E-Series

Maintaining E2800 Hardware

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Contents

Batteries 6
Overview and requirements 6
Battery overview 6
Requirements for replacing a failed battery 7
Replace battery 7
Prepare to replace battery 7
Remove failed battery 11
Install new battery 14
Complete battery replacement 17
Controllers 21
Overview and requirements 21
Controller overview 21
Requirements for replacing or adding a controller 22
Add second controller canister 23
Prepare to add second controller 24
Change configuration to duplex 27
Add second controller canister 30
Complete adding a second controller 32
Replace controller in duplex configuration 35
Prepare to replace controller (duplex) 35
Remove failed controller (duplex) 38
Install new controller (duplex) 43
Complete controller replacement (duplex) 48
Replace controller in simplex configuration 49
Prepare to replace controller (simplex) 49
Remove failed controller (simplex) 51
Install new controller (simplex) 56
Complete controller replacement (simplex) 61
Canisters 64
Overview and requirements 64
Power supply overview 64
Power canister overview 65
Fan canister overview 65
Requirements for replacing a power supply 66
Requirements for replacing a power canister 67
Requirements for replacing a fan canister 67
Replace power supply (12-drive or 24-drive) 68
Prepare to replace power supply 68
Remove failed power supply 70
Install new power supply 71
Complete power supply replacement 72

Replace power canister (60-drive) 73
Prepare to replace power canister 73
Remove failed power canister 75
Install new power canister 75
Complete power canister replacement 76
Replace fan canister (60-drive) 76
Prepare to replace fan canister 77
Remove failed fan canister and install new one 78
Complete fan canister replacement 80
Drives 81
Overview and requirements 81
Drives overview 81
Drive drawer overview 83
Requirements for handling drives 83
Replace drive (12-drive or 24-drive) 84
Prepare to replace drive (12-drive or 24-drive) 85
Remove failed drive (12-drive or 24-drive) 85
Install new drive (12-drive or 24-drive) 86
Complete drive replacement (12-drive or 24-drive) 87
Replace drive (60-drive) 87
Prepare to replace drive (60-drive) 88
Remove failed drive (60-drive) 90
Install new drive (60-drive) 91
Complete drive replacement (60-drive) 92
Replace drive drawer (60-drive) 93
Prepare to replace drive drawer (60-drive) 94
Remove cable chains 96
Remove failed drive drawer (60-drive) 101
Install new drive drawer (60-drive) 103
Attach cable chains 104
Complete drive drawer replacement 107
Host interface cards 110
Overview and requirements 110
Host interface card overview 110
Requirements for adding, upgrading or replacing a HIC 110
Add host interface cards 111
Prepare to add host interface cards 111
Add host interface card 113
Complete adding a host interface card 120
Upgrade host interface card 121
Prepare to upgrade host interface cards 122
Upgrade host interface card 124
Complete host interface card upgrade 131
Replace host interface card 132
Prepare to replace host interface card 132

Replace host interface card 136
Complete host interface card replacement 142
Host port protocol conversion 146
Overview and requirements 146
Host protocol overview 146
Which host ports can you change 147
Requirements for changing the host protocol 147
Considerations for changing the host protocol 147
Change host protocol 152
Determine whether you have dual-protocol SFPs 152
Obtain the feature pack 153
Stop host I/O 157
Change the feature pack 158
Complete host protocol conversion 159
Copyright 166
Trademark 167
How to send comments about documentation and receive update notifications 168

Batteries

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

Overview and requirements

Before you replace a battery, you need to be aware of certain requirements and considerations.

Battery overview

Each controller canister includes a battery that preserves cached data if the AC power fails. To protect your data, you must replace a failed battery as soon as possible.

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.

Duplex or simplex configuration

The steps to replace a battery depend on whether you have one or two controllers, as follows:

If your storage array has...	You must...
Two controllers (duplex)	**1.** Take controller offline. **2.** Remove the controller canister. **3.** Replace the battery. **4.** Replace the controller canister. **5.** Bring the controller online.
One controller (simplex)	**1.** Stop host I/O operations. **2.** Power down the controller shelf. **3.** Remove the controller canister. **4.** Replace the battery. **5.** Replace the controller canister. **6.** Apply power to the controller shelf.

Requirements for replacing a failed battery

If you plan to replace a failed battery, keep the following requirements in mind.

- You must have installed SANtricity Storage Manager on a management station, so you can use the storage array's command line interface (CLI).
  If this software has not yet been installed, follow the instructions in the *Linux express configuration*, *Windows express configuration*, or *VMware express configuration* to download and install it.
- You must have a replacement battery.
- You have an ESD wristband, or you have taken other antistatic precautions.
- You should use labels to identify each cable that is connected to the controller canister.

Replace battery

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.

Steps

1. Prepare to replace battery on page 7
   The steps to prepare for battery replacement depend on whether you have a duplex configuration (two controllers) or a simplex configuration (one controller). If you have a duplex configuration, you must take the affected controller offline or, if you have a simplex configuration, you must stop host I/O operations and power down the controller shelf.
2. Remove failed battery on page 11
   You must remove the failed battery so you can install a new one.
3. Install new battery on page 14
   You install a new battery into the controller canister to replace the failed one.
4. Complete battery replacement on page 17
   The steps to complete a battery replacement depend on whether you have a duplex configuration (two controllers) or a simplex configuration (one controller). If you have a duplex configuration, you place the affected controller online or, if you have a simplex configuration, you apply power to the controller shelf and confirm that all components are working correctly. Then, you can collect support data and resume operations.

Prepare to replace battery

The steps to prepare for battery replacement depend on whether you have a duplex configuration (two controllers) or a simplex configuration (one controller). If you have a duplex configuration, you must take the affected controller offline or, if you have a simplex configuration, you must stop host I/O operations and power down the controller shelf.

Choices

- Place controller offline (duplex) on page 8
  Place the affected controller offline so you can safely remove the failed battery. You must back up the configuration and collect support data first. Then, you can take the affected controller offline.
- Power down the controller shelf (simplex) on page 10

Power down the controller shelf so you can safely remove the failed battery. You must back up the configuration and collect support data first. Then, you can stop host I/O operations and power down the controller shelf.

Related concepts

Battery overview on page 6
Requirements for replacing a failed battery on page 7

Place controller offline (duplex)

If you have a duplex configuration, you must place the affected controller offline so you can safely remove the failed battery. You must back up the configuration and collect support data first. Then, you can take the affected controller offline.

Before you begin

- Your storage array must have two controllers. The controller that you are not placing offline must be online (in the optimal state).
- Make sure that no volumes are in use or that you have a multipath driver installed on all hosts using these volumes.

About this task

Perform this task only if your storage array has two controllers (duplex configuration).

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.

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

   a. Open the Enterprise Management Window (EMW) for SANtricity Storage Manager on your management station.

   b. Select the storage array.

   c. Select **Tools** > **Execute Script**.

   d. Type the following command in the text box.

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

   In this command, *filename* is the file path and file name to which you want to save the database. Enclose the file name in double quotation marks (" "). For example:

   ```
   file="C:\Program Files\CLI\logs\dbmdata.zip"
   ```

   This command does not automatically append a file extension to the saved file. You must specify a file extension when entering the file name.

   e. Select **Tools** > **Verify and Execute**.

4. 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`.

5. If the controller is not already offline, take it offline now using either SANtricity System Manager or the Enterprise Management Window's (EMW) script editor:

   - To use 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.

     Note: 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.

   - To use script editor in the EMW:
     a. Open the Enterprise Management Window (EMW) in SANtricity Storage Manager on your local host.
     b. Select the storage array.
     c. Select **Tools > Execute Script**.
     d. Type one of the following commands in the text box.

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

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

     e. Select **Tools > Verify and Execute**.

     The system attempts to take the controller offline.

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

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

After you finish

Go to *Remove failed battery* on page 11.

Power down the controller shelf (simplex)

If you have a simplex configuration, you power down the controller shelf so you can safely remove the failed battery. You must back up the configuration and collect support data first. Then, you can stop host I/O operations and power down the controller shelf.

Before you begin

- You have reviewed 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.

About this task

Perform this task only if your storage array has one controller (simplex configuration).

Steps

1. Back up the storage array's configuration database.

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

   a. Open the Enterprise Management Window (EMW) for SANtricity Storage Manager on your management station.

   b. Select the storage array.

   c. Select **Tools** > **Execute Script**.

   d. Type the following command in the text box.

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

   In this command, *`filename`* is the file path and file name to which you want to save the database. Enclose the file name in double quotation marks (" "). For example:

   ```
   file="C:\Program Files\CLI\logs\dbmdata.zip"
   ```

   This command does not automatically append a file extension to the saved file. You must specify a file extension when entering the file name.

   e. Select **Tools** > **Verify and Execute**.

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.

  Note: 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.

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

4. 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.

5. From the home page of SANtricity System Manager, select **View Operations in Progress**.
6. Confirm that all operations have completed before continuing with the next step.
7. Turn off both power switches on the controller shelf.
8. Wait for all LEDs on the controller shelf to turn off.

After you finish

Go to *Remove failed battery* on page 11.

Remove failed battery

You must remove the failed battery so you can install a new one.

Steps

1. Step 1: Remove controller canister on page 11
   Remove the controller canister so you can disconnect all cables. Then, you can slide the controller canister out of the controller shelf.
2. Step 2: Remove failed battery on page 13
   Remove the failed battery by pushing the release latch down and away from the controller canister.

Related concepts

Battery overview on page 6
Requirements for replacing a failed battery on page 7

Remove controller canister

When you remove a controller canister, you must disconnect all cables. Then, you can slide the controller canister out of the controller shelf.

Steps

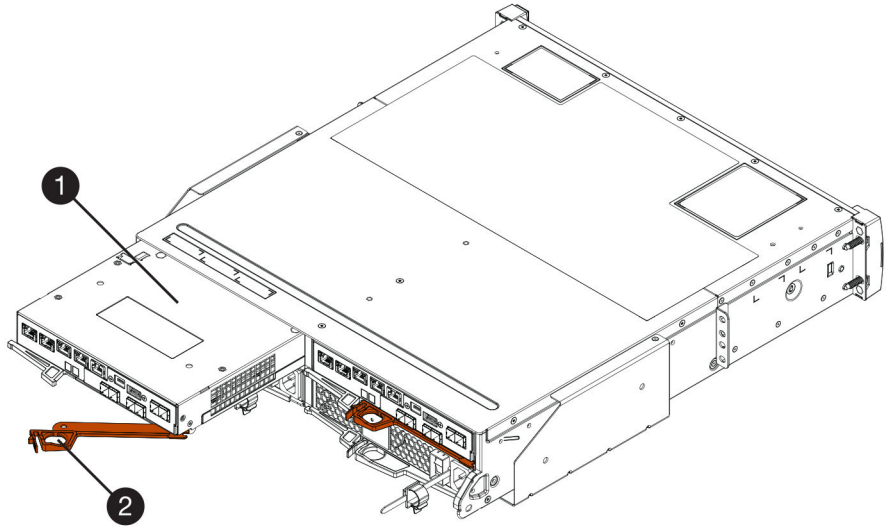
1. Put on an ESD wristband or take other antistatic precautions.
2. Label each cable that is attached to the controller canister.
3. Disconnect all the cables from the controller canister.

