



ASA A1K systems

Install and maintain

NetApp

November 08, 2024

Table of Contents

- ASA A1K systems 1
- Maintain ASA A1K hardware 1
- Boot media - automated recovery 2
- Boot media - manual recovery 10
- Controller 30
- Replace a DIMM - ASA A1K 41
- Replace a fan - ASA A1K 45
- Replace NVRAM - ASA A1K 46
- Replace the NV Battery - ASA A1K 51
- I/O module 55
- Replace a power supply - ASA A1K 62
- Replace the real-time clock battery - ASA A1K 65
- Replace system management module - ASA A1K 69

ASA A1K systems

Maintain ASA A1K hardware

You might need to perform maintenance procedures on your hardware. Procedures specific to maintaining your ASA A1K system components are in this section.

The procedures in this section assume that the A1K system has already been deployed as a storage node in the ONTAP environment.

System components

For the ASA A1K storage system, you can perform maintenance procedures on the following components.

Boot media - manual recovery	You can replace a failed boot media manually by using USB module for the boot image.
Boot media - automated recovery	Automated boot media replace uses the boot image from the partner node and automatically runs the appropriate boot menu option to install the boot image on the replacement boot media.
Controller	A controller consists of a board, firmware, and software. It controls the storage, I/O cards, and runs the ONTAP operating system software.
DIMM	A dual in-line memory module (DIMM) is a type of computer memory. They are installed to add system memory to a controller motherboard.
Fan	A fan cools the controller.
NVRAM	The NVRAM (Non-Volatile Random Access Memory) is a module that allows the controller to protect and save in-flight data if the system loses power. The system ID resides in the NVRAM module. When replaced, the controller assumes the new system ID from the replacement NVRAM module.
NV battery	The NV battery is responsible for providing power to the NVRAM module while data in-flight is being destaged to flash memory after a power loss.
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.
Power supply	A power supply provides a redundant power source in a controller.
Real-time clock battery	A real-time clock battery preserves system date and time information if the power is off.

System management module The System management module provides the interface between the controller and a console or laptop for controller or system maintenance purposes. The System management module contains the boot media and stores the system serial number (SSN).

Boot media - automated recovery

Overview of automated boot media recovery - ASA A1K

You can replace a failed boot media through the automated boot media replace (BMR) option.

Automated boot media replace uses the boot image from the partner node and automatically runs the appropriate boot menu option to install the boot image on the replacement boot media.

Boot media replacement workflow - ASA A1K

Follow these workflow steps to replace your boot media.

1

Review the boot media requirements

To replace the boot media, you must meet certain requirements.

2

Shut down the impaired controller

Shut down or take over the impaired controller so that the healthy controller continues to serve data from the impaired controller storage.

3

Replace the boot media

Remove the failed boot media from the System Management module and install the replacement boot media.

4

Restore the image on the boot media (automated boot recovery)

Restore the ONTAP image from the partner controller.

5

Return the failed part to NetApp

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

Boot media replace requirements - ASA A1K

Before replacing the boot media, make sure to review the following requirements.

- 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.
- There must be no faulty cluster ports on the impaired controller.

Shut down the impaired controller - ASA A1K

You need to complete the shutdown of the impaired controller. Shut down or take over 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.

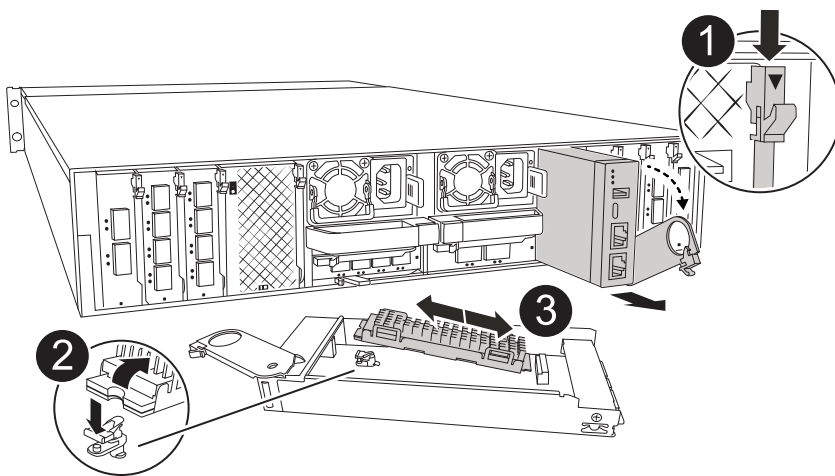
If the impaired controller is displaying...	Then...
System prompt or password prompt	Take over or halt the impaired controller from the healthy controller: <pre>storage failover takeover -ofnode impaired_node_name</pre> When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then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

Replace the boot media - ASA A1K

To replace the boot media, you must remove the System Management module from the back of the system, remove the impaired boot media, install the replacement boot media in the System Management module.

Steps

The boot media is located inside the System Management module and is accessed by removing the module from the system.



1	System Management module cam latch
2	Boot media locking button
3	Boot media

1. If you are not already grounded, properly ground yourself.
2. Unplug the power supply cables from the PSUs from the controller.



If your storage system has DC power supplies, disconnect the power cable block from the power supply units (PSUs).

- a. Remove any cables connected to the System Management module. Make sure that you label where

the cables were connected, so that you can connect them to the correct ports when you reinstall the module.

- b. Rotate the cable management tray down by pulling the buttons on both sides on the inside of the cable management tray and then rotate the tray down.
 - c. Depress the System Management cam button.
 - d. Rotate the cam latch down as far as it will go.
 - e. Remove the System Management module from the enclosure by hooking your finger into the cam lever opening and pulling the module out of the enclosure.
 - f. Place the System Management module on an anti-static mat, so that the boot media is accessible.
3. Remove the boot media from the management module:
 - a. Press the blue locking button.
 - b. Rotate the boot media up, slide it out of the socket, and set it aside.
 4. Install the replacement boot media into the System Management module:
 - a. Align the edges of the boot media with the socket housing, and then gently push it squarely into the socket.
 - b. Rotate the boot media down toward the locking button.
 - c. Push the locking button, rotate the boot media all the way down and then release the locking button.
 5. Reinstall the System Management module.
 - a. Align the module with the edges of the enclosure slot opening.
 - b. Gently slide the module into the slot all the way into the enclosure, and then rotate the cam latch all the way up to lock the module in place.
 6. Rotate the cable management tray up to the closed position.
 - a. Recable the System Management module.

Automated boot recovery - ASA A1K

Restore the ONTAP image from the partner node when the boot media is corrupted.

About this task

If a node's boot media is corrupted, the boot process will halt at the LOADER prompt and display boot error messages.

When you encounter these boot error messages, you need to restore the ONTAP image from the partner node.

Show example of boot error messages

```
Can't find primary boot device u0a.0
Can't find backup boot device u0a.1
ACPI RSDP Found at 0x777fe014

Starting AUTOBOOT press Ctrl-C to abort...
Could not load fat://boot0/X86_64/freebsd/image1/kernel: Device not
found

ERROR: Error booting OS on: 'boot0' file:
fat://boot0/X86_64/Linux/image1/vmlinuz (boot0, fat)
ERROR: Error booting OS on: 'boot0' file:
fat://boot0/X86_64/freebsd/image1/kernel (boot0, fat)

Autoboot of PRIMARY image failed. Device not found (-6)
LOADER-A>
```

Steps

1. From the LOADER prompt, enter the command:

```
boot_recovery -partner
```

The screen displays the following message:

```
Starting boot media recovery (BMR) process. Press Ctrl-C to abort...
```

2. Monitor the boot media recovery process as LOADER configures the local cluster ports and executes netboot from the partner node.

When netboot is running, the Starting BMR message displays.

3. Depending on the encryption method, select the option that matches your single-node configuration:

No Encryption

If no encryption is detected, the boot media recovery process continues without requiring key management.

Continue to monitor the recovery process as it restores the backup config, env file, mdb, and rdb from the partner node.

When the recovery process is complete, the node will reboot. The following messages indicate a successful recovery:

```
varfs_backup_restore: update checksum for varfs.tgz
varfs_backup_restore: restore using
/cfcard/x86_64/freebsd/oldvarfs.tgz
varfs_backup_restore: Rebooting to load the new varfs
.
Terminated
varfs_backup_restore: bootarg.abandon_varfs is set! Skipping /var
backup.
```

Onboard Key Manager (OKM)

If Onboard Key Manager (OKM) is detected, the system displays the following prompt.

```
key manager is configured.
Entering Bootmenu Option 10...

This option must be used only in disaster recovery procedures. Are
you sure? (y or n):
```

- a. From the Bootmenu Option prompt, enter `Y` to confirm you want to use the bootmedia recovery option.
- b. Enter the passphrase for onboard key manager when prompted, and enter the passphrase again to confirm.

Show example of passphrase prompts

```
Enter the passphrase for onboard key management:
Enter the passphrase again to confirm:
Enter the backup data:
TmV0QXBwIEtleSBCbG9iAAECAAAEAAAAcAEAAAAAAAAA3yR6UAAAAACEAAAAAAAA
AA
QAAAAAAAAACJz1u2AAAAAPX84XY5AU0p4Jcb9t8wiwOZoqyJPJ4L6/j5FHJ9yj
/w
RVDO1sZB1E4HO79/zYc82nBwtiHaSPWCbkCrMWuQQDsiAAAAAAAAACgAAAAAAA
AA
3WTh7gAAAAAAAAAAAAAAAAAIAAAAAAAGAZJEIWvdeHr5RCAvHGclo+wAAAAAAA
AA
IgAAAAAAAAoAAAAAAAAEOTcR0AAAAAAAAAAAAAAAAACAAAAAAAJAGr3tJA/LR
zU
QRHwv+1aWvAAAAAAAAAACQAAAAAAAAAgAAAAAAAAABHVFpxAAAAAHUgdVq0EK
Np
.
.
.
.
```

- c. Continue to monitor the recovery process as it restores the backup config, env file, mdb, and rdb from the partner node.

When the recovery process is complete, the node will reboot. The following messages indicate a successful recovery:

```
Trying to recover keymanager secrets....
Setting recovery material for the onboard key manager
Recovery secrets set successfully
Trying to delete any existing km_onboard.wkeydb file.

Successfully recovered keymanager secrets.
```

External Key Manager (EKM)

If EKM is configured, the system displays the following prompt.

```
Error when fetching key manager config from partner <IP>: 28

Has key manager been configured on this system? {y|n}
```

- a. Enter `y` if EKM has been configured.

```
key manager is configured.  
Entering Bootmenu Option 11...
```

You'll be prompted for the EKM settings that were initially used during setup.

b. Enter each EKM configuration setting when prompted.

c. Verify that the attributes for the Cluster UUID and the Keystore UUID are correct.

- On the partner node, retrieve the Cluster UUID using the following command.

```
cluster identity show
```

- On the partner node, retrieve the Keystore UUID using the following commands.

```
vserver show -type admin
```

```
key-manager keystore show -vserver <nodename>
```

- If the partner node is unavailable, use the Mroot-AK key to retrieve the UUID:

- For the Cluster UUID, enter the following command:

```
x-NETAPP-ClusterName: <cluster name>
```

- For the Keystore UUID, enter the following command:

```
x-NETAPP-KeyUsage: MROOT-AK
```

d. Enter the values for Keystore UUID and Cluster UUID when prompted.

e. Depending on whether the key is successfully restored, take one of the following actions:

- If the key is successfully restored, the recovery process continues and reboots the node. Proceed to step 4.
- If the key is not successfully restored, the system will halt and display error and warning messages. Rerun the recovery process.

Show example of key recovery error and warning messages

```
ERROR: kmip_init: halting this system with encrypted
mroot...

WARNING: kmip_init: authentication keys might not be
available.

System cannot connect to key managers.

ERROR: kmip_init: halting this system with encrypted
mroot...

Terminated

Uptime: 11m32s

System halting...

LOADER-B>
```

4. When the node reboots, verify the boot media recovery was successful by confirming that the system is back online and operational.
5. Return the impaired controller to normal operation by giving back its storage:

```
storage failover giveback -ofnode impaired_node_name.
```

6. If automatic giveback was disabled, reenable it:

```
storage failover modify -node local -auto-giveback true.
```

7. If AutoSupport is enabled, restore automatic case creation:

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

Return the failed part to NetApp - ASA A1K

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

Boot media - manual recovery

Overview of manual boot media recovery - ASA A1K

You can replace a failed boot media manually by using a USB module for the boot image.

