



EF300 and EF600

E-Series storage systems

NetApp
January 20, 2026

Table of Contents

EF300 and EF600	1
Maintain the hardware - EF300 and EF600	1
System components	1
Batteries	1
Requirements to replace the battery - EF300 or EF600	2
Replace the battery - EF300 and EF600	2
Controllers	10
Requirements to replace the controller - EF300 or EF600	10
Replace the controller - EF300 and EF600	11
DIMMs	31
Requirements to replace the DIMM - EF300 and EF600	31
Replace the DIMMs - EF300 or EF600	31
Drives	38
Requirements to replace the drive - EF300 or EF600	38
Replace the drive - EF300	39
Replace the drive - EF600	49
Hot-add a drive shelf - IOM12 or IOM12B modules - EF300 and EF600	52
Fans	65
Requirements to replace the fan - EF300 and EF600	65
Replace the fan - EF300 or EF600	65
Host interface cards	71
Requirements to upgrade the host interface card (HIC) - EF300 or EF600	71
Upgrade the host interface card (HIC) - EF300 and EF600	72
Replace failed host interface card (HIC) - EF300 or EF600	80
Host port protocol conversion	89
Requirements to convert host protocol - EF300 or EF600	89
Change the host protocol - EF300 and EF600	90
Complete host protocol conversion - EF300 and EF600	97
Power supplies	97
Requirements to replace the power supply - EF300 or EF600	97
Replace the power supply - EF300 and EF600	97
SAS expansion cards	100
Requirements to replace the SAS expansion card - EF300 and EF600	100
Add a SAS expansion card - EF300 and EF600	101

EF300 and EF600

Maintain the hardware - EF300 and EF600

You might need to perform maintenance procedures on your hardware. Procedures specific to maintaining your EF300, EF600, EF300C, or EF600C system components are in this section.

The procedures in this section assume that the EF300 or EF600 system has already been deployed in the E-Series environment.

System components

For the EF300, EF600, EF300C, and EF600C storage systems, you can perform maintenance procedures on the following components.

Batteries	A battery is included with a controller and preserves cached data if the AC power fails.
Controllers	A controller consists of a board, firmware, and software. It controls the drives and implements the SANtricity System Manager functions.
DIMMs	You must replace a DIMM (dual in-line memory module) when a memory mismatch is present, or you have a failed DIMM.
Drives	A drive is a device that provides the physical storage media for data.
Fans	Each EF300 or EF600 controller shelf or drive shelf includes five fans for cooling the controller.
Host interface cards (HICs)	A host interface card (HIC) must be installed within a controller canister. The EF600 controller includes host ports on the optional HIC. Host ports that are built into the HIC are called HIC ports.
Host port protocol	You can convert the protocol of a host to a different protocol so that compatibility and communication can be established.
Power supplies	A power supply provides a redundant power source in a controller shelf.
SAS expansion cards	A SAS expansion card may be installed within a controller canister. The EF300 controller supports SAS expansion.

Batteries

Requirements to replace the battery - EF300 or EF600

Before you replace an EF300, EF600, EF300C, or EF600C battery, review the requirements and considerations.

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

Recovery Guru alerts

If the Recovery Guru in SANtricity System Manager reports one of following statuses, you must replace the affected battery:

- Battery Failed
- Battery Replacement Required

From SANtricity System Manager, review the details in the Recovery Guru to confirm that there is an issue with a battery and to ensure no other items must be addressed first.

Procedure overview

To protect your data, you must replace a failed battery as soon as possible.

The following is an overview of the steps to replace a battery in EF300 or EF600 controllers:

1. Take controller offline.
2. Remove the controller canister.
3. Replace the battery.
4. Replace the controller canister.
5. Bring the controller online.

Requirements

If you plan to replace a battery, you must have:

- A replacement battery.
- An ESD wristband, or you have taken other antistatic precautions.
- Labels to identify each cable that is connected to the controller canister.
- A management station with a browser that can access SANtricity System Manager for the controller. (To open the System Manager interface, point the browser to the controller's domain name or IP address.)

Optionally, you can use the command line interface (CLI) to perform some of the procedures. If you do not have access to the CLI, you can do one of the following:

- **For SANtricity System Manager (version 11.60 and above)** — Download the CLI package (zip file) from System Manager. Go to **Settings > System > Add-ons > Command Line Interface**. You can then issue CLI commands from an operating system prompt, such as the DOS C: prompt.

Replace the battery - EF300 and EF600

You can replace a battery in an EF300, EF600, EF300C, or EF600C storage system.

About this task

Each controller canister includes a battery that preserves cached data if the AC power fails. If the Recovery Guru in SANtricity System Manager reports either a Battery Failed status or a Battery Replacement Required status, you must replace the affected battery.

Before you begin

- Verify that no volumes are in use or that you have a multipath driver installed on all hosts using these volumes.
- Review the [Requirements for EF300 or EF600 battery replacement](#).
- Make sure you have the following:
 - The replacement battery.
 - An ESD wristband, or other antistatic precautions.
 - A flat, static free work area.
 - Labels to identify each cable that is connected to the controller canister.
 - A management station with a browser that can access SANtricity System Manager for the controller. (To open the System Manager interface, point the browser to the controller's domain name or IP address.)

Step 1: Place controller offline

Back up data and place the affected controller offline.

Steps

1. From SANtricity System Manager, review the details in the Recovery Guru to confirm that there is an issue with a battery and to ensure no other items must be addressed first.
2. From the Details area of the Recovery Guru, determine which battery to replace.
3. Back up the storage array's configuration database using SANtricity System Manager.

If a problem occurs when you remove a controller, you can use the saved file to restore your configuration. The system will save the current state of the RAID configuration database, which includes all data for volume groups and disk pools on the controller.

- From System Manager:
 - a. Select **Support** > **Support Center** > **Diagnostics**.
 - b. Select **Collect Configuration Data**.
 - c. Click **Collect**.

The file is saved in the Downloads folder for your browser with the name, **configurationData-
<arrayName>-<dateTime>.7z**.

4. If the controller is not already offline, take it offline now using SANtricity System Manager.
 - a. Select **Hardware**.
 - b. If the graphic shows the drives, select **Show back of shelf** to show the controllers.
 - c. Select the controller that you want to place offline.
 - d. From the context menu, select **Place offline**, and confirm that you want to perform the operation.



If you are accessing SANtricity System Manager using the controller you are attempting to take offline, a SANtricity System Manager Unavailable message is displayed. Select **Connect to an alternate network connection** to automatically access SANtricity System Manager using the other controller.

5. Wait for SANtricity System Manager to update the controller's status to offline.



Do not begin any other operations until after the status has been updated.

6. Select **Recheck** from the Recovery Guru, and confirm that the OK to remove field in the Details area displays Yes, indicating that it is safe to remove this component.

Step 2: Remove controller canister

Replace the failed battery with a new one.

Steps

1. Put on an ESD wristband or take other antistatic precautions.
2. Label each cable that is attached to the controller canister.
3. Disconnect all the cables from the controller canister.



To prevent degraded performance, do not twist, fold, pinch, or step on the cables.

4. Confirm that the Cache Active LED on the back of the controller is off.
5. Squeeze the handles on either side of the controller, and pull back until it releases from the shelf.



6. Using two hands and the handles, slide the controller canister out of the shelf. When the front of the controller is free of the enclosure, use two hands to pull it out completely.



Always use two hands to support the weight of a controller canister.



7. Place the controller canister on a flat, static-free surface.

Step 3: Remove failed battery

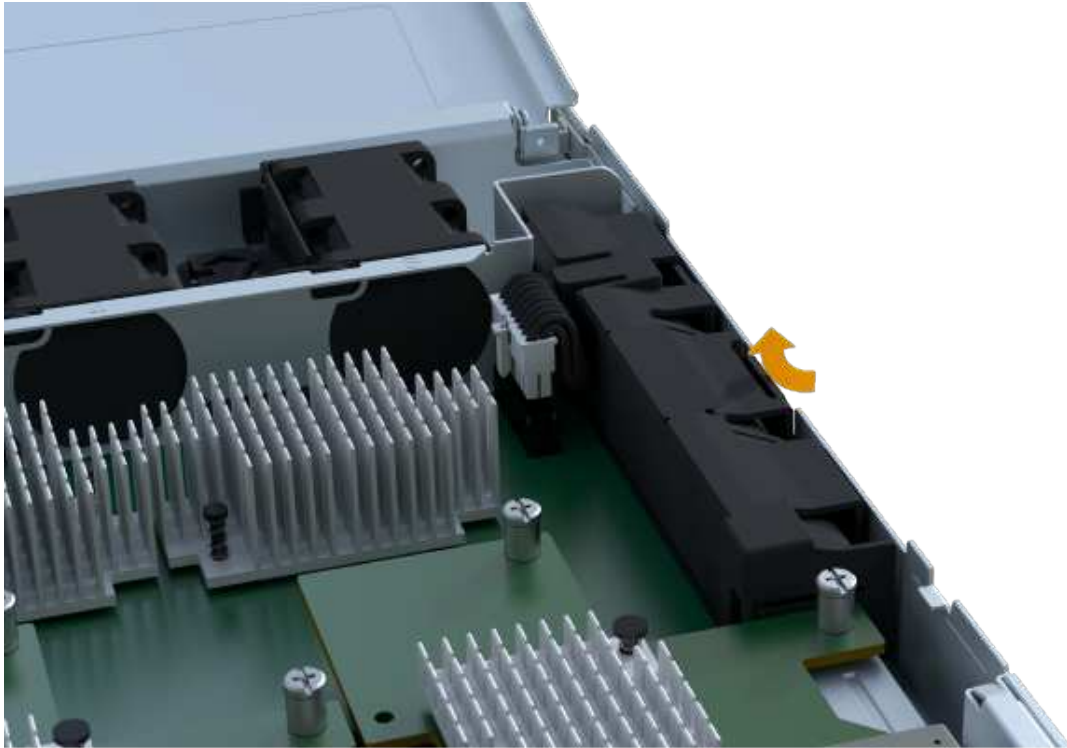
Pull the failed battery out of the controller.

Steps

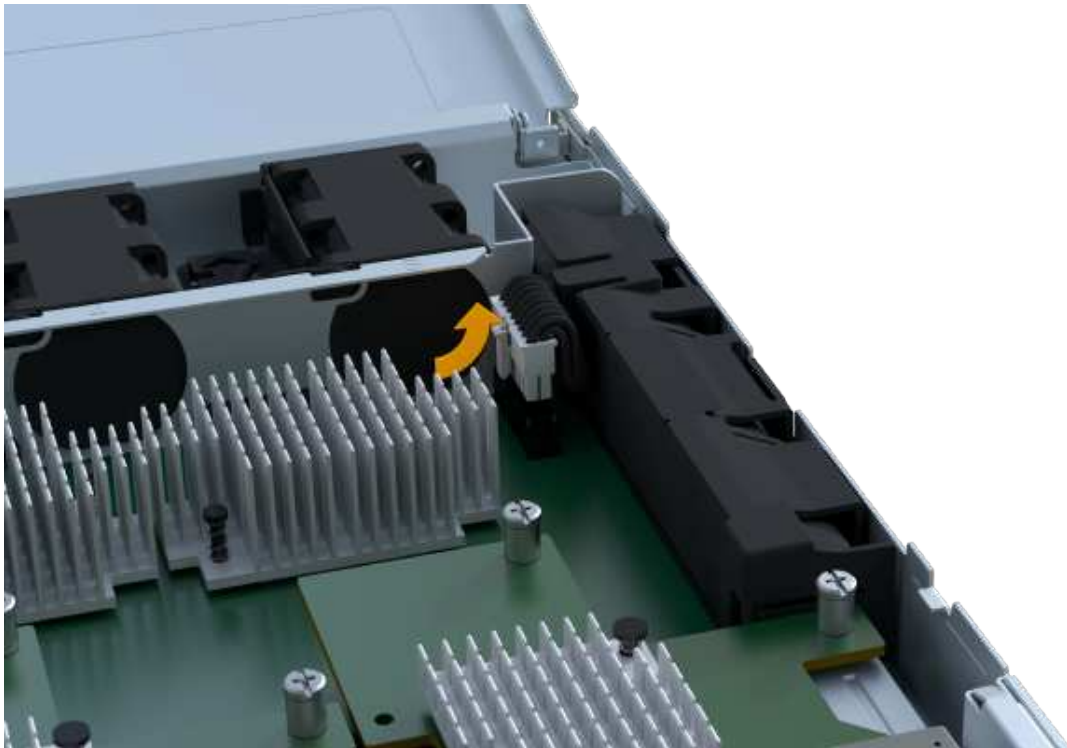
1. Remove the controller canister's cover by unscrewing the single thumbscrew and lifting the lid open.
2. Confirm that the green LED inside the controller is off.

If this green LED is on, the controller is still using battery power. You must wait for this LED to go off before removing any components.

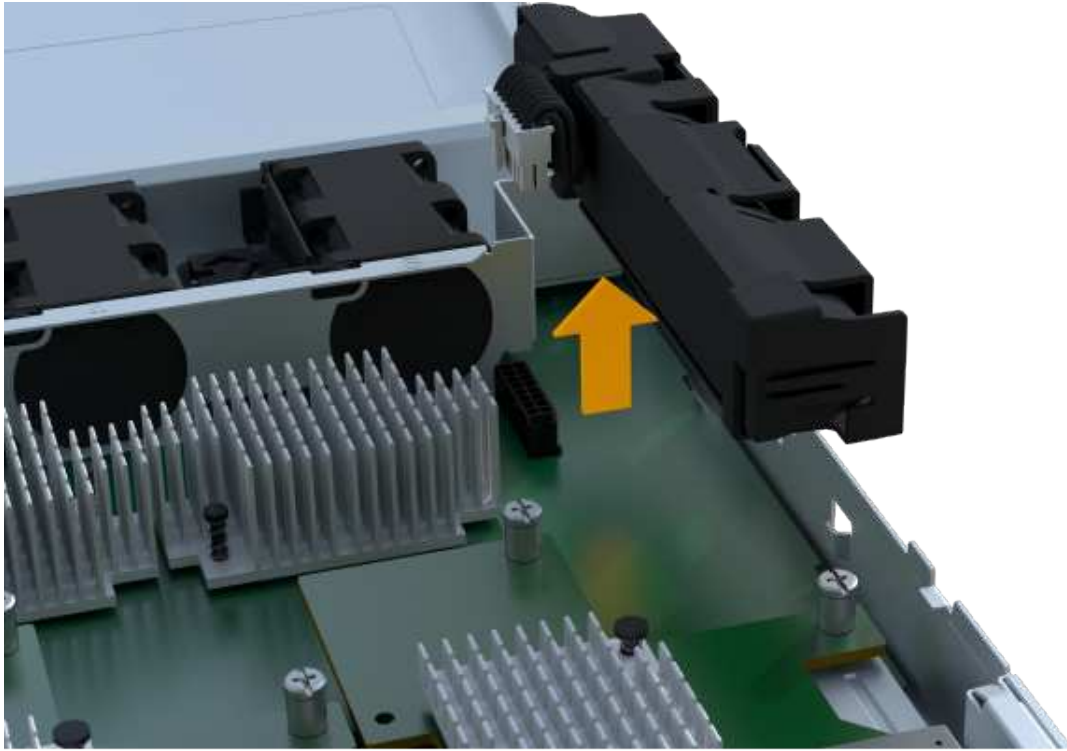
3. Locate the 'press' tab on the side of the controller.
4. Unlatch the battery by pressing the tab and squeezing the battery casing.



5. Gently squeeze the connector housing the battery wiring. Pull up, disconnecting the battery from the board.



6. Lift the battery out of the controller and place on a flat, static-free surface.



7. Follow the appropriate procedures for your location to recycle or dispose of the failed battery.



To comply with International Air Transport Association (IATA) regulations, never ship a lithium battery by air unless it is installed within the controller shelf.

Step 4: Install new battery

After you have removed the failed battery from the controller canister, follow this step to install the new battery.

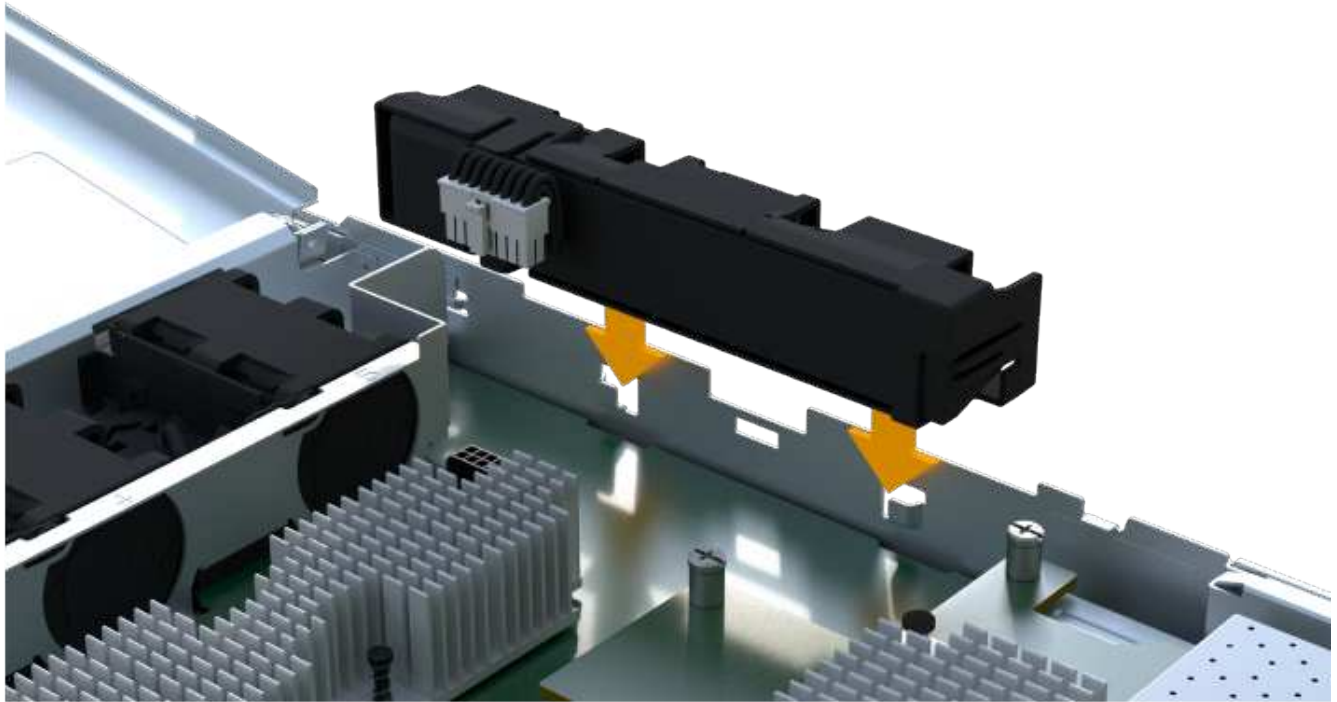
Steps

1. Unpack the new battery, and set it on a flat, static-free surface.



To comply with IATA safety regulations, replacement batteries are shipped with a state of charge (SoC) of 30 percent or less. When you reapply power, keep in mind that write caching does not resume until the replacement battery is fully charged and it has completed its initial learn cycle.

2. Insert the battery into the controller by lining up the battery casing with the metal latches on the side of the controller.



The battery clicks into place.

3. Plug the battery connector back into the board.

Step 5: Reinstall controller canister

Reinstall the controller into the controller shelf.

Steps

1. Lower the cover on the controller canister and secure the thumbscrew.
2. While squeezing the controller handles, gently slide the controller canister all the way into the controller shelf.



The controller audibly clicks when correctly installed into the shelf.



Step 6: Complete battery replacement

Place the controller online, collect support data, and resume operations.

Steps

1. Place controller online.
 - a. In System Manager, navigate to the Hardware page.
 - b. Select **Show back of controller**.
 - c. Select the controller with the replaced battery.
 - d. Select **Place online** from the drop-down list.
2. As the controller boots, check the controller LEDs.

When communication with the other controller is reestablished:

- The amber Attention LED remains on.
 - The Host Link LEDs might be on, blinking, or off, depending on the host interface.
3. When the controller is back online, confirm that its status is Optimal and check the controller shelf's Attention LEDs.

If the status is not Optimal or if any of the Attention LEDs are on, confirm that all cables are correctly seated, and the controller canister is installed correctly. If necessary, remove and reinstall the controller canister.



If you cannot resolve the problem, contact technical support.

4. Click **Support > Upgrade Center** to ensure that the latest version of SANtricity OS is installed.

As needed, install the latest version.

5. Verify that all volumes have been returned to the preferred owner.
 - a. Select **Storage › Volumes**. From the **All Volumes** page, verify that volumes are distributed to their preferred owners. Select **More › Change ownership** to view volume owners.
 - b. If volumes are all owned by preferred owner continue to Step 6.
 - c. If none of the volumes are returned, you must manually return the volumes. Go to **More › Redistribute volumes**.
 - d. If only some of the volumes are returned to their preferred owners after auto-distribution or manual distribution you must check the Recovery Guru for host connectivity issues.
 - e. If there is no Recovery Guru present or if following the recovery guru steps the volumes are still not returned to their preferred owners contact support.
6. Collect support data for your storage array using SANtricity System Manager.
 - a. Select **Support › Support Center › Diagnostics**.
 - b. Select **Collect Support Data**.
 - c. Click **Collect**.

The file is saved in the Downloads folder for your browser with the name, **support-data.7z**.

What's next?

Your battery replacement is complete. You can resume normal operations.

Controllers

Requirements to replace the controller - EF300 or EF600

Before you replace an EF300, EF600, EF300C, or EF600C controller, review the requirements and considerations.

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

Controller replacement requirements

Before you replace a controller, you must have:

- A replacement controller canister with the same part number as the controller canister you are replacing.
- An ESD wristband, or you have taken other antistatic precautions.
- Labels to identify each cable that is connected to the controller canister.
- A #1 Phillips screwdriver.
- A management station with a browser that can access SANtricity System Manager for the controller. (To open the System Manager interface, point the browser to the controller's domain name or IP address.)

Replacement while powered on

You can replace a controller canister while your storage array is powered on and performing host I/O

operations, if the following conditions are true:

- The second controller canister in the shelf has Optimal status.
- The **OK to remove** field in the Details area of the Recovery Guru in SANtricity System Manager displays **Yes**, indicating that it is safe to remove this component.

Replace the controller - EF300 and EF600

You can replace a single controller in your EF300, EF600, EF300C, or EF600C controller shelf.

About this task

When you replace a failed controller canister, you must remove the battery, power supply, DIMMs, fans, and host interface card (HIC) from the original controller canister, and then install them in the replacement controller canister.

Before you begin

- Review [Requirements for EF300 or EF600 controller replacement](#).
- Determine if you have a failed controller canister in one of two ways:
 - The Recovery Guru in SANtricity System Manager directs you to replace the controller canister.
 - The amber Attention LED on the controller canister is on, indicating that the controller has a fault.



The controller's amber Attention LED will be turned off whenever the following replacement conditions exist:

- Alt power supply failed
- Alt drive path failed
- Drawer is open/missing
- Fan is failed/missing
- Power supply missing

- Make sure you have the following:
 - A replacement controller canister with the same part number as the controller canister you are replacing.
 - An ESD wristband, or you have taken other antistatic precautions.
 - A flat, static free work area.
 - A #1 Phillips screwdriver
 - Labels to identify each cable that is connected to the controller canister.
 - A management station with a browser that can access SANtricity System Manager for the controller. (To open the System Manager interface, point the browser to the controller's domain name or IP address.)

Step 1: Prepare to replace controller

Prepare to replace a failed controller canister by verifying that the replacement controller canister has the correct FRU part number, backing up the configuration, and collecting support data.


Steps

1. Unpack the new controller canister, and set it on a flat, static-free surface.

Save the packing materials to use when shipping the failed controller canister.

2. Locate the MAC address and FRU part number labels on the back of the controller canister.
3. From SANtricity System Manager, locate the replacement part number for the controller canister you are replacing.

When a controller has a fault and needs to be replaced, the replacement part number is displayed in the Details area of the Recovery Guru. If you need to find this number manually, follow these steps:

- a. Select **Hardware**.
 - b. Locate the controller shelf, which is marked with the controller icon .
 - c. Click the controller icon.
 - d. Select the controller, and click **Next**.
 - e. On the **Base** tab, make a note of the **Replacement Part Number** for the controller.
4. Confirm that the replacement part number for the failed controller is the same as the FRU part number for the replacement controller.



Possible loss of data access — If the two-part numbers are not the same, do not attempt this procedure. In addition, if the failed controller canister includes a host interface card (HIC), you must install that HIC into the new controller canister. The presence of mismatched controllers or HICs causes the new controller to lock down when you bring it online.

5. Back up the storage array's configuration database using SANtricity System Manager.

If a problem occurs when you remove a controller, you can use the saved file to restore your configuration. The system will save the current state of the RAID configuration database, which includes all data for volume groups and disk pools on the controller.

- From System Manager:
 - a. Select **Support > Support Center > Diagnostics**.
 - b. Select **Collect Configuration Data**.
 - c. Click **Collect**.

The file is saved in the Downloads folder for your browser with the name, **configurationData-
<arrayName>-<dateTime>.7z**.

6. If the controller is not already offline, take it offline now using SANtricity System Manager.
 - a. Select **Hardware**.
 - b. If the graphic shows the drives, select **Show back of shelf** to show the controllers.

- c. Select the controller that you want to place offline.
- d. From the context menu, select **Place offline**, and confirm that you want to perform the operation.



If you are accessing SANtricity System Manager using the controller you are attempting to take offline, a SANtricity System Manager Unavailable message is displayed. Select **Connect to an alternate network connection** to automatically access SANtricity System Manager using the other controller.

7. Wait for SANtricity System Manager to update the controller's status to offline.



Do not begin any other operations until after the status has been updated.

8. Select **Recheck** from the Recovery Guru, and confirm that the **OK to remove** field in the Details area displays **Yes**, indicating that it is safe to remove this component.

Step 2: Remove failed controller

Remove a controller canister to replace the failed canister with a new one.

This is a multi-step procedure that requires you to remove the following components: battery, host interface card, power supply, DIMMs, and fans.

Step 2a: Remove controller canister

Remove the failed controller canister so you can replace it with a new one.

Steps

1. Put on an ESD wristband or take other antistatic precautions.
2. Label each cable that is attached to the controller canister.
3. Disconnect all the cables from the controller canister.



To prevent degraded performance, do not twist, fold, pinch, or step on the cables.

4. If the controller canister has a HIC that uses SFP+ transceivers, remove the SFPs.

Because you must remove the HIC from the failed controller canister, you must remove any SFPs from the HIC ports. When you reconnect the cables, you can move those SFPs to the new controller canister.

5. Squeeze the handles on either side of the controller, and pull back until it releases from the shelf.



6. Using two hands and the handles, slide the controller canister out of the shelf. When the front of the controller is free of the enclosure, use two hands to pull it out completely.



Always use two hands to support the weight of a controller canister.



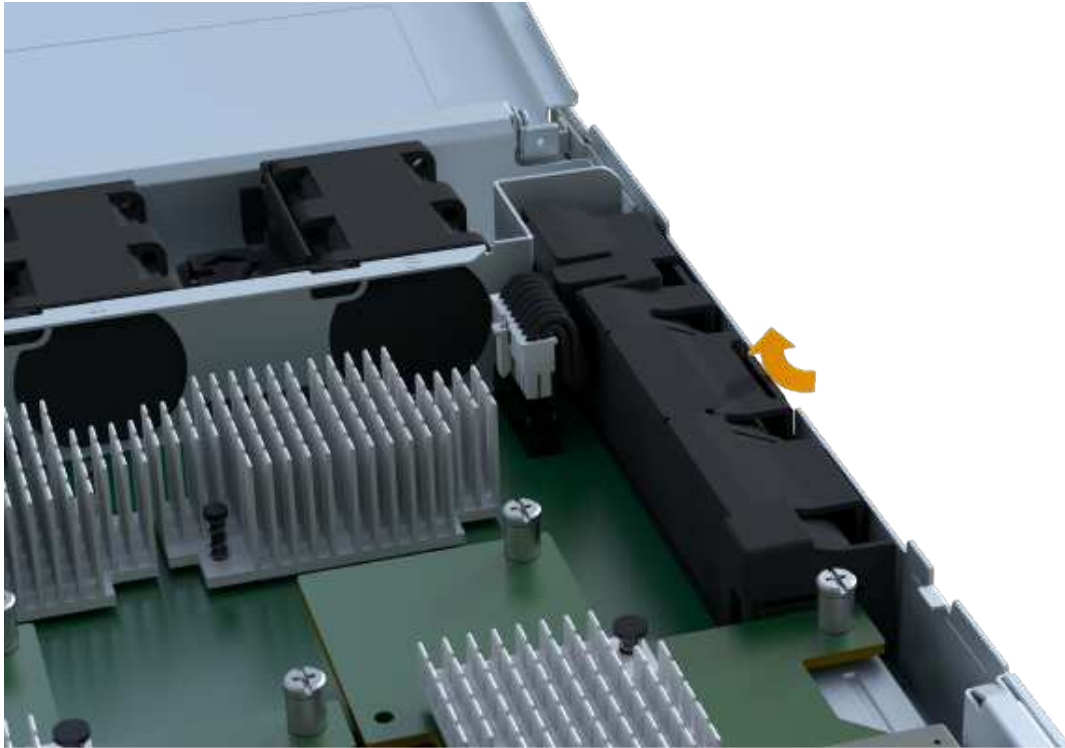
7. Place the controller canister on a flat, static-free surface.

Step 2b: Remove battery

Remove the battery from the failed controller canister so you can install it in the new controller canister.

Steps

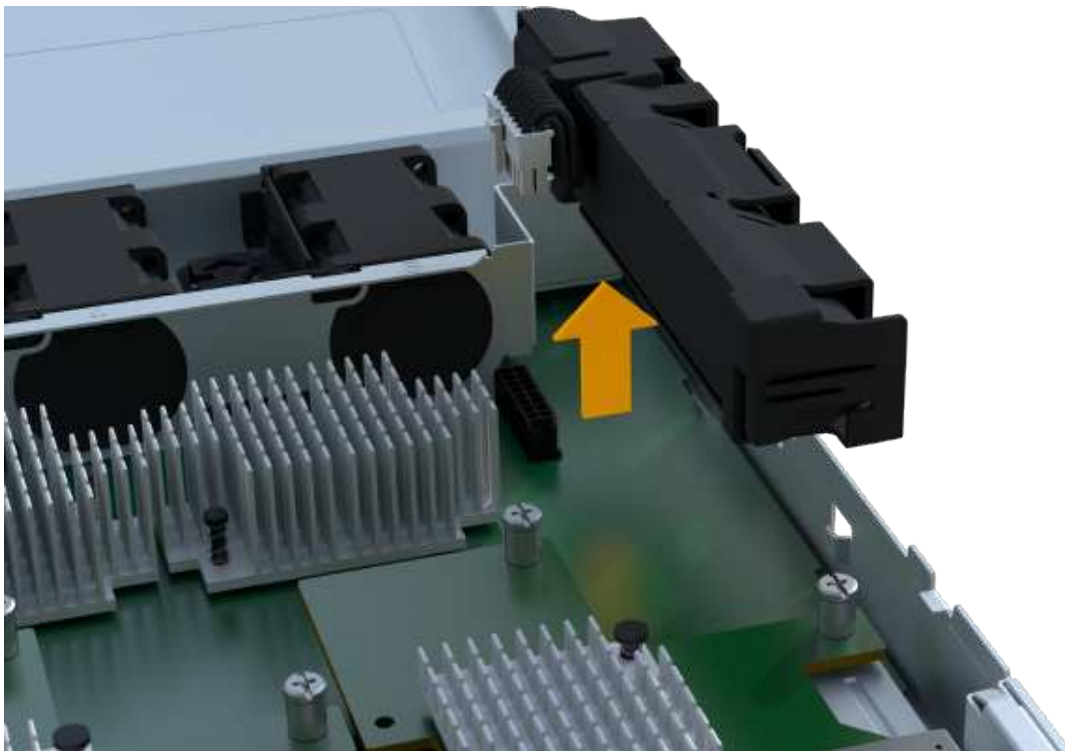
1. Remove the controller canister's cover by unscrewing the single thumbscrew and lifting the lid open.
2. Locate the 'press' tab on the side of the controller.
3. Unlatch the battery by pressing the tab and squeezing the battery casing.