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

4. If the host ports on the controller canister use SFP+ transceivers, leave them installed.

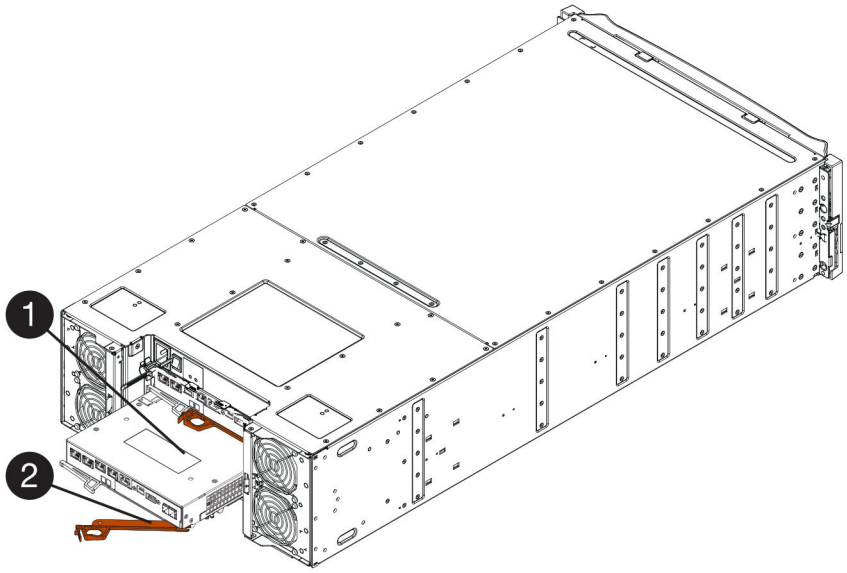
5. Confirm that the Cache Active LED on the back of the controller is off.
6. Squeeze the latch on the cam handle until it releases, and then open the cam handle to the right to release the controller canister from the shelf.

   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.

   Attention: 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.

After you finish

Go to *Remove failed battery* on page 13.

Remove failed battery

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

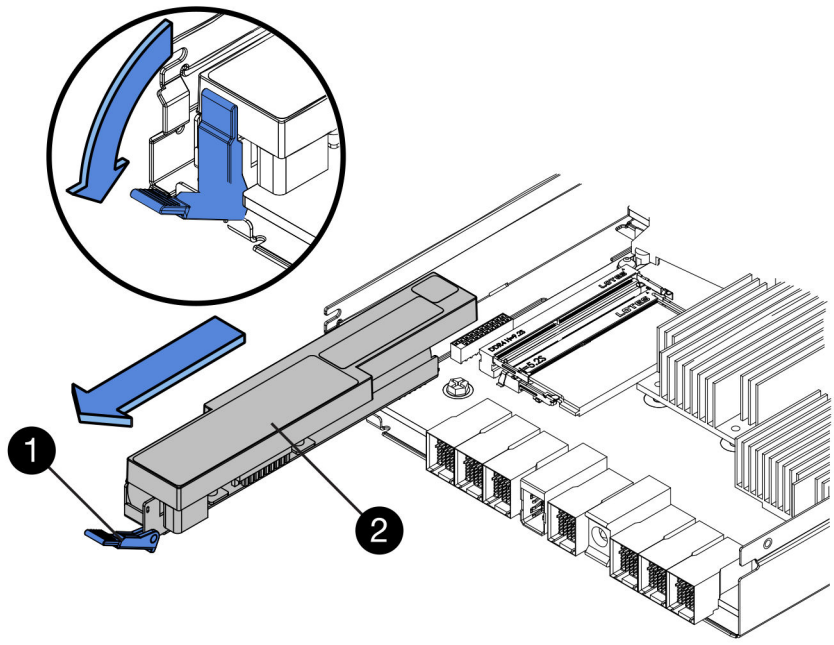
Steps

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

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

After you finish

Go to *Install new battery* on page 14.

Install new battery

You install a new battery into the controller canister to replace the failed one.

Steps

1. Step 1: Install new battery on page 15
   Install a new battery when the old one has failed.
2. Step 2: Re-install controller canister on page 16
   Reinstall the controller canister into the controller shelf after installing the new battery.

Related concepts

Battery overview on page 6
Requirements for replacing a failed battery on page 7

Install new battery

Install a new battery when the old one has failed.

Before you begin

- You have the failed battery from the controller canister.
- You have the replacement battery.

Steps

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

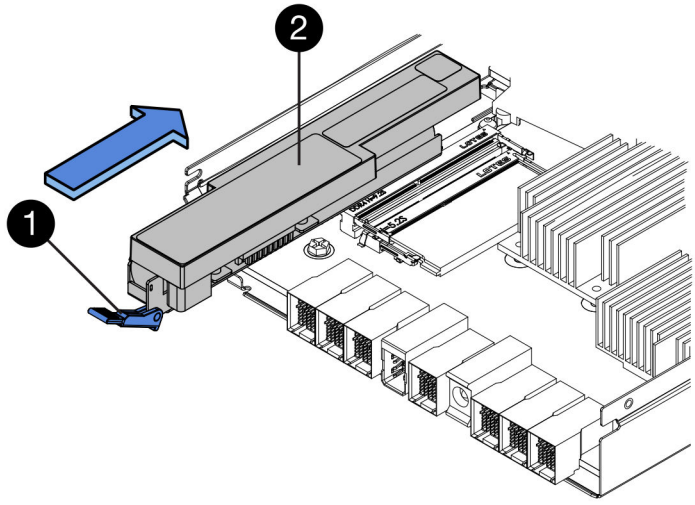
   Important: To comply with IATA safely regulations, replacement batteries are shipped with a state of charge (SoC) of 30 percent or less. When you reapply power, keep in mind that write caching will not resume until the replacement battery is fully charged and it has completed its initial learn cycle.

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

4. 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

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

   Attention: 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:**

After you finish

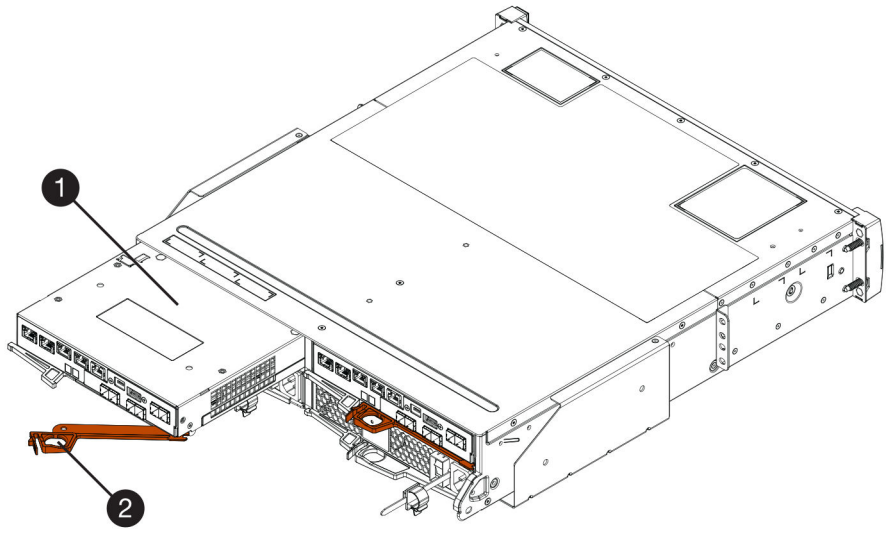
Go to *Re-install controller canister* on page 16

Re-install controller canister

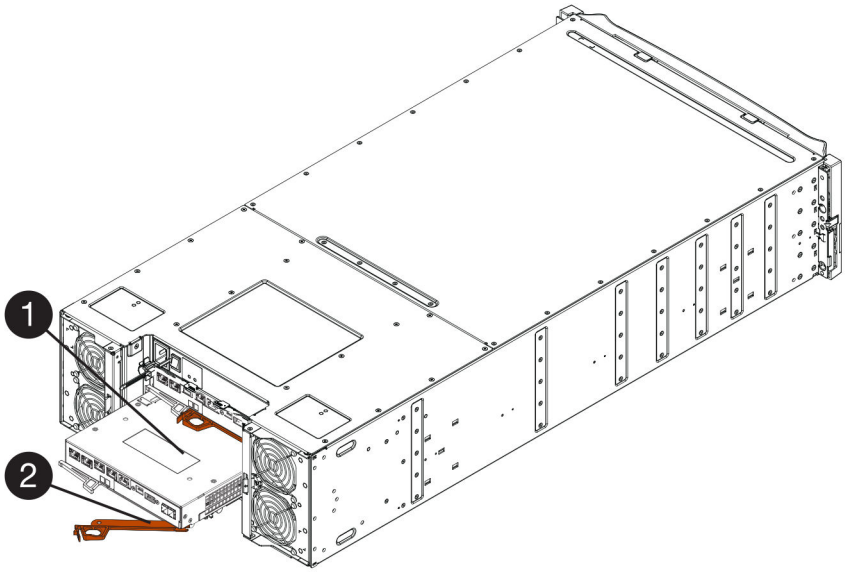
Reinstall the controller canister into the controller shelf after installing the new battery.

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



1 Controller canister 2 Cam handle

4. Move the cam handle to the left to lock the controller canister in place.
5. Reconnect all the cables.

After you finish

Go to *Complete battery replacement* on page 17.

Complete battery replacement

The steps to complete a battery replacement depend on whether you have a duplex configuration (two controllers) or a simplex configuration (one controller). If you have a duplex configuration, you place the affected controller online or, if you have a simplex configuration, you apply power to the

controller shelf and confirm that all components are working correctly. Then, you can collect support data and resume operations.