Manual boot media replace uses the traditional method of downloading the ONTAP image from the NetApp support site, transferring the image to a USB drive, downloading it to the target replacement boot media, and manually walking through the boot menu options to install the ONTAP image on the replacement boot media.

Boot media replacement workflow - ASA A1K

Follow these workflow steps to replace your boot media.

1

Review the boot media requirements

To replace the boot media, you must meet certain requirements.

2

Check onboard encryption keys

Verify whether the system has security key manager enabled or encrypted disks.

3

Shut down the impaired controller

Shut down or take over the impaired controller so that the healthy controller continues to serve data from the impaired controller storage.

4

Replace the boot media

Remove the failed boot media from the System Management module and install the replacement boot media, and then transfer an ONTAP image using a USB flash drive to the replacement boot media.

5

Boot the recovery image

Boot the ONTAP image from the USB drive, restore the file system, and verify the environmental variables.

6

Restore encryption

Restore the onboard key manager configuration or the external key manager from the ONATP boot menu.

7

Return the failed part to NetApp

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

Boot media replace requirements - ASA A1K

Before replacing the boot media, make sure to review the following requirements.

- You must have a USB flash drive, formatted to FAT32, with the appropriate amount of storage to hold the

image_XXX.tgz file.

- You must copy the image_XXX.tgz file to the USB flash drive for later use in this procedure.
- You must replace the failed component with a replacement FRU component you received NetApp.
- 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 encryption key support and status - ASA A1K

Before shutting down the impaired controller, check if your version of ONTAP supports NetApp Volume Encryption (NVE) and if your key management system is properly configured.

Step 1: Check if your version of ONTAP supports NetApp Volume Encryption

Check whether your ONTAP version supports NetApp Volume Encryption (NVE). This information is crucial for downloading the correct ONTAP image.

1. Determine if your ONTAP version supports encryption by running the following command:

```
version -v
```

If the output includes 1Ono-DARE, NVE is not supported on your cluster version.

2. Depending on whether NVE is supported on your system, take one of the following actions:
 - If NVE is supported, download the ONTAP image with NetApp Volume Encryption.
 - If NVE is not supported, download the ONTAP image **without** NetApp Volume Encryption.

Step 2: Determine if it is safe to shut down the controller

To safely shut down a controller, first identify whether the External Key Manager (EKM) or the Onboard Key Manager (OKM) is active. Then, verify the key manager in use, display the appropriate key information, and take action based on the status of the authentication keys.

1. Determine which key manager is enabled on your system:

ONTAP version	Run this command
ONTAP 9.14.1 or later	<pre>security key-manager keystore show</pre> <ul style="list-style-type: none">• If EKM is enabled, EKM is listed in the command output.• If OKM is enabled, OKM is listed in the command output.• If no key manager is enabled, No key manager keystores configured is listed in the command output.

ONTAP version	Run this command
ONTAP 9.13.1 or earlier	<pre>security key-manager show-key-store</pre> <ul style="list-style-type: none"> • If EKM is enabled, <code>external</code> is listed in the command output. • If OKM is enabled, <code>onboard</code> is listed in the command output. • If no key manager is enabled, <code>No key managers configured</code> is listed in the command output.

2. Depending on whether a key manger is configured on your system, select one of the following options.

No key manager configured

You can safely shut down the impaired controller. Go to [shutdown the impaired controller](#).

External or Onboard key manager configured

- a. Enter the following query command to display the status of the authentication keys in your key manager.

```
security key-manager key query
```

- b. Check the output for the value in the `Restored` column for your key manager.

This column indicates whether the authentication keys for your key manager (either EKM or OKM) have been successfully restored.

3. Depending on whether your system is using the External Key Manager or Onboard Key Manager, select one of the following options.

External Key Manager

Depending on the output value displayed in the `Restored` column, follow the appropriate steps.

Output value in <code>Restored</code> column	Follow these steps...
<code>true</code>	You can safely shut down the impaired controller. Go to shutdown the impaired controller .
Anything other than <code>true</code>	<ol style="list-style-type: none">Restore the external key management authentication keys to all nodes in the cluster using the following command: <pre>security key-manager external restore</pre><p>If the command fails, contact NetApp Support.</p>Verify that the <code>Restored</code> column displays <code>true</code> for all authentication keys by entering the <code>security key-manager key query</code> command. If all the authentication keys are <code>true</code>, you can safely shut down the impaired controller. Go to shutdown the impaired controller.

Onboard Key Manager

Depending on the output value displayed in the `Restored` column, follow the appropriate steps.

Output value in <code>Restored</code> column	Follow these steps...
<code>true</code>	<p>Manually back up the OKM information.</p> <ol style="list-style-type: none">Go to the advanced mode by entering <code>set -priv advanced</code> and then enter <code>Y</code> when prompted.Enter the following command to display the key management information: <pre>security key-manager onboard show-backup</pre>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.You can safely shut down the impaired controller. Go to shutdown the impaired controller.

Output value in Restored column	Follow these steps...
Anything other than <code>true</code>	<p>a. Enter the onboard security key-manager sync command:</p> <pre>security key-manager onboard sync</pre> <p>b. Enter the 32 character, alphanumeric onboard key management passphrase when prompted.</p> <p>If the passphrase cannot be provided, contact NetApp Support.</p> <p>c. Verify the Restored column displays <code>true</code> for all authentication keys:</p> <pre>security key-manager key query</pre> <p>d. Verify that the Key Manager type displays <code>onboard</code>, and then manually back up the OKM information.</p> <p>e. Enter the command to display the key management backup information:</p> <pre>security key-manager onboard show-backup</pre> <p>f. Copy the contents of the backup information to a separate file or your log file.</p> <p>You'll need it in disaster scenarios where you might need to manually recover OKM.</p> <p>g. You can safely shut down the impaired controller. Go to shutdown the impaired controller.</p>

Shut down the impaired controller - ASA A1K

You need to complete the shutdown of the impaired controller. Shut down or take over 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:

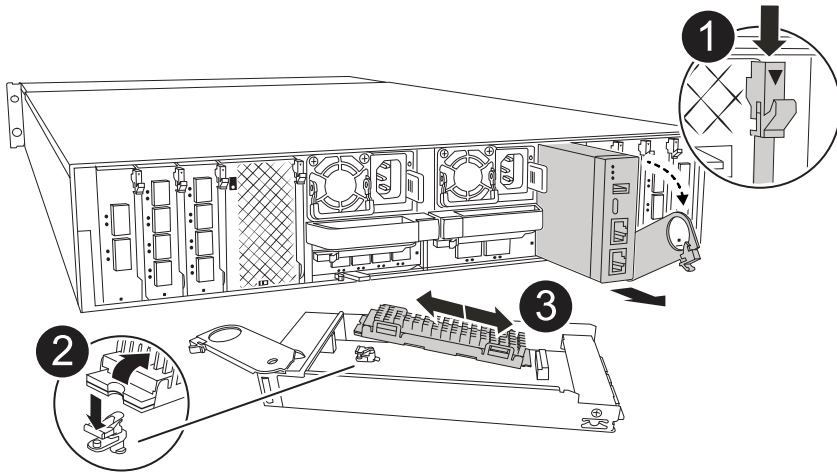
If the impaired controller is displaying...	Then...
The LOADER prompt	Go to the next step.
Waiting for giveback...	Press Ctrl-C, and then respond <code>y</code> when prompted.
System prompt or password prompt	Take over or halt the impaired controller from the healthy controller: <pre>storage failover 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 - ASA A1K

You must unplug the controller module, remove the System Management module from the back of the system, remove the impaired boot media, and install the replacement boot media in the System Management module.

Step 1: Replace the boot media

The boot media is located inside the System Management module and is accessed by removing the module from the system.



1	System Management module cam latch
2	Boot media locking button
3	Boot media

1. If you are not already grounded, properly ground yourself.
2. Unplug the power supply cables from the PSUs from the controller.



If your storage system has DC power supplies, disconnect the power cable block from the power supply units (PSUs).

- a. Remove any cables connected to the System Management module. Make sure that you label where the cables were connected, so that you can connect them to the correct ports when you reinstall the module.
 - b. Rotate the cable management tray down by pulling the buttons on both sides on the inside of the cable management tray and then rotate the tray down.
 - c. Depress the System Management cam button.
 - d. Rotate the cam latch down as far as it will go.
 - e. Remove the System Management module from the enclosure by hooking your finger into the cam lever opening and pulling the module out of the enclosure.
 - f. Place the System Management module on an anti-static mat, so that the boot media is accessible.
3. Remove the boot media from the management module:
 - a. Press the blue locking button.
 - b. Rotate the boot media up, slide it out of the socket, and set it aside.
 4. Install the replacement boot media into the System Management module:
 - a. Align the edges of the boot media with the socket housing, and then gently push it squarely into the socket.
 - b. Rotate the boot media down toward the locking button.
 - c. Push the locking button, rotate the boot media all the way down and then release the locking button.

5. Reinstall the System Management module.
 - a. Align the module with the edges of the enclosure slot opening.
 - b. Gently slide the module into the slot all the way into the enclosure, and then rotate the cam latch all the way up to lock the module in place.
6. Rotate the cable management tray up to the closed position.
 - a. Recable the System Management module.

Step 2: Transfer the ONTAP image to the boot media

The replacement boot media that you installed is without an ONTAP image. You can transfer the ONTAP image to the replacement boot media by downloading the appropriate ONTAP service image from the [NetApp Support Site](#) to a USB flash drive and then to the replacement boot media.

Before you begin

- You must have an empty USB flash drive, formatted to FAT32, with at least 4GB capacity.
- Download 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. Use the `version -v` command to display if your version of ONTAP supports NVE. If the command output displays `<10no- DARE>`, your version of ONTAP does not support NVE.
 - If NVE is supported by your version of ONTAP, download the image with NetApp Volume Encryption, as indicated in the download button.
 - If NVE is not supported, 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 between the node management ports of the controllers (typically the e0M interfaces).

Steps

1. Download and copy the appropriate service image from the [NetApp Support Site](#) to the USB flash drive.
 - a. Download the service image from the Downloads link on the page, 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.

The USB flash drive should have the appropriate ONTAP image of what the impaired controller is running.

- c. Remove the USB flash drive from your laptop.
2. Insert the USB flash drive into the USB slot on the System Management module.

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

3. Plug the power cables into the power supplies and reinstall the power cable retainer.

The controller begins to boot as soon as power is reconnected to the system.

4. 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.

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

- If you are configuring DHCP: `ifconfig e0M -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 e0M -addr=filer_addr -mask=netmask -gw=gateway`
 - `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.



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

Boot the recovery image - ASA A1K

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:

Option 1: ONTAP 9.16.0 or earlier

- a. On the impaired controller, press `Y` when you see `Do you want to restore the backup configuration now?`
- b. On the impaired controller, press `Y` when prompted to overwrite `/etc/ssh/ssh_host_ecdsa_key`.
- c. On the healthy partner controller, set the impaired controller to advanced privilege level: `set -privilege advanced`.
- d. On the healthy partner controller, run the restore backup command: `system node restore-backup -node local -target-address impaired_node_IP_address`.

NOTE: If you see any message other than a successful restore, contact [NetApp Support](#).

- e. On the healthy partner controller, return the impaired controller to admin level: `set -privilege admin`.
- f. On the impaired controller, press `Y` when you see `Was the restore backup procedure successful?`.
- g. On the impaired controller, press `Y` when you see `...would you like to use this restored copy now?`.
- h. On the impaired controller, press `Y` when prompted to reboot the impaired controller and press `ctrl-c` for the Boot Menu.
- i. If the system does not use encryption, select *Option 1 Normal Boot.*, otherwise go to [Restore key managers](#).

Option 2: ONTAP 9.16.1 or later

- a. On the impaired controller, press `Y` when prompted to restore the backup configuration.

After restore procedure is successful, this message will be seen on the console -
`syncflash_partner: Restore from partner complete.`

- b. On the impaired controller, press `Y` when prompted to confirm if the restore backup was successful.
- c. On the impaired controller, press `Y` when prompted to use the restored configuration.
- d. On the impaired controller, press `Y` when prompted to reboot the node.
- e. On the impaired controller, press `Y` when prompted to reboot the impaired controller and press `ctrl-c` for the Boot Menu.
- f. If the system does not use encryption, select *Option 1 Normal Boot.*, otherwise go to [Restore key managers](#).

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

NOTE: If the process fails, contact [NetApp Support](#).

Restore encryption - ASA A1K

Restore encryption on the replacement boot media.