4. Gently squeeze the connector housing the battery wiring. Pull up, disconnecting the battery from the board.



5. Lift the battery out of the controller and place on a flat, static-free surface.

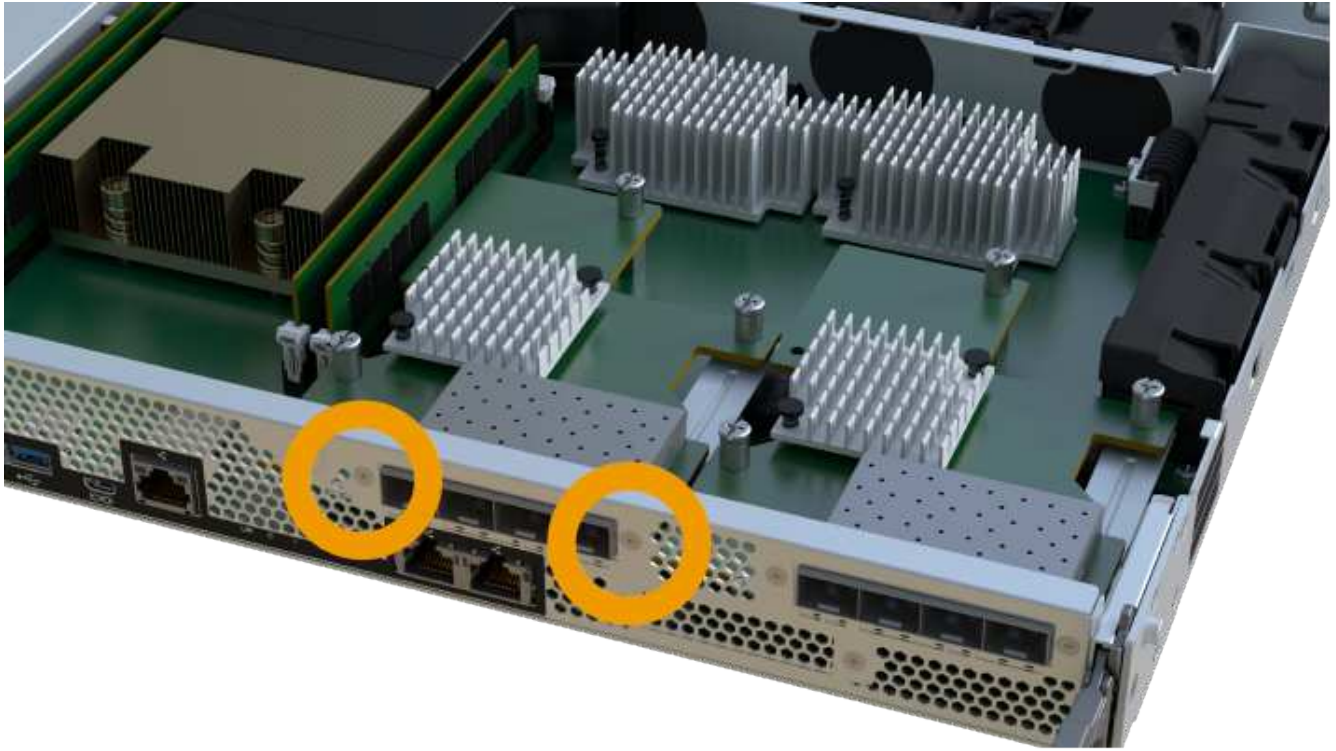


Step 2c: Remove the HIC

If the controller canister includes a HIC, you must remove the HIC from the original controller canister. Otherwise, you can skip this step.

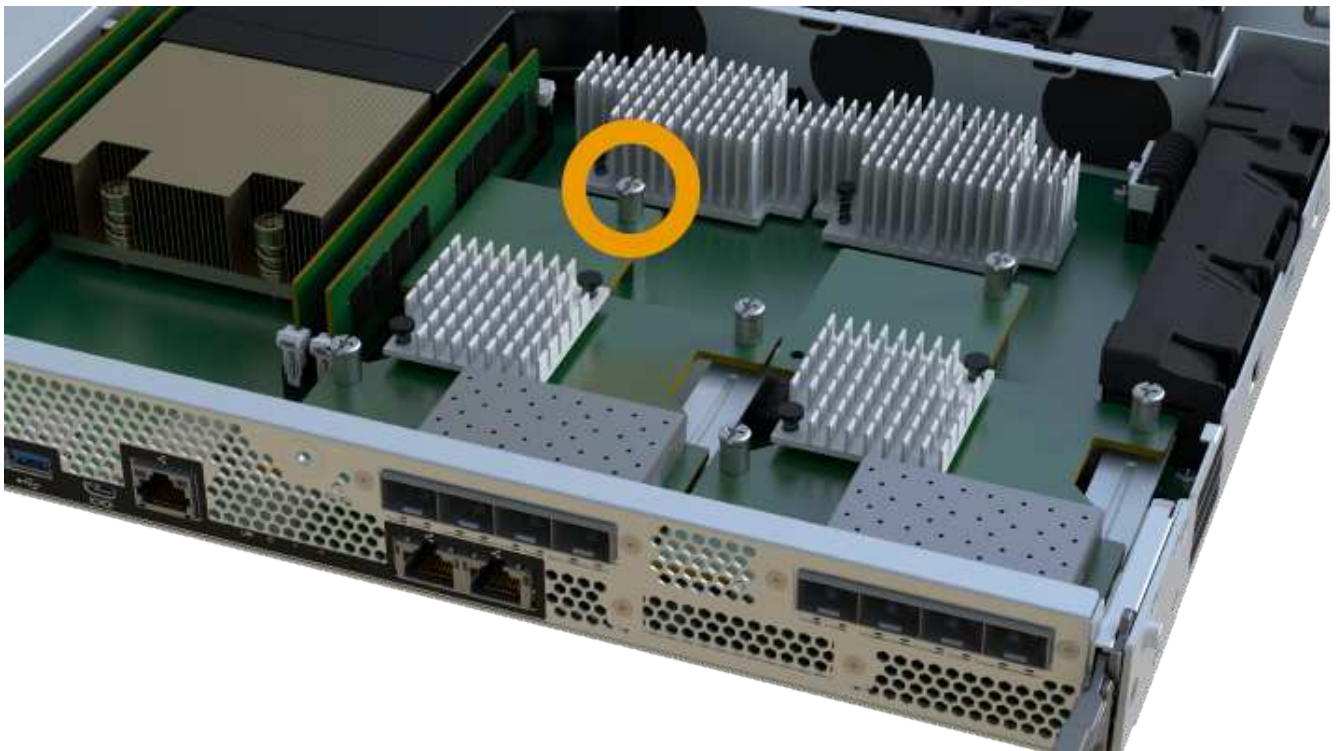
Steps

1. Using a Phillips screwdriver, remove the two screws that attach the HIC faceplate to the controller canister.



The image above is an example, the appearance of your HIC may differ.

2. Remove the HIC faceplate.
3. Using your fingers or a Phillips screwdriver, loosen the single thumbscrew that secure the HIC to the controller card.

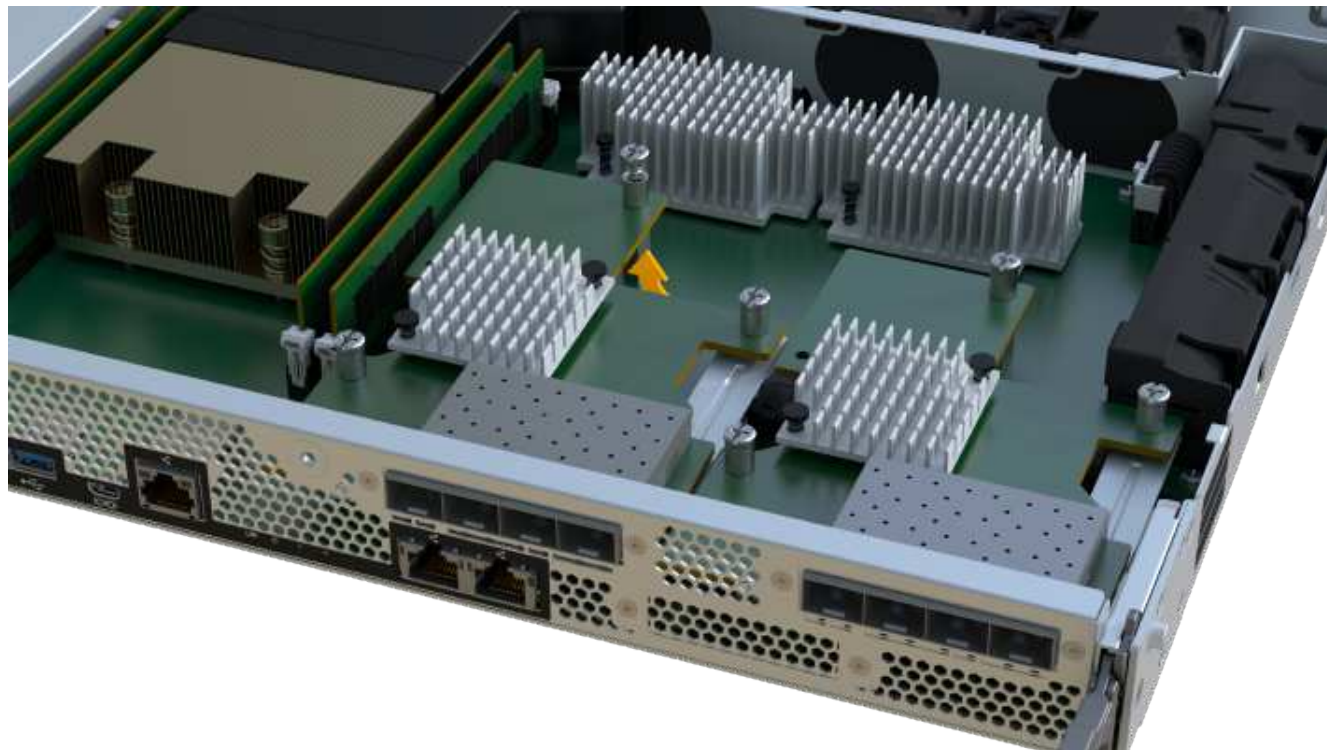


The HIC comes with three screw locations on the top but is secured with only one.

4. Carefully detach the HIC from the controller card by lifting the card up and out of the controller.



Be careful not to scratch or bump the components on the bottom of the HIC or on the top of the controller card.



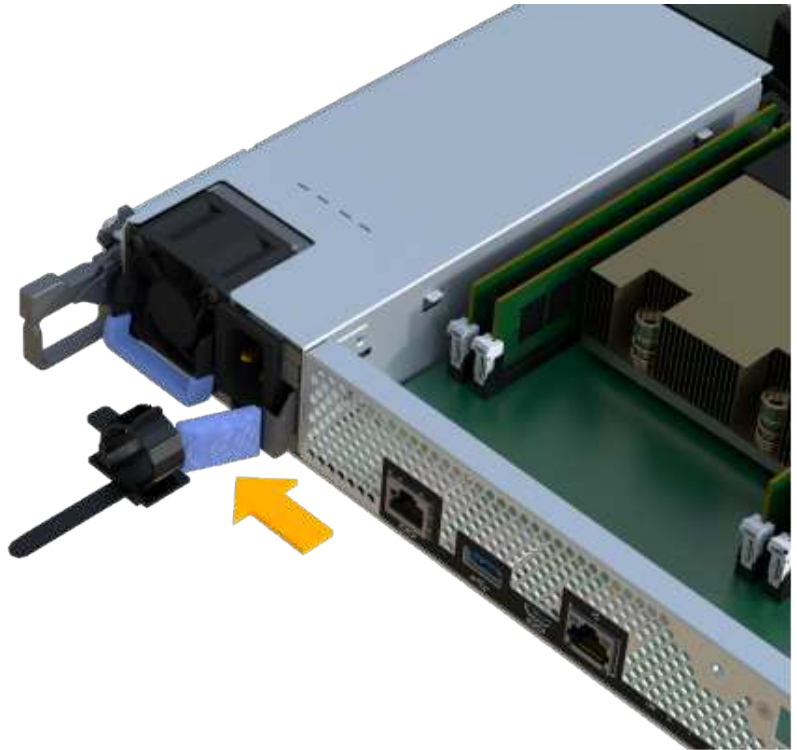
5. Place the HIC on a flat, static-free surface.

Step 2d: Remove power supply

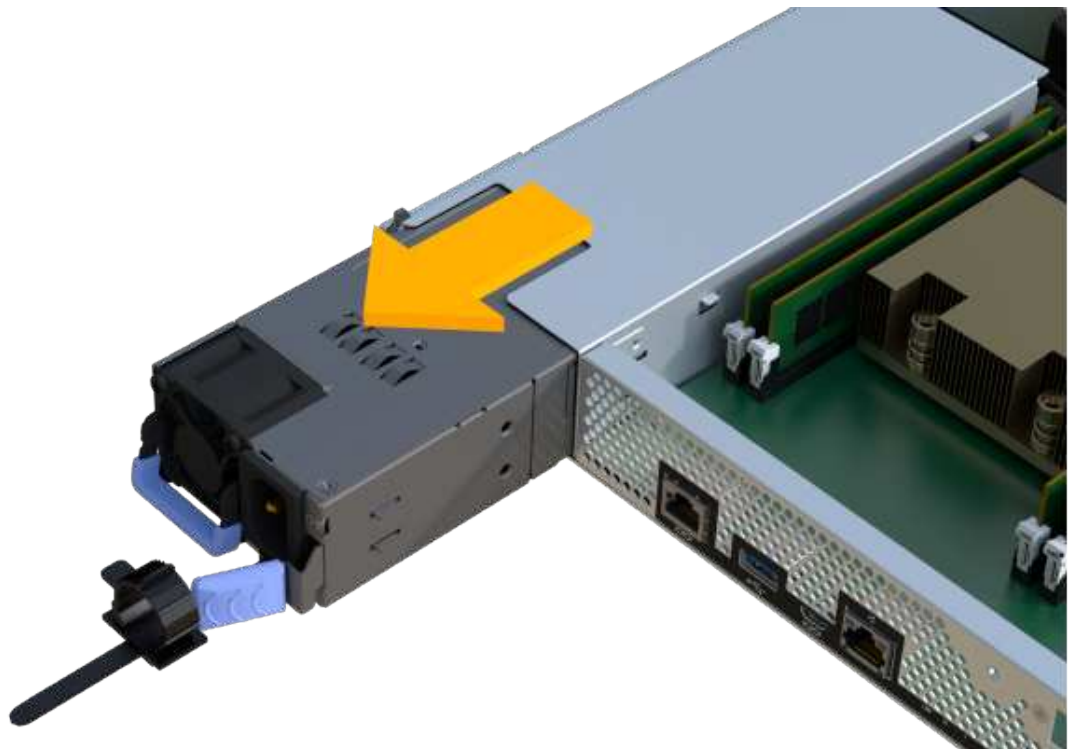
Remove the power supply so you can install it in the new controller.

Steps

1. Disconnect the power cables:
 - a. Open the power cord retainer, and then unplug the power cord from the power supply.
 - b. Unplug the power cord from the power source.
2. Locate the tab to the right of the power supply and press it towards the power supply unit.



3. Locate the handle on the front of the power supply.
4. Use the handle to slide the power supply straight out of the system.



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

Step 2e: Remove DIMMs

Remove the DIMMs so you can install them in the new controller.

Steps

1. Locate the DIMMs on your controller.
2. Note the orientation of the DIMM in the socket so that you can insert the replacement DIMM in the proper orientation.

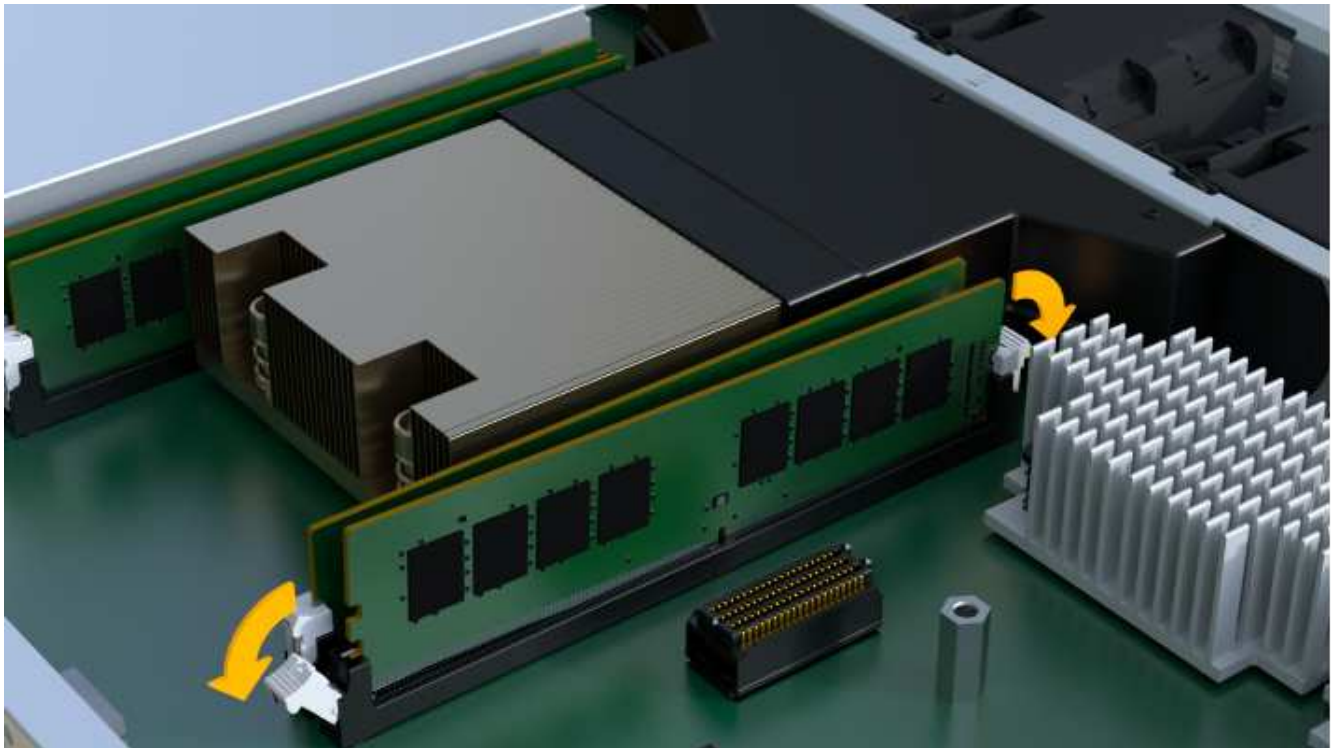


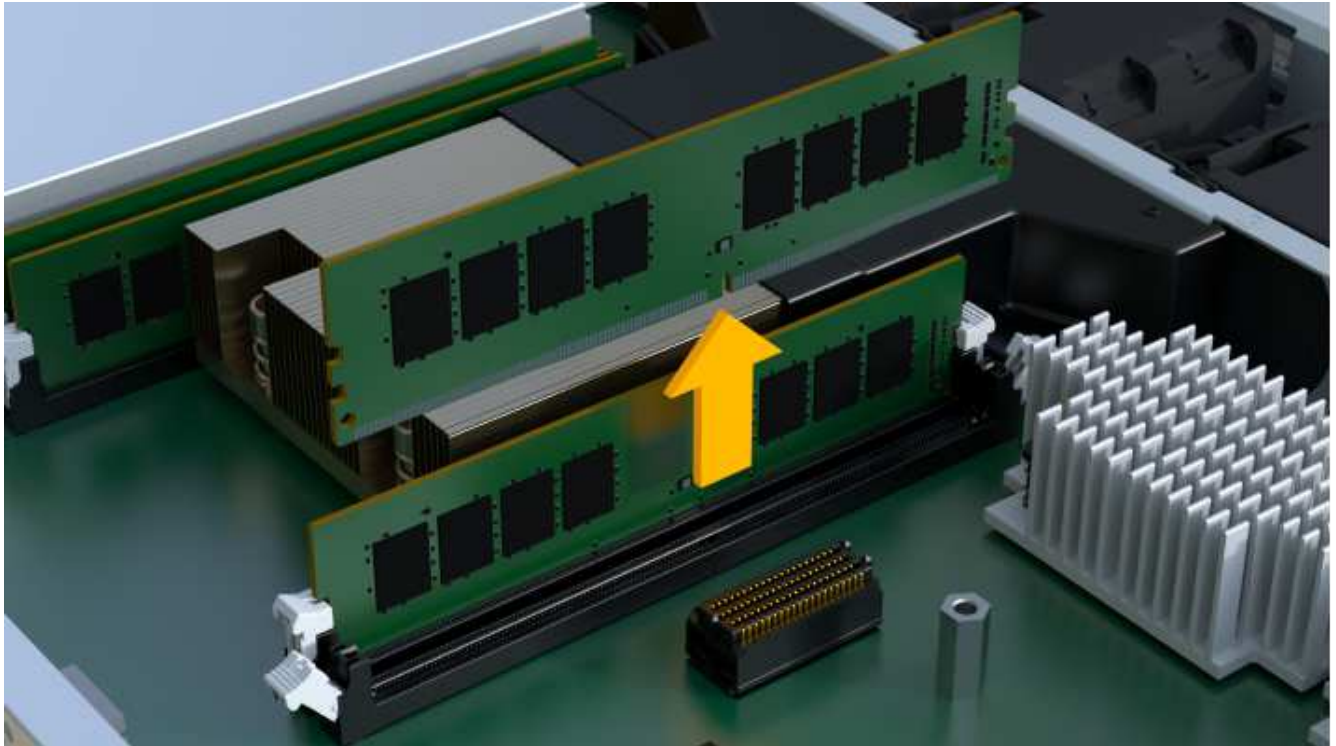
A notch at the bottom of the DIMM helps you align the DIMM during installation.

3. Slowly push apart on the two DIMM ejector tabs on either side of the DIMM to eject the DIMM from its slot, and then slide it out of the slot.



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



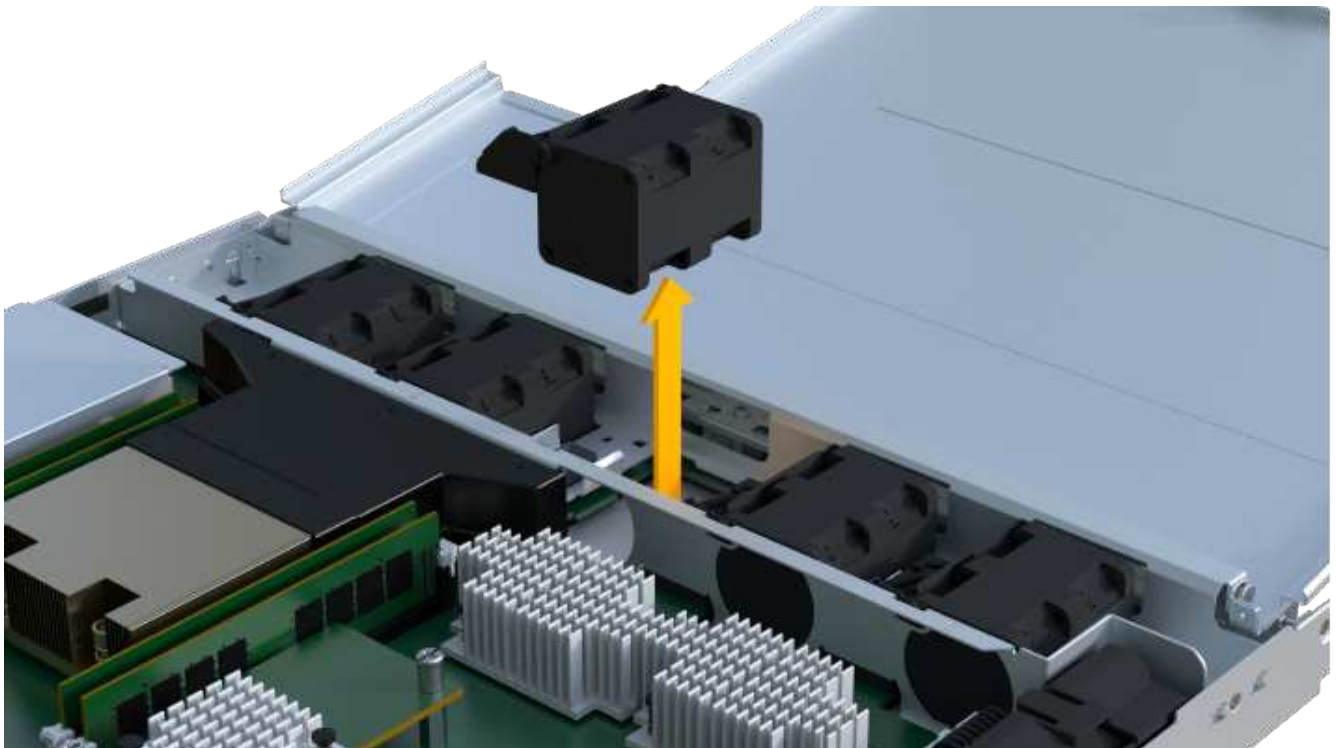


Step 2f: Remove fans

Remove the fans so you can install them in the new controller.

Steps

1. Gently lift the fan from the controller.



2. Repeat until all fans are removed.

Step 3: Install new controller

Install a new controller canister to replace the failed one.

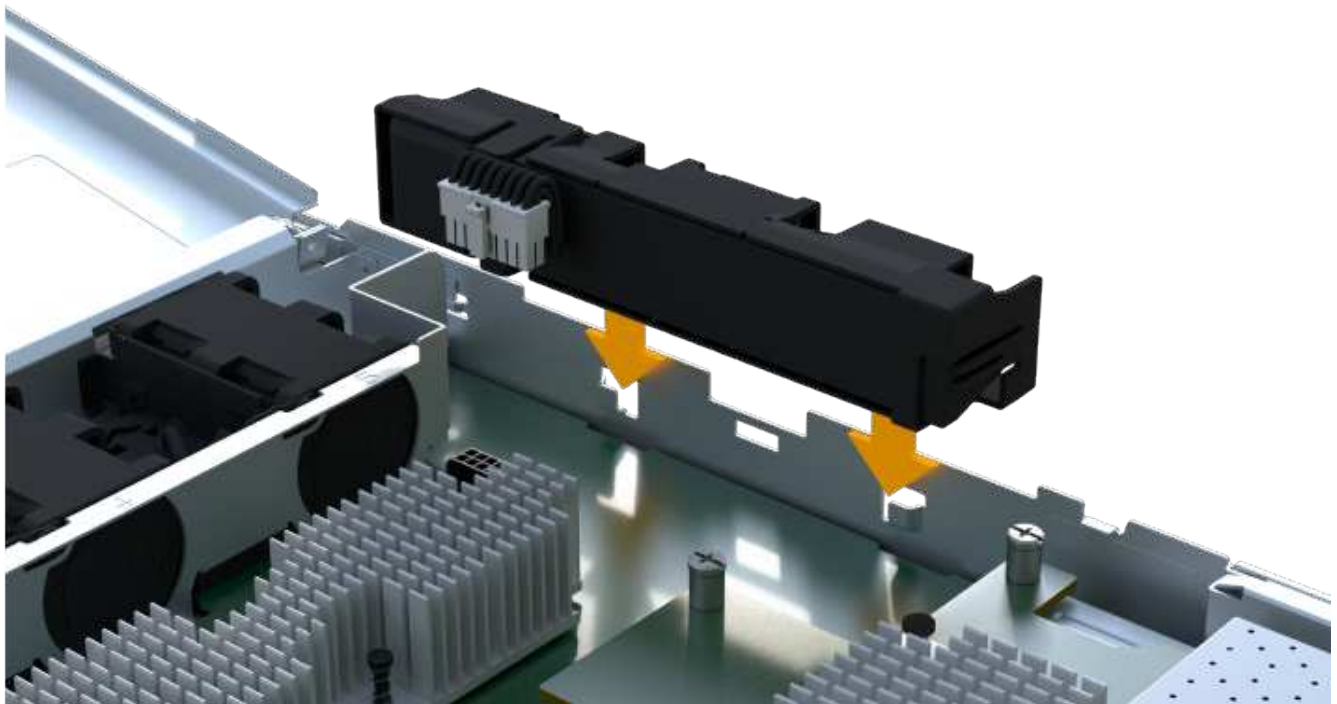
This is a multi-step procedure that requires you to install the following components from the original controller: battery, host interface card, power supply, DIMMs, and fans.

Step 3a: Install battery

Install the battery into the replacement controller canister.

Steps

1. Make sure that you have:
 - The battery from the original controller canister, or a new battery that you ordered.
 - The replacement controller canister.
2. Insert the battery into the controller by lining up the battery casing with the metal latches on the side of the controller.



The battery clicks into place.

3. Plug the battery connector back into the board.

Step 3b: Install the HIC

If you removed a HIC from the original controller canister, you must install that HIC in the new controller canister. Otherwise, you can skip this step.

Steps

1. Using a #1 Phillips screwdriver, remove the two screws that attach the blank faceplate to the replacement controller canister, and remove the faceplate.

2. Align the single thumbscrew on the HIC with the corresponding hole on the controller, and align the connector on the bottom of the HIC with the HIC interface connector on the controller card.

Be careful not to scratch or bump the components on the bottom of the HIC or on the top of the controller card.



The image above is an example; the appearance of your HIC may differ.

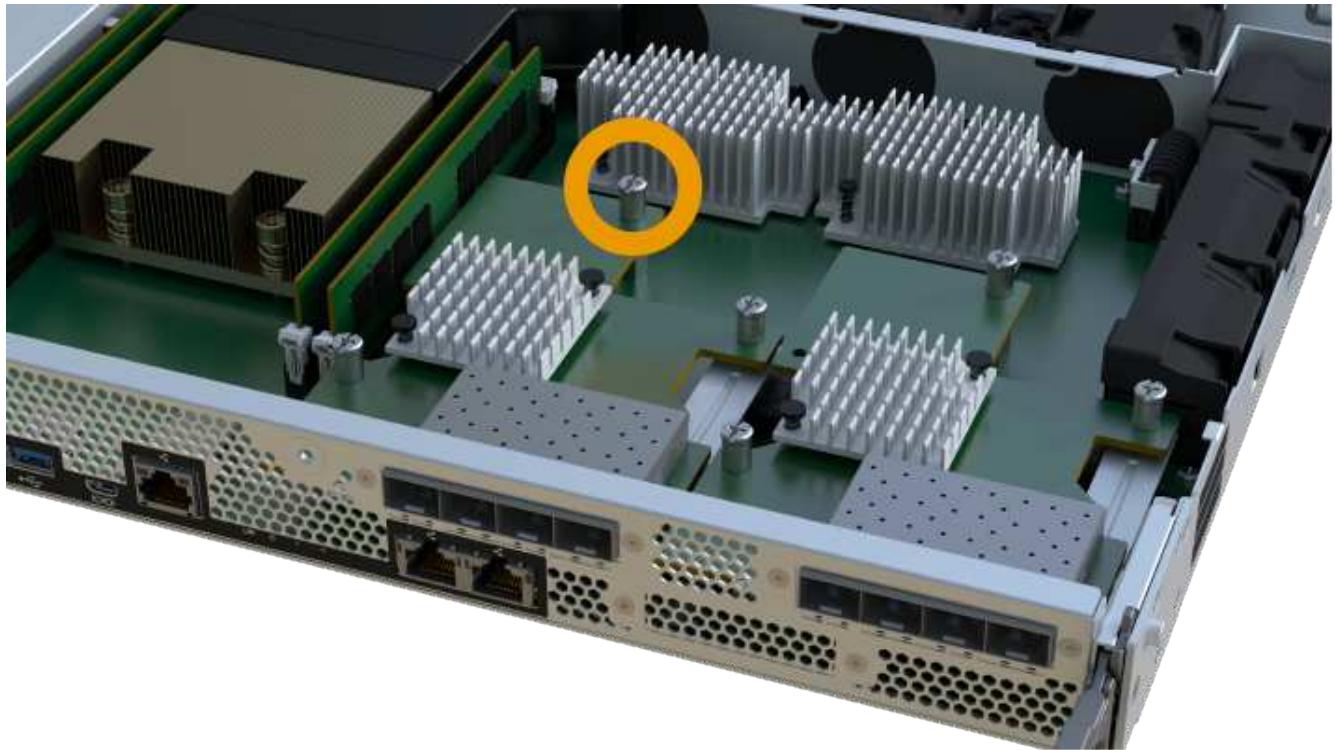
3. Carefully lower the HIC into place, and seat the HIC connector by pressing gently on the HIC.