Choices

- Place controller online (duplex) on page 18
  Place the controller online to confirm the storage array is working correctly. Then, you can collect support data and resume operations.
- Power up controller (simplex) on page 19
  Power up the controller shelf to confirm that it is working correctly. Then, you can collect support data and resume operations.

Place controller online (duplex)

Place the controller online to confirm the storage array is working correctly. Then, you can collect support data and resume operations.

About this task

Perform this task only if your storage array has two controllers.

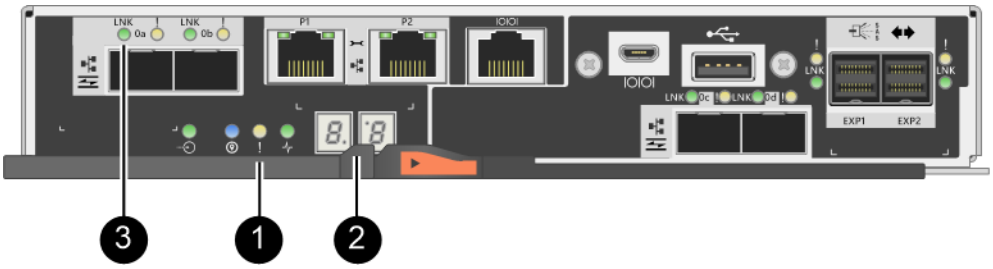
Steps

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

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

   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 lit.
   - 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. Bring the controller online using either SANtricity System Manager or the Enterprise Management Window's (EMW) script editor:

   - To use SANtricity System Manager:
     a. Select **Hardware**.
     b. If the graphic shows the drives, select **Show back of shelf**.
     c. Select the controller you want to place online.

d. Select **Place Online** from the context menu, and confirm that you want to perform the operation.

The system places the controller online.

- To use script editor in the EMW:

a. Open the Enterprise Management Window (EMW) in SANtricity Storage Manager on your local host.

b. Select the storage array.

c. Select **Tools > Execute Script**.

d. Type one of the following commands in the text box.

```
For controller A: set controller [a] availability=online;
```

```
For controller B: set controller [b] availability=online;
```

e. Select **Tools > Verify and Execute**.

The system places the controller online.

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 check that the battery and the controller canister are installed correctly. If necessary, remove and reinstall the controller canister and the battery.

Note: If you cannot resolve the problem, contact technical support.

4. 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`.

Result

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

Power up controller (simplex)

Power up the controller shelf to confirm that it is working correctly. Then, you can collect support data and resume operations.

About this task

Perform this task only if your storage array has one controller.

Steps

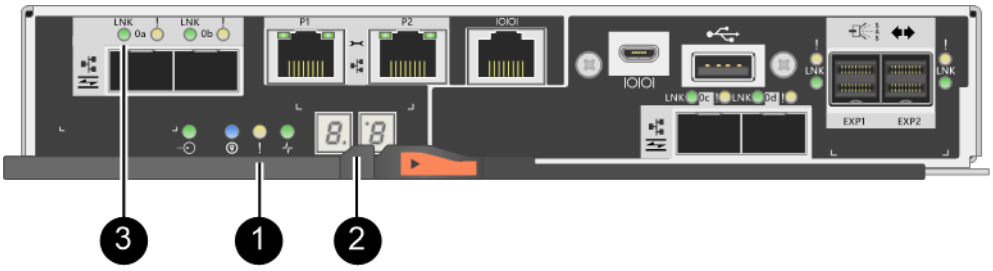
1. Turn on the two power switches at the back of the controller shelf.

- 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.

2. 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.

     Note: 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. Confirm that the controller's 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 check that the battery and the controller canister are installed correctly. If necessary, remove and reinstall the controller canister and the battery.

   Note: If you cannot resolve the problem, contact technical support.

4. 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`.

Result

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

Controllers

A controller consists of a board, firmware, and software. It controls the drives and implements the System Manager functions. This section describes how to convert to a duplex configuration by adding a second controller and how to replace a controller in a simplex configuration and in a duplex configuration.

Overview and requirements

Before you replace or add a controller you need to be aware of certain requirements and considerations.

Controller overview

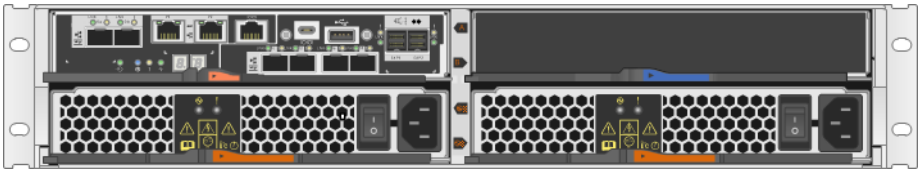
Each controller canister contains a controller card, a battery, and an optional host interface card (HIC). You can add a second controller to a simplex configuration or replace a failed controller.

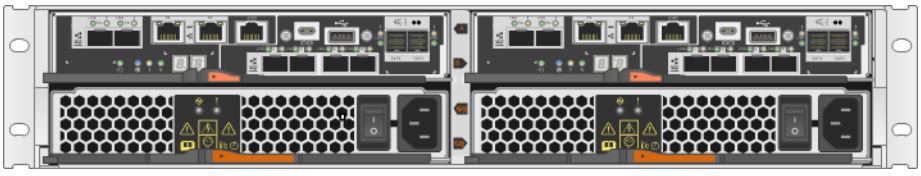
Add second controller

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).





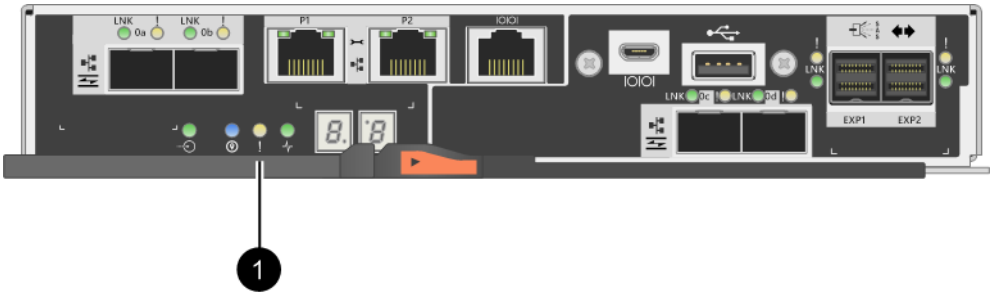
Note: The figures show example controller canisters; the host ports on your controller canisters might be different.

Replace 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.



1 Attention LED

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

Requirements for replacing or adding a controller

If you plan to replace a controller or add a second controller, keep the following requirements in mind.

Requirements for adding a second controller

- You must have a new controller canister with the same part number as the currently installed controller canister.
- If the currently installed controller canister includes a host interface card (HIC), you must have a new HIC that is identical to the HIC in the currently installed controller canister.
- You must have 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*.
- You must have installed a multipath driver 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.
- You have an ESD wristband, or you have taken other antistatic precautions.
- You must have a #1 Phillips screwdriver.
- You must have labels to identify the new cables.
- You must have installed SANtricity Storage Manager on a management station, so you can use the storage array's command line interface (CLI).
  If SANtricity Storage Manager has not yet been installed, follow the instructions in the *Linux express configuration*, *Windows express configuration*, or *VMware express configuration* to download and install the software.

Requirements for replacing a failed controller

- You must have a replacement controller canister with the same part number as the controller canister you are replacing.

- You have an ESD wristband, or you have taken other antistatic precautions.
- You must use labels to identify each cable that is connected to the controller canister.
- You must have a #1 Phillips screwdriver.
- You must have installed SANtricity Storage Manager on a management station, so you can use the storage array's command line interface (CLI).
  If this software has not yet been installed, follow the instructions in the *Linux express configuration*, *Windows express configuration*, or *VMware express configuration* to download and install it.

Duplex configuration

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

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

You add a second controller to a controller shelf that has only one controller canister. You can 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. This is an online procedure. You can access data on the storage array while you perform this procedure.

Steps

1. Prepare to add second controller on page 24
   You prepare to add a second controller by verifying the new controller's part number, installing the same model of host interface card (HIC) in the second controller canister, and collecting support data for your storage array.
2. Change configuration to duplex on page 27
   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.
3. Add second controller canister on page 30
   You add a second controller canister to convert the simplex version of the controller shelf to a duplex configuration.
4. Complete adding a second controller on page 32
   You complete the process of adding a second controller by confirming that it is working correctly. Then, you can reinstall the duplex NVSRAM file, distribute volumes between the controllers, and collect support data.

Related concepts

Controller overview on page 21
Requirements for replacing or adding a controller on page 22

Prepare to add second controller

You prepare to add a second controller by verifying the new controller's part number, installing the same model of host interface card (HIC) in the second controller canister, and collecting support data for your storage array.

Steps

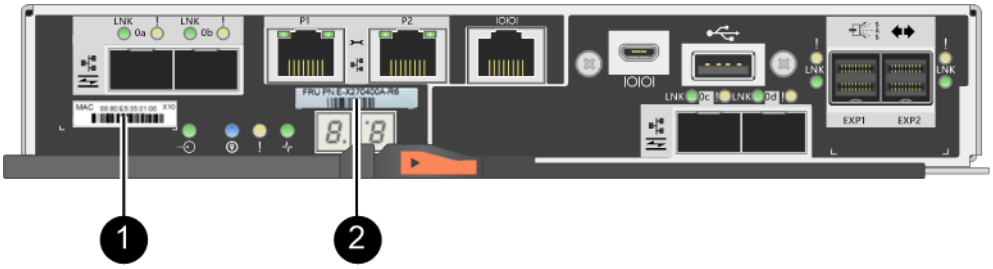
1. Step 1: Verify the new controller's part number on page 24
   Confirm that the new controller has the same part number as the currently installed controller.
2. Step 2: Install host interface card on page 25
   Install the same model of HIC in the second controller canister, if the currently installed controller includes a HIC.
3. Step 3: Collect support data on page 27
   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.

Verify the new controller's part number

You 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.

   Attention: 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.

After you finish

Go to *Install host interface card* on page 25.

Install host interface card

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

Before you begin

- If the currently installed controller canister includes a HIC, you have a new HIC that is identical to the HIC in the currently installed controller canister.
- You have an ESD wristband, or you have taken other antistatic precautions.
- You have a #1 Phillips screwdriver.

