



Controllers

E-Series storage systems

NetApp
August 22, 2025

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Controllers

Requirements to replace a controller - E2800

Before you replace or add an E2800 controller, review the requirements and considerations.

Each controller canister contains a controller card, a battery, and an optional host interface card (HIC). You can add a second controller to a simplex configuration or replace a failed controller.

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.



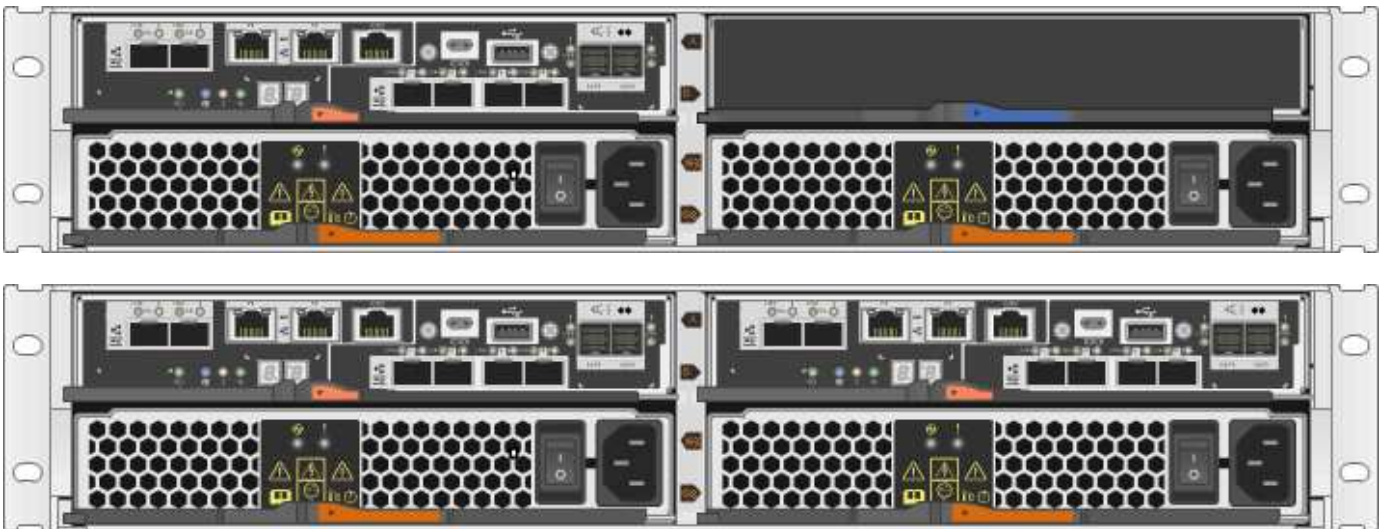
These procedures are for like-for-like shelf IOM hot-swaps or replacements. This means you can only replace an IOM12 module with another IOM12 module or replace an IOM12C module with another IOM12C module. (Your shelf can have two IOM12 modules or have two IOM12C modules.)

Requirements for adding second controller

You can add a second controller canister to the simplex version of the following controller shelves:

- E2812 controller shelf
- E2824 controller shelf
- EF280 flash array

The figures show an example controller shelf before adding a second controller (one controller canister and a controller blank) and after adding a second controller (two controller canisters).



The figures show example controller canisters; the host ports on your controller canisters might be different.

Before you add a second controller, you must have:

- A new controller canister with the same part number as the currently installed controller canister.
- A new HIC that is identical to the HIC in the currently installed controller canister (only necessary if the currently installed controller canister includes a host interface card).
- All cables, transceivers, switches, and host bus adapters (HBAs) needed to connect the new controller ports.

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

- Multipath driver installed on the host so that you can use both controllers. Refer to the [Linux express configuration](#), [Windows express configuration](#), or [VMware express configuration](#) for instructions.
- An ESD wristband, or you have taken other antistatic precautions.
- A #1 Phillips screwdriver.
- Labels to identify the new cables.
- 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.

Requirements for replacing controller

When you replace a failed controller canister, you must remove the battery and HIC, if one is installed, from the original controller canister, and install them in the replacement controller canister.

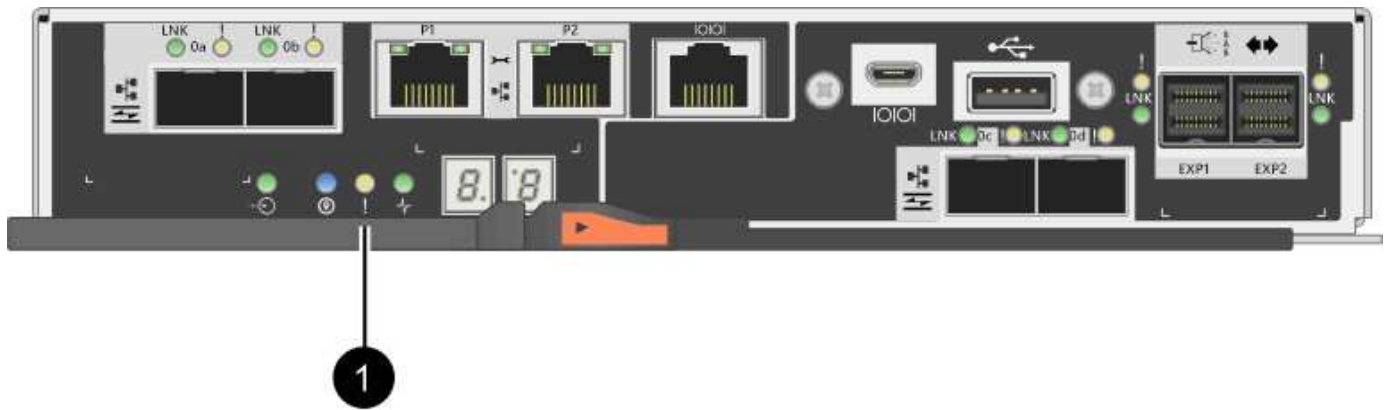
You can determine if you have a failed controller canister in two ways:

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



(1) Attention LED



The figure shows an example controller canister; the host ports on your controller canister might be different.

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.
- #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.)

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.

Duplex configuration requirements

If the controller shelf has two controllers (duplex configuration), you can replace a controller canister while your storage array is powered on and performing host I/O operations, as long as 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.

Simplex configuration requirements

If you have only one controller canister (simplex configuration), data on the storage array will not be accessible until you replace the controller canister. You must stop host I/O operations and power down the storage array.

Add second controller canister - E2800

You can add a second controller canister in the E2800 array.

About this task

This task describes how to add a second controller canister to the simplex version of either a E2812 controller shelf, E2824 controller shelf, or EF280 flash array. This procedure is also referred to as a simplex-to-duplex conversion, which is an online procedure. You can access data on the storage array while you perform this procedure.

Before you begin

Make sure you have the following:

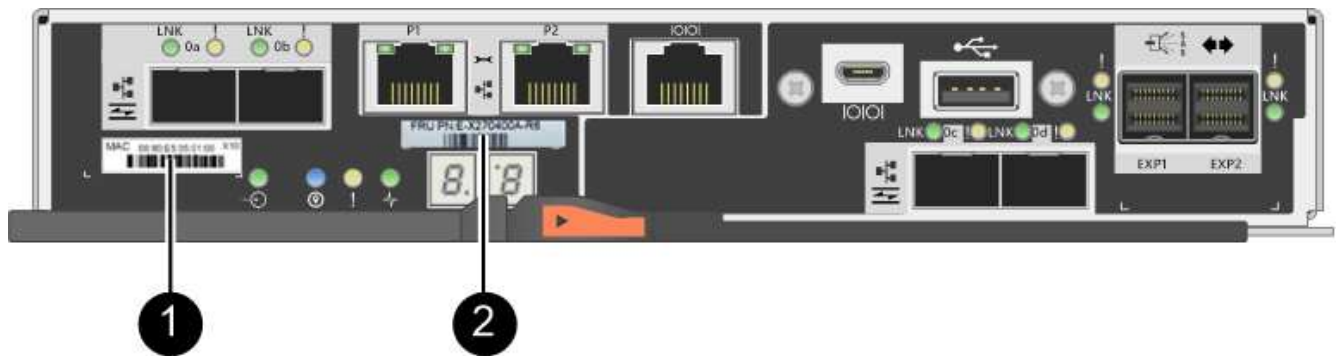
- A new controller canister with the same part number as the currently installed controller canister. (See step 1 to verify the part number.)
- A new HIC that is identical to the HIC in the currently installed controller canister (only necessary if the currently installed controller canister includes a host interface card).
- An ESD wristband, or take other antistatic precautions.
- A #1 Phillips screwdriver.
- Labels to identify the new cables. For information about compatible hardware, refer to the [NetApp Interoperability Matrix](#) or the [NetApp Hardware Universe](#).
- All cables, transceivers, switches, and host bus adapters (HBAs) needed to connect the new controller ports.
- 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: Verify the new controller's part number

Confirm that the new controller has the same part number as the currently installed controller.

Steps


1. Unpack the new controller canister, and set it on a flat, static-free surface.
2. Locate the MAC address and FRU part number labels on the back of the controller canister.



(1) MAC address: The MAC address for management port 1 ("P1"). If you used DHCP to obtain the original controller's IP address, you will need this address to connect to the new controller.

(2) FRU part number: This number must match the replacement part number for the currently installed controller.

3. From SANtricity System Manager, locate the replacement part number for the installed controller canister.
 - 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 installed controller is the same as the FRU part number for the new controller.



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

Step 2: Install host interface card

If the currently installed controller includes a HIC, you must install the same model of host interface card (HIC) in the second controller canister.

Steps

1. Unpack the new HIC, and confirm it is identical to the existing HIC.



Possible loss of data access — The HICs installed in the two controller canisters must be identical. If the replacement HIC is not identical to the HIC you are replacing, do not attempt this procedure. The presence of mismatched HICs will cause the new controller to lock down when it comes online.

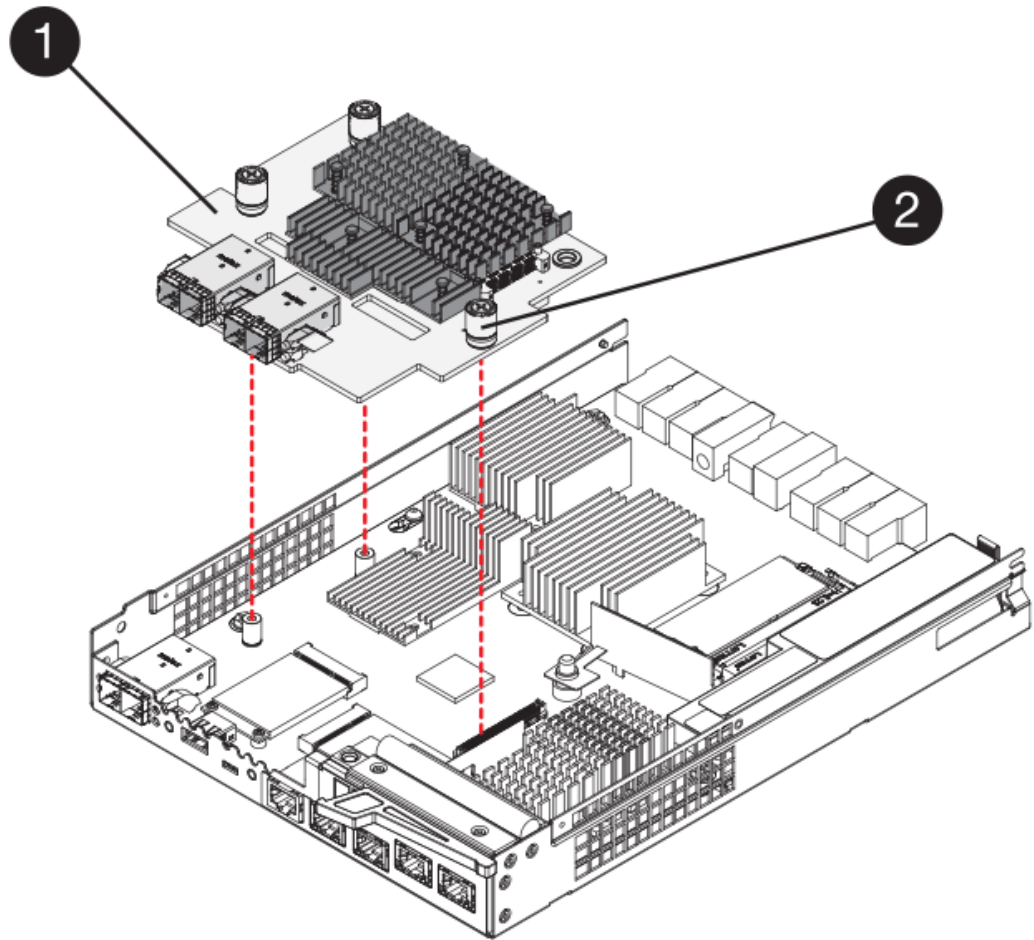
2. Turn the new controller canister over, so that the cover faces up.
3. Press the button on the cover, and slide the cover off.
4. Using a #1 Phillips screwdriver, remove the four screws that attach the blank faceplate to the controller canister, and remove the faceplate.
5. Align the three thumbscrews 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.

6. 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 thumbscrews.



