates
State: successful
Start Time: 7/25/2016 18:45:55
End Time: 7/25/2016 18:45:56
Errors: -
```

5. Check the state of the aggregates by using the `storage aggregate show` command.

```

controller_A_1:> storage aggregate show
Aggregate      Size Available Used% State    #Vols  Nodes
RAID Status
-----
...
aggr_b2        227.1GB    227.1GB    0% online      0 mcc1-a2
raid_dp, mirrored, normal...

```

6. Heal the root aggregates by using the `metrocluster heal -phase root-aggregates` command.

```

mcc1A:> metrocluster heal -phase root-aggregates
[Job 137] Job succeeded: Heal Root Aggregates is successful

```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

7. Verify that the heal operation is complete by using the `metrocluster operation show` command on the destination cluster:

```

mcc1A:> metrocluster operation show
Operation: heal-root-aggregates
State: successful
Start Time: 7/29/2016 20:54:41
End Time: 7/29/2016 20:54:42
Errors: -

```

8. On the impaired controller module, disconnect the power supplies.

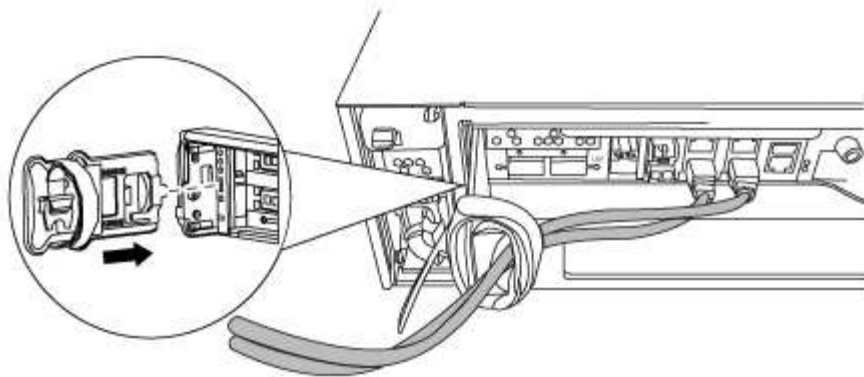
Step 2: Open the controller module

To access components inside the controller, you must first remove the controller module from the system and then remove the cover on the controller module.

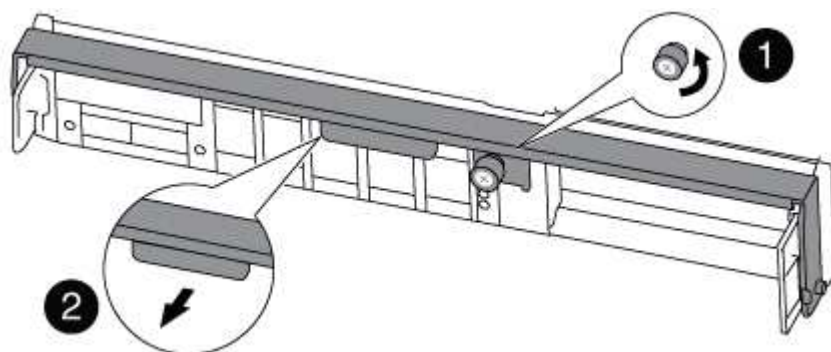
1. If you are not already grounded, properly ground yourself.
2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

3. Remove and set aside the cable management devices from the left and right sides of the controller module.



4. Loosen the thumbscrew on the cam handle on the controller module.



1	Thumbscrew
2	Cam handle

5. Pull the cam handle downward and begin to slide the controller module out of the chassis.

Make sure that you support the bottom of the controller module as you slide it out of the chassis.

Step 3: Replace the DIMMs

To replace the DIMMs, locate them inside the controller and follow the specific sequence of steps.

1. Check the NVMEM LED on the controller module.

You must perform a clean system shutdown before replacing system components to avoid losing unwritten data in the nonvolatile memory (NVMEM). The LED is located on the back of the controller module. Look for the following icon:



2. If the NVMEM LED is not flashing, there is no content in the NVMEM; you can skip the following steps and proceed to the next task in this procedure.

3. Unplug the battery:

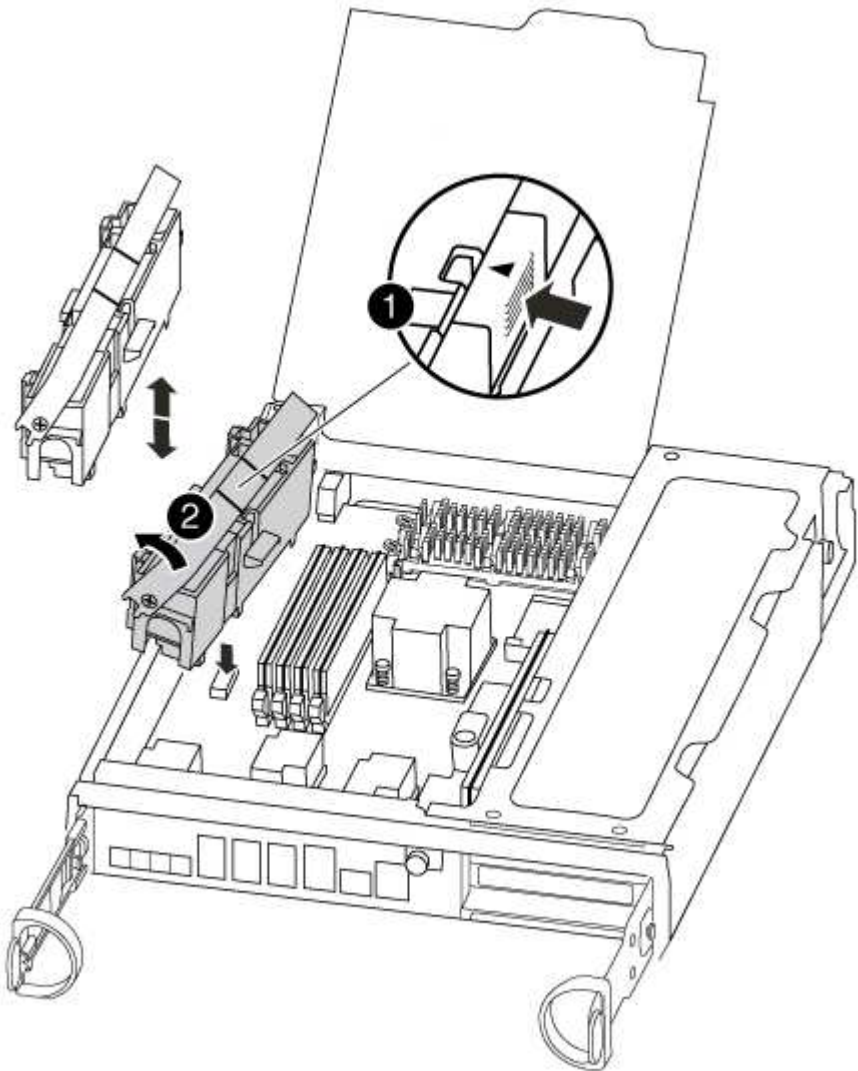


The NVMEM LED blinks while destaging contents to the flash memory when you halt the system. After the destage is complete, the LED turns off.

- If power is lost without a clean shutdown, the NVMEM LED flashes until the destage is complete, and then the LED turns off.
- If the LED is on and power is on, unwritten data is stored on NVMEM.

This typically occurs during an uncontrolled shutdown after Data ONTAP has successfully booted.

- a. Open the CPU air duct and locate the NVMEM battery.



1	NVMEM battery lock tab
2	NVMEM battery

- b. Locate the battery plug and squeeze the clip on the face of the battery plug to release the plug from

the socket, and then unplug the battery cable from the socket.

c. Wait a few seconds, and then plug the battery back into the socket.

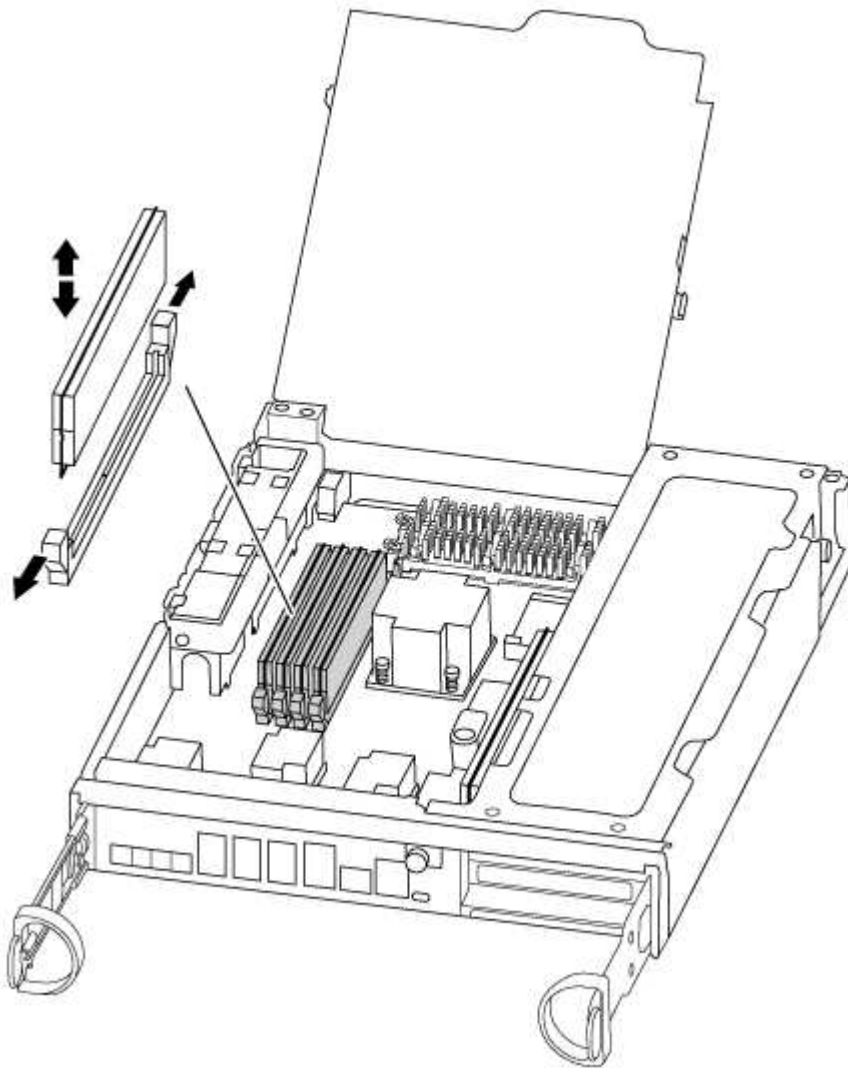
4. Check the NVMEM LED on the controller module.
5. Locate the DIMMs on your controller module.
6. Note the orientation of the DIMM in the socket so that you can insert the replacement DIMM in the proper orientation.
7. Eject the DIMM from its slot by slowly pushing apart the two DIMM ejector tabs on either side of the DIMM, and then slide the DIMM out of the slot.



Carefully hold the DIMM by the edges to avoid pressure on the components on the DIMM circuit board.

The number and placement of system DIMMs depends on the model of your system.

The following illustration shows the location of system DIMMs:



8. Remove the replacement DIMM from the antistatic shipping bag, hold the DIMM by the corners, and align it to the slot.

The notch among the pins on the DIMM should line up with the tab in the socket.

9. Make sure that the DIMM ejector tabs on the connector are in the open position, and then insert the DIMM squarely into the slot.

The DIMM fits tightly in the slot, but should go in easily. If not, realign the DIMM with the slot and reinsert it.



Visually inspect the DIMM to verify that it is evenly aligned and fully inserted into the slot.

10. Push carefully, but firmly, on the top edge of the DIMM until the ejector tabs snap into place over the notches at the ends of the DIMM.
11. Locate the NVMEM battery plug socket, and then squeeze the clip on the face of the battery cable plug to insert it into the socket.

Make sure that the plug locks down onto the controller module.

12. Close the controller module cover.

Step 4: Reinstall the controller

After you replace a component within the controller module, you must reinstall the controller module in the system chassis.

1. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.



Do not completely insert the controller module in the chassis until instructed to do so.

2. Recable the system, as needed.

If you removed the media converters (QSFPs or SFPs), remember to reinstall them if you are using fiber optic cables.

3. Complete the reinstallation of the controller module:

The controller module begins to boot as soon as it is fully seated in the chassis.

- a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position.



Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.

- b. Tighten the thumbscrew on the cam handle on back of the controller module.
- c. If you have not already done so, reinstall the cable management device.
- d. Bind the cables to the cable management device with the hook and loop strap.

Step 5 (Two-node MetroCluster only): Switch back aggregates

After you have completed the FRU replacement in a two-node MetroCluster configuration, you can perform the MetroCluster switchback operation. This returns the configuration to its normal operating state, with the sync-source storage virtual machines (SVMs) on the formerly impaired site now active and serving data from the local disk pools.

This task only applies to two-node MetroCluster configurations.

Steps

1. Verify that all nodes are in the enabled state: `metrocluster node show`

```
cluster_B::> metrocluster node show

DR                               Configuration  DR
Group Cluster Node              State          Mirroring Mode
-----
1      cluster_A
      controller_A_1 configured      enabled    heal roots
completed
      cluster_B
      controller_B_1 configured      enabled    waiting for
switchback recovery
2 entries were displayed.
```

2. Verify that resynchronization is complete on all SVMs: `metrocluster vserver show`
3. Verify that any automatic LIF migrations being performed by the healing operations were completed successfully: `metrocluster check lif show`
4. Perform the switchback by using the `metrocluster switchback` command from any node in the surviving cluster.
5. Verify that the switchback operation has completed: `metrocluster show`

The switchback operation is still running when a cluster is in the `waiting-for-switchback` state:

```
cluster_B::> metrocluster show
Cluster              Configuration State      Mode
-----
Local: cluster_B configured      switchover
Remote: cluster_A configured      waiting-for-switchback
```

The switchback operation is complete when the clusters are in the `normal` state.:

```
cluster_B::> metrocluster show
Cluster              Configuration State      Mode
-----
Local: cluster_B configured      normal
Remote: cluster_A configured      normal
```

If a switchback is taking a long time to finish, you can check on the status of in-progress baselines by using

the metrocluster config-replication resync-status show command.

- 6. Reestablish any SnapMirror or SnapVault configurations.

Step 6: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

Swap out a fan - FAS8200

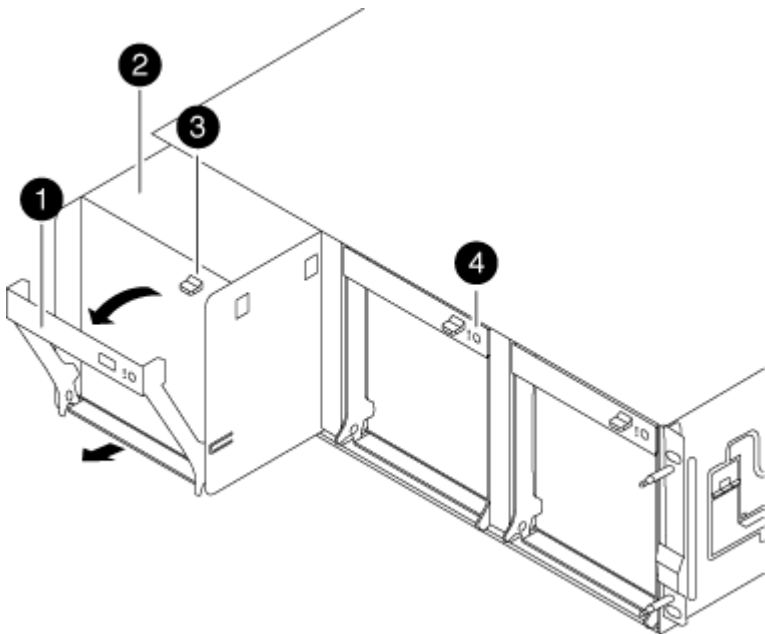
To swap out a fan module without interrupting service, you must perform a specific sequence of tasks.



You must replace the fan module within two minutes of removing it from the chassis. System airflow is disrupted and the controller module or modules shut down after two minutes to avoid overheating.

- 1. If you are not already grounded, properly ground yourself.
- 2. Remove the bezel (if necessary) with two hands, by grasping the openings on each side of the bezel, and then pulling it toward you until the bezel releases from the ball studs on the chassis frame.
- 3. Identify the fan module that you must replace by checking the console error messages and looking at the Attention LED on each fan module.
- 4. Press down the release latch on the fan module cam handle, and then pull the cam handle downward.

The fan module moves a little bit away from the chassis.



1	Cam handle
2	Fan module

3	Cam handle release latch
4	Fan module Attention LED

- Pull the fan module straight out from the chassis, making sure that you support it with your free hand so that it does not swing out of the chassis.



The fan modules are short. Always support the bottom of the fan module with your free hand so that it does not suddenly drop free from the chassis and injure you.

- Set the fan module aside.
- Insert the replacement fan module into the chassis by aligning it with the opening, and then sliding it into the chassis.
- Push firmly on the fan module cam handle so that it is seated all the way into the chassis.

The cam handle raises slightly when the fan module is completely seated.

- Swing the cam handle up to its closed position, making sure that the cam handle release latch clicks into the locked position.

The fan LED should be green after the fan is seated and has spun up to operational speed.

- Align the bezel with the ball studs, and then gently push the bezel onto the ball studs.
- Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

Replace the NVMEM battery - FAS8200

To replace an NVMEM battery in the system, you must remove the controller module from the system, open it, replace the battery, and close and replace the controller module.

All other components in the system must be functioning properly; if not, you must contact technical support.

Step 1: Shut down the impaired controller

You can shut down or take over the impaired controller using different procedures, depending on the storage system hardware configuration.

Option 1: Most configurations

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced` mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message MAINT=<# of hours>h
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`



When you see *Do you want to disable auto-giveback?*, enter *y*.

3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying...	Then...
The LOADER prompt	Go to the next step.
Waiting for giveback...	Press Ctrl-C, and then respond <i>y</i> when prompted.
System prompt or password prompt	<p>Take over or halt the impaired controller from the healthy controller: <code>storage failover takeover -ofnode <i>impaired_node_name</i></code></p> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i>.</p>

Option 2: Controller is in a two-node MetroCluster

To shut down the impaired controller, you must determine the status of the controller and, if necessary,

switch over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- You must leave the power supplies turned on at the end of this procedure to provide power to the healthy controller.

Steps

1. Check the MetroCluster status to determine whether the impaired controller has automatically switched over to the healthy controller: `metrocluster show`
2. Depending on whether an automatic switchover has occurred, proceed according to the following table:

If the impaired controller...	Then...
Has automatically switched over	Proceed to the next step.
Has not automatically switched over	Perform a planned switchover operation from the healthy controller: <code>metrocluster switchover</code>
Has not automatically switched over, you attempted switchover with the <code>metrocluster switchover</code> command, and the switchover was vetoed	Review the veto messages and, if possible, resolve the issue and try again. If you are unable to resolve the issue, contact technical support.

3. Resynchronize the data aggregates by running the `metrocluster heal -phase aggregates` command from the surviving cluster.

```
controller_A_1::> metrocluster heal -phase aggregates
[Job 130] Job succeeded: Heal Aggregates is successful.
```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

4. Verify that the operation has been completed by using the `metrocluster operation show` command.

```
controller_A_1::> metrocluster operation show
Operation: heal-aggregates
State: successful
Start Time: 7/25/2016 18:45:55
End Time: 7/25/2016 18:45:56
Errors: -
```

5. Check the state of the aggregates by using the `storage aggregate show` command.

```

controller_A_1:> storage aggregate show
Aggregate      Size Available Used% State    #Vols  Nodes
RAID Status
-----
...
aggr_b2        227.1GB    227.1GB    0% online      0 mcc1-a2
raid_dp, mirrored, normal...

```

6. Heal the root aggregates by using the `metrocluster heal -phase root-aggregates` command.

```

mcc1A:> metrocluster heal -phase root-aggregates
[Job 137] Job succeeded: Heal Root Aggregates is successful

```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

7. Verify that the heal operation is complete by using the `metrocluster operation show` command on the destination cluster:

```

mcc1A:> metrocluster operation show
Operation: heal-root-aggregates
State: successful
Start Time: 7/29/2016 20:54:41
End Time: 7/29/2016 20:54:42
Errors: -

```

8. On the impaired controller module, disconnect the power supplies.

Step 2: Open the controller module

To access components inside the controller, you must first remove the controller module from the system and then remove the cover on the controller module.

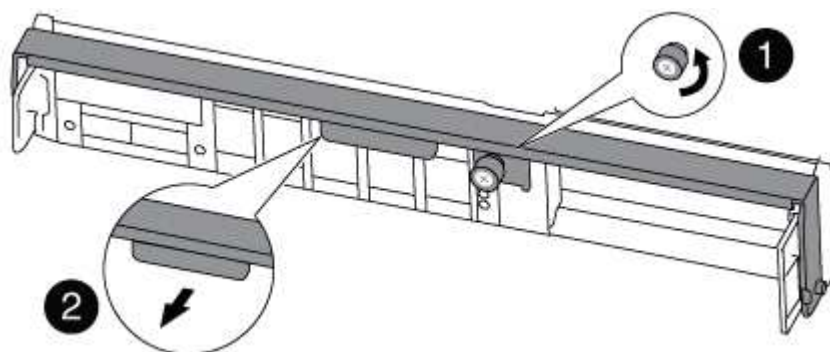
1. If you are not already grounded, properly ground yourself.
2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

3. Remove and set aside the cable management devices from the left and right sides of the controller module.



4. Loosen the thumbscrew on the cam handle on the controller module.



1	Thumbscrew
2	Cam handle

5. Pull the cam handle downward and begin to slide the controller module out of the chassis.

Make sure that you support the bottom of the controller module as you slide it out of the chassis.

Step 3: Replace the NVMEM battery

To replace the NVMEM battery in your system, you must remove the failed NVMEM battery from the system and replace it with a new NVMEM battery.

1. Check the NVMEM LED:

- If your system is in an HA configuration, go to the next step.
- If your system is in a stand-alone configuration, cleanly shut down the controller module, and then check the NVRAM LED identified by the NV icon.



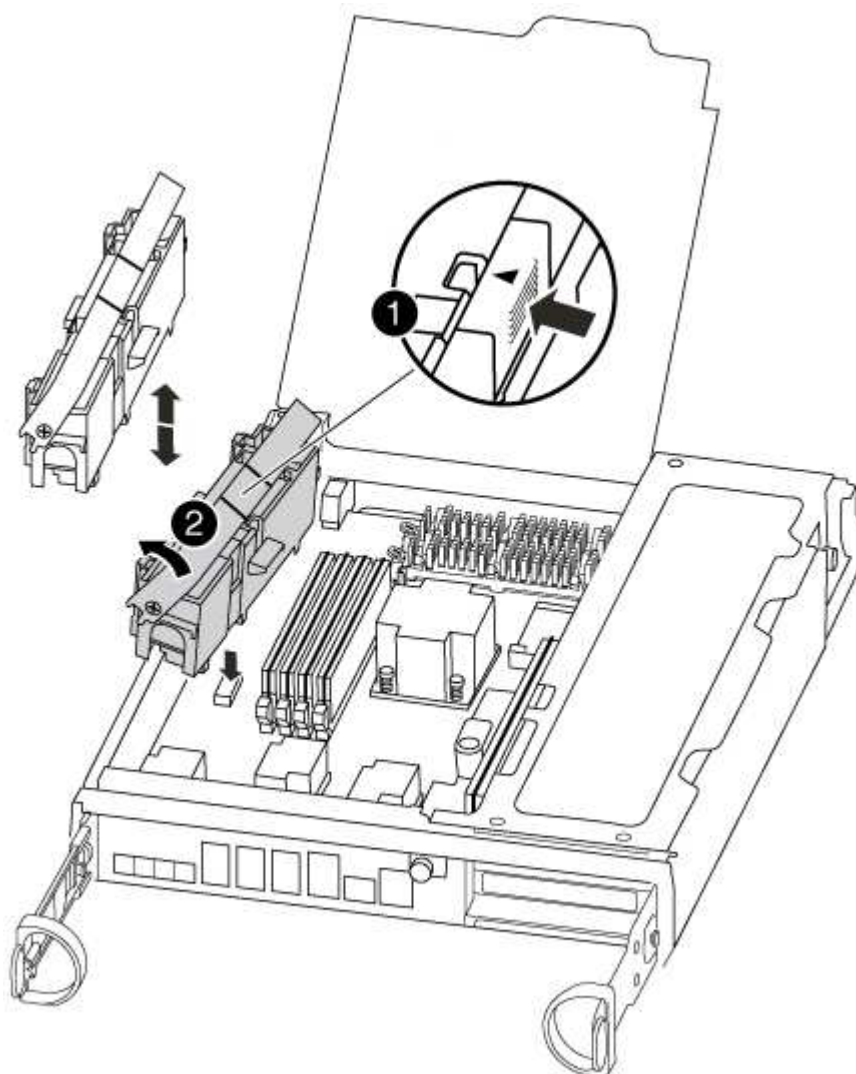


The NVRAM LED blinks while destaging contents to the flash memory when you halt the system. After the destage is complete, the LED turns off.

- If power is lost without a clean shutdown, the NVMEM LED flashes until the destage is complete, and then the LED turns off.
- If the LED is on and power is on, unwritten data is stored on NVMEM.

This typically occurs during an uncontrolled shutdown after ONTAP has successfully booted.

2. Open the CPU air duct and locate the NVMEM battery.



1	Battery lock tab
2	NVMEM battery pack

3. Grasp the battery and press the blue locking tab marked PUSH, and then lift the battery out of the holder and controller module.
4. Remove the replacement battery from its package.

5. Align the tab or tabs on the battery holder with the notches in the controller module side, and then gently push down on the battery housing until the battery housing clicks into place.
6. Close the CPU air duct.

Make sure that the plug locks down to the socket.

Step 4: Reinstall the controller

After you replace a component within the controller module, you must reinstall the controller module in the system chassis and boot it.

1. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.



Do not completely insert the controller module in the chassis until instructed to do so.

2. Recable the system, as needed.

If you removed the media converters (QSFPs or SFPs), remember to reinstall them if you are using fiber optic cables.

3. Complete the reinstallation of the controller module:

The controller module begins to boot as soon as it is fully seated in the chassis.

- a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position.



Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.

- b. Tighten the thumbscrew on the cam handle on back of the controller module.
- c. If you have not already done so, reinstall the cable management device.
- d. Bind the cables to the cable management device with the hook and loop strap.

Step 5: Switch back aggregates in a two-node MetroCluster configuration

After you have completed the FRU replacement in a two-node MetroCluster configuration, you can perform the MetroCluster switchback operation. This returns the configuration to its normal operating state, with the sync-source storage virtual machines (SVMs) on the formerly impaired site now active and serving data from the local disk pools.

This task only applies to two-node MetroCluster configurations.

Steps

1. Verify that all nodes are in the enabled state: `metrocluster node show`

```
cluster_B::> metrocluster node show
```

DR		Configuration	DR
Group	Cluster Node	State	Mirroring Mode
-----	-----	-----	-----
1	cluster_A		
	controller_A_1	configured	enabled
completed	cluster_B		
	controller_B_1	configured	enabled
	switchback recovery		waiting for

2 entries were displayed.

2. Verify that resynchronization is complete on all SVMs: `metrocluster vserver show`
3. Verify that any automatic LIF migrations being performed by the healing operations were completed successfully: `metrocluster check lif show`
4. Perform the switchback by using the `metrocluster switchback` command from any node in the surviving cluster.
5. Verify that the switchback operation has completed: `metrocluster show`

The switchback operation is still running when a cluster is in the **waiting-for-switchback** state:

```
cluster_B::> metrocluster show
```

Cluster	Configuration	State	Mode
-----	-----	-----	-----
Local: cluster_B	configured	switchover	
Remote: cluster_A	configured	waiting-for-switchback	

The switchback operation is complete when the clusters are in the **normal** state.:

```
cluster_B::> metrocluster show
```

Cluster	Configuration	State	Mode
-----	-----	-----	-----
Local: cluster_B	configured	normal	
Remote: cluster_A	configured	normal	

If a switchback is taking a long time to finish, you can check on the status of in-progress baselines by using the `metrocluster config-replication resync-status show` command.

6. Reestablish any SnapMirror or SnapVault configurations.

Step 6: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

Replace a PCIe card - FAS8200

To replace a PCIe card, you must perform a specific sequence of tasks.

- You can use this procedure with all versions of ONTAP supported by your system
- All other components in the system must be functioning properly; if not, you must contact technical support.

Step 1: Shut down the impaired controller

You can shut down or take over the impaired controller using different procedures, depending on the storage system hardware configuration.

Option 1: Most configurations

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced` mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message MAINT=<# of hours>h
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`



When you see *Do you want to disable auto-giveback?*, enter *y*.

3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying...	Then...
The LOADER prompt	Go to the next step.
Waiting for giveback...	Press Ctrl-C, and then respond <i>y</i> when prompted.
System prompt or password prompt	<p>Take over or halt the impaired controller from the healthy controller: <code>storage failover takeover -ofnode <i>impaired_node_name</i></code></p> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i>.</p>

Option 2: Controller is in a two-node MetroCluster

To shut down the impaired controller, you must determine the status of the controller and, if necessary,

switch over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- You must leave the power supplies turned on at the end of this procedure to provide power to the healthy controller.

Steps

1. Check the MetroCluster status to determine whether the impaired controller has automatically switched over to the healthy controller: `metrocluster show`
2. Depending on whether an automatic switchover has occurred, proceed according to the following table:

If the impaired controller...	Then...
Has automatically switched over	Proceed to the next step.
Has not automatically switched over	Perform a planned switchover operation from the healthy controller: <code>metrocluster switchover</code>
Has not automatically switched over, you attempted switchover with the <code>metrocluster switchover</code> command, and the switchover was vetoed	Review the veto messages and, if possible, resolve the issue and try again. If you are unable to resolve the issue, contact technical support.

3. Resynchronize the data aggregates by running the `metrocluster heal -phase aggregates` command from the surviving cluster.

```
controller_A_1::> metrocluster heal -phase aggregates
[Job 130] Job succeeded: Heal Aggregates is successful.
```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

4. Verify that the operation has been completed by using the `metrocluster operation show` command.

```
controller_A_1::> metrocluster operation show
Operation: heal-aggregates
State: successful
Start Time: 7/25/2016 18:45:55
End Time: 7/25/2016 18:45:56
Errors: -
```

5. Check the state of the aggregates by using the `storage aggregate show` command.

```

controller_A_1:> storage aggregate show
Aggregate      Size Available Used% State    #Vols  Nodes
RAID Status
-----
...
aggr_b2        227.1GB    227.1GB    0% online      0 mcc1-a2
raid_dp, mirrored, normal...

```

6. Heal the root aggregates by using the `metrocluster heal -phase root-aggregates` command.

```

mcc1A:> metrocluster heal -phase root-aggregates
[Job 137] Job succeeded: Heal Root Aggregates is successful

```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

7. Verify that the heal operation is complete by using the `metrocluster operation show` command on the destination cluster:

```

mcc1A:> metrocluster operation show
Operation: heal-root-aggregates
State: successful
Start Time: 7/29/2016 20:54:41
End Time: 7/29/2016 20:54:42
Errors: -

```

8. On the impaired controller module, disconnect the power supplies.

Step 2: Open the controller module

To access components inside the controller, you must first remove the controller module from the system and then remove the cover on the controller module.

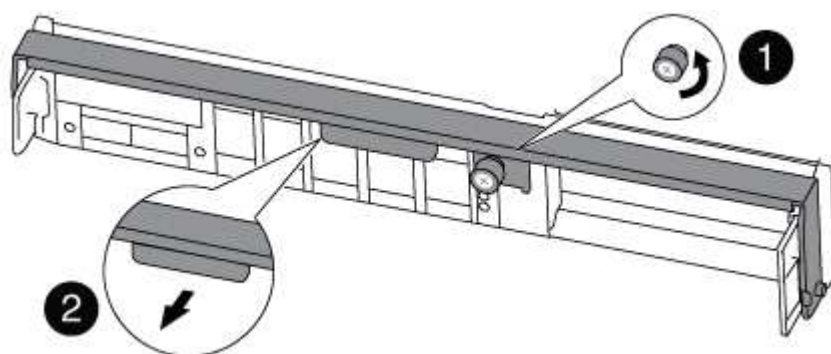
1. If you are not already grounded, properly ground yourself.
2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

3. Remove and set aside the cable management devices from the left and right sides of the controller module.



4. Loosen the thumbscrew on the cam handle on the controller module.



1	Thumbscrew
2	Cam handle

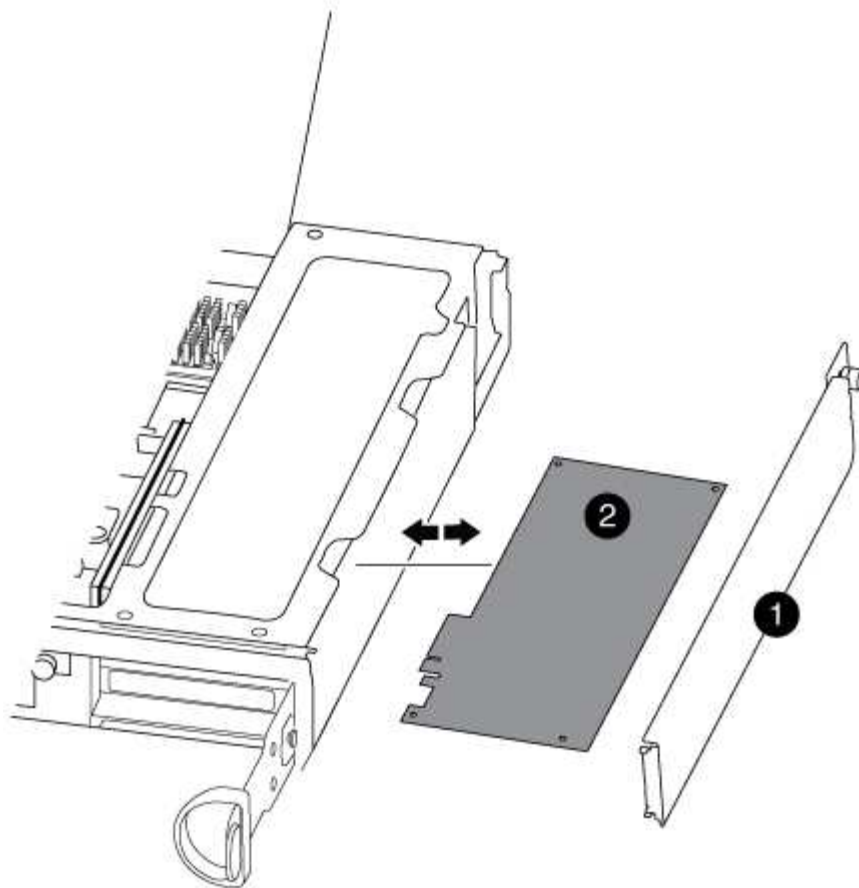
5. Pull the cam handle downward and begin to slide the controller module out of the chassis.

Make sure that you support the bottom of the controller module as you slide it out of the chassis.

Step 3: Replace a PCIe card

To replace a PCIe card, locate it within the controller and follow the specific sequence of steps.

1. Loosen the thumbscrew on the controller module side panel.
2. Swing the side panel off the controller module.



1	Side panel
2	PCIe card

3. Remove the PCIe card from the controller module and set it aside.
4. Install the replacement PCIe card.

Be sure that you properly align the card in the slot and exert even pressure on the card when seating it in the socket. The PCIe card must be fully and evenly seated in the slot.



If you are installing a card in the bottom slot and cannot see the card socket well, remove the top card so that you can see the card socket, install the card, and then reinstall the card you removed from the top slot.

5. Close the side panel and tighten the thumbscrew.

Step 4: Reinstall the controller

After you replace a component within the controller module, you must reinstall the controller module in the system chassis and boot it.

1. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.



Do not completely insert the controller module in the chassis until instructed to do so.

2. Recable the system, as needed.

If you removed the media converters (QSFPs or SFPs), remember to reinstall them if you are using fiber optic cables.

3. Complete the reinstallation of the controller module:

The controller module begins to boot as soon as it is fully seated in the chassis.

If your system is in...	Then perform these steps...
An HA pair	<div><div>a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position. Tighten the thumbscrew on the cam handle on back of the controller module.</div><div><div></div><div>Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.</div></div><div><div>b. If you have not already done so, reinstall the cable management device.</div><div>c. If you have not already done so, reconnect the cables to the controller module.</div><div>d. Bind the cables to the cable management device with the hook and loop strap.</div></div></div>
A two-node MetroCluster configuration	<div><div>a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position. Tighten the thumbscrew on the cam handle on back of the controller module.</div><div><div></div><div>Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.</div></div><div><div>b. If you have not already done so, reinstall the cable management device.</div><div>c. If you have not already done so, reconnect the cables to the controller module.</div><div>d. Bind the cables to the cable management device with the hook and loop strap.</div><div>e. Reconnect the power cables to the power supplies and to the power sources, and then turn on the power to start the boot process.</div></div></div>

4. If your system is configured to support 10 GbE cluster interconnect and data connections on 40 GbE NICs or onboard ports, convert these ports to 10 GbE connections by using the `nicadmin convert` command from Maintenance mode.



Be sure to exit Maintenance mode after completing the conversion.

- Return the controller to normal operation:

If your system is in...	Issue this command from the partner's console...
An HA pair	<code>storage failover giveback -ofnode <i>impaired_node_name</i></code>
A two-node MetroCluster configuration	Proceed to the next step. The MetroCluster switchback procedure is done in the next task in the replacement process.

- If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`

Step 5 (two-node MetroCluster only): Switch back aggregate

After you have completed the FRU replacement in a two-node MetroCluster configuration, you can perform the MetroCluster switchback operation. This returns the configuration to its normal operating state, with the sync-source storage virtual machines (SVMs) on the formerly impaired site now active and serving data from the local disk pools.

This task only applies to two-node MetroCluster configurations.

Steps

- Verify that all nodes are in the enabled state: `metrocluster node show`

```
cluster_B::> metrocluster node show

DR                               Configuration  DR
Group Cluster Node              State          Mirroring Mode
-----
1      cluster_A
      controller_A_1 configured      enabled      heal roots
completed
      cluster_B
      controller_B_1 configured      enabled      waiting for
switchback recovery
2 entries were displayed.
```

- Verify that resynchronization is complete on all SVMs: `metrocluster vservers show`
- Verify that any automatic LIF migrations being performed by the healing operations were completed successfully: `metrocluster check lif show`
- Perform the switchback by using the `metrocluster switchback` command from any node in the surviving cluster.
- Verify that the switchback operation has completed: `metrocluster show`

The switchback operation is still running when a cluster is in the `waiting-for-switchback` state:

```
cluster_B::> metrocluster show
Cluster           Configuration State      Mode
-----
Local: cluster_B configured      switchover
Remote: cluster_A configured      waiting-for-switchback
```

The switchback operation is complete when the clusters are in the `normal` state.:

```
cluster_B::> metrocluster show
Cluster           Configuration State      Mode
-----
Local: cluster_B configured      normal
Remote: cluster_A configured      normal
```

If a switchback is taking a long time to finish, you can check on the status of in-progress baselines by using the `metrocluster config-replication resync-status show` command.

6. Reestablish any SnapMirror or SnapVault configurations.

Step 6: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

Swap out a power supply - FAS8200

Swapping out a power supply involves turning off, disconnecting, and removing the old power supply and installing, connecting, and turning on the replacement power supply.

All other components in the system must be functioning properly; if not, you must contact technical support.

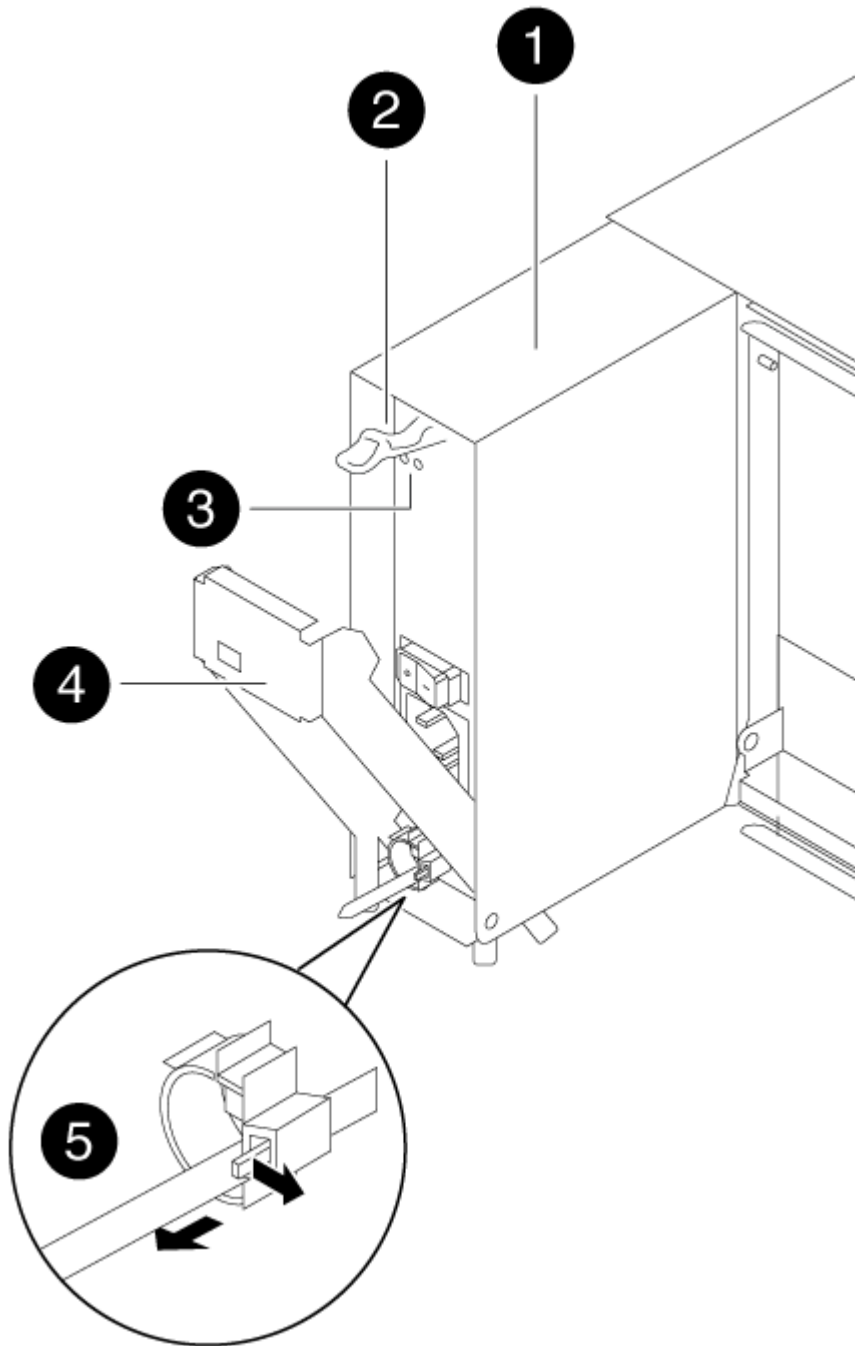
- The power supplies are redundant and hot-swappable.
- This procedure is written for replacing one power supply at a time.






It is a best practice to replace the power supply within two minutes of removing it from the chassis. The system continues to function, but ONTAP sends messages to the console about the degraded power supply until the power supply is replaced.

- The number of power supplies in the system depends on the model.
- Power supplies are auto-ranging.
 1. Identify the power supply you want to replace, based on console error messages or through the LEDs on the power supplies.
 2. If you are not already grounded, properly ground yourself.
 3. Turn off the power supply and disconnect the power cables:
 - a. Turn off the power switch on the power supply.

- b. Open the power cable retainer, and then unplug the power cable from the power supply.
 - c. Unplug the power cable from the power source.
4. Press down the release latch on the power supply cam handle, and then lower the cam handle to the fully open position to release the power supply from the mid plane.



1	Power supply
2	Cam handle release latch

	Power and Fault LEDs
	Cam handle
	Power cable locking mechanism

5. Use the cam handle to slide the power supply out of the system.



When removing a power supply, always use two hands to support its weight.

6. Make sure that the on/off switch of the new power supply is in the Off position.

7. Using both hands, support and align the edges of the power supply with the opening in the system chassis, and then gently push the power supply into the chassis using the cam handle.

The power supplies are keyed and can only be installed one way.



Do not use excessive force when sliding the power supply into the system. You can damage the connector.

8. Push firmly on the power supply cam handle to seat it all the way into the chassis, and then push the cam handle to the closed position, making sure that the cam handle release latch clicks into its locked position.

9. Reconnect the power supply cabling:

- a. Reconnect the power cable to the power supply and the power source.
- b. Secure the power cable to the power supply using the power cable retainer.

Once power is restored to the power supply, the status LED should be green.

1. Turn on the power to the new power supply, and then verify the operation of the power supply activity LEDs.

The power supply LEDs are lit when the power supply comes online.

2. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

Replace the real-time clock battery - FAS8200

You replace the real-time clock (RTC) battery in the controller module so that your system's services and applications that depend on accurate time synchronization continue to function.

- You can use this procedure with all versions of ONTAP supported by your system
- All other components in the system must be functioning properly; if not, you must contact technical support.

Step 1: Shut down the impaired controller

You can shut down or take over the impaired controller using different procedures, depending on the storage system hardware configuration.

Option 1: Most configurations

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced` mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message MAINT=<# of hours>h
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller:

```
storage failover modify -node local -auto-giveback false
```



When you see *Do you want to disable auto-giveback?*, enter *y*.

3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying...	Then...
The LOADER prompt	Go to the next step.
Waiting for giveback...	Press Ctrl-C, and then respond <i>y</i> when prompted.
System prompt or password prompt	<p>Take over or halt the impaired controller from the healthy controller: <code>storage failover takeover -ofnode <i>impaired_node_name</i></code></p> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i>.</p>

Option 2: Controller is in a two-node MetroCluster

To shut down the impaired controller, you must determine the status of the controller and, if necessary,

switch over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- You must leave the power supplies turned on at the end of this procedure to provide power to the healthy controller.

Steps

1. Check the MetroCluster status to determine whether the impaired controller has automatically switched over to the healthy controller: `metrocluster show`
2. Depending on whether an automatic switchover has occurred, proceed according to the following table:

If the impaired controller...	Then...
Has automatically switched over	Proceed to the next step.
Has not automatically switched over	Perform a planned switchover operation from the healthy controller: <code>metrocluster switchover</code>
Has not automatically switched over, you attempted switchover with the <code>metrocluster switchover</code> command, and the switchover was vetoed	Review the veto messages and, if possible, resolve the issue and try again. If you are unable to resolve the issue, contact technical support.

3. Resynchronize the data aggregates by running the `metrocluster heal -phase aggregates` command from the surviving cluster.

```
controller_A_1::> metrocluster heal -phase aggregates
[Job 130] Job succeeded: Heal Aggregates is successful.
```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

4. Verify that the operation has been completed by using the `metrocluster operation show` command.

```
controller_A_1::> metrocluster operation show
Operation: heal-aggregates
State: successful
Start Time: 7/25/2016 18:45:55
End Time: 7/25/2016 18:45:56
Errors: -
```

5. Check the state of the aggregates by using the `storage aggregate show` command.


```

controller_A_1::> storage aggregate show
Aggregate      Size Available Used% State    #Vols  Nodes
RAID Status
-----
...
aggr_b2        227.1GB    227.1GB    0% online      0 mcc1-a2
raid_dp, mirrored, normal...

```

6. Heal the root aggregates by using the `metrocluster heal -phase root-aggregates` command.

```

mcc1A::> metrocluster heal -phase root-aggregates
[Job 137] Job succeeded: Heal Root Aggregates is successful

```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

7. Verify that the heal operation is complete by using the `metrocluster operation show` command on the destination cluster:

```

mcc1A::> metrocluster operation show
Operation: heal-root-aggregates
State: successful
Start Time: 7/29/2016 20:54:41
End Time: 7/29/2016 20:54:42
Errors: -

```

8. On the impaired controller module, disconnect the power supplies.

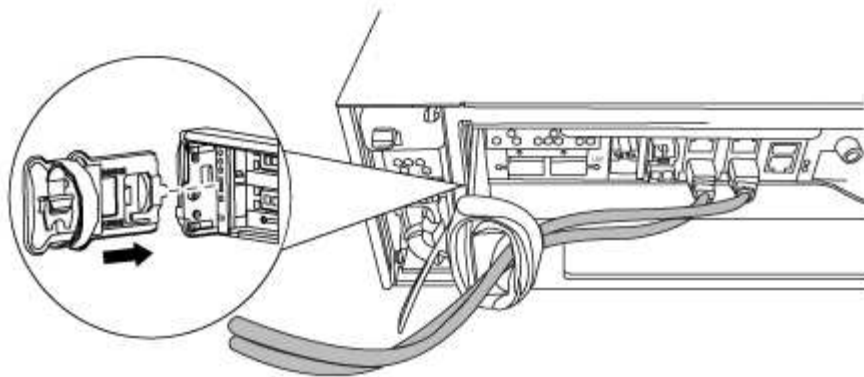
Step 2: Open the controller module

To access components inside the controller, you must first remove the controller module from the system and then remove the cover on the controller module.

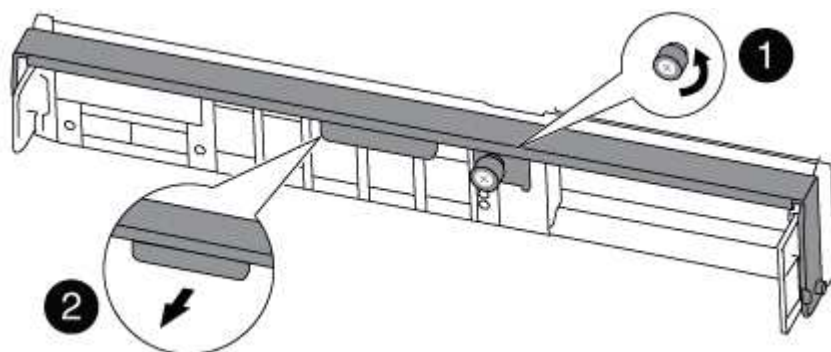
1. If you are not already grounded, properly ground yourself.
2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.

Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.

3. Remove and set aside the cable management devices from the left and right sides of the controller module.



4. Loosen the thumbscrew on the cam handle on the controller module.



1	Thumbscrew
2	Cam handle

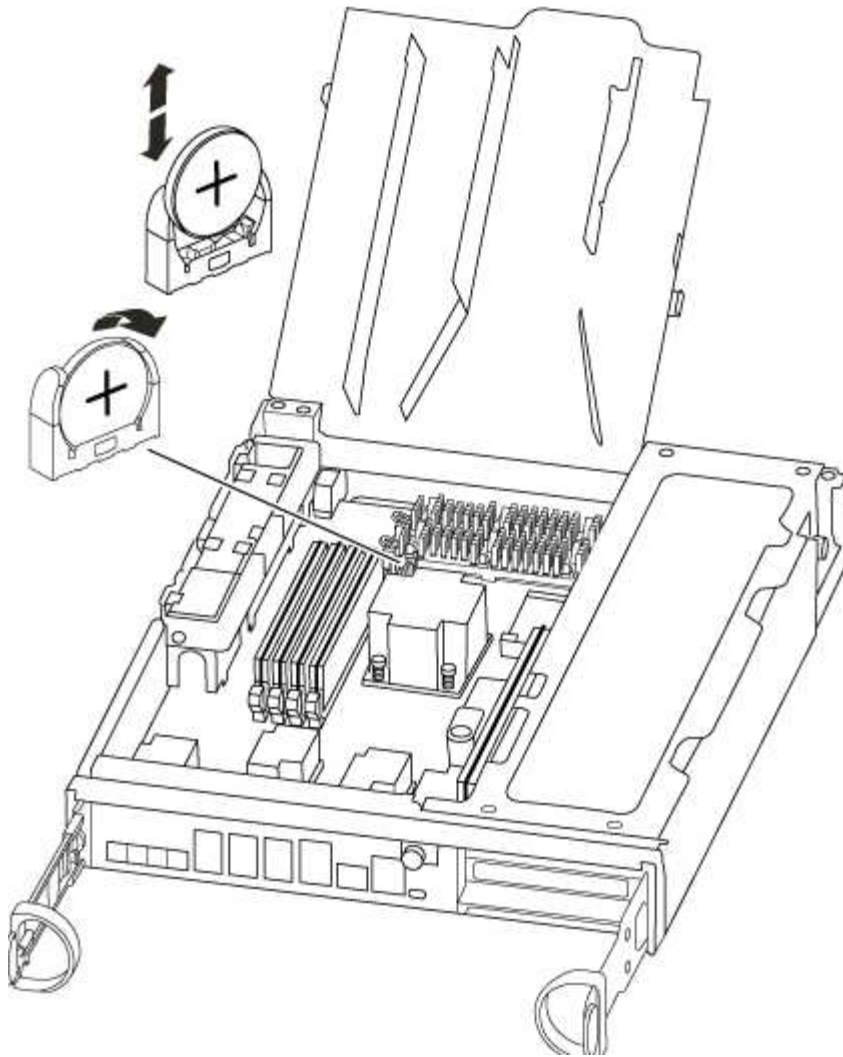
5. Pull the cam handle downward and begin to slide the controller module out of the chassis.

Make sure that you support the bottom of the controller module as you slide it out of the chassis.

Step 3: Replace the RTC Battery

To replace the RTC battery, locate them inside the controller and follow the specific sequence of steps.

1. If you are not already grounded, properly ground yourself.
2. Locate the RTC battery.



3. Gently push the battery away from the holder, rotate it away from the holder, and then lift it out of the holder.



Note the polarity of the battery as you remove it from the holder. The battery is marked with a plus sign and must be positioned in the holder correctly. A plus sign near the holder tells you how the battery should be positioned.

4. Remove the replacement battery from the antistatic shipping bag.
5. Locate the empty battery holder in the controller module.
6. Note the polarity of the RTC battery, and then insert it into the holder by tilting the battery at an angle and pushing down.
7. Visually inspect the battery to make sure that it is completely installed into the holder and that the polarity is correct.

Step 4: Reinstall the controller module and setting time/date after RTC battery replacement

After you replace a component within the controller module, you must reinstall the controller module in the system chassis, reset the time and date on the controller, and then boot it.

1. If you have not already done so, close the air duct or controller module cover.

2. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.

Do not completely insert the controller module in the chassis until instructed to do so.

3. Recable the system, as needed.

If you removed the media converters (QSFPs or SFPs), remember to reinstall them if you are using fiber optic cables.

4. If the power supplies were unplugged, plug them back in and reinstall the power cable retainers.
5. Complete the reinstallation of the controller module:

- a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position.

Tighten the thumbscrew on the cam handle on back of the controller module.



Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.

- b. If you have not already done so, reinstall the cable management device.
 - c. Bind the cables to the cable management device with the hook and loop strap.
 - d. Reconnect the power cables to the power supplies and to the power sources, and then turn on the power to start the boot process.
 - e. Halt the controller at the LOADER prompt.
6. Reset the time and date on the controller:
 - a. Check the date and time on the healthy controller with the `show date` command.
 - b. At the LOADER prompt on the target controller, check the time and date.
 - c. If necessary, modify the date with the `set date mm/dd/yyyy` command.
 - d. If necessary, set the time, in GMT, using the `set time hh:mm:ss` command.
 - e. Confirm the date and time on the target controller.
 7. At the LOADER prompt, enter `bye` to reinitialize the PCIe cards and other components and let the controller reboot.
 8. Return the controller to normal operation by giving back its storage: `storage failover giveback -ofnode impaired_node_name`
 9. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`

Step 5: Switch back aggregates in a two-node MetroCluster configuration

After you have completed the FRU replacement in a two-node MetroCluster configuration, you can perform the MetroCluster switchback operation. This returns the configuration to its normal operating state, with the sync-source storage virtual machines (SVMs) on the formerly impaired site now active and serving data from the local disk pools.

This task only applies to two-node MetroCluster configurations.

Steps

1. Verify that all nodes are in the enabled state: `metrocluster node show`

```
cluster_B::> metrocluster node show

DR                               Configuration  DR
Group Cluster Node              State          Mirroring Mode
-----
1      cluster_A
      controller_A_1 configured      enabled    heal roots
completed
      cluster_B
      controller_B_1 configured      enabled    waiting for
switchback recovery
2 entries were displayed.
```

2. Verify that resynchronization is complete on all SVMs: `metrocluster vserver show`
3. Verify that any automatic LIF migrations being performed by the healing operations were completed successfully: `metrocluster check lif show`
4. Perform the switchback by using the `metrocluster switchback` command from any node in the surviving cluster.
5. Verify that the switchback operation has completed: `metrocluster show`

The switchback operation is still running when a cluster is in the `waiting-for-switchback` state:

```
cluster_B::> metrocluster show

Cluster              Configuration State      Mode
-----
Local: cluster_B configured      switchover
Remote: cluster_A configured      waiting-for-switchback
```

The switchback operation is complete when the clusters are in the `normal` state.:

```
cluster_B::> metrocluster show

Cluster              Configuration State      Mode
-----
Local: cluster_B configured      normal
Remote: cluster_A configured      normal
```

If a switchback is taking a long time to finish, you can check on the status of in-progress baselines by using the `metrocluster config-replication resync-status show` command.

6. Reestablish any SnapMirror or SnapVault configurations.

Step 6: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

FAS9000 systems

Install and setup

Start here: Choose your installation and setup experience

For most configurations, you can choose from different content formats.

- [Quick steps](#)

A printable PDF of step-by-step instructions with live links to additional content.

- [Video steps](#)

Video step-by-step instructions.

- [Detailed steps](#)

Online step-by-step instructions with live links to additional content.

For MetroCluster configurations, see either:

- [Install MetroCluster IP configuration](#)
- [Install MetroCluster Fabric-Attached configuration](#)

Quick steps - FAS9000

This guide gives graphic instructions for a typical installation of your system from racking and cabling, through initial system bring-up. Use this guide if you are familiar with installing NetApp systems.

Access the *Installation and Setup Instructions* PDF poster:

[AFF A700 Installation and Setup Instructions](#)

[FAS9000 Installation and Setup Instructions](#)

Video steps - FAS9000

The following video shows how to install and cable your new system.

[Animation - Install and setup of an AFF A700 or FAS9000](#)

Detailed guide - FAS9000

This guide gives detailed step-by-step instructions for installing a typical NetApp system. Use this guide if you want more detailed installation instructions.

Step 1: Prepare for installation

To install your system, you need to create an account on the NetApp Support Site, register your system, and get license keys. You also need to inventory the appropriate number and type of cables for your system and collect specific network information.

Before you begin

You need to have access to the Hardware Universe for information about site requirements as well as additional information on your configured system. You might also want to have access to the Release Notes for your version of ONTAP for more information about this system.

[NetApp Hardware Universe](#)

[Find the Release Notes for your version of ONTAP 9](#)

You need to provide the following at your site:

- Rack space for the storage system
- Phillips #2 screwdriver
- Additional networking cables to connect your system to your network switch and laptop or console with a Web browser

Steps

1. Unpack the contents of all boxes.
2. Record the system serial number from the controllers.








3. Inventory and make a note of the number and types of cables you received.

The following table identifies the types of cables you might receive. If you receive a cable not listed in the table, see the Hardware Universe to locate the cable and identify its use.

[NetApp Hardware Universe](#)

Type of cable...	Part number and length	Connector type	For...
10 GbE network cable	X6566B-2-R6, (112-00299), 2m		Network cable
	X6566B-3-R6, 112-00300, 3m		
	X6566B-5-R6 , 112-00301, 5m		

Type of cable...	Part number and length	Connector type	For...
40 GbE network cable	X66100-1, 112-00542, 1m		40 GbE network
40 GbE cluster interconnect	X66100-3, 112-00543, 3m		Cluster interconnect
100 GbE network cable	X66211A-05 (112-00595), 0.5m		Network cable
100 GbE storage cable	X66211A-1 (112-00573), 1m		Storage cable
	X66211A-2 (112-00574), 2m		 This cable applies to AFF A700 only.
	X66211A-5 (112-00574), 5m		
Optical network cables (order dependent)	X6553-R6 (112-00188), 2m		FC host network
	X6536-R6 (112-00090), 5m		
Cat 6, RJ-45 (order dependent)	Part numbers X6585-R6 (112-00291), 3m		Management network and Ethernet data
	X6562-R6 (112-00196), 5m		
Storage	X66031A (112-00436), 1m		Storage
	X66032A (112-00437), 2m		
	X66033A (112-00438), 3m		
Micro-USB console cable	Not applicable		Console connection during software setup on non-Windows or Mac laptop/console
Power cables	Not applicable		Powering up the system

4. Review the *NetApp ONTAP Configuration Guide* and collect the required information listed in that guide.

[ONTAP Configuration Guide](#)

Step 2: Install the hardware

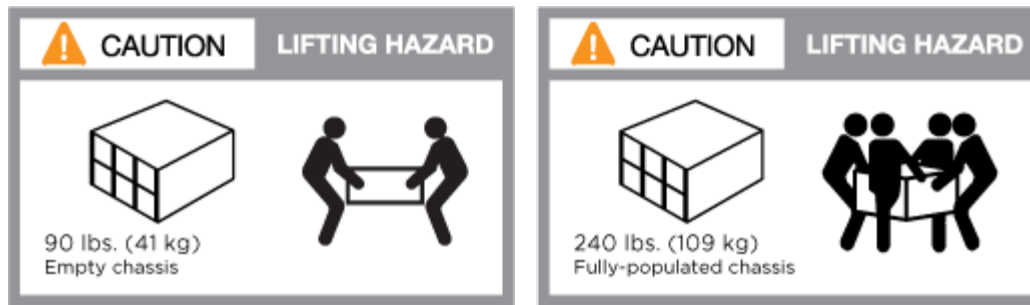
You need to install your system in a 4-post rack or NetApp system cabinet, as applicable.

Steps

1. Install the rail kits, as needed.
2. Install and secure your system using the instructions included with the rail kit.

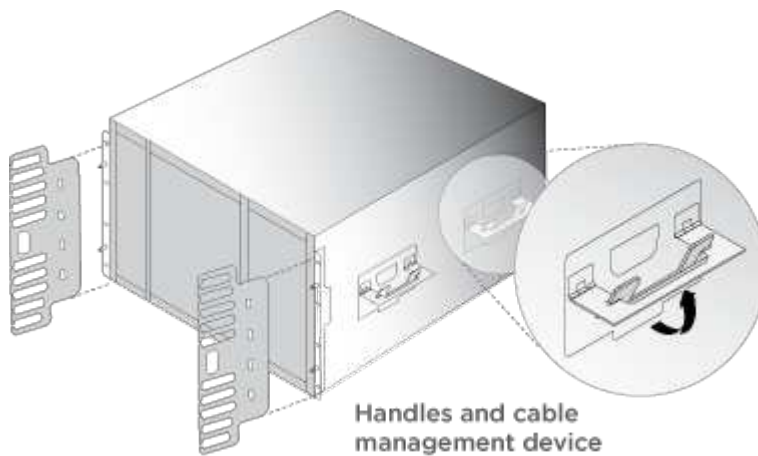


You need to be aware of the safety concerns associated with the weight of the system.



The label on the left indicates an empty chassis, while the label on the right indicates a fully-populated system.

1. Attach cable management devices (as shown).



2. Place the bezel on the front of the system.

Step 3: Cable controllers to your network

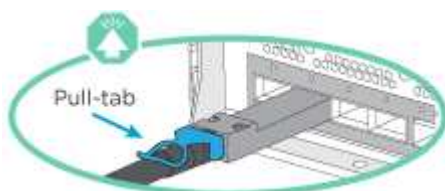
You can cable the controllers to your network by using the two-node switchless cluster method or by using the cluster interconnect network.

Option 1: Two-node switchless cluster

Management network, data network, and management ports on the controllers are connected to switches. The cluster interconnect ports are cabled on both controllers.

You must have contacted your network administrator for information about connecting the system to the switches.

Be sure to check the direction of the cable pull-tabs when inserting the cables in the ports. Cable pull-tabs are up for all networking module ports.



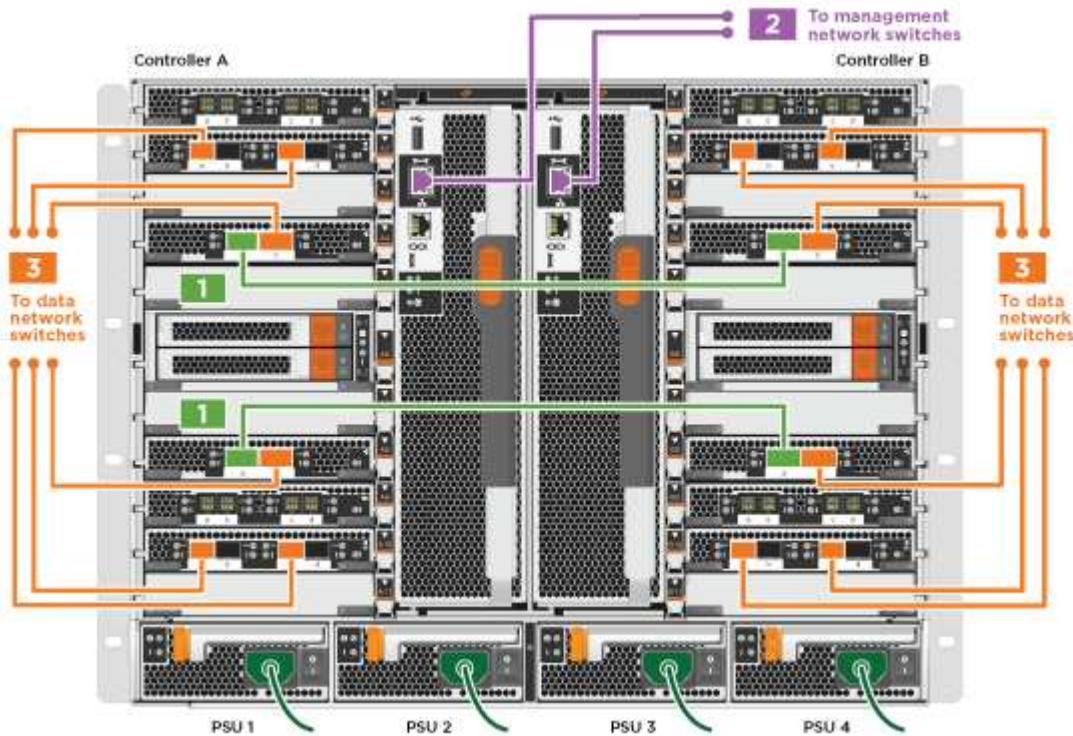


As you insert the connector, you should feel it click into place; if you do not feel it click, remove it, turn it around and try again.

Steps

1. Use the animation or illustration to complete the cabling between the controllers and to the switches:

[Animation - Cable a two-node switchless cluster](#)



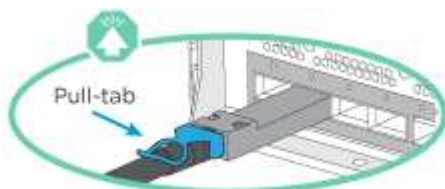
1. Go to [Step 4: Cable controllers to drive shelves](#) for drive shelf cabling instructions.

Option 2: Switched cluster

Management network, data network, and management ports on the controllers are connected to switches. The cluster interconnect and HA ports are cabled on to the cluster/HA switch.

You must have contacted your network administrator for information about connecting the system to the switches.

Be sure to check the direction of the cable pull-tabs when inserting the cables in the ports. Cable pull-tabs are up for all networking module ports.

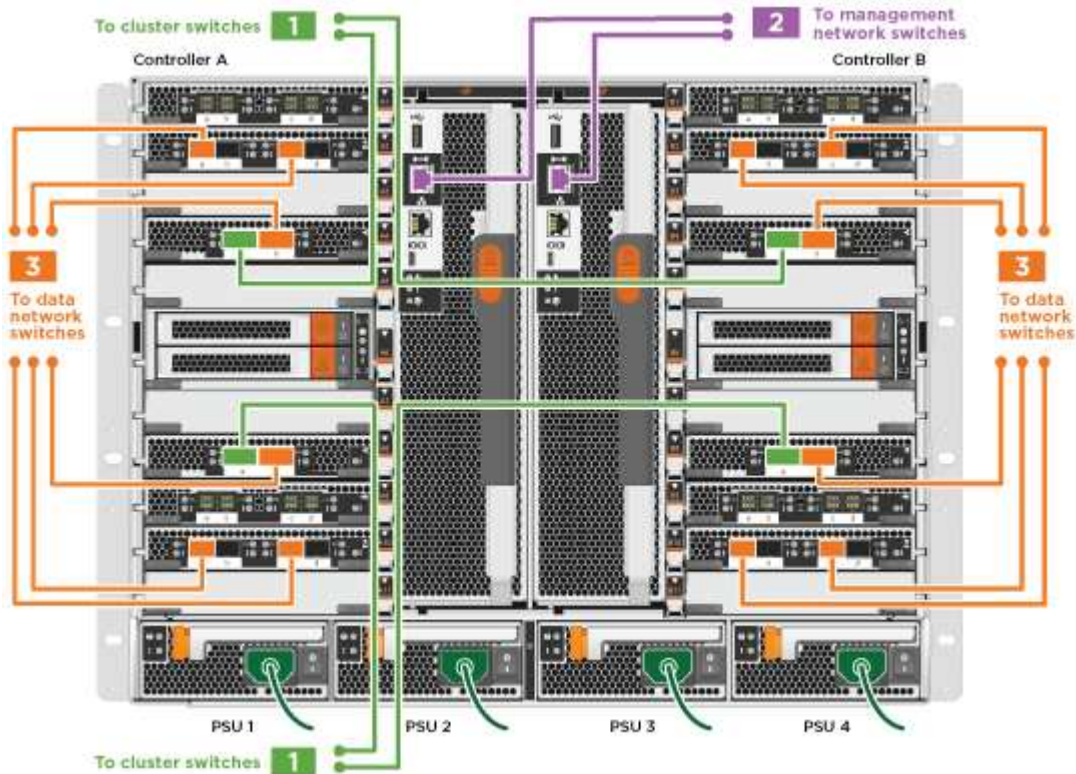


As you insert the connector, you should feel it click into place; if you do not feel it click, remove it, turn it around and try again.

Steps

1. Use the animation or illustration to complete the cabling between the controllers and to the switches:

Animation - Switched cluster cabling



1. Go to [Step 4: Cable controllers to drive shelves](#) for drive shelf cabling instructions.

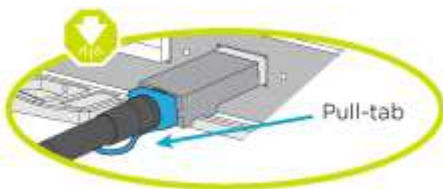
Step 4: Cable controllers to drive shelves

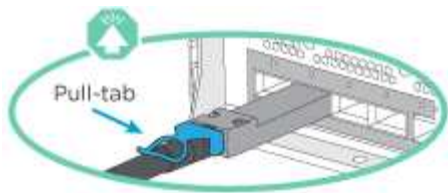
You can cable your new system to DS212C, DS224C, or NS224 shelves, depending on if it is an AFF or FAS system.

Option 1: Cable the controllers to DS212C or DS224C drive shelves

You must cable the shelf-to-shelf connections, and then cable both controllers to the DS212C or DS224C drive shelves.

The cables are inserted into the drive shelf with the pull-tabs facing down, while the other end of the cable is inserted into the controller storage modules with the pull-tabs up.





Steps

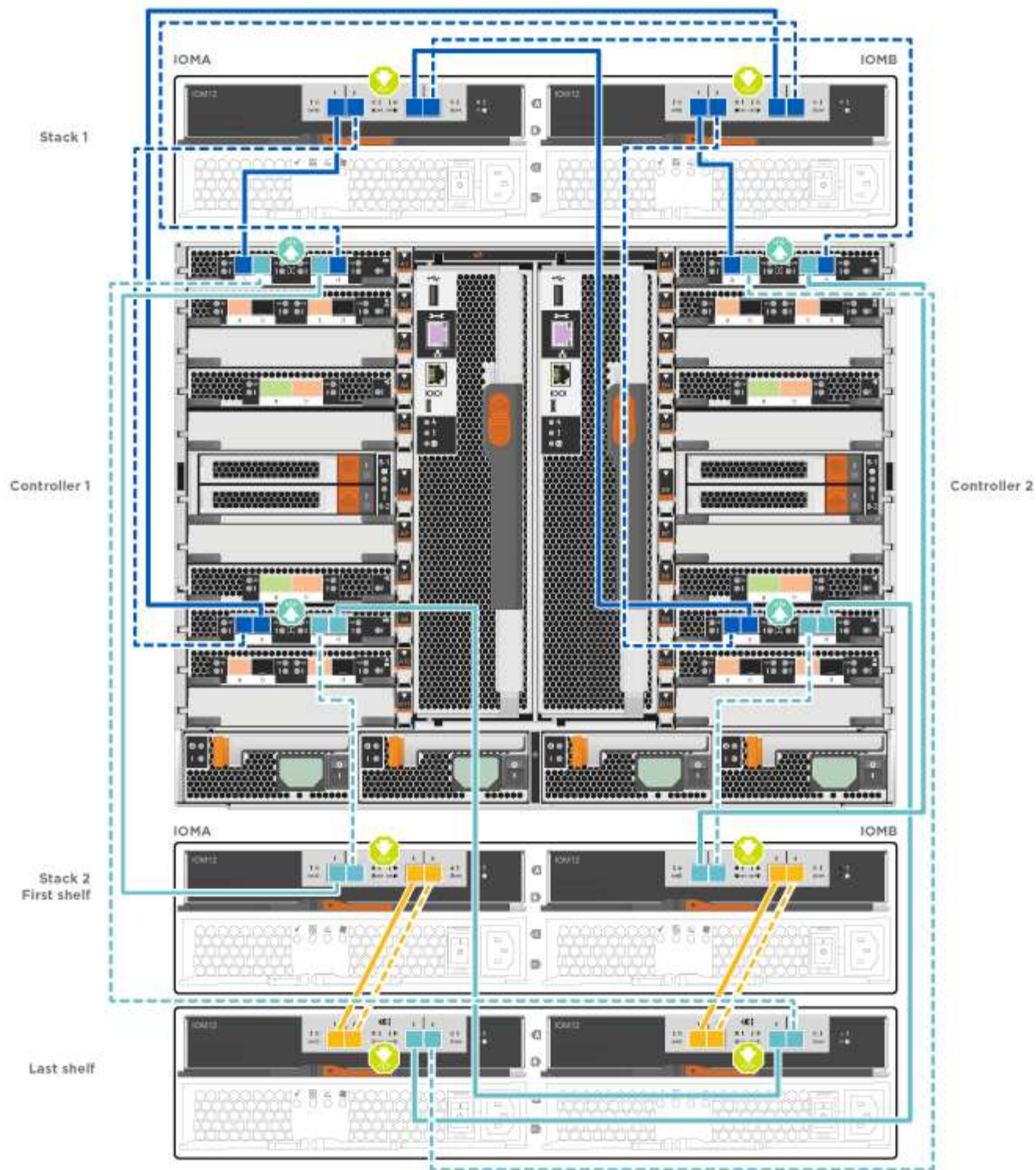
1. Use the following animations or illustrations to cable your drive shelves to your controllers.



The examples use DS224C shelves. Cabling is similar with other supported SAS drive shelves.

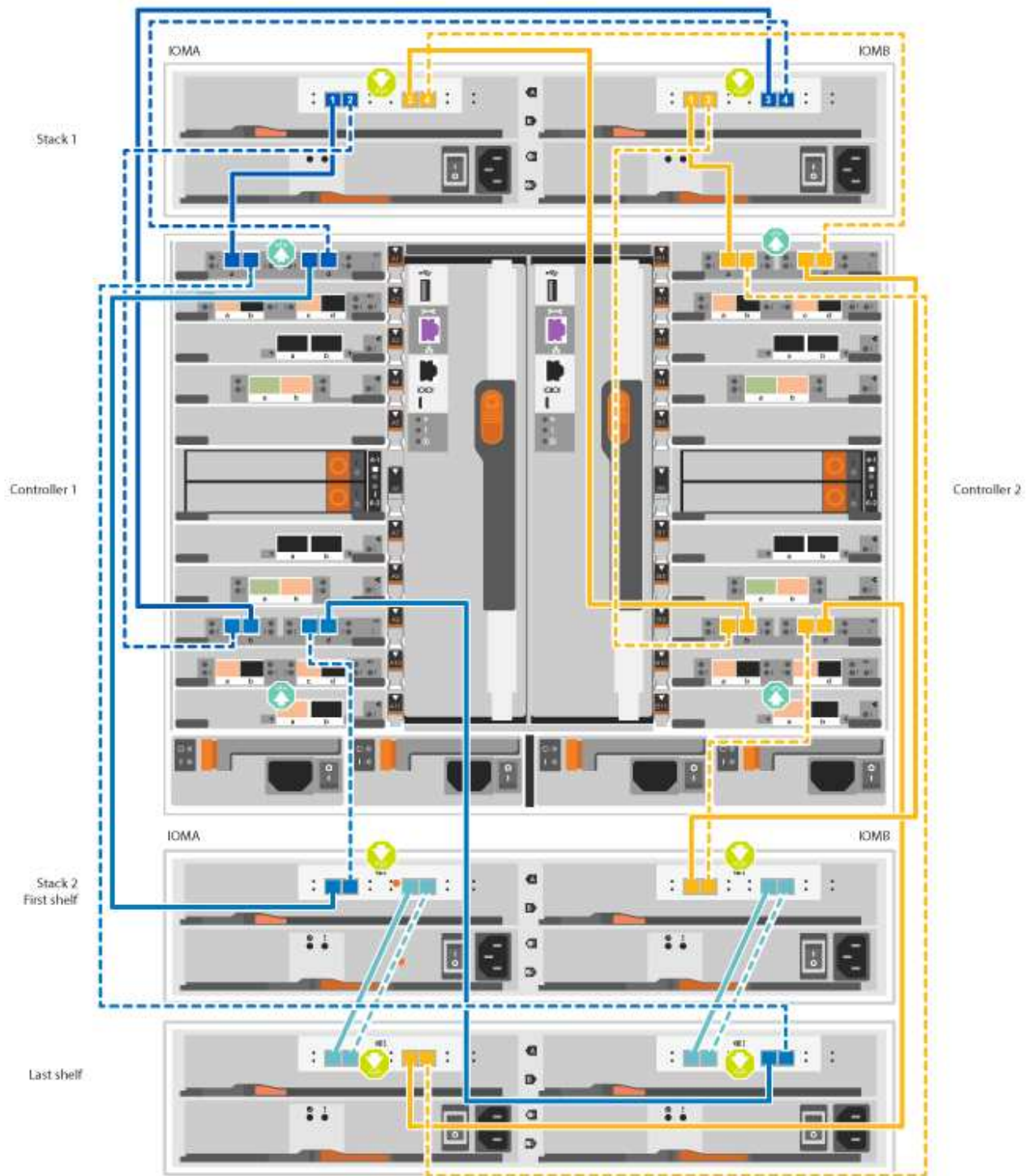
- Cabling SAS shelves in FAS9000, AFF A700, and ASA AFF A700, ONTAP 9.7 and earlier:

[Animation - Cable SAS storage - ONTAP 9.7 and earlier](#)



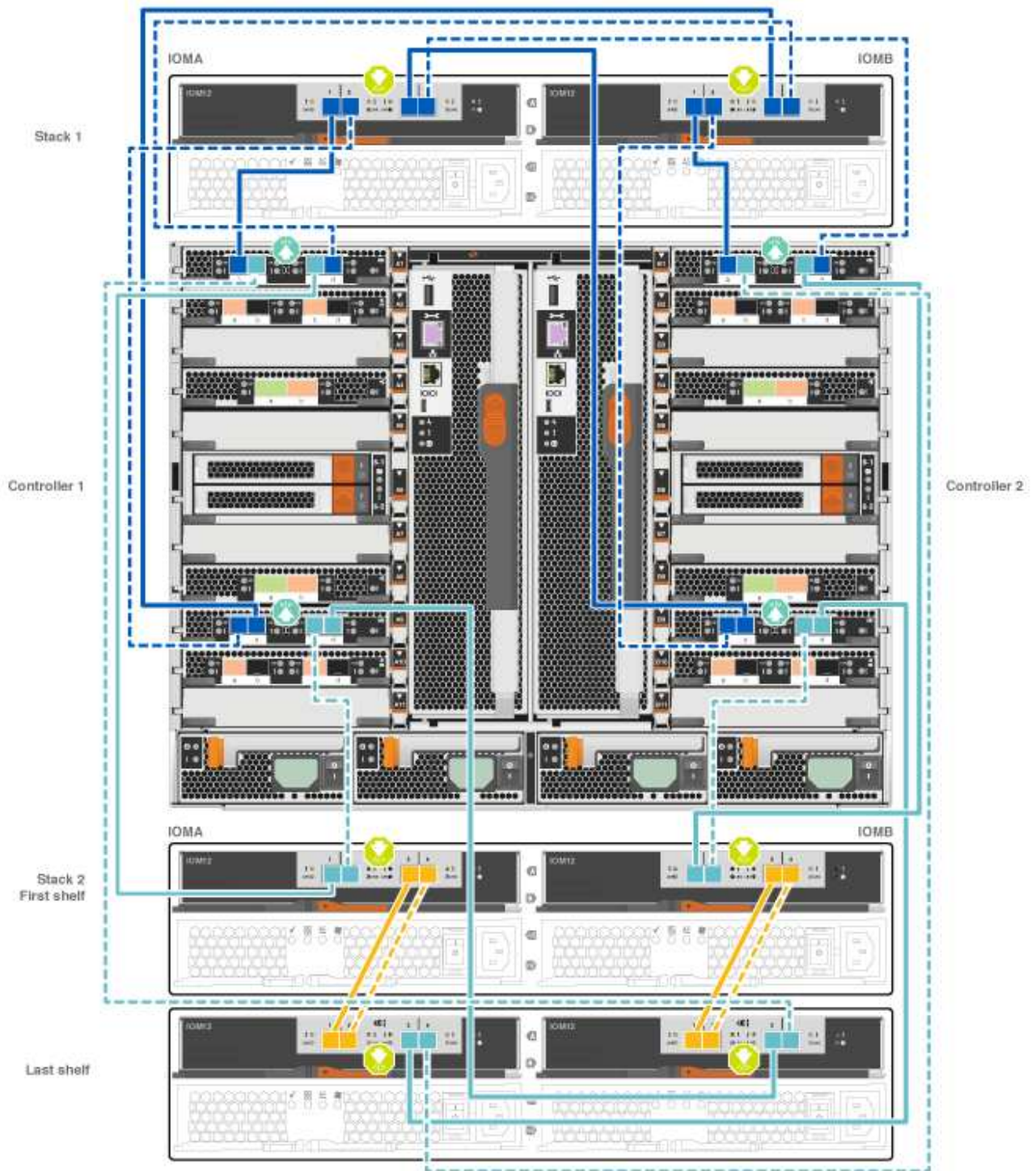
- Cabling SAS shelves in FAS9000, AFF A700, and ASA AFF A700, ONTAP 9.8 and later:

[Animation - Cable SAS storage - ONTAP 9.8 and later](#)



If you have more than one drive shelf stack, see the *Installation and Cabling Guide* for your drive shelf type.

Install and cable shelves for a new system installation - shelves with IOM12 modules



2. Go to [Step 5: Complete system setup and configuration](#) to complete system setup and configuration.

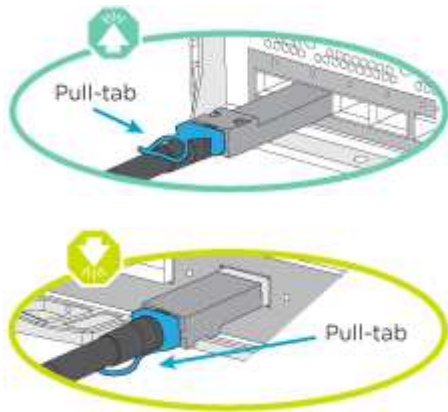
Option 2: Cable the controllers to a single NS224 drive shelf in ASA AFF A700 systems running ONTAP 9.8 and later only

You must cable each controller to the NSM modules on the NS224 drive shelf on an AFF A700 or ASA AFF A700 running system ONTAP 9.8 or later.

- This task applies to ASA AFF A700 running ONTAP 9.8 or later only.
- The systems must have at least one X91148A module installed in slots 3 and/or 7 for each controller. The

animation or illustrations show this module installed in both slots 3 and 7.

- Be sure to check the illustration arrow for the proper cable connector pull-tab orientation. The cable pull-tab for the storage modules are up, while the pull tabs on the shelves are down.

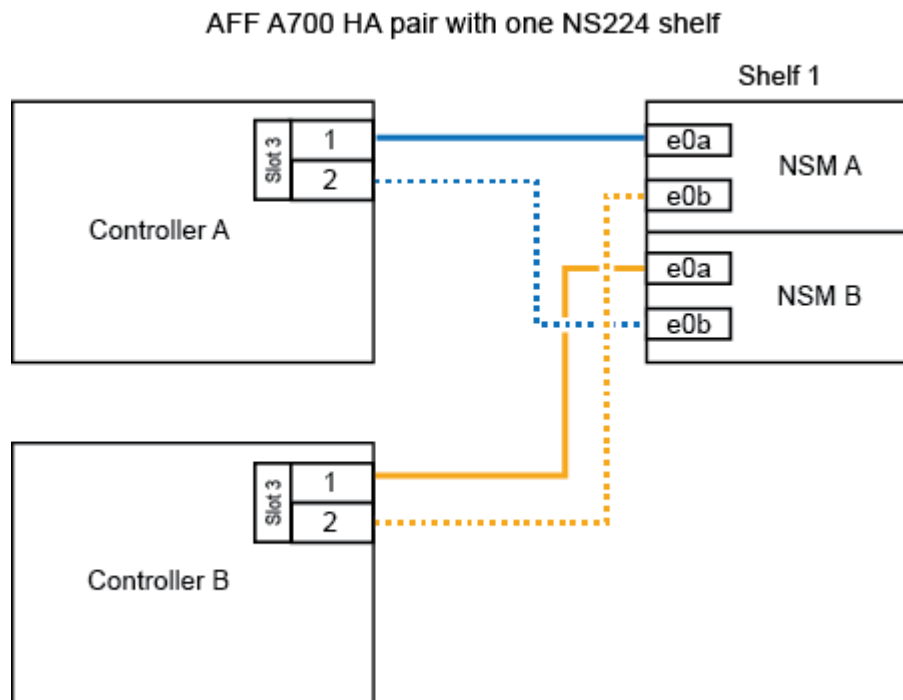


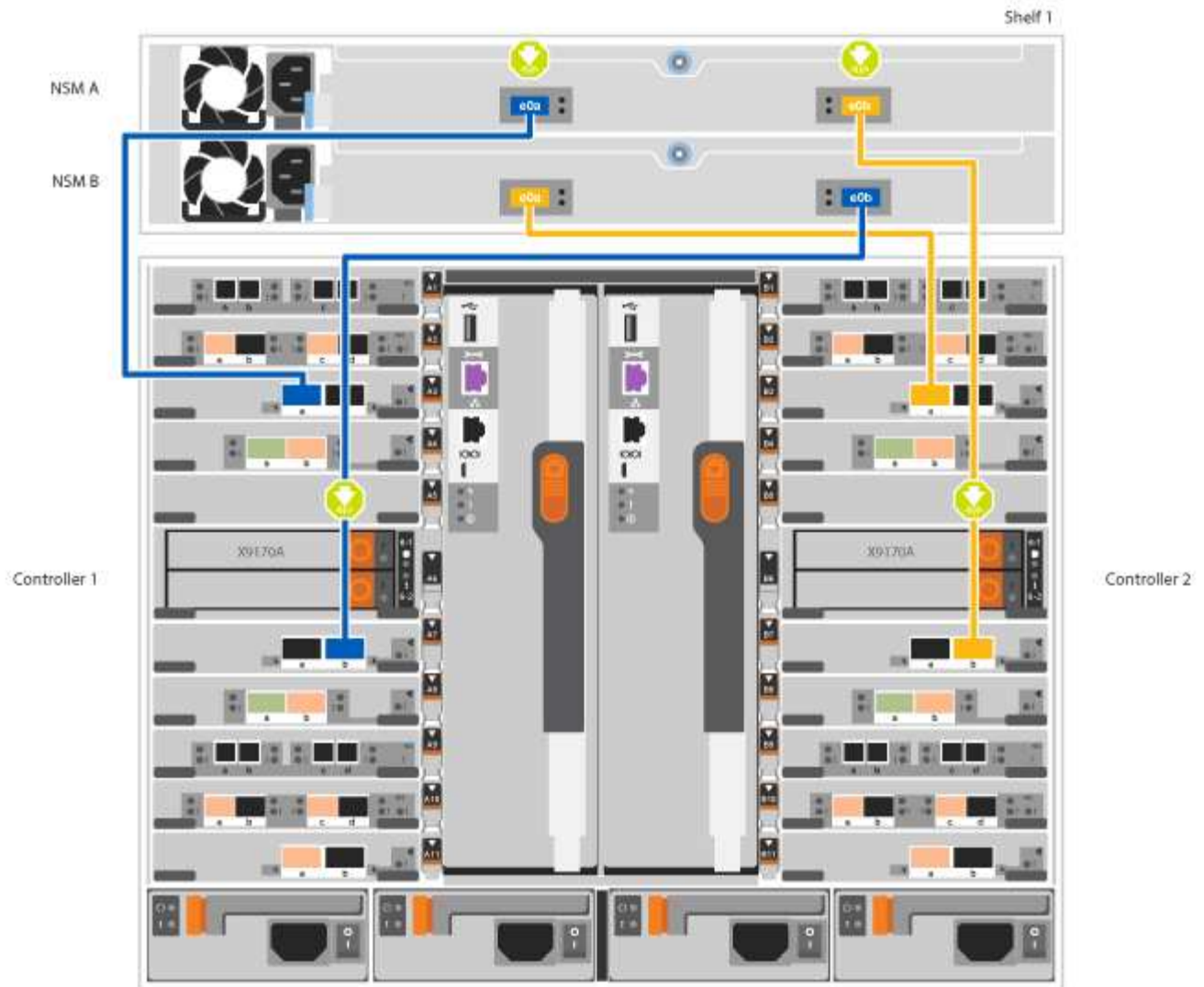
As you insert the connector, you should feel it click into place; if you do not feel it click, remove it, turn it around and try again.

Steps

1. Use the following animation or illustrations to cable your controllers with two X91148A storage modules to a single NS224 drive shelf, or use the diagram to cable your controllers with one X91148A storage module to a single NS224 drive shelf.

[Animation - Cable a single NS224 shelf - ONTAP 9.8 and later](#)



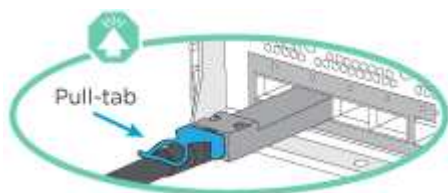


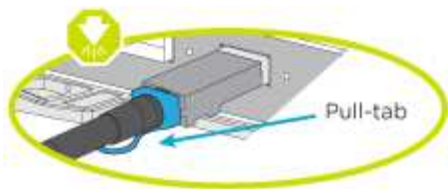
2. Go to [Step 5: Complete system setup and configuration](#) to complete system setup and configuration.

Option 3: Cable the controllers to two NS224 drive shelves in ASA AFF A700 systems running ONTAP 9.8 and later only

You must cable each controller to the NSM modules on the NS224 drive shelves on an AFF A700 or ASA AFF A700 running system ONTAP 9.8 or later.

- This task applies to ASA AFF A700 running ONTAP 9.8 or later only.
- The systems must have two X91148A modules, per controller, installed in slots 3 and 7.
- Be sure to check the illustration arrow for the proper cable connector pull-tab orientation. The cable pull-tab for the storage modules are up, while the pull tabs on the shelves are down.





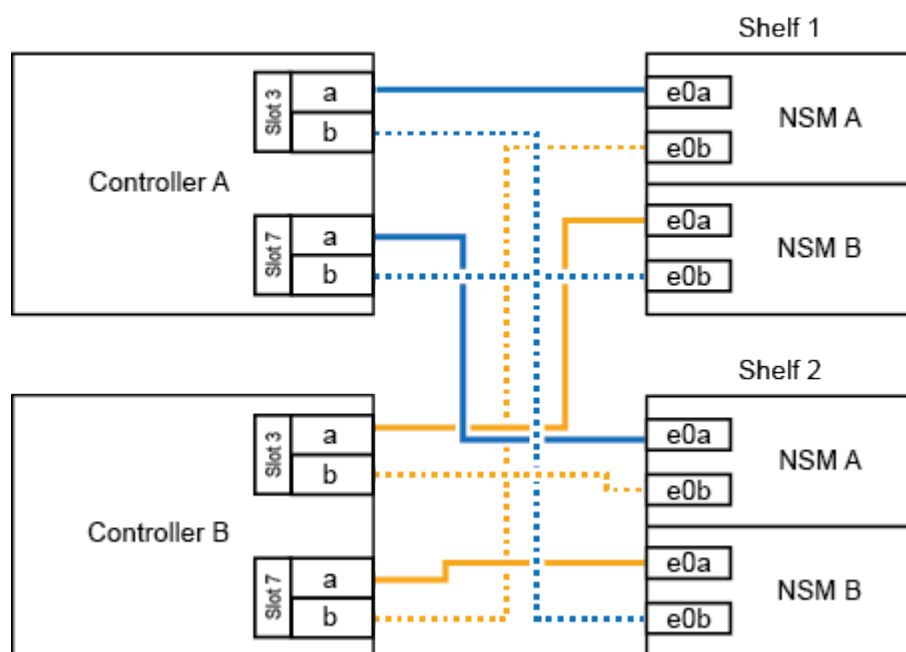
As you insert the connector, you should feel it click into place; if you do not feel it click, remove it, turn it around and try again.

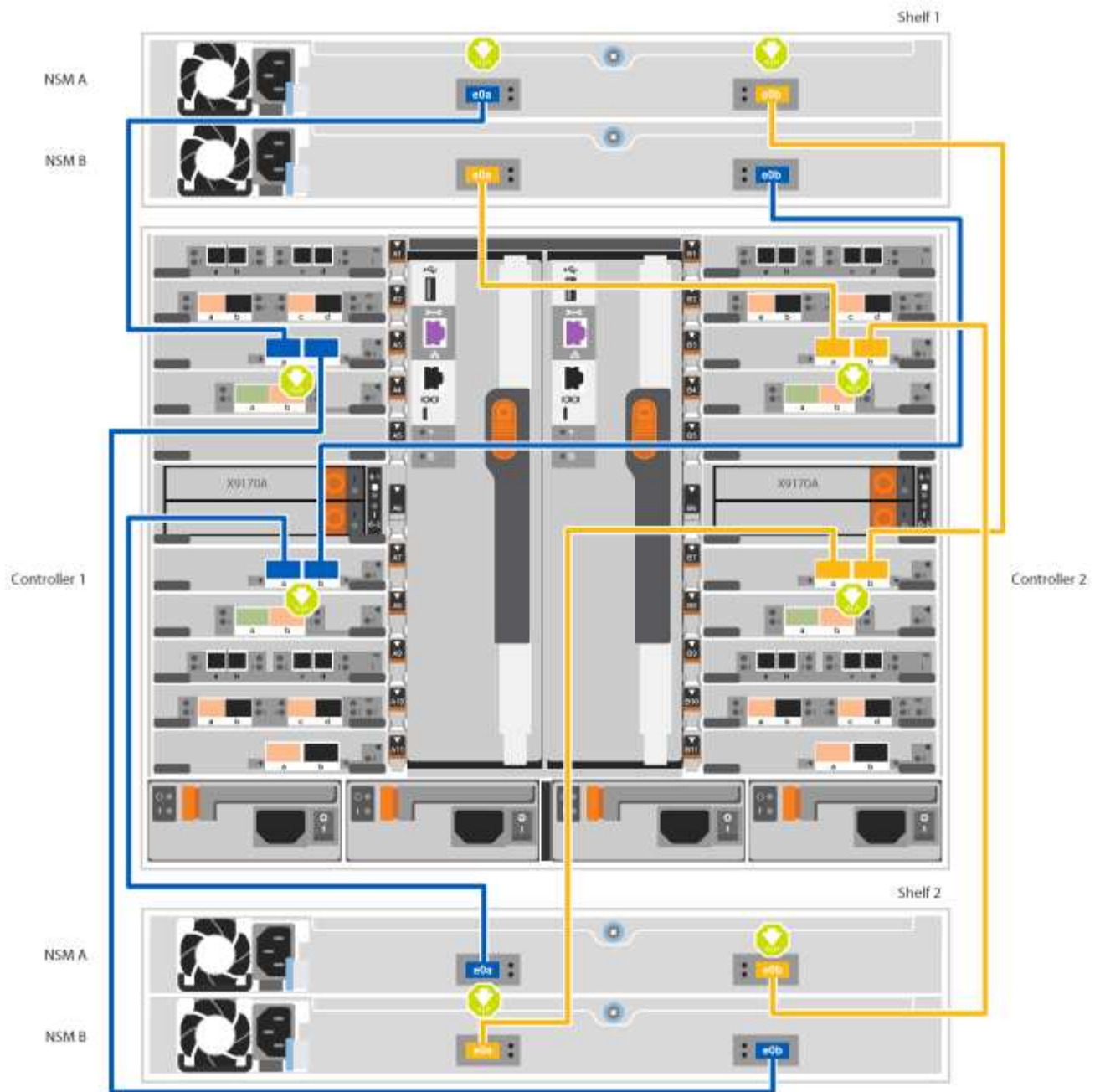
Steps

1. Use the following animation or illustrations to cable your controllers to two NS224 drive shelves.

[Animation - Cable two NS224 shelves - ONTAP 9.8 and later](#)

AFF A700 HA pair with two NS224 shelves





2. Go to [Step 5: Complete system setup and configuration](#) to complete system setup and configuration.

Step 5: Complete system setup and configuration

You can complete the system setup and configuration using cluster discovery with only a connection to the switch and laptop, or by connecting directly to a controller in the system and then connecting to the management switch.

Option 1: Completing system setup and configuration if network discovery is enabled

If you have network discovery enabled on your laptop, you can complete system setup and configuration using automatic cluster discovery.

Steps

1. Use the following animation to set one or more drive shelf IDs:

If your system has NS224 drive shelves, the shelves are pre-set to shelf ID 00 and 01. If you want to change the shelf IDs, you must create a tool to insert into the hole where button is located.

Animation - Set SAS or NVMe drive shelf IDs

2. Plug the power cords into the controller power supplies, and then connect them to power sources on different circuits.
3. Turn on the power switches to both nodes.

Animation - Turn on the power to the controllers



Initial booting may take up to eight minutes.

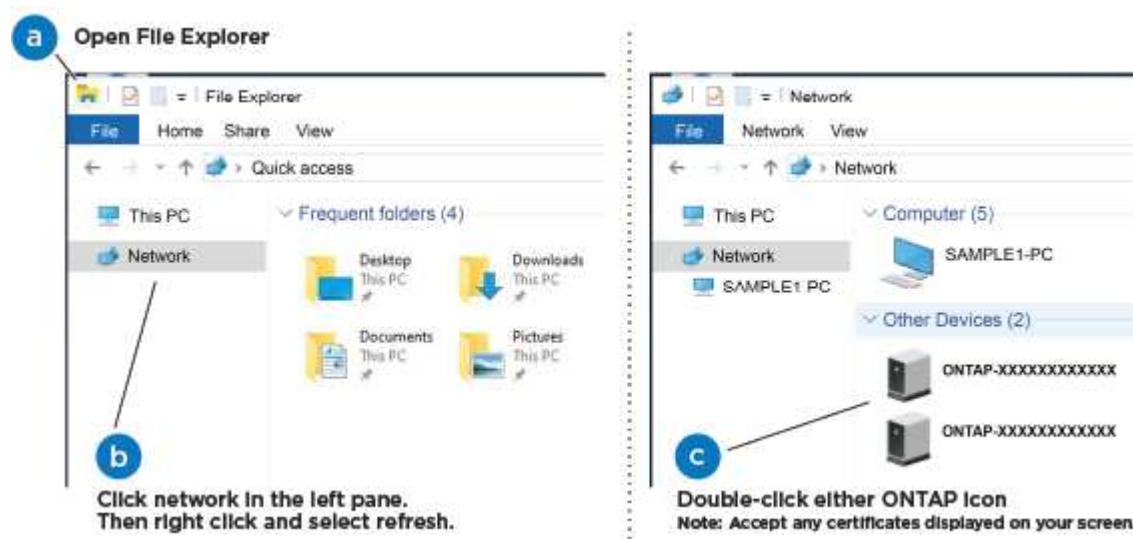
4. Make sure that your laptop has network discovery enabled.

See your laptop's online help for more information.

5. Use the following animation to connect your laptop to the Management switch.

Animation - Connect your laptop to the Management switch

6. Select an ONTAP icon listed to discover:



- a. Open File Explorer.
- b. Click network in the left pane.
- c. Right click and select refresh.
- d. Double-click either ONTAP icon and accept any certificates displayed on your screen.



XXXXX is the system serial number for the target node.

System Manager opens.

7. Use System Manager guided setup to configure your system using the data you collected in the *NetApp ONTAP Configuration Guide*.

8. Set up your account and download Active IQ Config Advisor:

- a. Log in to your existing account or create an account.

[NetApp Support Registration](#)

- b. Register your system.

[NetApp Product Registration](#)

- c. Download Active IQ Config Advisor.

[NetApp Downloads: Config Advisor](#)

9. Verify the health of your system by running Config Advisor.

10. After you have completed the initial configuration, go to the [ONTAP & ONTAP System Manager Documentation Resources](#) page for information about configuring additional features in ONTAP.

Option 2: Completing system setup and configuration if network discovery is not enabled

If network discovery is not enabled on your laptop, you must complete the configuration and setup using this task.

Steps

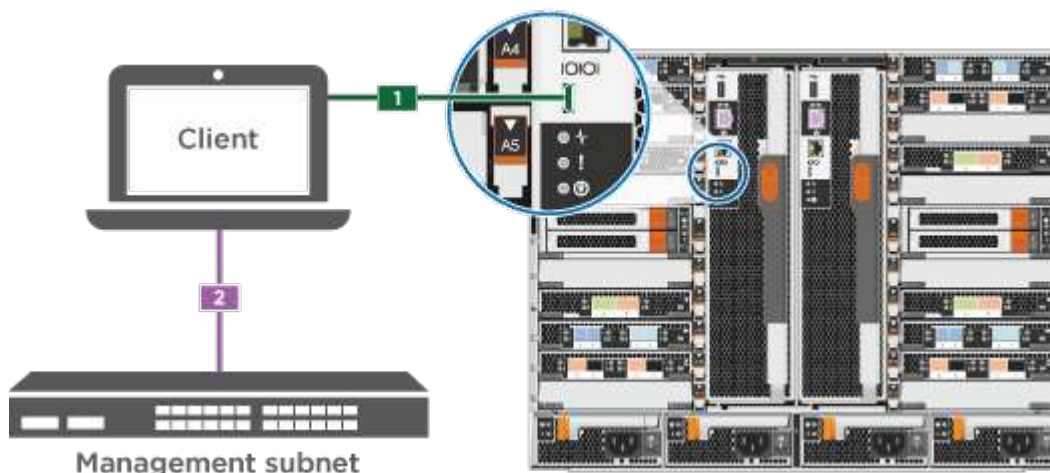
1. Cable and configure your laptop or console:

- a. Set the console port on the laptop or console to 115,200 baud with N-8-1.



See your laptop or console's online help for how to configure the console port.

- b. Connect the console cable to the laptop or console using the console cable that came with your system, and then connect the laptop to the management switch on the management subnet .



- c. Assign a TCP/IP address to the laptop or console, using one that is on the management subnet.

2. Use the following animation to set one or more drive shelf IDs:

If your system has NS224 drive shelves, the shelves are pre-set to shelf ID 00 and 01. If you want to change the shelf IDs, you must create a tool to insert into the hole where button is located.

[Animation - Set SAS or NVMe drive shelf IDs](#)

3. Plug the power cords into the controller power supplies, and then connect them to power sources on different circuits.
4. Turn on the power switches to both nodes.

[Animation - Turn on the power to the controllers](#)



Initial booting may take up to eight minutes.

5. Assign an initial node management IP address to one of the nodes.

If the management network has DHCP...	Then...
Configured	Record the IP address assigned to the new controllers.
Not configured	<div><div><div><div></div><div>Check your laptop or console's online help if you do not know how to configure PuTTY.</div></div></div><div><div>a. Open a console session using PuTTY, a terminal server, or the equivalent for your environment.</div><div>b. Enter the management IP address when prompted by the script.</div></div></div>

6. Using System Manager on your laptop or console, configure your cluster:
 - a. Point your browser to the node management IP address.



The format for the address is https://x.x.x.x.

- b. Configure the system using the data you collected in the *NetApp ONTAP Configuration guide*.

[ONTAP Configuration Guide](#)

7. Set up your account and download Active IQ Config Advisor:
 - a. Log in to your existing account or create an account.

[NetApp Support Registration](#)

- b. Register your system.

[NetApp Product Registration](#)

- c. Download Active IQ Config Advisor.

[NetApp Downloads: Config Advisor](#)

8. Verify the health of your system by running Config Advisor.
9. After you have completed the initial configuration, go to the [ONTAP & ONTAP System Manager Documentation Resources](#) page for information about configuring additional features in ONTAP.

Maintain

Maintain FAS9000 hardware

For the FAS9000 storage system, you can perform maintenance procedures on the following components.

Boot media

The boot media stores a primary and secondary set of boot image files that the system uses when it boots.

Caching module

You must replace the controller's caching module when your system registers a single AutoSupport (ASUP) message that the module has gone offline.

Chassis

The chassis is the physical enclosure housing all the controller components such as the controller/CPU unit, power supply, and I/O.

Controller

A controller consists of a board, firmware, and software. It controls the drives and implements the ONTAP functions.

DCPM

The DCPM (destage controller power module) contains the NVRAM11 battery.

DIMM

You must replace a DIMM (dual in-line memory module) when a memory mismatch is present, or you have a failed DIMM.

Fan

The fan cools the controller.

I/O module

The I/O module (Input/Output module) is a hardware component that acts as an intermediary between the controller and various devices or systems that need to exchange data with the controller.

LED USB

The LED USB module provides connectivity to console ports and system status.

NVRAM

The NVRAM module (Non-Volatile Random Access Memory) allows the controller to retain data across power cycles or system reboots.

Power supply

A power supply provides a redundant power source in a controller shelf.

Real-time clock battery

A real time clock battery preserves system date and time information if the power is off.

X91148A module

The X91148A module is an I/O module that acts as an intermediary between the controller and various devices or systems that need to exchange data with the controller.

Boot media

Overview of boot media replacement - FAS9000

The boot media stores a primary and secondary set of system (boot image) files that the system uses when it boots. Depending on your network configuration, you can perform either a nondisruptive or disruptive replacement.

You must have a USB flash drive, formatted to FAT32, with the appropriate amount of storage to hold the `image_XXX.tgz`.

You also must copy the `image_XXX.tgz` file to the USB flash drive for later use in this procedure.

- The nondisruptive and disruptive methods for replacing a boot media both require you to restore the `var` file system:
 - For nondisruptive replacement, the HA pair does not require connection to a network to restore the `var` file system. The HA pair in a single chassis has an internal e0S connection, which is used to transfer `var` config between them.
 - For disruptive replacement, you do not need a network connection to restore the `var` file system, but the process requires two reboots.
- You must replace the failed component with a replacement FRU component you received from your provider.
- It is important that you apply the commands in these steps on the correct node:
 - The *impaired* node is the node on which you are performing maintenance.
 - The *healthy node* is the HA partner of the impaired node.

Check onboard encryption keys

Prior to shutting down the impaired controller and checking the status of the onboard encryption keys, you must check the status of the impaired controller, disable automatic giveback, and check which version of ONTAP is running on the system.

If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see the [Synchronize a node with the cluster](#).

Steps

1. Check the status of the impaired controller:

- If the impaired controller is at the login prompt, log in as `admin`.
- If the impaired controller is at the `LOADER` prompt and is part of HA configuration, log in as `admin` on the healthy controller.
- If the impaired controller is in a standalone configuration and at `LOADER` prompt, contact mysupport.netapp.com.

2. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message  
MAINT=number_of_hours_downh
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:*>`

```
system node autosupport invoke -node * -type all -message MAINT=2h
```

3. Check the version of ONTAP the system is running on the impaired controller if up, or on the partner controller if the impaired controller is down, using the `version -v` command:

- If `<Ino-DARE>` or `<1Ono-DARE>` is displayed in the command output, the system does not support NVE, proceed to shut down the controller.
- If `<Ino-DARE>` is not displayed in the command output, and the system is running ONTAP 9.5, go to [Option 1: Check NVE or NSE on systems running ONTAP 9.5 and earlier](#).
- If `<Ino-DARE>` is not displayed in the command output, and the system is running ONTAP 9.6 or later, go to [Option 2: Check NVE or NSE on systems running ONTAP 9.6 and later](#).

4. If the impaired node is part of an HA configuration, disable automatic giveback from the healthy node:

```
storage failover modify -node local -auto-giveback false or storage failover  
modify -node local -auto-giveback-after-panic false
```

Option 1: Check NVE or NSE on systems running ONTAP 9.5 and earlier

Before shutting down the impaired controller, you need to check whether the system has either NetApp Volume Encryption (NVE) or NetApp Storage Encryption (NSE) enabled. If so, you need to verify the configuration.

Steps

1. Connect the console cable to the impaired controller.
2. Check whether NVE is configured for any volumes in the cluster: `volume show -is-encrypted true`

If any volumes are listed in the output, NVE is configured and you need to verify the NVE configuration. If no volumes are listed, check whether NSE is configured.

3. Check whether NSE is configured: `storage encryption disk show`

- If the command output lists the drive details with Mode & Key ID information, NSE is configured and you need to verify the NSE configuration.
- If NVE and NSE are not configured, it's safe to shut down the impaired controller.

Verify NVE configuration

Steps

1. Display the key IDs of the authentication keys that are stored on the key management servers: `security key-manager query`

- If the Restored column displays `yes` and all key managers display `available`, it's safe to shut down the impaired controller.
 - If the Restored column displays anything other than `yes`, or if any key manager displays `unavailable`, you need to complete some additional steps.
 - If you see the message `This command is not supported when onboard key management is enabled`, you need to complete some other additional steps.
2. If the Restored column displayed anything other than `yes`, or if any key manager displayed `unavailable`:
 - a. Retrieve and restore all authentication keys and associated key IDs: `security key-manager restore -address *`

If the command fails, contact NetApp Support.

mysupport.netapp.com
 - b. Verify that the Restored column displays `yes` for all authentication keys and that all key managers display `available`: `security key-manager query`
 - c. Shut down the impaired controller.
 3. If you saw the message `This command is not supported when onboard key management is enabled`, display the keys stored in the onboard key manager: `security key-manager key show -detail`
 - a. If the Restored column displays `yes` manually back up the onboard key management information:
 - Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
 - Enter the command to display the OKM backup information: `security key-manager backup show`
 - Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
 - Return to admin mode: `set -priv admin`
 - Shut down the impaired controller.
 - b. If the Restored column displays anything other than `yes`:
 - Run the key-manager setup wizard: `security key-manager setup -node target/impaired node name`



Enter the customer's onboard key management passphrase at the prompt. If the passphrase cannot be provided, contact mysupport.netapp.com

- Verify that the Restored column displays `yes` for all authentication key: `security key-manager key show -detail`
- Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
- Enter the command to display the OKM backup information: `security key-manager backup show`
- Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
- Return to admin mode: `set -priv admin`

- You can safely shutdown the controller.

Verify NSE configuration

Steps

1. Display the key IDs of the authentication keys that are stored on the key management servers: `security key-manager query`
 - If the `Restored` column displays `yes` and all key managers display `available`, it's safe to shut down the impaired controller.
 - If the `Restored` column displays anything other than `yes`, or if any key manager displays `unavailable`, you need to complete some additional steps.
 - If you see the message `This command is not supported when onboard key management is enabled`, you need to complete some other additional steps
2. If the `Restored` column displayed anything other than `yes`, or if any key manager displayed `unavailable`:
 - a. Retrieve and restore all authentication keys and associated key IDs: `security key-manager restore -address *`

If the command fails, contact NetApp Support.

mysupport.netapp.com

- b. Verify that the `Restored` column displays `yes` for all authentication keys and that all key managers display `available`: `security key-manager query`
 - c. Shut down the impaired controller.
3. If you saw the message `This command is not supported when onboard key management is enabled`, display the keys stored in the onboard key manager: `security key-manager key show -detail`
 - a. If the `Restored` column displays `yes`, manually back up the onboard key management information:
 - Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
 - Enter the command to display the OKM backup information: `security key-manager backup show`
 - Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
 - Return to admin mode: `set -priv admin`
 - Shut down the impaired controller.
 - b. If the `Restored` column displays anything other than `yes`:
 - Run the key-manager setup wizard: `security key-manager setup -node target/impaired node name`



Enter the customer's OKM passphrase at the prompt. If the passphrase cannot be provided, contact mysupport.netapp.com

- Verify that the `Restored` column shows `yes` for all authentication keys: `security key-manager key show -detail`

- Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
- Enter the command to back up the OKM information: `security key-manager backup show`



Make sure that OKM information is saved in your log file. This information will be needed in disaster scenarios where OKM might need to be manually recovered.

- Copy the contents of the backup information to a separate file or your log. You'll need it in disaster scenarios where you might need to manually recover OKM.
- Return to admin mode: `set -priv admin`
- You can safely shut down the controller.

Option 2: Check NVE or NSE on systems running ONTAP 9.6 and later

Before shutting down the impaired controller, you need to verify whether the system has either NetApp Volume Encryption (NVE) or NetApp Storage Encryption (NSE) enabled. If so, you need to verify the configuration.

1. Verify whether NVE is in use for any volumes in the cluster: `volume show -is-encrypted true`

If any volumes are listed in the output, NVE is configured and you need to verify the NVE configuration. If no volumes are listed, check whether NSE is configured and in use.

2. Verify whether NSE is configured and in use: `storage encryption disk show`
 - If the command output lists the drive details with Mode & Key ID information, NSE is configured and you need to verify the NSE configuration and in use.
 - If no disks are shown, NSE is not configured.
 - If NVE and NSE are not configured, no drives are protected with NSE keys, it's safe to shut down the impaired controller.


Verify NVE configuration

1. Display the key IDs of the authentication keys that are stored on the key management servers: `security key-manager key query`



After the ONTAP 9.6 release, you may have additional key manager types. The types are KMIP, AKV, and GCP. The process for confirming these types is the same as confirming external or onboard key manager types.

- If the Key Manager type displays `external` and the Restored column displays `yes`, it's safe to shut down the impaired controller.
 - If the Key Manager type displays `onboard` and the Restored column displays `yes`, you need to complete some additional steps.
 - If the Key Manager type displays `external` and the Restored column displays anything other than `yes`, you need to complete some additional steps.
 - If the Key Manager type displays `onboard` and the Restored column displays anything other than `yes`, you need to complete some additional steps.
2. If the Key Manager type displays `onboard` and the Restored column displays `yes`, manually back up the OKM information:

- a. Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
 - b. Enter the command to display the key management information: `security key-manager onboard show-backup`
 - c. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
 - d. Return to admin mode: `set -priv admin`
 - e. Shut down the impaired controller.
3. If the `Key Manager` type displays `external` and the `Restored` column displays anything other than `yes`:
- a. Restore the external key management authentication keys to all nodes in the cluster: `security key-manager external restore`
- If the command fails, contact NetApp Support.
- mysupport.netapp.com
- b. Verify that the `Restored` column equals `yes` for all authentication keys: `security key-manager key query`
 - c. Shut down the impaired controller.
4. If the `Key Manager` type displays `onboard` and the `Restored` column displays anything other than `yes`:
- a. Enter the onboard security key-manager sync command: `security key-manager onboard sync`
-  Enter the customer's 32 character, alphanumeric onboard key management passphrase at the prompt. If the passphrase cannot be provided, contact NetApp Support.

mysupport.netapp.com
- b. Verify the `Restored` column shows `yes` for all authentication keys: `security key-manager key query`
 - c. Verify that the `Key Manager` type shows `onboard`, and then manually back up the OKM information.
 - d. Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
 - e. Enter the command to display the key management backup information: `security key-manager onboard show-backup`
 - f. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
 - g. Return to admin mode: `set -priv admin`
 - h. You can safely shut down the controller.

Verify NSE configuration

1. Display the key IDs of the authentication keys that are stored on the key management servers: `security key-manager key query -key-type NSE-AK`



After the ONTAP 9.6 release, you may have additional key manager types. The types are KMIP, AKV, and GCP. The process for confirming these types is the same as confirming external or onboard key manager types.

- If the Key Manager type displays `external` and the Restored column displays `yes`, it's safe to shut down the impaired controller.
 - If the Key Manager type displays `onboard` and the Restored column displays `yes`, you need to complete some additional steps.
 - If the Key Manager type displays `external` and the Restored column displays anything other than `yes`, you need to complete some additional steps.
 - If the Key Manager type displays `external` and the Restored column displays anything other than `yes`, you need to complete some additional steps.
2. If the Key Manager type displays `onboard` and the Restored column displays `yes`, manually back up the OKM information:
 - a. Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
 - b. Enter the command to display the key management information: `security key-manager onboard show-backup`
 - c. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
 - d. Return to admin mode: `set -priv admin`
 - e. You can safely shut down the controller.
 3. If the Key Manager type displays `external` and the Restored column displays anything other than `yes`:
 - a. Restore the external key management authentication keys to all nodes in the cluster: `security key-manager external restore`

If the command fails, contact NetApp Support.

mysupport.netapp.com
 - b. Verify that the Restored column equals `yes` for all authentication keys: `security key-manager key query`
 - c. You can safely shut down the controller.
 4. If the Key Manager type displays `onboard` and the Restored column displays anything other than `yes`:
 - a. Enter the onboard security key-manager sync command: `security key-manager onboard sync`

Enter the customer's 32 character, alphanumeric onboard key management passphrase at the prompt. If the passphrase cannot be provided, contact NetApp Support.

mysupport.netapp.com
 - b. Verify the Restored column shows `yes` for all authentication keys: `security key-manager key query`
 - c. Verify that the Key Manager type shows `onboard`, and then manually back up the OKM information.

- d. Go to advanced privilege mode and enter `y` when prompted to continue: `set -priv advanced`
- e. Enter the command to display the key management backup information: `security key-manager onboard show-backup`
- f. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.
- g. Return to admin mode: `set -priv admin`
- h. You can safely shut down the controller.

Shut down the impaired controller - FAS9000

Option 1: Most systems

After completing the NVE or NSE tasks, you need to complete the shutdown of the impaired controller.

Steps

- a. Take the impaired controller to the LOADER prompt:

If the impaired controller displays...	Then...
The LOADER prompt	Go to Remove controller module.
Waiting for giveback...	Press Ctrl-C, and then respond <code>y</code> when prompted.
System prompt or password prompt (enter system password)	<p>Take over or halt the impaired controller from the healthy controller:</p> <pre>storage failover takeover -ofnode impaired_node_name</pre> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <code>y</code>.</p>

- b. From the LOADER prompt, enter: `printenv` to capture all boot environmental variables. Save the output to your log file.



This command may not work if the boot device is corrupted or non-functional.

Option 2: Controller is in a MetroCluster

After completing the NVE or NSE tasks, you need to complete the shutdown of the impaired node.

NOTE: Do not use this procedure if your system is in a two-node MetroCluster configuration.

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).
- If you have a MetroCluster configuration, you must have confirmed that the MetroCluster Configuration

State is configured and that the nodes are in an enabled and normal state (`metrocluster node show`).

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message  
MAINT=number_of_hours_downh
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:>`