Steps

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

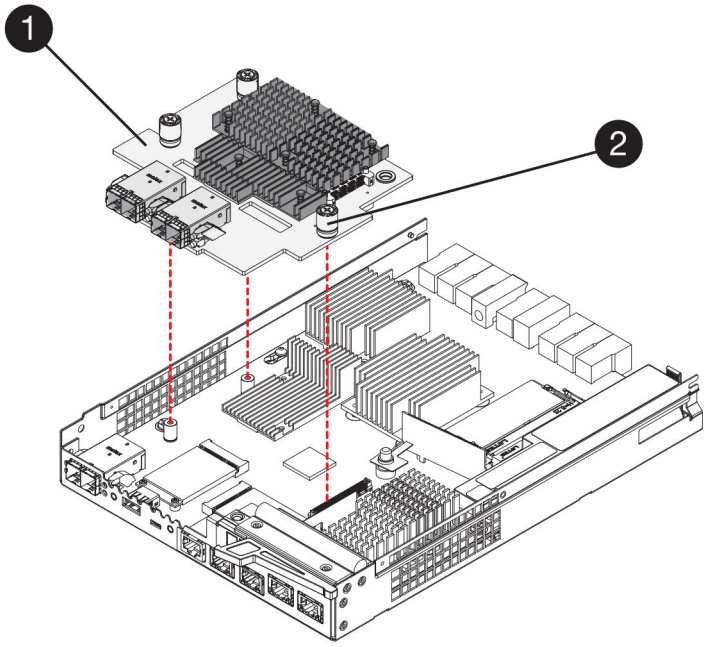
   Attention: Possible loss of data access – The HICs installed in the two controller canisters must be identical. If the replacement HIC is not identical to the HIC you are replacing, do not attempt this procedure. The presence of mismatched HICs will cause the new controller to lock down when it comes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

   Attention: Possible equipment damage – Be very careful not to pinch the gold ribbon connector for the controller LEDs between the HIC and the thumbscrews.

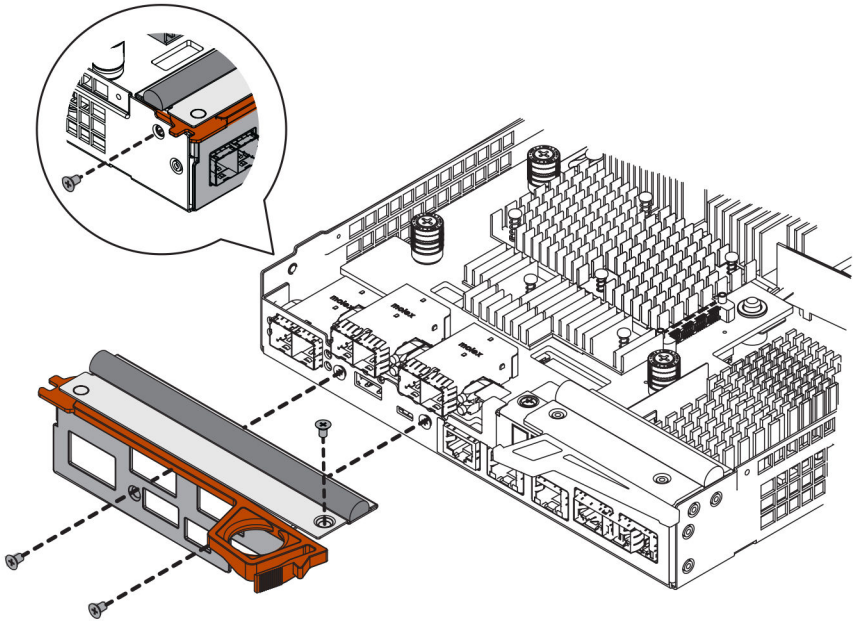


1 Host interface card (HIC) 2 Thumbscrews

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.

After you finish

Go to *Collect support data* on page 27.

Collect support data

You 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.

Before you begin

- You have installed SANtricity Storage Manager on a management station, so you can use the storage array's command line interface (CLI).
  If SANtricity Storage Manager has not yet been installed, follow the instructions in the *Linux express configuration*, *Windows express configuration*, or *VMware express configuration* to download and install the software.

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.

   Note: 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.

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

After you finish

Go to *Change configuration to duplex* on page 27.

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.

Steps

1. Step 1: Install duplex NVSRAM on page 28
   Change the configuration to duplex by installing a new NVSRAM file. The duplex version of the NVSRAM file is included with the download file for SANtricity OS Software (controller firmware).
2. Step 2: Set the storage array to duplex on page 30
   Use the script editor in the Enterprise Management Window to set the storage array to duplex mode.

Install duplex NVSRAM

You change the configuration to duplex by installing a new NVSRAM file. The duplex version of the NVSRAM file is included with the download file for SANtricity OS Software (controller firmware).

Before you begin

- You have installed SANtricity Storage Manager on a management station, so you can use the storage array's command line interface (CLI).
  If SANtricity Storage Manager has not yet been installed, follow the instructions in the *Linux express configuration*, *Windows express configuration*, or *VMware express configuration* to download and install the software.

Steps

1. Download the latest SANtricity OS software files from the NetApp Support Site to your management client.
   a. From SANtricity System Manager, select **Support > Upgrade Center**.
   b. In the area labeled “SANtricity OS Software upgrade,” click **NetApp Support**.
   c. On the NetApp Support Site, click the **Downloads** tab, and then select **Software**.
   d. Locate **E-Series/EF-Series SANtricity OS (Controller Firmware)**.
   e. For the platform, select **E2800**, and click **Go!**
   f. Select the version of SANtricity OS (Controller Firmware) you want to install, and click **View & Download**.
   g. Follow the online instructions to complete the file download.
      SANtricity OS software files have filenames similar to `E29xx_1150` with a `.zip` or `.tar.gz` extension. The packaged file includes three files.
      - SANtricity OS software (controller firmware)
        Example file name: RCB_11.50_290x.dlp
      - Controller NVSRAM – duplex
        Example file name: N290X-830834-**D01**.dlp
      - Controller NVSRAM – simplex
        Example file name: N290X-830834-**S01**.dlp
2. Upgrade the files using either SANtricity System Manager or the Enterprise Management Window's (EMW) script editor.
   Attention: 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.

- To use SANtricity System Manager:

  a. Under SANtricity OS Software upgrade, click **Begin Upgrade**.

  b. Click **Browse**, and select the SANtricity OS software file.

  c. Select the checkbox labeled **Transfer Controller NVSRAM file with upgrade**.

  d. Click **Browse**, and select the duplex version of the Controller NVSRAM file (the file with "D" near the end of its name).

  e. Click **Start**, and confirm that you want to perform the operation.

  The upgrade begins and the following occurs: (1) 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. (2) The controller files are transferred and activated. The time required depends on your storage array configuration. (3) The controller reboots automatically to apply the new settings.

- To use script editor in the Enterprise Management Window (EMW):

  a. Open the EMW in SANtricity Storage Manager on your local host.

  b. Select the storage array.

  c. Select **Tools > Execute Script**.

  d. Type the following command in the text box.

  ```
  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"
  ```

  e. Select **Tools > Verify and Execute**.

  The upgrade begins and the following occurs: (1) 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. (2) The controller files are transferred and activated. The time required depends on your storage array configuration. (3) The controller reboots automatically to apply the new settings.

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`.

4. Do the following:

- Verify that all components appear on the Hardware page.
- Verify the new software and firmware versions by checking the Software and Firmware Inventory dialog box (go to **Support > Upgrade Center**, and then click the link for **Software and Firmware Inventory**).
- If you upgraded controller NVSRAM, any custom settings that you have applied to the existing NVSRAM are lost during the process of activation. You need to apply the custom settings to the NVSRAM again after the process of activation is complete.

After you finish

Go to *Set the storage array to duplex* on page 30.

Set the storage array to duplex

You use the script editor in the Enterprise Management Window (EMW) to set the storage array to duplex mode.

Before you begin

- You have installed SANtricity Storage Manager on a management station, so you can use the storage array's command line interface (CLI).
  If SANtricity Storage Manager has not yet been installed, follow the instructions in the *Linux express configuration*, *Windows express configuration*, or *VMware express configuration* to download and install the software.

Steps

1. Open the EMW for SANtricity Storage Manager on your management station.
2. Select the storage array.
3. Select **Tools** > **Execute Script**.
4. Type the following command in the text box.

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

5. Select **Tools** > **Verify and Execute**.
6. Type the following command in the text box.

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

7. 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.

After you finish

Go to *Add second controller canister* on page 30.

Add second controller canister

You add a second controller canister to convert the simplex version of the controller shelf to a duplex configuration.

Steps

1. Step 1: Remove the controller blank on page 31
   Remove the controller blank before you can install the second controller. A controller blank is installed in controller shelves that have only one controller.
2. Step 2: Install second controller canister on page 31
   Install a second controller canister to change a simplex configuration to a duplex configuration.

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.

After you finish

Go to *Install second controller canister* on page 31.

Install second controller canister

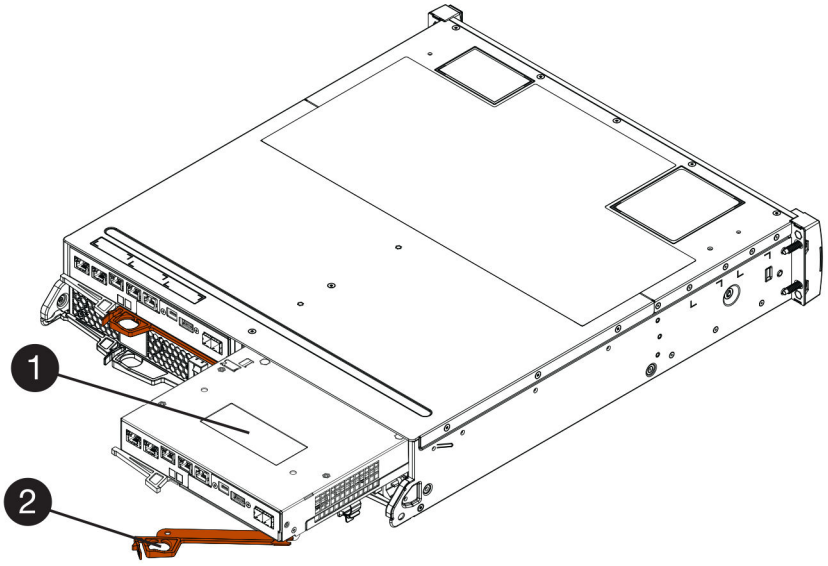
You install a second controller canister to change a simplex configuration to a duplex configuration.