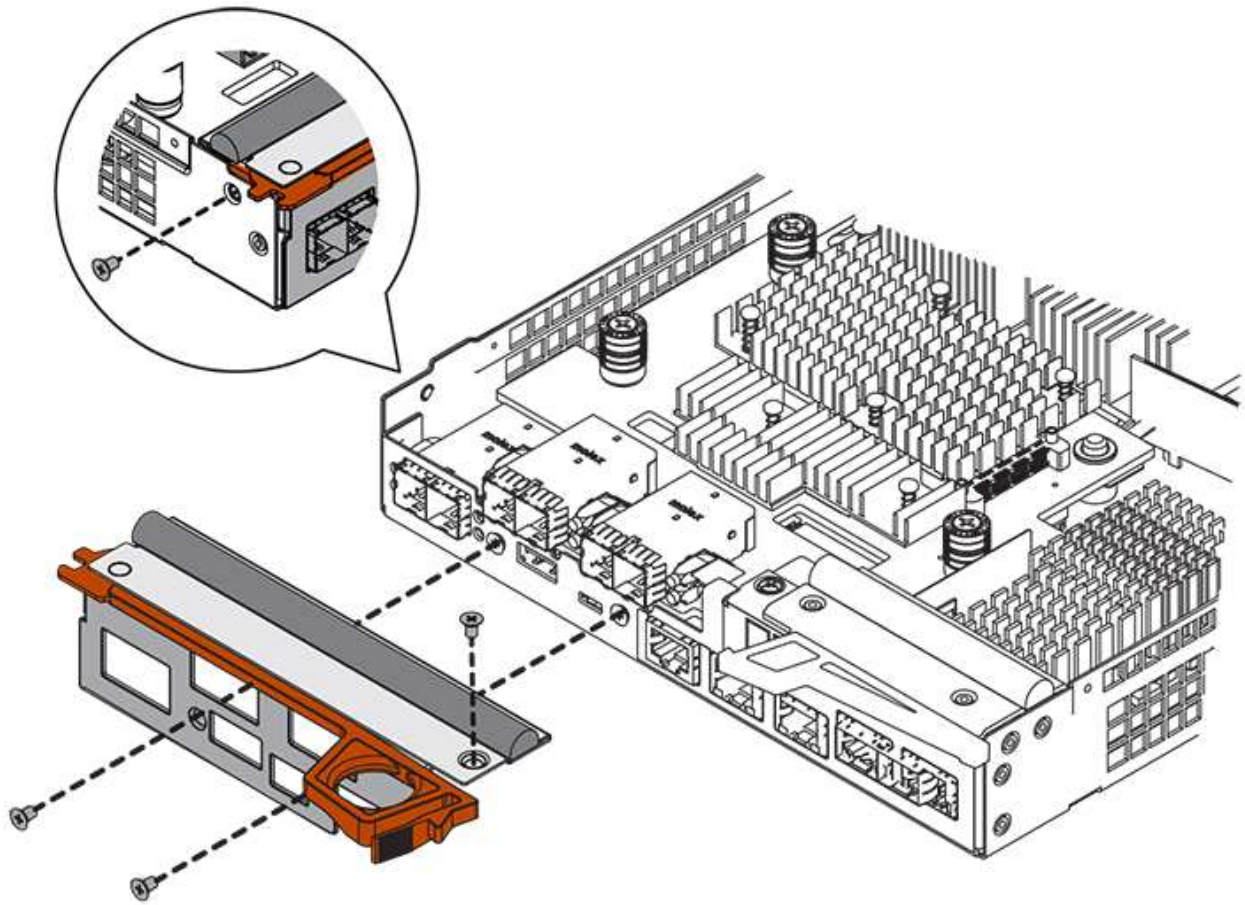
(1) *Host interface card*

(2) *Thumbscrews*

7. Hand-tighten the HIC thumbscrews.

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

8. Using a #1 Phillips screwdriver, attach the new HIC faceplate to the controller canister with the four screws you removed previously.



9. Reinstall the cover on the controller canister by sliding the cover from back to front until the button clicks.
10. Set the controller canister aside until you are ready to install it.

Step 3: Collect support data

Collect support data before and after replacing a component to ensure you can send a full set of logs to technical support in case the replacement does not resolve the problem.

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. 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**.

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, you might lose data.

Step 4: Change configuration to duplex

Before adding a second controller to the controller shelf, you must change the configuration to duplex by installing a new NVSRAM file and using the command line interface to set the storage array to duplex. The duplex version of the NVSRAM file is included with the download file for SANtricity OS Software (controller firmware).

Steps

1. Download the latest NVSRAM file from the NetApp Support site to your management client.
 - a. From SANtricity System Manager, select **Support > Upgrade Center**. In the area labeled “SANtricity OS Software upgrade,” click **NetApp SANtricity OS Downloads**.
 - b. From the NetApp Support site, select **E-Series SANtricity OS Controller software**.
 - c. Follow the online instructions to select the version of NVSRAM you want to install, and then complete the file download. Be sure to select the duplex version of the NVSRAM (the file has “D” near the end of its name).

The file name will be similar to: **N290X-830834-D01.dlp**

2. Upgrade the files using SANtricity System Manager.



Risk of data loss or risk of damage to the storage array — Do not make changes to the storage array while the upgrade is occurring. Maintain power to the storage array.

You can cancel the operation during the pre-upgrade health check, but not during transferring or activating.

- From SANtricity System Manager:
 - a. Under **SANtricity OS Software upgrade**, click **Begin Upgrade**.
 - b. Next to **Select Controller NVSRAM file**, click **Browse**, and then select the NVSRAM file you downloaded.
 - c. Click **Start**, and then confirm that you want to perform the operation.

The upgrade begins and the following occurs:

- The pre-upgrade health check begins. If the pre-upgrade health check fails, use the Recovery Guru or contact technical support to resolve the problem.
- The controller files are transferred and activated. The time required depends on your storage array configuration.

- The controller reboots automatically to apply the new settings.
- Alternatively, you can use the following CLI command to perform the upgrade:

```
download storageArray NVSRAM file="filename"  
healthCheckMelOverride=FALSE;
```

In this command, `filename` is the file path and the file name for duplex version of the Controller NVSRAM file (the file with "D" in its name). Enclose the file path and the file name in double quotation marks (" "). For example:

```
file="C:\downloads\N290X-830834-D01.dlp"
```

3. (Optional) To see a list of what was upgraded, click **Save Log**.

The file is saved in the Downloads folder for your browser with the name, **latest-upgrade-log-timestamp.txt**.

- After upgrading controller NVSRAM, verify the following in SANtricity System Manager:
 - Go to the Hardware page, and verify that all components appear.
 - Go to the Software and Firmware Inventory dialog box (go to **Support > Upgrade Center**, and then click the link for **Software and Firmware Inventory**). Verify the new software and firmware versions.
 - When you upgrade controller NVSRAM, any custom settings that you have applied to the existing NVSRAM are lost during the process of activation. You must apply the custom settings to the NVSRAM again after the process of activation is complete.
4. Change the storage array setting to duplex using CLI commands. To use CLI, open a command prompt if you downloaded the CLI package or you can open the Enterprise Management Window (EMW) if you have Storage Manager installed.

- From a command prompt:
 - a. Use the following command to switch the array from simplex to duplex:

```
set storageArray redundancyMode=duplex;
```

- b. Use the following command to reset the controller.

```
reset controller [a];
```

- From the EMW interface:
 - a. Select the storage array.
 - b. Select **Tools > Execute Script**.
 - c. Type the following command in the text box.

```
set storageArray redundancyMode=duplex;
```

- d. Select **Tools › Verify and Execute**.
- e. Type the following command in the text box.

```
reset controller [a];
```

- f. Select **Tools › Verify and Execute**.

After the controller reboots, an “alternate controller missing” error message is displayed. This message indicates that controller A has been successfully converted to duplex mode. This message persists until you install the second controller and connect the host cables.

Step 5: Remove the controller blank

Remove the controller blank before you install the second controller. A controller blank is installed in controller shelves that have only one controller.

Steps

1. Squeeze the latch on the cam handle for the controller blank until it releases, and then open the cam handle to the right.
2. Slide the blank controller canister out of the shelf and set it aside.

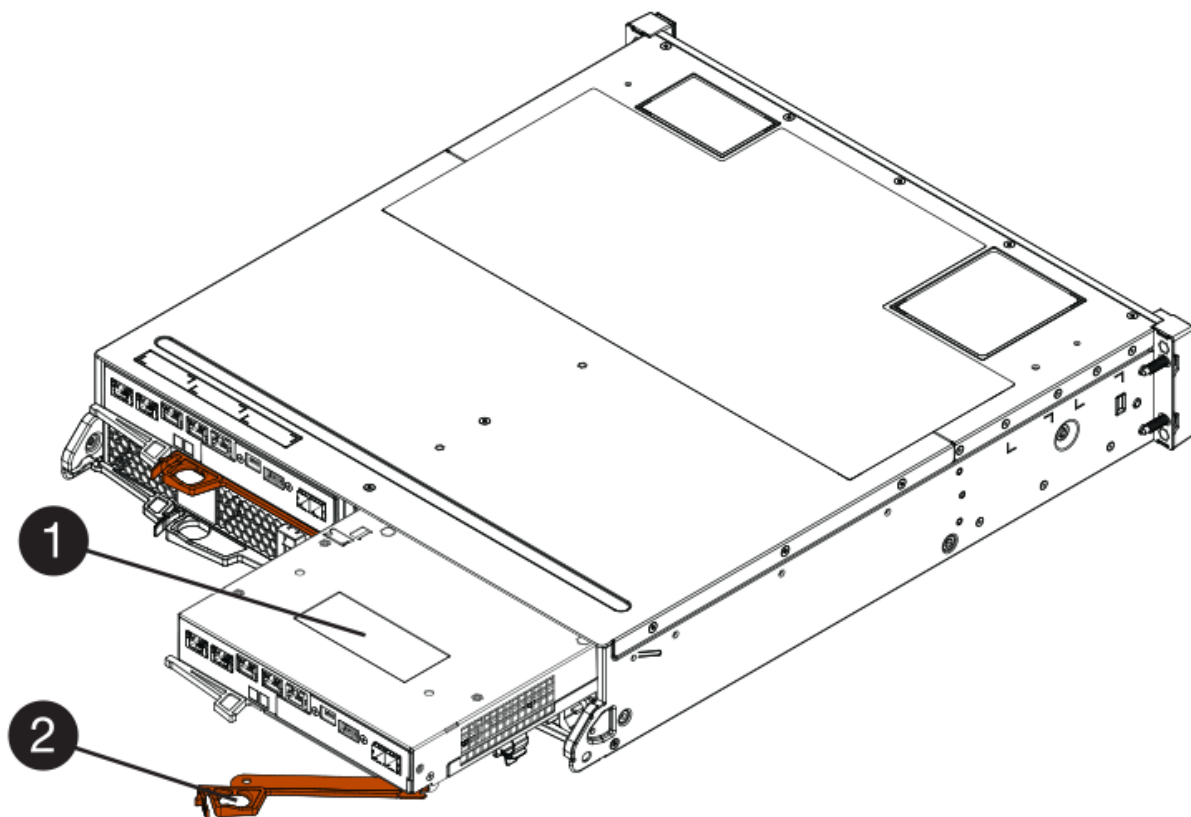
When you remove the controller blank, a flap swings into place to block the empty bay.

Step 6: Install second controller canister

Install a second controller canister to change a simplex configuration to a duplex configuration.

Steps

1. Turn the controller canister over, so that the removable cover faces down.
2. With the cam handle in the open position, slide the controller canister all the way into the controller shelf.



(1) *Controller canister*

(2) *Cam handle*

3. Move the cam handle to the left to lock the controller canister in place.
4. Insert any SFP+ transceivers, and connect cables to the new controller.

Step 7: Complete adding a second controller

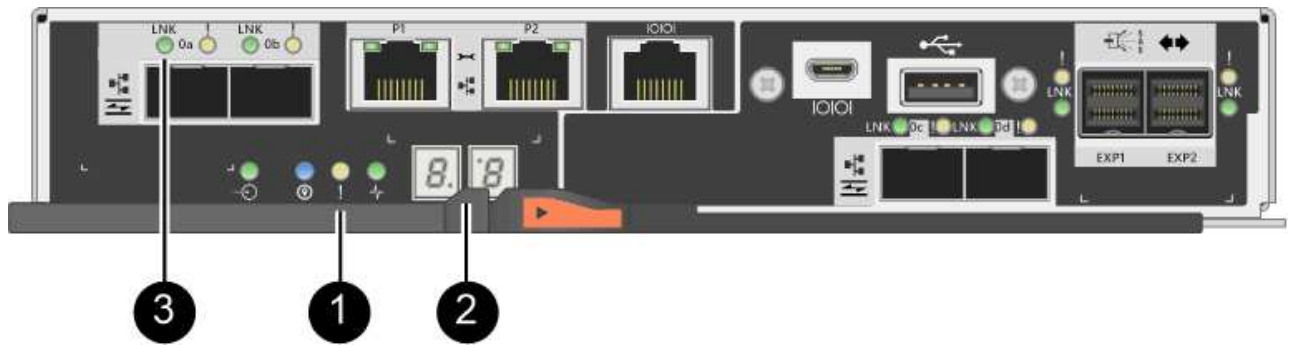
Complete the process of adding a second controller by confirming that it is working correctly, reinstall the duplex NVSRAM file, distribute volumes between the controllers, and collect support data.

Steps

1. As the controller boots, check the controller LEDs and the seven-segment display.

When communication with the other controller is reestablished:

- The seven-segment display shows the repeating sequence **OS**, **OL**, **blank** to indicate that the controller is offline.
- The amber Attention LED remains on.
- The Host Link LEDs might be on, blinking, or off, depending on the host interface.