Possible equipment damage — Be very careful not to pinch the gold ribbon connector for the controller LEDs between the HIC and the thumbscrew.

4. Hand-tighten the HIC thumbscrew.

Do not use a screwdriver, or you might over tighten the screw.



The image above is an example; the appearance of your HIC may differ.

5. Using a #1 Phillips screwdriver, attach the HIC faceplate you removed from the original controller canister to the new controller canister with the two screws.

Step 3c: Install power supply

Install the power supply into the replacement controller canister.

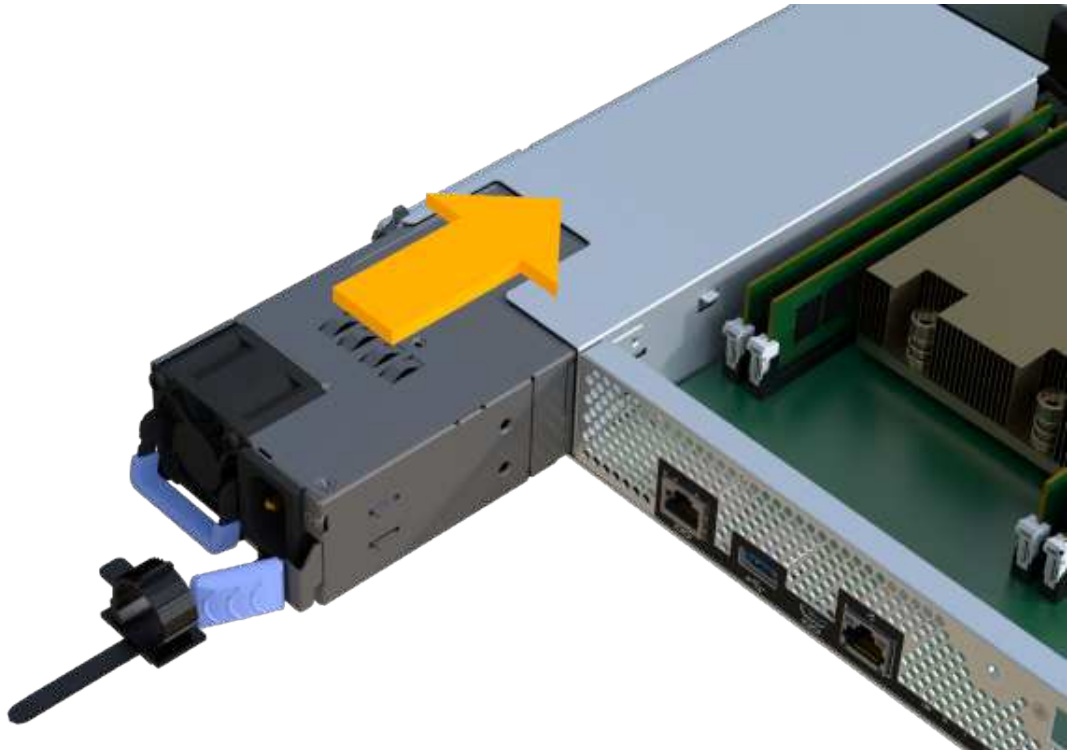
Steps

1. Using both hands, support and align the edges of the power supply with the opening in the system chassis, and then gently push the power supply into the chassis using the cam handle.

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



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



Step 3d: Install DIMMs

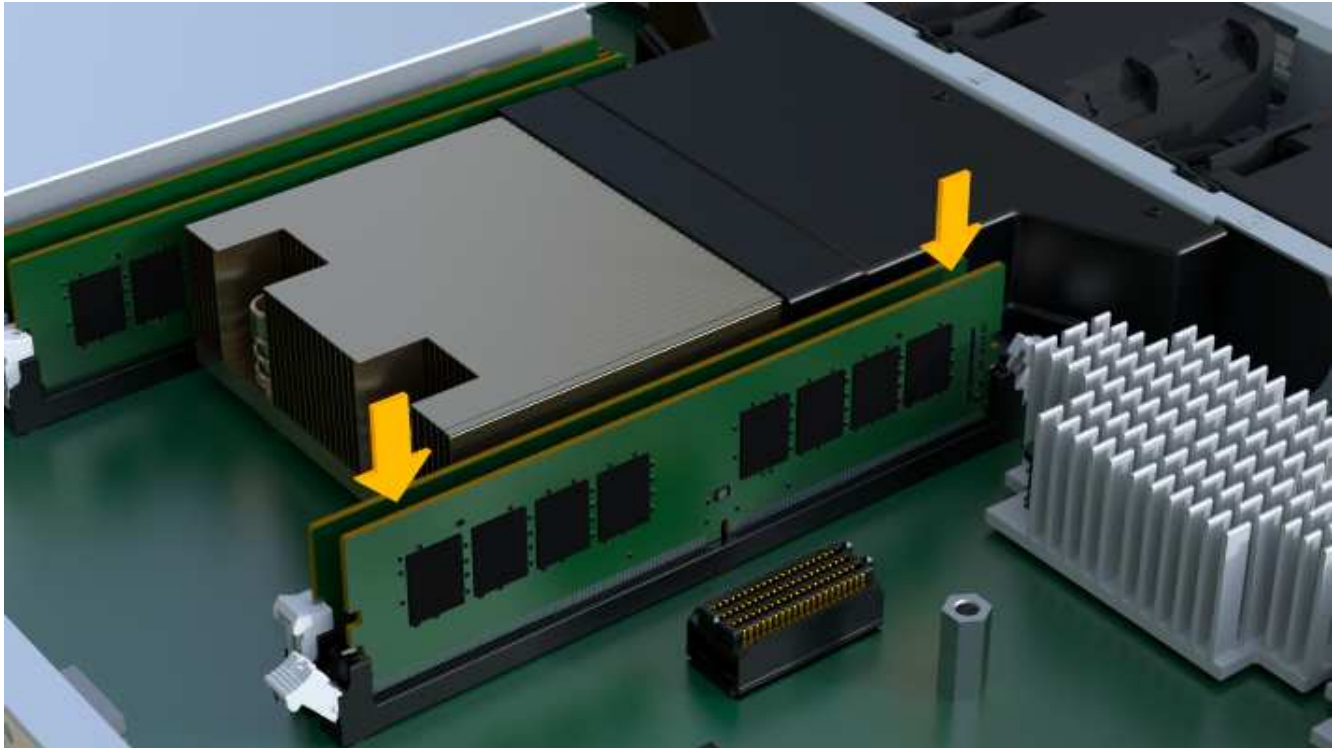
Install the DIMMs into the new controller canister.

Steps

1. 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.

2. 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.

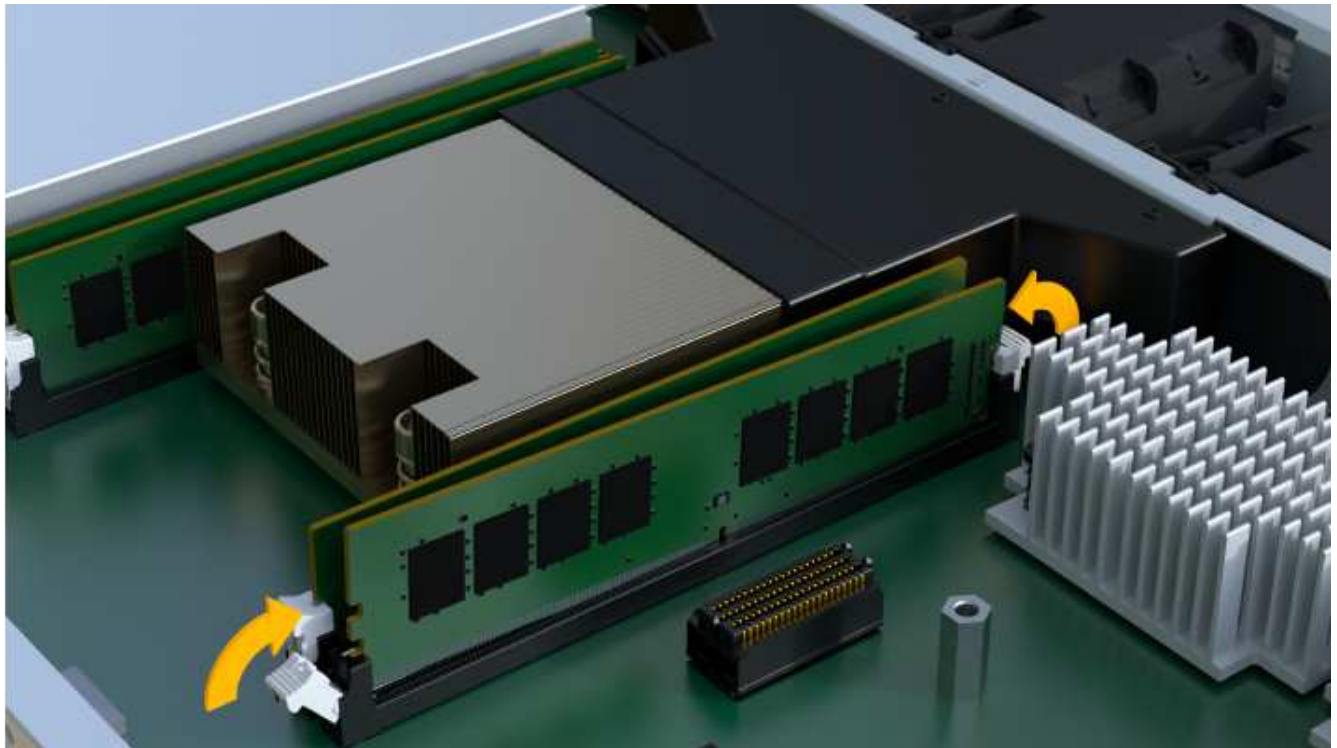


Visually inspect the DIMM to verify that it is evenly aligned and fully inserted into the slot.

3. Push carefully, but firmly, on the top edge of the DIMM until the latches snap into place over the notches at the ends of the DIMM.



DIMMs fit tightly. You might need to gently press on one side at a time and secure with each tab individually.

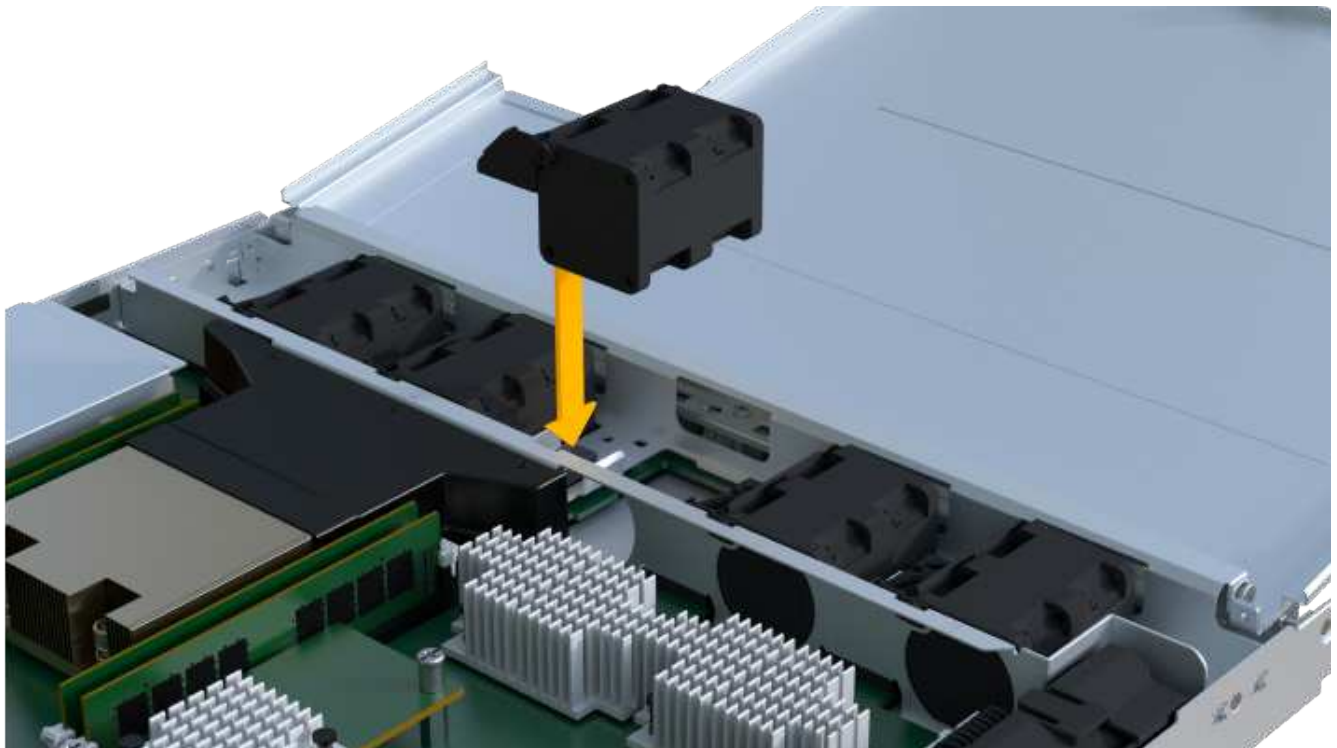


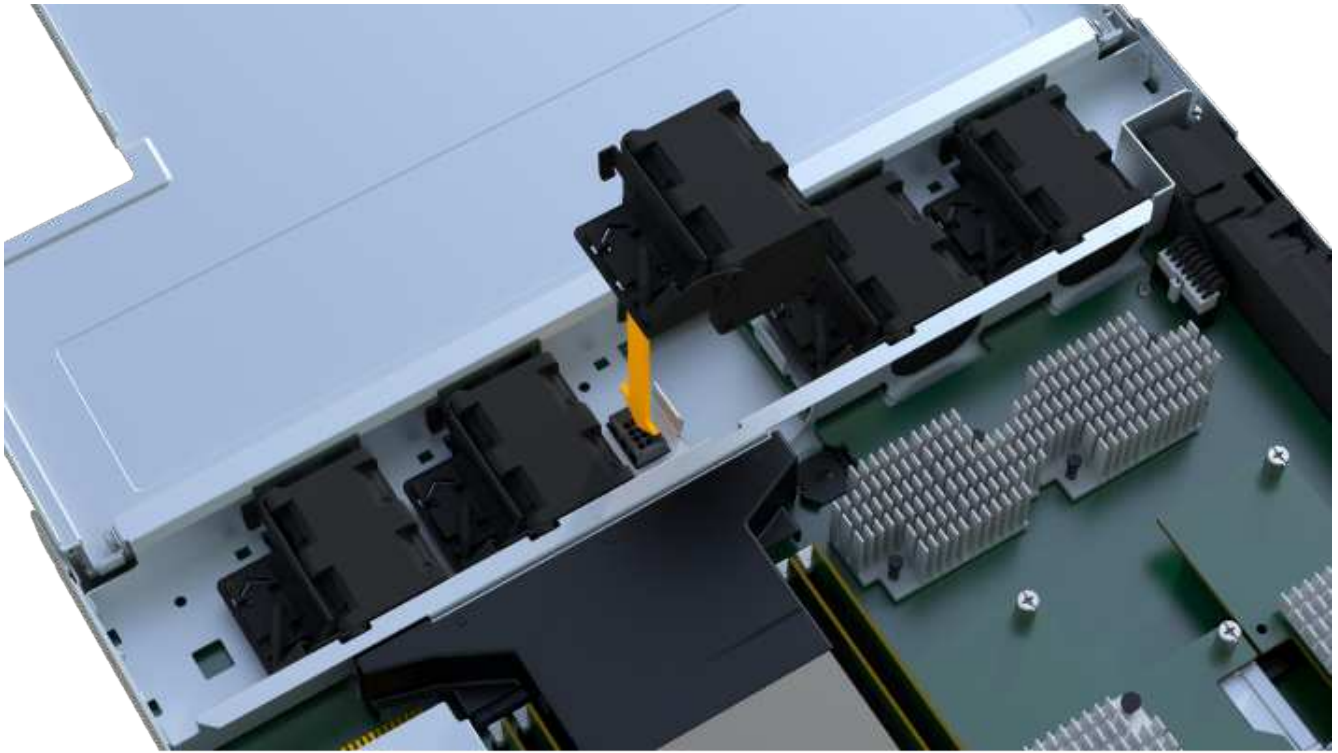
Step 3e: Install fans

Install the fans into the replacement controller canister.

Steps

1. Slide the fan all the way into the replacement controller.





2. Repeat until all fans are installed.

Step 3f: Install new controller canister

Last, install the new controller canister into the controller shelf.

Steps

1. Lower the cover on the controller canister and secure the thumbscrew.
2. While squeezing the controller handles, gently slide the controller canister all the way into the controller shelf.



The controller audibly clicks when correctly installed into the shelf.



3. Install the SFPs from the original controller in the host ports on the new controller, if they were installed in the original controller, and reconnect all the cables.

If you are using more than one host protocol, be sure to install the SFPs in the correct host ports.

4. If the original controller used DHCP for the IP address, locate the MAC address on the label on the back of the replacement controller. Ask your network administrator to associate the DNS/network and IP address for the controller you removed with the MAC address for the replacement controller.



If the original controller did not use DHCP for the IP address, the new controller adopts the IP address of the controller you removed.

Step 4: Complete controller replacement

Place the controller online, collect support data, and resume operations.

Steps

1. Place controller online.
 - a. In System Manager, navigate to the Hardware page.
 - b. Select **Show back of controller**.
 - c. Select the replaced controller.
 - d. Select **Place online** from the drop-down list.
2. As the controller boots, check the controller LEDs.

When communication with the other controller is reestablished:

- The amber Attention LED remains on.
- The Host Link LEDs might be on, blinking, or off, depending on the host interface.

3. When the controller is back online, check whether an NVSRAM mismatch is reported in Recovery Guru.

a. If an NVSRAM mismatch is reported, upgrade NVSRAM using the following SMcli command:

```
SMcli <controller A IP> <controller B IP> -u admin -p <password> -k  
-c "download storageArray NVSRAM  
file=\"C:\Users\testuser\Downloads\NVSRAM .dlp file>\"  
forceDownload=TRUE;"
```

The `-k` parameter is needed if the array is not https secure.



If the SMcli command cannot be completed, contact [NetApp Technical Support](#) or log in to the [NetApp Support Site](#) to create a case.

4. Confirm the status of the system is Optimal and check the controller shelf's Attention LEDs.

If the status is not Optimal or if any of the Attention LEDs are on, confirm that all cables are correctly seated and the controller canister is installed correctly. If necessary, remove and reinstall the controller canister.



If you cannot resolve the problem, contact technical support.

5. Click **Hardware > Support > Upgrade Center** to ensure that the firmware and NVSRAM versions on the system are at the desired levels.

As needed, install the latest version.

6. Verify that all volumes have been returned to the preferred owner.

- a. Select **Storage > Volumes**. From the **All Volumes** page, verify that volumes are distributed to their preferred owners. Select **More > Change ownership** to view volume owners.
- b. If volumes are all owned by preferred owner continue to Step 6.
- c. If none of the volumes are returned, you must manually return the volumes. Go to **More > Redistribute volumes**.
- d. If only some of the volumes are returned to their preferred owners after auto-distribution or manual distribution you must check the Recovery Guru for host connectivity issues.
- e. If there is no Recovery Guru present or if following the recovery guru steps the volumes are still not returned to their preferred owners contact support.

7. Collect support data for your storage array using SANtricity System Manager.

- a. Select **Support > Support Center > Diagnostics**.
- b. Select **Collect Support Data**.
- c. Click **Collect**.

The file is saved in the Downloads folder for your browser with the name, **support-data.7z**.

What's next?

Your controller replacement is complete. You can resume normal operations.

DIMMs

Requirements to replace the DIMM - EF300 and EF600

Before you replace a DIMM in an EF300, EF600, EF600C, or EF300C storage array, review the requirements and considerations.

You must replace a DIMM when a memory mismatch is present, or you have a failed DIMM. Be sure to verify the configuration of your EF300, EF600, EF300C, or EF600C controller to ensure the correct DIMM size is replaced.



Be aware that the DIMMs in your storage array are fragile; improper handling can lead to damage.

Follow these rules to avoid damaging the DIMMs in your storage array:

- Prevent electrostatic discharge (ESD):
 - Keep the DIMM in the ESD bag until you are ready to install it.
 - Open the ESD bag by hand or cut the top off with a pair of scissors. Do not insert a metal tool or knife into the ESD bag.
 - Keep the ESD bag and any packing materials in case you must return a DIMM later.



Always wear an ESD wrist strap grounded to an unpainted surface on your storage enclosure chassis.

- Handle DIMMs carefully:
 - Always use two hands when removing, installing, or carrying a DIMM.
 - Never force a DIMM into a shelf, and use gentle, firm pressure to completely engage the latch.
 - Always use approved packaging when shipping DIMMs.
- Avoid magnetic fields. Keep DIMMs away from magnetic devices.

Replace the DIMMs - EF300 or EF600

You can replace a DIMM in an EF300, EF600, EF300C, or EF600C array.

About this task

To replace a DIMM, you must verify the cache size of your controller, place the controller offline, remove the controller, remove the DIMMs, and install the new DIMMs in your controller. Then you can bring your controller back online and verify the storage array is working properly.

Before you begin

- Review [Requirements for replacing an EF300 or EF600 DIMM](#).
- Make sure that no volumes are in use or that you have a multipath driver installed on all hosts using these volumes.
- Make sure you have the following:
 - A replacement DIMM.

- An ESD wristband, or you have taken other antistatic precautions.
- A flat, static free work area.
- Labels to identify each cable that is connected to the controller canister.
- A management station with a browser that can access SANtricity System Manager for the controller. (To open the System Manager interface, point the browser to the controller's domain name or IP address.)

Step 1: Determine if you need to replace a DIMM

Verify the cache size of your controller before replacing the DIMMS.

Steps

1. Access the Storage Array profile for the controller. From SANtricity System Manager, go to **Support > Support Center**. From the Support Resources page, select **Storage Array Profile**.
2. Scroll down or use the Search field to locate the **Data Cache Module** information.
3. If one of the following is present, note the DIMM's location and continue with remaining procedures in this section to replace the DIMMs on your controller:
 - A failed DIMM, or a DIMM reporting **Data Cache Module** as not optimal.
 - A DIMM with a mismatched **Data Cache Module** capacity.

Step 2: Place controller offline

Place the controller offline so you can safely remove and replace the DIMMs.

Steps

1. From SANtricity System Manager, review the details in the Recovery Guru to confirm that there is an issue with a mismatched memory and to ensure no other items must be addressed first.
2. From the Details area of the Recovery Guru, determine which DIMM to replace.
3. Back up the storage array's configuration database using SANtricity System Manager.

If a problem occurs when you remove a controller, you can use the saved file to restore your configuration. The system will save the current state of the RAID configuration database, which includes all data for volume groups and disk pools on the controller.

- From System Manager:
 - a. Select **Support > Support Center > Diagnostics**.
 - b. Select **Collect Configuration Data**.
 - c. Click **Collect**.

The file is saved in the Downloads folder for your browser with the name, **configurationData-
<arrayName>-<dateTime>.7z**.

4. If the controller is not already offline, take it offline now using SANtricity System Manager.
 - a. Select **Hardware**.
 - b. If the graphic shows the drives, select **Show back of shelf** to show the controllers.
 - c. Select the controller that you want to place offline.

- d. From the context menu, select **Place offline**, and confirm that you want to perform the operation.



If you are accessing SANtricity System Manager using the controller you are attempting to take offline, a SANtricity System Manager Unavailable message is displayed. Select **Connect to an alternate network connection** to automatically access SANtricity System Manager using the other controller.

5. Wait for SANtricity System Manager to update the controller's status to offline.



Do not begin any other operations until after the status has been updated.

6. Select **Recheck** from the Recovery Guru, and confirm that the OK to remove field in the Details area displays Yes, indicating that it is safe to remove this component.

Step 3: Remove controller canister

You remove the failed controller canister so you can replace your DIMMs with new ones.

Steps

1. Put on an ESD wristband or take other antistatic precautions.
2. Label each cable that is attached to the controller canister.
3. Disconnect all the cables from the controller canister.



To prevent degraded performance, do not twist, fold, pinch, or step on the cables.

4. Squeeze the handles on either side of the controller, and pull back until it releases from the shelf.



5. Confirm that the Cache Active LED on the back of the controller is off.

6. Using two hands and the handles, slide the controller canister out of the shelf. When the front of the controller is free of the enclosure, use two hands to pull it out completely.



Always use two hands to support the weight of a controller canister.



7. Place the controller canister on a flat, static-free surface.

Step 4: Remove DIMMs

If there is a memory mismatch present, replace the DIMMs in your controller.

Steps

1. Remove the controller canister's cover by unscrewing the single thumbscrew and lifting the lid open.
2. Confirm that the green LED inside the controller is off.

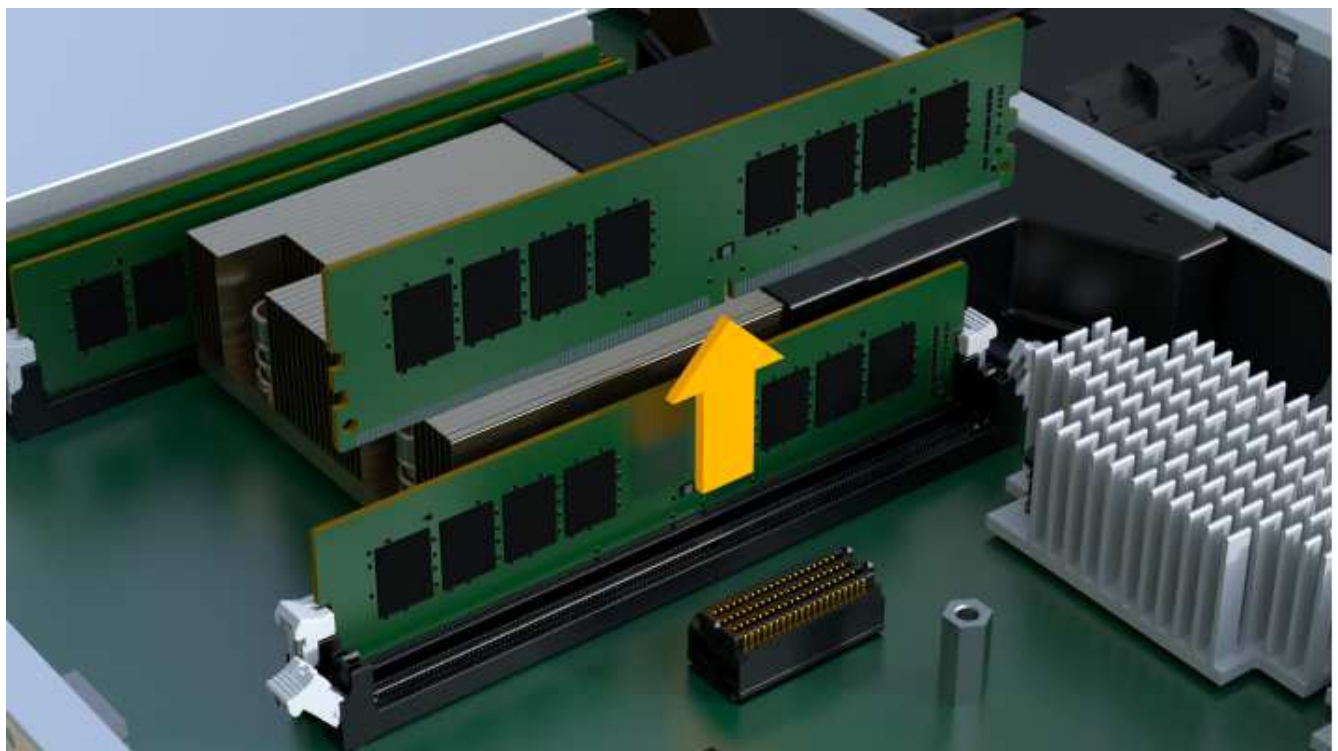
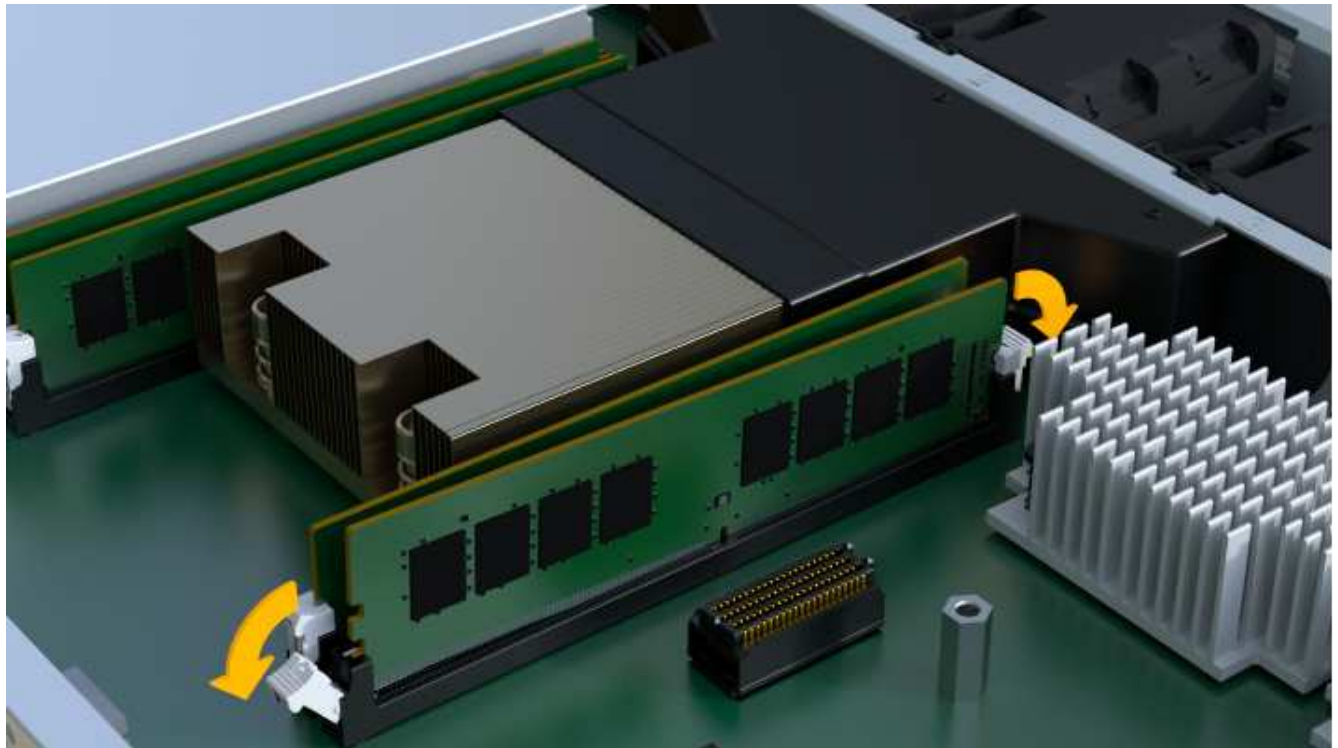
If this green LED is on, the controller is still using battery power. You must wait for this LED to go off before removing any components.