You must complete steps specific to systems that have Onboard Key Manager (OKM), NetApp Storage Encryption (NSE) or NetApp Volume Encryption (NVE) enabled using the settings that you captured at the beginning of the boot media replace procedure.

Depending on which a key manger is configured on your system, select one of the following options to restore it from the boot menu.

- [Option 1: Restore the Onboard Key Manager configuration](#)
- [Option 2: Restore the External Key Manager configuration](#)

Option 1: Restore the Onboard Key Manager configuration

Restore the Onboard Key Manager (OKM) configuration from the ONTAP boot menu.

Before you begin

- Make sure you have following information while restoring the OKM configuration:
 - Cluster-wide passphrase entered [while enabling onboard key management](#).
 - [Backup information for the Onboard Key Manager](#).
- Perform the [How to verify onboard key management backup and cluster-wide passphrase](#) procedure before proceeding.

Steps

1. Connect the console cable to the target controller.
2. From the ONTAP boot menu select the appropriate option from the boot menu.

ONTAP version	Select this option
ONTAP 9.8 or later	<p data-bbox="621 153 833 191">Select option 10.</p> <p data-bbox="621 222 951 260">Show example boot menu</p> <div data-bbox="654 296 1455 1079" style="border: 1px solid #ccc; padding: 10px;"><p data-bbox="683 331 1295 369">Please choose one of the following:</p><ul data-bbox="683 411 1370 1010" style="list-style-type: none"><li data-bbox="683 411 980 449">(1) Normal Boot.<li data-bbox="683 453 1138 491">(2) Boot without /etc/rc.<li data-bbox="683 495 1049 533">(3) Change password.<li data-bbox="683 537 1370 606">(4) Clean configuration and initialize all disks.<li data-bbox="683 611 1154 648">(5) Maintenance mode boot.<li data-bbox="683 653 1330 690">(6) Update flash from backup config.<li data-bbox="683 695 1243 732">(7) Install new software first.<li data-bbox="683 737 980 774">(8) Reboot node.<li data-bbox="683 779 1192 848">(9) Configure Advanced Drive Partitioning.<li data-bbox="683 852 1333 921">(10) Set Onboard Key Manager recovery secrets.<li data-bbox="683 926 1317 995">(11) Configure node for external key management.<p data-bbox="683 1010 1032 1047">Selection (1-11)? 10</p></div>

ONTAP version	Select this option
ONTAP 9.7 and earlier	<p data-bbox="621 163 1365 195">Select the hidden option <code>recover_onboard_keymanager</code></p> <p data-bbox="621 233 948 264">Show example boot menu</p> <div data-bbox="654 306 1455 968" style="border: 1px solid #ccc; padding: 10px; background-color: #f9f9f9;"> <p data-bbox="683 342 1292 373">Please choose one of the following:</p> <ul style="list-style-type: none"> <li data-bbox="683 422 976 453">(1) Normal Boot. <li data-bbox="683 464 1133 495">(2) Boot without <code>/etc/rc</code>. <li data-bbox="683 506 1045 537">(3) Change password. <li data-bbox="683 548 1365 611">(4) Clean configuration and initialize all disks. <li data-bbox="683 621 1154 653">(5) Maintenance mode boot. <li data-bbox="683 663 1328 695">(6) Update flash from backup config. <li data-bbox="683 705 1240 737">(7) Install new software first. <li data-bbox="683 747 976 779">(8) Reboot node. <li data-bbox="683 789 1192 852">(9) Configure Advanced Drive Partitioning. <p data-bbox="683 863 980 894">Selection (1-19)?</p> <p data-bbox="683 905 1138 936"><code>recover_onboard_keymanager</code></p> </div>

3. Confirm that you want to continue the recovery process.

Show example prompt

```
This option must be used only in disaster recovery procedures. Are you
sure? (y or n):
```

4. Enter the cluster-wide passphrase twice.

While entering the passphrase the console will not show any input.

Show example prompt

```
Enter the passphrase for onboard key management:

Enter the passphrase again to confirm:
```

5. Enter the backup information.

- a. Paste the entire content from the BEGIN BACKUP line through the END BACKUP line.

Show example prompt

```
Trying to recover keymanager secrets....
Setting recovery material for the onboard key manager
Recovery secrets set successfully
Trying to delete any existing km_onboard.wkeydb file.

Successfully recovered keymanager secrets.

*****
*****
* Select option "(1) Normal Boot." to complete recovery process.
*
* Run the "security key-manager onboard sync" command to
synchronize the key database after the node reboots.
*****
*****
```



Do not proceed if the displayed output is anything other than `Successfully recovered keymanager secrets`. Perform troubleshooting to correct the error.

6. Select option 1 from the boot menu to continue booting into ONTAP.

Show example prompt

```
*****  
*****  
* Select option "(1) Normal Boot." to complete the recovery process.  
*  
*****  
*****  
  
(1) Normal Boot.  
(2) Boot without /etc/rc.  
(3) Change password.  
(4) Clean configuration and initialize all disks.  
(5) Maintenance mode boot.  
(6) Update flash from backup config.  
(7) Install new software first.  
(8) Reboot node.  
(9) Configure Advanced Drive Partitioning.  
(10) Set Onboard Key Manager recovery secrets.  
(11) Configure node for external key management.  
Selection (1-11)? 1
```

7. Confirm that the controller's console displays the following message.

```
Waiting for giveback...(Press Ctrl-C to abort wait)
```

8. From the partner node, giveback the partner controller by entering the following command.

```
storage failover giveback -fromnode local -only-cfo-aggregates true.
```

9. After booting with only the CFO aggregate, run the following command.

```
security key-manager onboard sync
```

10. Enter the cluster-wide passphrase for the Onboard Key Manager.

Show example prompt

```
Enter the cluster-wide passphrase for the Onboard Key Manager:
```

```
All offline encrypted volumes will be brought online and the
corresponding volume encryption keys (VEKs) will be restored
automatically within 10 minutes. If any offline encrypted volumes
are not brought online automatically, they can be brought online
manually using the "volume online -vserver <vserver> -volume
<volume_name>" command.
```



If the sync is successful the cluster prompt is returned with no additional messages. If the sync fails an error message appears before returning to the cluster prompt. Do not continue until the error is corrected and the sync runs successfully.

11. Ensure that all keys are synced by entering the following command.

```
security key-manager key query -restored false.
```

```
There are no entries matching your query.
```



No results should appear when filtering for false in the restored parameter.

12. Giveback the node from the partner by entering the following command.

```
storage failover giveback -fromnode local
```

13. Restore automatic giveback, if you disabled it, by entering the following command.

```
storage failover modify -node local -auto-giveback true
```

14. If AutoSupport is enabled, restore automatic case creation by entering the following command.

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

Option 2: Restore the External Key Manager configuration

Restore the External Key Manager configuration from the ONTAP boot menu.

Before you begin

You need the following information for restoring the External Key Manager (EKM) configuration.

- A copy of the `/cfcard/kmip/servers.cfg` file from another cluster node or the following information:
 - The KMIP server address.
 - The KMIP port.
- A copy of the `/cfcard/kmip/certs/client.crt` file from another cluster node or the client certificate.

- A copy of the `/cfcard/kmip/certs/client.key` file from another cluster node or the client key.
- A copy of the `/cfcard/kmip/certs/CA.pem` file from another cluster node or the KMIP server CA(s).

Steps

1. Connect the console cable to the target controller.
2. Select option 11 from the ONTAP boot menu.

Show example boot menu

```
(1) Normal Boot.
(2) Boot without /etc/rc.
(3) Change password.
(4) Clean configuration and initialize all disks.
(5) Maintenance mode boot.
(6) Update flash from backup config.
(7) Install new software first.
(8) Reboot node.
(9) Configure Advanced Drive Partitioning.
(10) Set Onboard Key Manager recovery secrets.
(11) Configure node for external key management.
Selection (1-11)? 11
```

3. When prompted, confirm you have gathered the required information.

Show example prompt

```
Do you have a copy of the /cfcard/kmip/certs/client.crt file? {y/n}
Do you have a copy of the /cfcard/kmip/certs/client.key file? {y/n}
Do you have a copy of the /cfcard/kmip/certs/CA.pem file? {y/n}
Do you have a copy of the /cfcard/kmip/servers.cfg file? {y/n}
```

4. When prompted, enter the client and server information.

Show prompt

```
Enter the client certificate (client.crt) file contents:
Enter the client key (client.key) file contents:
Enter the KMIP server CA(s) (CA.pem) file contents:
Enter the server configuration (servers.cfg) file contents:
```

Show example

```
Enter the client certificate (client.crt) file contents:
-----BEGIN CERTIFICATE-----
MIIDvjCCAqagAwIBAgICN3gwDQYJKoZIhvcNAQELBQAwY8xCzAJBgNVBAYTAlVT
MRMwEQYDVQQLIEwpcDYWxpZm9ybmlhMQwwCgYDVQQHEwNTVkwxDzANBgNVBAoTBk5l
MSUubQusvzAFs8G3P54GG32iIRvaCFnj2gQpCxcilJ0qB2foiBGx5XVQ/Mtk+rlap
Pk4ECW/wqSOUXDYtJs1+RB+w0+SHx8mzxpzbz3mXF/X/1PC3YOzVNCq5eieek62si
Fp8=
-----END CERTIFICATE-----

Enter the client key (client.key) file contents:
-----BEGIN RSA PRIVATE KEY-----
<key_value>
-----END RSA PRIVATE KEY-----

Enter the KMIP server CA(s) (CA.pem) file contents:
-----BEGIN CERTIFICATE-----
MIIEizCCA3OgAwIBAgIBADANBgkqhkiG9w0BAQsFADCBjzELMAkGA1UEBhMCVVMx
7yaumMQETNrpMfP+nQMd34y4AmseWYGM6qG0z37BRnYU0Wf2qDL61cQ3/jkm7Y94
EQBKG1NY8dVyjphmYZv+
-----END CERTIFICATE-----

Enter the IP address for the KMIP server: 10.10.10.10
Enter the port for the KMIP server [5696]:

System is ready to utilize external key manager(s).
Trying to recover keys from key servers....
kmip_init: configuring ports
Running command '/sbin/ifconfig e0M'
..
..
kmip_init: cmd: ReleaseExtraBSDPort e0M
```

After you enter the client and server information, the recovery process completes.

Show example

```
System is ready to utilize external key manager(s).
Trying to recover keys from key servers....
[Aug 29 21:06:28]: 0x808806100: 0: DEBUG: kmip2::main:
[initOpenssl]:460: Performing initialization of OpenSSL
Successfully recovered keymanager secrets.
```

5. Select option 1 from the boot menu to continue booting into ONTAP.

Show example prompt

```
*****
*****
* Select option "(1) Normal Boot." to complete the recovery process.
*
*****
*****

(1) Normal Boot.
(2) Boot without /etc/rc.
(3) Change password.
(4) Clean configuration and initialize all disks.
(5) Maintenance mode boot.
(6) Update flash from backup config.
(7) Install new software first.
(8) Reboot node.
(9) Configure Advanced Drive Partitioning.
(10) Set Onboard Key Manager recovery secrets.
(11) Configure node for external key management.
Selection (1-11)? 1
```

6. Restore automatic giveback, if you disabled it, by entering the following command.

```
storage failover modify -node local -auto-giveback true
```

7. If AutoSupport is enabled, restore automatic case creation by entering the following command.

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

Return the failed part to NetApp - ASA A1K

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

Controller

Controller replacement workflow - ASA A1K

Follow these workflow steps to replace your controller module.

1

Review controller replacement requirements

To replace the controller module, you must meet certain requirements.

2

Shut down the impaired controller

Shut down or take over the impaired controller so that the healthy controller continues to serve data from the impaired controller storage.

3

Replace the controller

Replacing the controller includes removing the impaired controller, moving the FRU components to the replacement controller module, and then installing the replacement controller module in the enclosure.

4

Restore and verify the system configuration

Verify the low-level system configuration of the replacement controller and reconfigure system settings as necessary.

5

Give back the controller

Transfer the ownership of storage resources back to the replacement controller.

6

Complete controller replacement

Verify the Lifs, check cluster health, and return the failed part to NetApp.

Controller replace requirements - ASA A1K

Review the requirements for the controller 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 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.
- Because the boot device is located on the System Management module that is installed in the back of the system, you do not need to move the boot device when replacing a 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 log 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 - ASA A1K

Shut down or take over 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	Take over or halt the impaired controller from the healthy controller: <pre>storage failover takeover -ofnode impaired_node_name</pre> When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i> .