(1) Attention LED (amber)

(2) Seven-segment display

(3) Host Link LEDs

2. Check the codes on the controller's seven-segment display as it comes online. If the display shows one of the following repeating sequences, immediately remove the controller.

- **OE, L0, blank** (mismatched controllers)
- **OE, L6, blank** (unsupported HIC)



Possible loss of data access — If the controller you just installed shows one of these codes, and the other controller is reset for any reason, the second controller could also lock down.

3. Update the array's settings from simplex to duplex with the following CLI command:

```
set storageArray redundancyMode=duplex;
```

4. From SANtricity System Manager, confirm that the controller's status is Optimal.

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



If you cannot resolve the problem, contact technical support.

5. Reinstall the duplex version of the NVSRAM file using SANtricity System Manager.

This step ensures that both controllers have an identical version of this file.



Risk of data loss or risk of damage to the storage array — Do not make changes to the storage array while the upgrade is occurring. Maintain power to the storage array.



You must install SANtricity OS software when you install a new NVSRAM file using SANtricity System Manager. If you already have the latest version of SANtricity OS software, you must reinstall that version.

- a. If necessary, download the latest version of the SANtricity OS software from the NetApp Support site.
- b. In System Manager, go to the Upgrade Center.

- c. Under **SANtricity OS Software upgrade**, click **Begin Upgrade**.
- d. Click **Browse**, and select the SANtricity OS software file.
- e. Click **Browse**, and select the Controller NVSRAM file.
- f. Click **Start**, and confirm that you want to perform the operation.

The transfer of control operation begins.

6. After the controllers reboot, optionally distribute volumes between controller A and the new controller B.
 - a. Select **Storage > Volumes**.
 - b. From the All Volumes tab, select **More > Change Ownership**.
 - c. Type the following command in the text box: `change ownership`

The Change Ownership button is enabled.

- d. For each volume you want to redistribute, select **Controller B** from the **Preferred Owner** list.

Change Volume Ownership

Changing a volume's preferred controller while an application is using it will cause I/O errors UNLESS:

- The volumes are not in use, or
- There is a multi-path driver installed on all hosts using these volumes.

Volume Ownership

Volume	Preferred Owner	Current Owner
3	Controller B	Controller A
SQL_16	Controller B	Controller B
SQL_15	Controller A	Controller A
SQL_17	Controller B	Controller B

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

Change Ownership

Cancel

- e. Click **Change Ownership**.

When the process is complete, the Change Volume Ownership dialog shows the new values for **Preferred Owner** and **Current Owner**.

7. Collect support data for your storage array using SANtricity System Manager.
 - a. Select **Support > Support Center > Diagnostics**.
 - b. 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 adding a second controller is complete. You can resume normal operations.

Replace a controller in duplex configuration - E2800

You can replace a controller canister in a duplex (two-controller) configuration, for the following controller shelves:

- E2812 controller shelf
- E2824 controller shelf
- E2860 controller shelf
- EF280 flash array

About this task

Each controller canister contains a controller card, a battery, and an optional host interface card (HIC). When you replace a controller canister, you must remove the battery and HIC, if one is installed, from the original controller canister, and install them in the replacement controller canister.

Before you begin

Make sure you have the following:

- A replacement controller canister with the same part number as the controller canister you are replacing. (See step 1 to verify the part number.)
- An ESD wristband, or you have taken other antistatic precautions.
- #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 (duplex)

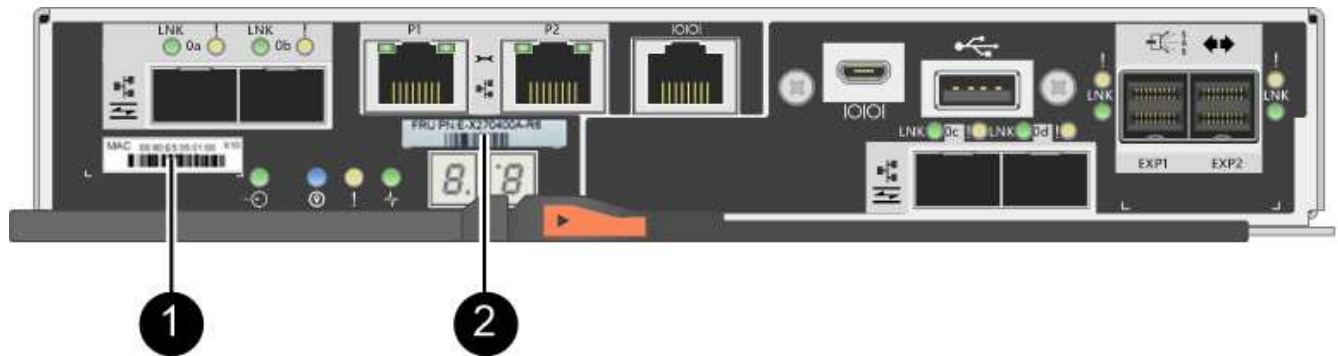
Prepare to replace the controller by verifying that the replacement controller canister has the correct FRU part number, backing up the configuration, and collecting support data. If the controller is still online, you must take it offline.

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.




(1) **MAC address:** The MAC address for management port 1 (“P1”). If you used DHCP to obtain the original controller’s IP address, you need this address to connect to the new controller.

(2) **FRU part number:** This number must match the replacement part number for the currently installed controller.

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 will cause 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**.

- Alternatively, you can back up the configuration database by using the following CLI command:

```
save storageArray dbmDatabase sourceLocation=onboard contentType=all  
file="filename";
```

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

If a problem occurs when you remove a controller, you can use the saved file to troubleshoot the issue. The system will save inventory, status, and performance data about your storage array in a single file.

- 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. If the controller is not already offline, take it offline now using SANtricity System Manager.

- From 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.

- Alternatively, you can take the controllers offline by using the following CLI commands:

For controller A: `set controller [a] availability=offline`

For controller B: `set controller [b] availability=offline`

8. 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.

9. 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 (duplex)

Replace the failed canister with a new one.

Step 2a: Remove controller canister (duplex)

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.



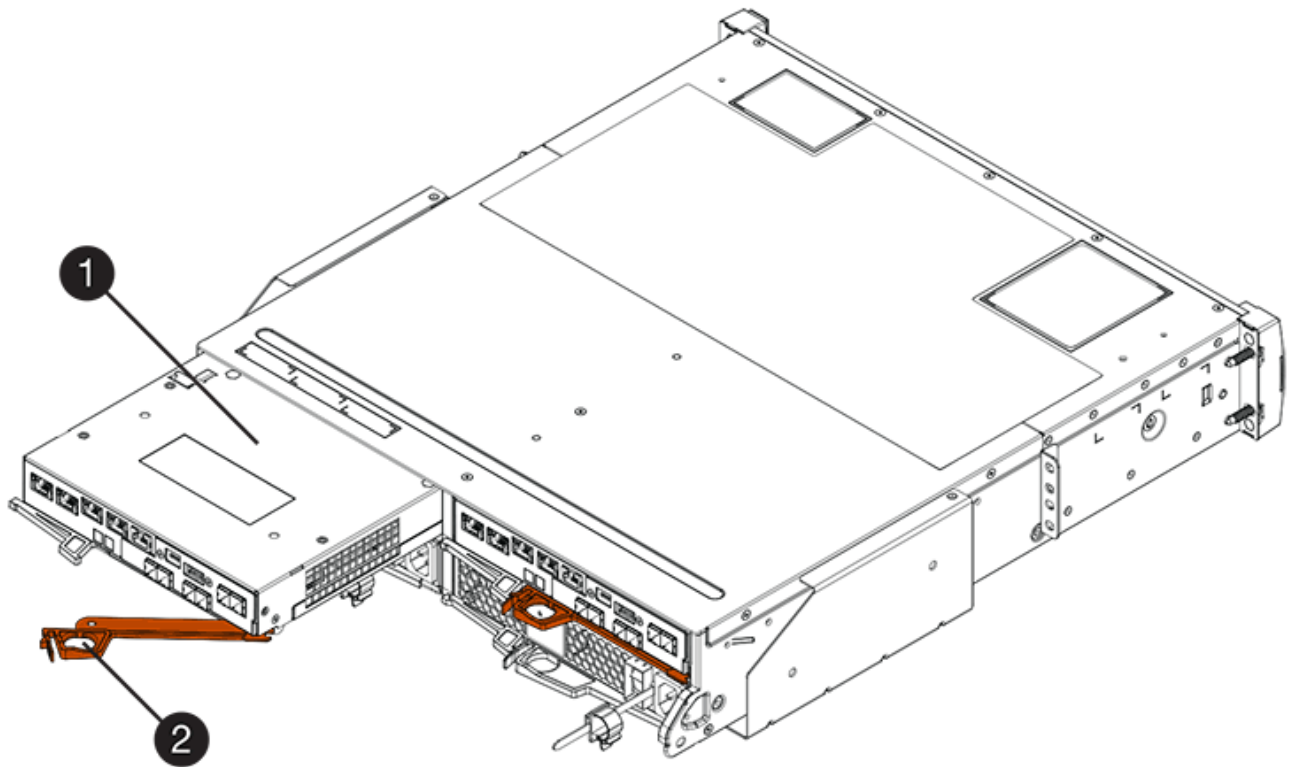
To prevent degraded performance, do not twist, fold, pinch, or step on the cables.

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. However, you can leave any SFPs installed in the baseboard host ports. When you reconnect the cables, you can move those SFPs to the new controller canister.

5. Confirm that the Cache Active LED on the back of the controller is off.
6. Squeeze the latch on the cam handle until it releases, and then open the cam handle to the right to release the controller canister from the shelf.

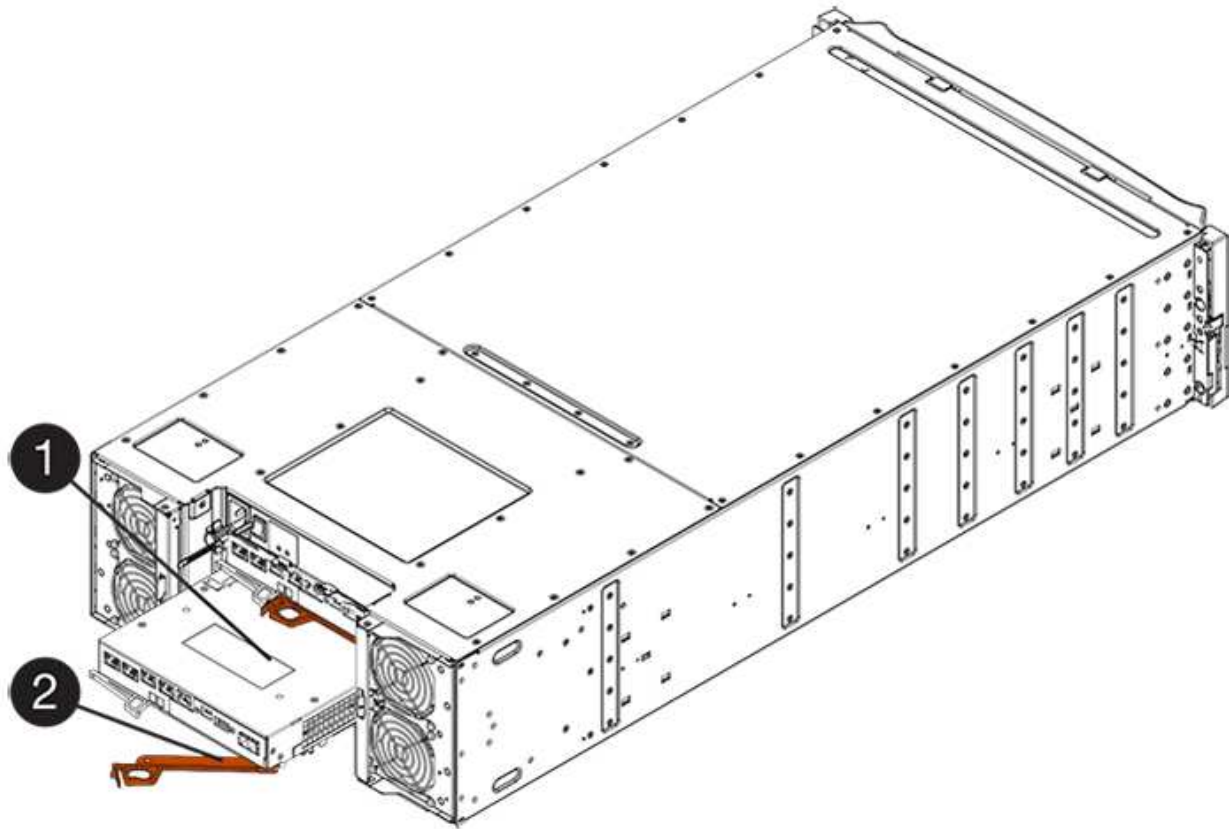
The following figure is an example of an E2812 controller shelf, E2824 controller shelf, or EF280 flash array:



(1) Controller canister

(2) Cam handle

The following figure is an example of an E2860 controller shelf:



(1) *Controller canister*

(2) *Cam handle*

7. Using two hands and the cam handle, slide the controller canister out of the shelf.



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

If you are removing the controller canister from an E2812 controller shelf, E2824 controller shelf, or EF280 flash array, a flap swings into place to block the empty bay, helping to maintain air flow and cooling.

8. Turn the controller canister over, so that the removable cover faces up.

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

Step 2b: Remove battery (duplex)

Remove the battery so you can install the new controller.

Steps

1. Remove the controller canister's cover by pressing down on the button and sliding the cover off.
2. Confirm that the green LED inside the controller (between the battery and the DIMMs) is off.