Before you begin

- You have a new controller canister with the same part number as the currently installed controller canister.
- Make sure you have labels to identify the new cables.
- Make sure you have 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*.

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.

After you finish

Go to *Complete adding a second controller* on page 32.

Complete adding a second controller

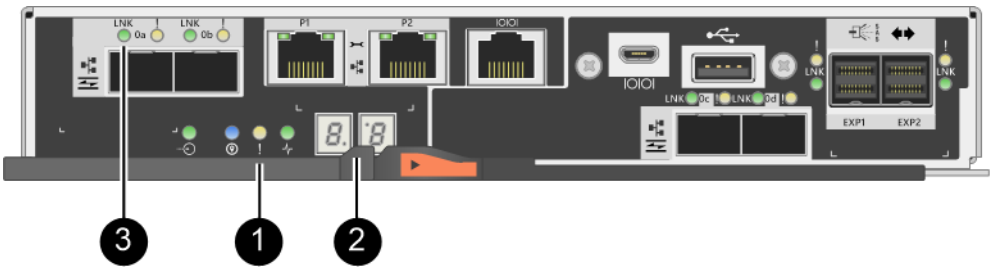
You complete the process of adding a second controller by confirming that it is working correctly. Then, you can reinstall the duplex NVSRAM file, distribute volumes between the controllers, and collect support data.

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)

   Attention: Possible loss of data access – If the controller you just installed shows one 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.

   a. Open the EMW in SANtricity Storage Manager on your local host.

   b. Select the storage array.

   c. Select **Tools** then **Execute Script**.

   d. Type in the following command:

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

e. Select **Tools** then **Verify and Execute**.

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.

Note: If you cannot resolve the problem, contact technical support.

5. Reinstall the duplex version of the NVSRAM file using either SANtricity System Manager or the Enterprise Management Window's (EMW) script editor.

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

Attention: 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.

- To use SANtricity System Manager:

  a. Under SANtricity OS Software upgrade, click **Begin Upgrade**.

  b. Click **Browse**, and select the SANtricity OS software file.

  c. Select the checkbox labeled **Transfer Controller NVSRAM file with upgrade**.

  Note: 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.

  d. Click **Browse**, and select the duplex version of the Controller NVSRAM file (the file with “D” near the end of its name).

  e. Click **Start**, and confirm that you want to perform the operation.

  The transfer of control operation begins.

- To use script editor in the Enterprise Management Window (EMW):

  a. Open the EMW in SANtricity Storage Manager on your local host.

  b. Select the storage array.

  c. Select **Tools > Execute Script**.

  d. Type the following command in the text box.

  ```
  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\N280X-830834-D01.dlp"
  ```

  e. Select **Tools > Verify and Execute**.

  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**.

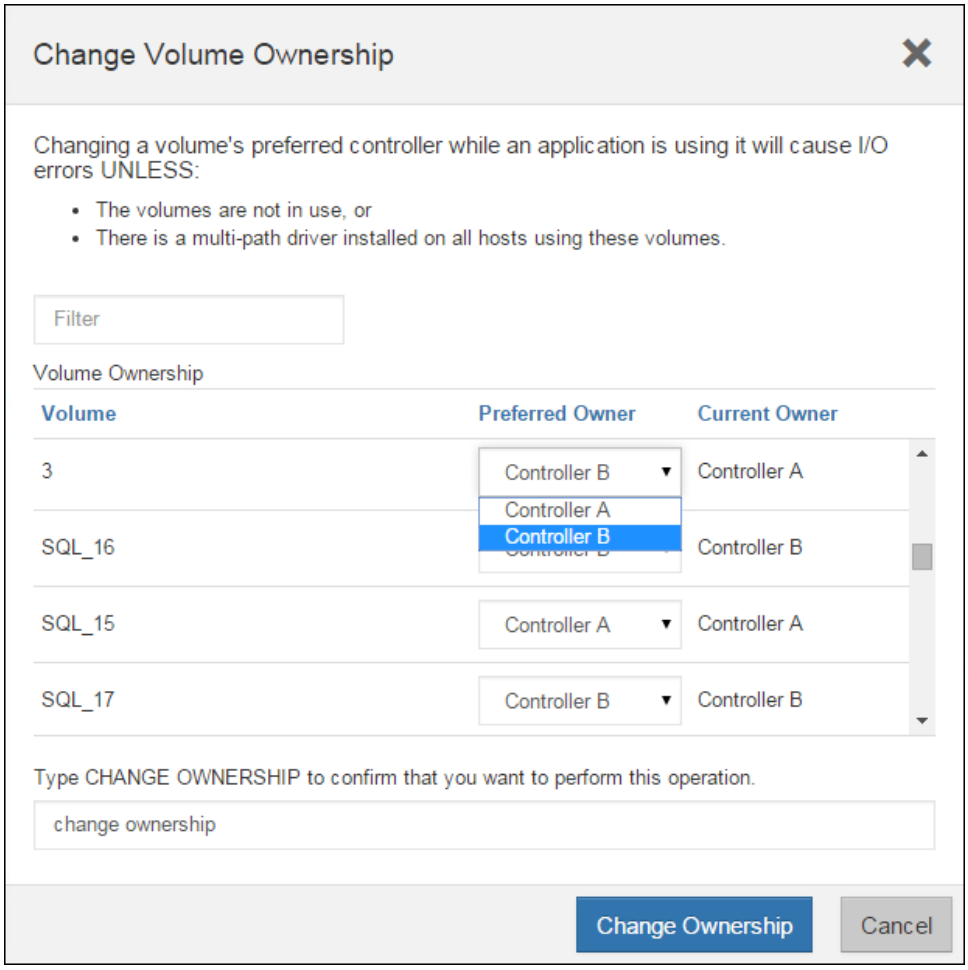
b. From the All Volumes tab, select **More > Change Ownership**.

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.



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. Select **Collect Support Data**.

c. Click **Collect**.

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

Result

The process of adding a second controller is complete. You can resume normal operations.

Replace controller in duplex configuration

You can replace a controller canister in a duplex configuration, which is a two-controller module configuration within the storage array. 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.

Steps

1. Prepare to replace controller (duplex) on page 35
   You prepare to replace a controller canister 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.
2. Remove failed controller (duplex) on page 38
   You remove a controller canister to replace the failed canister with a new one. Perform this task only if your storage array has two controllers (duplex configuration).
3. Install new controller (duplex) on page 43
   You install a new controller canister to replace the failed one. Perform this task only if your storage array has two controllers (duplex configuration).
4. Complete controller replacement (duplex) on page 48
   You complete the controller replacement by placing the controller online and confirming that the storage array is working correctly. Then, you can collect support data and resume operations.

Related concepts

Controller overview on page 21
Requirements for replacing or adding a controller on page 22

Prepare to replace controller (duplex)

You prepare to replace a controller canister 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.

About this task

This task describes how to prepare to replace a controller canister in the duplex version (two controllers) for the following controller shelves:

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

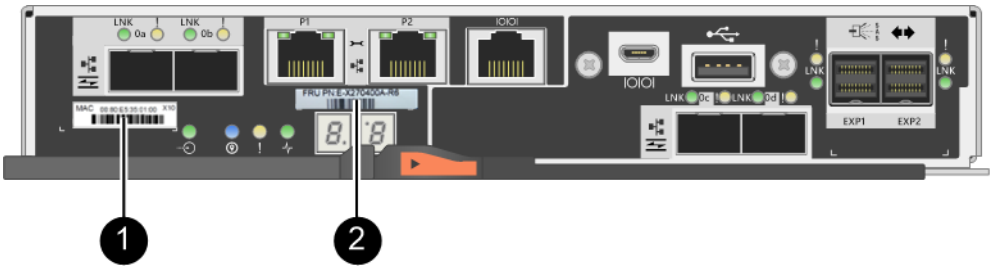
Perform this task only if your storage array has two controllers (duplex configuration).

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 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 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.

   Attention: 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.

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

   a. Open the Enterprise Management Window (EMW) for SANtricity Storage Manager on your management station.

   b. Select the storage array.

   c. Select **Tools > Execute Script**.

d. Type the following command in the text box.

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

In this command, *filename* is the file path and file name to which you want to save the database. Enclose the file name in double quotation marks (" "). For example:

```
file="C:\Program Files\CLI\logs\dbmdata.zip"
```

This command does not automatically append a file extension to the saved file. You must specify a file extension when entering the file name.

e. Select **Tools > Verify and Execute**.

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. If the controller is not already offline, take it offline now using either SANtricity System Manager or the Enterprise Management Window's (EMW) script editor:

- To use 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.

Note: 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.

- To use script editor in the EMW:

a. Open the Enterprise Management Window (EMW) in SANtricity Storage Manager on your local host.

b. Select the storage array.

c. Select **Tools > Execute Script**.

d. Type one of the following commands in the text box.

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

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

e. Select **Tools > Verify and Execute**.

The system attempts to take the controller offline.

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

   Attention: 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.

After you finish

Go to *Remove failed controller (duplex)* on page 38.

Remove failed controller (duplex)

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

Steps

1. Step 1: Remove controller canister (duplex) on page 38
   Remove the failed controller canister so you can replace it with a new one.
2. Step 2: Remove battery (duplex) on page 40
   Remove the battery so you can install the new controller.
3. Remove host interface card (duplex) on page 41
   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.

Remove controller canister (duplex)

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

Before you begin

- You must use labels to identify each cable that is connected to the controller canister.
- You must have a #1 Phillips screwdriver.
- You have an ESD wristband, or you have taken other antistatic precautions.

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.

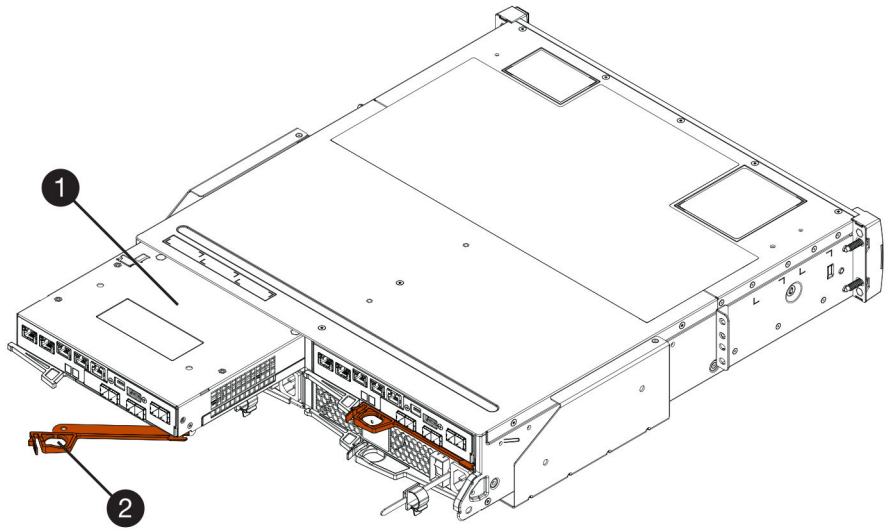
   Attention: To prevent degraded performance, do not twist, fold, pinch, or step on the cables.