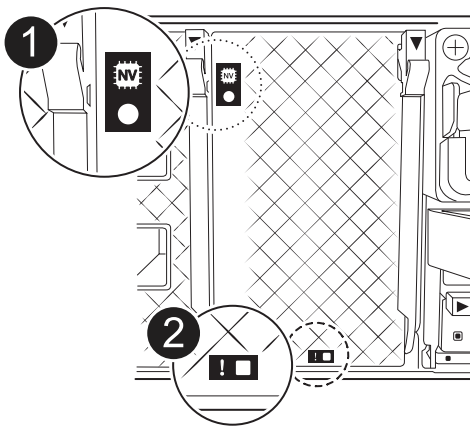
Replace the controller module hardware - ASA A1K

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

Step 1: Remove the controller module

You must remove the controller module from the enclosure when you replace the controller module or replace a component inside the controller module.

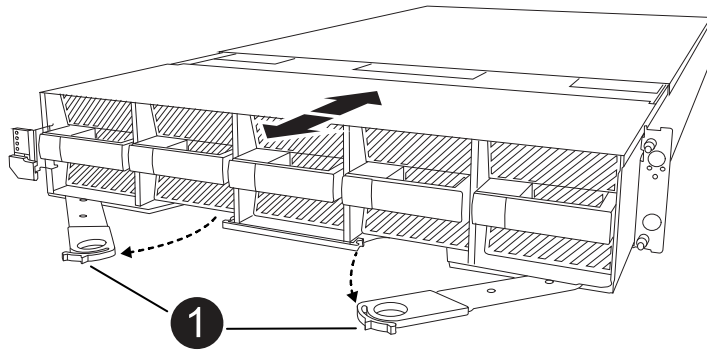
1. Check the NVRAM status LED located in slot 4/5 of the system. There is also an NVRAM LED on the front panel of the controller module. Look for the NV icon:



1	NVRAM status LED
2	NVRAM attention LED

- If the NV LED is off, go to the next step.
 - If the NV LED is flashing, wait for the flashing to stop. If flashing continues for longer than 5 minutes, contact Technical Support for assistance.
2. If you are not already grounded, properly ground yourself.
 3. On the front of the unit, hook your fingers into the holes in the locking cams, squeeze the tabs on the cam levers, and gently, but firmly rotate both latches toward you at the same time.

The controller module moves slightly out of the enclosure.



1	Locking cam latches
----------	---------------------

4. Slide the controller module out of the enclosure and place it on a flat, stable surface.

Make sure that you support the bottom of the controller module as you slide it out of the enclosure.

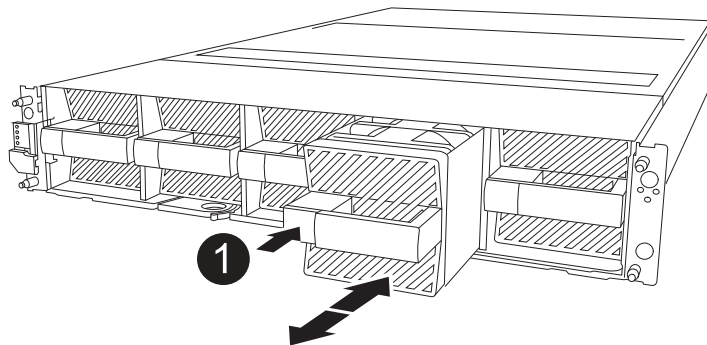
Step 2: Move the fans

You must remove the five fan modules from the impaired controller module to the replacement controller module.

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 the gray locking 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	Black locking button
----------	----------------------

4. Install the fan in the replacement controller module:

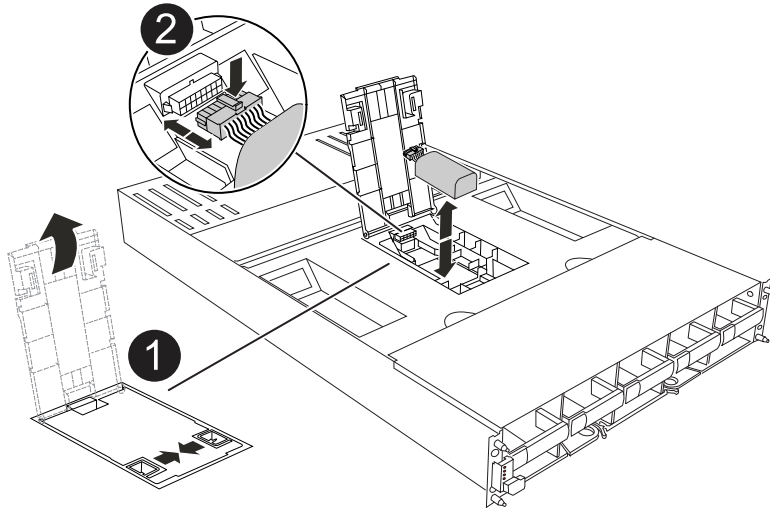
- a. Align the edges of the fan housing with the opening in the front of the replacement controller module.

- b. Gently slide the fan module all the way into the replacement controller module until it locks in place.
- 5. Repeat the preceding steps for the remaining fan modules.

Step 3: Move the NV battery

Move the NV battery to the replacement controller.

1. Open the NV battery air duct cover and locate the NV battery.



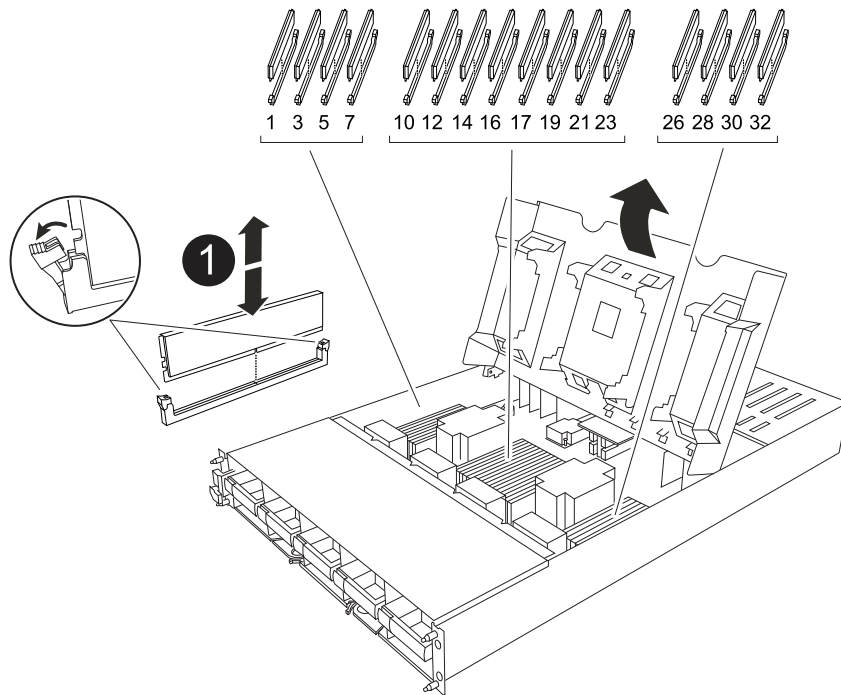
1	NV battery air duct cover
2	NV battery plug
3	NV battery pack

2. Lift the battery up to access the battery plug.
3. 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. Lift the battery out of the air duct and controller module.
5. Move the battery pack to the replacement controller module and then install it in the NV battery air duct:
 - a. Open the NV battery air duct in the replacement controller module.
 - b. Plug the battery plug into the socket and make sure that the plug locks into place.
 - c. Insert the battery pack into the slot and press firmly down on the battery pack to make sure that it is locked into place.
 - d. Close the air duct cover.

Step 4: Move system DIMMs

Move the DIMMs to the replacement controller module.

1. Open the motherboard air duct and locate the DIMMs.



1	System DIMM
----------	-------------

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.

4. Locate the slot where you are installing the DIMM in the replacement controller module.
5. 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. 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.
7. Repeat these steps for the remaining DIMMs. Close the motherboard air duct.

Step 5: Install the controller module

Reinstall the controller module and boot it.

1. Ensure the air duct is completely closed by rotating it down as far as it will go.

It must lie flush against the controller module sheet metal.

2. Align the end of the controller module with the opening in the enclosure, and slide the controller module into the chassis with the levers rotated away from the front of the system.
3. Once the controller module stops you from sliding it farther, rotate the cam handles inward until they latch back under the fans



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



The controller boots to the LOADER prompt as soon as it is fully seated.

4. From the LOADER prompt, enter `show date` to display the date and time on the replacement controller. Date and time are in GMT.



Time displayed is local time not always GMT and is displayed in 24hr mode.

5. Set the current time in GMT with the `set time hh:mm:ss` command. You can get the current GMT from the partner node the ``date -u`` command.
6. Recable the storage system, as needed.

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

Restore and verify the system configuration - ASA A1K

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

Step 1: Verify HA config settings

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

1. Boot to maintenance mode: `boot_ontap maint`
 - a. Enter `y` when you see *Continue with boot?*.

If you see the *System ID mismatch* warning message, enter `y`.

2. Enter `sysconfig -v` and capture the display contents.



if you see *PERSONALITY MISMATCH* contact customer support.

3. From the `sysconfig -v` output, compare the adapter card information with the cards and locations in the replacement controller.
4. Verify that all components display the same HA state: `ha-config show`

The HA state should be the same for all components.

5. 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` (not supported)
- `mccip` (not supported in ASA systems)
- `non-ha` (not supported)

6. 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`

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

Step 2: Verify disk list

1. Verify that the adapter lists the paths to all disks with the `storage show disk -p`.

If you see any issues, check cabling and reseal cables.

2. Exit Maintenance mode: `halt`.

Give back the controller - ASA A1K

Verify the storage and network connections, and then give back the controller.

Give back the controller

Reset encryption if enabled and return the controller to normal operation.

No encryption

1. From the LOADER prompt, enter `boot_ontap`.
2. Press <enter> when console messages stop.
 - If you see the *login* prompt, go to the next step at the end of this section.
 - If you see *Waiting for giveback*, press the <enter> key, log into the partner node, and then go to the next step at the end of this section.
3. Return the impaired controller to normal operation by giving back its storage: `storage failover giveback -ofnode impaired_node_name`.
4. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`.
5. If AutoSupport is enabled, restore/unsuppress automatic case creation: `system node autosupport invoke -node * -type all -message MAINT=END`.

Onboard encryption (OKM)

1. From the LOADER prompt, enter `boot_ontap maint`.
2. Check the TMP firmware version with the `sysconfig -v` command.
 - If version is less than 5.63, contact [NetApp Support](#).
 - If the version is more than 5.63, exit to the LOADER prompt: `halt`.
3. Boot to the ONTAP menu from the LOADER prompt `boot_ontap menu` and select option 10.
4. Enter the OKM passphrase. You can get this passphrase from the customer, or contact [NetApp Support](#).



You will be prompted twice for the passphrase.

5. Enter the backup key data when prompted.
6. At the boot menu, enter option 1 for normal boot.
7. Press <enter> when *Waiting for giveback* is displayed.
8. Move the console cable to the partner node and login as `admin`.
9. Ensure any core dumps on the repaired node are saved by going to advanced mode" `set -privilege advanced` and then run `local partner savecore`.
10. Return to admin lever: `set privilege admin`.
11. Give back only the CFO aggregates (the root aggregate): `storage failover giveback -fromnode local -only-cfo-aggregates true`
 - If you encounter errors, contact [NetApp Support](#).
12. Wait 5 minutes after the giveback report completes, and check failover status and giveback status: `storage failover show` and `storage failover show-giveback`.
13. Move the console cable to the replacement node and enter `security key-manager onboard sync`



You will be prompted for the cluster-wide passphrase of OKM for the cluster.

14. Check status of the keys with the following command: `security key-manager key query -key -type svm-KEK`.

If the *Restored* column shows anything but *true*, contact [NetApp Support](#).

15. Return the impaired controller to normal operation by giving back its storage: `storage failover giveback -ofnode impaired_node_name`.

16. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`.

17. If AutoSupport is enabled, restore/unsuppress automatic case creation: `system node autosupport invoke -node * -type all -message MAINT=END`.

External key manager (EKM)

1. If the root volume is encrypted with External Key Manager and the console cable is connected to the replacement node, enter `boot_ontap` menu and select option 11.