3. Locate the DIMMs on your controller.
4. Note the orientation of the DIMM in the socket so that you can insert the replacement DIMM in the proper orientation.



A notch at the bottom of the DIMM helps you align the DIMM during installation.

5. Slowly push apart on the two DIMM ejector tabs on either side of the DIMM to eject the DIMM from its slot, and then slide it out of the slot.



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

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

Step 5: Install new DIMMs

Install a new DIMM to replace the old one.

Steps

1. 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.

2. 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.

3. Push carefully, but firmly, on the top edge of the DIMM until the latches snap into place over the notches at the ends of the DIMM.



DIMMs fit tightly. You might need to gently press on one side at a time and secure with each tab individually.

Step 6: Reinstall controller canister

After installing the new DIMMs, reinstall the controller canister into the controller shelf.

Steps

1. Lower the cover on the controller canister and secure the thumbscrew.
2. While squeezing the controller handles, gently slide the controller canister all the way into the controller shelf.



The controller audibly clicks when correctly installed into the shelf.



3. Reconnect all the cables.

Step 7: Complete DIMMs replacement

Place the controller online, collect support data, and resume operations.

Steps

1. Place controller online.
 - a. In System Manager, navigate to the Hardware page.
 - b. Select **Show back of controller**.
 - c. Select the controller with the replaced DIMMs.
 - d. Select **Place online** from the drop-down list.
2. As the controller boots, check the controller LEDs.

When communication with the other controller is reestablished:

- The amber Attention LED remains on.
 - The Host Link LEDs might be on, blinking, or off, depending on the host interface.
3. When the controller is back online, confirm that its status is Optimal and check the controller shelf's Attention LEDs.

If the status is not Optimal or if any of the Attention LEDs are on, confirm that all cables are correctly seated and the controller canister is installed correctly. If necessary, remove and reinstall the controller canister.



If you cannot resolve the problem, contact technical support.

4. Click **Hardware > Support > Upgrade Center** to ensure that the latest version of SANtricity OS is installed.

As needed, install the latest version.

5. Verify that all volumes have been returned to the preferred owner.
 - a. Select **Storage > Volumes**. From the **All Volumes** page, verify that volumes are distributed to their preferred owners. Select **More > Change ownership** to view volume owners.
 - b. If volumes are all owned by preferred owner continue to Step 6.
 - c. If none of the volumes are returned, you must manually return the volumes. Go to **More > Redistribute volumes**.
 - d. If there is no Recovery Guru present or if following the Recovery Guru steps the volumes are still not returned to their preferred owners contact support.
6. Collect support data for your storage array using SANtricity System Manager.
 - a. Select **Support > Support Center > Diagnostics**.
 - b. Select **Collect Support Data**.
 - c. Click **Collect**.

The file is saved in the Downloads folder for your browser with the name, **support-data.7z**.

What's next?

Your DIMM replacement is complete. You can resume normal operations.

Drives

Requirements to replace the drive - EF300 or EF600

Before replacing a drive in an EF300, EF600, EF300C, or EF600C array, review the requirements and considerations.



Be aware that the drives in your storage array are fragile; improper drive handling is a leading cause of drive failure.

Drive replacement requirements

Follow these rules to avoid damaging the drives in your storage array:

- Prevent electrostatic discharge (ESD):
 - Keep the drive in the ESD bag until you are ready to install it.
 - Open the ESD bag by hand or cut the top off with a pair of scissors. Do not insert a metal tool or knife into the ESD bag.
 - Keep the ESD bag and any packing materials in case you must return a drive later.
 - Always wear an ESD wrist strap grounded to an unpainted surface on your storage enclosure chassis. If a wrist strap is unavailable, touch an unpainted surface on your storage enclosure chassis before handling the drive.
- Handle drives carefully:
 - Always use two hands when removing, installing, or carrying a drive.
 - Never force a drive into a shelf, and use gentle, firm pressure to completely engage the drive latch.
 - Place drives on cushioned surfaces, and never stack drives on top of each other.
 - Do not bump drives against other surfaces.
 - Before removing a drive from a shelf, unlatch the handle and wait 60 seconds for the drive to spin down.
 - Always use approved packaging when shipping drives.
- Avoid magnetic fields. Keep drives away from magnetic devices.

Magnetic fields can destroy all data on the drive and cause irreparable damage to the drive circuitry.

Drive staggering in 24-drive controller shelf

Standard 24-drive shelves require drive staggering. The following figure shows how the drives are numbered in each shelf (the shelf's front bezel has been removed).



When inserting fewer than 24 drives into an EF300 or EF600 controller, you must alternate between the two halves of the controller. Beginning with the far left and then moving to the far right, place the drives in one at a time.

The following figure shows how to stagger the drives between the two halves.



Replace the drive - EF300

You can replace a drive in an EF300 or EF300C array.

The EF300 and EF300C supports SAS expansion with 24-drive and 60-drive shelves. The procedure you follow depends on whether you have a 24-drive shelf or a 60-drive shelf:

- [Replace drive in an EF300 \(24-drive shelf\)](#)
- [Replace drive in an EF300 \(60-drive shelf\)](#)

Replace drive in an EF300 (24-drive shelf)

Follow this procedure to replace a drive in a 24-drive shelf.

About this task

The Recovery Guru in SANtricity System Manager monitors the drives in the storage array and can notify you of an impending drive failure or an actual drive failure. When a drive has failed, its amber Attention LED is on. You can hot-swap a failed drive while the storage array is receiving I/O.

Before you begin

- Review drive handling requirements in [Requirements for EF300 or EF600 drive replacement](#).
- Make sure you have the following:
 - A replacement drive that is supported by NetApp for your controller shelf or drive shelf.
 - An ESD wristband, or you have taken other antistatic precautions.

- A flat, static-free work surface.
- A management station with a browser that can access SANtricity System Manager for the controller. (To open the System Manager interface, point the browser to the controller's domain name or IP address.)

Step 1: Prepare to replace drive (24-drive)

Prepare to replace a drive by checking the Recovery Guru in SANtricity System Manager and completing any prerequisite steps. Then, you can locate the failed component.

Steps

1. If the Recovery Guru in SANtricity System Manager has notified you of an *impending drive failure*, but the drive has not yet failed, follow the instructions in the Recovery Guru to fail the drive.
2. If needed, use SANtricity System Manager to confirm you have a suitable replacement drive.
 - a. Select **Hardware**.
 - b. Select the failed drive on the shelf graphic.
 - c. Click the drive to display its context menu, and then select **View settings**.
 - d. Confirm that the replacement drive has a capacity equal to or greater than the drive you are replacing and that it has the features you expect.

For example, do not attempt to replace a hard disk drive (HDD) with a solid-state drive (SSD). Similarly, if you are replacing a secure-capable drive, make sure the replacement drive is also secure-capable.

3. If needed, use SANtricity System Manager to locate the drive within your storage array: From the drive's context menu, select **Turn on locator light**.

The drive's Attention LED (amber) blinks so you can identify which drive to replace.



If you are replacing a drive in a shelf that has a bezel, you must remove the bezel to see the drive LEDs.

Step 2: Remove failed drive (24-drive)

Remove a failed drive to replace it with a new one.

Steps

1. Unpack the replacement drive, and set it on a flat, static-free surface near the shelf.

Save all packing materials.

2. Press the release button on the failed drive.



- For drives in E5724 controller shelves or DE224C drive shelves, the release button is located at the top of the drive. The cam handle on the drive springs open partially, and the drive releases from the midplane.

3. Open the cam handle, and slide out the drive slightly.
4. Wait 60 seconds.
5. Using both hands, remove the drive from the shelf.
6. Place the drive on an antistatic, cushioned surface away from magnetic fields.
7. Wait 60 seconds for the software to recognize that the drive has been removed.



If you accidentally remove an active drive, wait at least 60 seconds, and then reinstall it. For the recovery procedure, refer to the storage management software.

Step 3: Install new drive (24-drive)

You install a new drive to replace the failed one. Install the replacement drive as soon as possible after removing the failed drive. Otherwise, there is a risk that the equipment might overheat.

Steps

1. Open the cam handle.
2. Using two hands, insert the replacement drive into the open bay, firmly pushing until the drive stops.
3. Slowly close the cam handle until the drive is fully seated in the midplane and the handle clicks into place.

The green LED on the drive comes on when the drive is inserted correctly.



Depending on your configuration, the controller might automatically reconstruct data to the new drive. If the shelf uses hot spare drives, the controller might need to perform a complete reconstruction on the hot spare before it can copy the data to the replaced drive. This reconstruction process increases the time that is required to complete this procedure.

Step 4: Complete drive replacement (24-drive)

Confirm that the new drive is working correctly.

Steps

1. Check the Power LED and the Attention LED on the drive you replaced.

When you first insert a drive, its Attention LED might be on. However, the LED should go off within a minute.

- Power LED is on or blinking, and the Attention LED is off: Indicates that the new drive is working correctly.
 - Power LED is off: Indicates that the drive might not be installed correctly. Remove the drive, wait 60 seconds, and then reinstall it.
 - Attention LED is on: Indicates that the new drive might be defective. Replace it with another new drive.
2. If the Recovery Guru in SANtricity System Manager still shows an issue, select **Recheck** to ensure the problem has been resolved.
 3. If the Recovery Guru indicates that drive reconstruction did not start automatically, start reconstruction

manually, as follows:



Perform this operation only when instructed to do so by technical support or the Recovery Guru.

- a. Select **Hardware**.
- b. Click the drive that you replaced.
- c. From the drive's context menu, select **Reconstruct**.
- d. Confirm that you want to perform this operation.

When the drive reconstruction completes, the volume group is in an Optimal state.

4. As required, reinstall the bezel.
5. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit.

What's next?

Your drive replacement is complete. You can resume normal operations.

Replace drive in an EF300 (60-drive shelf)

Follow this procedure to replace a drive in a 60-drive shelf.

About this task

The Recovery Guru in SANtricity System Manager monitors the drives in the storage array and can notify you of an impending drive failure or an actual drive failure. When a drive has failed, its amber Attention LED is on. You can hot-swap a failed drive while the storage array is receiving I/O operations.

Before you begin

- Review drive handling requirements in [Requirements for EF300 or EF600 drive replacement](#).
- Make sure you have the following:
 - A replacement drive that is supported by NetApp for your controller shelf or drive shelf.
 - An ESD wristband, or you have taken other antistatic precautions.
 - A management station with a browser that can access SANtricity System Manager for the controller. (To open the System Manager interface, point the browser to the controller's domain name or IP address.)

Step 1: Prepare to replace drive (60-drive)

Prepare to replace a drive by checking the Recovery Guru in SANtricity System Manager and completing any prerequisite steps. Then, you can locate the failed component.

Steps

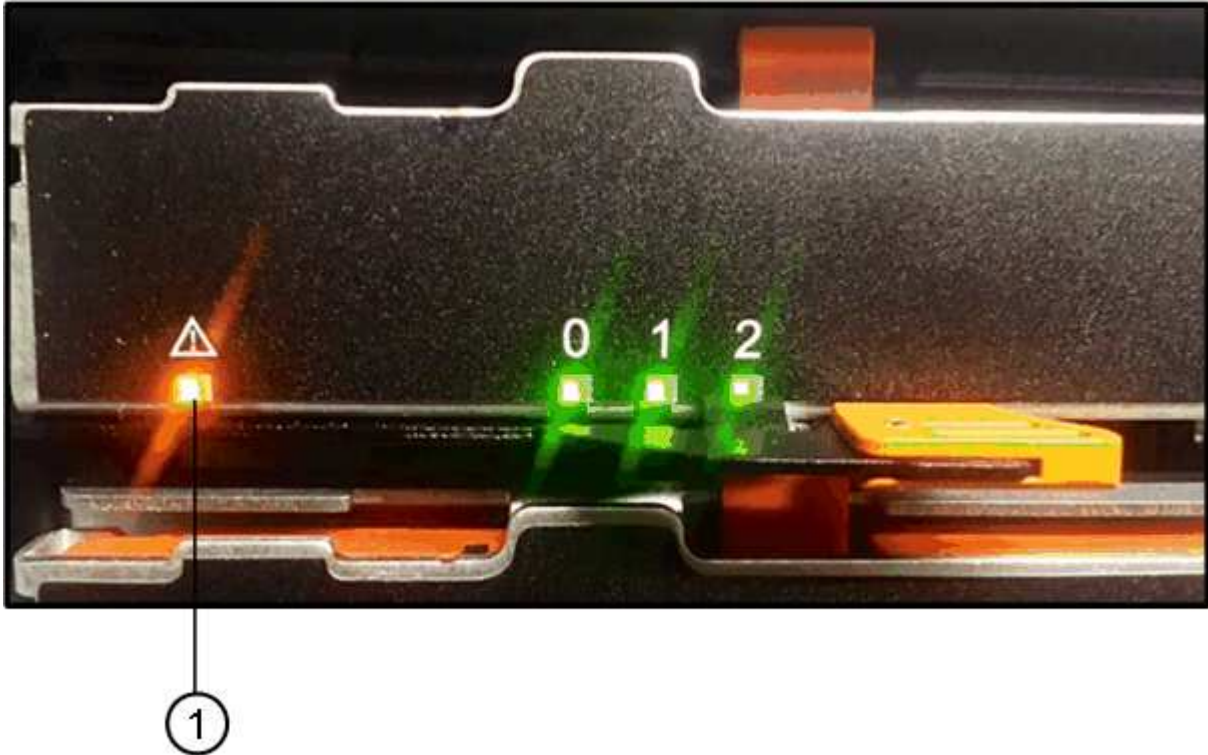
1. If the Recovery Guru in SANtricity System Manager has notified you of an *impending drive failure*, but the drive has not yet failed, follow the instructions in the Recovery Guru to fail the drive.
2. If needed, use SANtricity System Manager to confirm you have a suitable replacement drive.
 - a. Select **Hardware**.
 - b. Select the failed drive on the shelf graphic.
 - c. Click the drive to display its context menu, and then select **View settings**.

- d. Confirm that the replacement drive has a capacity equal to or greater than the drive you are replacing and that it has the features you expect.

For example, do not attempt to replace a hard disk drive (HDD) with a solid-state disk (SSD). Similarly, if you are replacing a secure-capable drive, make sure the replacement drive is also secure-capable.

3. If needed, use SANtricity System Manager to locate the drive within the storage array.
 - a. If the shelf has a bezel, remove it so you can see the LEDs.
 - b. From the drive's context menu, select **Turn on locator light**.

The drive drawer's Attention LED (amber) blinks so you can open the correct drive drawer to identify which drive to replace.



(1) Attention LED

- c. Unlatch the drive drawer by pulling on both levers.
- d. Using the extended levers, carefully pull the drive drawer out until it stops.
- e. Look at the top of the drive drawer to find the Attention LED in front of each drive.



(1) Attention LED light on for the drive on the top right side

The drive drawer Attention LEDs are on the left side in front of each drive, with an attention icon on the drive handle just behind the LED.



(1) *Attention icon*

(2) *Attention LED*

Step 2: Remove failed drive (60-drive)

Remove a failed drive to replace it with a new one.

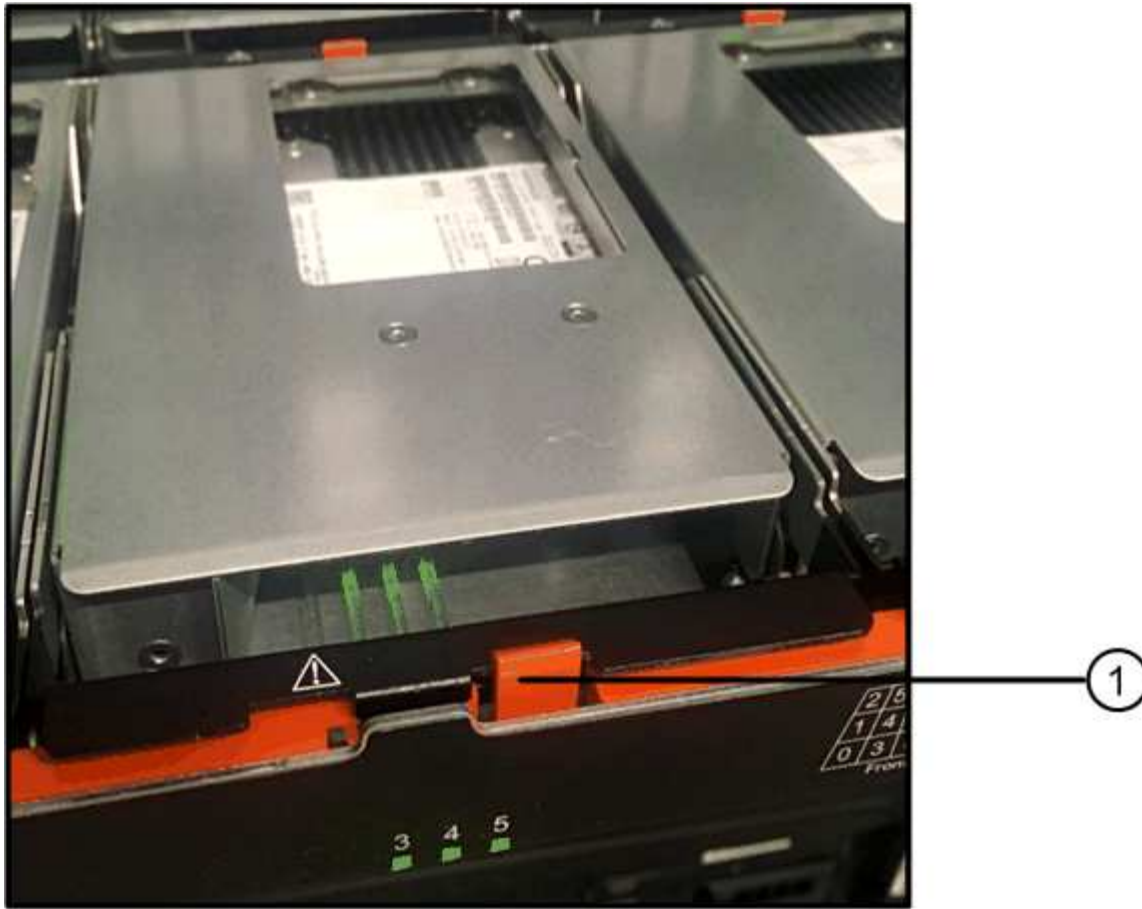
Steps

1. Unpack the replacement drive, and set it on a flat, static-free surface near the shelf.

Save all packing materials for the next time you need to send a drive back.

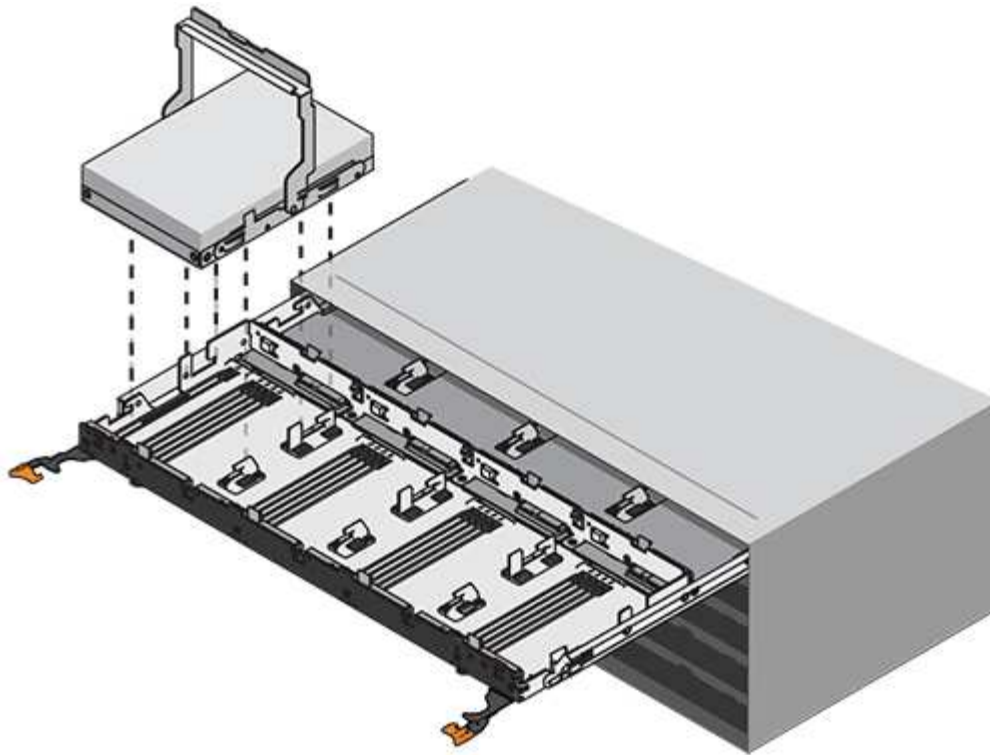
2. Release the drive drawer levers from the center of the appropriate drive drawer by pulling both towards the sides of the drawer.
3. Carefully pull on the extended drive drawer levers to pull out the drive drawer to its full extension without removing it from the enclosure.
4. Gently pull back the orange release latch that is in front of the drive you want to remove.

The cam handle on the drive springs open partially, and the drive is released from the drawer.



(1) *Orange release latch*

5. Open the cam handle, and lift out the drive slightly.
6. Wait 60 seconds.
7. Use the cam handle to lift the drive from the shelf.



8. Place the drive on an antistatic, cushioned surface away from magnetic fields.
9. Wait 60 seconds for the software to recognize that the drive has been removed.



If you accidentally remove an active drive, wait at least 60 seconds, and then reinstall it. For the recovery procedure, refer to the storage management software.

Step 3: Install new drive (60-drive)

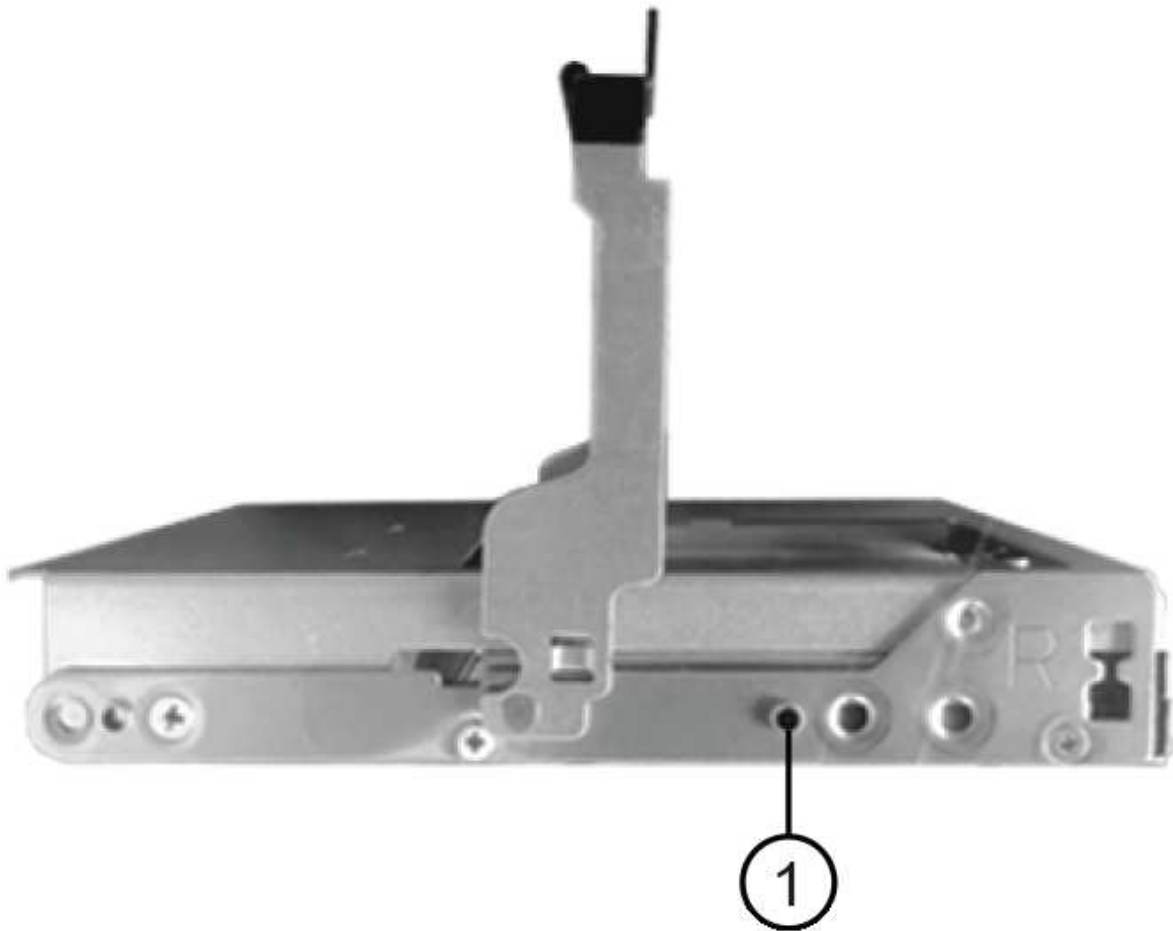
Install a new drive to replace the failed one.



Possible loss of data access — When pushing the drive drawer back into the enclosure, never slam the drawer shut. Push the drawer in slowly to avoid jarring the drawer and causing damage to the storage array.

Steps

1. Raise the cam handle on the new drive to vertical.
2. Align the two raised buttons on each side of the drive carrier with the matching gap in the drive channel on the drive drawer.



(1) Raised button on the right side of the drive carrier

3. Lower the drive straight down, and then rotate the cam handle down until the drive snaps into place under the orange release latch.
4. Carefully push the drive drawer back into the enclosure. Push the drawer in slowly to avoid jarring the drawer and causing damage to the storage array.
5. Close the drive drawer by pushing both levers towards the center.

The green Activity LED for the replaced drive on the front of the drive drawer comes on when the drive is inserted correctly.

Depending on your configuration, the controller might automatically reconstruct data to the new drive. If the shelf uses hot spare drives, the controller might need to perform a complete reconstruction on the hot spare before it can copy the data to the replaced drive. This reconstruction process increases the time that is required to complete this procedure.

Step 4: Complete drive replacement (60-drive)

Confirm that the new drive is working correctly.

Steps

1. Check the Power LED and the Attention LED on the drive you replaced. (When you first insert a drive, its Attention LED might be on. However, the LED should go off within a minute.)
 - Power LED is on or blinking, and the Attention LED is off: Indicates that the new drive is working correctly.
 - Power LED is off: Indicates that the drive might not be installed correctly. Remove the drive, wait 60 seconds, and then reinstall it.
 - Attention LED is on: Indicates that the new drive might be defective. Replace it with another new drive.
2. If the Recovery Guru in SANtricity System Manager still shows an issue, select **Recheck** to ensure the problem has been resolved.
3. If the Recovery Guru indicates that drive reconstruction did not start automatically, start reconstruction manually, as follows:



Perform this operation only when instructed to do so by technical support or the Recovery Guru.

- a. Select **Hardware**.
- b. Click the drive that you replaced.
- c. From the drive's context menu, select **Reconstruct**.
- d. Confirm that you want to perform this operation.

When the drive reconstruction completes, the volume group is in an Optimal state.

4. As required, reinstall the bezel.
5. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit.

What's next?

Your drive replacement is complete. You can resume normal operations.

Replace the drive - EF600

You can replace a drive in an EF600 or EF600C array.

About this task

The Recovery Guru in SANtricity System Manager monitors the drives in the storage array and can notify you of an impending drive failure or an actual drive failure. When a drive has failed, its amber Attention LED is on. You can hot-swap a failed drive while the storage array is receiving I/O.

Before you begin

- Review [Requirements for EF300 or EF600 drive replacement](#).
- Make sure you have the following:
 - A replacement drive that is supported by NetApp for your controller shelf or drive shelf.
 - An ESD wristband, or you have taken other antistatic precautions.
 - A flat, static-free work surface.
 - A management station with a browser that can access SANtricity System Manager for the controller. (To open the System Manager interface, point the browser to the controller's domain name or IP address.)

Step 1: Prepare to replace drive

Prepare for drive replacement by checking the Recovery Guru in SANtricity System Manager and completing any prerequisite steps. Then, you can locate the failed component.

Steps

1. If the Recovery Guru in SANtricity System Manager has notified you of an *impending drive failure*, but the drive has not yet failed, follow the instructions in the Recovery Guru to fail the drive.
2. If needed, use SANtricity System Manager to confirm you have a suitable replacement drive.
 - a. Select **Hardware**.
 - b. Select the failed drive on the shelf graphic.
 - c. Click the drive to display its context menu, and then select **View settings**.
 - d. Confirm that the replacement drive has a capacity equal to or greater than the drive you are replacing and that it has the features you expect.

For example, do not attempt to replace a hard disk drive (HDD) with a solid-state disk (SSD). Similarly, if you are replacing a secure-capable drive, make sure the replacement drive is also secure-capable.

3. If needed, use SANtricity System Manager to locate the drive within your storage array: From the drive's context menu, select **Turn on locator light**.

The drive's Attention LED (amber) blinks so you can identify which drive to replace.



If you are replacing a drive in a shelf that has a bezel, you must remove the bezel to see the drive LEDs.

Step 2: Remove drive

Remove a failed drive to replace it with a new one.

Steps

1. Unpack the replacement drive, and set it on a flat, static-free surface near the shelf.

Save all packing materials.

2. Press the black release button on the failed drive.

The latch on the drive springs partially opens, and then the drive releases from the controller.

3. Open the cam handle, and slide out the drive slightly.
4. Wait 60 seconds.
5. Using both hands, remove the drive from the shelf.



6. Place the drive on an antistatic, cushioned surface away from magnetic fields.
7. Wait 60 seconds for the software to recognize that the drive has been removed.



If you accidentally remove an active drive, wait at least 60 seconds, and then reinstall it. For the recovery procedure, refer to the storage management software.

Step 3: Install new drive

Install a new drive to replace the failed one. You should install the replacement drive as soon as possible after removing the failed drive.

Steps

1. Open the cam handle.
2. Using two hands, insert the replacement drive into the open bay, firmly pushing until the drive stops.
3. Slowly close the cam handle until the drive is fully seated in the midplane and the handle clicks into place.

The green LED on the drive comes on when the drive is inserted correctly.



Depending on your configuration, the controller might automatically reconstruct data to the new drive. If the shelf uses hot spare drives, the controller might need to perform a complete reconstruction on the hot spare before it can copy the data to the replaced drive. This reconstruction process increases the time that is required to complete this procedure.

Step 4: Complete drive replacement

Complete the drive replacement to confirm that the new drive is working correctly.

Steps

1. Check the Power LED and the Attention LED on the drive you replaced. (When you first insert a drive, its Attention LED might be on. However, the LED should go off within a minute.)
 - Power LED is on or blinking, and the Attention LED is off: Indicates that the new drive is working correctly.
 - Power LED is off: Indicates that the drive might not be installed correctly. Remove the drive, wait 60 seconds, and then reinstall it.

- Attention LED is on: Indicates that the new drive might be defective. Replace it with another new drive.
- 2. If the Recovery Guru in SANtricity System Manager still shows an issue, select **Recheck** to ensure the problem has been resolved.
- 3. If the Recovery Guru indicates that drive reconstruction did not start automatically, start reconstruction manually, as follows:



Perform this operation only when instructed to do so by technical support or the Recovery Guru.

- a. Select **Hardware**.
- b. Click the drive that you replaced.
- c. From the drive's context menu, select **Reconstruct**.
- d. Confirm that you want to perform this operation.

When the drive reconstruction completes, the volume group is in an Optimal state.

4. As required, reinstall the bezel.
5. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit.

What's next?

Your drive replacement is complete. You can resume normal operations.