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.

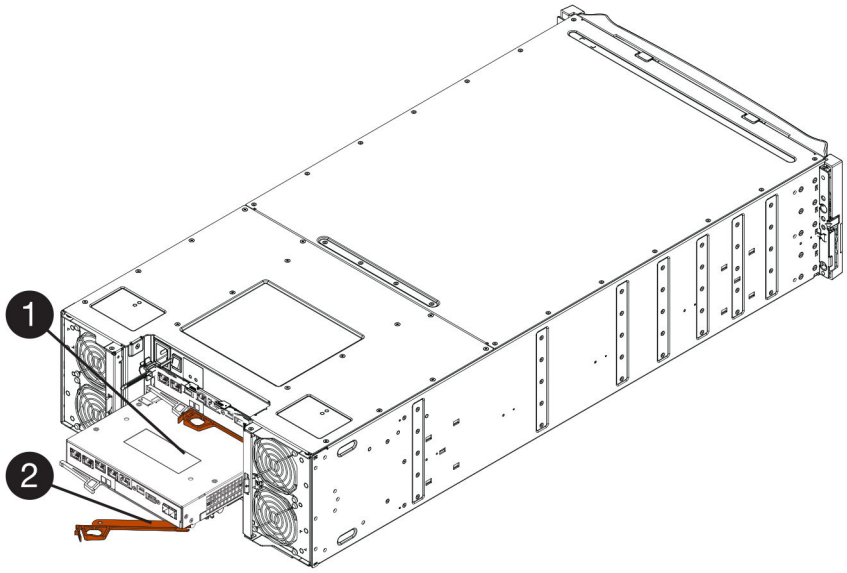
5. Confirm that the Cache Active LED on the back of the controller is off.
6. Squeeze the latch on the cam handle until it releases, and then open the cam handle to the right to release the controller canister from the shelf.

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.

   Attention: 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.

After you finish

Go to *Remove battery* on page 40.

Remove battery (duplex)

You remove the battery so you can install the new controller.

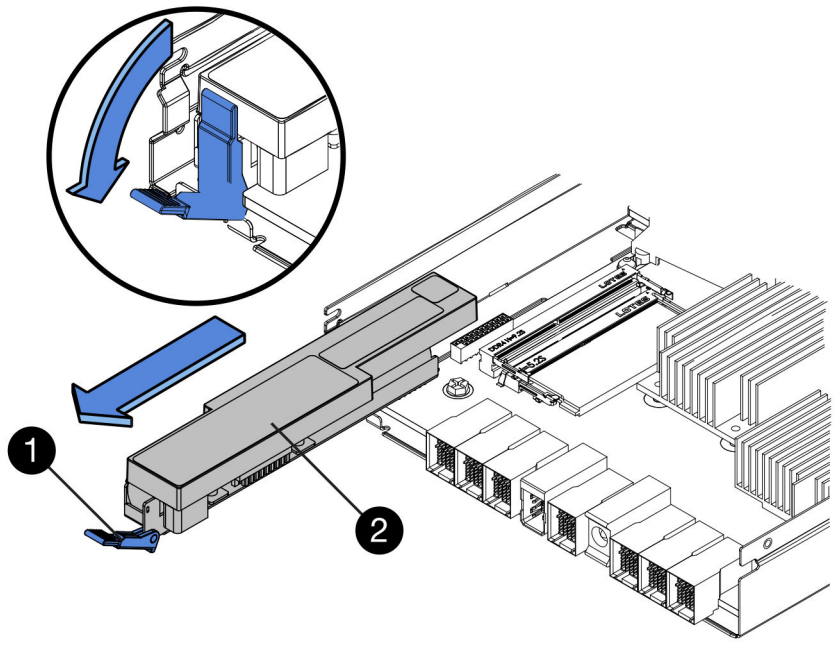
Steps

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.

After you finish

Go to *Remove host interface card* on page 41.

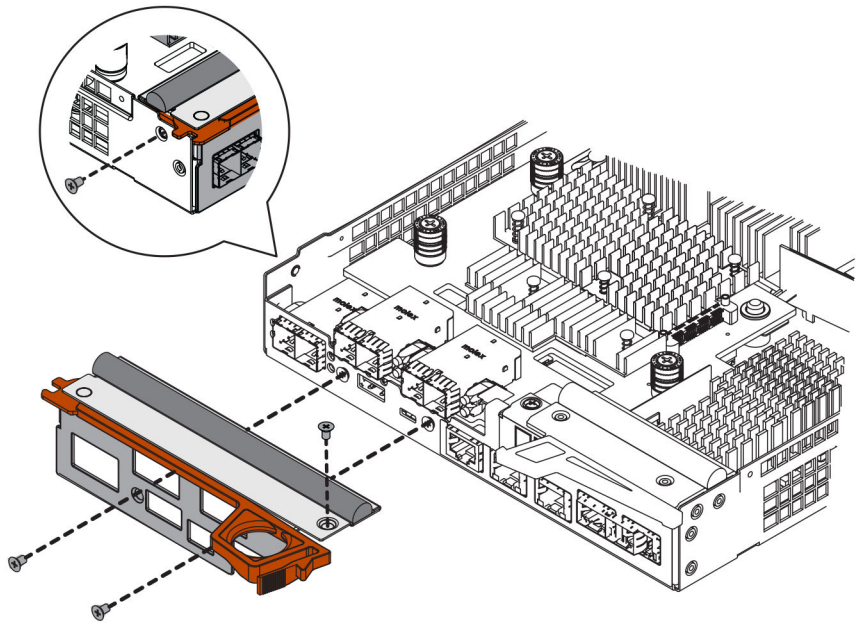
Remove host interface card (duplex)

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

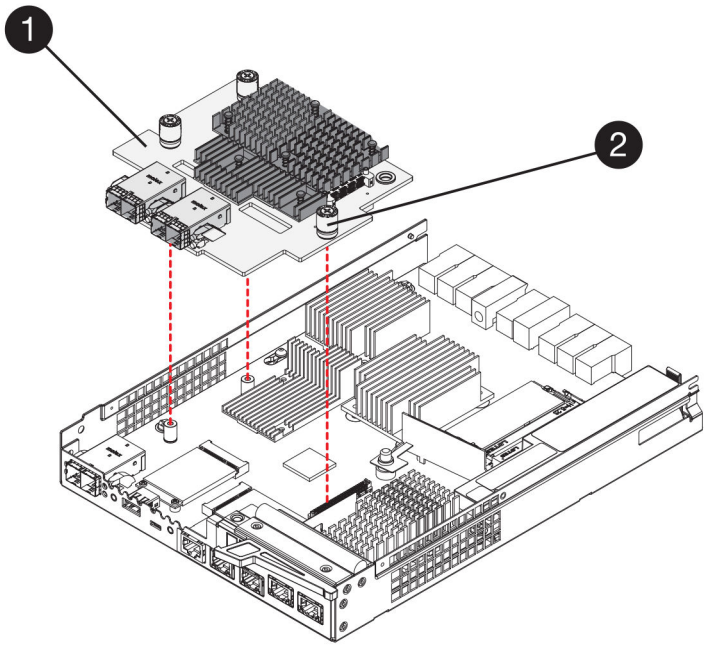
1. Using a #1 Phillips screwdriver, remove the screws that attach the HIC faceplate to the controller canister.

   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.

   Attention: 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.

After you finish

Go to *Install new controller (duplex)* on page 43.

Install new controller (duplex)

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

Steps

1. Install battery (duplex) on page 43
   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.
2. Install host interface card (duplex) on page 45
   If you removed a HIC from the original controller canister, you must install that HIC in the new controller canister.
3. Install new controller canister (duplex) on page 46
   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.

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.

Before you begin

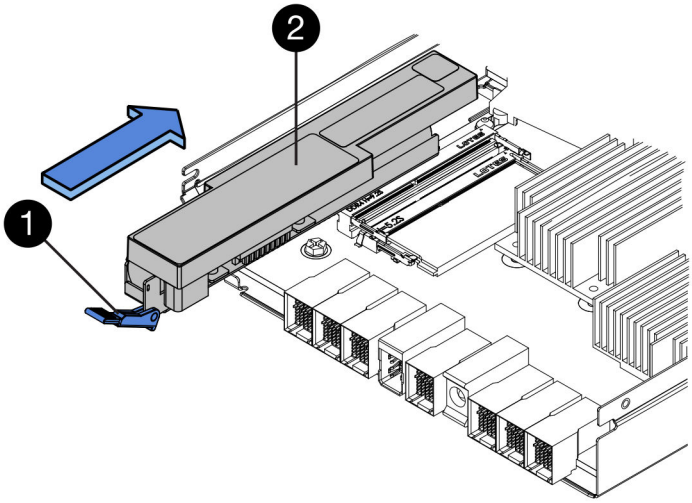
- You have the battery from the original controller canister.
- You have the replacement controller canister.

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.



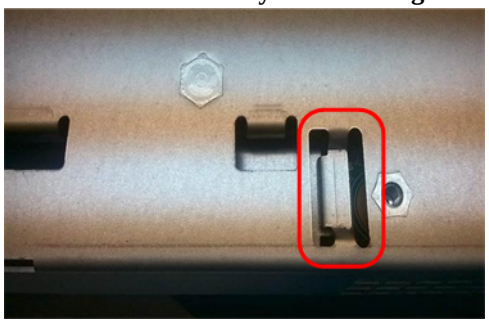
1 Battery release latch 2 Battery

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

   Attention: 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:**

After you finish

Go to *Install host interface card (duplex)* on page 45.

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.