2. Answer *y* or *n* to the following questions:

Do you have a copy of the `/cfcard/kmip/certs/client.crt` file? {y/n}

Do you have a copy of the `/cfcard/kmip/certs/client.key` file? {y/n}

Do you have a copy of the `/cfcard/kmip/certs/CA.pem` file? {y/n}

OR

Do you have a copy of the `/cfcard/kmip/servers.cfg` file? {y/n}

Do you know the KMIP server address? {y/n}

Do you know the KMIP port? {y/n}



Contact [NetApp Support](#) if you have issues.

3. Supply the information for:

- The client certificate (`client.crt`) file contents.
- The client key (`client.key`) file contents.
- The KMIP server CA(s) (`CA.pem`) file contents.
- The IP address for the KMIP server.
- The port for the KMIP server.

4. Once the system processes, you will see the Boot Menu. Select '1' for normal boot.

5. Check the takeover status: `storage failover show`.

6. Ensure any core dumps on the repaired node are saved by going to advanced mode" `set -privilege advanced` and then run `local partner savecore`.

7. Return the impaired controller to normal operation by giving back its storage: `storage failover giveback -ofnode impaired_node_name`.

8. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`.

```
9. If AutoSupport is enabled, restore/unsuppress automatic case creation: system node
   autosupport invoke -node * -type all -message MAINT=END.
```

Complete controller replacement - ASA A1K

To restore your system to full operation, you must verify the LIFs, check cluster health, and return the failed part to NetApp.

Step 1: Verify LIFs and and check cluster health

Before returning the *replacement* node to service, you should verify that the LIFs are on their home ports, check the cluster health, 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. Check the health of your cluster. See the [How to perform a cluster health check with a script in ONTAP KB](#) article for more information.
3. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`

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 and Replacements](#) page for further information.

Replace a DIMM - ASA A1K

You must replace a DIMM in the controller when your storage system encounters errors such as, excessive CECC (Correctable Error Correction Codes) errors that are based on Health Monitor alerts or uncorrectable ECC errors, typically caused by a single DIMM failure preventing the storage system from booting ONTAP.

Before you begin

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.

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*.

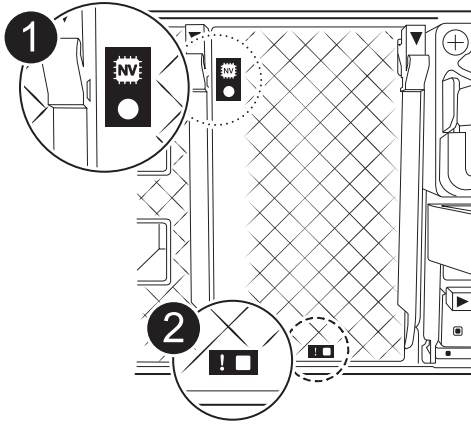
3. Take the impaired controller to the LOADER prompt:

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: <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 enclosure when you replace the controller module or replace a component inside the controller module.

1. Check the NVRAM status LED located in slot 4/5 of the system. There is also an NVRAM LED on the front panel of the controller module. Look for the NV icon:

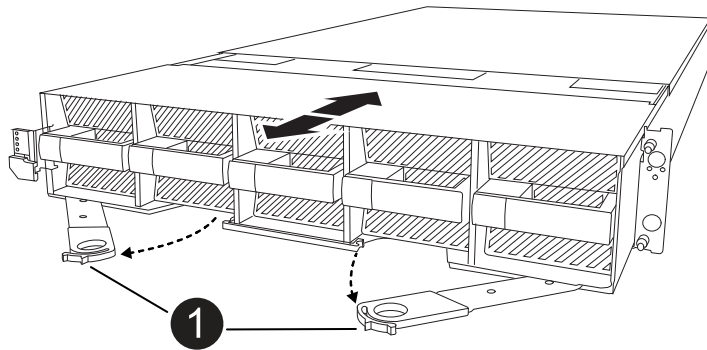


1	NVRAM status LED
2	NVRAM attention LED

- If the NV LED is off, go to the next step.
- If the NV LED is flashing, wait for the flashing to stop. If flashing continues for longer than 5 minutes, contact Technical Support for assistance.

2. If you are not already grounded, properly ground yourself.
3. On the front of the unit, hook your fingers into the holes in the locking cams, squeeze the tabs on the cam levers, and gently, but firmly rotate both latches toward you at the same time.

The controller module moves slightly out of the enclosure.



1	Locking cam latches
---	---------------------

4. Slide the controller module out of the enclosure and place it on a flat, stable surface.

Make sure that you support the bottom of the controller module as you slide it out of the enclosure.

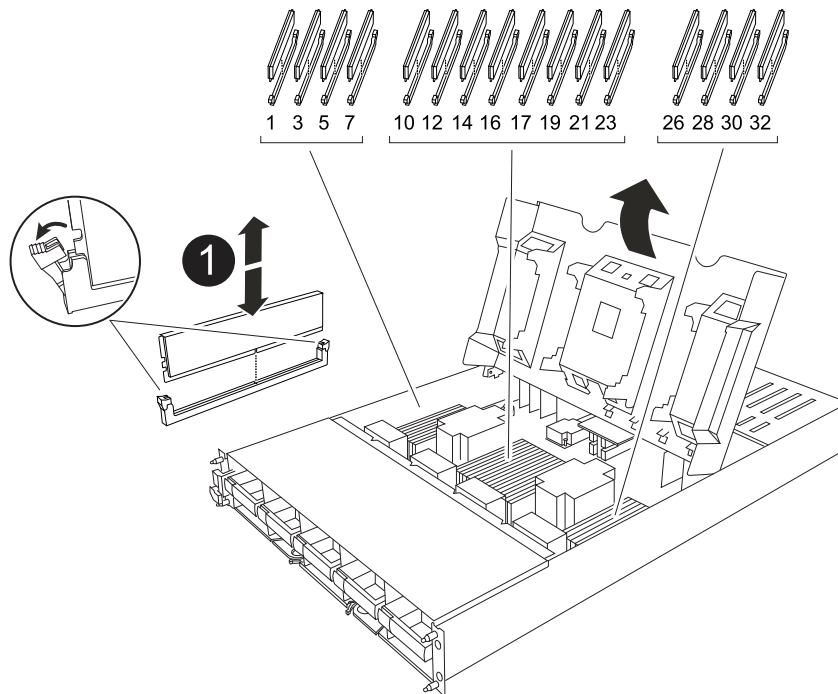
Step 3: Replace a DIMM

You must replace a DIMM when the system reports a permanent failure condition for that DIMM.

1. If you are not already grounded, properly ground yourself.
2. Open the controller air duct on the top of the controller.
 - a. Insert your fingers in the recesses at the far ends of the air duct.
 - b. Lift the air duct and rotate it upward as far as it will go.
3. Locate the DIMMs on your controller module and identify the DIMM for replacement.
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.



1

DIMM and DIMM ejector tabs

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 controller air duct.

Step 4: Install the controller

Reinstall the controller module and boot it.

1. Ensure the air duct is completely closed by rotating it down as far as it will go.

It must lie flush against the controller module sheet metal.

2. Align the end of the controller module with the opening in the enclosure, and slide the controller module into the chassis with the levers rotated away from the front of the system.
3. Once the controller module stops you from sliding it farther, rotate the cam handles inward until they latch back under the fans



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

The controller module begins to boot as soon as it is fully seated in the enclosure.

4. Return the impaired 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`.
6. If AutoSupport is enabled, restore/unsuppress automatic case creation: `system node autosupport invoke -node * -type all -message MAINT=END`.

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 and Replacements](#) page for further information.

Replace a fan - ASA A1K

To replace a fan module without interrupting service, you must perform a specific sequence of tasks.

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.

Facing the controller module, fan modules are numbered 1 through 5, from left to right.

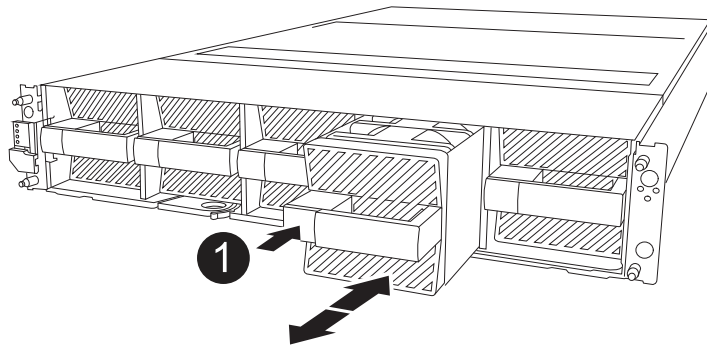


There is a single LED for each fan. It is green when the fan is functioning correctly and amber when not.

4. Press the black 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.



	Black 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 turns off once the fan is recognized by that system.

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 and Replacements](#) page for further information.

Replace NVRAM - ASA A1K

The NVRAM module consists of the NVRAM12 hardware and field-replaceable DIMMs. You can replace a failed NVRAM module or the DIMMs inside the NVRAM module. To replace a failed NVRAM module, you must remove the module from the enclosure, move the DIMMs to the replacement module, and install the replacement NVRAM module into the enclosure.

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

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:

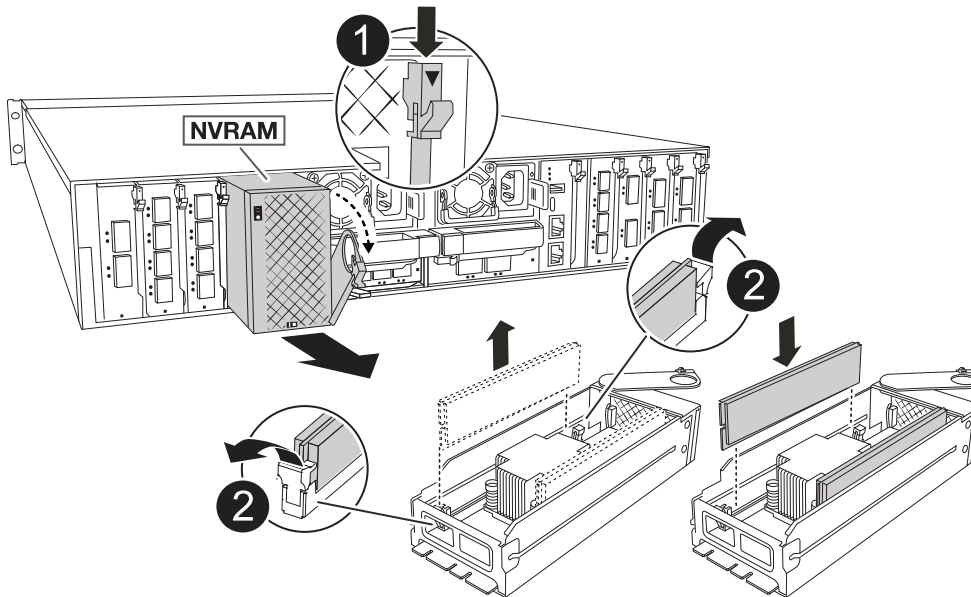
If the impaired controller is displaying...	Then...
The LOADER prompt	Go to the next step.
Waiting for giveback...	Press Ctrl-C, and then respond <code>y</code> when prompted.
System prompt or password prompt	Take over or halt the impaired controller from the healthy controller: <pre>storage failover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

Step 2: Replace the NVRAM module

To replace the NVRAM module, locate it in slot 4/5 in the enclosure and follow the specific sequence of steps.

1. If you are not already grounded, properly ground yourself.
2. Unplug the power cord from both PSUs.
3. Rotate the cable management tray down by gently pulling the pins on the ends of the tray and rotating the tray down.
4. Remove the impaired NVRAM module from the enclosure:

- a. Depress the locking cam button.
- b. Rotate the cam latch down as far as it will go.
- c. Remove the impaired NVRAM module from the enclosure by hooking your finger into the cam lever opening and pulling the module out of the enclosure.