Hot-add a drive shelf - IOM12 or IOM12B modules - EF300 and EF600

You can add a new drive shelf while power is still applied to the other components of the storage system. You can configure, reconfigure, add, or relocate storage system capacity without interrupting user access to data.

Before you begin

Due to the complexity of this procedure, the following is recommended:

- Read all steps before beginning the procedure.
- Ensure hot adding a drive shelf is the procedure you need.

About this task

This procedure applies to hot adding a DE212C, DE224C, or DE460C drive shelf to an E2800, E2800B, EF280, E5700, E5700B, EF570, EF300, EF600, EF300C, EF600C, or E4000 controller shelf.

This procedure applies to IOM12, IOM12B, and IOM12C drive shelves.



IOM12C modules are only supported on SANtricity OS 11.90R3 onward. Ensure your controller's firmware has been updated before installing or upgrading to an IOM12C.



This procedure is for like-for-like shelf IOM hot-swaps or replacements. This means you can only replace an IOM12 module with another IOM12 module or replace an IOM12C module with another IOM12C module. (Your shelf can have two IOM12 modules or have two IOM12C modules.)

If you are cabling an older controller shelf to a DE212C, DE224C, or DE460, see [Adding IOM Drive Shelves to an Existing E27XX, E56XX, or EF560 Controller Shelf](#).



To maintain system integrity, you must follow the procedure exactly in the order presented.

Step 1: Prepare to add the drive shelf

To prepare to hot add a drive shelf, you must check for critical events and check the status of the IOMs.

Before you begin

- The power source for your storage system must be able to accommodate the power requirements of the new drive shelf. For the power specification for your drive shelf, see the [Hardware Universe](#).
- The cabling pattern for the existing storage system must match one of the applicable schemes shown in this procedure.

Steps

1. In SANtricity System Manager, select **Support > Support Center > Diagnostics**.
2. Select **Collect Support Data**.

The Collect Support Data dialog box appears.

3. Click **Collect**.

The file is saved in the Downloads folder for your browser with the name support-data.7z. The data is not automatically sent to technical support.

4. Select **Support > Event Log**.

The Event Log page displays the event data.

5. Select the heading of the **Priority** column to sort critical events to the top of the list.
6. Review the system critical events for events that have occurred in the last two to three weeks, and verify that any recent critical events have been resolved or otherwise addressed.



If unresolved critical events have occurred within the previous two to three weeks, stop the procedure and contact technical support. Continue the procedure only when the issue is resolved.

7. If you have IOMs connected to your hardware, complete the following steps. Otherwise, go to [Step 2: Install the drive shelf and apply power](#).

- a. Select **Hardware**.
- b. Select the **IOMs (ESMs)** icon.



The Shelf Component Settings dialog box appears with the **IOMs (ESMs)** tab selected.

- c. Make sure that the status shown for each IOM/ESM is *Optimal*.
- d. Click **Show more settings**.
- e. Confirm that the following conditions exist:

- The number of ESMs/IOMs detected matches the number of ESMs/IOMs installed in the system and that for each drive shelf.
- Both of the ESMs/IOMs show that communication is OK.
- The data rate is 12Gb/s for DE212C, DE224C, and DE460C drive shelves or 6 Gb/s for other drive trays.

Step 2: Install the drive shelf and apply power

You install a new drive shelf or a previously installed drive shelf, turn on the power, and check for any LEDs that require attention.

Steps

1. If you are installing a drive shelf that has previously been installed in a storage system, remove the drives. The drives must be installed one at a time later in this procedure.

If the installation history of the drive shelf that you are installing is unknown, you should assume that it has been previously installed in a storage system.

2. Install the drive shelf in the rack that holds the storage system components.



See the installation instructions for your model for the full procedure for physical installation and power cabling. The installation instructions for your model includes notes and warnings that you must take into account to safely install a drive shelf.

3. Power on the new drive shelf, and confirm that no amber attention LEDs are illuminated on the drive shelf. If possible, resolve any fault conditions before you continue with this procedure.

Step 3: Cable your system

If you are cabling an older controller shelf to a DE212C, DE224C, or DE460, see [Adding IOM Drive Shelves to an Existing E27XX, E56XX, or EF560 Controller Shelf](#).

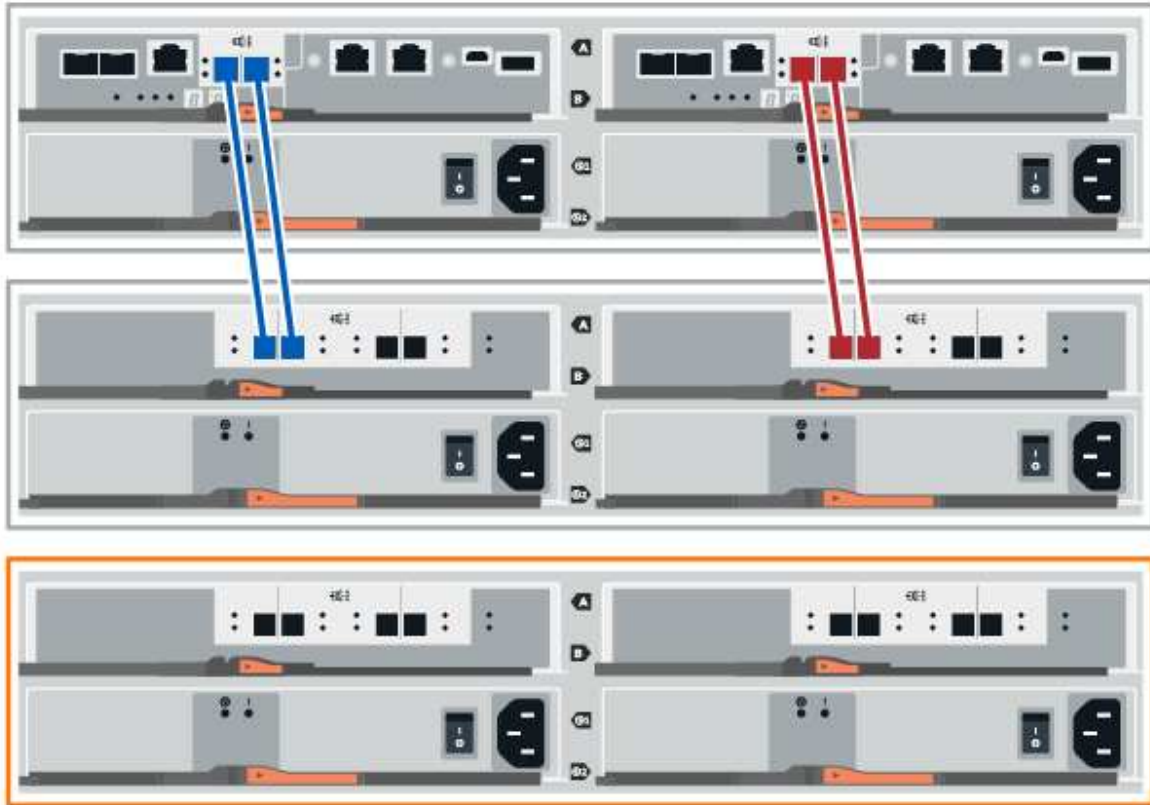
Connect the drive shelf for E2800 or E5700

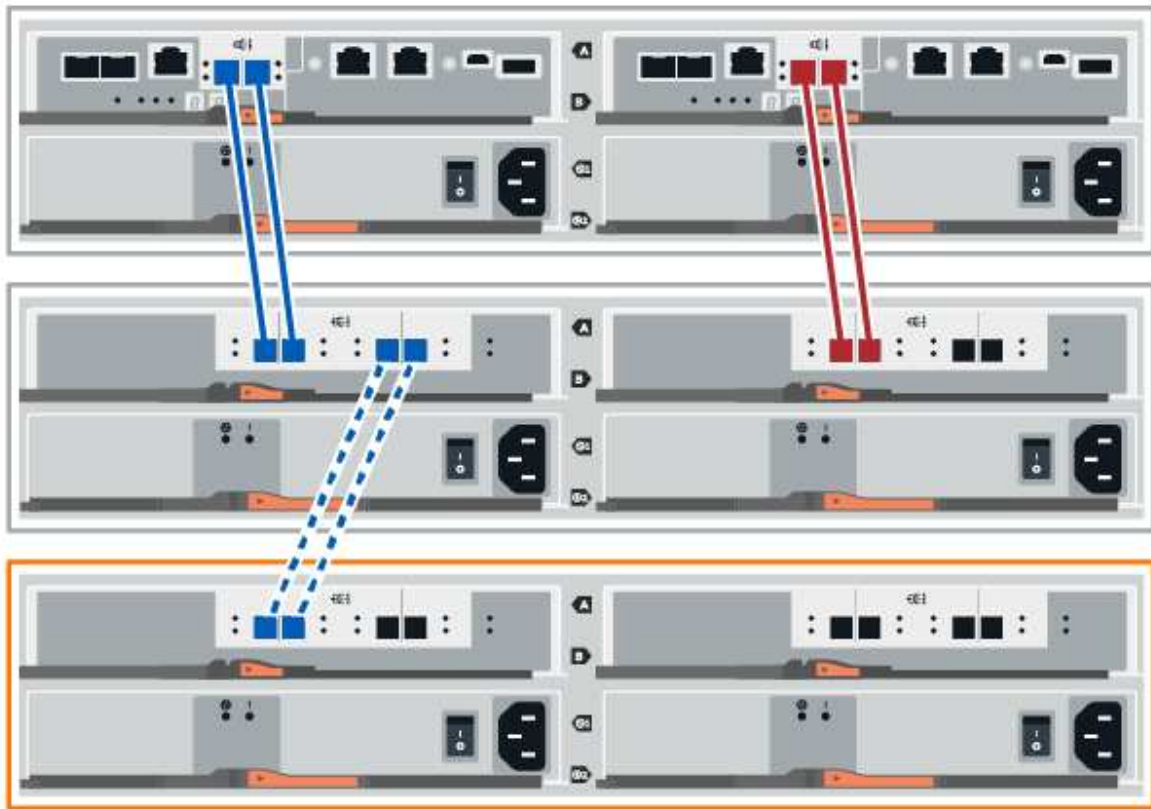
You connect the drive shelf to controller A, confirm IOM status, and then connect the drive shelf to controller B.

Steps

1. Connect the drive shelf to controller A.

The following figure shows an example connection between an additional drive shelf and controller A. To locate the ports on your model, see the [Hardware Universe](#).





2. In SANtricity System Manager, click **Hardware**.



At this point in the procedure, you have only one active path to the controller shelf.

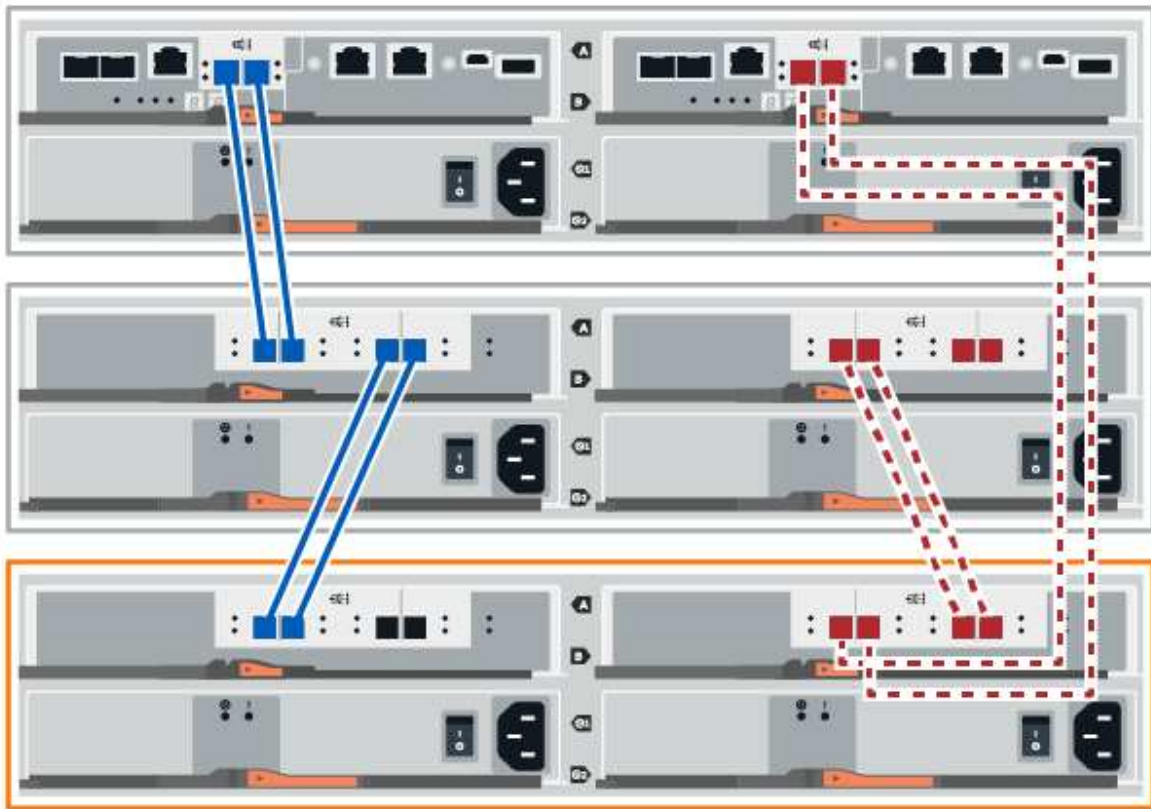
3. Scroll down, as necessary, to see all the drive shelves in the new storage system. If the new drive shelf is not displayed, resolve the connection issue.
4. Select the **ESMs/IOMs** icon for the new drive shelf.



The **Shelf Component Settings** dialog box appears.

5. Select the **ESMs/IOMs** tab in the **Shelf Component Settings** dialog box.
6. Select **Show more options**, and verify the following:
 - IOM/ESM A is listed.
 - Current data rate is 12 Gbps for a SAS-3 drive shelf.
 - Card communications is OK.
7. Disconnect all expansion cables from controller B.
8. Connect the drive shelf to controller B.

The following figure shows an example connection between an additional drive shelf and controller B. To locate the ports on your model, see the [Hardware Universe](#).



9. If it is not already selected, select the **ESMs/IOMs** tab in the **Shelf Component Settings** dialog box, and then select **Show more options**. Verify that Card communications is **YES**.



Optimal status indicates that the loss of redundancy error associated with the new drive shelf has been resolved and the storage system is stabilized.

Connect the drive shelf for EF300 or EF600

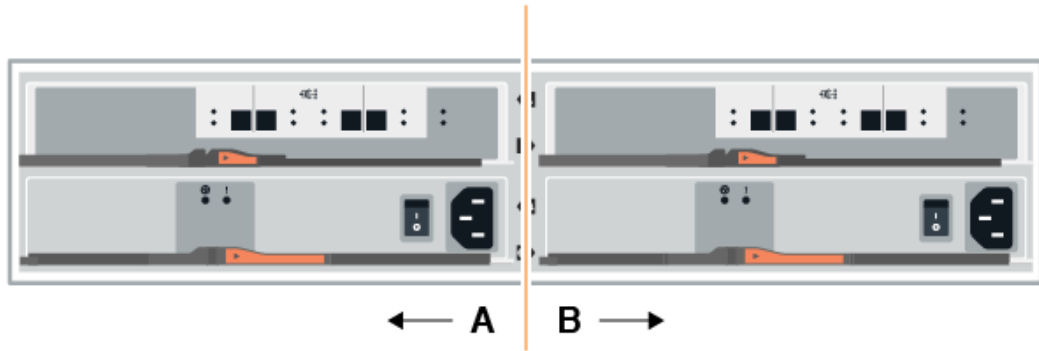
You connect the drive shelf to controller A, confirm IOM status, and then connect the drive shelf to controller B.

Before you begin

- You have updated your firmware to the latest version. To update your firmware, follow the instructions in the [Upgrading SANtricity OS](#).

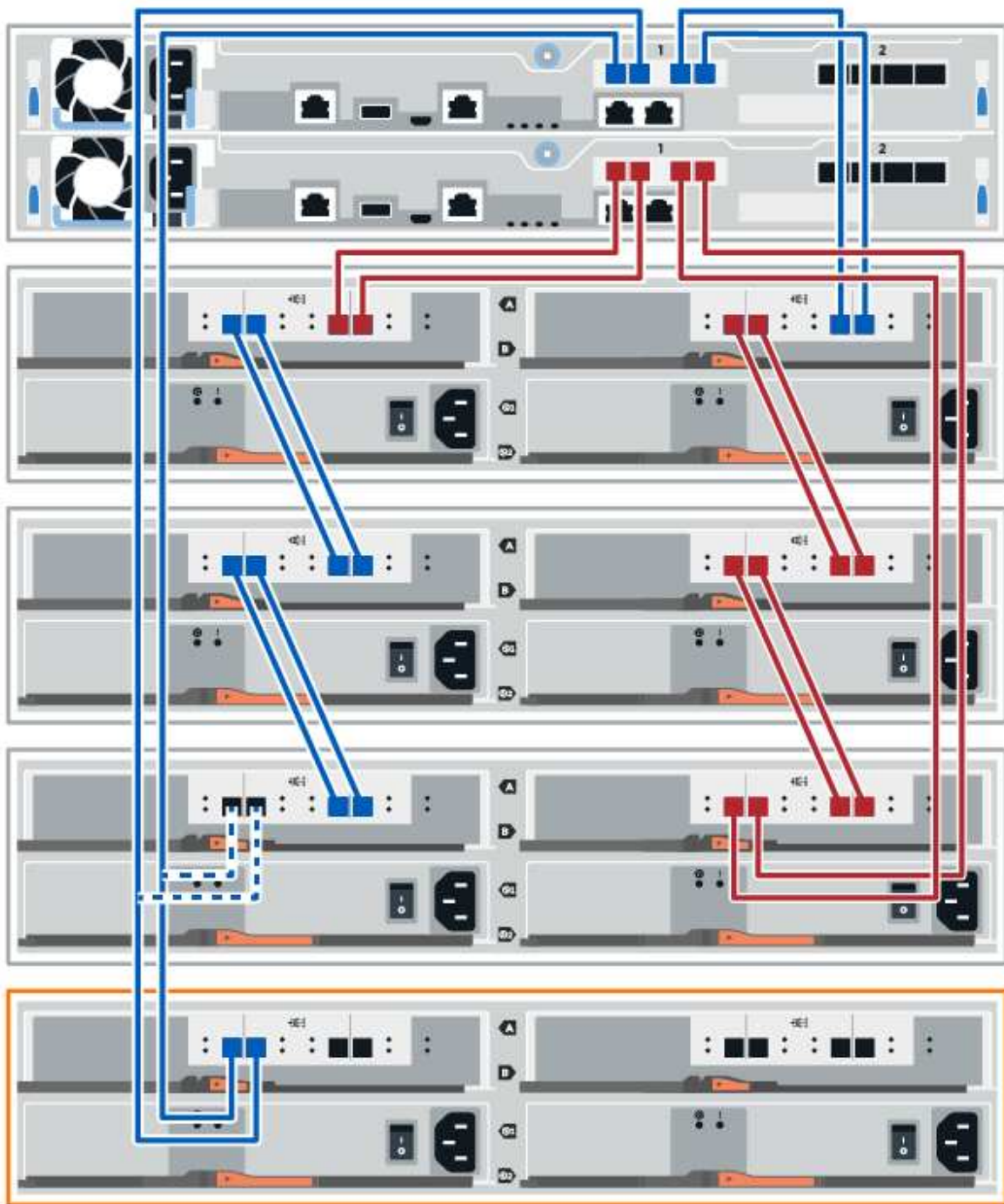
Steps

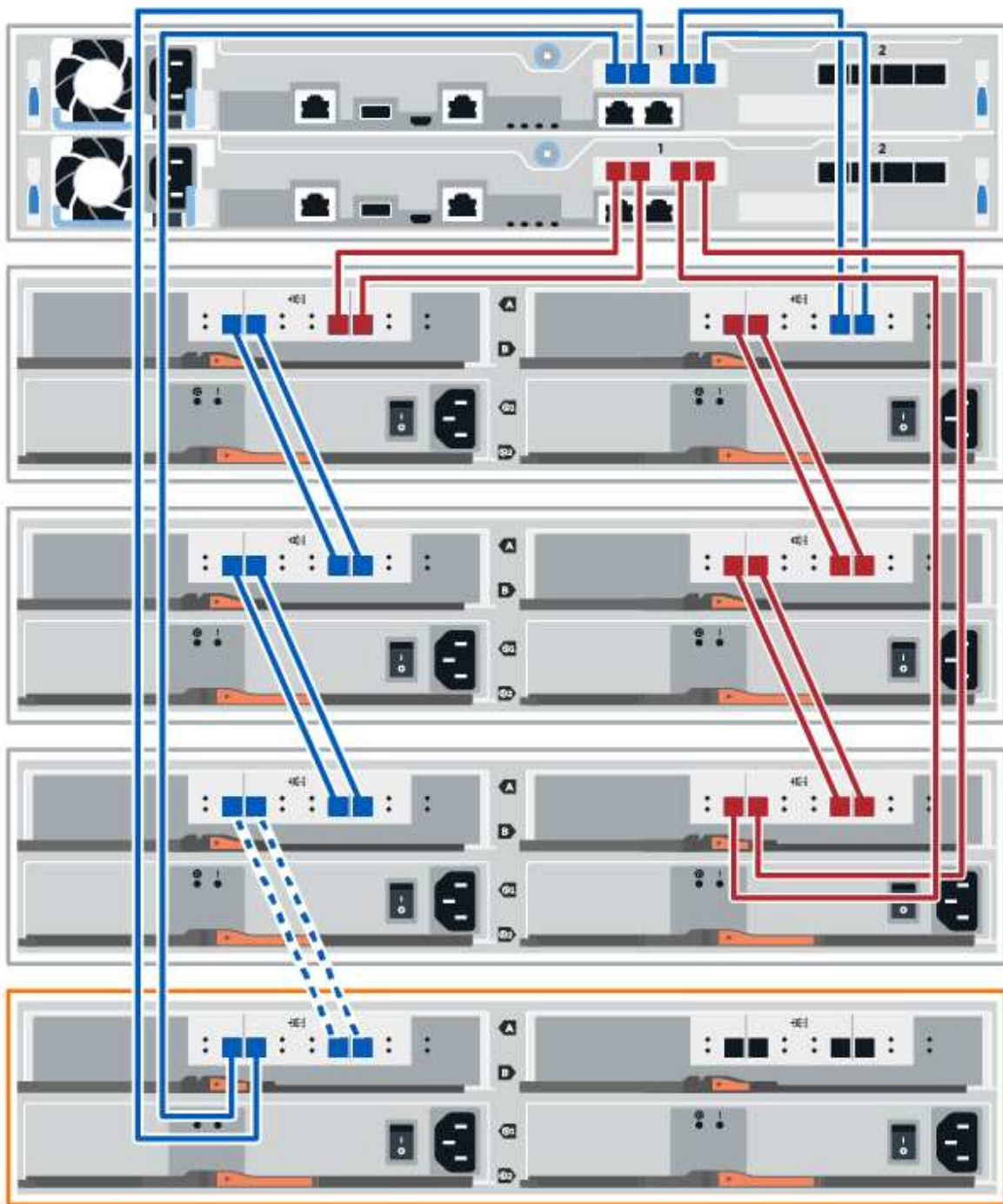
1. Disconnect both of the A-side controller cables from IOM12 ports one and two from previous last shelf in the stack and then connect them to the new shelf IOM12 ports one and two.



2. Connect the cables to A-side IOM12 ports three and four from the new shelf to previous last shelf IOM12 ports one and two.

The following figure shows an example connection for A side between an additional drive shelf and the previous last shelf. To locate the ports on your model, see the [Hardware Universe](#).





3. In SANtricity System Manager, click **Hardware**.



At this point in the procedure, you have only one active path to the controller shelf.

4. Scroll down, as necessary, to see all the drive shelves in the new storage system. If the new drive shelf is not displayed, resolve the connection issue.

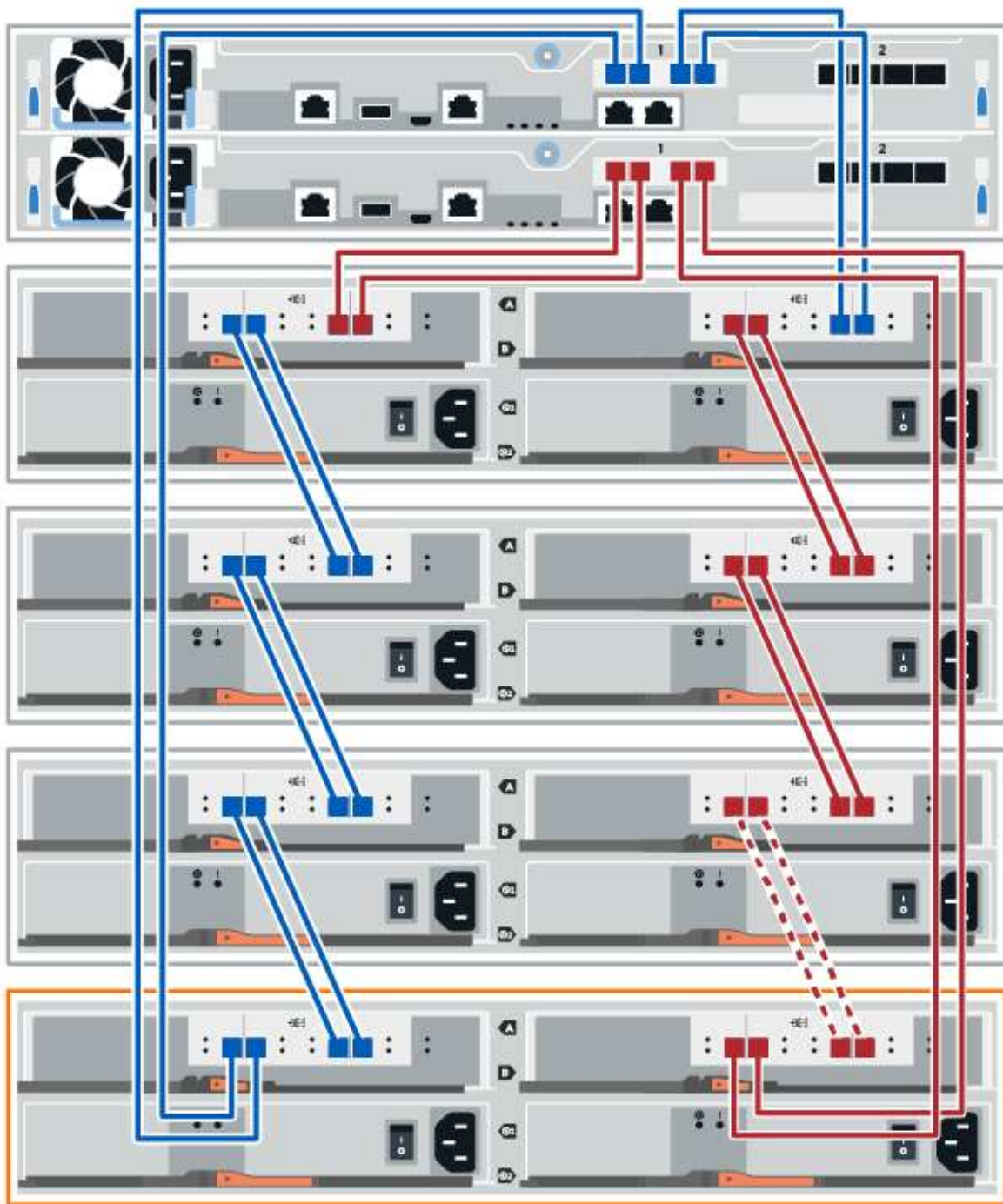
5. Select the **ESMs/IOMs** icon for the new drive shelf.



The **Shelf Component Settings** dialog box appears.

6. Select the **ESMs/IOMs** tab in the **Shelf Component Settings** dialog box.
7. Select **Show more options**, and verify the following:
 - IOM/ESM A is listed.
 - Current data rate is 12 Gbps for a SAS-3 drive shelf.
 - Card communications is OK.
8. Disconnect both the B-side controller cables from IOM12 ports one and two from the previous last shelf in the stack then connect them to the new shelf IOM12 ports one and two.
9. Connect the cables to B-side IOM12 ports three and four from the new shelf to the previous last shelf IOM12 ports one and two.

The following figure shows an example connection for B side between an additional drive shelf and the previous last shelf. To locate the ports on your model, see the [Hardware Universe](#).



10. If it is not already selected, select the **ESMs/IOMs** tab in the **Shelf Component Settings** dialog box, and then select **Show more options**. Verify that Card communications is **YES**.



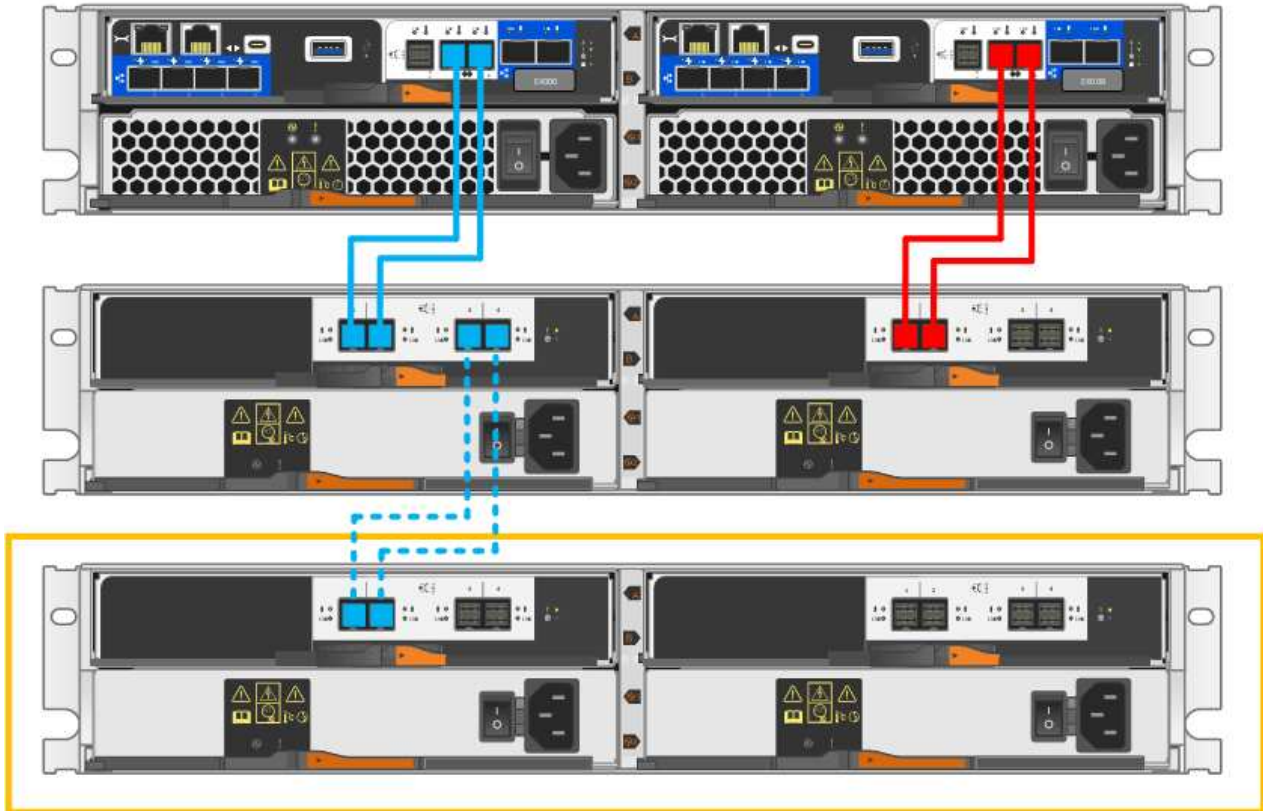
Optimal status indicates that the loss of redundancy error associated with the new drive shelf has been resolved and the storage system is stabilized.