```
system node autosupport invoke -node * -type all -message MAINT=2h
```

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`
3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying...	Then...
The LOADER prompt	Go to the next step.
Waiting for giveback...	Press Ctrl-C, and then respond <code>y</code> when prompted.
System prompt or password prompt (enter system password)	<p>Take over or halt the impaired controller from the healthy controller: <code>storage failover takeover -ofnode impaired_node_name</code></p> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <code>y</code>.</p>

Option 3: Controller is in a two-node MetroCluster

After completing the NVE or NSE tasks, you need to complete the shutdown of the impaired node.



Do not use this procedure if your system is in a two-node MetroCluster configuration.

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).
- If you have a MetroCluster configuration, you must have confirmed that the MetroCluster Configuration State is configured and that the nodes are in an enabled and normal state (`metrocluster node show`).

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message  
MAINT=number_of_hours_downh
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:>`


```
system node autosupport invoke -node * -type all -message MAINT=2h
```

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`
3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying...	Then...
The LOADER prompt	Go to the next step.
Waiting for giveback...	Press Ctrl-C, and then respond <code>y</code> when prompted.
System prompt or password prompt (enter system password)	<p>Take over or halt the impaired controller from the healthy controller: <code>storage failover takeover -ofnode <i>impaired_node_name</i></code></p> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <code>y</code>.</p>

Replace the boot media - FAS9000

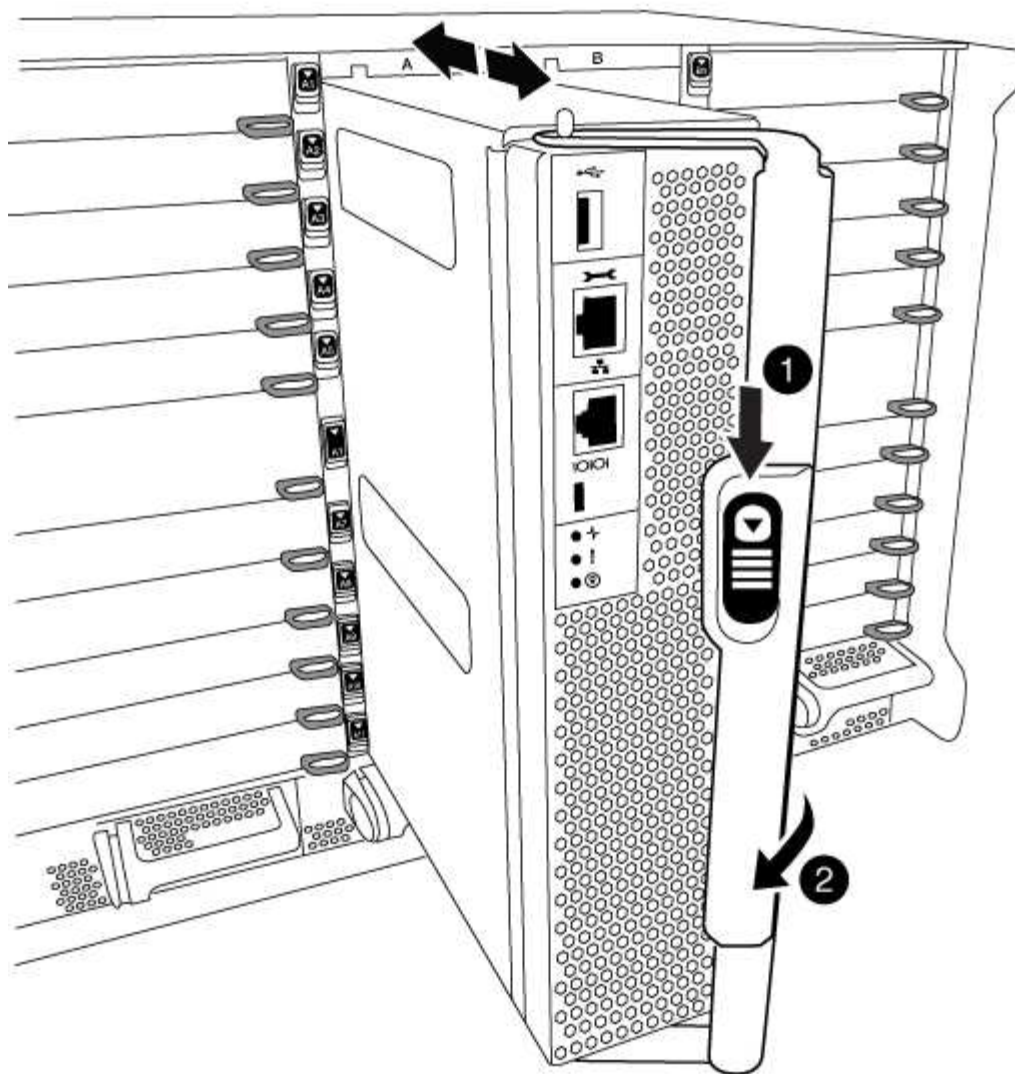
To replace the boot media, you must remove the impaired controller module, install the replacement boot media, and transfer the boot image to a USB flash drive.

Step 1: Remove the controller

To access components inside the controller, you must first remove the controller module from the system and then remove the cover on the controller module.

Steps

1. If you are not already grounded, properly ground yourself.
2. Unplug the cables from the impaired controller module, and keep track of where the cables were connected.
3. Slide the orange button on the cam handle downward until it unlocks.



1

Cam handle release button

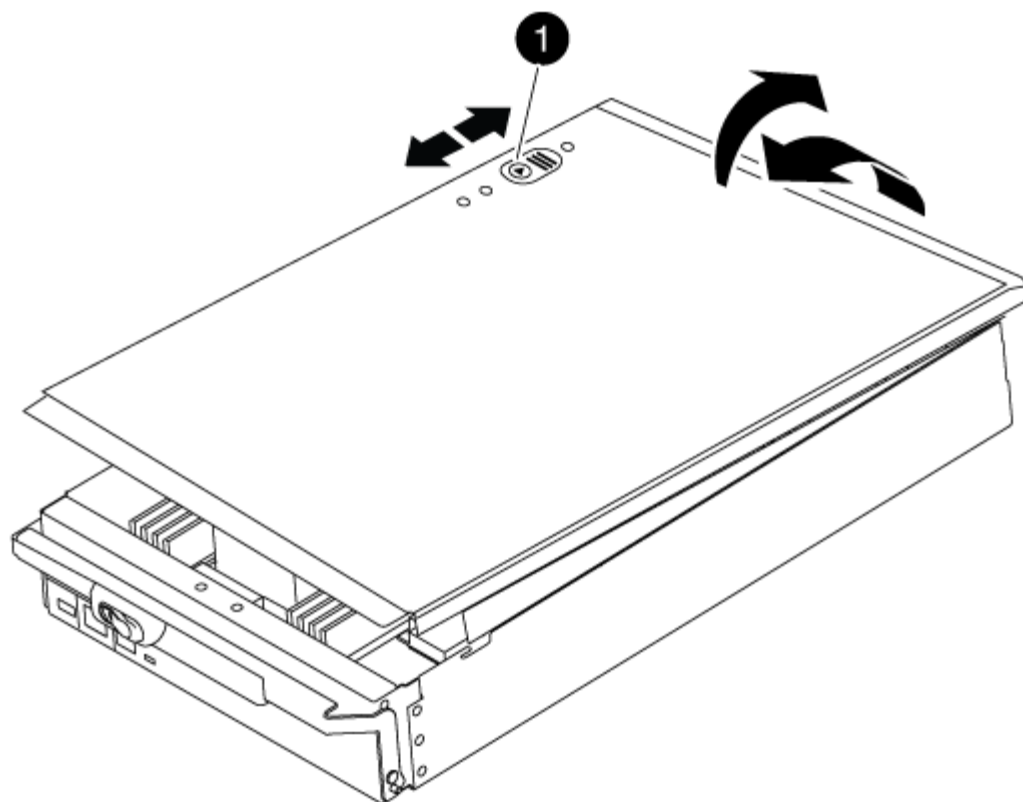
2

Cam handle

4. Rotate the cam handle so that it completely disengages the controller module from the chassis, and then slide the controller module out of the chassis.

Make sure that you support the bottom of the controller module as you slide it out of the chassis.

5. Place the controller module lid-side up on a stable, flat surface, press the blue button on the cover, slide the cover to the back of the controller module, and then swing the cover up and lift it off of the controller module.

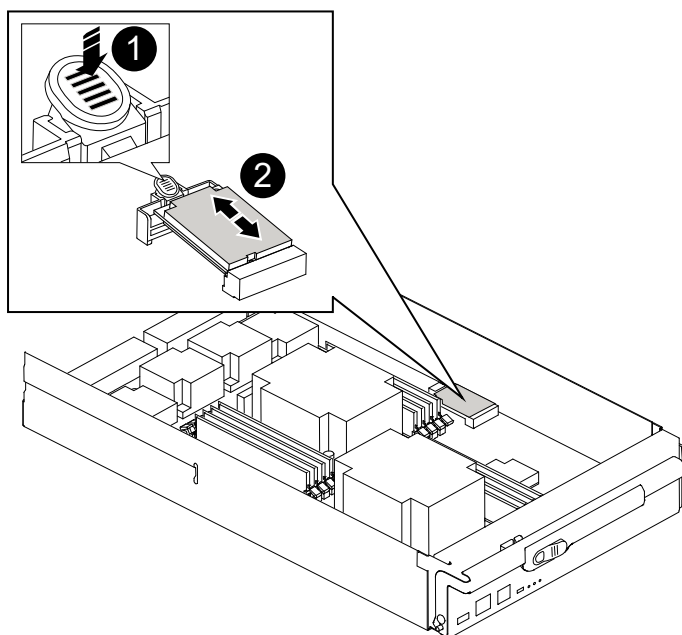


1

Controller module cover locking button

Step 2: Replace the boot media

Locate the boot media using the following illustration or the FRU map on the controller module:



1	
	Press release tab
2	
	Boot media

1. Press the blue button on the boot media housing to release the boot media from its housing, and then gently pull it straight out of the boot media socket.



Do not twist or pull the boot media straight up, because this could damage the socket or the boot media.

2. Align the edges of the replacement boot media with the boot media socket, and then gently push it into the socket.
3. Check the boot media to make sure that it is seated squarely and completely in the socket.

If necessary, remove the boot media and reseal it into the socket.

4. Push the boot media down to engage the locking button on the boot media housing.
5. Reinstall the controller module lid by aligning the pins on the lid with the slots on the motherboard carrier, and then slide the lid into place.

Step 3: Transfer the boot image to the boot media

You can install the system image to the replacement boot media using a USB flash drive with the image installed on it. However, you must restore the `var` file system during this procedure.

- You must have a USB flash drive, formatted to FAT32, with at least 4GB capacity.
- A copy of the same image version of ONTAP as what the impaired controller was running. You can download the appropriate image from the Downloads section on the NetApp Support Site
 - If NVE is enabled, download the image with NetApp Volume Encryption, as indicated in the download button.
 - If NVE is not enabled, download the image without NetApp Volume Encryption, as indicated in the download button.
- If your system is a stand-alone system you do not need a network connection, but you must perform an additional reboot when restoring the `var` file system.

Steps

1. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.
2. Recable the controller module, as needed.
3. Insert the USB flash drive into the USB slot on the controller module.

Make sure that you install the USB flash drive in the slot labeled for USB devices, and not in the USB

console port.

4. Push the controller module all the way into the system, making sure that the cam handle clears the USB flash drive, firmly push the cam handle to finish seating the controller module, and then push the cam handle to the closed position.

The node begins to boot as soon as it is completely installed into the chassis.

5. Interrupt the boot process to stop at the LOADER prompt by pressing Ctrl-C when you see Starting AUTOBOOT press Ctrl-C to abort....

If you miss this message, press Ctrl-C, select the option to boot to Maintenance mode, and then halt the node to boot to LOADER.

6. Set your network connection type at the LOADER prompt:

- If you are configuring DHCP: `ifconfig e0a -auto`



The target port you configure is the target port you use to communicate with the impaired node from the healthy node during `var` file system restore with a network connection. You can also use the `e0M` port in this command.

- If you are configuring manual connections: `ifconfig e0a -addr=filer_addr -mask=netmask -gw=gateway-dns=dns_addr-domain=dns_domain`
 - `filer_addr` is the IP address of the storage system.
 - `netmask` is the network mask of the management network that is connected to the HA partner.
 - `gateway` is the gateway for the network.
 - `dns_addr` is the IP address of a name server on your network.
 - `dns_domain` is the Domain Name System (DNS) domain name.

If you use this optional parameter, you do not need a fully qualified domain name in the netboot server URL. You need only the server's host name.



Other parameters might be necessary for your interface. You can enter `help ifconfig` at the firmware prompt for details.

7. If the controller is in a stretch or fabric-attached MetroCluster, you must restore the FC adapter configuration:

- a. Boot to Maintenance mode: `boot_ontap maint`
- b. Set the MetroCluster ports as initiators: `ucadmin modify -m fc -t initiator adapter_name`
- c. Halt to return to Maintenance mode: `halt`

The changes will be implemented when the system is booted.

Boot the recovery image - FAS9000

The procedure for booting the impaired node from the recovery image depends on whether the system is in a two-node MetroCluster configuration.

Option 1: Boot the recovery image in most systems

You must boot the ONTAP image from the USB drive, restore the file system, and verify the environmental variables.

This procedure applies to systems that are not in a two-node MetroCluster configuration.

Steps

- 1. From the LOADER prompt, boot the recovery image from the USB flash drive: `boot_recovery`

The image is downloaded from the USB flash drive.

- 2. When prompted, either enter the name of the image or accept the default image displayed inside the brackets on your screen.
- 3. Restore the `var` file system:

If your system has...	Then...
A network connection	<ul style="list-style-type: none">a. Press <code>y</code> when prompted to restore the backup configuration.b. Set the healthy node to advanced privilege level: <code>set -privilege advanced</code>c. Run the restore backup command: <code>system node restore-backup -node local -target-address <i>impaired_node_IP_address</i></code>d. Return the node to admin level: <code>set -privilege admin</code>e. Press <code>y</code> when prompted to use the restored configuration.f. Press <code>y</code> when prompted to reboot the node.
No network connection	<ul style="list-style-type: none">a. Press <code>n</code> when prompted to restore the backup configuration.b. Reboot the system when prompted by the system.c. Select the Update flash from backup config (sync flash) option from the displayed menu. <p>If you are prompted to continue with the update, press <code>y</code>.</p>

If your system has...	Then...
No network connection and is in a MetroCluster IP configuration	<p>a. Press n when prompted to restore the backup configuration.</p> <p>b. Reboot the system when prompted by the system.</p> <p>c. Wait for the iSCSI storage connections to connect.</p> <p>You can proceed after you see the following messages:</p> <pre data-bbox="672 394 1489 1255"> date-and-time [node- name:iscsi.session.stateChanged:notice]: iSCSI session state is changed to Connected for the target iSCSI-target (type: dr_auxiliary, address: ip-address). date-and-time [node- name:iscsi.session.stateChanged:notice]: iSCSI session state is changed to Connected for the target iSCSI-target (type: dr_partner, address: ip-address). date-and-time [node- name:iscsi.session.stateChanged:notice]: iSCSI session state is changed to Connected for the target iSCSI-target (type: dr_auxiliary, address: ip-address). date-and-time [node- name:iscsi.session.stateChanged:notice]: iSCSI session state is changed to Connected for the target iSCSI-target (type: dr_partner, address: ip-address).</pre> <p>d. Select the Update flash from backup config (sync flash) option from the displayed menu.</p> <p>If you are prompted to continue with the update, press y.</p>

4. Ensure that the environmental variables are set as expected:
 - a. Take the node to the **LOADER** prompt.
 - b. Check the environment variable settings with the `printenv` command.
 - c. If an environment variable is not set as expected, modify it with the `setenv environment-variable-name changed-value` command.
 - d. Save your changes using the `savenv` command.
5. The next depends on your system configuration:
 - If your system has onboard keymanager, NSE or NVE configured, go to [Restore OKM, NSE, and NVE as needed](#)

- If your system does not have onboard keymanager, NSE or NVE configured, complete the steps in this section.

6. From the LOADER prompt, enter the `boot_ontap` command.

If you see...	Then...
The login prompt	Go to the next Step.
Waiting for giveback...	a. Log into the partner node. b. Confirm the target node is ready for giveback with the <code>storage failover show</code> command.

7. Connect the console cable to the partner node.

8. Give back the node using the `storage failover giveback -fromnode local` command.

9. At the cluster prompt, check the logical interfaces with the `net int -is-home false` command.

If any interfaces are listed as "false", revert those interfaces back to their home port using the `net int revert` command.

10. Move the console cable to the repaired node and run the `version -v` command to check the ONTAP versions.

11. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.

Option 2: Boot the recovery image in a two-node MetroCluster configuration

You must boot the ONTAP image from the USB drive and verify the environmental variables.

This procedure applies to systems in a two-node MetroCluster configuration.

Steps

1. From the LOADER prompt, boot the recovery image from the USB flash drive: `boot_recovery`

The image is downloaded from the USB flash drive.

2. When prompted, either enter the name of the image or accept the default image displayed inside the brackets on your screen.

3. After the image is installed, start the restoration process:

- Press `n` when prompted to restore the backup configuration.
- Press `y` when prompted to reboot to start using the newly installed software.

You should be prepared to interrupt the boot process when prompted.

4. As the system boots, press `Ctrl-C` after you see the `Press Ctrl-C for Boot Menu` message., and when the Boot Menu is displayed select option 6.

5. Verify that the environmental variables are set as expected.

- Take the node to the LOADER prompt.

- b. Check the environment variable settings with the `printenv` command.
- c. If an environment variable is not set as expected, modify it with the `setenv environment-variable-name changed-value` command.
- d. Save your changes using the `savenv` command.
- e. Reboot the node.

Switch back aggregates in a two-node MetroCluster configuration - FAS9000

After you have completed the FRU replacement in a two-node MetroCluster configuration, you can perform the MetroCluster switchback operation. This returns the configuration to its normal operating state, with the sync-source storage virtual machines (SVMs) on the formerly impaired site now active and serving data from the local disk pools.

This task only applies to two-node MetroCluster configurations.

Steps

1. Verify that all nodes are in the enabled state: `metrocluster node show`

```
cluster_B::> metrocluster node show
```

DR Group	Cluster	Node	Configuration State	DR Mirroring Mode
1	cluster_A	controller_A_1	configured	enabled
completed				
	cluster_B	controller_B_1	configured	enabled
switchback recovery				

2 entries were displayed.

2. Verify that resynchronization is complete on all SVMs: `metrocluster vserver show`
3. Verify that any automatic LIF migrations being performed by the healing operations were completed successfully: `metrocluster check lif show`
4. Perform the switchback by using the `metrocluster switchback` command from any node in the surviving cluster.
5. Verify that the switchback operation has completed: `metrocluster show`

The switchback operation is still running when a cluster is in the `waiting-for-switchback` state:

```
cluster_B::> metrocluster show
Cluster              Configuration State      Mode
-----
Local: cluster_B configured          switchover
Remote: cluster_A configured          waiting-for-switchback
```

The switchback operation is complete when the clusters are in the normal state.:

```
cluster_B::> metrocluster show
Cluster              Configuration State      Mode
-----
Local: cluster_B configured          normal
Remote: cluster_A configured          normal
```

If a switchback is taking a long time to finish, you can check on the status of in-progress baselines by using the `metrocluster config-replication resync-status show` command.

6. Reestablish any SnapMirror or SnapVault configurations.

Restore OKM, NSE, and NVE as needed - FAS9000

Once environment variables are checked, you must complete steps specific to systems that have Onboard Key Manager (OKM), NetApp Storage Encryption (NSE) or NetApp Volume Encryption (NVE) enabled.

Determine which section you should use to restore your OKM, NSE, or NVE configurations:

If NSE or NVE are enabled along with Onboard Key Manager you must restore settings you captured at the beginning of this procedure.

- If NSE or NVE are enabled and Onboard Key Manager is enabled, go to [Option 1: Restore NVE or NSE when Onboard Manager is enabled](#).
- If NSE or NVE are enabled for ONATP 9.5, go to [Option 2: Restore NSE/NVE on systems running ONTAP 9.5 and earlier](#).
- If NSE or NVE are enabled for ONTAP 9.6, go to [Option 3: Restore NSE/NVE on systems running ONTAP 9.6 and later](#).

Option 1: Restore NVE or NSE when Onboard Key Manager is enabled

Steps

1. Connect the console cable to the target controller.
2. Use the `boot_ontap` command at the LOADER prompt to boot the controller.
3. Check the console output:

If the console displays...	Then...
The LOADER prompt	Boot the controller to the boot menu: <code>boot_ontap menu</code>
Waiting for giveback...	a. Enter <code>Ctrl-C</code> at the prompt b. At the message: Do you wish to halt this controller rather than wait [y/n]? , enter: <code>y</code> c. At the LOADER prompt, enter the <code>boot_ontap menu</code> command.

- At the Boot Menu, enter the hidden command, `recover_onboard_keymanager` and reply `y` at the prompt.
- Enter the passphrase for the onboard key manager you obtained from the customer at the beginning of this procedure.
- When prompted to enter the backup data, paste the backup data you captured at the beginning of this procedure, when asked. Paste the output of `security key-manager backup show` OR `security key-manager onboard show-backup` command.



The data is output from either `security key-manager backup show` or `security key-manager onboard show-backup` command.

Example of backup data:

```

-----BEGIN BACKUP-----
TmV0QXBwIEtleSBCbG9iAAEAAAAEAAAAcAEAAAAAADuD+byAAAAACEAAAAAAAAA
QAAAAAAAAABvOIH0AAAAAMh7qDLRyH1DBz12piVdy9ATSFMT0C0TIYFss4PDjTaV
dzRYkLd1PhQLxAWJwOlyqSr8qY1SEBgm1IWgE5DLRqkiAAAAAAAAACgAAAAAAAA
3WTh7gAAAAAAAAAAAAAAAAAIAAAAAAAgAZJEIWvdeHr5RCAvHGclo+wAAAAAAAAA
lgAAAAAAAAAoAAAAAAAAAEOTcR0AAAAAAAAAAAAAAAAACAAAAAAAAJAGr3tJA/
LRzUQRHwv+1aWvAAAAAAAAAACQAAAAAAAAAgAAAAAAAAACdhTcvAAAAAJ1PXeBf
ml4NBsSyV1B4jc4A7cvWEFY6ILG6hc6tbKLAHZuvfQ4rlbYAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
.
.
.
.
H4nPQM0nrDRYRa9SCv8AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAA
-----END BACKUP-----

```

- At the Boot Menu select the option for Normal Boot.

The system boots to `Waiting for giveback...` prompt.

- Move the console cable to the partner controller and login as admin.

9. Confirm the target controller is ready for giveback with the `storage failover show` command.
10. Give back only the CFO aggregates with the `storage failover giveback -fromnode local -only-cfo -aggregates true` command.
 - If the command fails because of a failed disk, physically disengage the failed disk, but leave the disk in the slot until a replacement is received.
 - If the command fails because of an open CIFS session, check with the customer on how to close out CIFS sessions.
11. Once the giveback completes, check the failover and giveback status with the `storage failover show` and ``storage failover show-giveback`` commands.



Terminating CIFS can cause loss of data.

- If the command fails because the partner is "not ready", wait 5 minutes for the NVMEMs to synchronize.
 - If the command fails because of an NDMP, SnapMirror, or SnapVault process, disable the process. See the appropriate Documentation Center for more information.
12. Move the console cable to the target controller.
 13. If you are running ONTAP 9.5 and earlier, run the key-manager setup wizard:
 - a. Start the wizard using the `security key-manager setup -nodenodename` command, and then enter the passphrase for onboard key management when prompted.
 - b. Enter the `security key-manager key show -detail` command to see a detailed view of all keys stored in the onboard key manager and verify that the `Restored` column = `yes` for all authentication keys.



If the `Restored` column = anything other than `yes`, contact Customer Support.

- c. Wait 10 minutes for the key to synchronize across the cluster.
14. If you are running ONTAP 9.6 or later:
 - a. Run the `security key-manager onboard sync` command and then enter the passphrase when prompted.
 - b. Enter the `security key-manager key query` command to see a detailed view of all keys stored in the onboard key manager and verify that the `Restored` column = `yes/true` for all authentication keys.



If the `Restored` column = anything other than `yes/true`, contact Customer Support.

- c. Wait 10 minutes for the key to synchronize across the cluster.
15. Move the console cable to the partner controller.
16. Give back the target controller using the `storage failover giveback -fromnode local` command.
17. Check the giveback status, 3 minutes after it reports complete, using the `storage failover show` command.

If giveback is not complete after 20 minutes, contact Customer Support.

18. At the clustershell prompt, enter the `net int show -is-home false` command to list the logical interfaces that are not on their home controller and port.

If any interfaces are listed as `false`, revert those interfaces back to their home port using the `net int revert -vserver Cluster -lif nodename` command.

19. Move the console cable to the target controller and run the `version -v` command to check the ONTAP versions.
20. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.

Option 2: Restore NSE/NVE on systems running ONTAP 9.5 and earlier

Steps

1. Connect the console cable to the target controller.
2. Use the `boot_ontap` command at the LOADER prompt to boot the controller.
3. Check the console output:

If the console displays...	Then...
The login prompt	Go to Step 7.
Waiting for giveback...	<ol style="list-style-type: none">a. Log into the partner controller.b. Confirm the target controller is ready for giveback with the <code>storage failover show</code> command.

4. Move the console cable to the partner controller and give back the target controller storage using the `storage failover giveback -fromnode local -only-cfo-aggregates true local` command.
 - If the command fails because of a failed disk, physically disengage the failed disk, but leave the disk in the slot until a replacement is received.
 - If the command fails because of an open CIFS sessions, check with customer how to close out CIFS sessions.



Terminating CIFS can cause loss of data.

- If the command fails because the partner "not ready", wait 5 minutes for the NVMEMs to synchronize.
 - If the command fails because of an NDMP, SnapMirror, or SnapVault process, disable the process. See the appropriate Documentation Center for more information.
5. Wait 3 minutes and check the failover status with the `storage failover show` command.
 6. At the clustershell prompt, enter the `net int show -is-home false` command to list the logical interfaces that are not on their home controller and port.

If any interfaces are listed as `false`, revert those interfaces back to their home port using the `net int`

```
revert -vserver Cluster -lif nodename command.
```

7. Move the console cable to the target controller and run the `version -v` command to check the ONTAP versions.
8. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.
9. Use the `storage encryption disk show` at the cluster shell prompt, to review the output.



This command does not work if NVE (NetApp Volume Encryption) is configured

10. Use the security key-manager query to display the key IDs of the authentication keys that are stored on the key management servers.
 - If the `Restored` column = `yes` and all key managers report in an available state, go to *Complete the replacement process*.
 - If the `Restored` column = anything other than `yes`, and/or one or more key managers is not available, use the `security key-manager restore -address` command to retrieve and restore all authentication keys (AKs) and key IDs associated with all nodes from all available key management servers.

Check the output of the security key-manager query again to ensure that the `Restored` column = `yes` and all key managers report in an available state

11. If the Onboard Key Management is enabled:
 - a. Use the `security key-manager key show -detail` to see a detailed view of all keys stored in the onboard key manager.
 - b. Use the `security key-manager key show -detail` command and verify that the `Restored` column = `yes` for all authentication keys.

If the `Restored` column = anything other than `yes`, use the `security key-manager setup -node Repaired(Target)node` command to restore the Onboard Key Management settings. Rerun the `security key-manager key show -detail` command to verify `Restored` column = `yes` for all authentication keys.

12. Connect the console cable to the partner controller.
13. Give back the controller using the `storage failover giveback -fromnode local` command.
14. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.

Option 3: Restore NSE/NVE on systems running ONTAP 9.6 and later

Steps

1. Connect the console cable to the target controller.
2. Use the `boot_ontap` command at the `LOADER` prompt to boot the controller.
3. Check the console output:

If the console displays...	Then...
The login prompt	Go to Step 7.
Waiting for giveback...	<ul style="list-style-type: none"> a. Log into the partner controller. b. Confirm the target controller is ready for giveback with the <code>storage failover show</code> command.

4. Move the console cable to the partner controller and give back the target controller storage using the `storage failover giveback -fromnode local -only-cfo-aggregates true local` command.
 - If the command fails because of a failed disk, physically disengage the failed disk, but leave the disk in the slot until a replacement is received.
 - If the command fails because of an open CIFS session, check with the customer on how to close out CIFS sessions.



Terminating CIFS can cause loss of data.

- If the command fails because the partner is "not ready", wait 5 minutes for the NVMEMs to synchronize.
 - If the command fails because of an NDMP, SnapMirror, or SnapVault process, disable the process. See the appropriate Documentation Center for more information.
5. Wait 3 minutes and check the failover status with the `storage failover show` command.
 6. At the clustershell prompt, enter the `net int show -is-home false` command to list the logical interfaces that are not on their home controller and port.

If any interfaces are listed as `false`, revert those interfaces back to their home port using the `net int revert -vserver Cluster -lif nodename` command.

7. Move the console cable to the target controller and run the `version -v` command to check the ONTAP versions.
8. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.
9. Use the `storage encryption disk show` at the clustershell prompt, to review the output.
10. Use the `security key-manager key query` command to display the key IDs of the authentication keys that are stored on the key management servers.
 - If the `Restored` column = `yes/true`, you are done and can proceed to complete the replacement process.
 - If the `Key Manager type` = `external` and the `Restored` column = anything other than `yes/true`, use the `security key-manager external restore` command to restore the key IDs of the authentication keys.



If the command fails, contact Customer Support.

- If the `Key Manager type = onboard` and the `Restored column = anything other than yes/true`, use the `security key-manager onboard sync` command to re-sync the Key Manager type.

Use the `security key-manager key query` to verify that the `Restored column = yes/true` for all authentication keys.

11. Connect the console cable to the partner controller.
12. Give back the controller using the `storage failover giveback -fromnode local` command.
13. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.
14. If AutoSupport is enabled, restore/unsuppress automatic case creation by using the `system node autosupport invoke -node * -type all -message MAINT=END`

Return the failed part to NetApp - FAS9000

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

Replace the caching module or add/replace a core dump module - FAS9000

You must replace the caching module in the controller module when your system registers a single AutoSupport (ASUP) message that the module has gone offline; failure to do so results in performance degradation. If AutoSupport is not enabled, you can locate the failed caching module by the fault LED on the front of the module. You can also add or replace the 1TB, X9170A core dump module, which is required if you are installing NS224 drive shelves in an AFF A700 system.

Before you begin

- You must replace the failed component with a replacement FRU component you received from your provider.
- For instructions about hot swapping the caching module, see [Hot-swapping a caching module](#).
- When removing, replacing, or adding caching or core dump modules, the target node must be halted to the LOADER.
- AFF A700 supports the 1TB core dump module, X9170A, which is required if you are adding NS224 drive shelves.
- The core dump modules can be installed in slots 6-1 and 6-2. The recommended best practice is to install the module in slot 6-1.
- The X9170A core dump module is not hot-swappable.

Step 1: Shut down the impaired controller

You can shut down or take over the impaired controller using different procedures, depending on the storage system hardware configuration.

Option 1: Most configurations

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced` mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message MAINT=<# of hours>h
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`



When you see *Do you want to disable auto-giveback?*, enter *y*.

3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying...	Then...
The LOADER prompt	Go to the next step.
Waiting for giveback...	Press Ctrl-C, and then respond <i>y</i> when prompted.
System prompt or password prompt	<p>Take over or halt the impaired controller from the healthy controller: <code>storage failover takeover -ofnode <i>impaired_node_name</i></code></p> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i>.</p>

Option 2: Controller is in a two-node MetroCluster

To shut down the impaired controller, you must determine the status of the controller and, if necessary,

switch over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- You must leave the power supplies turned on at the end of this procedure to provide power to the healthy controller.

Steps

1. Check the MetroCluster status to determine whether the impaired controller has automatically switched over to the healthy controller: `metrocluster show`
2. Depending on whether an automatic switchover has occurred, proceed according to the following table:

If the impaired controller...	Then...
Has automatically switched over	Proceed to the next step.
Has not automatically switched over	Perform a planned switchover operation from the healthy controller: <code>metrocluster switchover</code>
Has not automatically switched over, you attempted switchover with the <code>metrocluster switchover</code> command, and the switchover was vetoed	Review the veto messages and, if possible, resolve the issue and try again. If you are unable to resolve the issue, contact technical support.

3. Resynchronize the data aggregates by running the `metrocluster heal -phase aggregates` command from the surviving cluster.

```
controller_A_1::> metrocluster heal -phase aggregates
[Job 130] Job succeeded: Heal Aggregates is successful.
```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

4. Verify that the operation has been completed by using the `metrocluster operation show` command.

```
controller_A_1::> metrocluster operation show
Operation: heal-aggregates
State: successful
Start Time: 7/25/2016 18:45:55
End Time: 7/25/2016 18:45:56
Errors: -
```

5. Check the state of the aggregates by using the `storage aggregate show` command.

```

controller_A_1::> storage aggregate show
Aggregate      Size Available Used% State    #Vols  Nodes
RAID Status
-----
...
aggr_b2      227.1GB   227.1GB    0% online      0 mcc1-a2
raid_dp, mirrored, normal...

```

6. Heal the root aggregates by using the `metrocluster heal -phase root-aggregates` command.