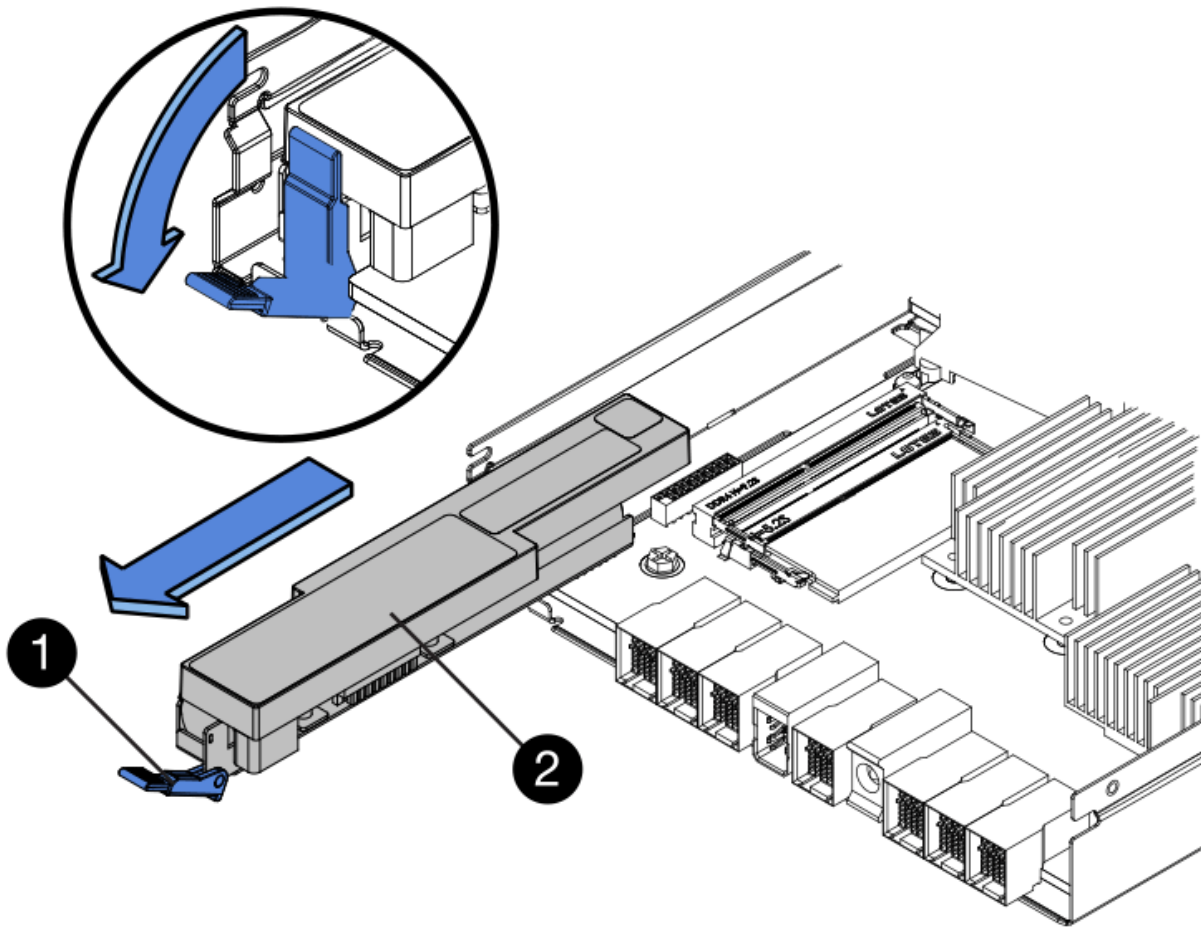
If this green LED is on, the controller is still using battery power. You must wait for this LED to go off before removing any components.



(1) Internal Cache Active LED

(2) Battery

3. Locate the blue release latch for the battery.
4. Unlatch the battery by pushing the release latch down and away from the controller canister.



(1) Battery release latch

(2) Battery

5. Lift up on the battery, and slide it out of the controller canister.

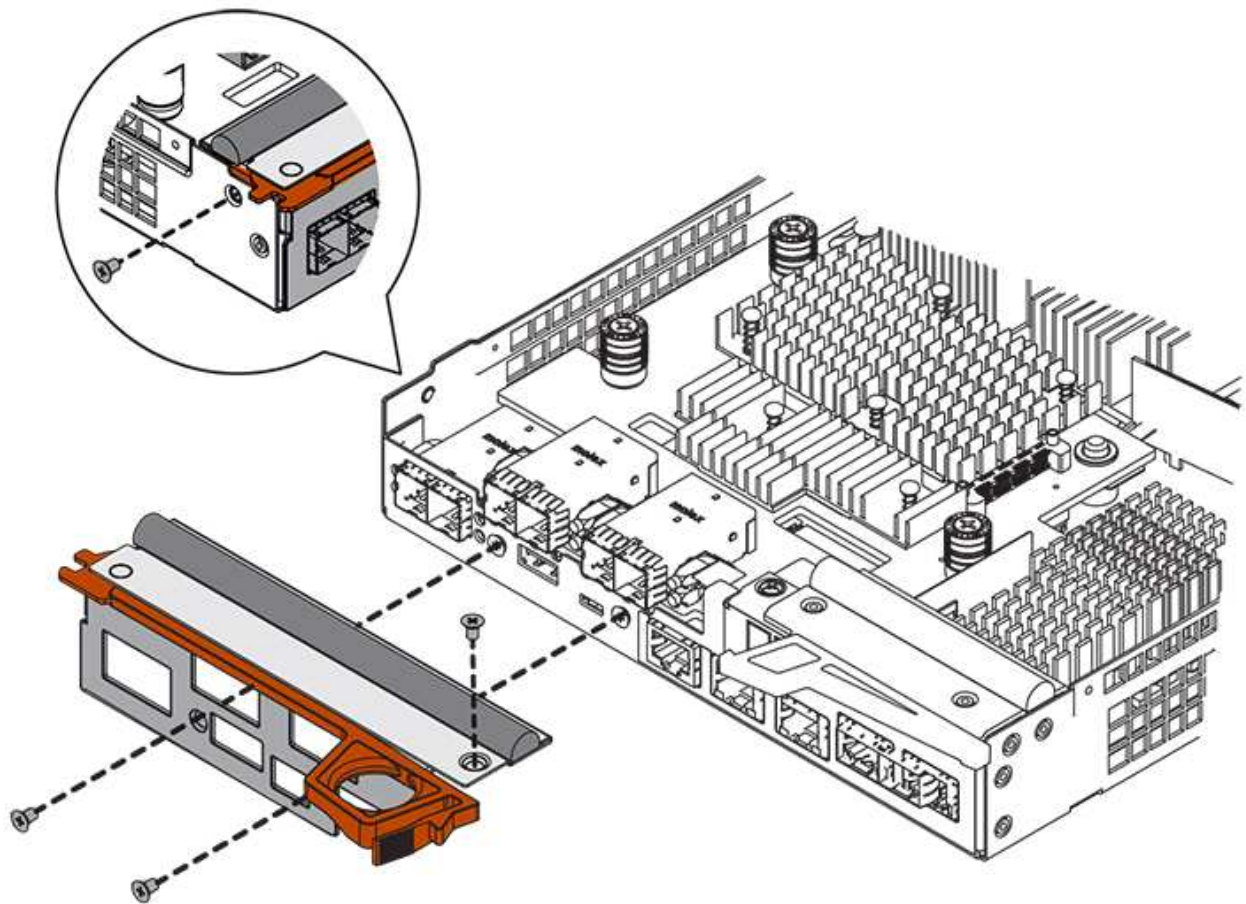
Step 2c: Remove host interface card (duplex)

If the controller canister includes a host interface card (HIC), you must remove the HIC from the original controller canister, so you can reuse it in the new controller canister.

Steps

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

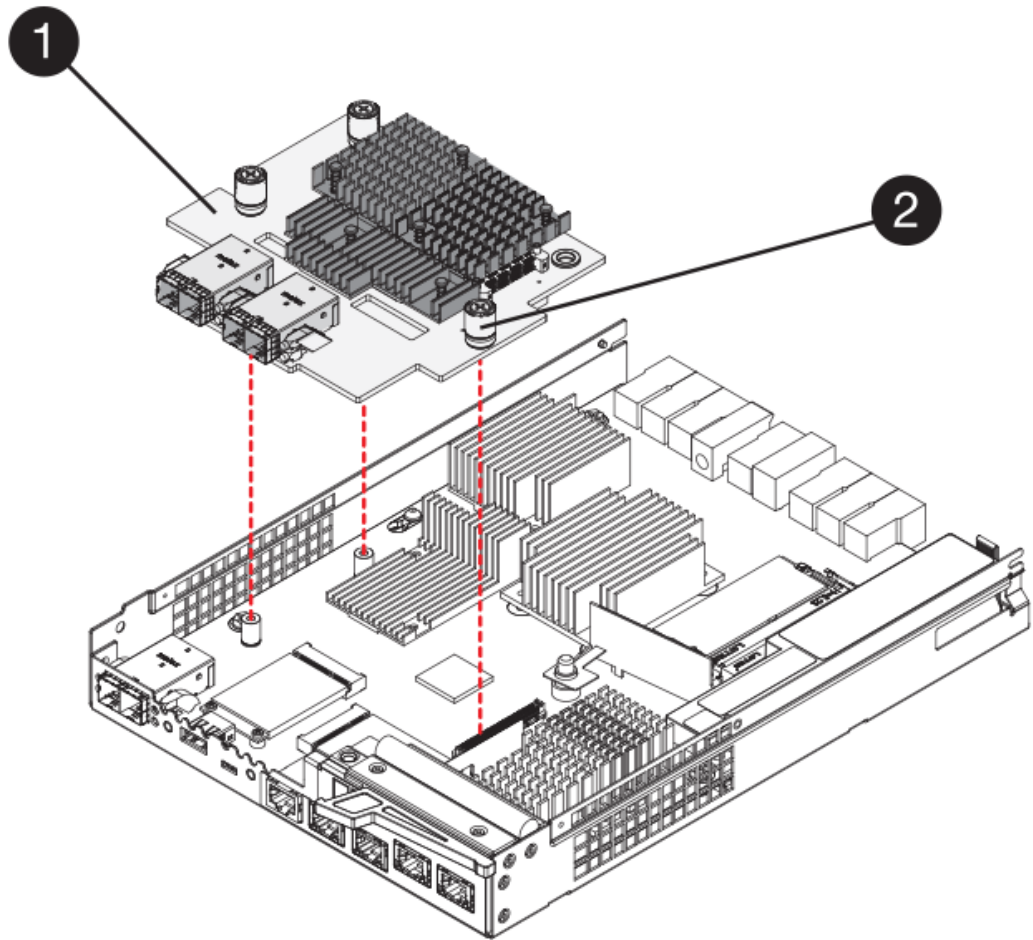
There are four screws: one on the top, one on the side, and two on the front.



2. Remove the HIC faceplate.
3. Using your fingers or a Phillips screwdriver, loosen the three thumbscrews that secure the HIC to the controller card.
4. Carefully detach the HIC from the controller card by lifting the card up and sliding it back.



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



(1) *Host interface card (HIC)*

(2) *Thumbscrews*

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

Step 3: Install new controller (duplex)

Install a new controller canister to replace the failed one. Perform this task only if your storage array has two controllers (duplex configuration).

Step 3a: Install battery (duplex)

You must install the battery into the replacement controller canister. You can install the battery that you removed from the original controller canister or install a new battery that you ordered.

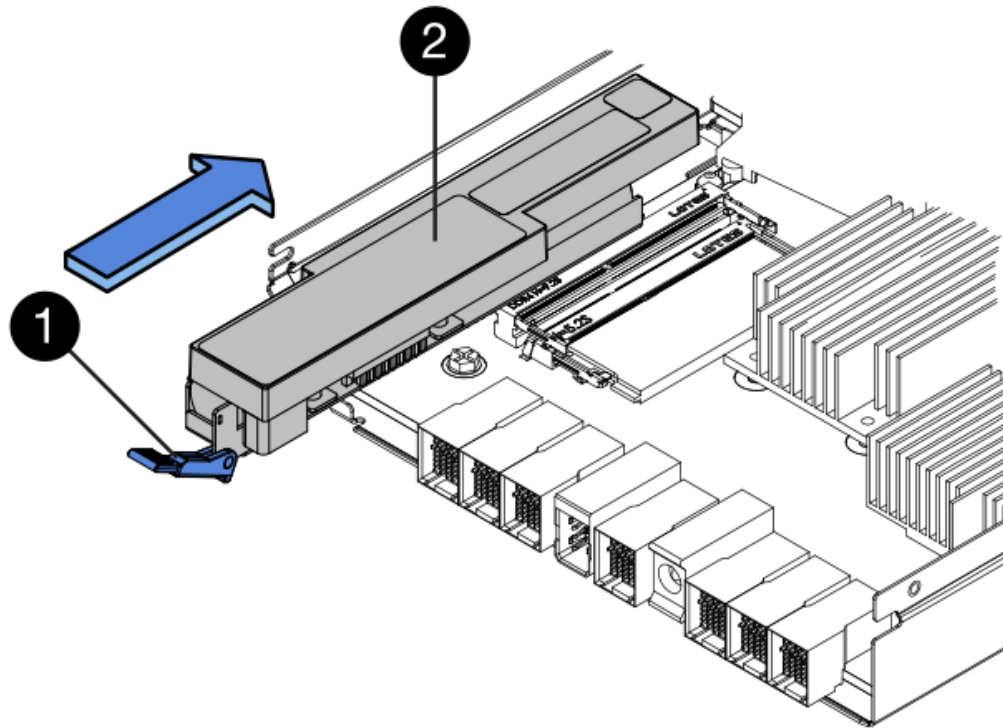
Steps

1. Turn the replacement controller canister over, so that the removable cover faces up.
2. Press down on the cover button, and slide the cover off.
3. Orient the controller canister so that the slot for the battery faces toward you.
4. Insert the battery into the controller canister at a slight downward angle.