Connect the drive shelf for E4000

You connect the drive shelf to controller A, confirm IOM status, and then connect the drive shelf to controller B.

Steps

1. Connect the drive shelf to controller A.



2. In SANtricity System Manager, click **Hardware**.



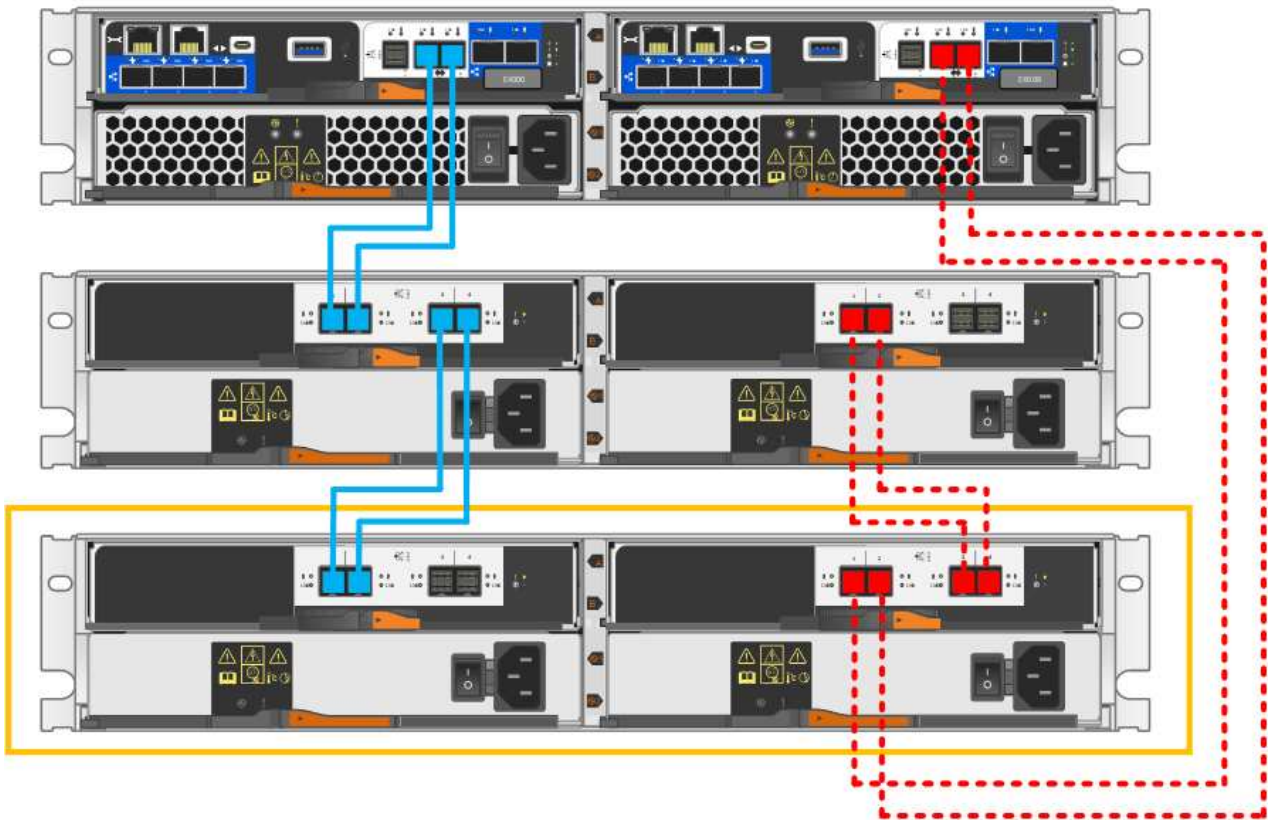
At this point in the procedure, you have only one active path to the controller shelf.

3. Scroll down, as necessary, to see all the drive shelves in the new storage system. If the new drive shelf is not displayed, resolve the connection issue.
4. Select the **ESMs/IOMs** icon for the new drive shelf.



The **Shelf Component Settings** dialog box appears.

5. Select the **ESMs/IOMs** tab in the **Shelf Component Settings** dialog box.
6. Select **Show more options**, and verify the following:
 - IOM/ESM A is listed.
 - Current data rate is 12 Gbps for a SAS-3 drive shelf.
 - Card communications is OK.
7. Disconnect all expansion cables from controller B.
8. Connect the drive shelf to controller B.



9. If it is not already selected, select the **ESMs/IOMs** tab in the **Shelf Component Settings** dialog box, and then select **Show more options**. Verify that Card communications is **YES**.



Optimal status indicates that the loss of redundancy error associated with the new drive shelf has been resolved and the storage system is stabilized.

Step 4: Complete hot add

You complete the hot add by checking for any errors and confirming that the newly added drive shelf uses the latest firmware.

Steps

1. In SANtricity System Manager, click **Home**.
2. If the link labeled **Recover from problems** appears at the center top of the page, click the link, and resolve any issues indicated in the Recovery Guru.
3. In SANtricity System Manager, click **Hardware**, and scroll down, as necessary, to see the newly added drive shelf.
4. For drives that were previously installed in a different storage system, add one drive at time to the newly installed drive shelf. Wait for each drive to be recognized before you insert the next drive.

When a drive is recognized by the storage system, the representation of the drive slot in the **Hardware** page displays as a blue rectangle.

5. Select **Support > Support Center > Support Resources** tab.
6. Click the **Software and Firmware Inventory** link, and check which versions of the IOM/ESM firmware and the drive firmware are installed on the new drive shelf.



You might need to scroll down the page to locate this link.

7. If necessary, upgrade the drive firmware.

IOM/ESM firmware automatically upgrades to the latest version unless you have disabled the upgrade feature.

The hot add procedure is complete. You can resume normal operations.

Fans

Requirements to replace the fan - EF300 and EF600

Before replacing a failed fan in an EF300, EF600, EF300C, or EF600C array, review the following requirements.

- You have a replacement fan that is supported for your controller shelf or drive shelf model.
- You have an ESD wristband, or you have taken other antistatic precautions.



If the Recovery Guru indicates that it is not OK to remove the fan, contact technical support.

Replace the fan - EF300 or EF600

You can replace a fan in an EF300, EF600, EF300C, or EF600C array.

About this task

Each EF300 and EF600 controller shelf or drive shelf includes five fans. If a fan fails, you must replace it as soon as possible to ensure that the shelf has adequate cooling.

Before you begin

Make sure you have the following:

- A replacement fan.
- An ESD wristband, or you have taken other antistatic precautions.
- A flat, static free work area.
- Labels to identify each cable that is connected to the controller canister.
- A management station with a browser that can access SANtricity System Manager for the controller. (To open the System Manager interface, point the browser to the controller's domain name or IP address.)

Step 1: Place controller offline

Place the controller canister offline so you can safely replace the failed fan.

Steps

1. From SANtricity System Manager, review the details in the Recovery Guru to confirm that there is an issue with a fan and to ensure no other items must be addressed first.
2. From the Details area of the Recovery Guru, determine which fan to replace.

3. Back up the storage array's configuration database using SANtricity System Manager.

If a problem occurs when you remove a controller, you can use the saved file to restore your configuration. The system will save the current state of the RAID configuration database, which includes all data for volume groups and disk pools on the controller.

- From System Manager:
 - a. Select **Support > Support Center > Diagnostics**.
 - b. Select **Collect Configuration Data**.
 - c. Click **Collect**.

The file is saved in the Downloads folder for your browser with the name, **configurationData-
<arrayName>-<dateTime>.7z**.

4. If the controller is not already offline, take it offline now using SANtricity System Manager.
 - a. Select **Hardware**.
 - b. If the graphic shows the drives, select **Show back of shelf** to show the controllers.
 - c. Select the controller that you want to place offline.
 - d. From the context menu, select **Place offline**, and confirm that you want to perform the operation.



If you are accessing SANtricity System Manager using the controller you are attempting to take offline, a SANtricity System Manager Unavailable message is displayed. Select **Connect to an alternate network connection** to automatically access SANtricity System Manager using the other controller.

5. Wait for SANtricity System Manager to update the controller's status to offline.



Do not begin any other operations until after the status has been updated.

6. Select **Recheck** from the Recovery Guru, and confirm that the **OK to remove** field in the Details area displays Yes, indicating that it is safe to remove this component.

Step 2: Remove controller canister

Remove the controller canister so you can replace the failed fan with a new one.

Steps

1. Put on an ESD wristband or take other antistatic precautions.
2. Label each cable that is attached to the controller canister.
3. Disconnect all the cables from the controller canister.



To prevent degraded performance, do not twist, fold, pinch, or step on the cables.

4. Confirm that the Cache Active LED on the back of the controller is off.
5. Squeeze the handles on either side of the controller, and pull back until it releases from the shelf.



6. Using two hands and the handles, slide the controller canister out of the shelf. When the front of the controller is free of the enclosure, use two hands to pull it out completely.



Always use two hands to support the weight of a controller canister.



7. Place the controller canister on a flat, static-free surface.

Step 3: Remove failed fan

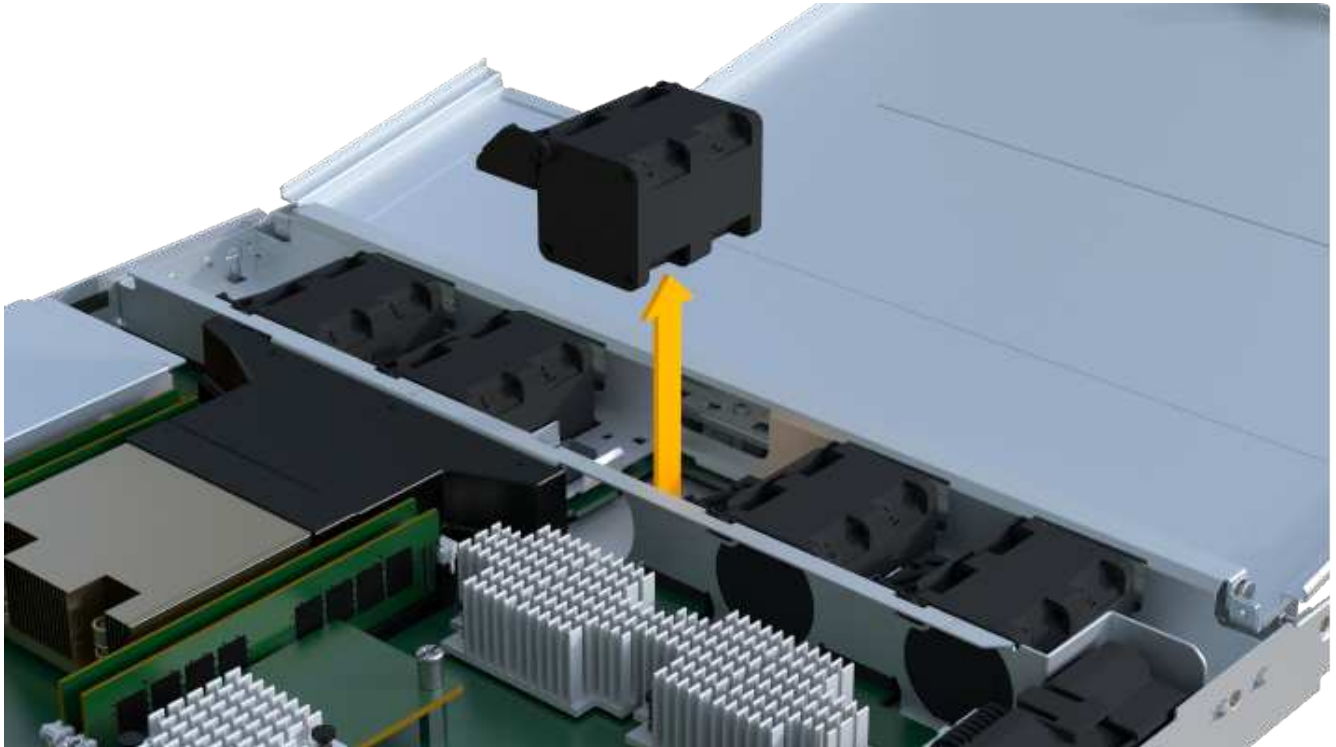
You remove a failed fan so you can replace it with a new one.

Steps

1. Remove the controller canister's cover by unscrewing the single thumbscrew and lifting the lid open.
2. Confirm that the green LED inside the controller is off.

If this green LED is on, the controller is still using battery power. You must wait for this LED to go off before removing any components.

3. Gently lift the failed fan from the controller.

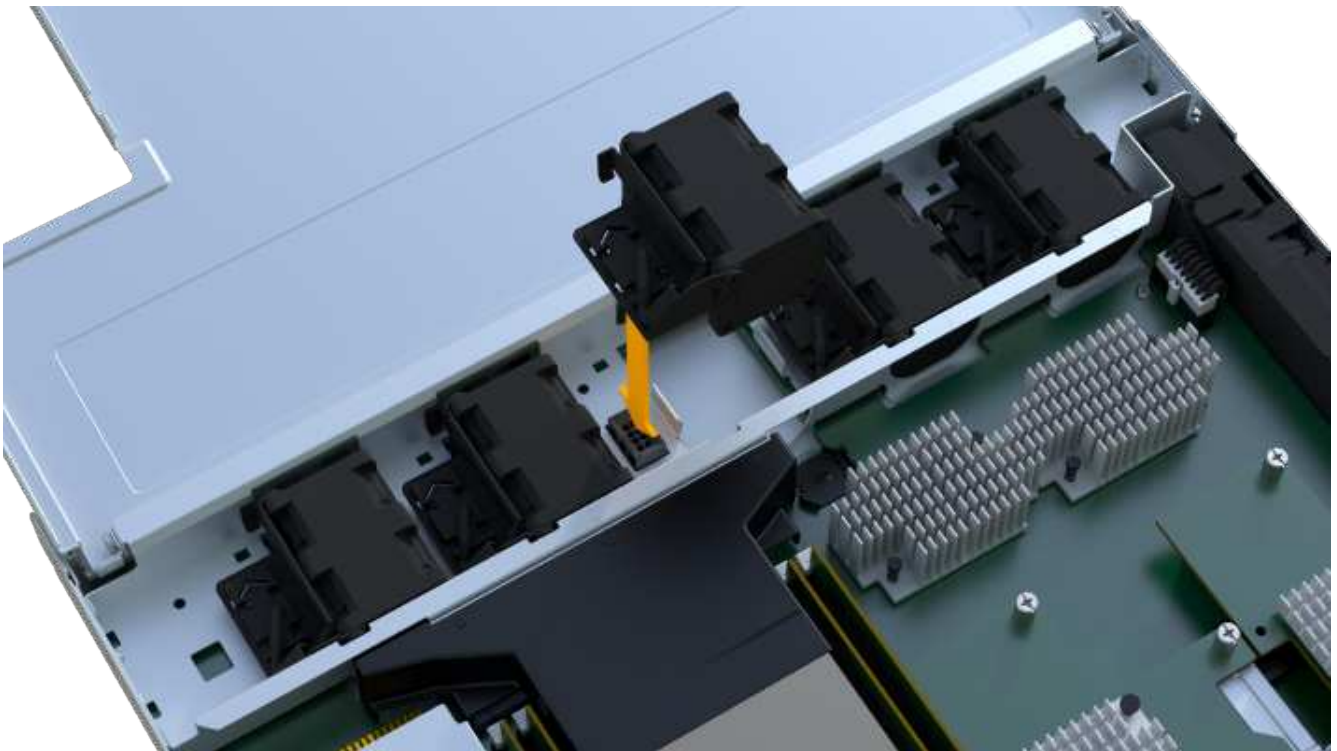
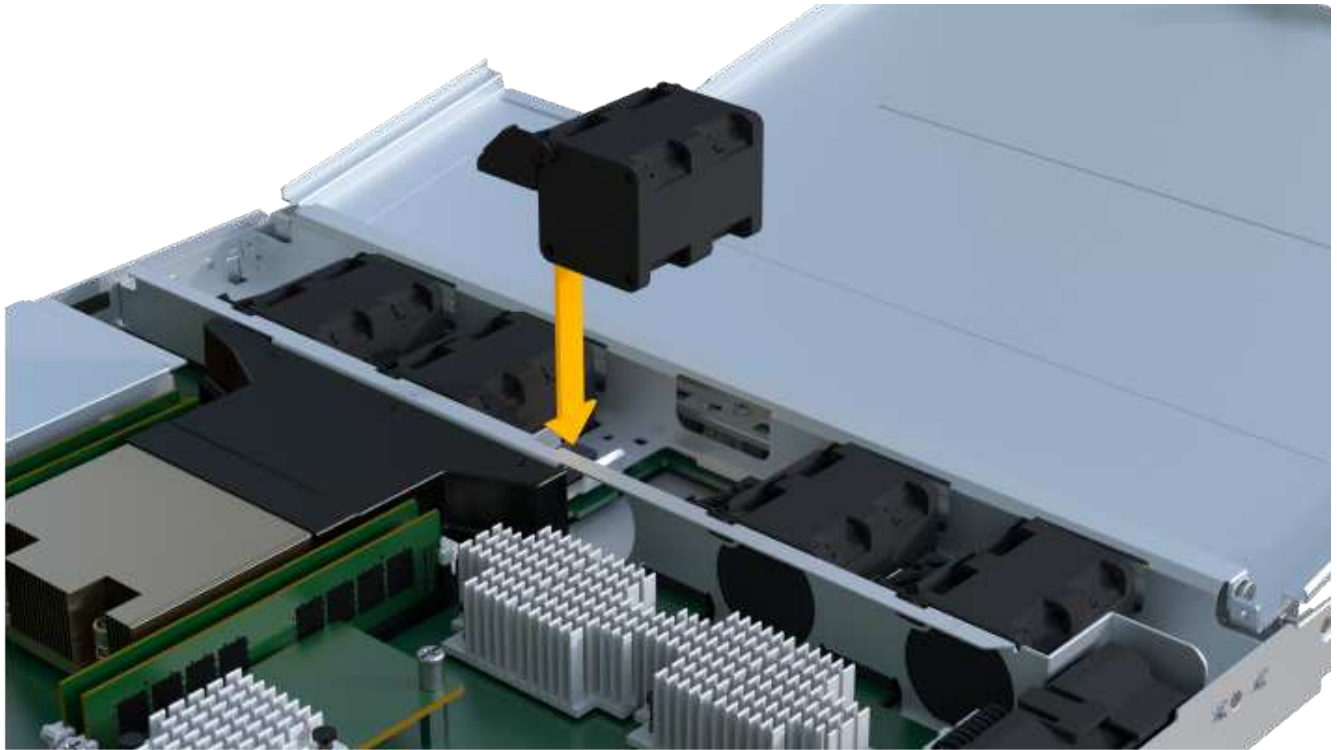


Step 4: Install new fan

Install a new fan to replace the failed one.

Steps

1. Slide the replacement fan all the way into the shelf.



Step 5: Reinstall controller canister

After installing the new fan, reinstall the controller canister into the controller shelf.

Steps

1. Lower the cover on the controller canister and secure the thumbscrew.
2. While squeezing the controller handles, gently slide the controller canister all the way into the controller shelf.



The controller audibly clicks when correctly installed into the shelf.



Step 6: Complete fan replacement

Place the controller online, collect support data, and resume operations.

1. Place controller online.
 - a. In System Manager, navigate to the hardware page.
 - b. Select **Show back of controller**.
 - c. Select the controller with the replaced fan.
 - d. Select **Place online** from the drop-down list.
2. As the controller boots, check the controller LEDs.

When communication with the other controller is reestablished:

- The amber Attention LED remains on.
 - The Host Link LEDs might be on, blinking, or off, depending on the host interface.
3. When the controller is back online, confirm that its status is Optimal and check the controller shelf's Attention LEDs.

If the status is not Optimal or if any of the Attention LEDs are on, confirm that all cables are correctly seated and the controller canister is installed correctly. If necessary, remove and reinstall the controller canister.



If you cannot resolve the problem, contact technical support.

4. Click **Hardware > Support > Upgrade Center** to ensure that the latest version of SANtricity OS is installed.

As needed, install the latest version.

5. Verify that all volumes have been returned to the preferred owner.
 - a. Select **Storage > Volumes**. From the **All Volumes** page, verify that volumes are distributed to their preferred owners. Select **More > Change ownership** to view volume owners.
 - b. If volumes are all owned by preferred owner continue to Step 6.
 - c. If none of the volumes are returned, you must manually return the volumes. Go to **More > Redistribute volumes**.
 - d. If only some of the volumes are returned to their preferred owners after auto-distribution or manual distribution you must check the Recovery Guru for host connectivity issues.
 - e. If there is no Recovery Guru present or if following the recovery guru steps the volumes are still not returned to their preferred owners contact support.
6. Collect support data for your storage array using SANtricity System Manager.
 - a. Select **Support > Support Center > Diagnostics**.
 - b. Select **Collect Support Data**.
 - c. Click **Collect**.

The file is saved in the Downloads folder for your browser with the name, **support-data.7z**.

What's next?

Your fan replacement is complete. You can resume normal operations.

Host interface cards

Requirements to upgrade the host interface card (HIC) - EF300 or EF600

Before upgrading or replacing a host interface card (HIC) in a EF300, EF600, EF300C, or EF600C array, review the following requirements.

- You have scheduled a downtime maintenance window for this procedure. You cannot access data on the storage array until you have successfully completed this procedure. Because both controllers must have the same HIC configuration when they are powered on, the power must be off when you change HIC configuration. The presence of mismatched HICs causes the controller with the replacement HIC to lock down when you bring it online.
- You have all cables, transceivers, switches, and host bus adapters (HBAs) needed to connect the new host ports.

For information about compatible hardware, refer to the [NetApp Interoperability Matrix](#) or the [NetApp Hardware Universe](#).

- You have an ESD wristband, or you have taken other antistatic precautions.
- You have a #1 Phillips screwdriver.
- You have labels to identify each cable that is connected to the controller canister.
- A management station with a browser that can access SANtricity System Manager for the controller. (To open the System Manager interface, point the browser to the controller's domain name or IP address.)

- Some HIC replacements or upgrades might require a host port protocol conversion. Follow the instructions in the [Change host protocol for an EF300 or EF600](#) for this requirement.
- EF300 controllers must have HIC port 2 filled with a HIC for host connectivity.

Upgrade the host interface card (HIC) - EF300 and EF600

You can upgrade the host interface cards (HICs) to increase the number of host ports or to change host protocols.

About this task

- When you upgrade HICs, you must power off the storage array, upgrade the HICs, and reapply power.
- When upgrading HICs in an EF300, EF600, EF300C, or EF600C controller repeat all steps to remove the second controller, upgrade the second controller's HICs, and reinstall the second controller before reapplying power to the controller shelf.

Before you begin

- Review [Requirements for EF300 or EF600 HIC upgrades](#).
- Schedule a downtime maintenance window for this procedure. You cannot access data on the storage array until you have successfully completed this procedure. Because both controllers must have the same HIC configuration when they are powered on, the power must be off when you install HICs.
- Make sure you have the following:
 - Two HICs that are compatible with your controllers.
 - An ESD wristband, or you have taken other antistatic precautions.
 - A flat, static free work area.
 - Labels to identify each cable that is connected to the controller canister.
 - A #1 Phillips screwdriver.
 - A management station with a browser that can access SANtricity System Manager for the controller. (To open the System Manager interface, point the browser to the controller's domain name or IP address.)



Possible loss of data access — Never install a HIC in an EF300 or EF600 controller canister if that HIC was designed for another E-Series controller. In addition, both controllers and both HICs must be identical. The presence of incompatible or mismatched HICs causes the controllers to lock down when you apply power.

Step 1: Place controller shelf offline

Place the controller shelf offline so you can safely upgrade the HICs.

Steps

1. From the Home page of SANtricity System Manager, ensure that the storage array has Optimal status.

If the status is not Optimal, use the Recovery Guru or contact technical support to resolve the problem. Do not continue with this procedure.

2. Back up the storage array's configuration database using SANtricity System Manager.

If a problem occurs when you remove a controller, you can use the saved file to restore your configuration.

The system will save the current state of the RAID configuration database, which includes all data for volume groups and disk pools on the controller.

- From System Manager:
 - a. Select **Support > Support Center > Diagnostics**.
 - b. Select **Collect Configuration Data**.
 - c. Click **Collect**.

The file is saved in the Downloads folder for your browser with the name, **configurationData-
<arrayName>-<dateTime>.7z**.

3. Ensure that no I/O operations are occurring between the storage array and all connected hosts. For example, you can perform these steps:

- Stop all processes that involve the LUNs mapped from the storage to the hosts.
- Ensure that no applications are writing data to any LUNs mapped from the storage to the hosts.
- Unmount all file systems associated with volumes on the array.



The exact steps to stop host I/O operations depend on the host operating system and the configuration, which are beyond the scope of these instructions. If you are not sure how to stop host I/O operations in your environment, consider shutting down the host.



Possible data loss — If you continue this procedure while I/O operations are occurring, the host application might lose access to the data because the storage is not accessible.

4. Wait for any data in cache memory to be written to the drives.

The green Cache Active LED on the back of each controller is on when cached data needs to be written to the drives. You must wait for this LED to turn off.

5. From the Home page of SANtricity System Manager, select **View Operations in Progress**. Wait for all operations to complete before continuing with the next step.
6. Power down the controller shelf.
 - a. Label and then unplug both power cables from controller shelf.
 - b. Wait for all LEDs on the controller shelf to turn off.

Step 2: Remove controller canister

Remove the controller canister so you can upgrade the new HIC.

Steps

1. Label each cable that is attached to the controller canister.
2. Disconnect all the cables from the controller canister.



To prevent degraded performance, do not twist, fold, pinch, or step on the cables.

3. If the HIC ports use SFP+ transceivers, remove them.

Depending on what type of HIC you are upgrading to, you might be able to reuse these SFPs.

4. Confirm that the Cache Active LED on the back of the controller is off.
5. Squeeze the handles on either side of the controller, and pull back until it releases from the shelf.



6. Using two hands and the handles, slide the controller canister out of the shelf. When the front of the controller is free of the enclosure, use two hands to pull it out completely.



Always use two hands to support the weight of a controller canister.



7. Place the controller canister on a flat, static-free surface.

Step 3: Remove the HIC

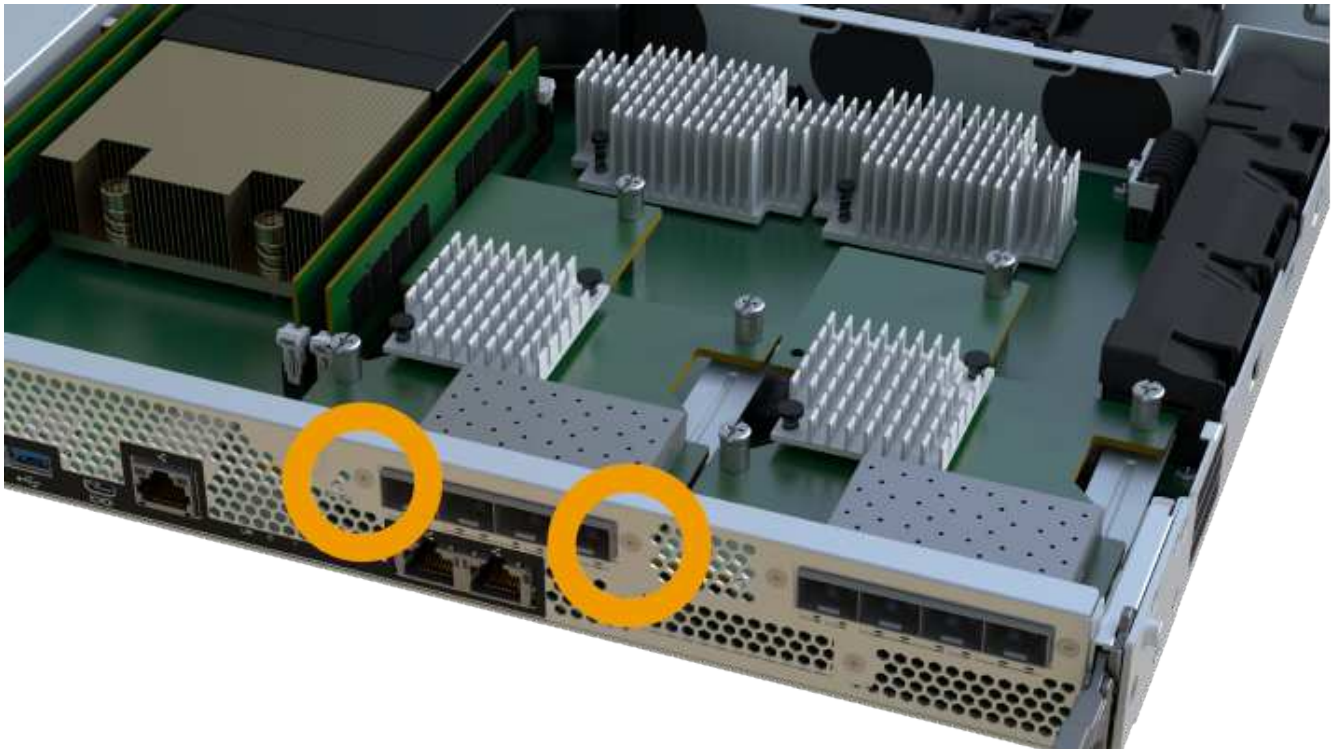
Remove the original HIC so you can replace it with an upgraded one.

Steps

1. Remove the controller canister's cover by unscrewing the single thumbscrew and lifting the lid open.
2. Confirm that the green LED inside the controller is off.

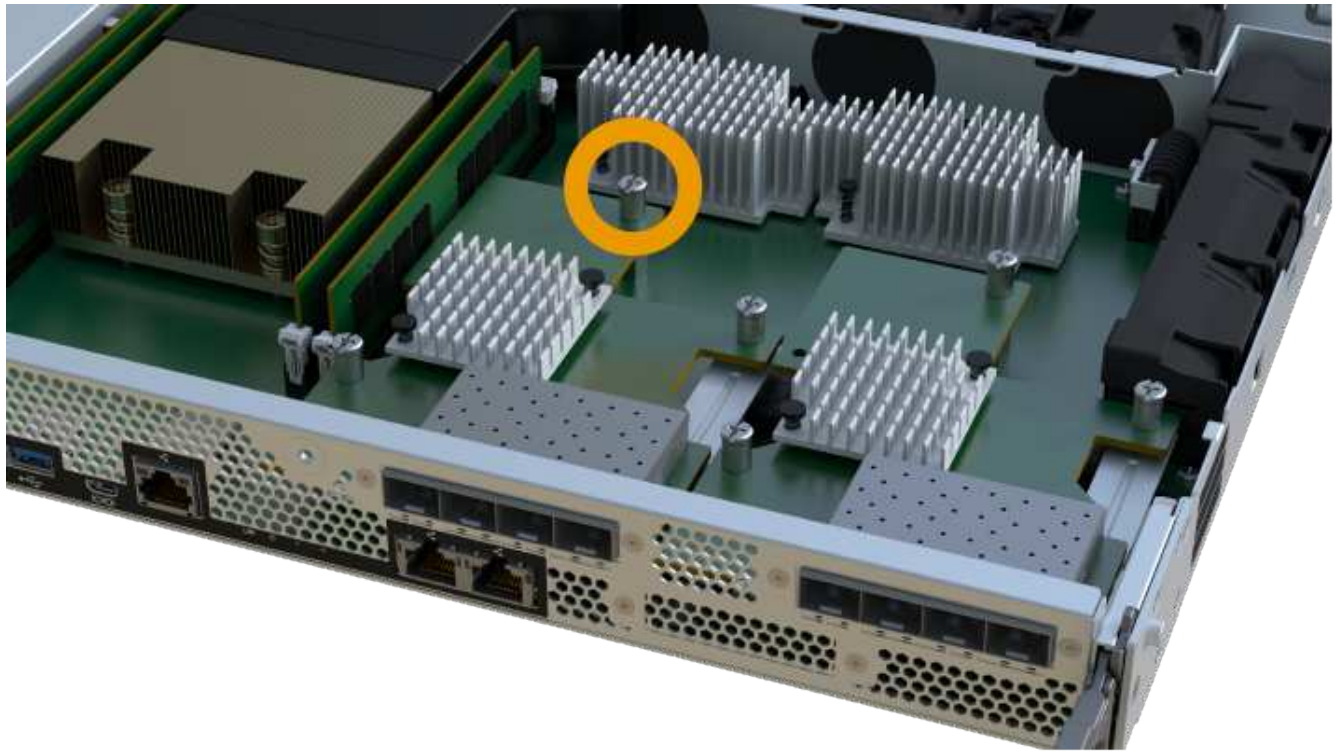
If this green LED is on, the controller is still using battery power. You must wait for this LED to go off before removing any components.