```

mcc1A::> metrocluster heal -phase root-aggregates
[Job 137] Job succeeded: Heal Root Aggregates is successful

```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

7. Verify that the heal operation is complete by using the `metrocluster operation show` command on the destination cluster:

```

mcc1A::> metrocluster operation show
Operation: heal-root-aggregates
State: successful
Start Time: 7/29/2016 20:54:41
End Time: 7/29/2016 20:54:42
Errors: -

```

8. On the impaired controller module, disconnect the power supplies.

Step 2: Replace or add a caching module

The NVMe SSD Flash Cache modules (FlashCache or caching modules) are separate modules. They are located in the front of the NVRAM module. To replace or add a caching module, locate it on the rear of the system on slot 6, and then follow the specific sequence of steps to replace it.

Before you begin

Your storage system must meet certain criteria depending on your situation:

- It must have the appropriate operating system for the caching module you are installing.
- It must support the caching capacity.
- The target node must be at the `LOADER` prompt before adding or replacing the caching module.
- The replacement caching module must have the same capacity as the failed caching module, but can be

from a different supported vendor.

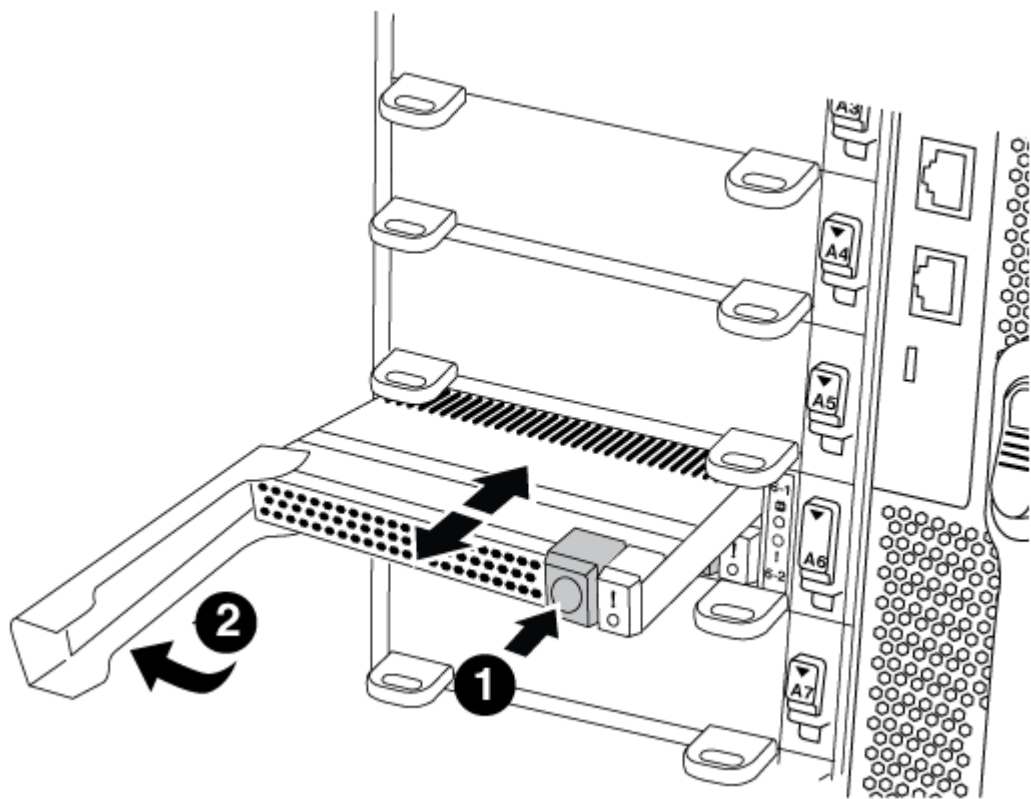
- All other components in the storage system must be functioning properly; if not, you must contact technical support.

Steps

1. If you are not already grounded, properly ground yourself.
2. Locate the failed caching module, in slot 6, by the lit amber Attention LED on the front of the caching module.
3. Remove the caching module:



If you are adding another caching module to your system, remove the blank module and go to the next step.



1	Orange release button.
2	Caching module cam handle.

- a. Press the orange release button on the front of the caching module.



Do not use the numbered and lettered I/O cam latch to eject the caching module. The numbered and lettered I/O cam latch ejects the entire NVRAM10 module and not the caching module.

- b. Rotate the cam handle until the caching module begins to slide out of the NVRAM10 module.
- c. Gently pull the cam handle straight toward you to remove the caching module from the NVRAM10

module.

Be sure to support the caching module as you remove it from the NVRAM10 module.

4. Install the caching module:

- a. Align the edges of the caching module with the opening in the NVRAM10 module.
- b. Gently push the caching module into the bay until the cam handle engages.
- c. Rotate the cam handle until it locks into place.

Step 3: Add or replace an X9170A core dump module

The 1TB cache core dump, X9170A, is only used in the AFF A700 systems. The core dump module cannot be hot-swapped. The core dump module typically is located in the front of the NVRAM module in slot 6-1 in the rear of the system. To replace or add the core dump module, locate slot 6-1, and then follow the specific sequence of steps to add or replace it.

Before you begin

- Your system must be running ONTAP 9.8 or later in order to add a core dump module.
- The X9170A core dump module is not hot-swappable.
- The target node must be at the LOADER prompt before adding or replacing the code dump module.
- You must have received two X9170 core dump modules; one for each controller.
- All other components in the storage system must be functioning properly; if not, you must contact technical support.

Steps

1. If you are not already grounded, properly ground yourself.
2. If you are replacing a failed core dump module, locate and remove it:



1	Orange release button.
2	Core dump module cam handle.

- a. Locate the failed module by the amber Attention LED on the front of the module.
- b. Press the orange release button on the front of the core dump module.



Do not use the numbered and lettered I/O cam latch to eject the core dump module. The numbered and lettered I/O cam latch ejects the entire NVRAM10 module and not the core dump module.

- c. Rotate the cam handle until the core dump module begins to slide out of the NVRAM10 module.
- d. Gently pull the cam handle straight toward you to remove the core dump module from the NVRAM10 module and set it aside.

Be sure to support the core dump module as you remove it from the NVRAM10 module.

3. Install the core dump module:

- a. If you are installing a new core dump module, remove the blank module from slot 6-1.
- b. Align the edges of the core dump module with the opening in the NVRAM10 module.
- c. Gently push the core dump module into the bay until the cam handle engages.
- d. Rotate the cam handle until it locks into place.

Step 4: Reboot the controller after FRU replacement

After you replace the FRU, you must reboot the controller module.

Step

- 1. To boot ONTAP from the LOADER prompt, enter `bye`.

Step 5: Switch back aggregates in a two-node MetroCluster configuration

After you have completed the FRU replacement in a two-node MetroCluster configuration, you can perform the MetroCluster switchback operation. This returns the configuration to its normal operating state, with the sync-source storage virtual machines (SVMs) on the formerly impaired site now active and serving data from the local disk pools.

This task only applies to two-node MetroCluster configurations.

Steps

- 1. Verify that all nodes are in the enabled state: `metrocluster node show`

```
cluster_B::> metrocluster node show

DR
Group Cluster Node          Configuration  DR
-----
-----
1      cluster_A
      controller_A_1 configured    enabled    heal roots
completed
      cluster_B
      controller_B_1 configured    enabled    waiting for
switchback recovery
2 entries were displayed.
```

- 2. Verify that resynchronization is complete on all SVMs: `metrocluster vserver show`
- 3. Verify that any automatic LIF migrations being performed by the healing operations were completed successfully: `metrocluster check lif show`
- 4. Perform the switchback by using the `metrocluster switchback` command from any node in the surviving cluster.
- 5. Verify that the switchback operation has completed: `metrocluster show`

The switchback operation is still running when a cluster is in the `waiting-for-switchback` state:

```
cluster_B::> metrocluster show
Cluster           Configuration State      Mode
-----
Local: cluster_B configured          switchover
Remote: cluster_A configured          waiting-for-switchback
```

The switchback operation is complete when the clusters are in the `normal` state.:

```
cluster_B::> metrocluster show
Cluster           Configuration State      Mode
-----
Local: cluster_B configured          normal
Remote: cluster_A configured          normal
```

If a switchback is taking a long time to finish, you can check on the status of in-progress baselines by using the `metrocluster config-replication resync-status show` command.

6. Reestablish any SnapMirror or SnapVault configurations.

Step 6: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

Hot-swap a caching module - FAS9000

The NVMe SSD FlashCache modules (FlashCache or caching modules) are located in the front of the NVRAM10 module in Slot 6 of FAS9000 systems only. Beginning with ONTAP 9.4, you can hot-swap the caching module of the same capacity from the same or different supported vendor.

Before you begin

Your storage system must meet certain criteria depending on your situation:

- It must have the appropriate operating system for the caching module you are installing.
- It must support the caching capacity.
- The replacement caching module must have the same capacity as the failed caching module, but can be from a different supported vendor.
- All other components in the storage system must be functioning properly; if not, you must contact technical support.

Steps

1. If you are not already grounded, properly ground yourself.
2. Locate the failed caching module, in slot 6, by the lit amber Attention LED on the front of the caching module.

3. Prepare the caching module slot for replacement as follows:

a. For ONTAP 9.7 and earlier:

- i. Record the caching module capacity, part number, and serial number on the target node: `system node run local sysconfig -av 6`
- ii. In admin privilege level, prepare the target NVMe slot for replacement, responding `y` when prompted whether to continue: `system controller slot module replace -node node_name -slot slot_number` The following command prepares slot 6-2 on node1 for replacement, and displays a message that it is safe to replace:

```
::> system controller slot module replace -node node1 -slot 6-2

Warning: NVMe module in slot 6-2 of the node node1 will be powered
off for replacement.
Do you want to continue? (y|n): `y`

The module has been successfully powered off. It can now be
safely replaced.
After the replacement module is inserted, use the "system
controller slot module insert" command to place the module into
service.
```

- iii. Display the slot status with the `system controller slot module show` command.

The NVMe slot status displays waiting-for-replacement in the screen output for the caching module that needs replacing.

b. For ONTAP 9.8 and later:

- i. Record the caching module capacity, part number, and serial number on the target node: `system node run local sysconfig -av 6`
- ii. In admin privilege level, prepare the target NVMe slot for removal, responding `y` when prompted whether to continue: `system controller slot module remove -node node_name -slot slot_number` The following command prepares slot 6-2 on node1 for removal, and displays a message that it is safe to remove:

```
::> system controller slot module remove -node node1 -slot 6-2

Warning: SSD module in slot 6-2 of the node node1 will be powered
off for removal.
Do you want to continue? (y|n): `y`

The module has been successfully removed from service and powered
off. It can now be safely removed.
```

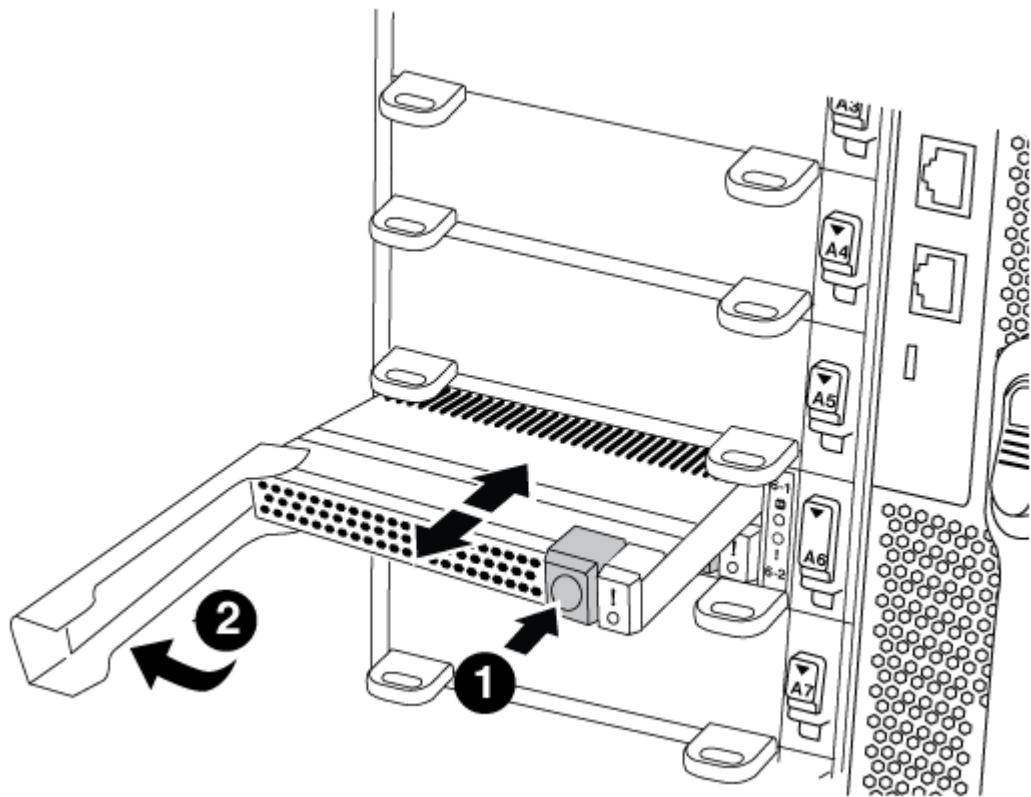
- iii. Display the slot status with the `system controller slot module show` command.

The NVMe slot status displays `powered-off` in the screen output for the caching module that needs replacing.



See the [Command man pages](#) for your version of ONTAP for more details.

4. Remove the caching module:



1	Orange release button.
2	Caching module cam handle.

- a. Press the orange release button on the front of the caching module.



Do not use the numbered and lettered I/O cam latch to eject the caching module. The numbered and lettered I/O cam latch ejects the entire NVRAM10 module and not the caching module.

- b. Rotate the cam handle until the caching module begins to slide out of the NVRAM10 module.
c. Gently pull the cam handle straight toward you to remove the caching module from the NVRAM10 module.

Be sure to support the caching module as you remove it from the NVRAM10 module.

5. Install the caching module:

- a. Align the edges of the caching module with the opening in the NVRAM10 module.

- b. Gently push the caching module into the bay until the cam handle engages.
 - c. Rotate the cam handle until it locks into place.
6. Bring the replacement caching module online by using the `system controller slot module insert` command as follows:

The following command prepares slot 6-2 on node1 for power-on, and displays a message that it is powered on:

```
::> system controller slot module insert -node node1 -slot 6-2

Warning: NVMe module in slot 6-2 of the node localhost will be powered
on and initialized.
Do you want to continue? (y|n): `y`

The module has been successfully powered on, initialized and placed into
service.
```

7. Verify the slot status using the `system controller slot module show` command.

Make sure that command output reports status for slot 6-1 or 6-2 as `powered-on` and ready for operation.

8. Verify that the replacement caching module is online and recognized, and then visually confirm that the amber attention LED is not lit: `sysconfig -av slot_number`



If you replace the caching module with a caching module from a different vendor, the new vendor name is displayed in the command output.

9. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

Chassis

Overview of chassis replacement - FAS9000

All other components in the system must be functioning properly; if not, you must contact technical support.

- You can use this procedure with all versions of ONTAP supported by your system.
- This procedure is disruptive. For a two-node cluster, you will have a complete service outage and a partial outage in a multi-node cluster.

Shut down the controllers - FAS9000

To replace the chassis, you must shutdown the controllers.

Option 1: Shut down the controllers

This procedure is for 2-node, non-MetroCluster configurations only. If you have a system with more than two nodes, see [How to perform a graceful shutdown and power up of one HA pair in a 4-node cluster](#).

Before you begin

You need:

- Local administrator credentials for ONTAP.
- NetApp onboard key management (OKM) cluster-wide passphrase if using storage encryption or NVE/NAE.
- BMC accessibility for each controller.
- Stop all clients/host from accessing data on the NetApp system.
- Suspend external backup jobs.
- Necessary tools and equipment for the replacement.



If the system is a NetApp StorageGRID or ONTAP S3 used as FabricPool cloud tier, refer to the [Gracefully shutdown and power up your storage system Resolution Guide](#) after performing this procedure.



If using SSDs, refer to [SU490: \(Impact: Critical\) SSD Best Practices: Avoid risk of drive failure and data loss if powered off for more than two months](#)

As a best practice before shutdown, you should:

- Perform additional [system health checks](#).
- Upgrade ONTAP to a recommended release for the system.
- Resolve any [Active IQ Wellness Alerts and Risks](#).
Make note of any faults presently on the system, such as LEDs on the system components.

Steps

1. Log into the cluster through SSH or log in from any node in the cluster using a local console cable and a laptop/console.
2. Turn off AutoSupport and indicate how long you expect the system to be offline:

```
system node autosupport invoke -node * -type all -message "MAINT=8h Power Maintenance"
```

3. Identify the SP/BMC address of all nodes:

```
system service-processor show -node * -fields address
```

4. Exit the cluster shell: `exit`
5. Log into SP/BMC over SSH using the IP address of any of the nodes listed in the output from the previous step.

If you're using a console/laptop, log into the controller using the same cluster administrator credentials.



Open an SSH session to every SP/BMC connection so that you can monitor progress.

6. Halt the 2 nodes located in the impaired chassis:

```
system node halt -node <node>,<node2> -skip-lif-migration-before-shutdown true
```

```
-ignore-quorum-warnings true -inhibit-takeover true
```



For clusters using SnapMirror synchronous operating in StrictSync mode: `system node halt -node <node>,<node2> -skip-lif-migration-before-shutdown true -ignore-quorum-warnings true -inhibit-takeover true -ignore-strict-sync-warnings true`

7. Enter **y** for each controller in the cluster when you see *Warning: Are you sure you want to halt node "cluster <node-name> number"?*
`{y|n}:`
8. Wait for each controller to halt and display the LOADER prompt.

Option 2: Shut down a node in a two-node MetroCluster configuration

To shut down the impaired controller, you must determine the status of the controller and, if necessary, switch over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- You must leave the power supplies turned on at the end of this procedure to provide power to the healthy controller.

Steps

1. Check the MetroCluster status to determine whether the impaired controller has automatically switched over to the healthy controller: `metrocluster show`
2. Depending on whether an automatic switchover has occurred, proceed according to the following table:

If the impaired controller...	Then...
Has automatically switched over	Proceed to the next step.
Has not automatically switched over	Perform a planned switchover operation from the healthy controller: <code>metrocluster switchover</code>
Has not automatically switched over, you attempted switchover with the <code>metrocluster switchover</code> command, and the switchover was vetoed	Review the veto messages and, if possible, resolve the issue and try again. If you are unable to resolve the issue, contact technical support.

3. Resynchronize the data aggregates by running the `metrocluster heal -phase aggregates` command from the surviving cluster.

```
controller_A_1::> metrocluster heal -phase aggregates
[Job 130] Job succeeded: Heal Aggregates is successful.
```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

4. Verify that the operation has been completed by using the `metrocluster operation show` command.

```
controller_A_1:> metrocluster operation show
  Operation: heal-aggregates
    State: successful
Start Time: 7/25/2016 18:45:55
  End Time: 7/25/2016 18:45:56
  Errors: -
```

5. Check the state of the aggregates by using the `storage aggregate show` command.

```
controller_A_1:> storage aggregate show
Aggregate      Size Available Used% State   #Vols  Nodes      RAID
Status
-----
...
aggr_b2      227.1GB   227.1GB    0% online    0 mcc1-a2
raid_dp, mirrored, normal...
```

6. Heal the root aggregates by using the `metrocluster heal -phase root-aggregates` command.

```
mcc1A:> metrocluster heal -phase root-aggregates
[Job 137] Job succeeded: Heal Root Aggregates is successful
```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

7. Verify that the heal operation is complete by using the `metrocluster operation show` command on the destination cluster:

```
mcc1A:> metrocluster operation show
  Operation: heal-root-aggregates
    State: successful
Start Time: 7/29/2016 20:54:41
  End Time: 7/29/2016 20:54:42
  Errors: -
```

8. On the impaired controller module, disconnect the power supplies.

Move the fans, hard drives, and controller module or modules from the impaired chassis to the new chassis, and swap out the impaired chassis from the equipment rack or system cabinet with the new chassis of the same model as the impaired chassis.

Step 1: Remove the power supplies

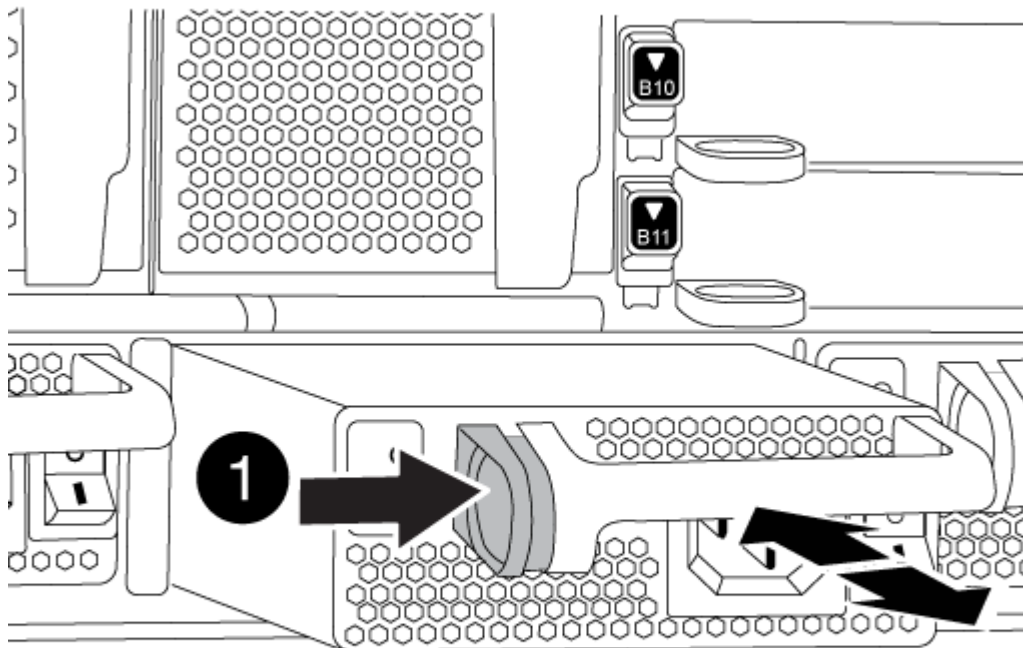
Steps

Removing the power supplies when replacing a chassis involves turning off, disconnecting, and then removing the power supply from the old chassis.

1. If you are not already grounded, properly ground yourself.
2. Turn off the power supply and disconnect the power cables:
 - a. Turn off the power switch on the power supply.
 - b. Open the power cable retainer, and then unplug the power cable from the power supply.
 - c. Unplug the power cable from the power source.
3. Press and hold the orange button on the power supply handle, and then pull the power supply out of the chassis.



When removing a power supply, always use two hands to support its weight.



1

Locking button

4. Repeat the preceding steps for any remaining power supplies.

Step 2: Remove the fans

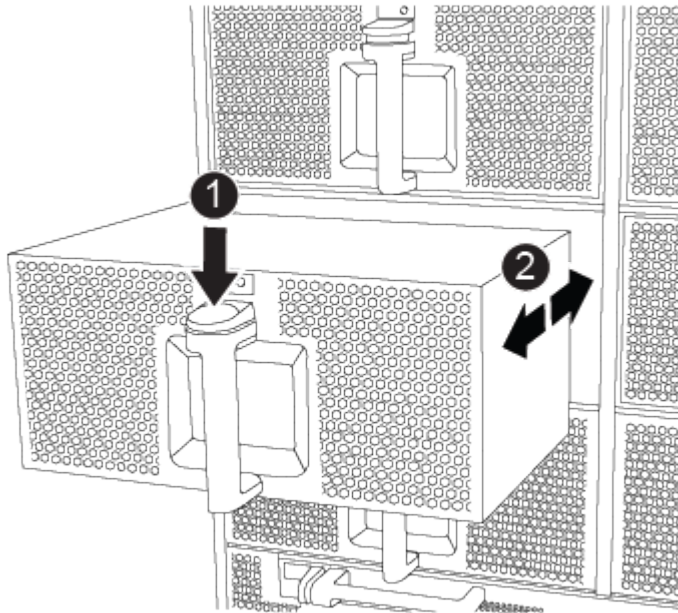
To remove the fan modules when replacing the chassis, you must perform a specific sequence of tasks.

Steps

1. Remove the bezel (if necessary) with two hands, by grasping the openings on each side of the bezel, and then pulling it toward you until the bezel releases from the ball studs on the chassis frame.
2. Press the orange button on the fan module and pull the fan module straight out of the chassis, making sure that you support it with your free hand.



The fan modules are short. Always support the bottom of the fan module with your free hand so that it does not suddenly drop free from the chassis and injure you.



1

Orange release button

3. Set the fan module aside.
4. Repeat the preceding steps for any remaining fan modules.

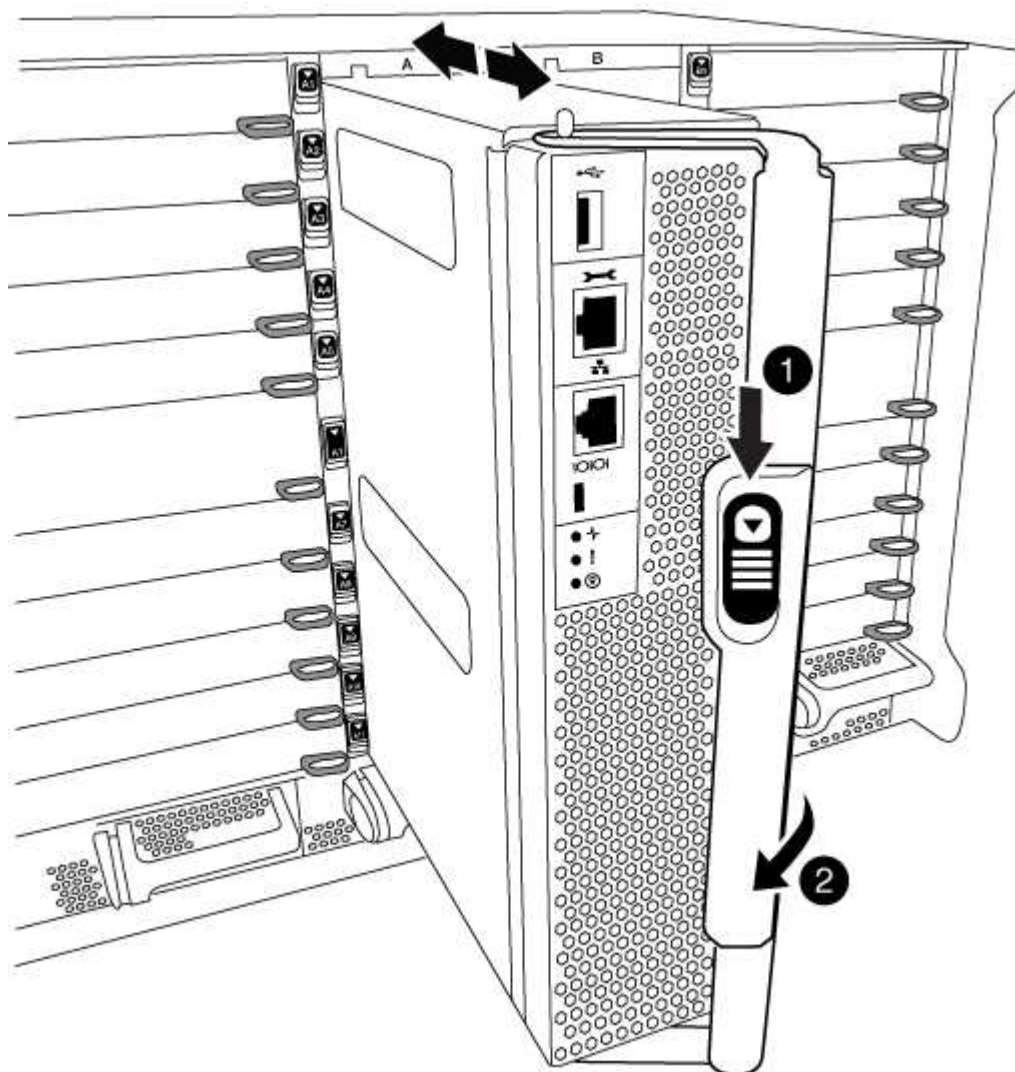
Step 3: Remove the controller module

To replace the chassis, you must remove the controller module or modules from the old chassis.

Steps

1. Unplug the cables from the impaired controller module, and keep track of where the cables were connected.

2. Slide the orange button on the cam handle downward until it unlocks.



1	Cam handle release button
2	Cam handle

3. Rotate the cam handle so that it completely disengages the controller module from the chassis, and then slide the controller module out of the chassis.

Make sure that you support the bottom of the controller module as you slide it out of the chassis.

4. Set the controller module aside in a safe place, and repeat these steps if you have another controller module in the chassis.

Step 4: Remove the I/O modules

Steps

To remove I/O modules from the old chassis, including the NVRAM modules, follow the specific sequence of

steps. You do not have to remove the FlashCache module from the NVRAM module when moving it to a new chassis.

- 1. Unplug any cabling associated with the target I/O module.

Make sure that you label the cables so that you know where they came from.

- 2. Remove the target I/O module from the chassis:
 - a. Depress the lettered and numbered cam button.

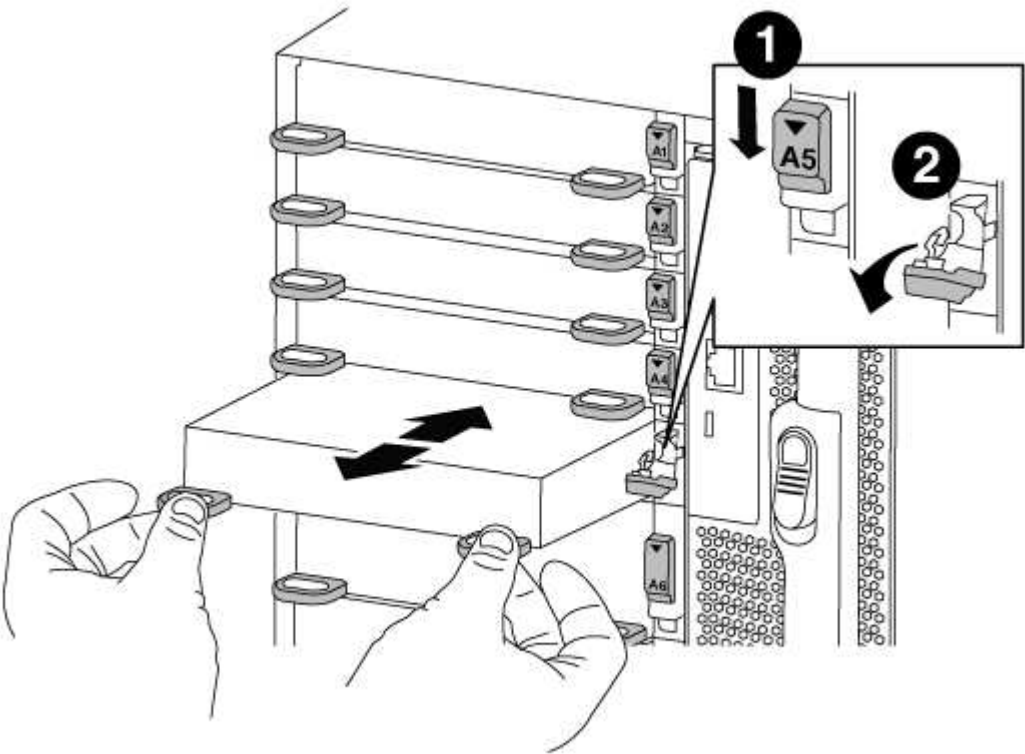
The cam button moves away from the chassis.

- b. Rotate the cam latch down until it is in a horizontal position.

The I/O module disengages from the chassis and moves about 1/2 inch out of the I/O slot.

- c. Remove the I/O module from the chassis by pulling on the pull tabs on the sides of the module face.

Make sure that you keep track of which slot the I/O module was in.



1	Lettered and numbered I/O cam latch
2	I/O cam latch completely unlocked

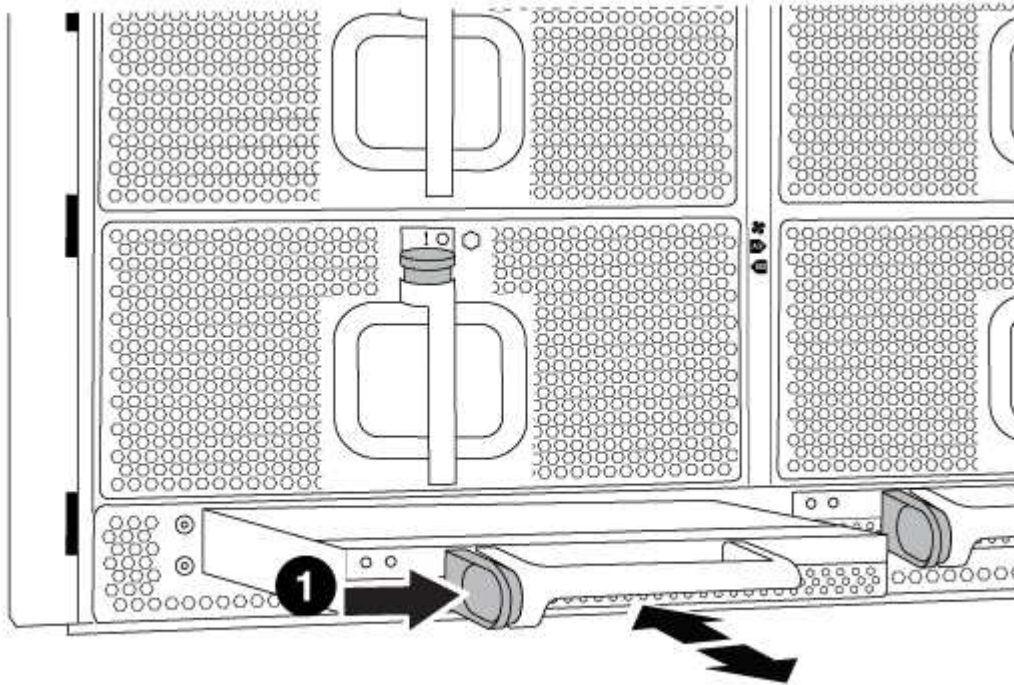
- 3. Set the I/O module aside.
- 4. Repeat the preceding step for the remaining I/O modules in the old chassis.

Step 5: Remove the De-stage Controller Power Module

Steps

You must remove the de-stage controller power modules from the old chassis in preparation for installing the replacement chassis.

1. Press the orange locking button on the module handle, and then slide the DCPM module out of the chassis.



1

DCPM module orange locking button

2. Set the DCPM module aside in a safe place and repeat this step for the remaining DCPM module.

Step 6: Replace a chassis from within the equipment rack or system cabinet

Steps

You must remove the existing chassis from the equipment rack or system cabinet before you can install the replacement chassis.

1. Remove the screws from the chassis mount points.



If the system is in a system cabinet, you might need to remove the rear tie-down bracket.

2. With the help of two or three people, slide the old chassis off the rack rails in a system cabinet or L brackets in an equipment rack, and then set it aside.
3. If you are not already grounded, properly ground yourself.
4. Using two or three people, install the replacement chassis into the equipment rack or system cabinet by guiding the chassis onto the rack rails in a system cabinet or L brackets in an equipment rack.

5. Slide the chassis all the way into the equipment rack or system cabinet.
6. Secure the front of the chassis to the equipment rack or system cabinet, using the screws you removed from the old chassis.
7. Secure the rear of the chassis to the equipment rack or system cabinet.
8. If you are using the cable management brackets, remove them from the old chassis, and then install them on the replacement chassis.
9. If you have not already done so, install the bezel.

Step 7: Move the USB LED module to the new chassis

Steps

Once the new chassis is installed into the rack or cabinet, you must move the USB LED module from the old chassis to the new chassis.

1. Locate the USB LED module on the front of the old chassis, directly under the power supply bays.
2. Press the black locking button on the right side of the module to release the module from the chassis, and then slide it out of the old chassis.
3. Align the edges of the module with the USB LED bay at the bottom-front of the replacement chassis, and gently push the module all the way into the chassis until it clicks into place.

Step 8: Install the de-stage controller power module when replacing the chassis

Steps

Once the replacement chassis is installed into the rack or system cabinet, you must reinstall the de-stage controller power modules into it.

1. Align the end of the DCPM module with the chassis opening, and then gently slide it into the chassis until it clicks into place.



The module and slot are keyed. Do not force the module into the opening. If the module does not go in easily, realign the module and slide it into the chassis.

2. Repeat this step for the remaining DCPM module.

Step 9: Install fans into the chassis

Steps

To install the fan modules when replacing the chassis, you must perform a specific sequence of tasks.

1. Align the edges of the replacement fan module with the opening in the chassis, and then slide it into the chassis until it snaps into place.

When inserted into a live system, the amber Attention LED flashes four times when the fan module is successfully inserted into the chassis.

2. Repeat these steps for the remaining fan modules.
3. Align the bezel with the ball studs, and then gently push the bezel onto the ball studs.

Step 10: Install I/O modules

Steps

To install I/O modules, including the NVRAM/FlashCache modules from the old chassis, follow the specific sequence of steps.

You must have the chassis installed so that you can install the I/O modules into the corresponding slots in the new chassis.

1. After the replacement chassis is installed in the rack or cabinet, install the I/O modules into their corresponding slots in the replacement chassis by gently sliding the I/O module into the slot until the lettered and numbered I/O cam latch begins to engage, and then push the I/O cam latch all the way up to lock the module in place.
2. Recable the I/O module, as needed.
3. Repeat the preceding step for the remaining I/O modules that you set aside.



If the old chassis has blank I/O panels, move them to the replacement chassis at this time.

Step 11: Install the power supplies

Steps

Installing the power supplies when replacing a chassis involves installing the power supplies into the replacement chassis, and connecting to the power source.

1. Using both hands, support and align the edges of the power supply with the opening in the system chassis, and then gently push the power supply into the chassis until it locks into place.

The power supplies are keyed and can only be installed one way.



Do not use excessive force when sliding the power supply into the system. You can damage the connector.

2. Reconnect the power cable and secure it to the power supply using the power cable locking mechanism.



Only connect the power cable to the power supply. Do not connect the power cable to a power source at this time.

3. Repeat the preceding steps for any remaining power supplies.

Step 12: Install the controller

Steps

After you install the controller module and any other components into the new chassis, boot it.

1. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.



Do not completely insert the controller module in the chassis until instructed to do so.

2. Recable the console to the controller module, and then reconnect the management port.

3. Connect the power supplies to different power sources, and then turn them on.
4. With the cam handle in the open position, slide the controller module into the chassis and firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle until it clicks into the locked position.



Do not use excessive force when sliding the controller module into the chassis; you might damage the connectors.

The controller module begins to boot as soon as it is fully seated in the chassis.

5. Repeat the preceding steps to install the second controller into the new chassis.
6. Boot each node to Maintenance mode:
 - a. As each node starts the booting, press `Ctrl-C` to interrupt the boot process when you see the message `Press Ctrl-C for Boot Menu`.



If you miss the prompt and the controller modules boot to ONTAP, enter `halt`, and then at the `LOADER` prompt enter `boot_ontap`, press `Ctrl-C` when prompted, and then repeat this step.

- b. From the boot menu, select the option for Maintenance mode.

Complete the restoration and replacement process - FAS9000

You must verify the HA state of the chassis and return the failed part to NetApp, as described in the RMA instructions shipped with the kit.

Step 1: Verify and set the HA state of the chassis

You must verify the HA state of the chassis, and, if necessary, update the state to match your system configuration.

Steps

1. In Maintenance mode, from either controller module, display the HA state of the local controller module and chassis: `ha-config show`

The HA state should be the same for all components.

2. If the displayed system state for the chassis does not match your system configuration:
 - a. Set the HA state for the chassis: `ha-config modify chassis HA-state`

The value for `HA-state` can be one of the following:

- `ha`
- `mcc`
- `mcc-2n`
- `mccip`
- `non-ha`

- b. Confirm that the setting has changed: `ha-config show`
3. If you have not already done so, recable the rest of your system.
4. Exit Maintenance mode: `halt`

The LOADER prompt appears.

Step 2: Switch back aggregates in a two-node MetroCluster configuration

After you have completed the FRU replacement in a two-node MetroCluster configuration, you can perform the MetroCluster switchback operation. This returns the configuration to its normal operating state, with the sync-source storage virtual machines (SVMs) on the formerly impaired site now active and serving data from the local disk pools.

This task only applies to two-node MetroCluster configurations.

Steps

1. Verify that all nodes are in the enabled state: `metrocluster node show`

```
cluster_B::> metrocluster node show
```

DR	Configuration	DR
Group Cluster Node	State	Mirroring Mode
-----	-----	-----
1	cluster_A	
	controller_A_1 configured	enabled heal roots
completed	cluster_B	
	controller_B_1 configured	enabled waiting for
switchback recovery		
2 entries were displayed.		

2. Verify that resynchronization is complete on all SVMs: `metrocluster vserver show`
3. Verify that any automatic LIF migrations being performed by the healing operations were completed successfully: `metrocluster check lif show`
4. Perform the switchback by using the `metrocluster switchback` command from any node in the surviving cluster.
5. Verify that the switchback operation has completed: `metrocluster show`

The switchback operation is still running when a cluster is in the `waiting-for-switchback` state:

```
cluster_B::> metrocluster show
Cluster           Configuration State      Mode
-----
Local: cluster_B configured           switchover
Remote: cluster_A configured          waiting-for-switchback
```

The switchback operation is complete when the clusters are in the normal state.:

```
cluster_B::> metrocluster show
Cluster           Configuration State      Mode
-----
Local: cluster_B configured           normal
Remote: cluster_A configured          normal
```

If a switchback is taking a long time to finish, you can check on the status of in-progress baselines by using the `metrocluster config-replication resync-status show` command.

6. Reestablish any SnapMirror or SnapVault configurations.

Step 3: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

Controller

Overview of controller module replacement - FAS9000

You must review the prerequisites for the replacement procedure and select the correct one for your version of the ONTAP operating system.

- All drive shelves must be working properly.
- If your system is a FlexArray system or has a V_StorageAttach license, you must refer to the additional required steps before performing this procedure.
- If your system is in an HA pair, the healthy node must be able to take over the node that is being replaced (referred to in this procedure as the “impaired node”).
- If your system is in a MetroCluster configuration, you must review the section [Choosing the correct recovery procedure](#) to determine whether you should use this procedure.

If this is the procedure you should use, note that the controller replacement procedure for a node in a four or eight node MetroCluster configuration is the same as that in an HA pair. No MetroCluster-specific steps are required because the failure is restricted to an HA pair and storage failover commands can be used to provide nondisruptive operation during the replacement.

- You must replace the failed component with a replacement FRU component you received from your provider.
- You must be replacing a controller module with a controller module of the same model type. You cannot

upgrade your system by just replacing the controller module.

- You cannot change any drives or drive shelves as part of this procedure.
- In this procedure, the boot device is moved from the impaired node to the *replacement* node so that the *replacement* node will boot up in the same version of ONTAP as the old controller module.
- It is important that you apply the commands in these steps on the correct systems:
 - The *impaired* node is the node that is being replaced.
 - The *replacement* node is the new node that is replacing the impaired node.
 - The *healthy* node is the surviving node.
- You must always capture the node's console output to a text file.

This provides you a record of the procedure so that you can troubleshoot any issues that you might encounter during the replacement process.

Shut down the impaired controller

Shut down or take over the impaired controller using the appropriate procedure for your configuration.

Option 1: Most systems

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced` mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message MAINT=<# of hours>h
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller:

```
storage failover modify -node local -auto-giveback false
```



When you see *Do you want to disable auto-giveback?*, enter *y*.

3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying...	Then...
The LOADER prompt	Go to the next step.
Waiting for giveback...	Press Ctrl-C, and then respond <i>y</i> when prompted.
System prompt or password prompt	<p>Take over or halt the impaired controller from the healthy controller: <code>storage failover takeover -ofnode <i>impaired_node_name</i></code></p> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i>.</p>

Option 2: Controller is in a two-node MetroCluster

To shut down the impaired controller, you must determine the status of the controller and, if necessary,

switch over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- You must leave the power supplies turned on at the end of this procedure to provide power to the healthy controller.

Steps

1. Check the MetroCluster status to determine whether the impaired controller has automatically switched over to the healthy controller: `metrocluster show`
2. Depending on whether an automatic switchover has occurred, proceed according to the following table:

If the impaired controller...	Then...
Has automatically switched over	Proceed to the next step.
Has not automatically switched over	Perform a planned switchover operation from the healthy controller: <code>metrocluster switchover</code>
Has not automatically switched over, you attempted switchover with the <code>metrocluster switchover</code> command, and the switchover was vetoed	Review the veto messages and, if possible, resolve the issue and try again. If you are unable to resolve the issue, contact technical support.

3. Resynchronize the data aggregates by running the `metrocluster heal -phase aggregates` command from the surviving cluster.