You must insert the metal flange at the front of the battery into the slot on the bottom of the controller canister and slide the top of the battery beneath the small alignment pin on the left side of the canister.

5. Move the battery latch up to secure the battery.

When the latch clicks into place, the bottom of the latch hooks into a metal slot on the chassis.



(1) *Battery release latch*

(2) *Battery*

6. Turn the controller canister over to confirm that the battery is installed correctly.

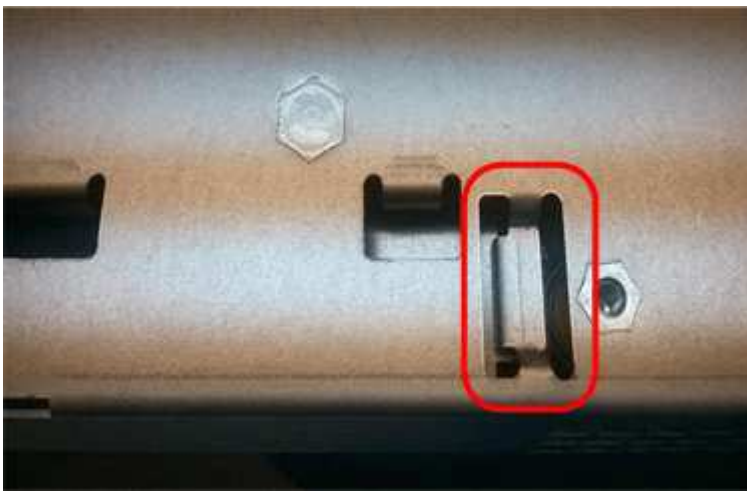


Possible hardware damage — The metal flange at the front of the battery must be completely inserted into the slot on the controller canister (as shown in the first figure). If the battery is not installed correctly (as shown in the second figure), the metal flange might contact the controller board, causing damage to the controller when you apply power.

- **Correct** — The battery's metal flange is completely inserted in the slot on the controller:



- **Incorrect** — The battery's metal flange is not inserted into the slot on the controller:



Step 3b: Install host interface card (duplex)

If you removed a HIC from the original controller canister, you must install that HIC in the new controller canister.

Steps

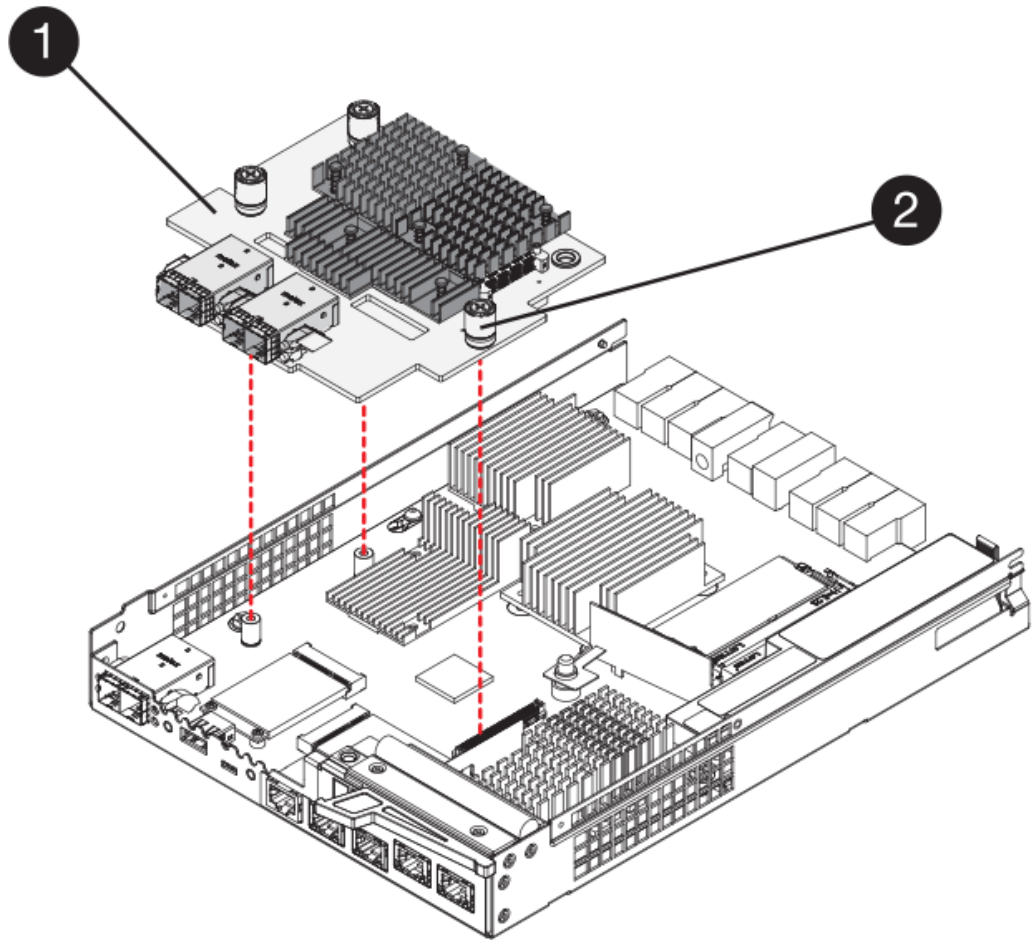
1. Using a #1 Phillips screwdriver, remove the four screws that attach the blank faceplate to the replacement controller canister, and remove the faceplate.
2. Align the three thumbscrews on the HIC with the corresponding holes on the controller, and align the connector on the bottom of the HIC with 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 thumbscrews.



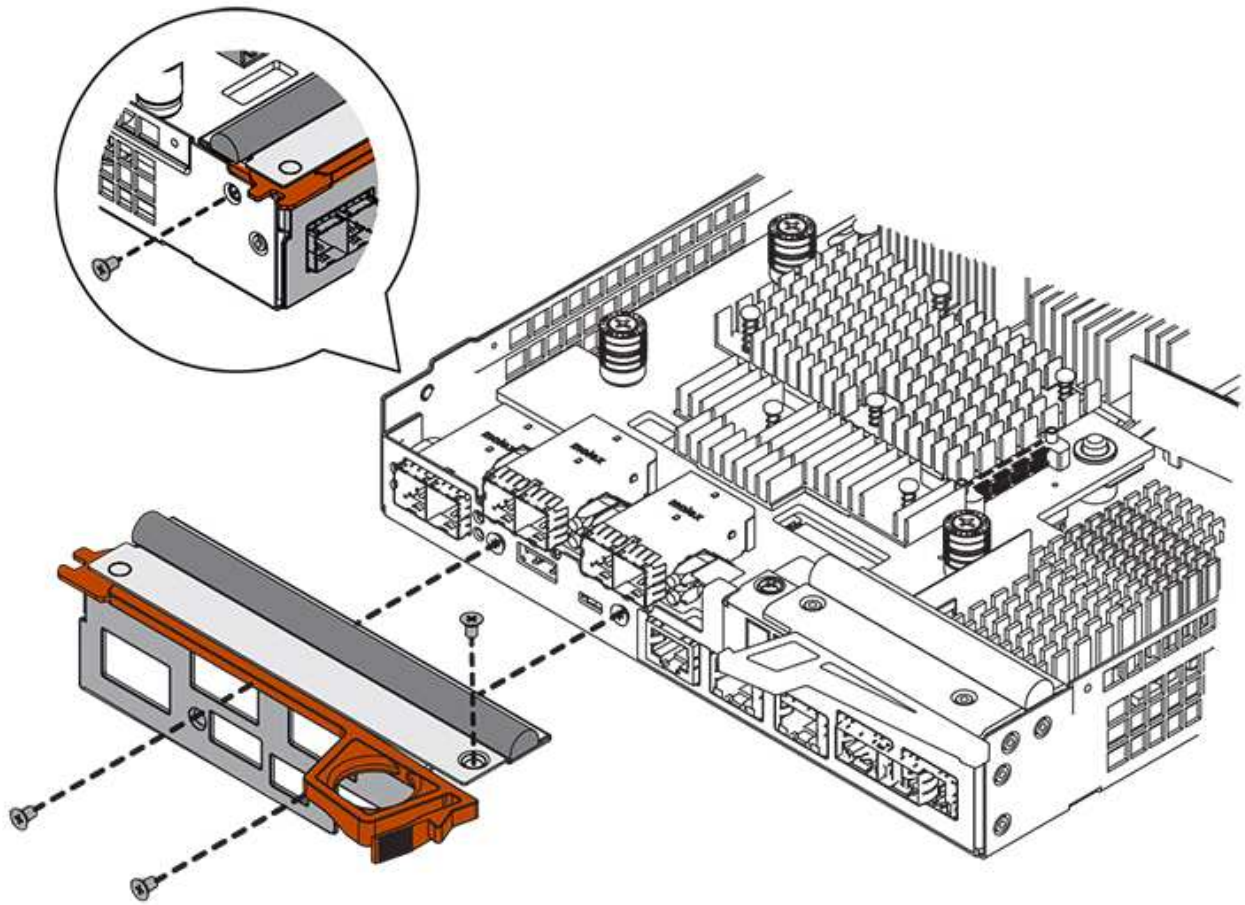
(1) *Host interface card (HIC)*

(2) *Thumbscrews*

4. Hand-tighten the HIC thumbscrews.

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 controller canister to the new controller canister with four screws.



Step 3c: Install new controller canister (duplex)

After installing the battery and the host interface card (HIC), if one was initially installed, you can install the new controller canister into the controller shelf.

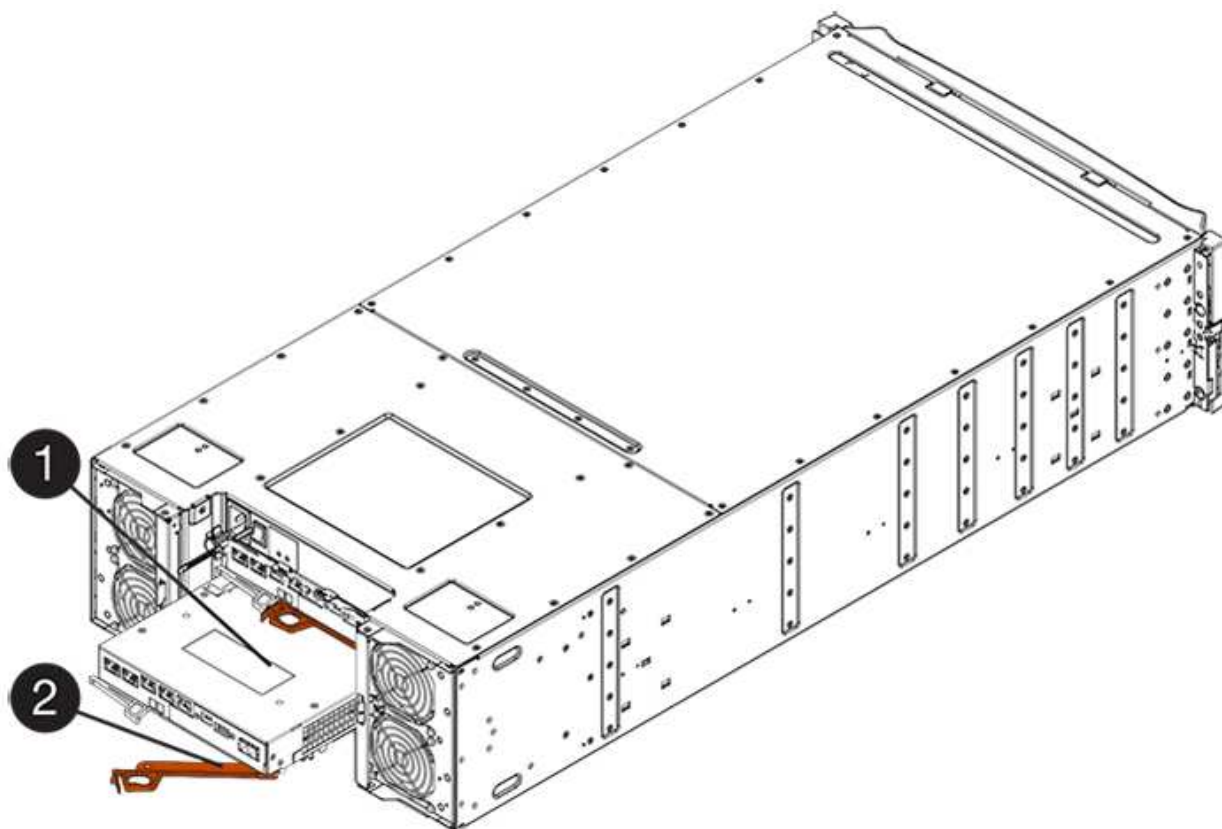
Steps

1. Reinstall the cover on the controller canister by sliding the cover from back to front until the button clicks.
2. Turn the controller canister over, so that the removable cover faces down.
3. With the cam handle in the open position, slide the controller canister all the way into the controller shelf.