3. Using a Phillips screwdriver, remove the two screws that attach the HIC faceplate to the controller canister.



The image above is an example, the appearance of your HIC may differ.

4. Remove the HIC faceplate.
5. Using your fingers or a Phillips screwdriver, loosen the single thumbscrew that secure the HIC to the controller card.



The HIC comes with three screw locations on the top, but is secured with only one.

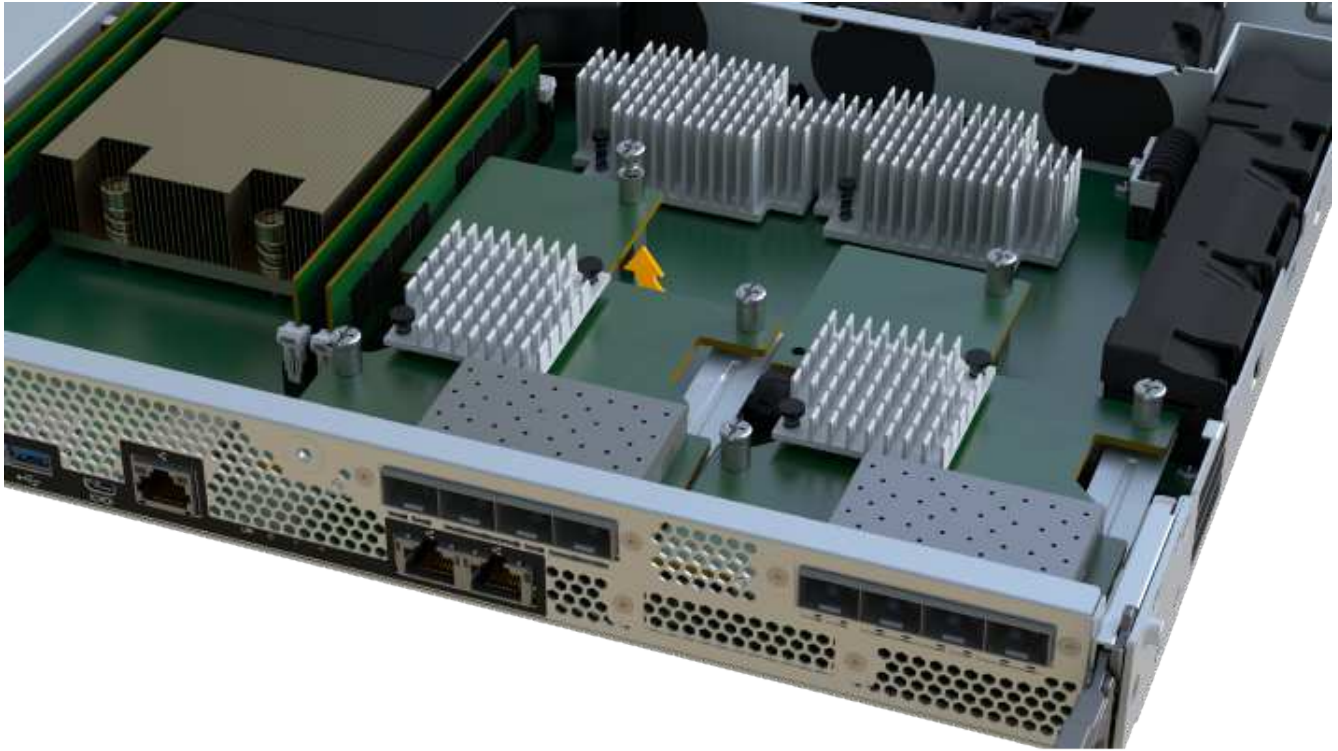


The image above is an example, the appearance of your HIC may differ.

6. Carefully detach the HIC from the controller card by lifting the card up and out of the controller.



Be careful not to scratch or bump the components on the bottom of the HIC or on the top of the controller card.



The image above is an example, the appearance of your HIC may differ.

7. Place the HIC on a flat, static-free surface.

Step 4: Upgrade the HIC

After removing the old HIC, you install the new one.

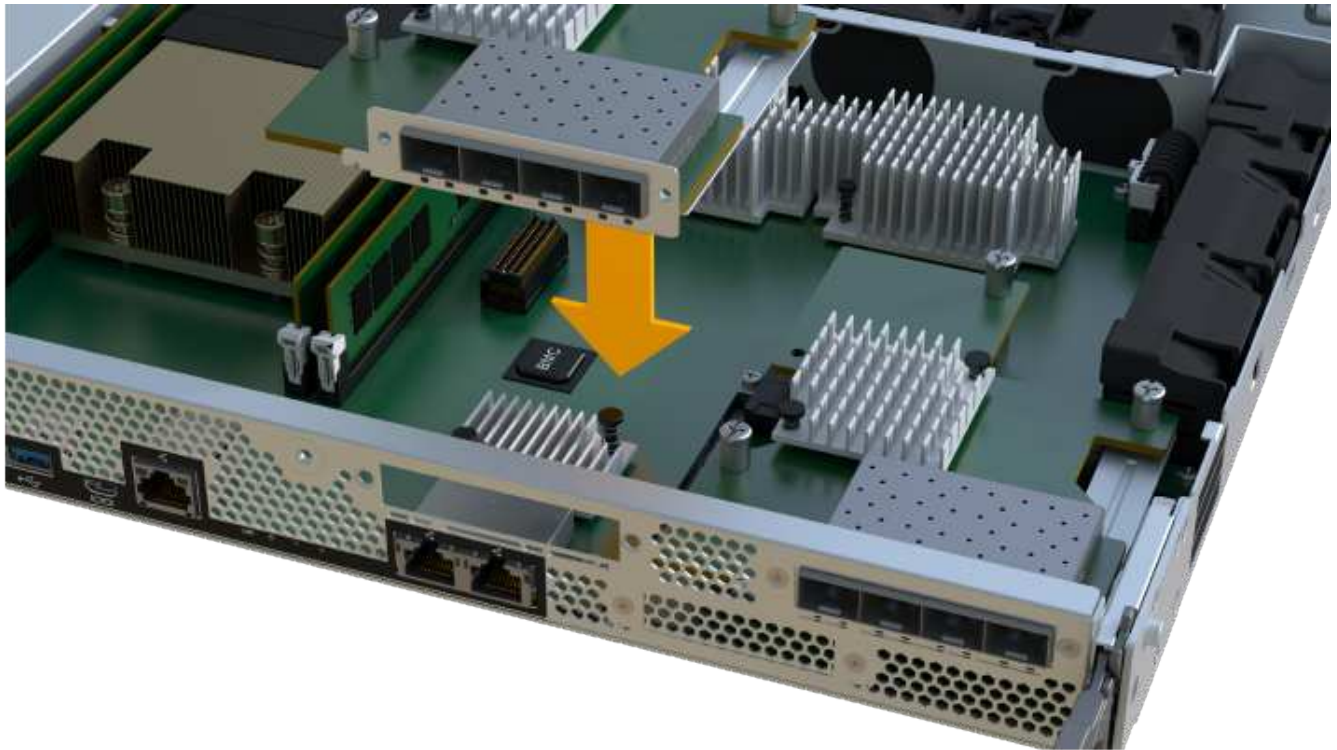


Possible loss of data access — Never install a HIC in an EF300 or EF600 controller canister if that HIC was designed for another E-Series controller. In addition, both controllers and both HICs must be identical. The presence of incompatible or mismatched HICs causes the controllers to lock down when you apply power.

Steps

1. Unpack the new HIC and the new HIC faceplate.
2. Align the single thumbscrew on the HIC with the corresponding holes on the controller, and align the connector on the bottom of the HIC with the HIC interface connector on the controller card.

Be careful not to scratch or bump the components on the bottom of the HIC or on the top of the controller card.



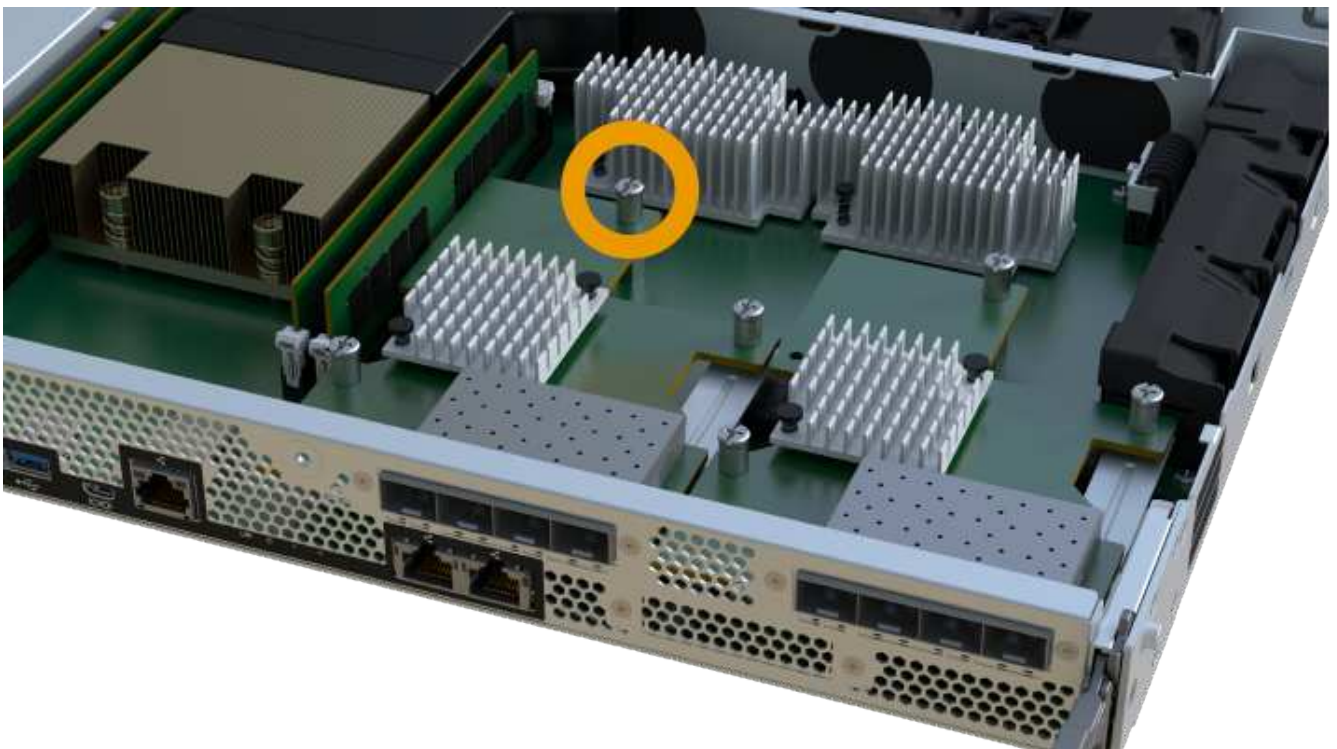
The image above is an example, the appearance of your HIC may differ.

3. Carefully lower the HIC into place, and seat the HIC connector by pressing gently on the HIC.



Possible equipment damage — Be very careful not to pinch the gold ribbon connector for the controller LEDs between the HIC and the thumbscrew.

4. Hand-tighten the HIC thumbscrew.





The image above is an example; the appearance of your HIC may differ.



Do not use a screwdriver, or you might over tighten the screws.

5. Using a #1 Phillips screwdriver, attach the HIC faceplate you removed from the original HIC with the three screws.

Step 5: Reinstall controller canister

After upgrading the HIC, reinstall the controller canister into the controller shelf.

Steps

1. Lower the cover on the controller canister and secure the thumbscrew.
2. While squeezing the controller handles, gently slide the controller canister all the way into the controller shelf.



The controller audibly clicks when correctly installed into the shelf.



3. If removed, install the SFPs into the new HIC and reconnect all the cables. If you are using more than one host protocol, be sure to install the SFPs in the correct host ports.

If you are using more than one host protocol, be sure to install the SFPs in the correct host ports.

Step 6: Complete the HIC upgrade

Place the controller online, collect support data, and resume operations.

Steps

1. Place controller online.

- a. Plug in power cables.
2. As the controller boots, check the controller LEDs.
 - The amber Attention LED remains on.
 - The Host Link LEDs might be on, blinking, or off, depending on the host interface.
3. When the controller is back online, confirm that its status is Optimal and check the controller shelf's Attention LEDs.

If the status is not Optimal or if any of the Attention LEDs are on, confirm that all cables are correctly seated and the controller canister is installed correctly. If necessary, remove and reinstall the controller canister.



If you cannot resolve the problem, contact technical support.

4. Click **Hardware > Support > Upgrade Center** to ensure that the latest version of SANtricity OS is installed.

As needed, install the latest version.

5. Verify that all volumes have been returned to the preferred owner.
 - a. Select **Storage > Volumes**. From the **All Volumes** page, verify that volumes are distributed to their preferred owners. Select **More > Change ownership** to view volume owners.
 - b. If volumes are all owned by preferred owner continue to Step 6.
 - c. If none of the volumes are returned, you must manually return the volumes. Go to **More > Redistribute volumes**.
 - d. If only some of the volumes are returned to their preferred owners after auto-distribution or manual distribution you must check the Recovery Guru for host connectivity issues.
 - e. If there is no Recovery Guru present or if following the recovery guru steps the volumes are still not returned to their preferred owners contact support.
6. Collect support data for your storage array using SANtricity System Manager.
 - a. Select **Support > Support Center > Diagnostics**.
 - b. Select **Collect Support Data**.
 - c. Click **Collect**.

The file is saved in the Downloads folder for your browser with the name, **support-data.7z**.

What's next?

The process of upgrading a host interface card in your storage array is complete. You can resume normal operations.

Replace failed host interface card (HIC) - EF300 or EF600

Follow this procedure to replace a failed host interface card (HIC) in an EF300, EF600, EF300C, or EF600C array.

About this task

When you replace a failed HIC, you must power off the storage array, replace the HIC, and reapply power.

Before you begin

- Review [Requirements for EF300 or EF600 HIC upgrades](#).
- Schedule a downtime maintenance window for this procedure. You cannot access data on the storage array until you have successfully completed this procedure. Because both controllers must have the same HIC configuration when they are powered on, the power must be off when you install HICs.
- Make sure you have the following:
 - HICs that are compatible with your controllers.
 - An ESD wristband, or you have taken other antistatic precautions.
 - A flat, static free work area.
 - Labels to identify each cable that is connected to the controller canister.
 - A #1 Phillips screwdriver.
 - A management station with a browser that can access SANtricity System Manager for the controller. (To open the System Manager interface, point the browser to the controller's domain name or IP address.)



Possible loss of data access — Never install a HIC in an EF300 or EF600 controller canister if that HIC was designed for another E-Series controller. In addition, both controllers and both HICs must be identical. The presence of incompatible or mismatched HICs causes the controllers to lock down when you apply power.

Step 1: Place the controller offline

Place the affected controller offline so you can safely replace the HICs.

Steps

1. From SANtricity System Manager, review the details in the Recovery Guru to confirm that there is an issue with a battery and to ensure no other items must be addressed first.
2. From the Details area of the Recovery Guru, determine which battery to replace.
3. Back up the storage array's configuration database using SANtricity System Manager.

If a problem occurs when you remove a controller, you can use the saved file to restore your configuration. The system will save the current state of the RAID configuration database, which includes all data for volume groups and disk pools on the controller.

- From System Manager:
 - a. Select **Support > Support Center > Diagnostics**.
 - b. Select **Collect Configuration Data**.
 - c. Click **Collect**.

The file is saved in the Downloads folder for your browser with the name, **configurationData-
<arrayName>-<dateTime>.7z**.

4. If the controller is not already offline, take it offline now using SANtricity System Manager.
 - a. Select **Hardware**.
 - b. If the graphic shows the drives, select **Show back of shelf** to show the controllers.
 - c. Select the controller that you want to place offline.

- d. From the context menu, select **Place offline**, and confirm that you want to perform the operation.



If you are accessing SANtricity System Manager using the controller you are attempting to take offline, a SANtricity System Manager Unavailable message is displayed. Select **Connect to an alternate network connection** to automatically access SANtricity System Manager using the other controller.

5. Wait for SANtricity System Manager to update the controller's status to offline.



Do not begin any other operations until after the status has been updated.

6. Select **Recheck** from the Recovery Guru, and confirm that the OK to remove field in the Details area displays Yes, indicating that it is safe to remove this component.

Step 2: Remove controller canister

Remove the controller canister so you can replace the failed host interface card.

Steps

1. Label each cable that is attached to the controller canister.
2. Disconnect all the cables from the controller canister.



To prevent degraded performance, do not twist, fold, pinch, or step on the cables.

3. If the HIC ports use SFP+ transceivers, remove them.

Depending on what type of HIC you are upgrading to, you might be able to reuse these SFPs.

4. Confirm that the Cache Active LED on the back of the controller is off.
5. Squeeze the handles on either side of the controller, and pull back until it releases from the shelf.



6. Using two hands and the handles, slide the controller canister out of the shelf. When the front of the controller is free of the enclosure, use two hands to pull it out completely.



Always use two hands to support the weight of a controller canister.



7. Place the controller canister on a flat, static-free surface.

Step 3: Remove the HIC

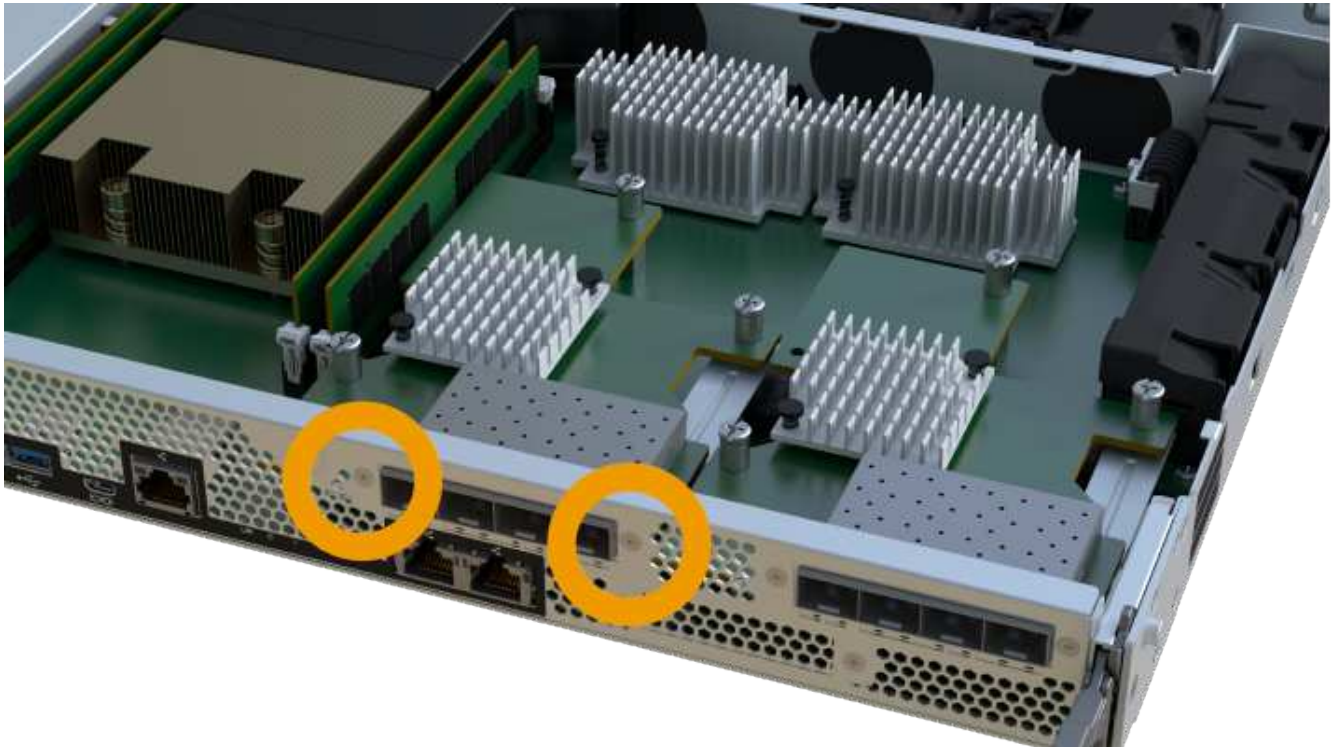
Remove the original HIC so you can replace it with an upgraded one.

Steps

1. Remove the controller canister's cover by unscrewing the single thumbscrew and lifting the lid open.
2. Confirm that the green LED inside the controller is off.

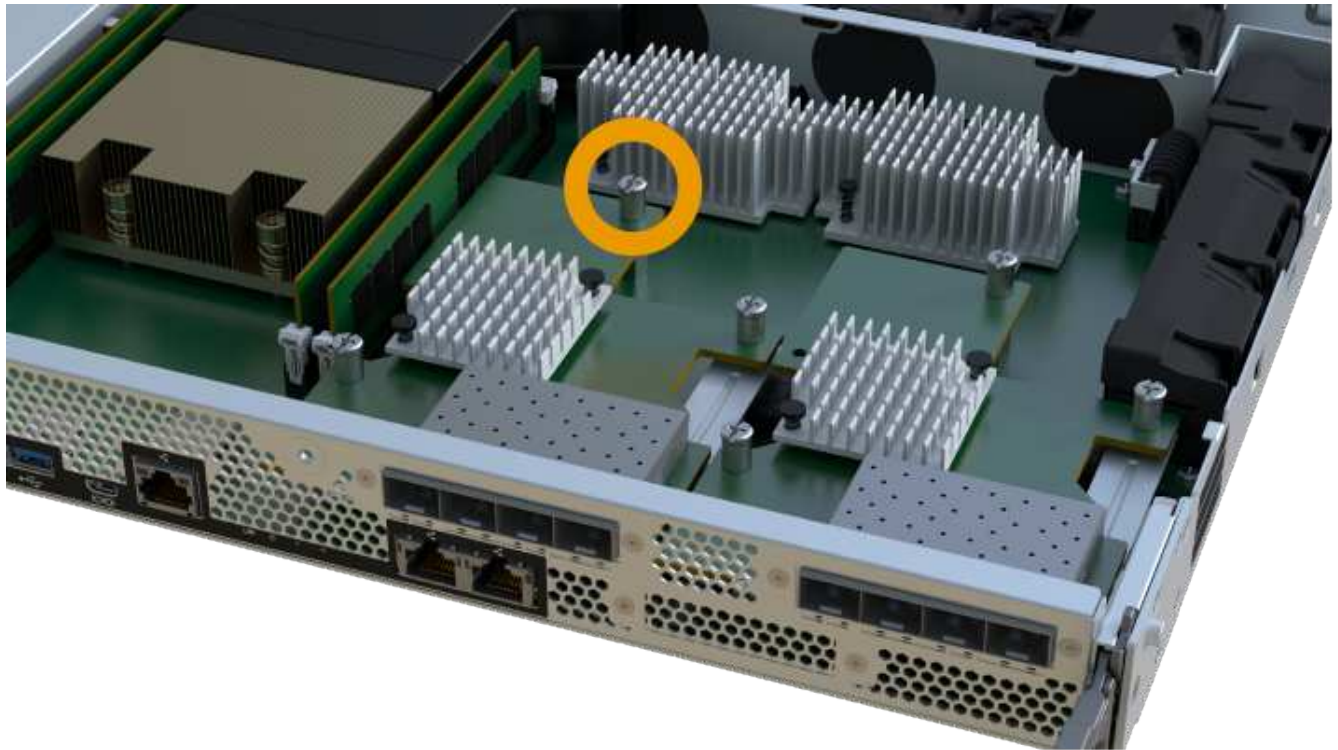
If this green LED is on, the controller is still using battery power. You must wait for this LED to go off before removing any components.

3. Using a Phillips screwdriver, remove the two screws that attach the HIC faceplate to the controller canister.



The image above is an example; the appearance of your HIC may differ.

4. Remove the HIC faceplate.
5. Using your fingers or a Phillips screwdriver, loosen the single thumbscrew that secure the HIC to the controller card.



The HIC comes with three screw locations on the top, but is secured with only one.

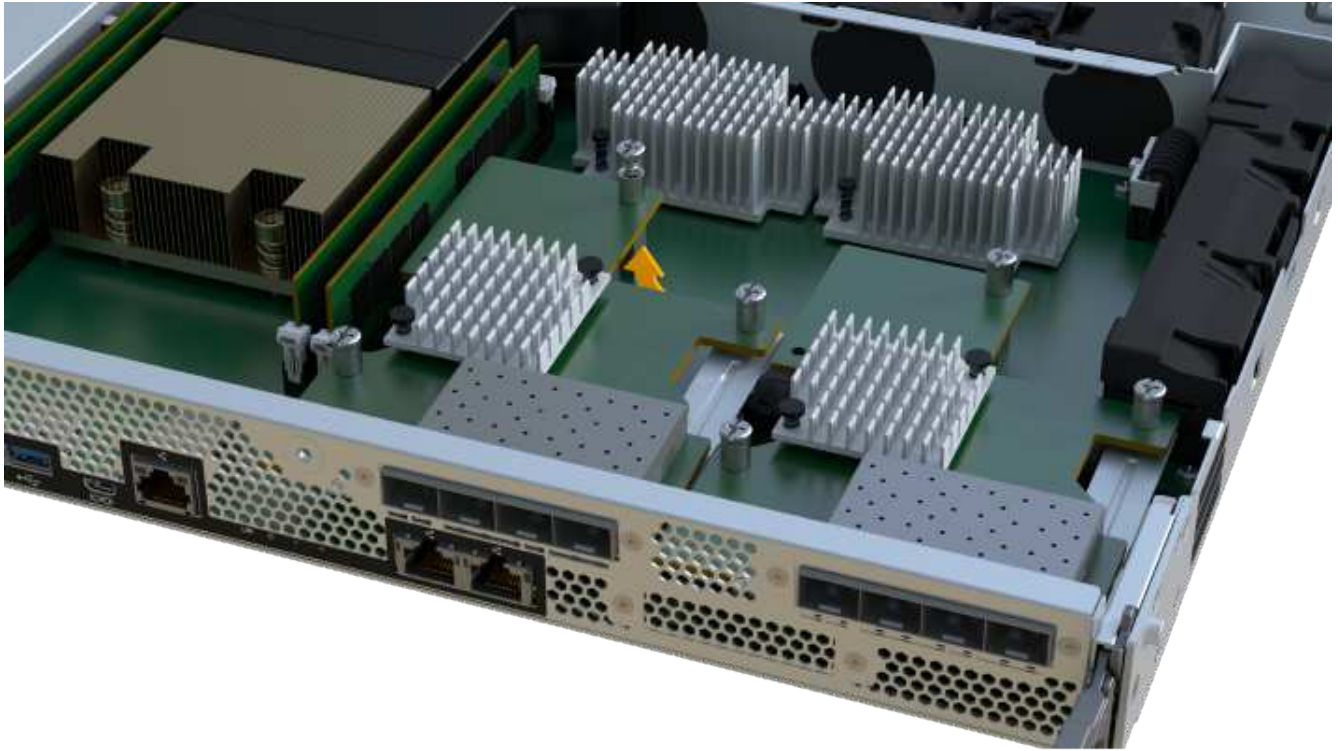


The image above is an example; the appearance of your HIC may differ.

6. Carefully detach the HIC from the controller card by lifting the card up and out of the controller.



Be careful not to scratch or bump the components on the bottom of the HIC or on the top of the controller card.



The image above is an example; the appearance of your HIC may differ.

7. Place the HIC on a flat, static-free surface.

Step 4: Replace the HIC

After removing the old HIC, install a new HIC.



Possible loss of data access — Never install a HIC in an EF300 or EF600 controller canister if that HIC was designed for another E-Series controller. In addition, if you have a duplex configuration, both controllers and both HICs must be identical. The presence of incompatible or mismatched HICs causes the controllers to lock down when you apply power.

Steps

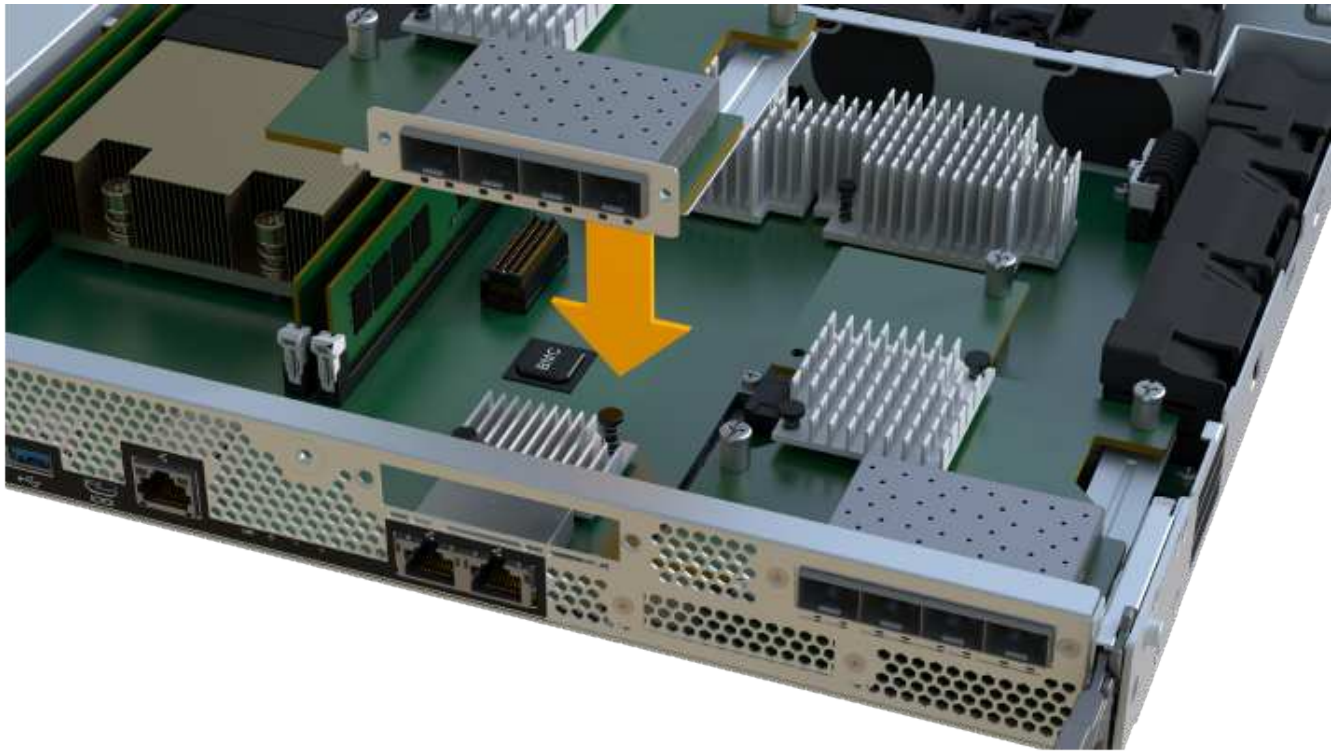
1. Unpack the new HIC and the new HIC faceplate.
2. Align the single thumbscrew on the HIC with the corresponding holes on the controller, and align the connector on the bottom of the HIC with the HIC interface connector on the controller card.

Be careful not to scratch or bump the components on the bottom of the HIC or on the top of the controller card.