```
controller_A_1::> metrocluster heal -phase aggregates
[Job 130] Job succeeded: Heal Aggregates is successful.
```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

4. Verify that the operation has been completed by using the `metrocluster operation show` command.

```
controller_A_1::> metrocluster operation show
Operation: heal-aggregates
State: successful
Start Time: 7/25/2016 18:45:55
End Time: 7/25/2016 18:45:56
Errors: -
```

5. Check the state of the aggregates by using the `storage aggregate show` command.

```

controller_A_1::> storage aggregate show
Aggregate      Size Available Used% State    #Vols  Nodes
RAID Status
-----
...
aggr_b2        227.1GB    227.1GB    0% online      0 mcc1-a2
raid_dp, mirrored, normal...

```

6. Heal the root aggregates by using the `metrocluster heal -phase root-aggregates` command.

```

mcc1A::> metrocluster heal -phase root-aggregates
[Job 137] Job succeeded: Heal Root Aggregates is successful

```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

7. Verify that the heal operation is complete by using the `metrocluster operation show` command on the destination cluster:

```

mcc1A::> metrocluster operation show
Operation: heal-root-aggregates
State: successful
Start Time: 7/29/2016 20:54:41
End Time: 7/29/2016 20:54:42
Errors: -

```

8. On the impaired controller module, disconnect the power supplies.

Replace the controller module hardware - FAS9000

To replace the controller module hardware, you must remove the impaired node, move FRU components to the replacement controller module, install the replacement controller module in the chassis, and then boot the system to Maintenance mode.

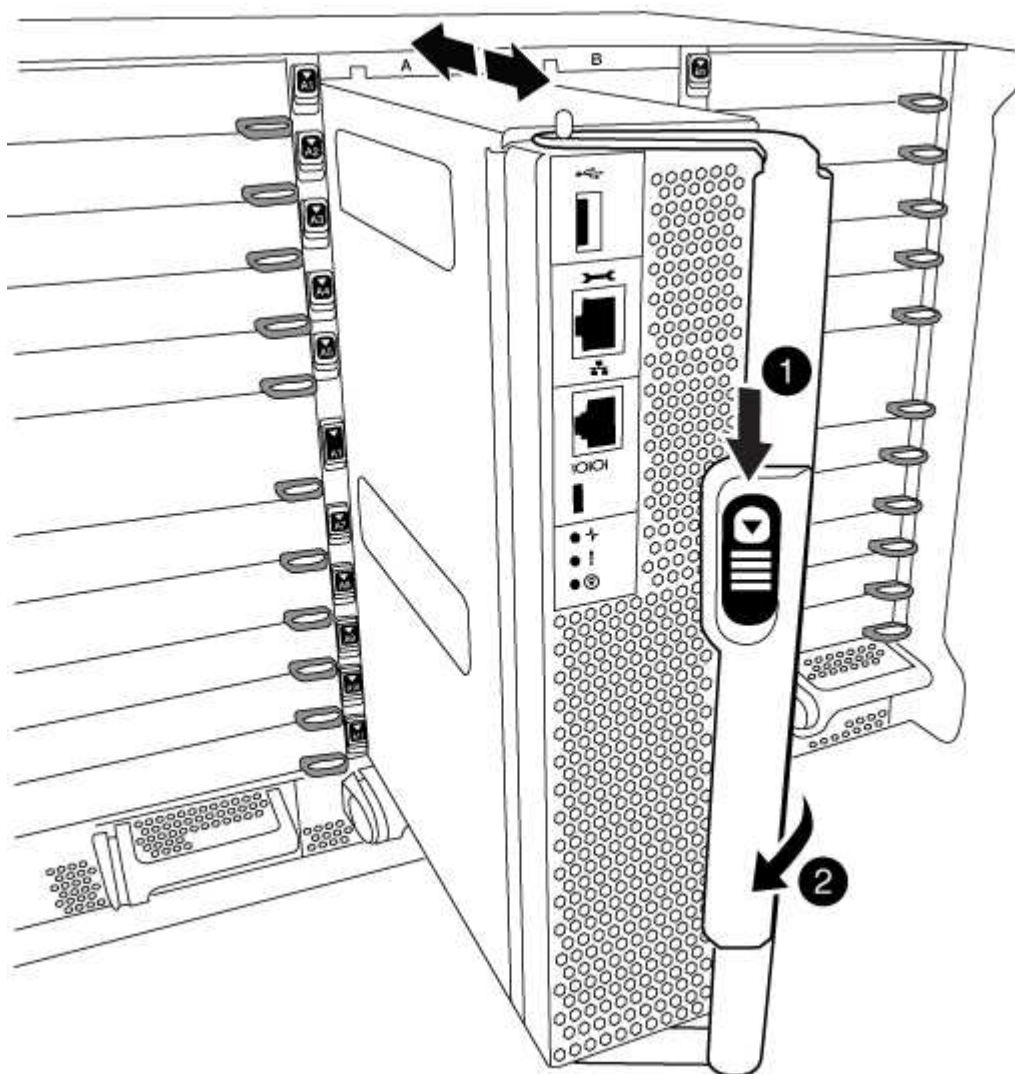
Step 1: Remove the controller module

To access components inside the controller, you must first remove the controller module from the system and then remove the cover on the controller module.

Steps

1. If you are not already grounded, properly ground yourself.

2. Unplug the cables from the impaired controller module, and keep track of where the cables were connected.
3. Slide the orange button on the cam handle downward until it unlocks.

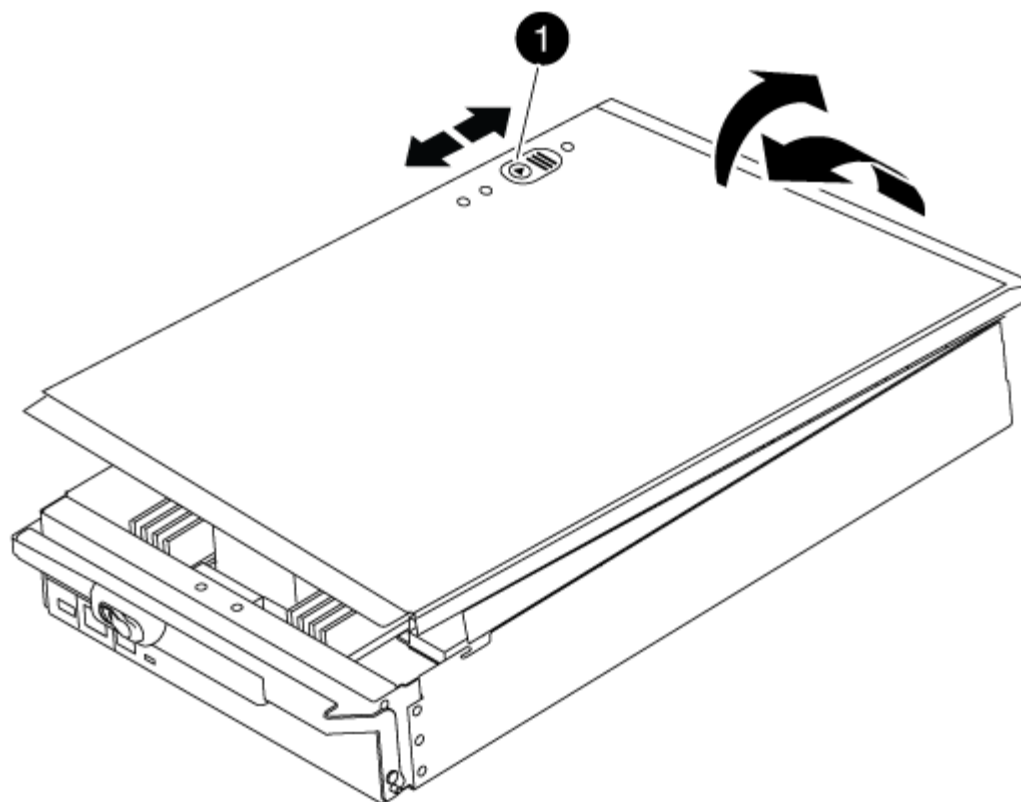


1	Cam handle release button
2	Cam handle

1. Rotate the cam handle so that it completely disengages the controller module from the chassis, and then slide the controller module out of the chassis.

Make sure that you support the bottom of the controller module as you slide it out of the chassis.

2. Place the controller module lid-side up on a stable, flat surface, press the blue button on the cover, slide the cover to the back of the controller module, and then swing the cover up and lift it off of the controller module.



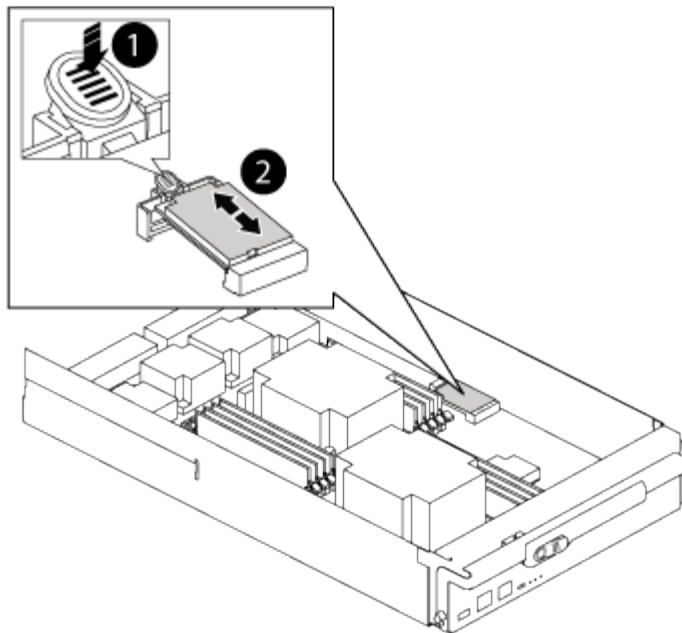
1	Controller module cover locking button
---	--

Step 2: Move the boot media

You must locate the boot media and follow the directions to remove it from the old controller and insert it in the new controller.

Steps

1. Lift the black air duct at the back of the controller module and then locate the boot media using the following illustration or the FRU map on the controller module:



1	Press release tab
2	Boot media

2. Press the blue button on the boot media housing to release the boot media from its housing, and then gently pull it straight out of the boot media socket.



Do not twist or pull the boot media straight up, because this could damage the socket or the boot media.

3. Move the boot media to the new controller module, align the edges of the boot media with the socket housing, and then gently push it into the socket.
4. Check the boot media to make sure that it is seated squarely and completely in the socket.

If necessary, remove the boot media and reseal it into the socket.

5. Push the boot media down to engage the locking button on the boot media housing.


Step 3: Move the system DIMMs

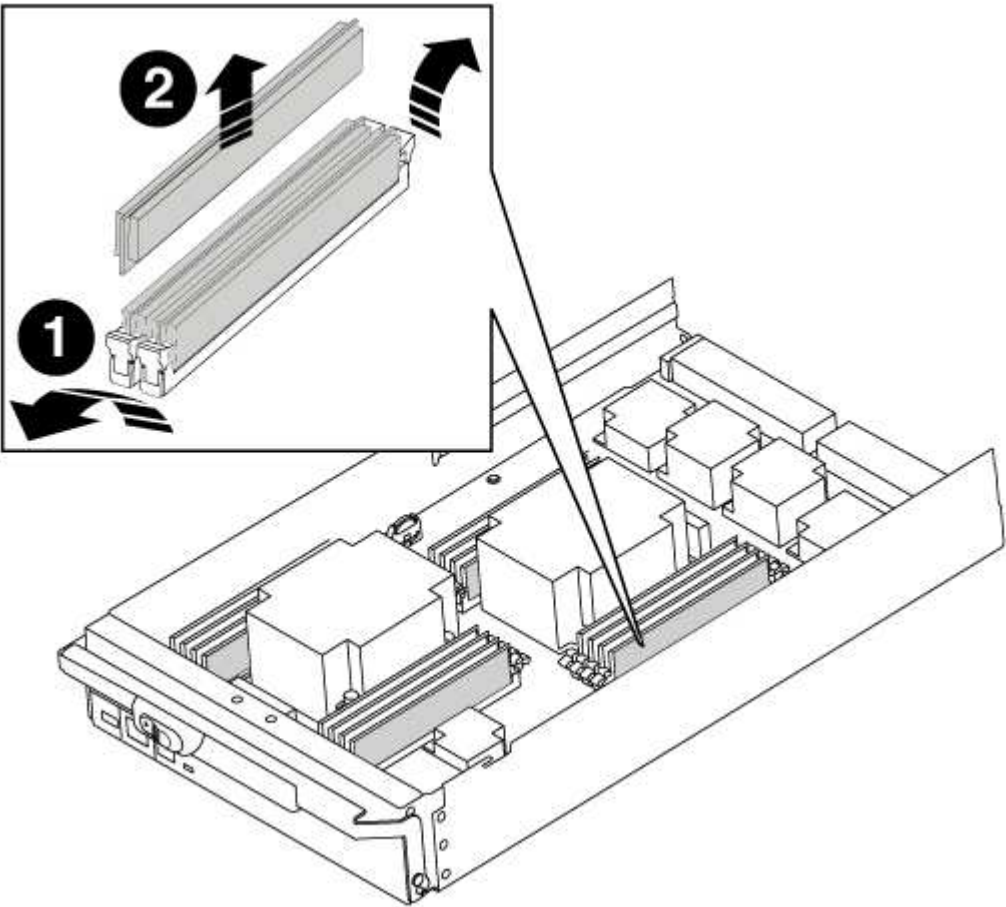
To move the DIMMs, locate and move them from the old controller into the replacement controller and follow the specific sequence of steps.



Steps

1. If you are not already grounded, properly ground yourself.
2. Locate the DIMMs on your controller module.
3. Note the orientation of the DIMM in the socket so that you can insert the DIMM in the replacement controller module in the proper orientation.
4. Eject the DIMM from its slot by slowly pushing apart the two DIMM ejector tabs on either side of the DIMM,

and then slide the DIMM out of the slot.


- 
- Carefully hold the DIMM by the edges to avoid pressure on the components on the DIMM circuit board.



	DIMM ejector tabs
	DIMM


5. Locate the slot where you are installing the DIMM.
6. Make sure that the DIMM ejector tabs on the connector are in the open position, and then insert the DIMM squarely into the slot.

The DIMM fits tightly in the slot, but should go in easily. If not, realign the DIMM with the slot and reinsert it.

- 
- Visually inspect the DIMM to verify that it is evenly aligned and fully inserted into the slot.

7. Insert the DIMM squarely into the slot.

The DIMM fits tightly in the slot, but should go in easily. If not, realign the DIMM with the slot and reinsert it.

- 
- Visually inspect the DIMM to verify that it is evenly aligned and fully inserted into the slot.

8. Push carefully, but firmly, on the top edge of the DIMM until the ejector tabs snap into place over the notches at the ends of the DIMM.
9. Repeat these steps for the remaining DIMMs.

Step 4: Install the controller

After you install the components into the controller module, you must install the controller module back into the system chassis and boot the operating system.

For HA pairs with two controller modules in the same chassis, the sequence in which you install the controller module is especially important because it attempts to reboot as soon as you completely seat it in the chassis.



The system might update system firmware when it boots. Do not abort this process. The procedure requires you to interrupt the boot process, which you can typically do at any time after prompted to do so. However, if the system updates the system firmware when it boots, you must wait until after the update is complete before interrupting the boot process.

Steps

1. If you are not already grounded, properly ground yourself.
2. If you have not already done so, replace the cover on the controller module.
3. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.



Do not completely insert the controller module in the chassis until instructed to do so.

4. Cable the management and console ports only, so that you can access the system to perform the tasks in the following sections.



You will connect the rest of the cables to the controller module later in this procedure.

5. Complete the reinstallation of the controller module:
 - a. If you have not already done so, reinstall the cable management device.
 - b. Firmly push the controller module into the chassis until it meets the midplane and is fully seated.

The locking latches rise when the controller module is fully seated.



Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.

The controller module begins to boot as soon as it is fully seated in the chassis. Be prepared to interrupt the boot process.

- c. Rotate the locking latches upward, tilting them so that they clear the locking pins, and then lower them into the locked position.
- d. Interrupt the boot process by pressing `Ctrl-C` when you see `Press Ctrl-C for Boot Menu`.
- e. Select the option to boot to Maintenance mode from the displayed menu.

After completing the hardware replacement and booting to Maintenance mode, you verify the low-level system configuration of the replacement controller and reconfigure system settings as necessary.

Step 1: Set and verify system time

You should check the time and date on the replacement controller module against the healthy controller module in an HA pair, or against a reliable time server in a stand-alone configuration. If the time and date do not match, you must reset them on the replacement controller module to prevent possible outages on clients due to time differences.

About this task

It is important that you apply the commands in the steps on the correct systems:

- The *replacement* node is the new node that replaced the impaired node as part of this procedure.
- The *healthy* node is the HA partner of the *replacement* node.

Steps

1. If the *replacement* node is not at the LOADER prompt, halt the system to the LOADER prompt.
2. On the *healthy* node, check the system time: `cluster date show`

The date and time are based on the configured timezone.

3. At the LOADER prompt, check the date and time on the *replacement* node: `show date`

The date and time are given in GMT.

4. If necessary, set the date in GMT on the replacement node: `set date mm/dd/yyyy`
5. If necessary, set the time in GMT on the replacement node: `set time hh:mm:ss`
6. At the LOADER prompt, confirm the date and time on the *replacement* node: `show date`

The date and time are given in GMT.

Step 2: Verify and set the controller's HA state

You must verify the HA state of the controller module and, if necessary, update the state to match your system configuration.

Steps

1. In Maintenance mode from the new controller module, verify that all components display the same HA state: `ha-config show`

The value for HA-state can be one of the following:

- `ha`
- `mcc`
- `mcc-2n`

- `mccip`
- `non-ha`
 - a. Confirm that the setting has changed: `ha-config show`

Recable the system and reassign disks - FAS9000

Continue the replacement procedure by recabling the storage and confirming disk reassignment.

Step 1: Recable the system

Recable the controller module's storage and network connections.

Steps

1. Recable the the controller module to storage and network connections.
2. Verify that the cabling is correct by using [Active IQ Config Advisor](#).
 - a. Download and install Config Advisor.
 - b. Enter the information for the target system, and then click Collect Data.
 - c. Click the Cabling tab, and then examine the output. Make sure that all disk shelves are displayed and all disks appear in the output, correcting any cabling issues you find.
 - d. Check other cabling by clicking the appropriate tab, and then examining the output from Config Advisor.

Step 2: Reassign disks

If the storage system is in an HA pair, the system ID of the new controller module is automatically assigned to the disks when the giveback occurs at the end of the procedure. You must confirm the system ID change when you boot the *replacement* node and then verify that the change was implemented.

This procedure applies only to systems running ONTAP in an HA pair.

1. If the *replacement* node is in Maintenance mode (showing the `*>` prompt, exit Maintenance mode and go to the LOADER prompt: `halt`
2. From the LOADER prompt on the *replacement* node, boot the node, entering `y` if you are prompted to override the system ID due to a system ID mismatch. `boot_ontap`
3. Wait until the `Waiting for giveback...` message is displayed on the *replacement* node console and then, from the healthy node, verify that the new partner system ID has been automatically assigned: `storage failover show`

In the command output, you should see a message that the system ID has changed on the impaired node, showing the correct old and new IDs. In the following example, node2 has undergone replacement and has a new system ID of 151759706.

```
node1> `storage failover show`
```

Node	Partner	Takeover Possible	State Description
-----	-----	-----	

node1	node2	false	System ID changed on partner (Old:
			151759706), In takeover
			151759755, New:
node2	node1	-	Waiting for giveback
(HA mailboxes)			

4. From the healthy node, verify that any coredumps are saved:

- a. Change to the advanced privilege level: `set -privilege advanced`

You can respond `y` when prompted to continue into advanced mode. The advanced mode prompt appears (`*>`).

- b. Save any coredumps: `system node run -node local-node-name partner savecore`

- c. Wait for the `savecore` command to complete before issuing the giveback.

You can enter the following command to monitor the progress of the `savecore` command: `system node run -node local-node-name partner savecore -s`

- d. Return to the admin privilege level: `set -privilege admin`

5. If your storage system has Storage or Volume Encryption configured, you must restore Storage or Volume Encryption functionality by using one of the following procedures, depending on whether you are using onboard or external key management:

- [Restore onboard key management encryption keys](#)
- [Restore external key management encryption keys](#)

6. Give back the node:

- a. From the healthy node, give back the replaced node's storage: `storage failover giveback -ofnode replacement_node_name`

The *replacement* node takes back its storage and completes booting.

If you are prompted to override the system ID due to a system ID mismatch, you should enter `y`.



If the giveback is vetoed, you can consider overriding the vetoes.

[Find the High-Availability Configuration Guide for your version of ONTAP 9](#)

- b. After the giveback has been completed, confirm that the HA pair is healthy and that takeover is possible: `storage failover show`

The output from the `storage failover show` command should not include the System ID changed

on partner message.

7. Verify that the disks were assigned correctly: `storage disk show -ownership`

The disks belonging to the *replacement* node should show the new system ID. In the following example, the disks owned by node1 now show the new system ID, 1873775277:

```
node1> `storage disk show -ownership`

Disk   Aggregate Home   Owner   DR Home   Home ID   Owner ID   DR Home ID
Reserver Pool
-----
-----
-----
1.0.0   aggr0_1   node1   node1   -         1873775277 1873775277 -
1873775277 Pool0
1.0.1   aggr0_1   node1   node1         1873775277 1873775277 -
1873775277 Pool0
.
.
.
```

8. If the system is in a MetroCluster configuration, monitor the status of the node: `metrocluster node show`

The MetroCluster configuration takes a few minutes after the replacement to return to a normal state, at which time each node will show a configured state, with DR Mirroring enabled and a mode of normal. The `metrocluster node show -fields node-systemid` command output displays the old system ID until the MetroCluster configuration returns to a normal state.

9. If the node is in a MetroCluster configuration, depending on the MetroCluster state, verify that the DR home ID field shows the original owner of the disk if the original owner is a node on the disaster site.

This is required if both of the following are true:

- The MetroCluster configuration is in a switchover state.
- The *replacement* node is the current owner of the disks on the disaster site.

[Disk ownership changes during HA takeover and MetroCluster switchover in a four-node MetroCluster configuration](#)

10. If your system is in a MetroCluster configuration, verify that each node is configured: `metrocluster node show - fields configuration-state`

```

node1_siteA::> metrocluster node show -fields configuration-state

dr-group-id          cluster node          configuration-state
-----
1 node1_siteA        node1mcc-001         configured
1 node1_siteA        node1mcc-002         configured
1 node1_siteB        node1mcc-003         configured
1 node1_siteB        node1mcc-004         configured

4 entries were displayed.

```

11. Verify that the expected volumes are present for each node: `vol show -node node-name`
12. If you disabled automatic takeover on reboot, enable it from the healthy node: `storage failover modify -node replacement-node-name -onreboot true`

Complete system restoration - FAS9000

To complete the replacement procedure and restore your system to full operation, you must recable the storage, restore the NetApp Storage Encryption configuration (if necessary), and install licenses for the new controller. You must complete a series of tasks before restoring your system to full operation.

Step 1: Install licenses for the replacement node in ONTAP

You must install new licenses for the *replacement* node if the impaired node was using ONTAP features that require a standard (node-locked) license. For features with standard licenses, each node in the cluster should have its own key for the feature.

About this task

Until you install license keys, features requiring standard licenses continue to be available to the *replacement* node. However, if the impaired node was the only node in the cluster with a license for the feature, no configuration changes to the feature are allowed.

Also, using unlicensed features on the node might put you out of compliance with your license agreement, so you should install the replacement license key or keys on the *replacement* node as soon as possible.

The licenses keys must be in the 28-character format.

You have a 90-day grace period in which to install the license keys. After the grace period, all old licenses are invalidated. After a valid license key is installed, you have 24 hours to install all of the keys before the grace period ends.

If the node is in a MetroCluster configuration and all nodes at a site have been replaced, license keys must be installed on the *replacement* node or nodes prior to switchback.

Steps

1. If you need new license keys, obtain replacement license keys on the [NetApp Support site](#) in the My Support section under Software licenses.



The new license keys that you require are automatically generated and sent to the email address on file. If you fail to receive the email with the license keys within 30 days, you should contact technical support.

2. Install each license key: `system license add -license-code license-key, license-key...`
3. Remove the old licenses, if desired:
 - a. Check for unused licenses: `license clean-up -unused -simulate`
 - b. If the list looks correct, remove the unused licenses: `license clean-up -unused`

Step 2: Verifying LIFs and registering the serial number

Before returning the *replacement* node to service, you should verify that the LIFs are on their home ports, and register the serial number of the *replacement* node if AutoSupport is enabled, and reset automatic giveback.

Steps

1. Verify that the logical interfaces are reporting to their home server and ports: `network interface show -is-home false`

If any LIFs are listed as false, revert them to their home ports: `network interface revert -vserver * -lif *`
2. Register the system serial number with NetApp Support.
 - If AutoSupport is enabled, send an AutoSupport message to register the serial number.
 - If AutoSupport is not enabled, call [NetApp Support](#) to register the serial number.
3. If an AutoSupport maintenance window was triggered, end it by using the `system node autosupport invoke -node * -type all -message MAINT=END` command.
4. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`

Step 3: (MetroCluster only): Switching back aggregates in a two-node MetroCluster configuration

After you have completed the FRU replacement in a two-node MetroCluster configuration, you can perform the MetroCluster switchback operation. This returns the configuration to its normal operating state, with the sync-source storage virtual machines (SVMs) on the formerly impaired site now active and serving data from the local disk pools.

This task only applies to two-node MetroCluster configurations.

Steps

1. Verify that all nodes are in the enabled state: `metrocluster node show`

```
cluster_B::> metrocluster node show
```

DR		Configuration	DR
Group	Cluster Node	State	Mirroring Mode
1	cluster_A	controller_A_1 configured	enabled heal roots
completed	cluster_B	controller_B_1 configured	enabled waiting for
		switchback recovery	

2 entries were displayed.

2. Verify that resynchronization is complete on all SVMs: `metrocluster vserver show`
3. Verify that any automatic LIF migrations being performed by the healing operations were completed successfully: `metrocluster check lif show`
4. Perform the switchback by using the `metrocluster switchback` command from any node in the surviving cluster.
5. Verify that the switchback operation has completed: `metrocluster show`

The switchback operation is still running when a cluster is in the **waiting-for-switchback** state:

```
cluster_B::> metrocluster show
```

Cluster	Configuration	State	Mode
Local: cluster_B	configured	switchover	
Remote: cluster_A	configured	waiting-for-switchback	

The switchback operation is complete when the clusters are in the **normal** state.:

```
cluster_B::> metrocluster show
```

Cluster	Configuration	State	Mode
Local: cluster_B	configured	normal	
Remote: cluster_A	configured	normal	

If a switchback is taking a long time to finish, you can check on the status of in-progress baselines by using the `metrocluster config-replication resync-status show` command.

6. Reestablish any SnapMirror or SnapVault configurations.

Step 4: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

Hot-swap a de-stage controller power module (DCPM) - FAS9000

To hot-swap a de-stage controller power module (DCPM), which contains the NVRAM10 battery, you must locate the failed DCPM module, remove it from the chassis, and install the replacement DCPM module.

You must have a replacement DCPM module in-hand before removing the failed module from the chassis and it must be replaced within five minutes of removal. Once the DCPM module is removed from the chassis, there is no shutdown protection for the controller module that owns the DCPM module, other than failover to the other controller module.

Step 1: Replace the DCPM module

To replace the DCPM module in your system, you must remove the failed DCPM module from the system and then replace it with a new DCPM module.

Steps

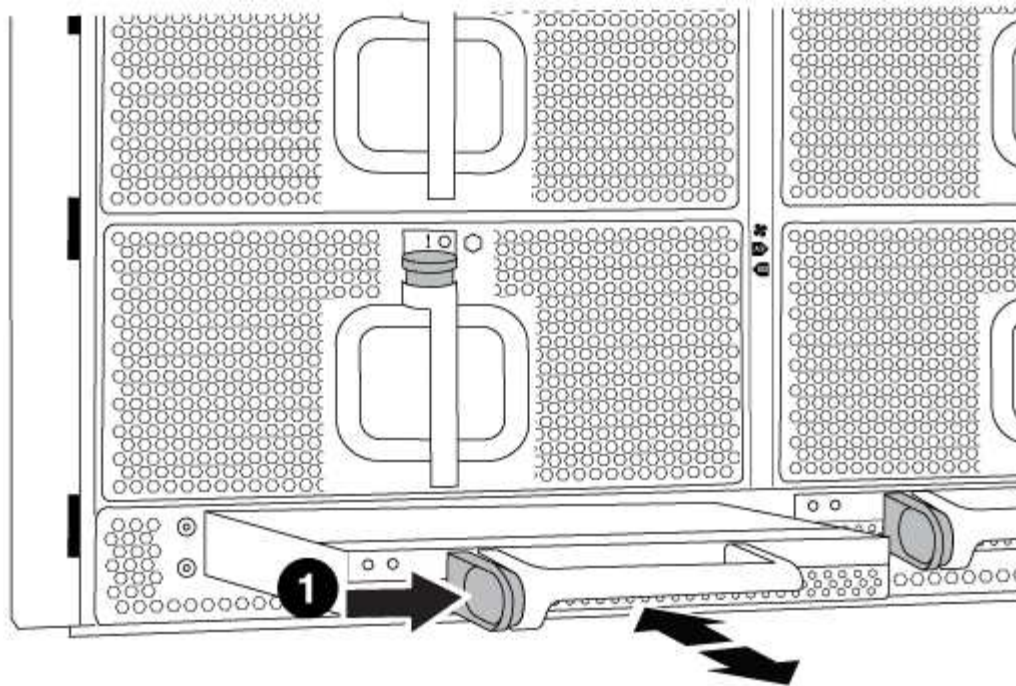
1. If you are not already grounded, properly ground yourself.
2. Remove the bezel on the front of the system and set it aside.
3. Locate the failed DCPM module in the front of the system by looking for the Attention LED on the module.

The LED will be steady amber if the module is faulty.



The DCPM module must be replaced in the chassis within five minutes of removal or the associated controller will shut down.

4. Press the orange locking button on the module handle, and then slide the DCPM module out of the chassis.



1	DCPM module orange locking button
---	-----------------------------------

- Align the end of the DCPM module with the chassis opening, and then gently slide it into the chassis until it clicks into place.



The module and slot are keyed. Do not force the module into the opening. If the module does not go in easily, realign the module and slide it into the chassis.

The DCPM module LED lights when the module is fully seated into the chassis.

Step 2: Dispose of batteries

You must dispose of batteries according to the local regulations regarding battery recycling or disposal. If you cannot properly dispose of batteries, you must return the batteries to NetApp, as described in the RMA instructions that are shipped with the kit.

https://library.netapp.com/ecm/ecm_download_file/ECMP12475945

Step 3: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

Replace a DIMM - FAS9000

You must replace a DIMM in the controller module when your system registers an increasing number of correctable error correction codes (ECC); failure to do so causes a system panic.

All other components in the system must be functioning properly; if not, you must contact technical support.

You must replace the failed component with a replacement FRU component you received from your provider.

Step 1: Shut down the impaired controller

You can shut down or take over the impaired controller using different procedures, depending on the storage system hardware configuration.

Option 1: Most configurations

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced` mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message MAINT=<# of hours>h
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`



When you see *Do you want to disable auto-giveback?*, enter *y*.

3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying...	Then...
The LOADER prompt	Go to the next step.
Waiting for giveback...	Press Ctrl-C, and then respond <i>y</i> when prompted.
System prompt or password prompt	<p>Take over or halt the impaired controller from the healthy controller: <code>storage failover takeover -ofnode <i>impaired_node_name</i></code></p> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i>.</p>

Option 2: Controller is in a two-node MetroCluster

To shut down the impaired controller, you must determine the status of the controller and, if necessary,

switch over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- You must leave the power supplies turned on at the end of this procedure to provide power to the healthy controller.

Steps

1. Check the MetroCluster status to determine whether the impaired controller has automatically switched over to the healthy controller: `metrocluster show`
2. Depending on whether an automatic switchover has occurred, proceed according to the following table:

If the impaired controller...	Then...
Has automatically switched over	Proceed to the next step.
Has not automatically switched over	Perform a planned switchover operation from the healthy controller: <code>metrocluster switchover</code>
Has not automatically switched over, you attempted switchover with the <code>metrocluster switchover</code> command, and the switchover was vetoed	Review the veto messages and, if possible, resolve the issue and try again. If you are unable to resolve the issue, contact technical support.

3. Resynchronize the data aggregates by running the `metrocluster heal -phase aggregates` command from the surviving cluster.

```
controller_A_1::> metrocluster heal -phase aggregates
[Job 130] Job succeeded: Heal Aggregates is successful.
```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

4. Verify that the operation has been completed by using the `metrocluster operation show` command.

```
controller_A_1::> metrocluster operation show
Operation: heal-aggregates
State: successful
Start Time: 7/25/2016 18:45:55
End Time: 7/25/2016 18:45:56
Errors: -
```

5. Check the state of the aggregates by using the `storage aggregate show` command.

```

controller_A_1::> storage aggregate show
Aggregate      Size Available Used% State    #Vols  Nodes
RAID Status
-----
...
aggr_b2      227.1GB   227.1GB    0% online      0 mcc1-a2
raid_dp, mirrored, normal...

```

6. Heal the root aggregates by using the `metrocluster heal -phase root-aggregates` command.

```

mcc1A::> metrocluster heal -phase root-aggregates
[Job 137] Job succeeded: Heal Root Aggregates is successful

```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

7. Verify that the heal operation is complete by using the `metrocluster operation show` command on the destination cluster:

```

mcc1A::> metrocluster operation show
Operation: heal-root-aggregates
State: successful
Start Time: 7/29/2016 20:54:41
End Time: 7/29/2016 20:54:42
Errors: -

```

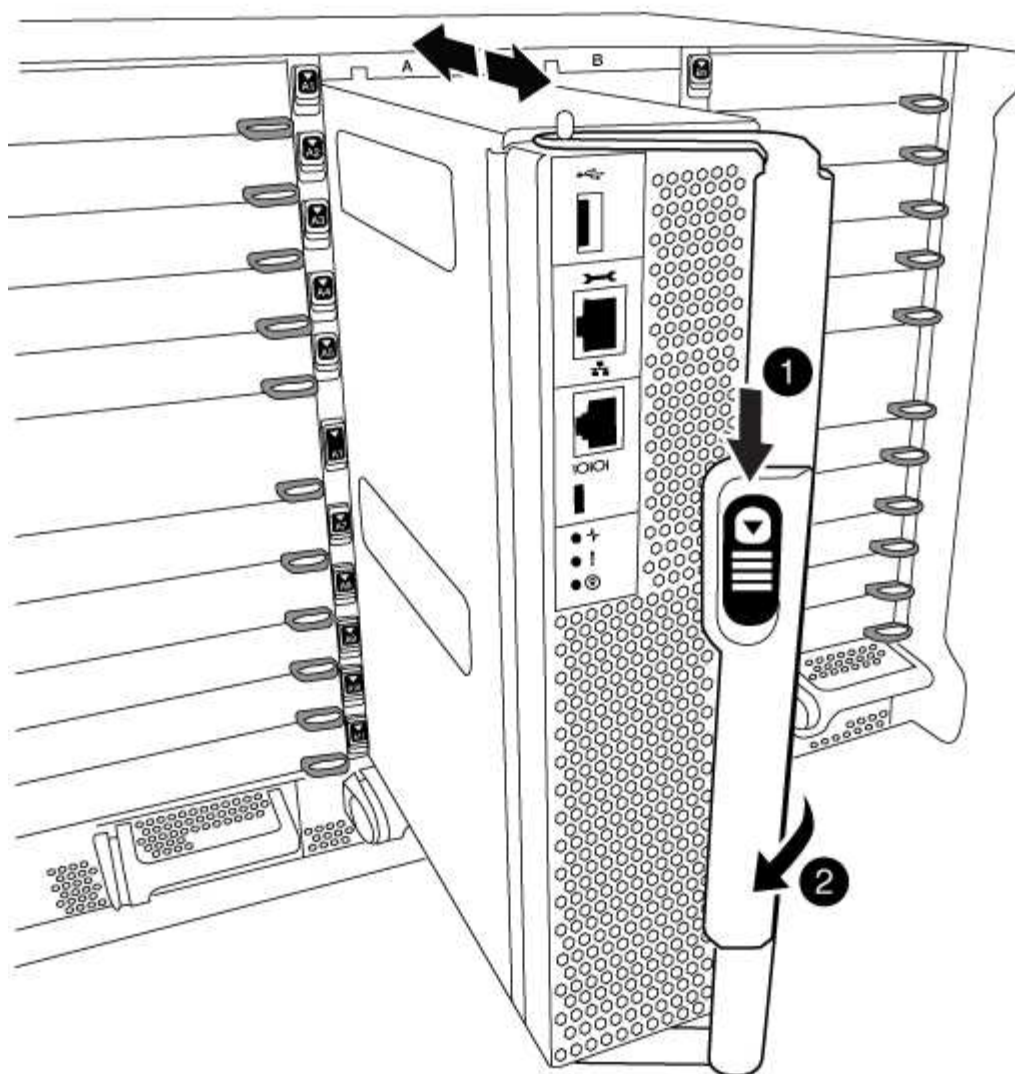
8. On the impaired controller module, disconnect the power supplies.

Step 2: Remove the controller module

To access components inside the controller, you must first remove the controller module from the system and then remove the cover on the controller module.

Steps

1. If you are not already grounded, properly ground yourself.
2. Unplug the cables from the impaired controller module, and keep track of where the cables were connected.
3. Slide the orange button on the cam handle downward until it unlocks.

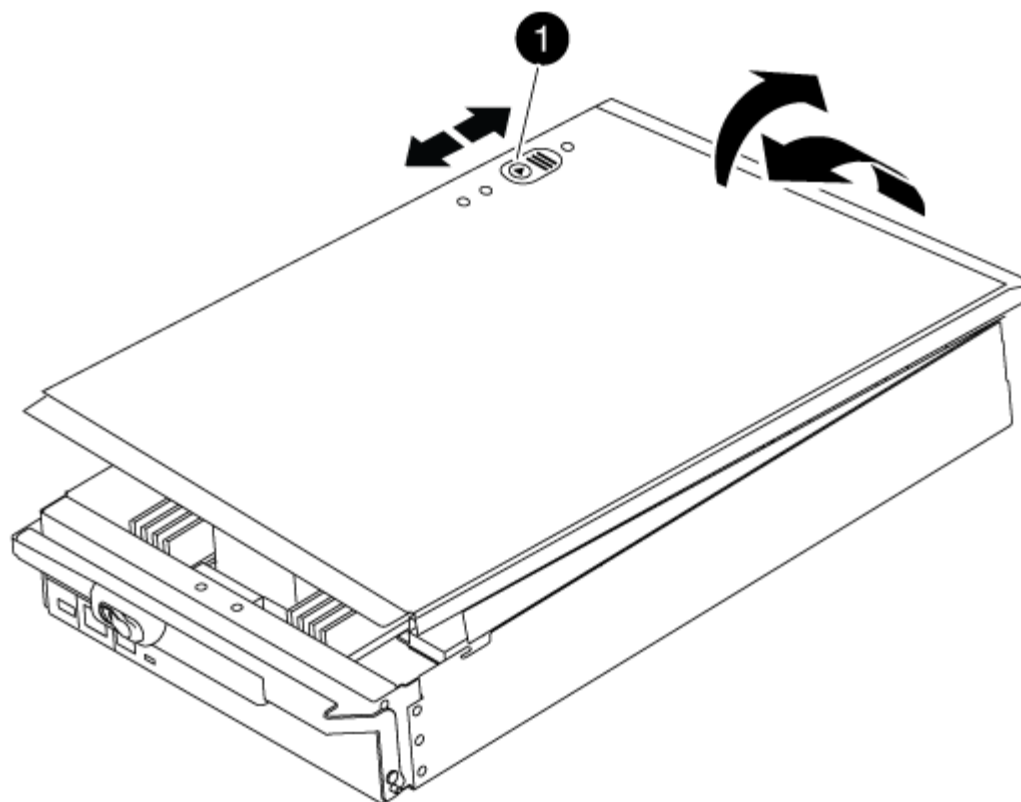


1	Cam handle release button
2	Cam handle

4. Rotate the cam handle so that it completely disengages the controller module from the chassis, and then slide the controller module out of the chassis.

Make sure that you support the bottom of the controller module as you slide it out of the chassis.

5. Place the controller module lid-side up on a stable, flat surface, press the blue button on the cover, slide the cover to the back of the controller module, and then swing the cover up and lift it off of the controller module.



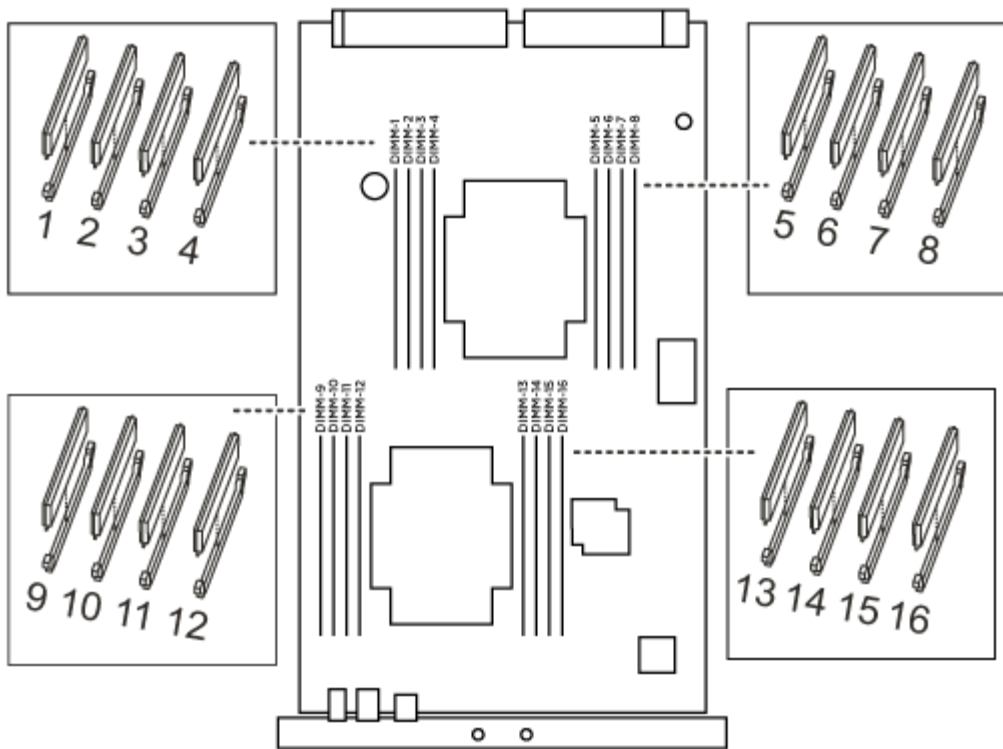
1	Controller module cover locking button
----------	--

Step 3: Replace the DIMMs

To replace the DIMMs, locate them inside the controller and follow the specific sequence of steps.

Steps

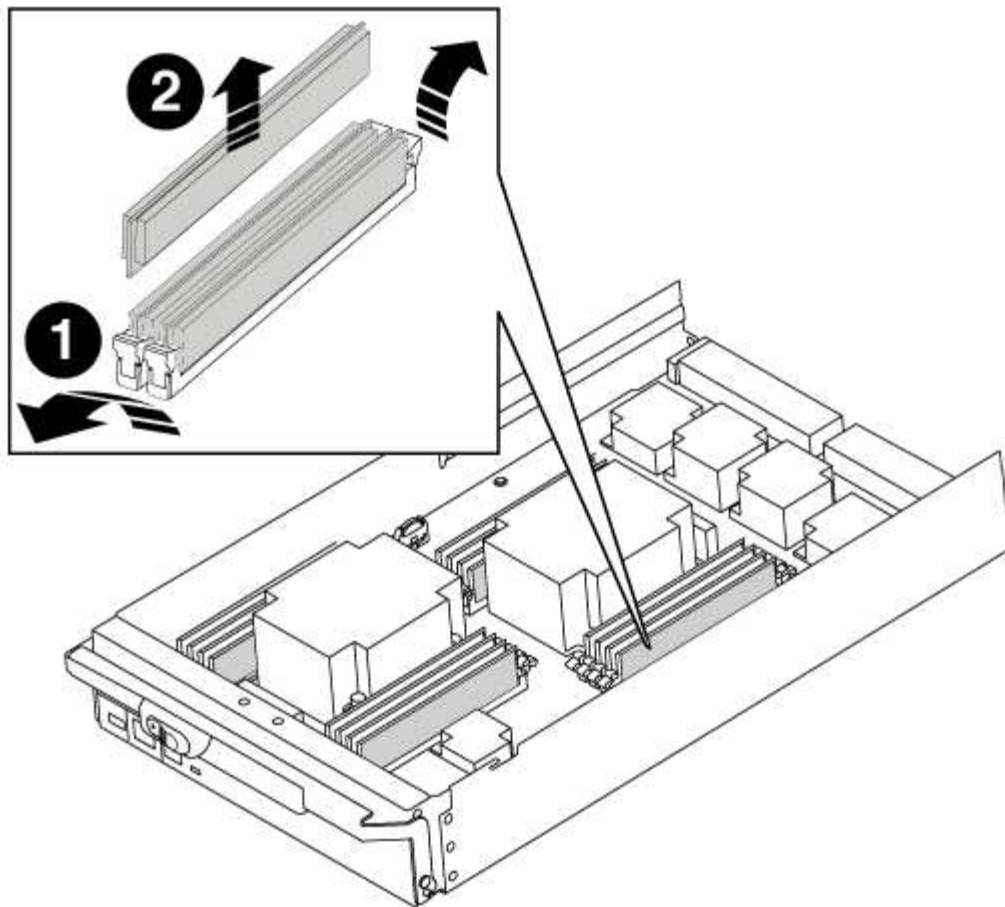
1. If you are not already grounded, properly ground yourself.
2. Locate the DIMMs on your controller module.



1. Eject the DIMM from its slot by slowly pushing apart the two DIMM ejector tabs on either side of the DIMM, and then slide the DIMM out of the slot.



Carefully hold the DIMM by the edges to avoid pressure on the components on the DIMM circuit board.



1	DIMM ejector tabs
2	DIMM

2. Remove the replacement DIMM from the antistatic shipping bag, hold the DIMM by the corners, and align it to the slot.

The notch among the pins on the DIMM should line up with the tab in the socket.

3. Make sure that the DIMM ejector tabs on the connector are in the open position, and then insert the DIMM squarely into the slot.

The DIMM fits tightly in the slot, but should go in easily. If not, realign the DIMM with the slot and reinsert it.



Visually inspect the DIMM to verify that it is evenly aligned and fully inserted into the slot.

4. Push carefully, but firmly, on the top edge of the DIMM until the ejector tabs snap into place over the notches at the ends of the DIMM.
5. Close the controller module cover.

Step 4: Install the controller

After you install the components into the controller module, you must install the controller module back into the system chassis and boot the operating system.

For HA pairs with two controller modules in the same chassis, the sequence in which you install the controller module is especially important because it attempts to reboot as soon as you completely seat it in the chassis.

Steps

1. If you are not already grounded, properly ground yourself.
2. If you have not already done so, replace the cover on the controller module.
3. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.



Do not completely insert the controller module in the chassis until instructed to do so.

4. Cable the management and console ports only, so that you can access the system to perform the tasks in the following sections.



You will connect the rest of the cables to the controller module later in this procedure.

5. Complete the reinstallation of the controller module:
 - a. If you have not already done so, reinstall the cable management device.
 - b. Firmly push the controller module into the chassis until it meets the midplane and is fully seated.

The locking latches rise when the controller module is fully seated.



Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.

The controller module begins to boot as soon as it is fully seated in the chassis.

- c. Rotate the locking latches upward, tilting them so that they clear the locking pins, and then lower them into the locked position.

Step 5: Switch back aggregates in a two-node MetroCluster configuration

After you have completed the FRU replacement in a two-node MetroCluster configuration, you can perform the MetroCluster switchback operation. This returns the configuration to its normal operating state, with the sync-source storage virtual machines (SVMs) on the formerly impaired site now active and serving data from the local disk pools.

This task only applies to two-node MetroCluster configurations.

Steps

1. Verify that all nodes are in the `enabled` state: `metrocluster node show`

```
cluster_B::> metrocluster node show
```

DR		Configuration	DR
Group	Cluster Node	State	Mirroring Mode
-----	-----	-----	-----
1	cluster_A		
	controller_A_1	configured	enabled
completed	cluster_B		
	controller_B_1	configured	enabled
	switchback recovery		waiting for
2 entries were displayed.			

2. Verify that resynchronization is complete on all SVMs: `metrocluster vserver show`
3. Verify that any automatic LIF migrations being performed by the healing operations were completed successfully: `metrocluster check lif show`
4. Perform the switchback by using the `metrocluster switchback` command from any node in the surviving cluster.
5. Verify that the switchback operation has completed: `metrocluster show`

The switchback operation is still running when a cluster is in the **waiting-for-switchback** state:

```
cluster_B::> metrocluster show
```

Cluster	Configuration	State	Mode
-----	-----	-----	-----
Local: cluster_B	configured	switchover	
Remote: cluster_A	configured	waiting-for-switchback	

The switchback operation is complete when the clusters are in the **normal** state.:

```
cluster_B::> metrocluster show
```

Cluster	Configuration	State	Mode
-----	-----	-----	-----
Local: cluster_B	configured	normal	
Remote: cluster_A	configured	normal	

If a switchback is taking a long time to finish, you can check on the status of in-progress baselines by using the `metrocluster config-replication resync-status show` command.

6. Reestablish any SnapMirror or SnapVault configurations.

Step 6: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

Swap out a fan - FAS9000

To swap out a fan module without interrupting service, you must perform a specific sequence of tasks.



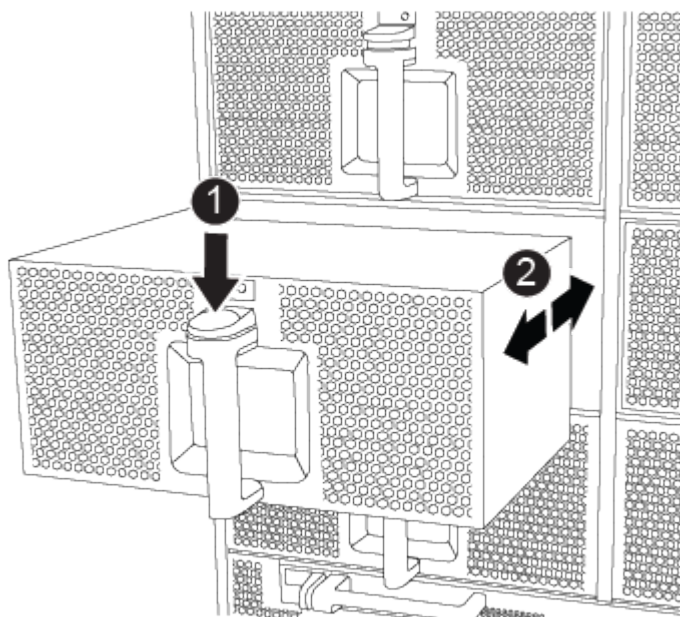
You must replace the fan module within two minutes of removing it from the chassis. System airflow is disrupted and the controller module or modules shut down after two minutes to avoid overheating.

Steps

1. If you are not already grounded, properly ground yourself.
2. Remove the bezel (if necessary) with two hands, by grasping the openings on each side of the bezel, and then pulling it toward you until the bezel releases from the ball studs on the chassis frame.
3. Identify the fan module that you must replace by checking the console error messages and looking at the Attention LED on each fan module.
4. Press the orange button on the fan module and pull the fan module straight out of the chassis, making sure that you support it with your free hand.



The fan modules are short. Always support the bottom of the fan module with your free hand so that it does not suddenly drop free from the chassis and injure you.



1

Orange release button

5. Set the fan module aside.
6. Align the edges of the replacement fan module with the opening in the chassis, and then slide it into the

chassis until it snaps into place.

When inserted into a live system, the amber Attention LED flashes four times when the fan module is successfully inserted into the chassis.

7. Align the bezel with the ball studs, and then gently push the bezel onto the ball studs.
8. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

Replace an I/O module - FAS9000

To replace an I/O module, you must perform a specific sequence of tasks.

- You can use this procedure with all versions of ONTAP supported by your system
- All other components in the system must be functioning properly; if not, you must contact technical support.

Step 1: Shut down the impaired controller

You can shut down or take over the impaired controller using different procedures, depending on the storage system hardware configuration.

Option 1: Most configurations

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced` mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message MAINT=<# of hours>h
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller:

```
storage failover modify -node local -auto-giveback false
```



When you see *Do you want to disable auto-giveback?*, enter *y*.

3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying...	Then...
The LOADER prompt	Go to the next step.
Waiting for giveback...	Press Ctrl-C, and then respond <i>y</i> when prompted.
System prompt or password prompt	<p>Take over or halt the impaired controller from the healthy controller: <code>storage failover takeover -ofnode <i>impaired_node_name</i></code></p> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i>.</p>

Option 2: Controller is in a two-node MetroCluster

To shut down the impaired controller, you must determine the status of the controller and, if necessary,

switch over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- You must leave the power supplies turned on at the end of this procedure to provide power to the healthy controller.

Steps

1. Check the MetroCluster status to determine whether the impaired controller has automatically switched over to the healthy controller: `metrocluster show`
2. Depending on whether an automatic switchover has occurred, proceed according to the following table:

If the impaired controller...	Then...
Has automatically switched over	Proceed to the next step.
Has not automatically switched over	Perform a planned switchover operation from the healthy controller: <code>metrocluster switchover</code>
Has not automatically switched over, you attempted switchover with the <code>metrocluster switchover</code> command, and the switchover was vetoed	Review the veto messages and, if possible, resolve the issue and try again. If you are unable to resolve the issue, contact technical support.

3. Resynchronize the data aggregates by running the `metrocluster heal -phase aggregates` command from the surviving cluster.

```
controller_A_1::> metrocluster heal -phase aggregates
[Job 130] Job succeeded: Heal Aggregates is successful.
```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

4. Verify that the operation has been completed by using the `metrocluster operation show` command.

```
controller_A_1::> metrocluster operation show
Operation: heal-aggregates
State: successful
Start Time: 7/25/2016 18:45:55
End Time: 7/25/2016 18:45:56
Errors: -
```

5. Check the state of the aggregates by using the `storage aggregate show` command.


```

controller_A_1::> storage aggregate show
Aggregate      Size Available Used% State    #Vols  Nodes
RAID Status
-----
...
aggr_b2      227.1GB   227.1GB    0% online      0 mcc1-a2
raid_dp, mirrored, normal...

```

6. Heal the root aggregates by using the `metrocluster heal -phase root-aggregates` command.

```

mcc1A::> metrocluster heal -phase root-aggregates
[Job 137] Job succeeded: Heal Root Aggregates is successful

```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

7. Verify that the heal operation is complete by using the `metrocluster operation show` command on the destination cluster:

```

mcc1A::> metrocluster operation show
Operation: heal-root-aggregates
State: successful
Start Time: 7/29/2016 20:54:41
End Time: 7/29/2016 20:54:42
Errors: -

```

8. On the impaired controller module, disconnect the power supplies.

Step 2: Replace I/O modules

To replace an I/O module, locate it within the chassis and follow the specific sequence of steps.

Steps

1. If you are not already grounded, properly ground yourself.
2. Unplug any cabling associated with the target I/O module.

Make sure that you label the cables so that you know where they came from.

3. Remove the target I/O module from the chassis:
 - a. Depress the lettered and numbered cam button.

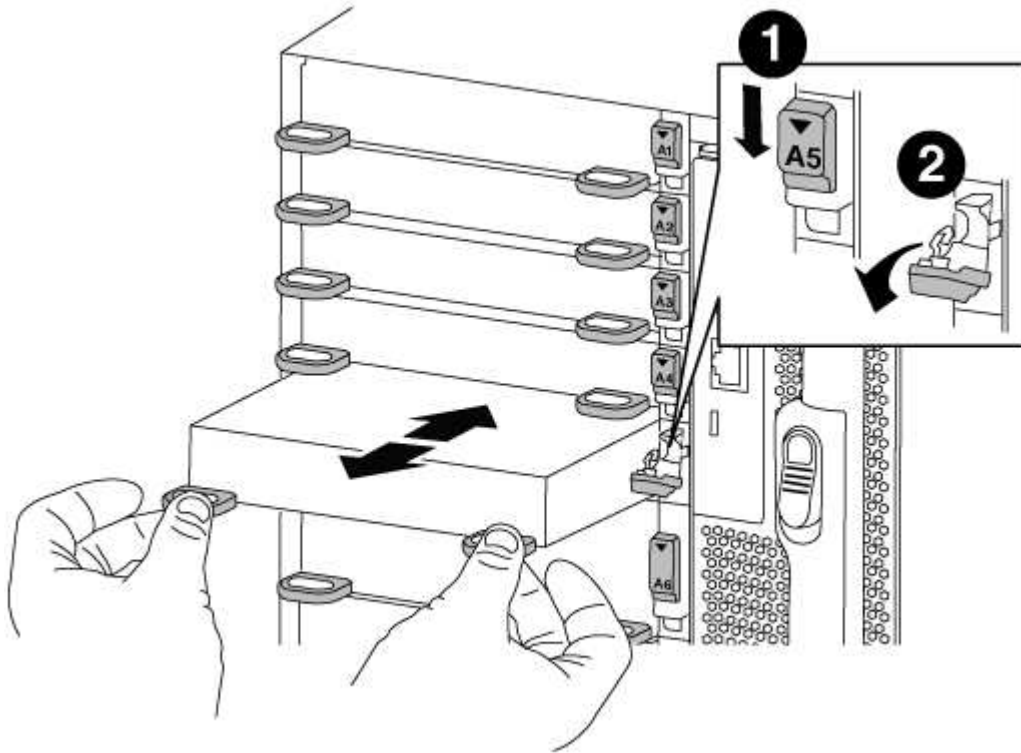
The cam button moves away from the chassis.

- b. Rotate the cam latch down until it is in a horizontal position.

The I/O module disengages from the chassis and moves about 1/2 inch out of the I/O slot.

- c. Remove the I/O module from the chassis by pulling on the pull tabs on the sides of the module face.

Make sure that you keep track of which slot the I/O module was in.



1	Lettered and numbered I/O cam latch
2	I/O cam latch completely unlocked

4. Set the I/O module aside.
5. Install the replacement I/O module into the chassis by gently sliding the I/O module into the slot until the lettered and numbered I/O cam latch begins to engage with the I/O cam pin, and then push the I/O cam latch all the way up to lock the module in place.
6. Recable the I/O module, as needed.

Step 3: Reboot the controller after I/O module replacement

After you replace an I/O module, you must reboot the controller module.



If the new I/O module is not the same model as the failed module, you must first reboot the BMC.

Steps

1. Reboot the BMC if the replacement module is not the same model as the old module:
 - a. From the LOADER prompt, change to advanced privilege mode: `priv set advanced`
 - b. Reboot the BMC: `sp reboot`
2. From the LOADER prompt, reboot the node: `bye`



This reinitializes the PCIe cards and other components and reboots the node.

3. If your system is configured to support 10 GbE cluster interconnect and data connections on 40 GbE NICs or onboard ports, convert these ports to 10 GbE connections by using the `nicadmin convert` command from Maintenance mode.



Be sure to exit Maintenance mode after completing the conversion.

4. Return the node to normal operation:
`storage failover giveback -ofnode impaired_node_name`
5. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`



If your system is in a two-node MetroCluster configuration, you must switch back the aggregates as described in the next step.

Step 4: Switch back aggregates in a two-node MetroCluster configuration

After you have completed the FRU replacement in a two-node MetroCluster configuration, you can perform the MetroCluster switchback operation. This returns the configuration to its normal operating state, with the sync-source storage virtual machines (SVMs) on the formerly impaired site now active and serving data from the local disk pools.

This task only applies to two-node MetroCluster configurations.

Steps

1. Verify that all nodes are in the `enabled` state: `metrocluster node show`

```
cluster_B::> metrocluster node show
```

DR		Configuration	DR
Group	Cluster Node	State	Mirroring Mode
-----	-----	-----	-----
1	cluster_A		
	controller_A_1	configured	enabled
completed	cluster_B		
	controller_B_1	configured	enabled
	switchback recovery		waiting for
2 entries were displayed.			

2. Verify that resynchronization is complete on all SVMs: `metrocluster vserver show`
3. Verify that any automatic LIF migrations being performed by the healing operations were completed successfully: `metrocluster check lif show`
4. Perform the switchback by using the `metrocluster switchback` command from any node in the surviving cluster.
5. Verify that the switchback operation has completed: `metrocluster show`

The switchback operation is still running when a cluster is in the `waiting-for-switchback` state:

```
cluster_B::> metrocluster show
```

Cluster	Configuration	State	Mode
-----	-----	-----	-----
Local: cluster_B	configured	switchover	
Remote: cluster_A	configured	waiting-for-switchback	

The switchback operation is complete when the clusters are in the `normal` state.:

```
cluster_B::> metrocluster show
```

Cluster	Configuration	State	Mode
-----	-----	-----	-----
Local: cluster_B	configured	normal	
Remote: cluster_A	configured	normal	

If a switchback is taking a long time to finish, you can check on the status of in-progress baselines by using the `metrocluster config-replication resync-status show` command.

6. Reestablish any SnapMirror or SnapVault configurations.

Step 5: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

Replace an LED USB module - FAS9000

You can replace an LED USB module without interrupting service.

The FAS9000 or AFF A700 LED USB module provides connectivity to console ports and system status. Replacement of this module does not require tools.

Steps

1. Remove the old LED USB module:



- a. With the bezel removed, locate the LED USB module at the front of the chassis, on the bottom left side.
- b. Slide the latch to partially eject the module.
- c. Pull the module out of the bay to disconnect it from the midplane. Do not leave the slot empty.

2. Install the new LED USB module:



- a. Align the module to the bay with the notch in the corner of the module positioned near the slider latch on the chassis. The bay will prevent you from installing the module upside down.

- b. Push the module into the bay until it is fully seated flush with the chassis.

There is an audible click when the module is secure and connected to the midplane.

Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

Replace the NVRAM module or NVRAM DIMMs - FAS9000

The NVRAM module consists of the NVRAM10 and DIMMs and up to two NVMe SSD Flash Cache modules (FlashCache or caching modules) per NVRAM module. You can replace a failed NVRAM module or the DIMMs inside the NVRAM module.

To replace a failed NVRAM module, you must remove it from the chassis, remove the FlashCache module or modules from the NVRAM module, move the DIMMs to the replacement module, reinstall the FlashCache module or modules, and install the replacement NVRAM module into the chassis.

Because the system ID is derived from the NVRAM module, if replacing the module, disks belonging to the system are reassigned to the new system ID.

Before you begin

- All disk shelves must be working properly.
- If your system is in an HA pair, the partner node must be able to take over the node associated with the NVRAM module that is being replaced.
- This procedure uses the following terminology:
 - The *impaired* node is the node on which you are performing maintenance.
 - The *healthy* node is the HA partner of the impaired node.
- This procedure includes steps for automatically or manually reassigning disks to the controller module associated with the new NVRAM module. You must reassign the disks when directed to in the procedure. Completing the disk reassignment before giveback can cause issues.
- You must replace the failed component with a replacement FRU component you received from your provider.
- You cannot change any disks or disk shelves as part of this procedure.

Step 1: Shut down the impaired controller

Shut down or take over the impaired controller using one of the following options.

Option 1: Most systems

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced` mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message MAINT=<# of hours>h
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`



When you see *Do you want to disable auto-giveback?*, enter *y*.

3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying...	Then...
The LOADER prompt	Go to the next step.
Waiting for giveback...	Press Ctrl-C, and then respond <i>y</i> when prompted.
System prompt or password prompt	<p>Take over or halt the impaired controller from the healthy controller: <code>storage failover takeover -ofnode <i>impaired_node_name</i></code></p> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i>.</p>

Option 2: Controller is in a Two-node MetroCluster

To shut down the impaired controller, you must determine the status of the controller and, if necessary,

switch over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- You must leave the power supplies turned on at the end of this procedure to provide power to the healthy controller.

Steps

1. Check the MetroCluster status to determine whether the impaired controller has automatically switched over to the healthy controller: `metrocluster show`
2. Depending on whether an automatic switchover has occurred, proceed according to the following table:

If the impaired controller...	Then...
Has automatically switched over	Proceed to the next step.
Has not automatically switched over	Perform a planned switchover operation from the healthy controller: <code>metrocluster switchover</code>
Has not automatically switched over, you attempted switchover with the <code>metrocluster switchover</code> command, and the switchover was vetoed	Review the veto messages and, if possible, resolve the issue and try again. If you are unable to resolve the issue, contact technical support.

3. Resynchronize the data aggregates by running the `metrocluster heal -phase aggregates` command from the surviving cluster.

```
controller_A_1::> metrocluster heal -phase aggregates
[Job 130] Job succeeded: Heal Aggregates is successful.
```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

4. Verify that the operation has been completed by using the `metrocluster operation show` command.

```
controller_A_1::> metrocluster operation show
Operation: heal-aggregates
State: successful
Start Time: 7/25/2016 18:45:55
End Time: 7/25/2016 18:45:56
Errors: -
```

5. Check the state of the aggregates by using the `storage aggregate show` command.


```

controller_A_1::> storage aggregate show
Aggregate      Size Available Used% State    #Vols  Nodes
RAID Status
-----
...
aggr_b2      227.1GB   227.1GB    0% online      0 mcc1-a2
raid_dp, mirrored, normal...

```

6. Heal the root aggregates by using the `metrocluster heal -phase root-aggregates` command.

```

mcc1A::> metrocluster heal -phase root-aggregates
[Job 137] Job succeeded: Heal Root Aggregates is successful

```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

7. Verify that the heal operation is complete by using the `metrocluster operation show` command on the destination cluster:

```

mcc1A::> metrocluster operation show
Operation: heal-root-aggregates
State: successful
Start Time: 7/29/2016 20:54:41
End Time: 7/29/2016 20:54:42
Errors: -

```

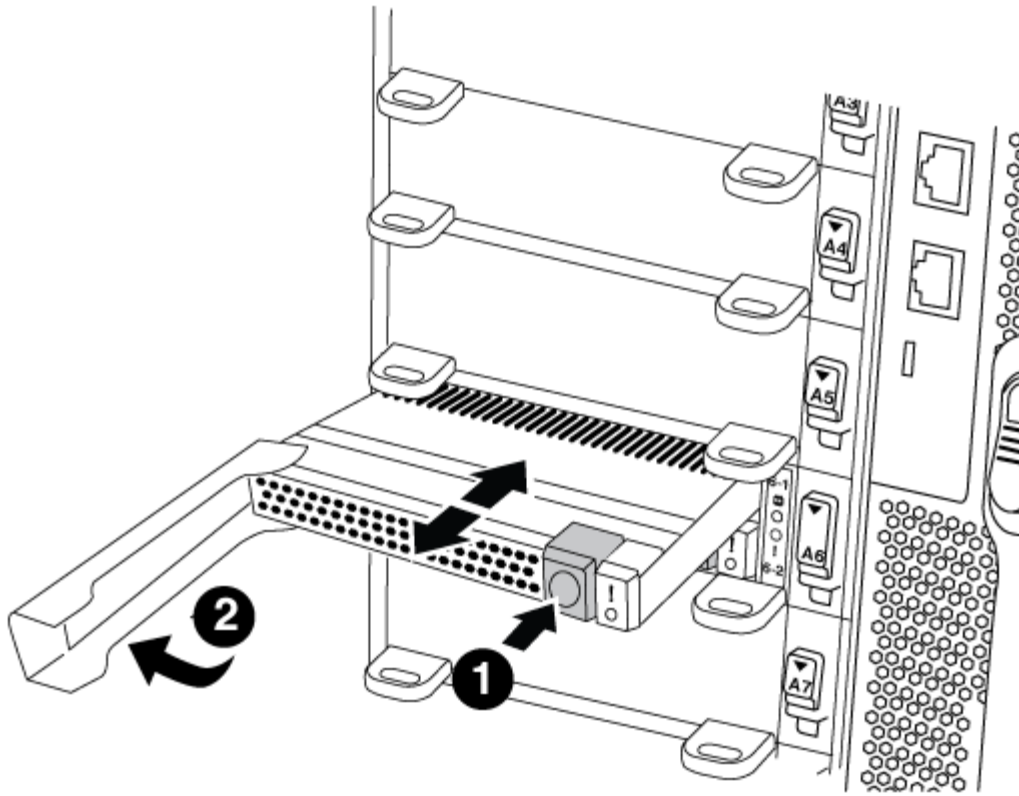
8. On the impaired controller module, disconnect the power supplies.

Step 2: Replace the NVRAM module

To replace the NVRAM module, locate it in slot 6 in the chassis and follow the specific sequence of steps.

Steps

1. If you are not already grounded, properly ground yourself.
2. Move the FlashCache module from the old NVRAM module to the new NVRAM module:



1	Orange release button (gray on empty FlashCache modules)
2	FlashCache cam handle

a. Press the orange button on the front of the FlashCache module.



The release button on empty FlashCache modules is gray.

b. Swing the cam handle out until the module begins to slide out of the old NVRAM module.

c. Grasp the module cam handle and slide it out of the NVRAM module and insert it into the front of the new NVRAM module.

d. Gently push the FlashCache module all the way into the NVRAM module, and then swing the cam handle closed until it locks the module in place.

3. Remove the target NVRAM module from the chassis:

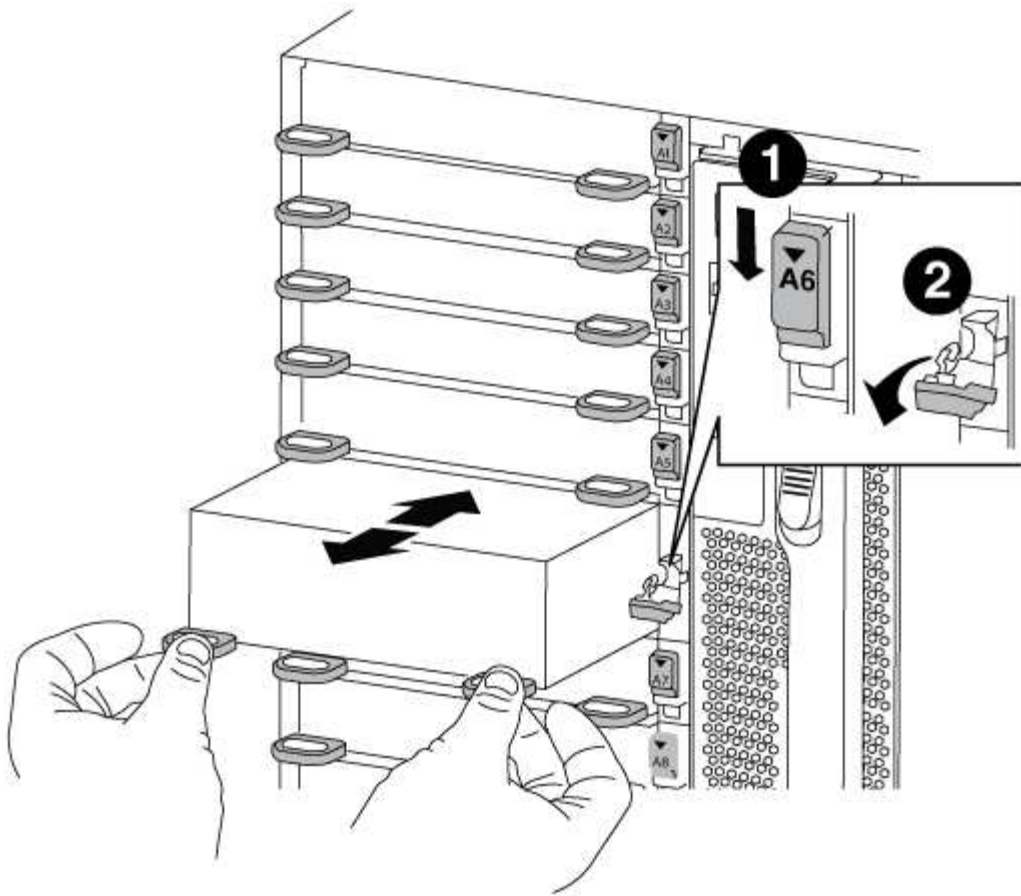
a. Depress the lettered and numbered cam button.

The cam button moves away from the chassis.

b. Rotate the cam latch down until it is in a horizontal position.

The NVRAM module disengages from the chassis and moves out a few inches.

c. Remove the NVRAM module from the chassis by pulling on the pull tabs on the sides of the module face.



1	Lettered and numbered I/O cam latch
2	I/O latch completely unlocked

4. Set the NVRAM module on a stable surface and remove the cover from the NVRAM module by pushing down on the blue locking button on the cover, and then, while holding down the blue button, slide the lid off the NVRAM module.



1	Cover locking button
2	DIMM and DIMM ejector tabs

5. Remove the DIMMs, one at a time, from the old NVRAM module and install them in the replacement NVRAM module.
6. Close the cover on the module.
7. Install the replacement NVRAM module into the chassis:
 - a. Align the module with the edges of the chassis opening in slot 6.
 - b. Gently slide the module into the slot until the lettered and numbered I/O cam latch begins to engage with the I/O cam pin, and then push the I/O cam latch all the way up to lock the module in place.

Step 3: Replace a NVRAM DIMM

To replace NVRAM DIMMs in the NVRAM module, you must remove the NVRAM module, open the module, and then replace the target DIMM.

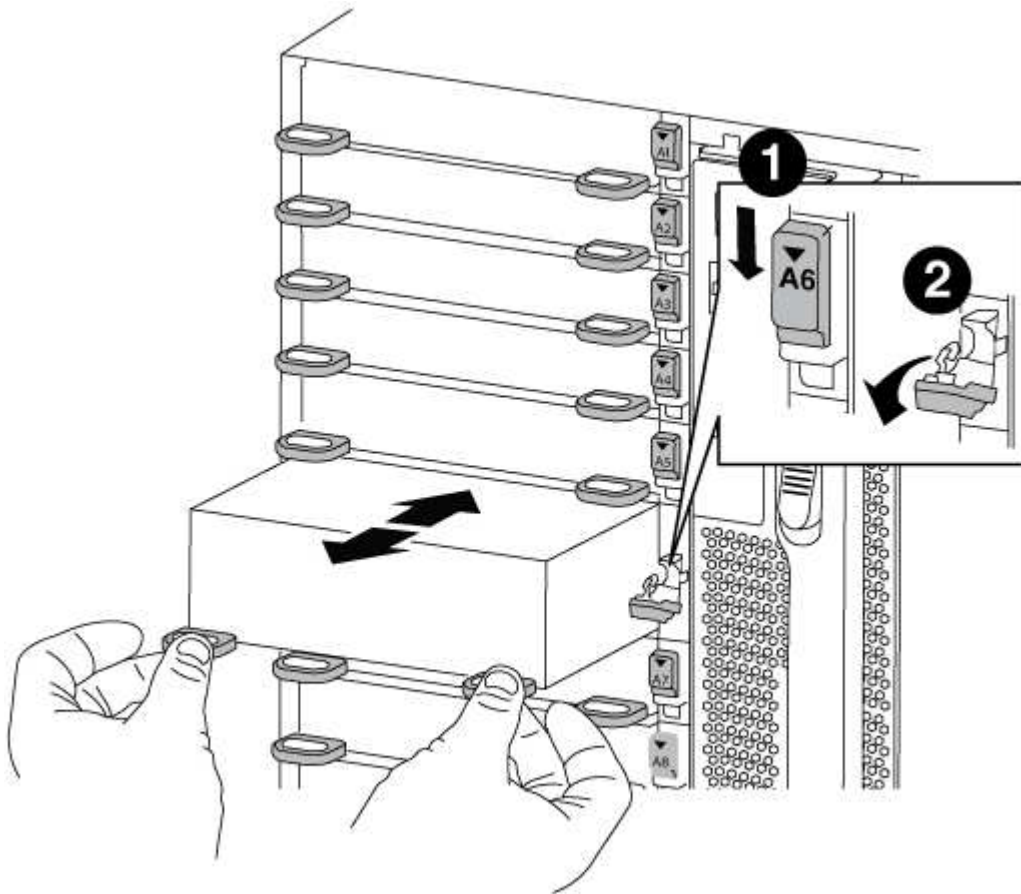
Steps

1. If you are not already grounded, properly ground yourself.
2. Remove the target NVRAM module from the chassis:
 - a. Depress the lettered and numbered cam button.

The cam button moves away from the chassis.
 - b. Rotate the cam latch down until it is in a horizontal position.

The NVRAM module disengages from the chassis and moves out a few inches.
 - c. Remove the NVRAM module from the chassis by pulling on the pull tabs on the sides of the module

face.



1	Lettered and numbered I/O cam latch
2	I/O latch completely unlocked

3. Set the NVRAM module on a stable surface and remove the cover from the NVRAM module by pushing down on the blue locking button on the cover, and then, while holding down the blue button, slide the lid off the NVRAM module.



1	Cover locking button
2	DIMM and DIMM ejector tabs

4. Locate the DIMM to be replaced inside the NVRAM module, and then remove it by pressing down on the DIMM locking tabs and lifting the DIMM out of the socket.
5. Install the replacement DIMM by aligning the DIMM with the socket and gently pushing the DIMM into the socket until the locking tabs lock in place.
6. Close the cover on the module.
7. Install the replacement NVRAM module into the chassis:
 - a. Align the module with the edges of the chassis opening in slot 6.
 - b. Gently slide the module into the slot until the lettered and numbered I/O cam latch begins to engage with the I/O cam pin, and then push the I/O cam latch all the way up to lock the module in place.

Step 4: Reboot the controller after FRU replacement

After you replace the FRU, you must reboot the controller module.

Step

1. To boot ONTAP from the LOADER prompt, enter `bye`.

Step 5: Reassign disks

Depending on whether you have an HA pair or two-node MetroCluster configuration, you must either verify the reassignment of disks to the new controller module or manually reassign the disks.

Select one of the following options for instructions on how to reassign disks to the new controller.

Option 1: Verify ID (HA pair)

Verify the system ID change on an HA system

You must confirm the system ID change when you boot the *replacement* node and then verify that the change was implemented.



Disk reassignment is only needed when replacing the NVRAM module and does not apply to NVRAM DIMM replacement.

Steps

1. If the replacement node is in Maintenance mode (showing the `*>` prompt, exit Maintenance mode and go to the LOADER prompt: `halt`
2. From the LOADER prompt on the replacement node, boot the node, entering `y` if you are prompted to override the system ID due to a system ID mismatch.