(1) Controller canister

(2) Cam handle



(2) Cam handle

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

- 

Step 4: Complete controller replacement (duplex)

Steps

- When communication with the other controller is reestablished:

-
- The diagram shows the rear panel of the HP Z440 Workstation. Callout 1 points to the LAN ports (labeled LNK 0a, 0b, 0c, 0d). Callout 2 points to the USB ports (labeled LNK 0c, LNK 0d, L). Callout 3 points to the FireWire ports (labeled EXP1, EXP2).

(1) Attention LED (amber)

(2) Seven-segment display

(3) Host Link LEDs

- 28



Possible loss of data access — If the controller you just installed shows one of these codes, and the other controller is reset for any reason, the second controller could also lock down.

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. If required, redistribute all volumes back to their preferred owner using SANtricity System Manager.
 - a. Select **Storage > Volumes**.
 - b. Select **More > Redistribute volumes**.
6. 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.

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.

Replace a controller in simplex configuration - E2800

You can replace a failed controller canister in a simplex (single-controller) configuration, for the following controller shelves:

- E2812 controller shelf
- E2824 controller shelf

About this task

The controller canister contains a controller card, a battery, and an optional host interface card (HIC). When you replace a failed controller canister, you must remove the battery and HIC, if one is installed, from the original controller canister, and install them in the replacement controller canister.

Before you begin

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.
- Labels to identify each cable that is connected to the controller canister.
- #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.)

Step 1: Prepare to replace controller (simplex)

Prepare to replace a controller canister by saving the drive security key, backing up the configuration, and collecting support data. Then, you can stop host I/O operations and power down the controller shelf.

Steps

1. If possible, make a note of which version of SANtricity OS software is currently installed on the controller. Open SANtricity System Manager and select **Support > Upgrade Center > View Software and Firmware Inventory**.
2. If the Drive Security feature is enabled, be sure a saved key exists and that you know the pass phrase required to install it.



Possible loss of data access — If all drives in the storage array are security enabled, the new controller will not be able to access the storage array until you unlock the secured drives using the Enterprise Management Window in SANtricity Storage Manager.

To save the key (might not be possible, depending on the state of the controller):

- a. From SANtricity System Manager, select **Settings > System**.
- b. Under **Drive security key management**, select **Back Up Key**.
- c. In the **Define a pass phrase/Re-enter pass phrase** fields, enter and confirm a pass phrase for this backup copy.
- d. Click **Backup**.
- e. Record your key information in a secure location, and then click **Close**.

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**.

- Alternatively, you can back up the configuration database by using the following CLI command:

```
save storageArray dbmDatabase sourceLocation=onboard contentType=all  
file="filename";
```

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

If a problem occurs when you remove a controller, you can use the saved file to troubleshoot the issue. The system will save inventory, status, and performance data about your storage array in a single file.

- 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**.

5. 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.

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

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

7. From the home page of SANtricity System Manager, select **View Operations in Progress**.

8. Confirm that all operations have completed before continuing with the next step.
9. Turn off both power switches on the controller shelf.
10. Wait for all LEDs on the controller shelf to turn off.
11. 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.

Data on the storage array will not be accessible until you replace the controller canister.

Step 2: Remove failed controller (simplex)

Replace the failed canister with a new one.

Step 2a: Remove controller canister (simplex)

Remove a controller canister.

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 HIC ports on the controller canister use SFP+ transceivers, remove the SFPs.

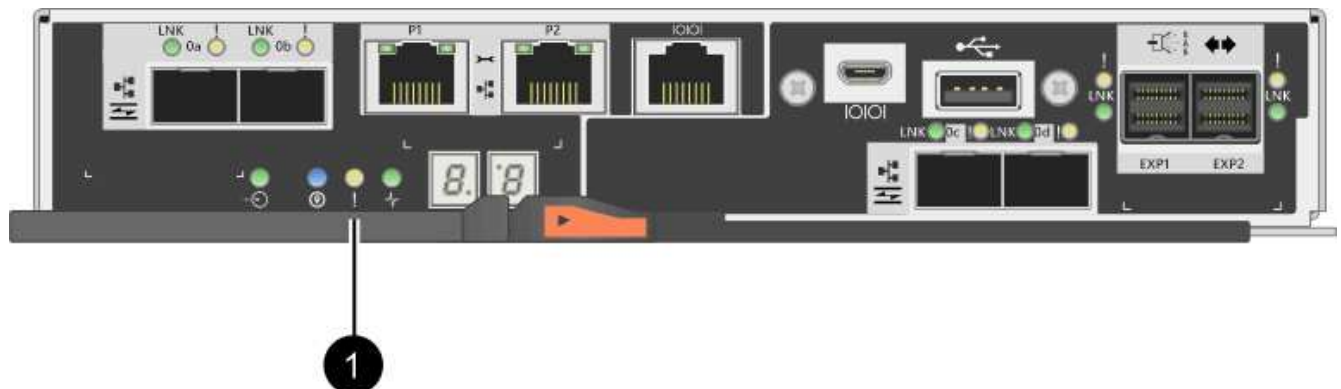
Because you must remove the HIC from the failed controller canister, you must remove any SFPs from the HIC ports. However, you can leave any SFPs installed in the baseboard host ports. When you are ready to cable the new controller, you can simply move those SFPs to the new controller canister. This approach is especially helpful if you have more than one type of SFP.

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

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

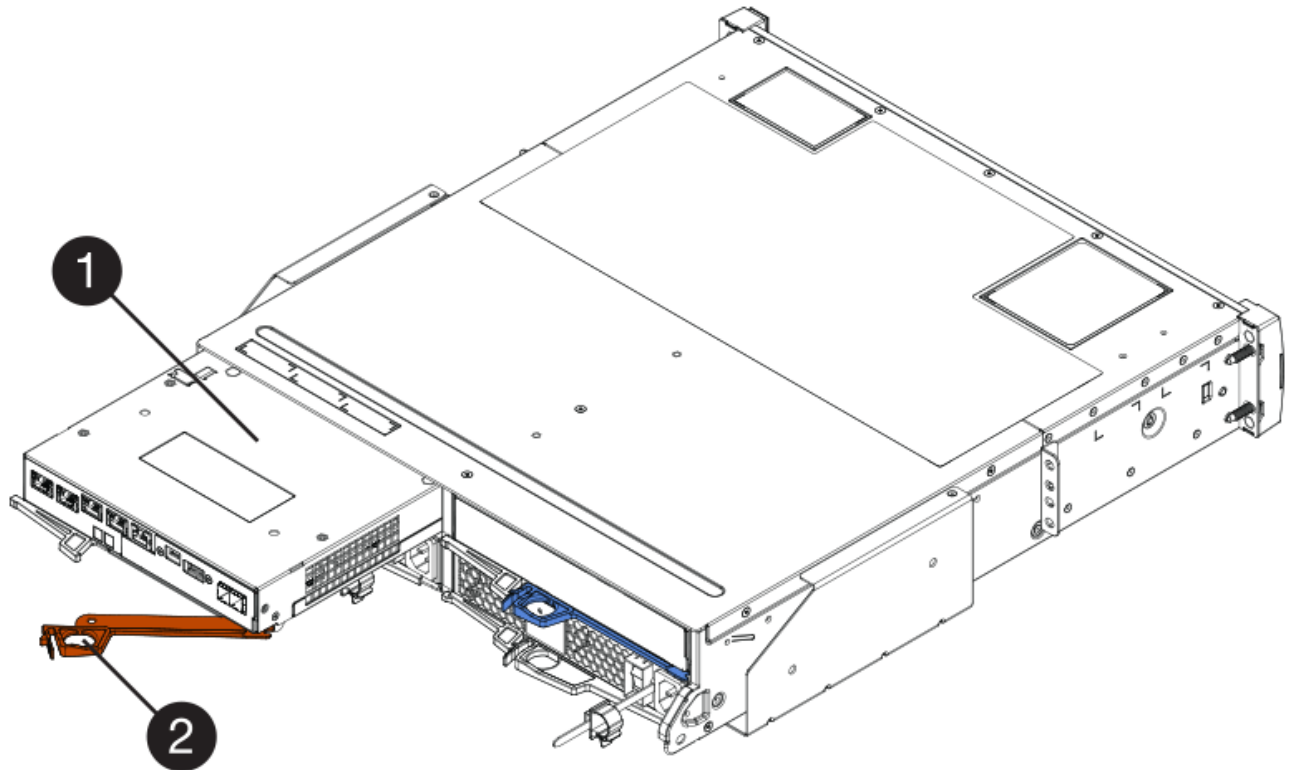


The figure shows an example controller canister. Your controller might have a different number and a different type of host ports.



(1) Cache Active LED

6. Squeeze the latch on the cam handle until it releases, and then open the cam handle to the right to release the controller canister from the midplane.



(1) Controller canister

(2) Cam handle

7. Using two hands and the cam handle, slide the controller canister out of the shelf.



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

When you remove the controller canister, a flap swings into place to block the empty bay, helping to maintain air flow and cooling.

8. Turn the controller canister over, so that the removable cover faces up.
9. Place the controller canister on a flat, static-free surface.

Step 2b: Remove battery (simplex)

After removing the controller canister from the controller shelf, remove the battery.

Steps

1. Remove the controller canister's cover by pressing down on the button and sliding the cover off.
2. Confirm that the green LED inside the controller (between the battery and the DIMMs) 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

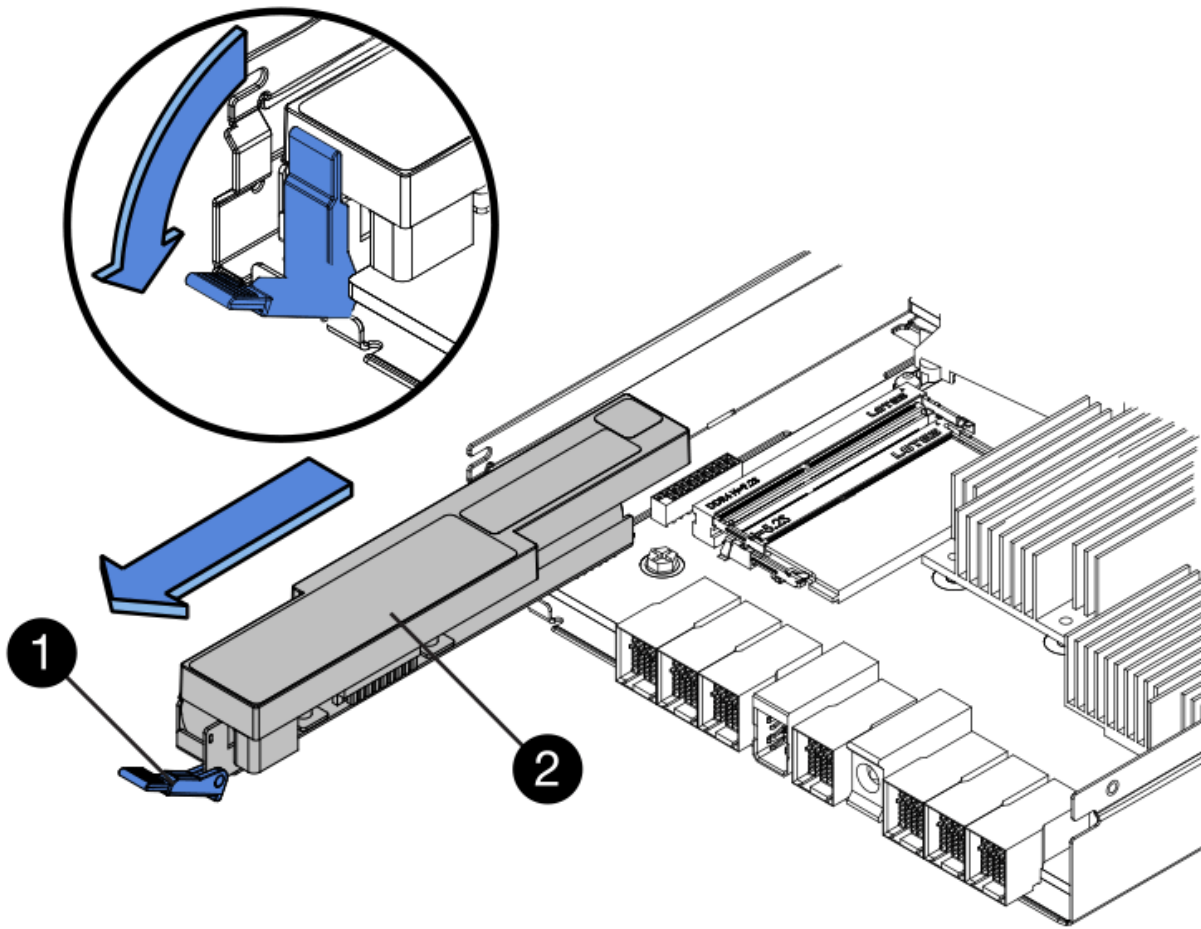
removing any components.



(1) Internal Cache Active

(2) Battery

3. Locate the blue release latch for the battery.
4. Unlatch the battery by pushing the release latch down and away from the controller canister.