3. Carefully lower the HIC into place, and seat the HIC connector by pressing gently on the HIC.



Possible equipment damage — Be very careful not to pinch the gold ribbon connector for the controller LEDs between the HIC and the thumbscrew.



The image above is an example; the appearance of your HIC may differ.

4. Hand-tighten the HIC thumbscrew.

Do not use a screwdriver, or you might over tighten the screws.

5. Using a #1 Phillips screwdriver, attach the HIC faceplate you removed from the original HIC with the three screws.

Step 5: Reinstall controller canister

After replacing the HIC, reinstall the controller canister into the controller shelf.

Steps

1. Lower the cover on the controller canister and secure the thumbscrew.
2. While squeezing the controller handles, gently slide the controller canister all the way into the controller shelf.



The controller audibly clicks when correctly installed into the shelf.



3. Install the SFPs into the new HIC and reconnect all the cables.

If you are using more than one host protocol, be sure to install the SFPs in the correct host ports.

Step 6: Complete HIC replacement

Place the controller online, collect support data, and resume operations.

Steps

1. Place controller online.
 - a. In System Manager, navigate to the hardware page.
 - b. Select **Show back of controller**.
 - c. Select the controller with the replaced host interface card.
 - d. Select **Place online** from the drop-down list.
2. As the controller boots, check the controller LEDs.

When communication with the other controller is reestablished:

- The amber Attention LED remains on.
 - The Host Link LEDs might be on, blinking, or off, depending on the host interface.
3. When the controller is back online, confirm that its status is Optimal and check the controller shelf's Attention LEDs.

If the status is not Optimal or if any of the Attention LEDs are on, confirm that all cables are correctly seated and the controller canister is installed correctly. If necessary, remove and reinstall the controller canister.



If you cannot resolve the problem, contact technical support.

4. Click **Hardware** › **Support** › **Upgrade Center** to ensure that the latest version of SANtricity OS is installed.

As needed, install the latest version.

5. Verify that all volumes have been returned to the preferred owner.
 - a. Select **Storage** › **Volumes**. From the **All Volumes** page, verify that volumes are distributed to their preferred owners. Select **More** › **Change ownership** to view volume owners.
 - b. If volumes are all owned by preferred owner continue to Step 6.
 - c. If none of the volumes are returned, you must manually return the volumes. Go to **More** › **Redistribute volumes**.
 - d. If only some of the volumes are returned to their preferred owners after auto-distribution or manual distribution you must check the Recovery Guru for host connectivity issues.
 - e. If there is no Recovery Guru present or if following the recovery guru steps the volumes are still not returned to their preferred owners contact support.
6. Collect support data for your storage array using SANtricity System Manager.
 - a. Select **Support** › **Support Center** › **Diagnostics**.
 - b. Select **Collect Support Data**.
 - c. Click **Collect**.

The file is saved in the Downloads folder for your browser with the name, **support-data.7z**.

What's next?

Your host interface card replacement is complete. You can resume normal operations.

Host port protocol conversion

Requirements to convert host protocol - EF300 or EF600

Before converting the host protocol for an EF300, EF600, EF300C, or EF600C array, review the following requirements.

- You have scheduled a downtime maintenance window for this procedure.
- You must stop host I/O operations when you perform the conversion. You cannot access data on the storage array until you have successfully completed the conversion.
- You are using out-of-band management. (You cannot use in-band management to complete this procedure.)
- You have obtained the necessary hardware for the conversion, which may include a new set of HICs and/or SFPs. Your NetApp Sales Representative can help you determine what hardware you need and help you order the correct parts.
- The dual-protocol SFP transceivers support 16Gb and 8Gb FC, as well as 10Gb iSCSI. Therefore, you may not need to change SFPs if you have the dual-protocol and are simply switching between FC and iSCSI or vice versa.
- Some host port protocol conversions may require a host interface card addition, or upgrade.

Change the host protocol - EF300 and EF600

Follow this procedure to change the host port protocol in an EF300, EF600, EF300C, or EF600C array. This procedure applies only to host interface cards (HICs) using either Infiniband (IB) or Fibre Channel (FC).

Step 1: Obtain the feature pack key

To obtain the feature pack key, you need the serial number from the controller shelf, a Feature Activation Code, and the Feature Enable Identifier for the storage array.

Steps

1. Locate the serial number.
 - a. From SANtricity System Manager, select **Support > Support Center**.
 - b. With the **Support Resources** tab selected, scroll to the **View top storage array properties** section.
 - c. Locate the **Chassis Serial Number**, and copy this value to a text file.

View top storage array properties

Storage array world-wide identifier (ID):	600A0980006CEF9B00000000574DB18C
Chassis serial number:	1142FG00061
Number of shelves:	2
Number of drives:	41
Drive media types:	HDD
Number of controllers:	2
Controller board ID:	2806

2. Locate the **feature pack submodel ID**.
 - a. From the SANtricity System Manager, select **Support**.
 - b. Select the **Support Center** tile.
 - c. On the Support Resources tab, locate and select the **Storage Array Profile** link.
 - d. Type **feature pack submodel ID** in the text box, and click **Find**.
 - e. Locate the feature pack submodel ID for the starting configuration.

Storage Array Profile



Feature pack submodel ID



Find

Results: 1 of 1

Feature pack submodel ID: 318

Additional feature information

Snapshot groups allowed per base volume (see note below): 4
Volume assignments per host or host cluster: 256

Note: If a volume is a member of a snapshot consistency group, that membership (member volume) counts against both th

FIRMWARE INVENTORY

Storage Array

Report Date: 2/13/17 4:56:33 PM UTC
Storage Array Name: LDAPandCLI-Cfg04-Arapaho
Current SANtricity OS Software Version: 88.40.39.74.001
Management Software Version: 11.40.0010.0051
Controller Firmware Version: 88.40.39.74
Supervisor Software Version: 88.40.39.74
IOM (ESM) Version: 81.40.0G00.0006
Current NVSRAM Version: N280X-840834-402
Staged SANtricity OS Software Version: None
Staged NVSRAM Version: None

- Using the feature pack submodel ID, locate the corresponding Controller submodel ID for the starting configuration and find the Feature Activation Code for the desired ending configuration within the following table. Then, copy that Feature Activation Code to a text file.

Starting configuration		Ending configuration		Feature Activation Code
Controller submodel ID	HIC ports	Controller submodel ID	HIC ports	
443	NVMe/FC, NVMe/RoCE, or iSCSI	444	NVME/FC or NVMe/IB	LHS-RB4-ZDV29
		448	FC	JHX-UB4-ZGTP1
		491	iSER/IB	0H1-675-Z5SII
		492	SRP/IB	NHD-V75-ZB6ZX
444	NVMe/FC or NVMe/IB	443	NVMe/FC, NVMe/RoCE, or iSCSI	2HU-BB4-ZFCG5
		448	FC	YH3-XB4-ZJRIZ
		491	iSER/IB	2H3-P75-Z6AQQ
		492	SRP/IB	5HG-G75-ZDNEZ

Starting configuration		Ending configuration		Feature Activation Code
448	FC	443	NVMe/FC, NVMe/RoCE, or iSCSI	7HZ-EB4-ZHAYW
		444	NVMe/FC or NVMe/IB	DH5-HB4-ZK9QH
		491	iSER/IB	FH6-975-Z7Q7H
		492	SRP/IB	0HI-Z75-ZE4L5
491	iSER/IB	443	NVMe/FC, NVMe/RoCE, or iSCSI	MHQ-M85-ZIJNT
		444	NVMe/FC or NVMe/IB	4HS-685-ZJZ1U
		448	FC	YHU-P85-ZLHCX
		465	FC/PTL	AHX-985-ZMXMI
		492	SRP/IB	ZHZ-S85-ZNF4J
492	SRP/IB	443	NVMe/FC, NVMe/RoCE, or iSCSI	EH3-C85-Z0V93
		444	NVMe/FC or NVMe/IB	BH5-V85-ZQDQJ
		448	FC	1H8-F85-ZRT1V
		465	FC/PTL	1HA-Y85-ZSB7S
		491	iSER/IB	KHD-I85-ZUSMI
465	FC/PTL	491	iSER	6H8-S75-Z98FH
		492	SRP	NHL-J75-ZFL3W

Starting configuration		Ending configuration		Feature Activation Code
516	NVMe/FC, NVMe/RoCE, or iSCSI	517	NVMe/IB or NVMe/FC	LHF-285-ZV9YZ
		518	FC	IHI-L85-ZXQEP
		519	iSER/IB	RHK-585-ZY7P5
		520	FC-PTL	NHN-095-ZZ0XF
		521	SRP/IB	GHP-895-Z25BD
517	NVMe/IB or NVMe/FC	516	NVMe/FC, NVMe/RoCE, or iSCSI	7HS-R95-Z3M06
		518	FC	UHU-B95-Z43X2
		519	FC-PTL	8HX-U95-Z5K6F
		520	iSER/IB	UHZ-E95-Z71LH
		521	SRP/IB	SH2-X95-Z8IVS
518	FC	516	NVMe/FC, NVMe/RoCE, or iSCSI	UH5-H95-Z9Z58
		517	NVMe/FC or NVMe/IB	XH7-195-ZBGJC
		519	FC-PTL	FHA-K95-ZCXX0
		520	iSER/IB	JHC-595-ZDE3X
		521	SRP/IB	0HF-095-ZFVFN

Starting configuration		Ending configuration		Feature Activation Code
519	FC-PTL	516	NVMe/FC, NVMe/RoCE, or iSCSI	YHH-895-ZGCXS
		517	NVMe/FC or NVMe/IB	2HK-R95-ZHT83
		518	FC	1HM-BA5-ZJALA
		520	iSER/IB	YHP-UA5-ZKRXA
		521	SRP/IB	MHR-EA5-ZL83V
520	iSER/IB	516	NVMe/FC, NVMe/RoCE, or iSCSI	HHU-XA5-ZNPLT
		517	NVMe/FC or NVMe/IB	YHW-HA5-Z07QK
		518	FC	WHZ-1A5-ZPN4U
		519	FC/PTL	7H2-KA5-ZR5C3
		521	SRP	3H5-4A5-ZSLVX
521	SRP/IB	516	NVMe/FC, NVMe/RoCE, or iSCSI	1H7-NA5-ZT31W
		517	NVMe/FC or NVMe/IB	XHA-7A5-ZVJGC
		518	FC	KHC-QA5-ZW1P3
		519	FC/PTL	CHE-AA5-ZXH2F
		520	iSER/IB	SHH-TA5-ZZYHS



If your controller submodel ID is not listed, contact [NetApp Support](#).

4. In System Manager, locate the Feature Enable Identifier.
 - a. Go to **Settings > System**.

- b. Scroll down to **Add-ons**.
- c. Under **Change Feature Pack**, locate the **Feature Enable Identifier**.
- d. Copy and paste this 32-digit number to a text file.

Change Feature Pack

✕

Ensure you have obtained a feature pack file from your Technical Support Engineer. After you have obtained the file, transfer it to the storage array to change your feature pack.

Feature Enable Identifier: 333030343238333030343439574DB18C

Select the feature pack file: Browse...

Current feature pack: SMID 261

Important: Changing a feature pack is an offline operation. Verify that there are no hosts or applications accessing the storage array and back up all data before proceeding.

Type CHANGE to confirm that you want to perform this operation.

Type change

Change
Cancel

5. Go to [NetApp License Activation: Storage Array Premium Feature Activation](#), and enter the information required to obtain the feature pack.
 - Chassis Serial Number
 - Feature Activation Code
 - Feature Enable Identifier



The Premium Feature Activation web site includes a link to “Premium Feature Activation Instructions.” Do not attempt to use those instructions for this procedure.

6. Choose whether to receive the key file for the feature pack in an email or download it directly from the site.

Step 2: Stop host I/O

Stop all I/O operations from the host before converting the protocol of the host ports.

You cannot access data on the storage array until you successfully complete the conversion.

Steps

1. Ensure that no I/O operations are occurring between the storage array and all connected hosts. For example, you can perform these steps:
 - Stop all processes that involve the LUNs mapped from the storage to the hosts.
 - Ensure that no applications are writing data to any LUNs mapped from the storage to the hosts.
 - Unmount all file systems associated with volumes on the array.



The exact steps to stop host I/O operations depend on the host operating system and the configuration, which are beyond the scope of these instructions. If you are not sure how to stop host I/O operations in your environment, consider shutting down the host.



Possible data loss — If you continue this procedure while I/O operations are occurring, you might lose data.

2. Wait for any data in cache memory to be written to the drives.

The green Cache Active LED on the back of each controller is on when cached data needs to be written to the drives. You must wait for this LED to turn off.

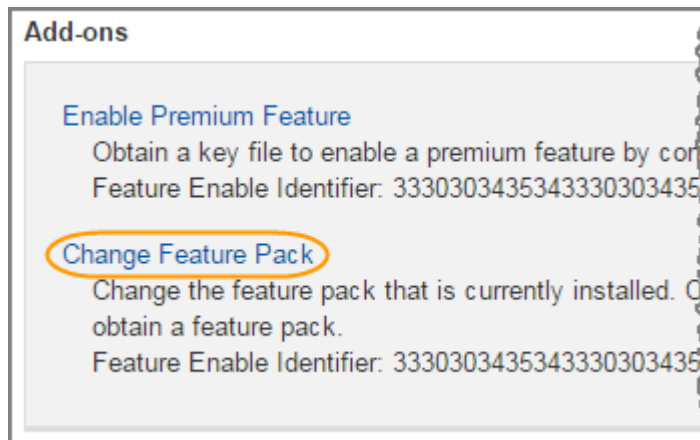
3. From the Home page of SANtricity System Manager, select **View Operations in Progress**.
4. Wait for all operations to complete before continuing with the next step.

Step 3: Change the feature pack

Change the feature pack to convert the host protocol of your host ports.

Steps

1. From SANtricity System Manager, select **Settings > System**.
2. Under **Add-ons**, select **Change Feature Pack**.



3. Click **Browse**, and then select the feature pack you want to apply.
4. Type **CHANGE** in the field.
5. Click **Change**.

The feature pack migration begins. Both controllers automatically reboot twice to allow the new feature pack to take effect. The storage array returns to a responsive state after the reboot is complete.

6. Confirm the host ports have the protocol you expect.
 - a. From SANtricity System Manager, select **Hardware**.
 - b. Click **Show back of shelf**.
 - c. Select the graphic for either Controller A or Controller B.
 - d. Select **View settings** from the context menu.

- e. Select the **Host Interfaces** tab.
- f. Click **Show more settings**.

What's next?

Go to [Complete host protocol conversion](#).

Complete host protocol conversion - EF300 and EF600

After you apply the feature pack key to convert the protocol, you must configure the host to use the appropriate protocol.

For step-by-step instructions, see the guide appropriate for your system:

- [Linux express configuration](#)
- [VMware express configuration](#)
- [Windows express configuration](#)

Specific settings might vary. Check the [NetApp Interoperability Matrix](#) for specific instructions and additional recommended settings for your solution.

Power supplies

Requirements to replace the power supply - EF300 or EF600

Before replacing a power supply in an EF300, EF600, EF300C, or EF600C array, review the following requirements.

- You must have a replacement power supply that is supported for your controller shelf or drive shelf model.



Do not mix PSUs of different voltage types. Always replace like for like.

- You must have an ESD wristband, or you have taken other antistatic precautions.

Replace the power supply - EF300 and EF600

You can replace a power supply when it fails in your EF300, EF600, EF300C, or EF600C controller.

If a power supply fails, you must replace it as soon as possible so the controller shelf has a redundant power source.

Before you begin

- Review the details in the Recovery Guru to confirm that there is an issue with the power supply. Select **Recheck** from the Recovery Guru to ensure no other items must be addressed first.
- Check that the amber Attention LED on the power supply is on, indicating that the power supply or its integrated fan has a fault.
- Make sure you have the following:

- A replacement power supply that is supported for your controller shelf.
- An ESD wristband, or you have taken other antistatic precautions.
- A management station with a browser that can access SANtricity System Manager for the controller.
(To open the System Manager interface, point the browser to the controller's domain name or IP address.)

Step 1: Remove failed power supply

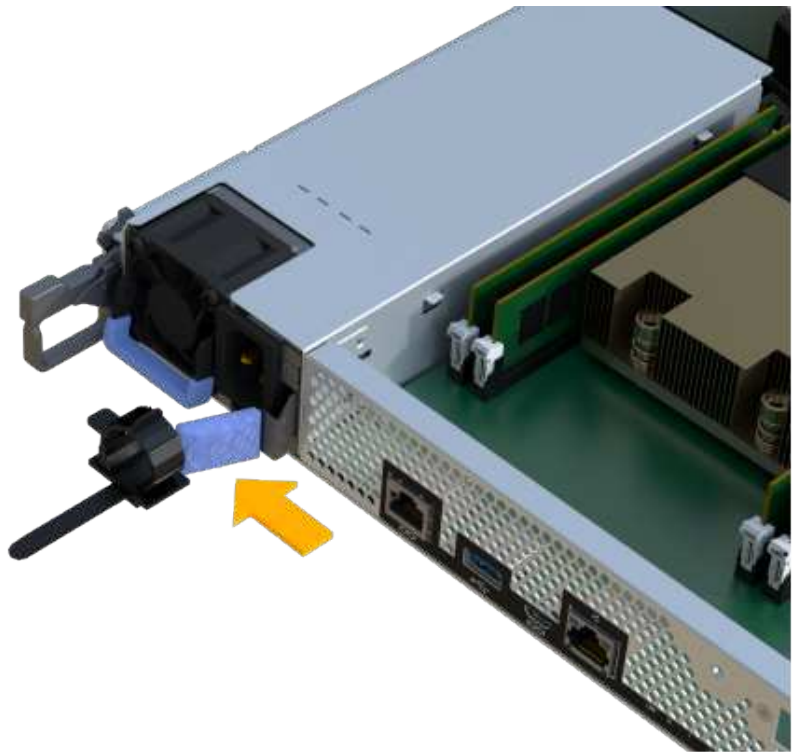
Remove a failed power supply so you can replace it with a new one.

Steps

1. Unpack the new power supply, and set it on a level surface near the drive shelf.

Save all packing materials for use when returning the failed power supply.

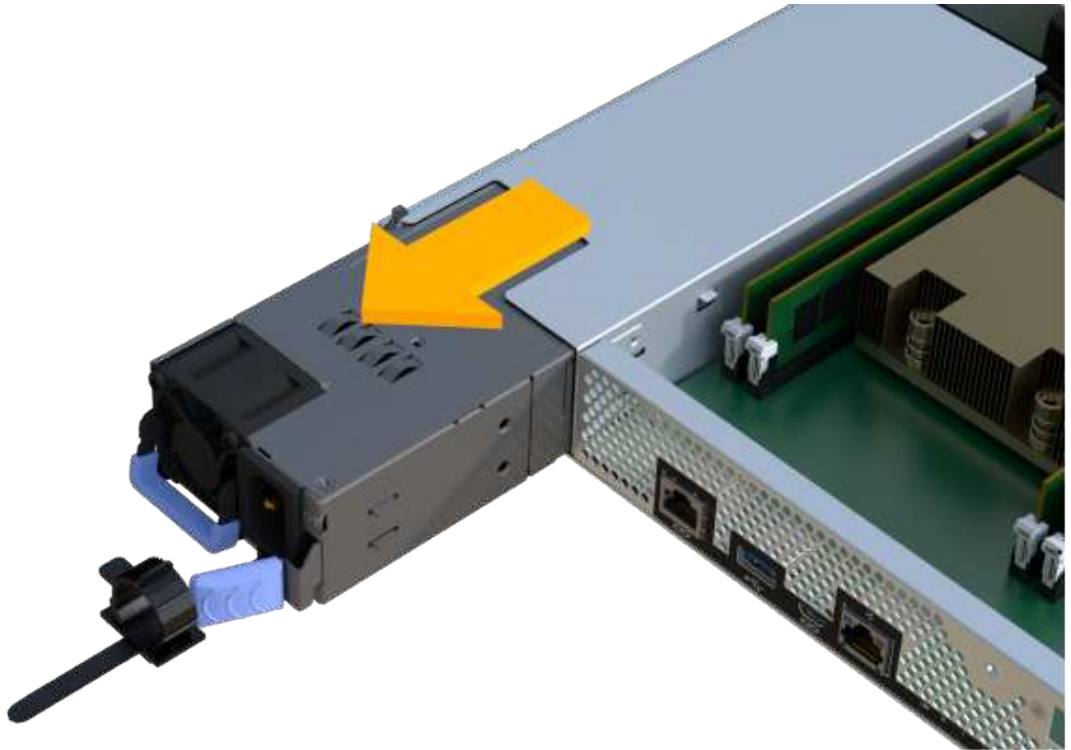
2. Disconnect the power cables:
 - a. Open the power cord retainer, and then unplug the power cord from the power supply.
 - b. Unplug the power cord from the power source.
3. Locate the tab to the right of the power supply and press it towards the power supply unit.



4. Locate the handle on the front of the power supply.
5. Use the handle to slide the power supply straight out of the system.



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



Step 2: Install new power supply and complete the replacement

After removing the failed power supply, install a new one.

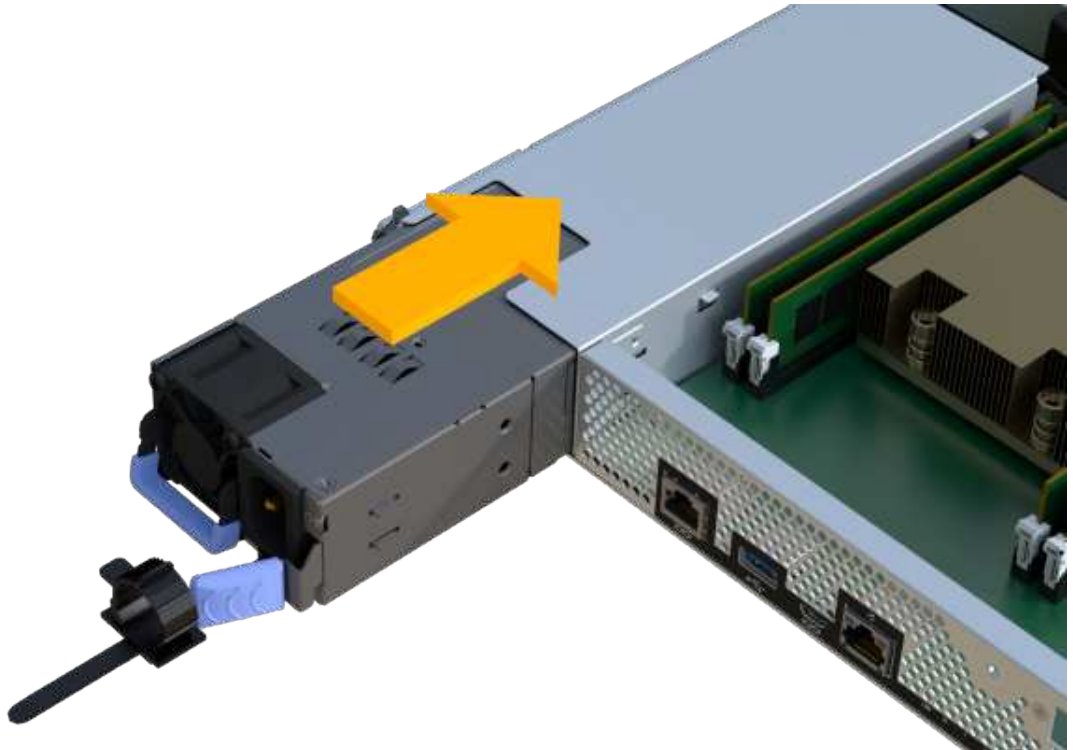
Steps

1. Using both hands, support and align the edges of the power supply with the opening in the system chassis, and then gently push the power supply into the chassis using the cam handle.

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



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



2. Confirm that its status is Optimal and check the controller shelf's Attention LEDs.

If the status is not Optimal or if any of the Attention LEDs are on, confirm that all cables are correctly seated and the controller canister is installed correctly. If necessary, remove and reinstall the controller canister.



If you cannot resolve the problem, contact technical support.

3. From SANtricity System Manager, click **Support** > **Upgrade Center** to ensure that the latest version of SANtricity OS is installed.

As needed, install the latest version.

What's next?

Your power supply replacement is complete. You can resume normal operations.

SAS expansion cards

Requirements to replace the SAS expansion card - EF300 and EF600

If you plan to add a SAS expansion card to an EF300, EF600, EF300C, or EF600C review the following requirements.

- You must follow the [Install and set up EF300 and EF600 storage systems](#) to set up your controller.
- You must update your firmware to the latest version. To update your firmware, follow the instructions in the [Upgrading SANtricity OS](#).
- You must schedule a downtime maintenance window for this procedure. You cannot access data on the storage array until you have successfully completed this procedure.

- You must perform this task with both controller canisters.
- You have an ESD wristband, or you have taken other antistatic precautions.
- You have a #1 Phillips screwdriver.
- You have labels to identify each cable that is connected to the controller canister.
- You have a management station with a browser that can access SANtricity System Manager for the controller. (To open the System Manager interface, point the browser to the controller's domain name or IP address.)
- EF300 controllers may have a SAS expansion card installed in port 1 to allow for drive tray expansion.
- To cable your SAS expansion, see [Cabling E-Series hardware](#) for instructions.

Add a SAS expansion card - EF300 and EF600

You can add a SAS expansion card to an EF300, EF600, EF300C, EF600C controller to allow for drive tray expansion.

About this task

When you add a SAS expansion card, you must power off the storage array, install the new SAS expansion card, and reapply power.

Before you begin

- Review [Requirements for EF300 and EF600 SAS expansion card replacement](#).
- You must schedule a downtime maintenance window for this procedure. You cannot access data on the storage array until you have successfully completed this procedure.



This procedure must be done with both controller canisters. Controller HIC configurations must match exactly.

- Make sure you have the following:
 - A SAS expansion card that is compatible with your controller.
 - An ESD wristband, or you have taken other antistatic precautions.
 - A flat, static free work area.
 - A #1 Phillips screwdriver.
 - Labels to identify each cable that is connected to the controller canister.
 - A management station with a browser that can access SANtricity System Manager for the controller. (To open the System Manager interface, point the browser to the controller's domain name or IP address.)

Step 1: Place controller shelf offline

Place the controller shelf offline so you can safely add the SAS expansion card.

Steps

1. From the Home page of SANtricity System Manager, ensure that the storage array has Optimal status.

If the status is not Optimal, use the Recovery Guru or contact technical support to resolve the problem. Do not continue with this procedure.

2. Back up the storage array's configuration database using SANtricity System Manager.

If a problem occurs when you remove a controller, you can use the saved file to restore your configuration. The system will save the current state of the RAID configuration database, which includes all data for volume groups and disk pools on the controller.

- From System Manager:
 - a. Select **Support > Support Center > Diagnostics**.
 - b. Select **Collect Configuration Data**.
 - c. Click **Collect**.

The file is saved in the Downloads folder for your browser with the name, **configurationData-
<arrayName>-<dateTime>.7z**.

3. Ensure that no I/O operations are occurring between the storage array and all connected hosts. For example, you can perform these steps:

- Stop all processes that involve the LUNs mapped from the storage to the hosts.
- Ensure that no applications are writing data to any LUNs mapped from the storage to the hosts.
- Unmount all file systems associated with volumes on the array.



The exact steps to stop host I/O operations depend on the host operating system and the configuration, which are beyond the scope of these instructions. If you are not sure how to stop host I/O operations in your environment, consider shutting down the host.



Possible data loss — If you continue this procedure while I/O operations are occurring, the host application might lose access to the data because the storage is not accessible.

4. Wait for any data in cache memory to be written to the drives.

The green Cache Active LED on the back of each controller is on when cached data needs to be written to the drives. You must wait for this LED to turn off.

5. From the Home page of SANtricity System Manager, select **View Operations in Progress**. Wait for all operations to complete before continuing with the next step.

6. Power down the controller shelf.

- a. Label and then unplug both power cables from controller shelf.
- b. Wait for all LEDs on the controller shelf to turn off.

Step 2: Remove controller canister

Remove the controller canister so you can add the new SAS expansion card.

Steps

1. Put on an ESD wristband or take other antistatic precautions.
2. Label each cable that is attached to the controller canister.
3. Disconnect all the cables from the controller canister.



To prevent degraded performance, do not twist, fold, pinch, or step on the cables.

4. Confirm that the Cache Active LED on the back of the controller is off.
5. Squeeze the handles on either side of the controller, and pull back until it releases from the shelf.



6. Using two hands and the handles, slide the controller canister out of the shelf. When the front of the controller is free of the enclosure, use two hands to pull it out completely.



Always use two hands to support the weight of a controller canister.



7. Place the controller canister on a flat, static-free surface.

Step 3: Add the new SAS expansion card

Install the SAS expansion card to allow for drive tray expansion.

Steps

1. Remove the controller canister's cover by unscrewing the single thumbscrew and lifting the lid open.
2. Confirm that the green LED inside the controller is off.

If this green LED is on, the controller is still using battery power. You must wait for this LED to go off before removing any components.

3. Using a #1 Phillips screwdriver, remove the two screws that attach the faceplate to the controller canister, and remove the faceplate.
4. Align the single thumbscrew on the SAS expansion card with the corresponding hole on the controller, and align the connector on the bottom of the expansion card with the expansion card interface connector on the controller card.

Be careful not to scratch or bump the components on the bottom of the SAS expansion card or on the top of the controller card.

5. Carefully lower the SAS expansion card into place, and seat the expansion card connector by pressing gently on the expansion card.
6. Hand-tighten the SAS expansion card thumbscrew.

Do not use a screwdriver, or you might over tighten the screws.

7. Using a #1 Phillips screwdriver, attach the faceplate you removed from the original controller canister to the new controller canister with the two screws.

Step 4: Reinstall the controller canister

After installing the new SAS expansion card, reinstall the controller canister into the controller shelf.

Steps

1. Lower the cover on the controller canister and secure the thumbscrew.
2. While squeezing the controller handles, gently slide the controller canister all the way into the controller shelf.



The controller audibly clicks when correctly installed into the shelf.



Step 5: Complete SAS expansion card addition

Place the controller online, collect support data, and resume operations.

Steps

1. Plug in power cables to place the controller online.
2. As the controller boots, check the controller LEDs.
 - The amber Attention LED remains on.
 - The Host Link LEDs might be on, blinking, or off, depending on the host interface.
3. When the controller is back online, confirm that its status is Optimal and check the controller shelf's Attention LEDs.

If the status is not Optimal or if any of the Attention LEDs are on, confirm that all cables are correctly seated and the controller canister is installed correctly. If necessary, remove and reinstall the controller canister.



If you cannot resolve the problem, contact technical support.

4. Click **Hardware > Support > Upgrade Center** to ensure that the latest version of SANtricity OS is installed.

As needed, install the latest version.

5. Verify that all volumes have been returned to the preferred owner.
 - a. Select **Storage > Volumes**. From the **All Volumes** page, verify that volumes are distributed to their preferred owners. Select **More > Change ownership** to view volume owners.
 - b. If volumes are all owned by preferred owner continue to Step 6.
 - c. If none of the volumes are returned, you must manually return the volumes. Go to **More > Redistribute**

volumes.

- d. If only some of the volumes are returned to their preferred owners after auto-distribution or manual distribution you must check the Recovery Guru for host connectivity issues.
 - e. If there is no Recovery Guru present or if following the recovery guru steps the volumes are still not returned to their preferred owners contact support.
6. Collect support data for your storage array using SANtricity System Manager.
 - a. Select **Support** › **Support Center** › **Diagnostics**.
 - b. Select **Collect Support Data**.
 - c. Click **Collect**.

The file is saved in the Downloads folder for your browser with the name, **support-data.7z**.

7. Repeat this task with your second controller canister.



To cable your SAS expansion, see [Cabling E-Series hardware](#) for instructions.

What's next?

The process of adding a SAS expansion card in your storage array is complete. You can resume normal operations.

Copyright information

Copyright © 2026 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.