```
boot_ontap bye
```

The node will reboot, if autoboot is set.

3. Wait until the `Waiting for giveback...` message is displayed on the *replacement* node console and then, from the healthy node, verify that the new partner system ID has been automatically assigned: `storage failover show`

In the command output, you should see a message that the system ID has changed on the impaired node, showing the correct old and new IDs. In the following example, node2 has undergone replacement and has a new system ID of 151759706.

```
node1> `storage failover show`
```

Node	Partner	Takeover Possible	State Description
node1	node2	false	System ID changed on partner (Old: 151759706), In takeover
node2	node1	-	Waiting for giveback (HA mailboxes)

4. From the healthy node, verify that any coredumps are saved:

- a. Change to the advanced privilege level: `set -privilege advanced`

You can respond `y` when prompted to continue into advanced mode. The advanced mode prompt appears (`*>`).

- b. Save any coredumps: `system node run -node local-node-name partner savecore`
- c. Wait for the `savecore` command to complete before issuing the giveback.

You can enter the following command to monitor the progress of the savecore command: `system node run -node local-node-name partner savecore -s`

d. Return to the admin privilege level: `set -privilege admin`

5. Give back the node:

a. From the healthy node, give back the replaced node's storage: `storage failover giveback -ofnode replacement_node_name`

The *replacement* node takes back its storage and completes booting.

If you are prompted to override the system ID due to a system ID mismatch, you should enter *y*.



If the giveback is vetoed, you can consider overriding the vetoes.

[Find the High-Availability Configuration Guide for your version of ONTAP 9](#)

b. After the giveback has been completed, confirm that the HA pair is healthy and that takeover is possible: `storage failover show`

The output from the `storage failover show` command should not include the System ID changed on partner message.

6. Verify that the disks were assigned correctly: `storage disk show -ownership`

The disks belonging to the *replacement* node should show the new system ID. In the following example, the disks owned by node1 now show the new system ID, 1873775277:

```
node1> `storage disk show -ownership`
```

Disk ID	Aggregate Reserver	Home Pool	Owner	DR	Home	Home ID	Owner ID	DR	Home
1.0.0	aggr0_1	node1	node1	-		1873775277	1873775277	-	
1873775277		Pool0							
1.0.1	aggr0_1	node1	node1			1873775277	1873775277	-	
1873775277		Pool0							
.									
.									
.									

7. If the system is in a MetroCluster configuration, monitor the status of the node: `metrocluster node show`

The MetroCluster configuration takes a few minutes after the replacement to return to a normal state, at which time each node will show a configured state, with DR Mirroring enabled and a mode of normal. The `metrocluster node show -fields node-systemid` command output displays the old system ID until the MetroCluster configuration returns to a normal state.

8. If the node is in a MetroCluster configuration, depending on the MetroCluster state, verify that the DR home ID field shows the original owner of the disk if the original owner is a node on the disaster site.

This is required if both of the following are true:

- The MetroCluster configuration is in a switchover state.
- The *replacement* node is the current owner of the disks on the disaster site.

[Disk ownership changes during HA takeover and MetroCluster switchover in a four-node MetroCluster configuration](#)

9. If your system is in a MetroCluster configuration, verify that each node is configured: `metrocluster node show - fields configuration-state`

```
node1_siteA::> metrocluster node show -fields configuration-state

dr-group-id          cluster node          configuration-state
-----
1 node1_siteA        node1mcc-001         configured
1 node1_siteA        node1mcc-002         configured
1 node1_siteB        node1mcc-003         configured
1 node1_siteB        node1mcc-004         configured

4 entries were displayed.
```

10. Verify that the expected volumes are present for each node: `vol show -node node-name`
11. If you disabled automatic takeover on reboot, enable it from the healthy node: `storage failover modify -node replacement-node-name -onreboot true`

Option 2: Reassign ID (MetroCluster config)

Reassign the system ID in a two-node MetroCluster configuration

In a two-node MetroCluster configuration running ONTAP, you must manually reassign disks to the new controller's system ID before you return the system to normal operating condition.

About this task

This procedure applies only to systems in a two-node MetroCluster configuration running ONTAP.

You must be sure to issue the commands in this procedure on the correct node:

- The *impaired* node is the node on which you are performing maintenance.
- The *replacement* node is the new node that replaced the impaired node as part of this procedure.
- The *healthy* node is the DR partner of the impaired node.

Steps

1. If you have not already done so, reboot the *replacement* node, interrupt the boot process by entering `Ctrl-C`, and then select the option to boot to Maintenance mode from the displayed menu.

You must enter `Y` when prompted to override the system ID due to a system ID mismatch.

2. View the old system IDs from the healthy node: ``metrocluster node show -fields node-systemid,dr-partner-systemid``

In this example, the `Node_B_1` is the old node, with the old system ID of 118073209:

```
dr-group-id cluster          node          node-systemid dr-
partner-systemid
-----
1            Cluster_A      Node_A_1      536872914
118073209
1            Cluster_B      Node_B_1      118073209
536872914
2 entries were displayed.
```

3. View the new system ID at the Maintenance mode prompt on the impaired node: `disk show`

In this example, the new system ID is 118065481:

```
Local System ID: 118065481
...
...
```

4. Reassign disk ownership (for FAS systems) or LUN ownership (for FlexArray systems), by using the system ID information obtained from the `disk show` command: `disk reassign -s old system ID`

In the case of the preceding example, the command is: `disk reassign -s 118073209`

You can respond `Y` when prompted to continue.

5. Verify that the disks (or FlexArray LUNs) were assigned correctly: `disk show -a`

Verify that the disks belonging to the *replacement* node show the new system ID for the *replacement* node. In the following example, the disks owned by system-1 now show the new system ID, 118065481:

```
*> disk show -a
Local System ID: 118065481
```

DISK	OWNER		POOL	SERIAL NUMBER	HOME
-----	-----		-----	-----	-----
disk_name (118065481)	system-1	(118065481)	Pool0	J8Y0TDZC	system-1
disk_name (118065481)	system-1	(118065481)	Pool0	J8Y09DXC	system-1
.					
.					
.					

6. From the healthy node, verify that any coredumps are saved:

a. Change to the advanced privilege level: `set -privilege advanced`

You can respond `Y` when prompted to continue into advanced mode. The advanced mode prompt appears (`*>`).

b. Verify that the coredumps are saved: `system node run -node local-node-name partner savecore`

If the command output indicates that `savecore` is in progress, wait for `savecore` to complete before issuing the `giveback`. You can monitor the progress of the `savecore` using the `system node run -node local-node-name partner savecore -s command.</info>`.

c. Return to the admin privilege level: `set -privilege admin`

7. If the *replacement* node is in Maintenance mode (showing the `*>` prompt), exit Maintenance mode and go to the LOADER prompt: `halt`

8. Boot the *replacement* node: `boot_ontap`

9. After the *replacement* node has fully booted, perform a switchback: `metrocluster switchback`

10. Verify the MetroCluster configuration: `metrocluster node show - fields configuration-state`

```
node1_siteA::> metrocluster node show -fields configuration-state
```

dr-group-id	cluster node	configuration-state
-----	-----	-----
1 node1_siteA	node1mcc-001	configured
1 node1_siteA	node1mcc-002	configured
1 node1_siteB	node1mcc-003	configured
1 node1_siteB	node1mcc-004	configured

```
4 entries were displayed.
```

11. Verify the operation of the MetroCluster configuration in Data ONTAP:

- Check for any health alerts on both clusters: `system health alert show`
- Confirm that the MetroCluster is configured and in normal mode: `metrocluster show`
- Perform a MetroCluster check: `metrocluster check run`
- Display the results of the MetroCluster check: `metrocluster check show`
- Run Config Advisor. Go to the Config Advisor page on the NetApp Support Site at support.netapp.com/NOW/download/tools/config_advisor/.

After running Config Advisor, review the tool's output and follow the recommendations in the output to address any issues discovered.

12. Simulate a switchover operation:

- From any node's prompt, change to the advanced privilege level: `set -privilege advanced`

You need to respond with `y` when prompted to continue into advanced mode and see the advanced mode prompt (`*>`).
- Perform the switchback operation with the `-simulate` parameter: `metrocluster switchover -simulate`
- Return to the admin privilege level: `set -privilege admin`

Step 6: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

Swap out a power supply - FAS9000

Swapping out a power supply involves turning off, disconnecting, and removing the old power supply and installing, connecting, and turning on the replacement power supply.

All other components in the system must be functioning properly; if not, you must contact technical support.

- The power supplies are redundant and hot-swappable.
- This procedure is written for replacing one power supply at a time.



It is a best practice to replace the power supply within two minutes of removing it from the chassis. The system continues to function, but ONTAP sends messages to the console about the degraded power supply until the power supply is replaced.

- The number of power supplies in the system depends on the model.
- Power supplies are auto-ranging.



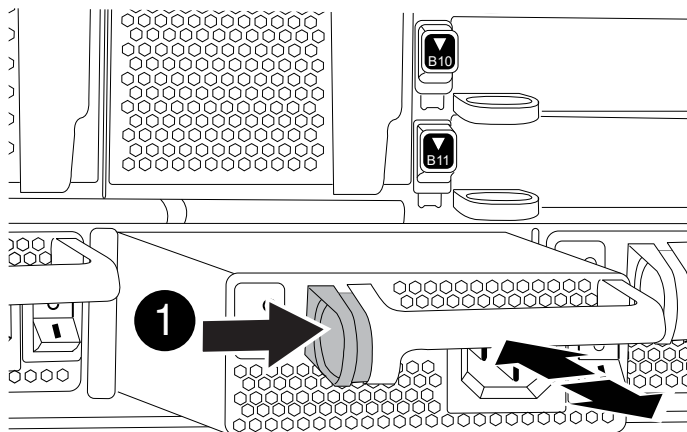
Do not mix PSUs with different efficiency ratings. Always replace like for like.

Steps

1. Identify the power supply you want to replace, based on console error messages or through the LEDs on the power supplies.
2. If you are not already grounded, properly ground yourself.
3. Turn off the power supply and disconnect the power cables:
 - a. Turn off the power switch on the power supply.
 - b. Open the power cable retainer, and then unplug the power cable from the power supply.
 - c. Unplug the power cable from the power source.
4. Press and hold the orange button on the power supply handle, and then pull the power supply out of the chassis.



When removing a power supply, always use two hands to support its weight.



1

Locking button

5. Make sure that the on/off switch of the new power supply is in the Off position.

6. Using both hands, support and align the edges of the power supply with the opening in the system chassis, and then gently push the power supply into the chassis until it locks into place.

The power supplies are keyed and can only be installed one way.



Do not use excessive force when sliding the power supply into the system. You can damage the connector.

7. Reconnect the power supply cabling:
 - a. Reconnect the power cable to the power supply and the power source.
 - b. Secure the power cable to the power supply using the power cable retainer.

Once power is restored to the power supply, the status LED should be green.

8. Turn on the power to the new power supply, and then verify the operation of the power supply activity LEDs.

The green power LED lights when the PSU is fully inserted into the chassis and the amber attention LED flashes initially, but turns off after a few moments.

9. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

Replace the real-time clock battery - AFF 9000

You replace the real-time clock (RTC) battery in the controller module so that your system's services and applications that depend on accurate time synchronization continue to function.

- You can use this procedure with all versions of ONTAP supported by your system
- All other components in the system must be functioning properly; if not, you must contact technical support.

Step 1: Shut down the impaired controller

You can shut down or take over the impaired controller using different procedures, depending on the storage system hardware configuration.

Option 1: Most configurations

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced` mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

```
system node autosupport invoke -node * -type all -message MAINT=<# of hours>h
```

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`



When you see *Do you want to disable auto-giveback?*, enter *y*.

3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying...	Then...
The LOADER prompt	Go to the next step.
Waiting for giveback...	Press Ctrl-C, and then respond <i>y</i> when prompted.
System prompt or password prompt	<p>Take over or halt the impaired controller from the healthy controller: <code>storage failover takeover -ofnode <i>impaired_node_name</i></code></p> <p>When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i>.</p>

Option 2: Controller is in a two-node MetroCluster

To shut down the impaired controller, you must determine the status of the controller and, if necessary,

switch over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- You must leave the power supplies turned on at the end of this procedure to provide power to the healthy controller.

Steps

1. Check the MetroCluster status to determine whether the impaired controller has automatically switched over to the healthy controller: `metrocluster show`
2. Depending on whether an automatic switchover has occurred, proceed according to the following table:

If the impaired controller...	Then...
Has automatically switched over	Proceed to the next step.
Has not automatically switched over	Perform a planned switchover operation from the healthy controller: <code>metrocluster switchover</code>
Has not automatically switched over, you attempted switchover with the <code>metrocluster switchover</code> command, and the switchover was vetoed	Review the veto messages and, if possible, resolve the issue and try again. If you are unable to resolve the issue, contact technical support.

3. Resynchronize the data aggregates by running the `metrocluster heal -phase aggregates` command from the surviving cluster.

```
controller_A_1::> metrocluster heal -phase aggregates
[Job 130] Job succeeded: Heal Aggregates is successful.
```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

4. Verify that the operation has been completed by using the `metrocluster operation show` command.

```
controller_A_1::> metrocluster operation show
Operation: heal-aggregates
State: successful
Start Time: 7/25/2016 18:45:55
End Time: 7/25/2016 18:45:56
Errors: -
```

5. Check the state of the aggregates by using the `storage aggregate show` command.


```

controller_A_1::> storage aggregate show
Aggregate      Size Available Used% State    #Vols  Nodes
RAID Status
-----
...
aggr_b2      227.1GB   227.1GB    0% online      0 mcc1-a2
raid_dp, mirrored, normal...

```

6. Heal the root aggregates by using the `metrocluster heal -phase root-aggregates` command.

```

mcc1A::> metrocluster heal -phase root-aggregates
[Job 137] Job succeeded: Heal Root Aggregates is successful

```

If the healing is vetoed, you have the option of reissuing the `metrocluster heal` command with the `-override-vetoes` parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

7. Verify that the heal operation is complete by using the `metrocluster operation show` command on the destination cluster:

```

mcc1A::> metrocluster operation show
Operation: heal-root-aggregates
State: successful
Start Time: 7/29/2016 20:54:41
End Time: 7/29/2016 20:54:42
Errors: -

```

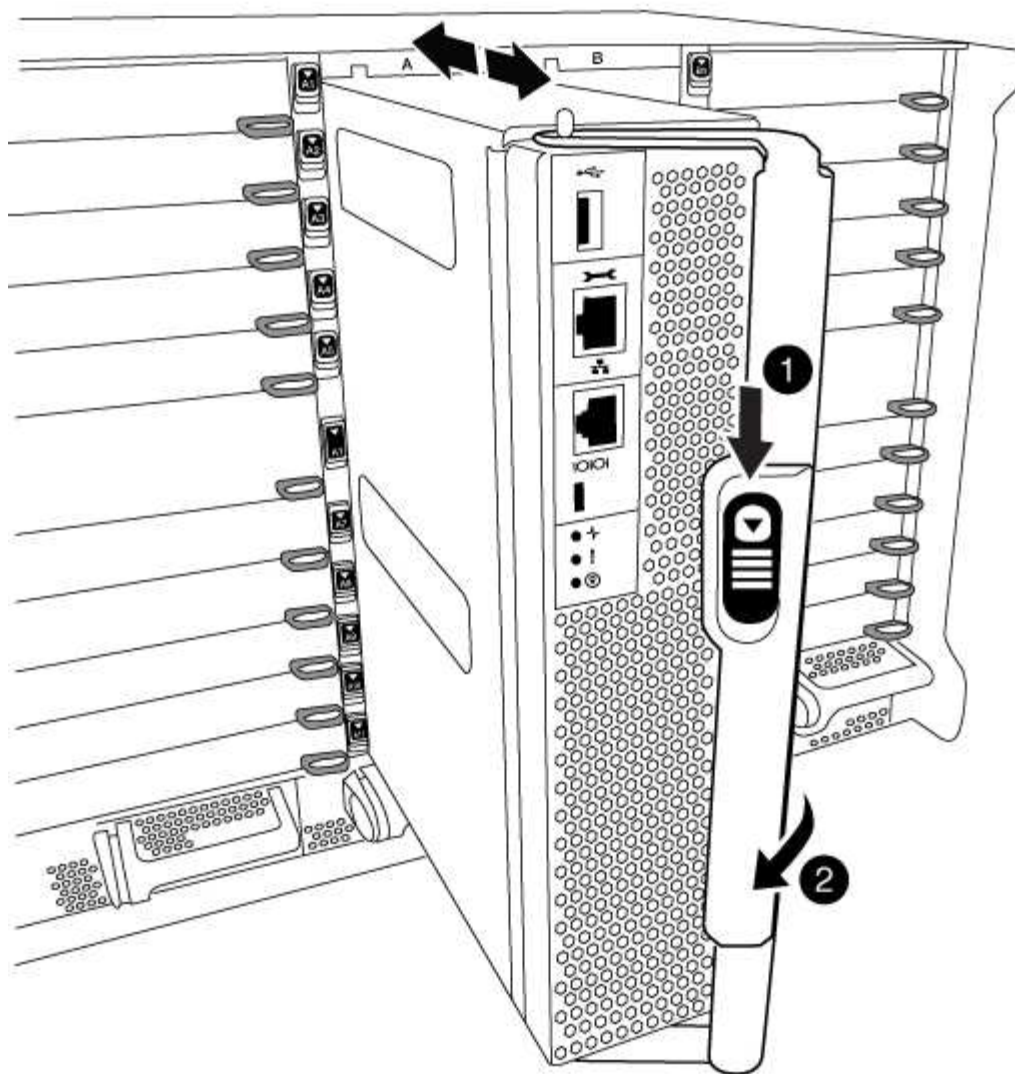
8. On the impaired controller module, disconnect the power supplies.

Step 2: Remove the controller module

To access components inside the controller, you must first remove the controller module from the system and then remove the cover on the controller module.

Steps

1. If you are not already grounded, properly ground yourself.
2. Unplug the cables from the impaired controller module, and keep track of where the cables were connected.
3. Slide the orange button on the cam handle downward until it unlocks.

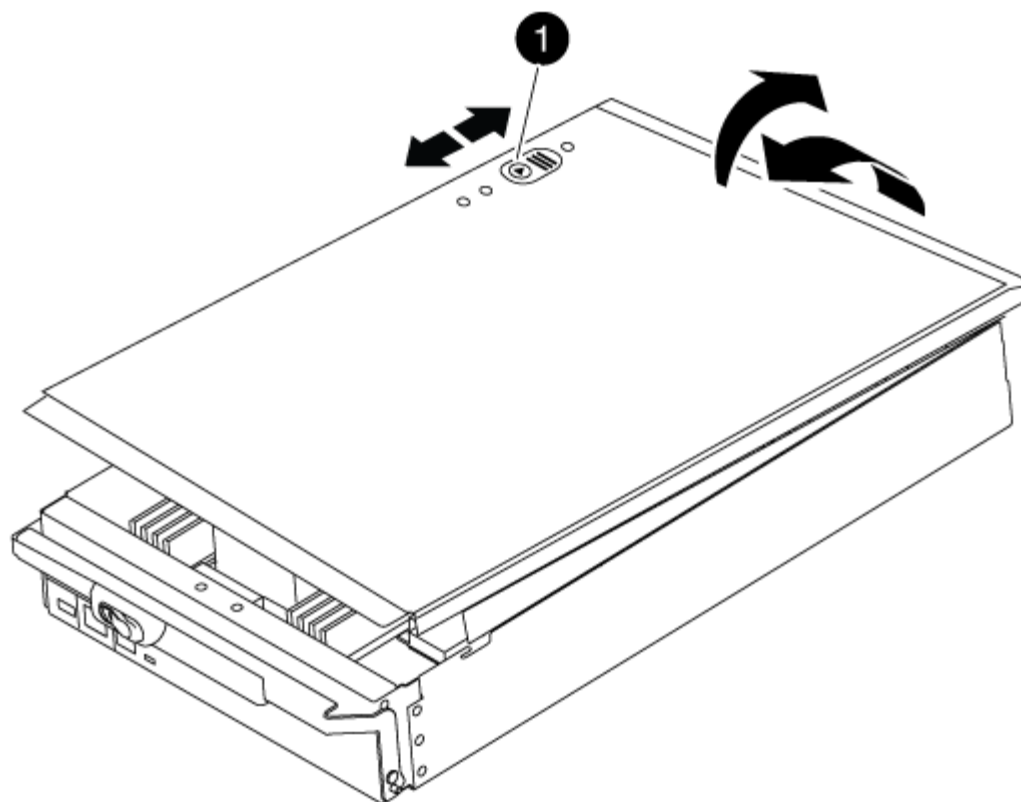


1	Cam handle release button
2	Cam handle

4. Rotate the cam handle so that it completely disengages the controller module from the chassis, and then slide the controller module out of the chassis.

Make sure that you support the bottom of the controller module as you slide it out of the chassis.

5. Place the controller module lid-side up on a stable, flat surface, press the blue button on the cover, slide the cover to the back of the controller module, and then swing the cover up and lift it off of the controller module.



1

Controller module cover locking button

Step 3: Replace the RTC battery

To replace the RTC battery, you must locate the failed battery in the controller module, remove it from the holder, and then install the replacement battery in the holder.

Steps

1. If you are not already grounded, properly ground yourself.
2. Locate the RTC battery.



1	RTC battery
2	RTC battery housing

3. Gently push the battery away from the holder, rotate it away from the holder, and then lift it out of the holder.



Note the polarity of the battery as you remove it from the holder. The battery is marked with a plus sign and must be positioned in the holder correctly. A plus sign near the holder tells you how the battery should be positioned.

4. Remove the replacement battery from the antistatic shipping bag.
5. Locate the empty battery holder in the controller module.
6. Note the polarity of the RTC battery, and then insert it into the holder by tilting the battery at an angle and pushing down.
7. Visually inspect the battery to make sure that it is completely installed into the holder and that the polarity is correct.
8. Reinstall the controller module cover.

Step 4: Reinstall the controller module and set time/date

After you replace a component within the controller module, you must reinstall the controller module in the system chassis, reset the time and date on the controller, and then boot it.

Steps

1. If you have not already done so, close the air duct or controller module cover.
2. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.

Do not completely insert the controller module in the chassis until instructed to do so.

3. Recable the system, as needed.

If you removed the media converters (QSFPs or SFPs), remember to reinstall them if you are using fiber optic cables.

4. If the power supplies were unplugged, plug them back in and reinstall the power cable retainers.
5. Complete the reinstallation of the controller module:

- a. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position.



Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.

- b. If you have not already done so, reinstall the cable management device.
 - c. Bind the cables to the cable management device with the hook and loop strap.
 - d. Reconnect the power cables to the power supplies and to the power sources, and then turn on the power to start the boot process.
 - e. Halt the controller at the LOADER prompt.
6. Reset the time and date on the controller:
 - a. Check the date and time on the healthy node with the `show date` command.
 - b. At the LOADER prompt on the target node, check the time and date.
 - c. If necessary, modify the date with the `set date mm/dd/yyyy` command.
 - d. If necessary, set the time, in GMT, using the `set time hh:mm:ss` command.
 - e. Confirm the date and time on the target node.
 7. At the LOADER prompt, enter `bye` to reinitialize the PCIe cards and other components and let the node reboot.
 8. Return the node to normal operation by giving back its storage: `storage failover giveback -ofnode impaired_node_name`
 9. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`

Step 5: Switch back aggregates in a two-node MetroCluster configuration

After you have completed the FRU replacement in a two-node MetroCluster configuration, you can perform the MetroCluster switchback operation. This returns the configuration to its normal operating state, with the sync-source storage virtual machines (SVMs) on the formerly impaired site now active and serving data from the local disk pools.

This task only applies to two-node MetroCluster configurations.

Steps

1. Verify that all nodes are in the enabled state: `metrocluster node show`

```
cluster_B::> metrocluster node show

DR                               Configuration  DR
Group Cluster Node              State          Mirroring Mode
-----
1      cluster_A
      controller_A_1 configured      enabled    heal roots
completed
      cluster_B
      controller_B_1 configured      enabled    waiting for
switchback recovery
2 entries were displayed.
```

2. Verify that resynchronization is complete on all SVMs: `metrocluster vserver show`
3. Verify that any automatic LIF migrations being performed by the healing operations were completed successfully: `metrocluster check lif show`
4. Perform the switchback by using the `metrocluster switchback` command from any node in the surviving cluster.
5. Verify that the switchback operation has completed: `metrocluster show`

The switchback operation is still running when a cluster is in the `waiting-for-switchback` state:

```
cluster_B::> metrocluster show

Cluster              Configuration State      Mode
-----
Local: cluster_B configured      switchover
Remote: cluster_A configured      waiting-for-switchback
```

The switchback operation is complete when the clusters are in the `normal` state.:

```
cluster_B::> metrocluster show

Cluster              Configuration State      Mode
-----
Local: cluster_B configured      normal
Remote: cluster_A configured      normal
```

If a switchback is taking a long time to finish, you can check on the status of in-progress baselines by using the `metrocluster config-replication resync-status show` command.

6. Reestablish any SnapMirror or SnapVault configurations.

Step 6: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return & Replacements](#) page for further information.

X91148A module

Overview of adding an X91148A module - AFF A9000

You can add an I/O module to your system by either replacing a NIC or storage adapter with a new one in a fully-populated system, or by adding a new NIC or storage adapter into an empty chassis slot in your system.

Before you begin

- Check the [NetApp Hardware Universe](#) to make sure that the new I/O module is compatible with your system and version of ONTAP you're running.
- If multiple slots are available, check the slot priorities in [NetApp Hardware Universe](#) and use the best one available for your I/O module.
- To non-disruptively add an I/O module, you must takeover the target controller, remove the slot blanking cover in the target slot or remove an existing I/O module, add the new or replacement I/O module, and then giveback the target controller.
- Make sure that all other components are functioning properly.

Add an X91148A module in a system with open slots - FAS9000

You can add an X91148A module into an empty module slot in your system as either a 100GbE NIC or a storage module for the NS224 storage shelves.

- Your system must be running ONTAP 9.8 and later.
- To non-disruptively add the X91148A module, you must takeover the target controller, remove the slot blanking cover in the target slot, add the module, and then giveback the target controller.
- There must be one or more open slots available on your system.
- If multiple slots are available, install the module according to the slot priority matrix for the X91148A module in the [NetApp Hardware Universe](#).
- If you are adding the X91148A module as a storage module, you must install the module slots 3 and/or 7.
- If you are adding the X91148A module as a 100GbE NIC, you can use any open slot. However, by default, slots 3 and 7 are set as storage slots. If you wish to use those slots as network slots and will not add NS224 shelves, you must modify the slots for networking use with the `storage port modify -node node name -port port name -mode network` command. See the [NetApp Hardware Universe](#) for other slots that can be used by the X91148A module for networking.
- All other components in the system must be functioning properly; if not, you must contact technical support.

Option 1: Add an X91148A module as a NIC module

To add an X91148A module as a NIC module in a system with open slots, you must follow the specific sequence of steps.

Steps

1. Shutdown controller A:
 - a. Disable automatic giveback: `storage failover modify -node local -auto-giveback false`
 - b. Take over the target node: `storage failover takeover -ofnode target_node_name`

The console connection shows that the node drops to the LOADER prompt when the takeover is complete.
2. If you are not already grounded, properly ground yourself.
3. Remove the target slot blanking cover:
 - a. Depress the lettered and numbered cam button.
 - b. Rotate the cam latch down until it is in a horizontal position.
 - c. Remove the blanking cover.
4. Install the X91148A module:
 - a. Align the X91148A module with the edges of the slot.
 - b. Slide the X91148A module into the slot until the lettered and numbered I/O cam latch begins to engage with the I/O cam pin.
 - c. Push the I/O cam latch all the way up to lock the module in place.
5. Cable the module to the data switches.
6. Reboot controller A from the LOADER prompt: `bye`



This reinitializes the PCIe cards and other components and reboots the node.

7. Giveback the node from the partner node: `storage failover giveback -ofnode target_node_name`
8. Enable automatic giveback if it was disabled: `storage failover modify -node local -auto-giveback true`
9. Repeat these steps for controller B.

Option 2: Add an X91148A module as a storage module

To add an X91148A module as a storage module in a system with open slots, you must follow the specific sequence of steps.

- This procedure presumes slots 3 and/or 7 are open.

Steps

1. Shut down controller A:
 - a. Disable automatic giveback: `storage failover modify -node local -auto-giveback false`

b. Take over the target node: `storage failover takeover -ofnode target_node_name`

The console connection shows that the node drops to the LOADER prompt when the takeover is complete.

2. If you are not already grounded, properly ground yourself.
3. Remove the target slot blanking cover:
 - a. Depress the lettered and numbered cam button.
 - b. Rotate the cam latch down until it is in a horizontal position.
 - c. Remove the blanking cover.
4. Install the X91148A module into slot 3:
 - a. Align the X91148A module with the edges of the slot.
 - b. Slide the X91148A module into the slot until the lettered and numbered I/O cam latch begins to engage with the I/O cam pin.
 - c. Push the I/O cam latch all the way up to lock the module in place.
 - d. If you are installing a second X91148A module for storage, repeat this step for the module in slot 7.
5. Reboot controller A:
 - If the replacement module is not the same model as the old module, reboot the BMC :
 - a. From the LOADER prompt, change to advanced privilege mode: `set -privilege advanced`
 - b. Reboot the BMC: `sp reboot`
 - If the replacement module is the same as the old module, boot from the LOADER prompt: `bye`



This reinitializes the PCIe cards and other components and reboots the node.

6. Giveback the node from the partner node: `storage failover giveback -ofnode target_node_name`
7. Enable automatic giveback if it was disabled: `storage failover modify -node local -auto-giveback true`
8. Repeat these steps for controller B.
9. Install and cable your NS224 shelves, as described in [Hot-add - NS224 shelves](#).

Add an X91148A storage module in a system with no open slots - FAS9000

You must remove one more or more existing NIC or storage modules in your system in order to install one or more X91148A storage modules into your fully-populated system.

- Your system must be running ONTAP 9.8 and later.
- To non-disruptively add the X91148A module, you must takeover the target controller, add the module, and then giveback the target controller.
- If you are adding the X91148A module as a storage adapter, you must install the module in slots 3 and/or 7.

- If you are adding the X91148A module as a 100GbE NIC, you can use any open slot. However, by default, slots 3 and 7 are set as storage slots. If you wish to use those slots as network slots and will not add NS224 shelves, you must modify the slots for networking use with the `storage port modify -node node name -port port name -mode network` command for each port. See the [NetApp Hardware Universe](#) for other slots that can be used by the X91148A module for networking.
- All other components in the system must be functioning properly; if not, you must contact technical support.

Option 1: Add an X91148A module as a NIC module

You must remove one or more existing NIC or storage modules in your system in order to install one or more X91148A NIC modules into your fully-populated system.

Steps

1. If you are adding an X91148A module into a slot that contains a NIC module with the same number of ports as the X91148A module, the LIFs will automatically migrate when its controller module is shut down. If the NIC module being replaced has more ports than the X91148A module, you must permanently reassign the affected LIFs to a different home port. See [Migrating a LIF](#) for information about using System Manager to permanently move the LIFs

2. Shut down controller A:

- a. Disable automatic giveback: `storage failover modify -node local -auto-giveback false`

- b. Take over the target node: `storage failover takeover -ofnode target_node_name`

The console connection shows that the node drops to the LOADER prompt when the takeover is complete.

3. If you are not already grounded, properly ground yourself.

4. Unplug any cabling on the target I/O module.

5. Remove the target I/O module from the chassis:

- a. Depress the lettered and numbered cam button.

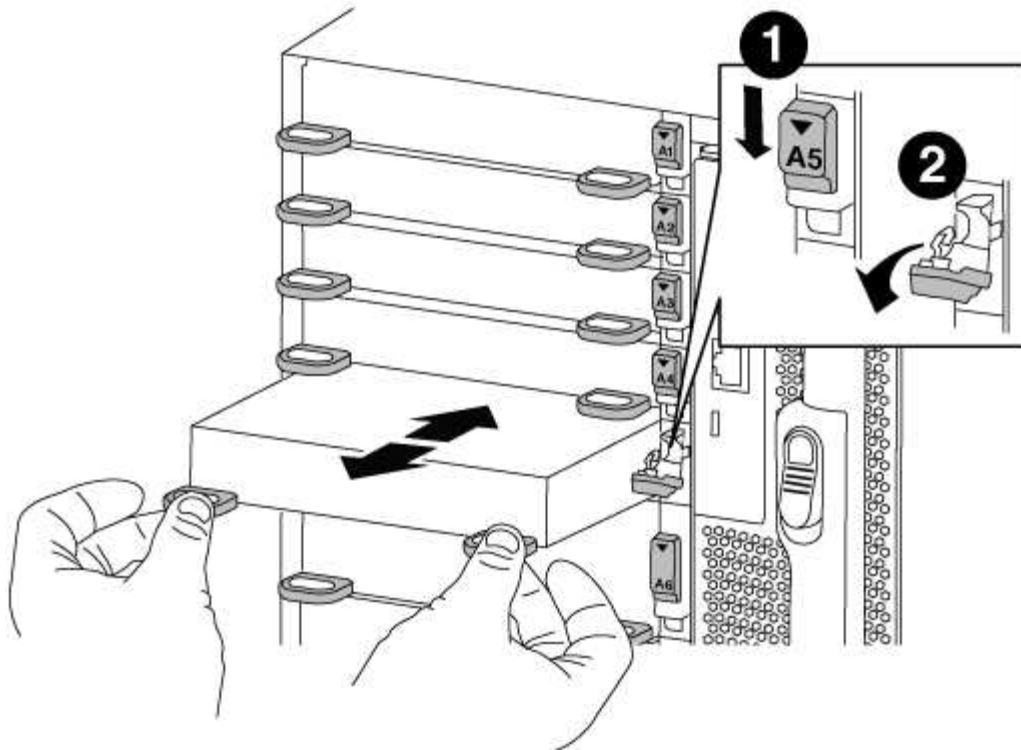
The cam button moves away from the chassis.

- b. Rotate the cam latch down until it is in a horizontal position.

The I/O module disengages from the chassis and moves about 1/2 inch out of the I/O slot.

- c. Remove the I/O module from the chassis by pulling on the pull tabs on the sides of the module face.

Make sure that you keep track of which slot the I/O module was in.



1	Lettered and numbered I/O cam latch
2	I/O cam latch completely unlocked

6. Install the X91148A module into the target slot:
 - a. Align the X91148A module with the edges of the slot.
 - b. Slide the X91148A module into the slot until the lettered and numbered I/O cam latch begins to engage with the I/O cam pin.
 - c. Push the I/O cam latch all the way up to lock the module in place.
7. Repeat the remove and install steps to replace additional modules for controller A.
8. Cable the module or modules to the data switches.
9. Reboot controller A from the LOADER prompt: `bye`



This reinitializes the PCIe cards and other components and reboots the node.

10. Giveback the node from the partner node: `storage failover giveback -ofnode target_node_name`
11. Enable automatic giveback if it was disabled: `storage failover modify -node local -auto-giveback true`
12. If you added the X91148A module as a NIC module in slots 3 or 7, for networking, use the `storage port modify -node node name -port port name -mode network` command for each port.

13. Repeat these steps for controller B.

Option 2: Adding an X91148A module as a storage module

You must remove one or more existing NIC or storage modules in your system in order to install one or more X91148A storage modules into your fully-populated system.

- This procedure presumes you re installing the X91148A module into slots 3 and/or 7.

Steps

1. If you are adding an X91148A module as a storage module in slots 3 and/or 7 into a slot that has an existing NIC module in it, use System Manager to permanently migrate the LIFs to different home ports, as described in [Migrating a LIF](#).

2. Shut down controller A:

a. Disable automatic giveback: `storage failover modify -node local -auto-giveback false`

b. Take over the target node: `storage failover takeover -ofnode target_node_name`

The console connection shows that the node drops to the LOADER prompt when the takeover is complete.

3. If you are not already grounded, properly ground yourself.

4. Unplug any cabling on the target I/O module.

5. Remove the target I/O module from the chassis:

a. Depress the lettered and numbered cam button.

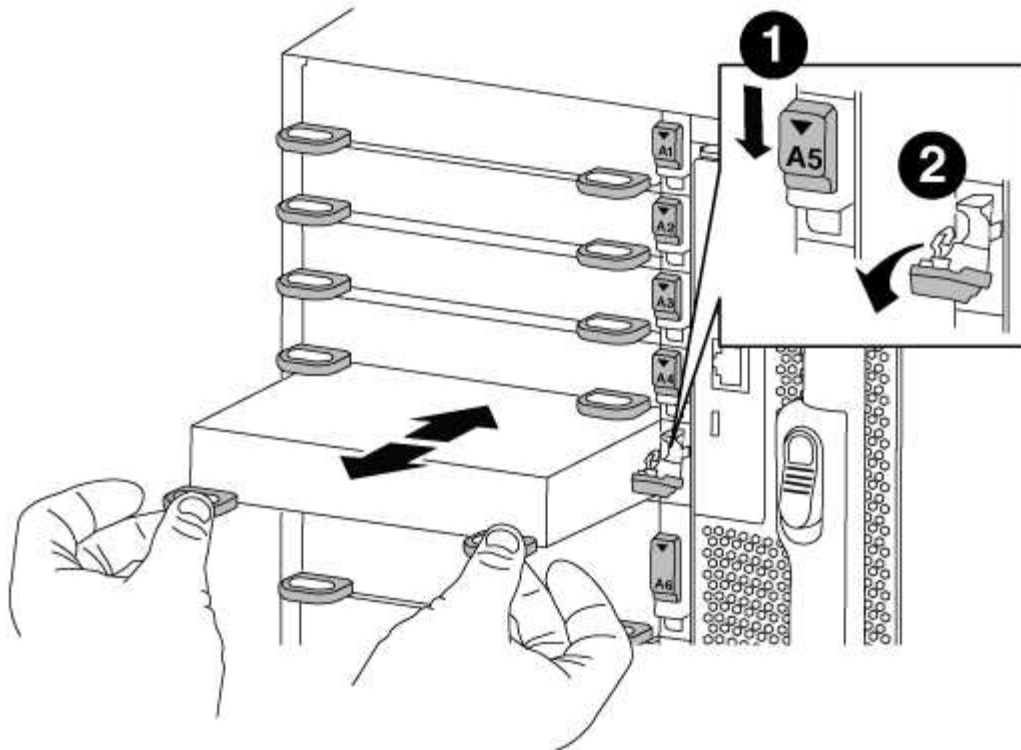
The cam button moves away from the chassis.

b. Rotate the cam latch down until it is in a horizontal position.

The I/O module disengages from the chassis and moves about 1/2 inch out of the I/O slot.

c. Remove the I/O module from the chassis by pulling on the pull tabs on the sides of the module face.

Make sure that you keep track of which slot the I/O module was in.



1	Lettered and numbered I/O cam latch
2	I/O cam latch completely unlocked

6. Install the X91148A module into slot 3:

- Align the X91148A module with the edges of the slot.
- Slide the X91148A module into the slot until the lettered and numbered I/O cam latch begins to engage with the I/O cam pin.
- Push the I/O cam latch all the way up to lock the module in place.
- If you are installing a second X91148A module for storage, repeat the remove and install steps for the module in slot 7.

7. Reboot controller A from the LOADER prompt: `bye`



This reinitializes the PCIe cards and other components and reboots the node.

8. Giveback the node from the partner node: `storage failover giveback -ofnode target_node_name`

9. Enable automatic giveback if it was disabled: `storage failover modify -node local -auto-giveback true`

10. Repeat these steps for controller B.

11. Install and cable your NS224 shelves, as described in [Hot-adding an NS224 drive shelf](#).

Other models

Documentation for AFF and FAS systems that have reached the end of hardware support are available for customer use in the [Archive](#). Documentation for older AFF and FAS models that are no longer available for purchase, but are still supported are available in the [A-Z Documentation Library](#).

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