Before you begin

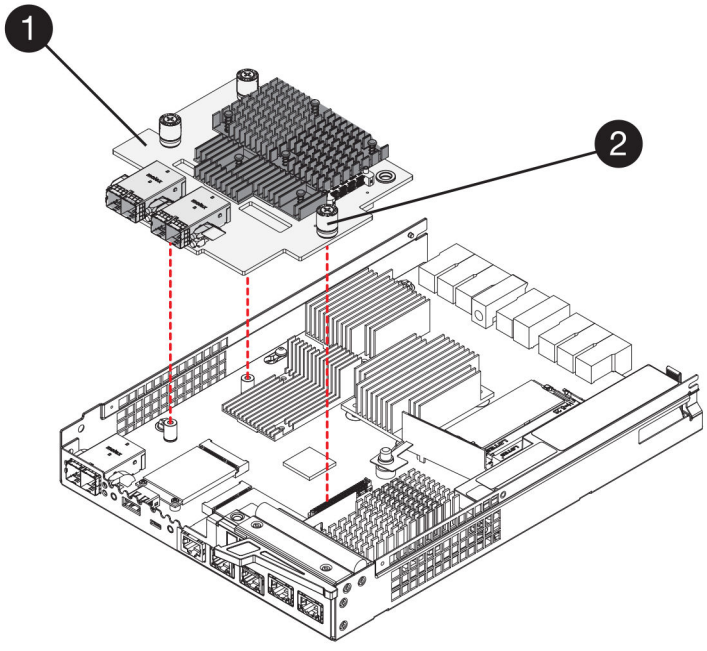
- You must have a replacement controller canister with the same part number as the controller canister you are replacing.
- You must have a #1 Phillips screwdriver.
- You have an ESD wristband, or you have taken other antistatic precautions.

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.

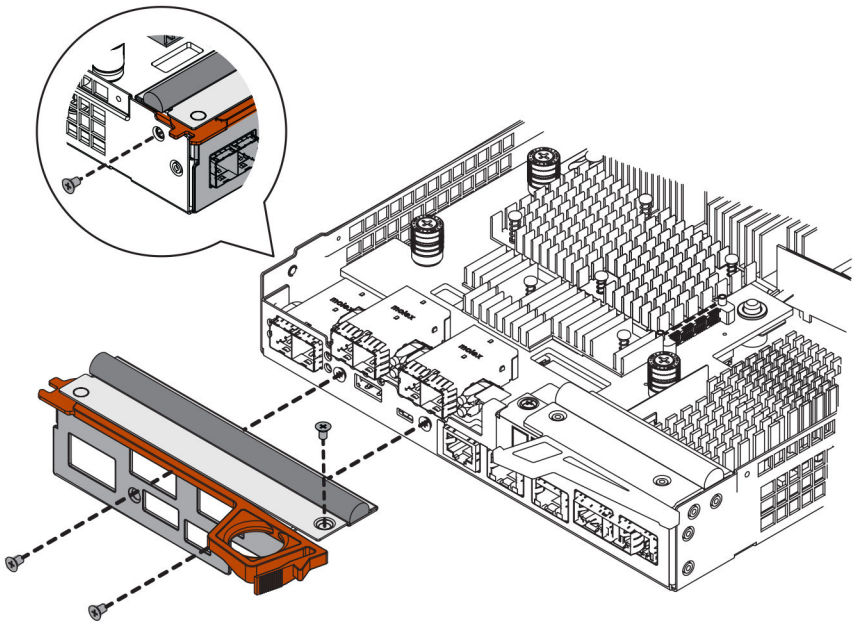
   Attention: Possible equipment damage – Be very careful not to pinch the gold ribbon connector for the controller LEDs between the HIC and the thumbscrews.



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.



After you finish

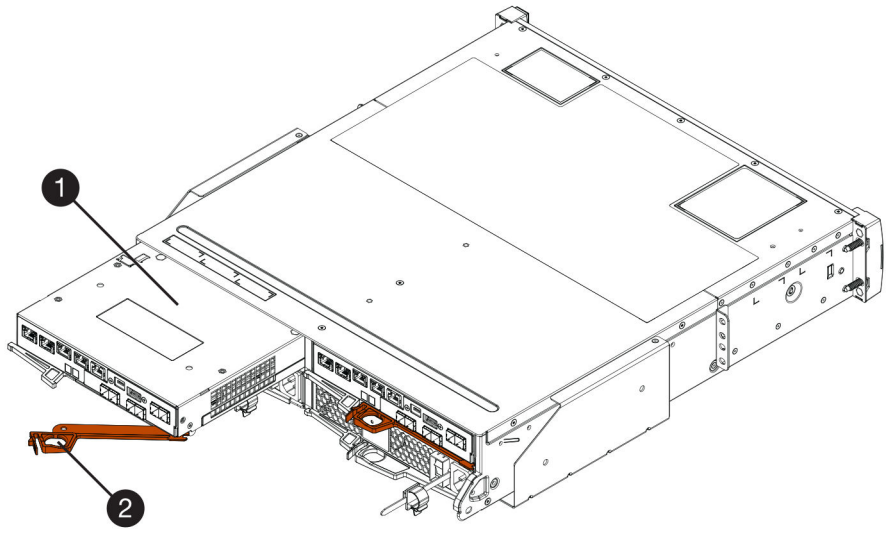
Go to *Install new controller canister (duplex)* on page 46.

Install new controller canister (duplex)

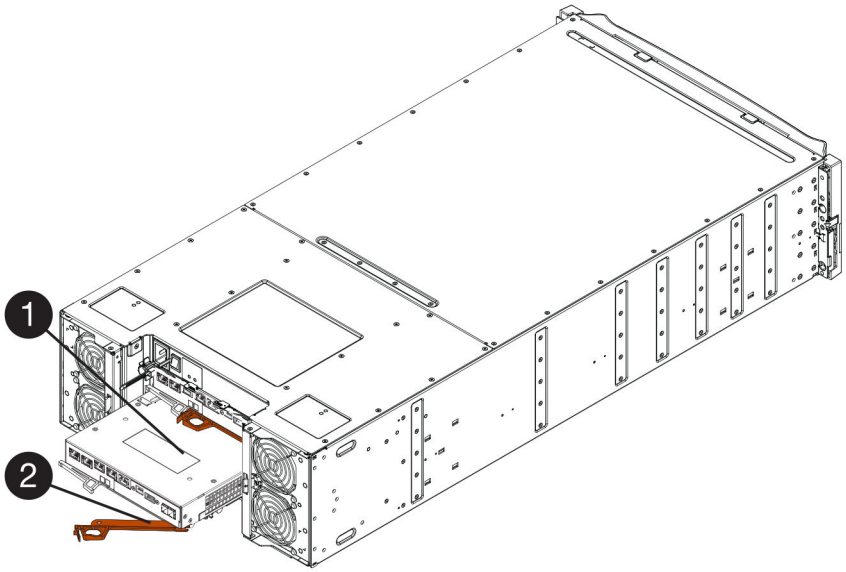
After installing the battery and the host interface card (HIC), if one was initially installed, you can install the new controller canister into the controller shelf.

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



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. 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.

   Note: If the original controller did not use DHCP for the IP address, the new controller will adopt the IP address of the controller you removed.

After you finish

Go to *Complete controller replacement (duplex)* on page 48.

Complete controller replacement (duplex)

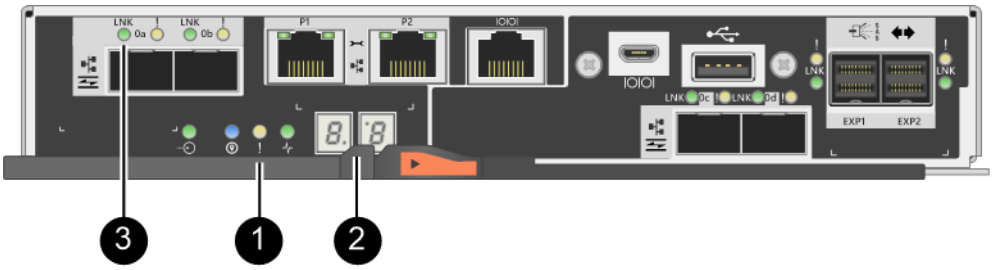
You complete the controller replacement by placing the controller online and confirming that the storage array is working correctly. Then, you can collect support data and resume operations.

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 back 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)

   Attention: Possible loss of data access – If the controller you just installed shows one 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, 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.

   Note: If you cannot resolve the problem, contact technical support.

4. If required, redistribute all volumes back to their preferred owner.

   a. Select **Storage > Volumes**.

   b. Select **More > Redistribute volumes**.

5. Click **Hardware > Support > Upgrade Center** to ensure that the latest version of SANtricity OS software (controller firmware) is installed.

   As needed, install the latest version.

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`.

Result

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

Replace controller in simplex configuration

You can replace a failed controller canister in a simplex configuration, which is a single-controller module configuration within the storage array. 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.

Steps

1. Prepare to replace controller (simplex) on page 49
   You 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.
2. Remove failed controller (simplex) on page 51
   You remove a controller canister to replace the failed canister with a new one. Perform this task only if your storage array has one controller (simplex configuration).
3. Install new controller (simplex) on page 56
   You install a new controller canister to replace the failed one. Perform this task only if your storage array has one controller (simplex configuration).
4. Complete controller replacement (simplex) on page 61
   You complete the controller replacement by powering on the controller shelf and confirming that it is working correctly. Then, you can collect support data and resume operations.

Related concepts

Controller overview on page 21
Requirements for replacing or adding a controller on page 22

Prepare to replace controller (simplex)

You 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.

About this task

This task describes how to prepare to replace a controller canister in the simplex version (one controller) for the following controller shelves:

- E2812 controller shelf
- E2824 controller shelf

- EF280 flash array

Perform this task only if your storage array has one controller (simplex configuration).

Steps

1. If possible, make a note of which version of SANtricity OS software is currently installed on the controller, by selecting **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.

   Attention: 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.

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

   a. Open the Enterprise Management Window (EMW) for SANtricity Storage Manager on your management station.

   b. Select the storage array.

   c. Select **Tools > Execute Script**.

   d. Type the following command in the text box.

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

   In this command, *filename* is the file path and file name to which you want to save the database. Enclose the file name in double quotation marks (" "). For example:

   ```
   file="C:\Program Files\CLI\logs\dbmdata.zip"
   ```

   This command does not automatically append a file extension to the saved file. You must specify a file extension when entering the file name.

   e. Select **Tools > Verify and Execute**.
4. 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`.

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.

   Note: 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.

   Attention: 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.

After you finish

Go to *Remove failed controller (simplex)* on page 51.

Remove failed controller (simplex)

You remove a controller canister to replace the failed canister with a new one. Perform this task only if your storage array has one controller (simplex configuration).