1	Cam locking button
2	DIMM locking tabs

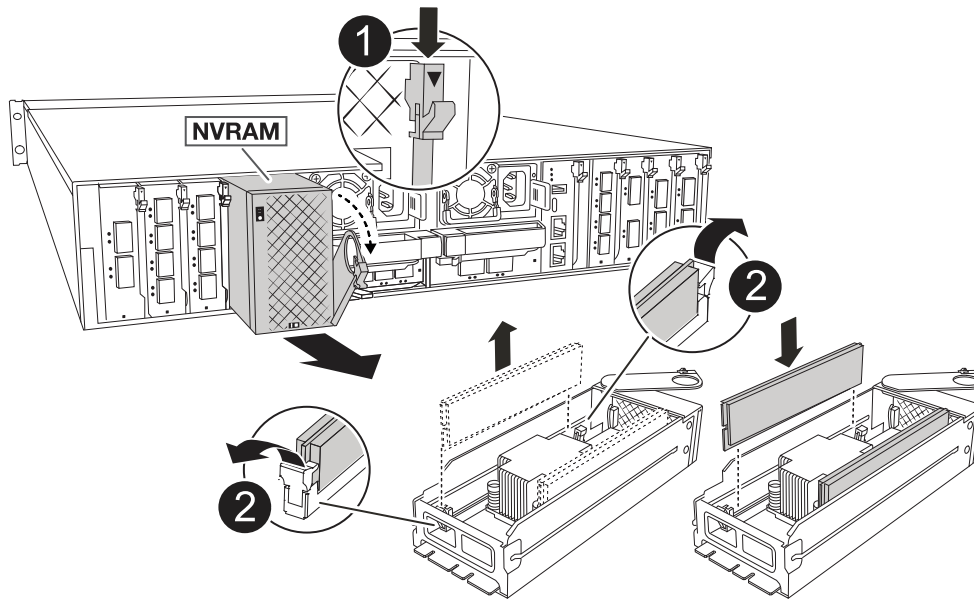
5. Set the NVRAM module on a stable surface.
6. Remove the DIMMs, one at a time, from the impaired NVRAM module and install them in the replacement NVRAM module.
7. Install the replacement NVRAM module into the enclosure:
 - a. Align the module with the edges of the enclosure opening in slot 4/5.
 - b. Gently slide the module into the slot all the way, and then rotate the cam latch all the way up to lock the module in place.
8. Recable the PSUs.
9. Rotate the cable management tray up to the closed position.

Step 3: Replace a NVRAM DIMM

To replace NVRAM DIMMs in the NVRAM module, you must remove the NVRAM module, and then replace the target DIMM.

1. If you are not already grounded, properly ground yourself.
2. Unplug the power cord from both PSUs.
3. Rotate the cable management tray down by gently pulling the pins on the ends of the tray and rotating the tray down.

4. Remove the target NVRAM module from the enclosure.



1	Cam locking button
2	DIMM locking tabs

5. Set the NVRAM module on a stable surface.

6. Locate the DIMM to be replaced inside the NVRAM module.



Consult the FRU map label on the side of the NVRAM module to determine the locations of DIMM slots 1 and 2.

7. Remove the DIMM by pressing down on the DIMM locking tabs and lifting the DIMM out of the socket.

8. 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.

9. Install the NVRAM module into the enclosure:

- a. Gently slide the module into the slot until the cam latch begins to engage with the I/O cam pin, and then rotate the cam latch all the way up to lock the module in place.

10. Recable the PSUs.

11. Rotate the cable management tray up to the closed position.

Step 4: Reboot the controller

After you replace the FRU, you must reboot the controller module.

1. To boot ONTAP from the LOADER prompt, enter *bye*.

Step 5: Verify controller state

You must confirm the controller state of the controllers connected to the disk pool when you boot the controller.

Steps

1. If the 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 controller, boot the controller and enter `y` when prompted to override the system ID due to a system ID mismatch.
3. Wait until the `Waiting for giveback...` message is displayed on the console of the controller with the replacement module and then, from the healthy controller, verify the system state: `storage failover show`

In the command output, you should see a message indicates the state of the controllers.

```
Node                Partner                Takeover
-----                -
Possible State Description
-----
<nodename>
                <nodename>-    true    Connected to <nodename>-P2-3-178.
                P2-3-178                Waiting for cluster applications
to
                come online on the local node.
AFF-A90-NBC-P2-3-178
                <nodename>-    true    Connected to <nodename>-P2-3-177,
                P2-3-177                Partial giveback
2 entries were displayed.
```

4. Give back the controller:
 - a. From the healthy controller, give back the replaced controller's storage: `storage failover giveback -ofnode replacement_node_name`

The controller connects back its storage pool 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.

For more information, see the [Manual giveback commands](#) topic to override the veto.

- b. After the giveback has been completed, confirm that the HA pair is healthy and that takeover is possible: `storage failover show`
5. Verify that the disks that the disk pools are as expected: `storage disk show -ownership`

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

Disk	Aggregate	Home Owner	DR Home	Home ID	Owner ID
DR Home ID	Reserver	Pool			

1.0.0	pod_NVME_SSD_1				
0 0	- 0	Pool0			
1.0.1	pod_NVME_SSD_1				
0 0	- 0	Pool0			
1.0.2	pod_NVME_SSD_1				
0 0	- 0	Pool0			

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 and Replacements](#) page for further information.

Replace the NV Battery - ASA A1K

To replace the NV 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 impaired controller

Shut down or take over 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*.

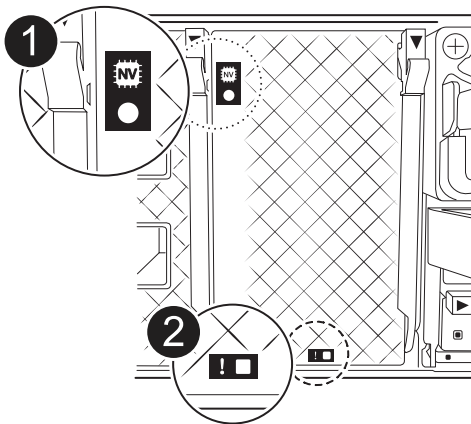
3. Take the impaired controller to the LOADER prompt:

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: <code>storage failover takeover -ofnode impaired_node_name</code> 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 enclosure when you replace the controller module or replace a component inside the controller module.

1. Check the NVRAM status LED located in slot 4/5 of the system. There is also an NVRAM LED on the front panel of the controller module. Look for the NV icon:



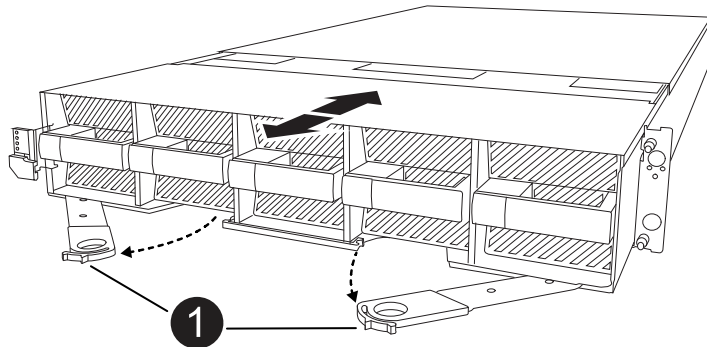
1	NVRAM status LED
----------	------------------

2**NVRAM attention LED**

- If the NV LED is off, go to the next step.
- If the NV LED is flashing, wait for the flashing to stop. If flashing continues for longer than 5 minutes, contact Technical Support for assistance.

2. If you are not already grounded, properly ground yourself.
3. On the front of the unit, hook your fingers into the holes in the locking cams, squeeze the tabs on the cam levers, and gently, but firmly rotate both latches toward you at the same time.

The controller module moves slightly out of the enclosure.

**1****Locking cam latches**

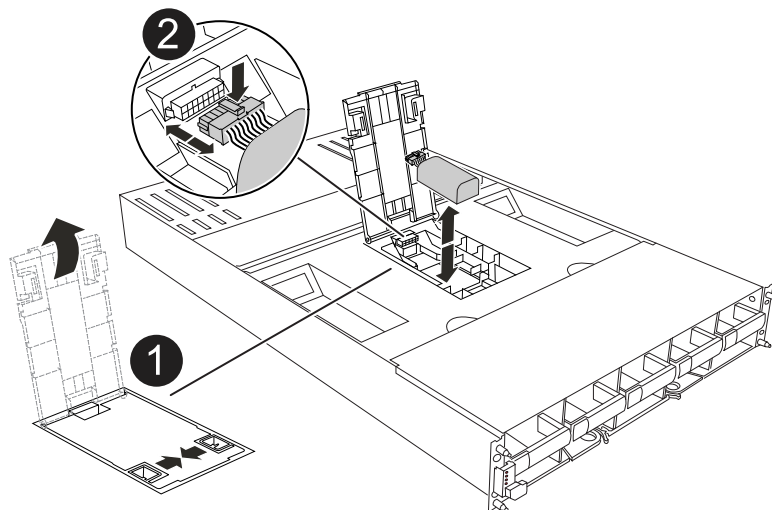
4. Slide the controller module out of the enclosure and place it on a flat, stable surface.

Make sure that you support the bottom of the controller module as you slide it out of the enclosure.

Step 3: Replace the NV battery

Remove the failed NV battery from the controller module and install the replacement NV battery.

1. Open the air duct cover and locate the NV battery.



1	NV battery air duct cover
2	NV battery plug

2. Lift the battery up to access the battery plug.
3. 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. Lift the battery out of the air duct and controller module, and then set it aside.
5. Remove the replacement battery from its package.
6. Install the replacement battery pack into the controller:
 - a. Plug the battery plug into the riser socket and make sure that the plug locks into place.
 - b. Insert the battery pack into the slot and press firmly down on the battery pack to make sure that it is locked into place.
7. Close the NV air duct cover.

Make sure that the plug locks into the socket.

Step 4: Reinstall the controller module

Reinstall the controller module and boot it.

1. Ensure the air duct is completely closed by rotating it down as far as it will go.

It must lie flush against the controller module sheet metal.
2. Align the end of the controller module with the opening in the enclosure, and slide the controller module into the chassis with the levers rotated away from the front of the system.
3. Once the controller module stops you from sliding it farther, rotate the cam handles inward until they latch back under the fans



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

The controller module begins to boot as soon as it is fully seated in the enclosure.

4. Return the impaired 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`.
6. If AutoSupport is enabled, restore/unsuppress automatic case creation: `system node autosupport invoke -node * -type all -message MAINT=END`.

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](#)

and [Replacements](#) page for further information.

I/O module

Overview of add and replace I/O module - ASA A1K

You can replace a failed I/O module in your storage system with the same type of I/O module, or with a different kind of I/O module. You can also add an I/O module into a system with empty slots.

- [Add an I/O module](#)

Adding additional modules can improve redundancy, helping to ensure that the system remains operational even if one module fails.

- [Replace an I/O module](#)

Replacing a failing I/O module can restore the system to its optimal operating state.

Add I/O module - ASA A1K

You can add an I/O module to your storage system by either adding a new I/O module into a storage system with empty slots or by replacing an I/O module with a new one in a fully-populated storage system.

Before you begin

- Check the [NetApp Hardware Universe](#) to make sure that the new I/O module is compatible with your storage 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.
- Make sure that all other components are functioning properly.

Option 1: Add an I/O module to a storage system with empty slots

You can add an I/O module into an empty module slot in your storage system.

Step 1: Shut down the impaired controller module

Shut down or take over the impaired controller module.

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; see [Synchronize a node with the cluster](#).

Steps

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

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

The following AutoSupport command 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:

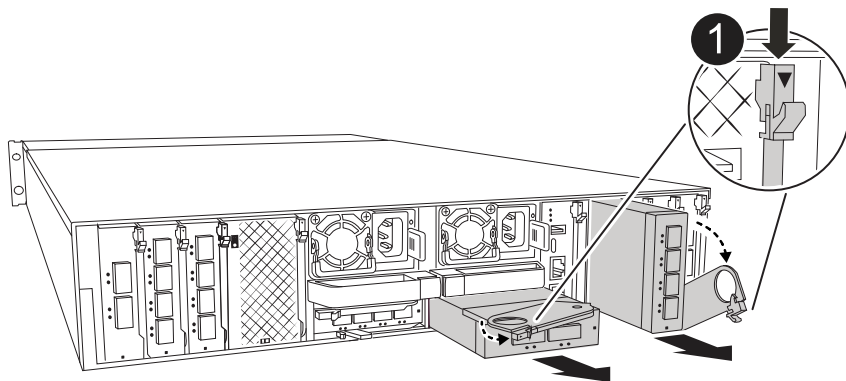
If the impaired controller is displaying...	Then...
The LOADER prompt	Go to the next step.
Waiting for giveback...	Press Ctrl-C, and then respond <code>y</code> when prompted.
System prompt or password prompt (enter system password)	Halt or take over the impaired controller from the healthy controller: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

Step 2: Add I/O modules

1. If you are not already grounded, properly ground yourself.
2. Rotate the cable management tray down by pulling the buttons on the inside of the cable management tray and rotating it down.
3. Remove the target slot blanking module from the carrier:



The following illustration shows removing a horizontal and vertical I/O module. Typically, you will only remove one I/O module.