(1) Battery release latch

(2) Battery

5. Lift up on the battery, and slide it out of the controller canister.

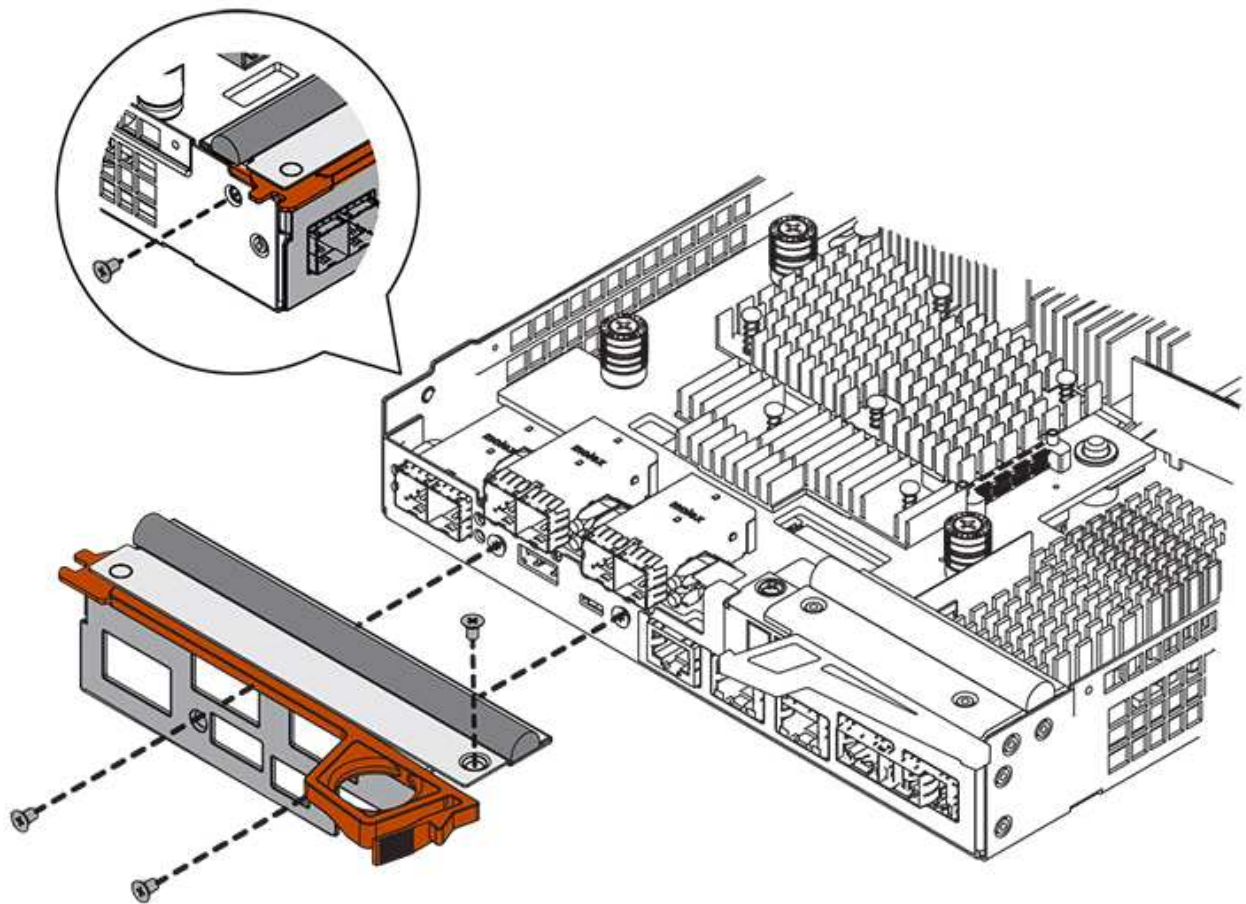
Step 2c: Remove host interface card (simplex)

If the controller canister includes a host interface card (HIC), remove the HIC from the original controller canister so you can reuse it in the new controller canister.

Steps

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

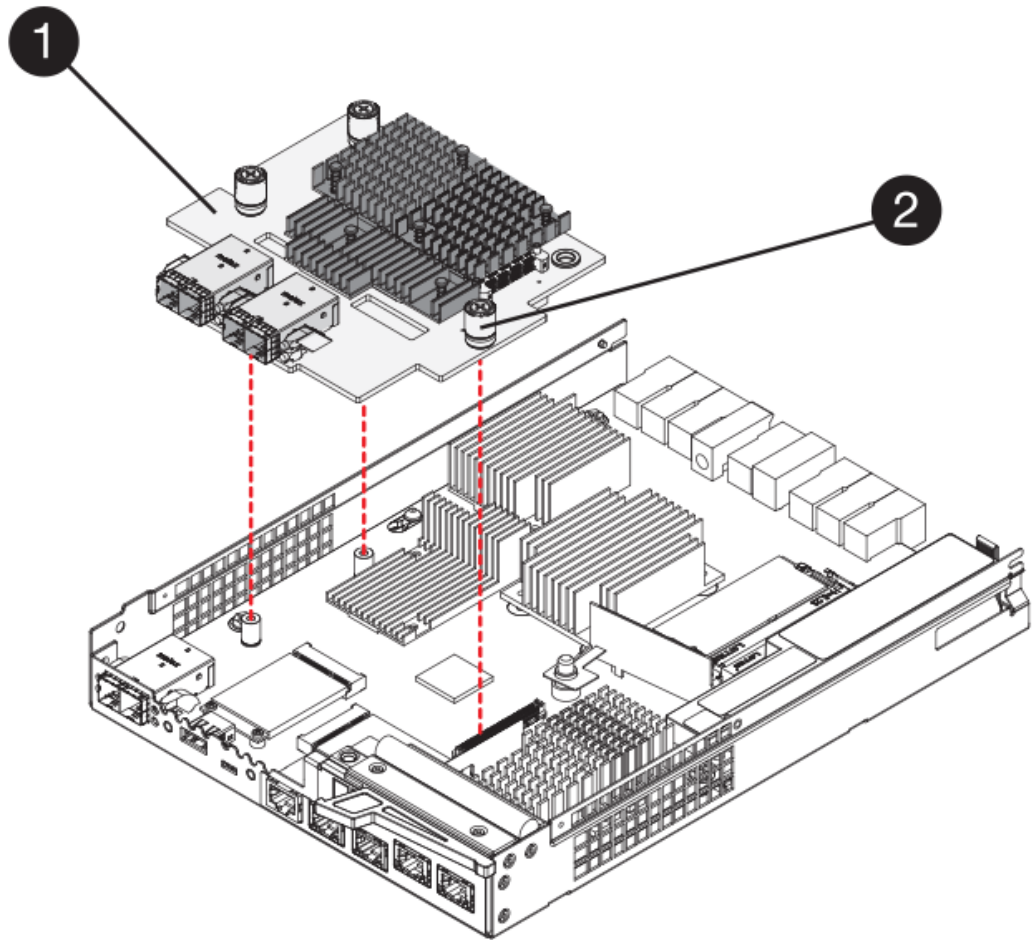
There are four screws: one on the top, one on the side, and two on the front.



2. Remove the HIC faceplate.
3. Using your fingers or a Phillips screwdriver, loosen the three thumbscrews that secure the HIC to the controller card.
4. Carefully detach the HIC from the controller card by lifting the card up and sliding it back.



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



(1) *Host interface card*

(2) *Thumbscrews*

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

Step 3: Install new controller (simplex)

Install a new controller canister to replace the failed one.

Step 3a: Install battery (simplex)

Install the battery into the replacement controller canister. You can install the battery that you removed from the original controller canister or install a new battery that you ordered.

Steps

1. Unpack the replacement controller canister, and set it on a flat, static-free surface so that the removable cover faces up.

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

2. Press down on the cover button, and slide the cover off.

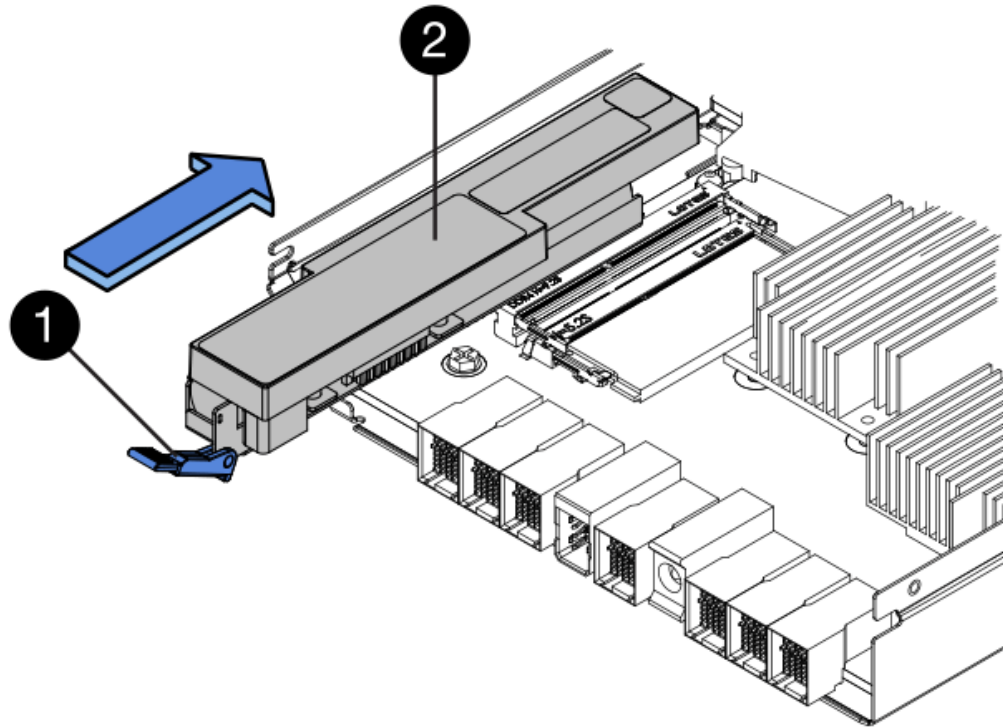
3. Orient the controller canister so that the slot for the battery faces toward you.

4. Insert the battery into the controller canister at a slight downward angle.

You must insert the metal flange at the front of the battery into the slot on the bottom of the controller canister, and slide the top of the battery beneath the small alignment pin on the left side of the canister.

5. Move the battery latch up to secure the battery.

When the latch clicks into place, the bottom of the latch hooks into a metal slot on the chassis.



(1) *Battery release latch*

(2) *Battery*

6. Turn the controller canister over to confirm that the battery is installed correctly.



Possible hardware damage — The metal flange at the front of the battery must be completely inserted into the slot on the controller canister (as shown in the first figure). If the battery is not installed correctly (as shown in the second figure), the metal flange might contact the controller board, causing damage to the controller when you apply power.

- **Correct** — The battery's metal flange is completely inserted in the slot on the controller:



- **Incorrect** — The battery's metal flange is not inserted into the slot on the controller:



Step 3b: Install host interface card (simplex)

If you removed a host interface card (HIC) from the original controller canister, install that HIC in the new controller canister.

Steps

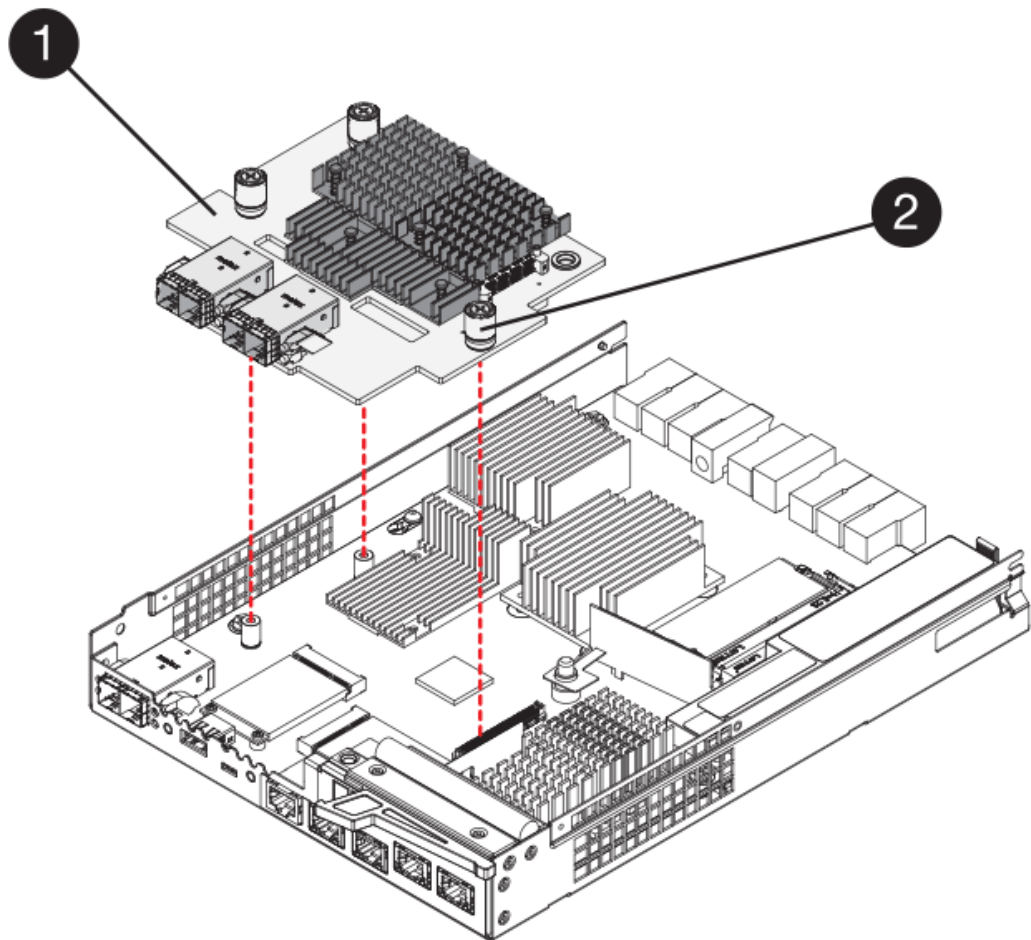
1. Using a #1 Phillips screwdriver, remove the four screws that attach the blank faceplate to the replacement controller canister, and remove the faceplate.
2. Align the three thumbscrews on the HIC with the corresponding holes on the controller, and align the connector on the bottom of the HIC with 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 thumbscrews.