1	Cam locking button
----------	--------------------

- a. Depress the cam latch on the blanking module in the target slot.
 - b. Rotate the cam latch away from the module as far as it will go.
 - c. Remove the module from the enclosure by hooking your finger into the cam lever opening and pulling the module out of the enclosure.
4. Install the I/O module:
 - a. Align the I/O module with the edges of the enclosure slot opening.
 - b. Gently slide the module into the slot all the way into the enclosure, and then rotate the cam latch all the way up to lock the module in place.
 5. Cable the I/O module.

If the I/O module is a NIC, cable the module to the data switches.

If the I/O module is a storage module, cable it to the NS224 shelf.



Make sure that any unused I/O slots have blanks installed to prevent possible thermal issues.

6. Rotate the cable management tray up to the closed position.
7. Reboot the controller from the LOADER prompt: `bye`



This reinitializes the PCIe cards and other components and reboots the node.

8. Give back the controller from the partner controller: `storage failover giveback -ofnode target_node_name`
9. Repeat these steps for controller B.
10. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.
11. If AutoSupport is enabled, restore/unsuppress automatic case creation by using the `system node autosupport invoke -node * -type all -message MAINT=END` command.
12. If you installed a storage I/O module, install and cable your NS224 shelves, as described in [Hot-add workflow](#).

Option 2: Add an I/O module in a storage system with no empty slots

You can change an I/O module in an I/O slot in a fully-populated system by removing an existing I/O module and replacing it with a different I/O module.

1. If you are:

Replacing a...	Then...
NIC I/O module with the same the same number of ports	The LIFs will automatically migrate when its controller module is shut down.
NIC I/O module with fewer ports	Permanently reassign the selected LIFs to a different home port. See Migrating a LIF for information about using System Manager to permanently move the LIFs.

Replacing a...	Then...
NIC I/O module with a storage I/O module	Use System Manager to permanently migrate the LIFs to different home ports, as described in Migrating a LIF .

Step 1: Shut down the impaired controller module

Shut down or take over the impaired controller module.

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; see [Synchronize a node with the cluster](#).

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message
command: `system node autosupport invoke -node * -type all -message MAINT=number_of_hours_downh`

The following AutoSupport command 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)	Halt or take over the impaired controller from the healthy controller: <code>storage failover takeover -ofnode <i>impaired_node_name</i></code> When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <code>y</code> .

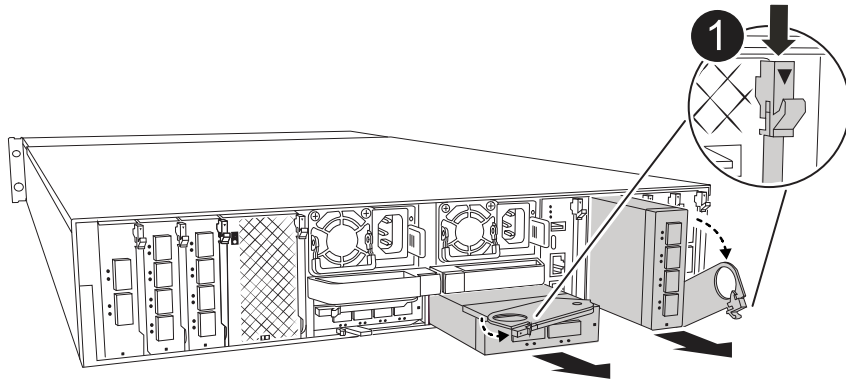
Step 2: Replace an I/O module

1. If you are not already grounded, properly ground yourself.
2. Unplug any cabling on the target I/O module.
3. Rotate the cable management tray down by pulling the buttons on the inside of the cable management tray and rotating it down.

4. Remove the target I/O module from the chassis:



The following illustration shows removing a horizontal and vertical I/O module. Typically, you will only remove one I/O module.



1	Cam locking button
----------	--------------------

- a. Depress the cam latch button.
- b. Rotate the cam latch away from the module as far as it will go.
- c. Remove the module from the enclosure by hooking your finger into the cam lever opening and pulling the module out of the enclosure.

Make sure that you keep track of which slot the I/O module was in.

5. Install the I/O module into the target slot in the enclosure:

- a. Align the module with the edges of the enclosure slot opening.
- b. Gently slide the module into the slot all the way into the enclosure, and then rotate the cam latch all the way up to lock the module in place.

6. Cable the I/O module.

7. Repeat the remove and install steps to replace additional modules for the controller.

8. Rotate the cable management tray up to the closed position.

9. Reboot the controller from the LOADER prompt: `_bye_`

- a. Check the version of BMC on the controller: `system service-processor show`
- b. Update the BMC firmware if needed: `system service-processor image update`
- c. Reboot the node: `bye`



This reinitializes the PCIe cards and other components and reboots the node.



If you encounter an issue during reboot, see [BURT 1494308 - Environment shutdown might be triggered during I/O module replacement](#)

10. Give back the controller from the partner controller: `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:

If the I/O module is a...	Then...
NIC module	Use the <code>storage port modify -node *<node name> -port *<port name> -mode network</code> command for each port.
Storage module	Install and cable your NS224 shelves, as described in Hot-add workflow .

13. Repeat these steps for controller B.

Replace I/O module - ASA A1K

Use this procedure to replace a failed I/O module.

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

Step 1: Shut down the impaired node

Shut down or take over 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; see [Synchronize a node with the cluster](#).

Steps

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

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

The following AutoSupport command 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.

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 (enter system password)	<p>Halt or take over 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>

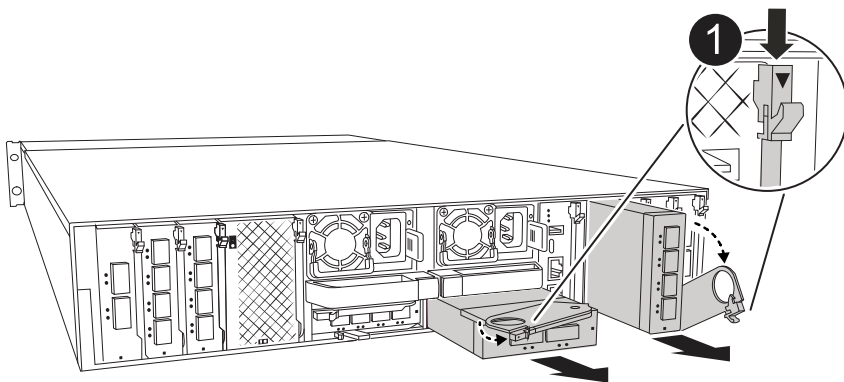
Step 2: Replace a failed I/O module

To replace an I/O module, locate it within the enclosure and follow the specific sequence of steps.

1. If you are not already grounded, properly ground yourself.
2. Unplug any cabling on the target I/O module.
3. Rotate the cable management tray down by pulling the buttons on both sides on the inside of the cable management tray and then rotate the tray down.



This following illustration shows removing a horizontal and vertical I/O module. Typically, you will only remove one I/O module.



1	I/O cam latch
----------	---------------

Make sure that you label the cables so that you know where they came from.

4. Remove the target I/O module from the enclosure:
 - a. Depress the cam button on the target module.
 - b. Rotate the cam latch away from the module as far as it will go.
 - c. Remove the module from the enclosure by hooking your finger into the cam lever opening and pulling the module out of the enclosure.

Make sure that you keep track of which slot the I/O module was in.

5. Set the I/O module aside.
6. Install the replacement I/O module into the enclosure:
 - a. Align the module with the edges of the enclosure slot opening.
 - b. Gently slide the module into the slot all the way into the enclosure, and then rotate the cam latch all the way up to lock the module in place.
7. Cable the I/O module.
8. Rotate the cable management tray up to the closed position.

Step 3: Reboot the controller

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: *set privilege advanced*
 - b. Reboot the BMC: *sp reboot*
2. From the LOADER prompt, reboot the node: *bye*



This reinitializes the I/O cards and other components and reboots the node.

3. Return the node to normal operation: *storage failover giveback -ofnode impaired_node_name*
4. If automatic giveback was disabled, reenable it: *storage failover modify -node local -auto-giveback true*

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 and Replacements](#) page for further information.

Replace a power supply - ASA A1K

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 it to the power source.

The power supplies are redundant and hot-swappable.

About this task

This procedure is written for replacing one PSU at a time.



Do not mix PSUs with different efficiency ratings. Always replace like for like.

Use the appropriate procedure for your type of PSU: AC or DC.

Option 1: Replace an AC PSU

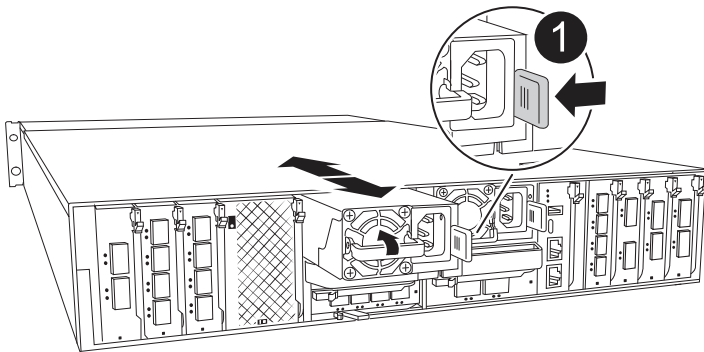
To replace an AC PSU, complete the following steps.

Steps

1. If you are not already grounded, properly ground yourself.
2. Identify the PSU you want to replace, based on console error messages or through the red Fault LED on the PSU.
3. Disconnect the PSU:
 - a. Open the power cable retainer, and then unplug the power cable from the PSU.
4. Remove the PSU by rotating the handle up, press the locking tab, and then pull PSU out of the controller module.



The PSU 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

Terracotta PSU locking tab

5. Install the replacement PSU in the controller module:
 - a. Using both hands, support and align the edges of the replacement PSU with the opening in the controller module.
 - b. Gently push the PSU 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 PSU into the system.

6. Reconnect the PSU cabling:
 - a. Reconnect the power cable to the PSU.
 - b. Secure the power cable to the PSU using the power cable retainer.

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

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

Option 2: Replace a DC PSU

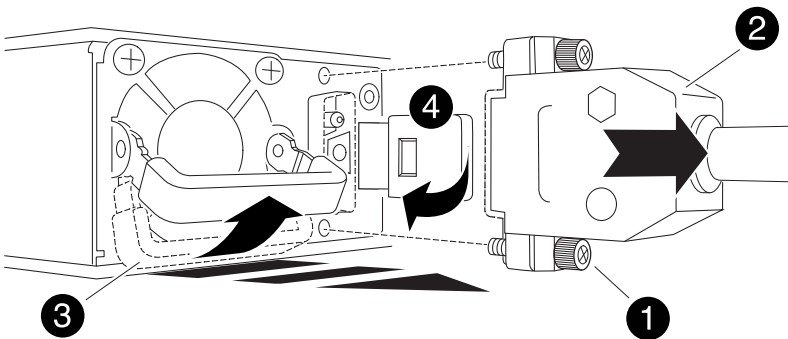
To replace a DC PSU, complete the following steps.

Steps

- If you are not already grounded, properly ground yourself.
- Identify the PSU you want to replace, based on console error messages or through the red Fault LED on the PSU.
- Disconnect the PSU:
 - Unscrew the D-SUB DC cable connector using the thumb screws on the plug.
 - Unplug the cable from the PSU and set it aside.
- Remove the PSU by rotating the handle up, press the locking tab, and then pull the PSU out of the controller module.



The PSU 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	Thumb screws
2	D-SUB DC power PSU cable connector
3	Power supply handle
4	Blue PSU locking tab

- Install the replacement PSU in the controller module:
 - Using both hands, support and align the edges of the replacement PSU with the opening in the controller module.
 - Gently push the PSU 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 PSU into the system.

6. Reconnect the D-SUB DC power cable:
 - a. Plug the power cable connector into the PSU.
 - b. Secure the power cable to the PSU with the thumbscrews.

Once power is restored to the PSU, 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 and Replacements](#) page for further information.

Replace the real-time clock battery - ASA A1K

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.

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*.

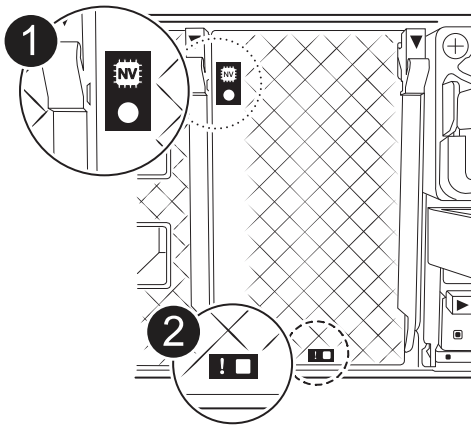
3. Take the impaired controller to the LOADER prompt:

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 impaired_node_name</code> 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 enclosure when you replace the controller module or replace a component inside the controller module.

1. Check the NVRAM status LED located in slot 4/5 of the system. There is also an NVRAM LED on the front panel of the controller module. Look for the NV icon:

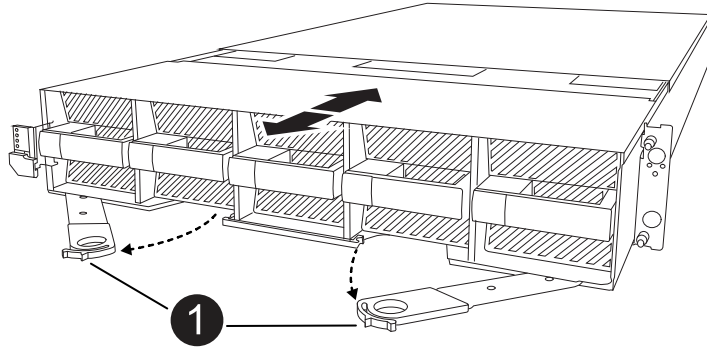


1	NVRAM status LED
2	NVRAM attention LED

- If the NV LED is off, go to the next step.

- If the NV LED is flashing, wait for the flashing to stop. If flashing continues for longer than 5 minutes, contact Technical Support for assistance.
2. If you are not already grounded, properly ground yourself.
 3. On the front of the unit, hook your fingers into the holes in the locking cams, squeeze the tabs on the cam levers, and gently, but firmly rotate both latches toward you at the same time.

The controller module moves slightly out of the enclosure.



1	Locking cam latches
----------	---------------------

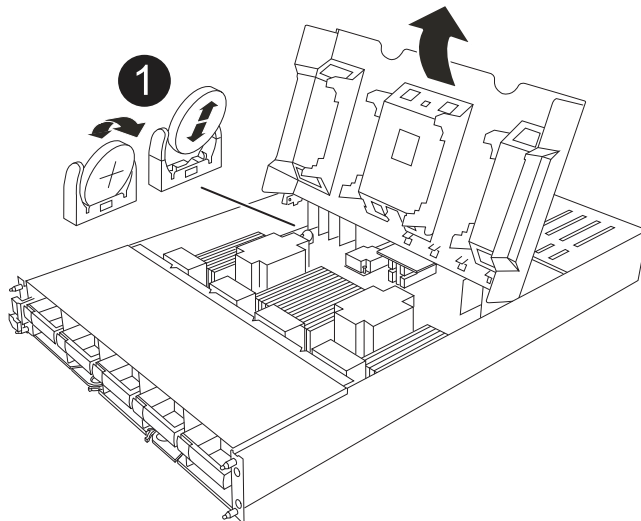
4. Slide the controller module out of the enclosure and place it on a flat, stable surface.

Make sure that you support the bottom of the controller module as you slide it out of the enclosure.

Step 3: Replace the RTC battery

Remove failed RTC battery and install the replacement RTC battery.

1. Open the controller air duct on the top of the controller.
 - a. Insert your fingers in the recesses at the far ends of the air duct.
 - b. Lift the air duct and rotate it upward as far as it will go.
2. Locate the RTC battery under the air duct.



1

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

Reinstall the controller module and boot it.

1. Ensure the air duct is completely closed by rotating it down as far as it will go.

It must lie flush against the controller module sheet metal.

2. Align the end of the controller module with the opening in the enclosure, and slide the controller module into the chassis with the levers rotated away from the front of the system.
3. Once the controller module stops you from sliding it farther, rotate the cam handles inward until they latch back under the fans



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

The controller module begins to boot as soon as it is fully seated in the enclosure.

4. Return the impaired 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`.
6. If AutoSupport is enabled, restore/unsuppress automatic case creation: `system node autosupport invoke -node * -type all -message MAINT=END`.

Step 5: Reset the time and date on the controller



After replacing the RTC battery, inserting controller and powering on first BIOS reset, you will see the following error messages: `RTC date/time error`. Reset date/time to default `RTC power failure error` These messages are expected and you can continue with this procedure.

1. Check the date and time on the healthy controller with the `cluster date show` command.



If your system stops at the boot menu, select the option for `Reboot node` and respond `y` when prompted, then boot to `LOADER` by pressing `Ctrl-C`

- a. At the `LOADER` prompt on the target controller, check the time and date with the `cluster date show` command.
- b. If necessary, modify the date with the `set date mm/dd/yyyy` command.
- c. If necessary, set the time, in GMT, using the `set time hh:mm:ss` command.
 1. Confirm the date and time on the target controller.
 2. At the `LOADER` prompt, enter `bye` to reinitialize the PCIe cards and other components and let the controller reboot.

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 and Replacements](#) page for further information.

Replace system management module - ASA A1K

The System Management module, located at the back of the controller in slot 8, contains onboard components for system management, as well as ports for external management. The target controller must be shut down to replace an impaired System Management module or replace the boot media.

The System Management module has the following onboard components:

- Boot media, allowing boot media replacement without removing the controller module.
- BMC
- Management switch

The System Management module also contains the following ports for external management:

- RJ45 Serial
- USB Serial (Type-C)
- USB Type-A (Boot recovery)
- e0M RJ45 Ethernet

To replace the System Management module or the boot media, you must shut down the impaired controller.

Before you begin

- 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.
- All other system components must be working properly.
- The partner controller must be able to take over the impaired controller.
- 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.

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: <pre>storage failover takeover -ofnode impaired_node_name</pre> When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i> .

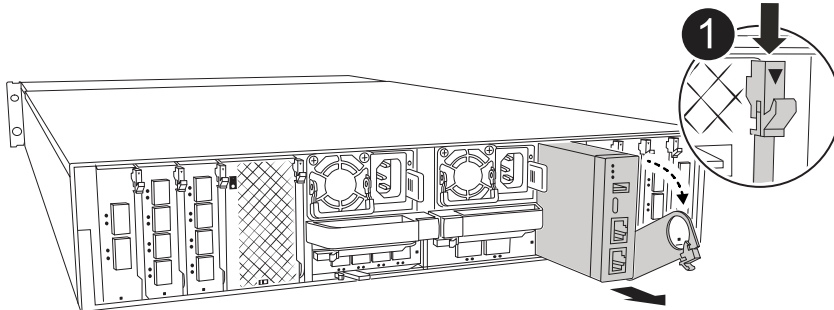
Step 2: Replace the impaired System Management module

Replace the impaired system management module.

1. Remove the System Management module:



Make sure NVRAM destage has completed before proceeding.



1

System Management module cam latch

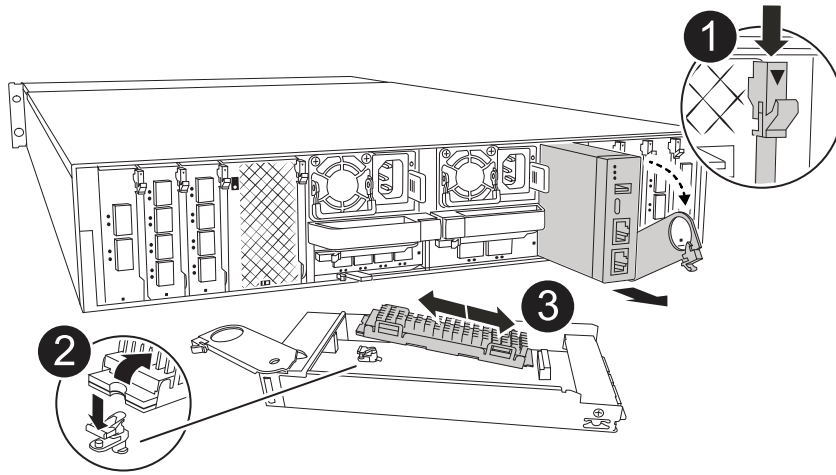
a. If you are not already grounded, properly ground yourself.



Make sure NVRAM destage has completed before proceeding.

- b. Remove any cables connected to the System Management module. Make sure that label where the cables were connected, so that you can connect them to the correct ports when you reinstall the module.
- c. Disconnect the power cords from the PSU for the impaired controller.
- d. Rotate the cable management tray down by pulling the buttons on both sides on the inside of the cable management tray and then rotate the tray down.
- e. Depress the cam button on the System Management module.
- f. Rotate the cam lever down as far as it will go.
- g. Loop your finger into the hole on the cam lever and pull the module straight out of the system.
- h. Place the System Management module on an anti-static mat, so that the boot media is accessible.

2. Move the boot media to the replacement System Management module:



1	System Management module cam latch
2	Boot media locking button
3	Boot media

- a. Press the blue boot media locking button in the impaired System Management module.
- b. Rotate the boot media up and slide it out of the socket.
3. Install the boot media in the replacement System Management module:
 - a. Align the edges of the boot media with the socket housing, and then gently push it squarely into the socket.
 - b. Rotate the boot media down until it touches the locking button.
 - c. Depress the blue locking and rotate the boot media all the way down and release the blue locking button.
4. Install the replacement System Management module into the enclosure:
 - a. Align the edges of the replacement System Management module with the system opening and gently push it into the controller module.
 - b. Gently slide the module into the slot until the cam latch begins to engage with the I/O cam pin, and then rotate the cam latch all the way up to lock the module in place.
5. Rotate the cable management arm up to the closed position.
6. Recable the System Management module.

Step 3: Reboot the controller module

Reboot the controller module.

1. Plug the power cables back into the PSU.

The system will begin to reboot, typically to the LOADER prompt.
2. Enter *bye* at the LOADER prompt.

3. Return the controller to normal operation by giving back its storage: `storage failover giveback -ofnode _impaired_node_name_`
4. Restore automatic giveback by using the `storage failover modify -node local -auto -giveback true` command.
5. If an AutoSupport maintenance window was triggered, end it by using the `system node autosupport invoke -node * -type all -message MAINT=END` command.

Step 4: Install licenses and register serial number

You must install new licenses for the 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 node. However, if the 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 for the 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.



If your system was initially running ONTAP 9.10.1 or later, use the procedure documented in [Post Motherboard Replacement Process to update Licensing on a AFF/FAS system](#). If you are unsure of the initial ONTAP release for your system, see [NetApp Hardware Universe](#) for more information.

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`
4. 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.

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 and Replacements](#) page for further information.

Copyright information

Copyright © 2024 NetApp, Inc. All Rights Reserved. Printed in the U.S. No part of this document covered by copyright may be reproduced in any form or by any means—graphic, electronic, or mechanical, including photocopying, recording, taping, or storage in an electronic retrieval system—without prior written permission of the copyright owner.

Software derived from copyrighted NetApp material is subject to the following license and disclaimer:

THIS SOFTWARE IS PROVIDED BY NETAPP "AS IS" AND WITHOUT ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WHICH ARE HEREBY DISCLAIMED. IN NO EVENT SHALL NETAPP BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

NetApp reserves the right to change any products described herein at any time, and without notice. NetApp assumes no responsibility or liability arising from the use of products described herein, except as expressly agreed to in writing by NetApp. The use or purchase of this product does not convey a license under any patent rights, trademark rights, or any other intellectual property rights of NetApp.

The product described in this manual may be protected by one or more U.S. patents, foreign patents, or pending applications.

LIMITED RIGHTS LEGEND: Use, duplication, or disclosure by the government is subject to restrictions as set forth in subparagraph (b)(3) of the Rights in Technical Data -Noncommercial Items at DFARS 252.227-7013 (FEB 2014) and FAR 52.227-19 (DEC 2007).

Data contained herein pertains to a commercial product and/or commercial service (as defined in FAR 2.101) and is proprietary to NetApp, Inc. All NetApp technical data and computer software provided under this Agreement is commercial in nature and developed solely at private expense. The U.S. Government has a non-exclusive, non-transferrable, nonsublicensable, worldwide, limited irrevocable license to use the Data only in connection with and in support of the U.S. Government contract under which the Data was delivered. Except as provided herein, the Data may not be used, disclosed, reproduced, modified, performed, or displayed without the prior written approval of NetApp, Inc. United States Government license rights for the Department of Defense are limited to those rights identified in DFARS clause 252.227-7015(b) (FEB 2014).

Trademark information

NETAPP, the NETAPP logo, and the marks listed at <http://www.netapp.com/TM> are trademarks of NetApp, Inc. Other company and product names may be trademarks of their respective owners.