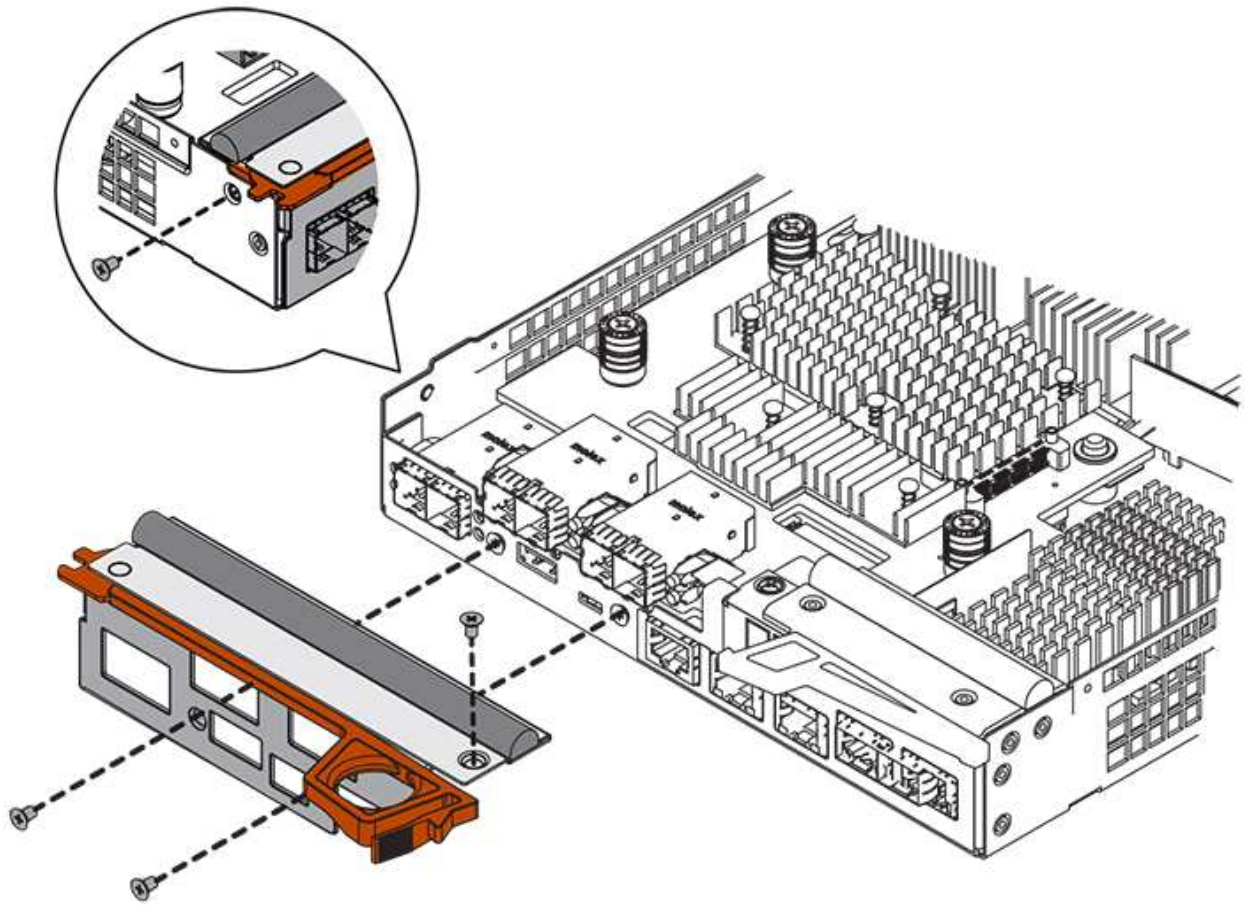
(1) *Host interface card*

(2) *Thumbscrews*

4. Hand-tighten the HIC thumbscrews.

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 controller canister to the new controller canister with four screws.

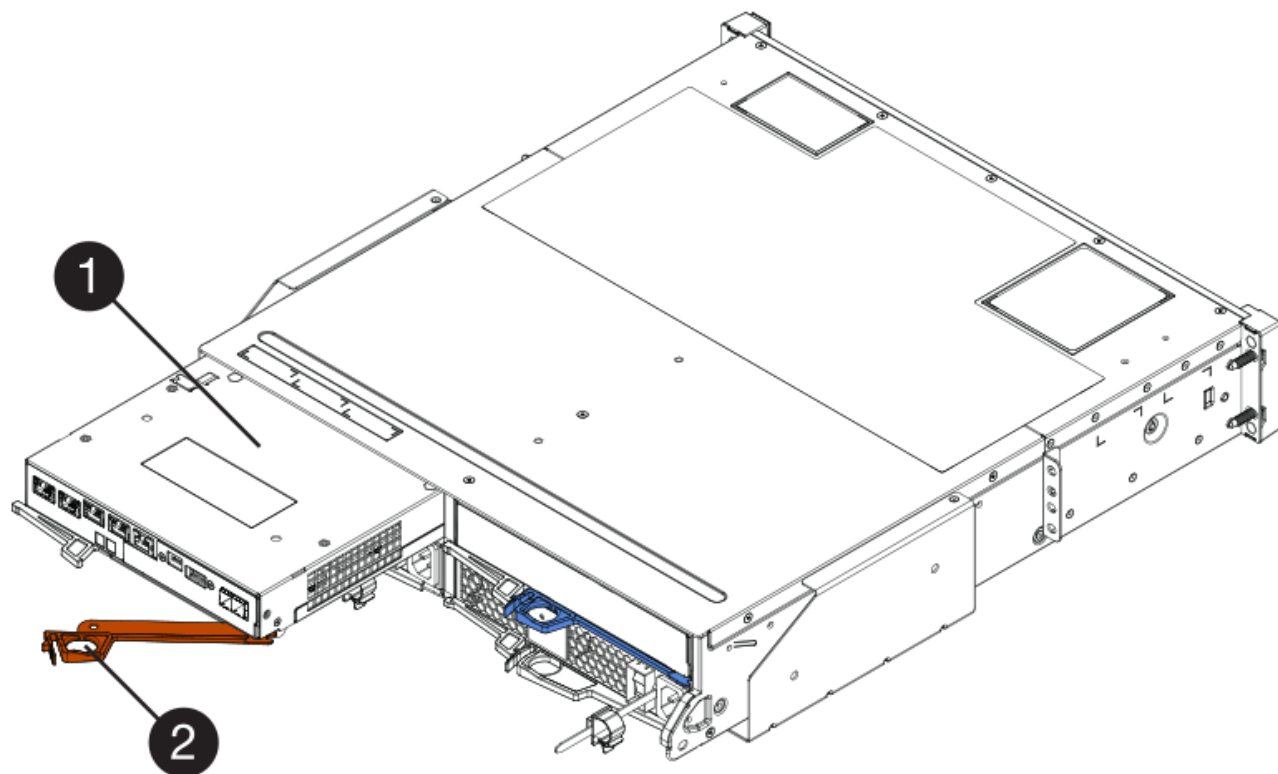


Step 3c: Install new controller canister (simplex)

After installing the battery and the HIC, if one was initially installed, you can install the new controller canister into the controller shelf.

Steps

1. Reinstall the cover on the controller canister by sliding the cover from back to front until the button clicks.
2. Turn the controller canister over, so that the removable cover faces down.
3. With the cam handle in the open position, slide the controller canister all the way into the controller shelf.



(1) *Controller canister*

(2) *Cam handle*

4. Move the cam handle to the left to lock the controller canister in place.
5. Install the SFPs from the original controller in the host ports on the new 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.

6. Determine how you will assign an IP address to the replacement controller, based on whether you connected its Ethernet port 1 (labeled P1) to a network with a DHCP server and on whether all drives are secured.

Using DHCP server?	All drives secured?	Steps
Yes	No	The new controller obtains its IP address from the DHCP server. This value might be different than the original controller's IP address. Locate the MAC address on the label on the back of the replacement controller, and contact your network administrator with this information to obtain the IP address that was assigned by the DHCP server.

Using DHCP server?	All drives secured?	Steps
Yes	Yes	The new controller obtains its IP address from the DHCP server. This value might be different than the original controller's IP address. Locate the MAC address on the label on the back of the replacement controller, and contact your network administrator with this information to obtain the IP address that was assigned by the DHCP server. You can then unlock the drives using the command line interface.
No	No	The new controller adopts the IP address of the controller you removed.
No	Yes	You must set the IP address of the new controller manually. (You can reuse the IP address of the old controller or use a new IP address.) When the controller has an IP address, you can unlock the drives using the command line interface. After the drives are unlocked, the new controller will re-use the original controller's IP address automatically.

Step 4: Complete controller replacement (simplex)

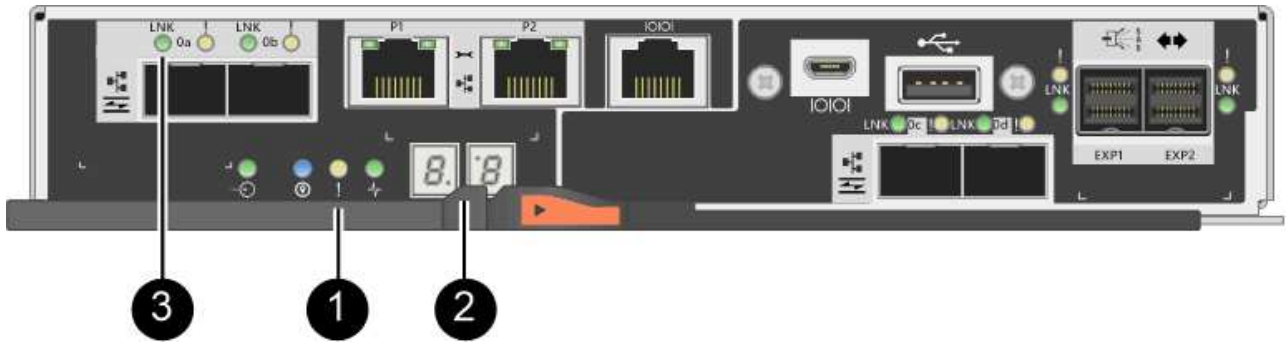
Power on the controller shelf, collect support data, and resume operations.

Steps

- Turn on the two power switches at the back of the controller shelf.
 - Do not turn off the power switches during the power-on process, which typically takes 90 seconds or less to complete.
 - The fans in each shelf are very loud when they first start up. The loud noise during start-up is normal.
- As the controller boots, check the controller LEDs and seven-segment display.
 - The seven-segment display shows the repeating sequence **OS**, **Sd**, **blank** to indicate that the controller is performing Start-of-day (SOD) processing. After a controller has successfully booted up, its seven-segment display should show the tray ID.
 - The amber Attention LED on the controller turns on and then turns off, unless there is an error.
 - The green Host Link LEDs turn on.



The figure shows an example controller canister. Your controller might have a different number and a different type of host ports.



(1) Attention LED (amber)

(2) Seven-segment display

(3) Host Link LEDs

3. If any of the controller shelf's Attention LEDs remain on, check that the controller canister has been installed correctly and that all cables are correctly seated. Reinstall the controller canister, if necessary.



If you cannot resolve the problem, contact technical support.

4. If the storage array has secure drives, import the drive security key; otherwise, go to the next step. Follow the appropriate procedure below for a storage array with all secure drives or a mix of secure and unsecure drives.



Unsecure drives are unassigned drives, global hot spare drives, or drives that are part of a volume group or a pool that is not secured by the Drive Security feature. *Secure drives* are assigned drives that are a part of a secured volume group or disk pool using Drive Security.

- **Only secured drives (no unsecure drives):**

- a. Access the storage array's command line interface (CLI).
- b. Enter the following command to import the security key:

```
import storageArray securityKey file="C:/file.slk"
passPhrase="passPhrase";
```

where:

- `C:/file.slk` represents the directory location and name of your drive security key
- `passPhrase` is the pass phrase needed to unlock the file After the security key has been imported, the controller reboots, and the new controller adopts the saved settings for the storage array.

- c. Go to the next step to confirm that the new controller is Optimal.

- **Mix of secure and unsecure drives:**

- a. Collect the support bundle and open the storage array profile.
- b. Find and record all the unsecure drives' locations, which are found in the support bundle.
- c. Power off the system.
- d. Remove the unsecure drives.
- e. Replace the controller.
- f. Power on the system and wait for the seven-segment display to show the tray number.
- g. From SANtricity System Manager, select **Settings > System**.
- h. In the Security Key Management section, select **Create/Change Key** to create a new security key.
 - i. Select **Unlock Secure Drives** to import the security key you saved.
 - j. Run the `set allDrives nativeState` CLI command.

The controller will reboot automatically.

- k. Wait for the controller to boot up and for the seven-segment display to show the tray number or a flashing L5.
 - l. Power off the system.
 - m. Reinstall the unsecure drives.
 - n. Reset the controller using SANtricity System Manager.
 - o. Power on the system and wait for the seven-segment display to show the tray number.
 - p. Go to the next step to confirm that the new controller is Optimal.
5. From SANtricity System Manager, confirm that the new controller is Optimal.
 - a. Select **Hardware**.
 - b. For the controller shelf, select **Show back of shelf**.
 - c. Select the controller canister you replaced.
 - d. Select **View settings**.
 - e. Confirm that the controller's **Status** is Optimal.
 - f. If the status is not Optimal, highlight the controller, and select **Place Online**.
6. 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.

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.

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