Steps

1. Remove controller canister (simplex) on page 52
   When you remove a controller canister, you must disconnect all cables. Then, you can slide the controller canister out of the controller shelf.
2. Remove battery (simplex) on page 53
   After removing the controller canister from the controller shelf, you can remove the battery.
3. Remove host interface card (simplex) on page 55
   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.

Remove controller canister (simplex)

When you remove a controller canister, you must disconnect all cables. Then, you can slide the controller canister out of the controller shelf.

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.

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

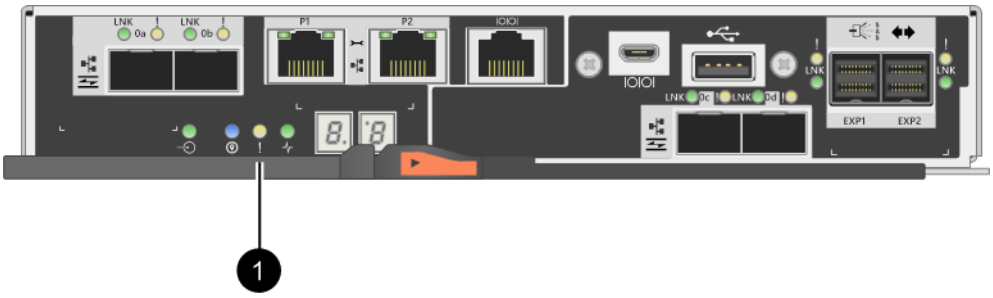
4. If the HIC ports on the controller canister use SFP+ transceivers, remove the SFPs.

   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.

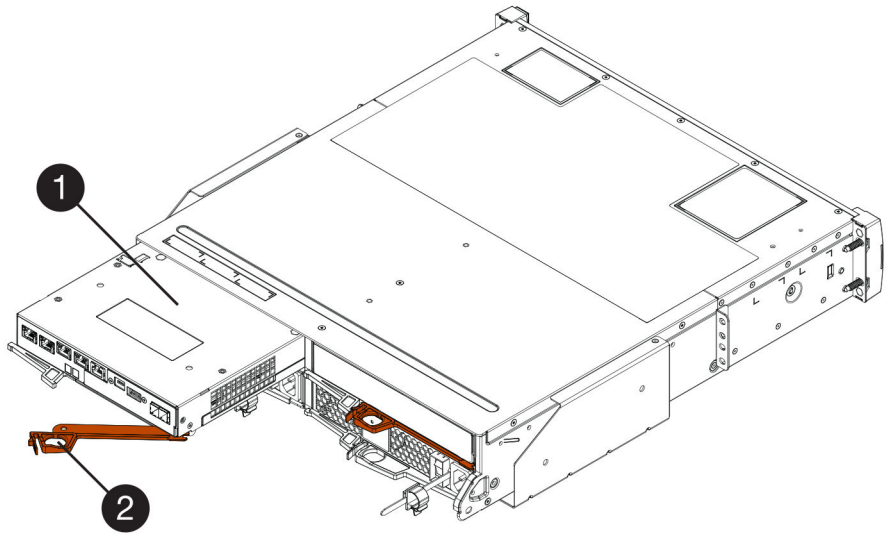
   The green Cache Active LED on the back of the controller is on when cached data needs to be written to the drives. You must wait for this LED to turn off before removing the controller canister.

   Note: 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.

   Attention: 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.

After you finish

Go to *Remove battery (simplex)* on page 53.

Remove battery (simplex)

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

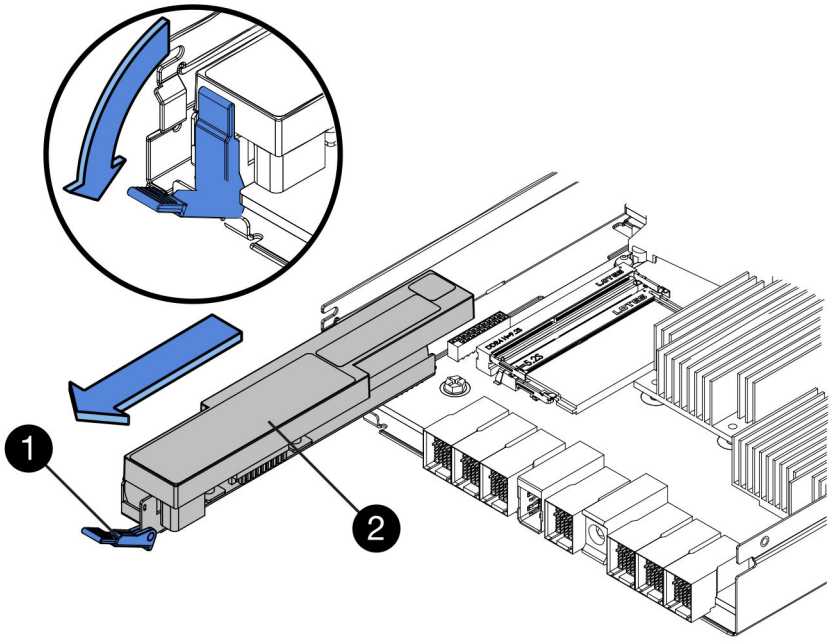
Steps

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 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.

After you finish

Go to *Remove host interface card (simplex)* on page 55.

Remove host interface card (simplex)

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.

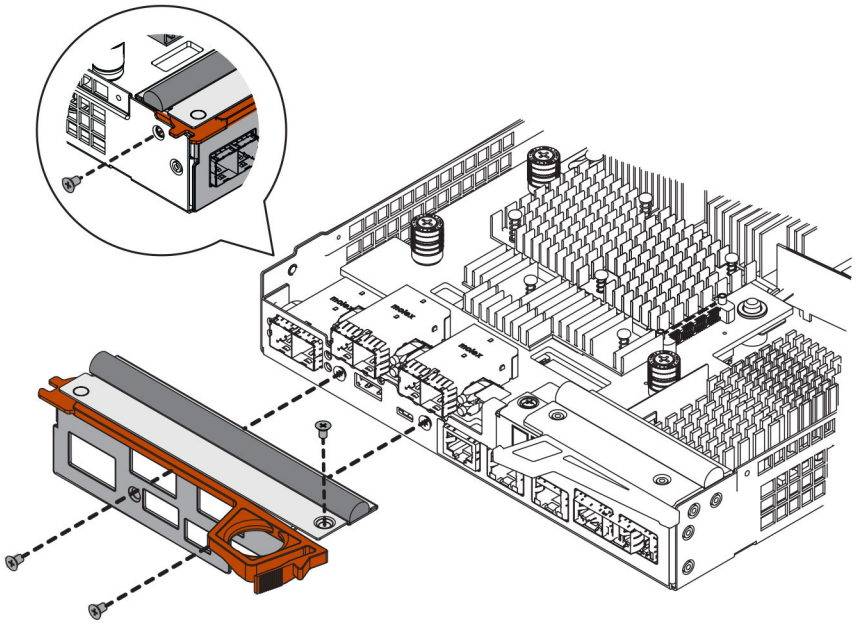
Before you begin

- You must have a replacement controller canister with the same part number as the controller canister you are replacing.
- You have an ESD wristband, or you have taken other antistatic precautions.
- You must use labels to identify each cable that is connected to the controller canister.
- You must have a #1 Phillips screwdriver.

Steps

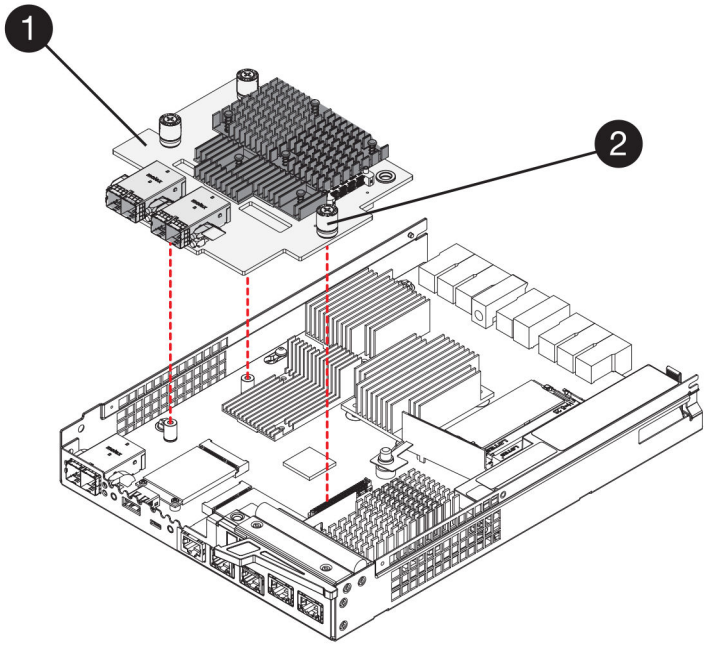
1. Using a #1 Phillips screwdriver, remove the screws that attach the HIC faceplate to the controller canister.

   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.

   Attention: 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.

After you finish

Go to *Install new controller (simplex)* on page 56.

Install new controller (simplex)

You install a new controller canister to replace the failed one. Perform this task only if your storage array has one controller (simplex configuration).

Install battery (simplex)

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.

Before you begin

- You have the battery from the original controller canister.
- You have the replacement controller canister.

Steps

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

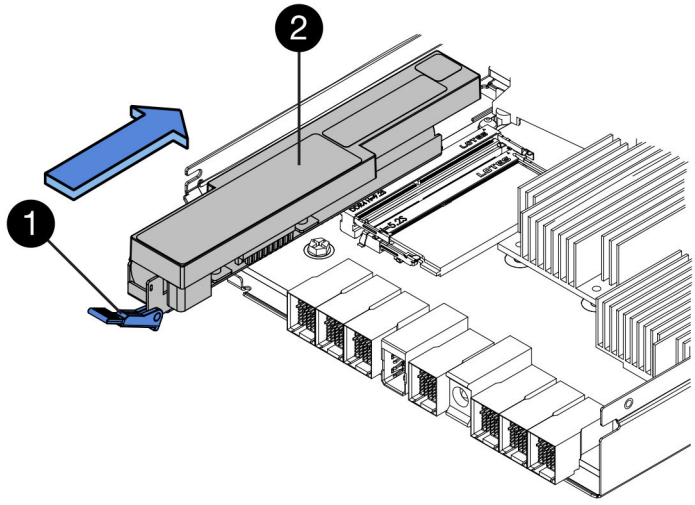
   Save the packing materials to use when shipping the failed controller canister.

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.



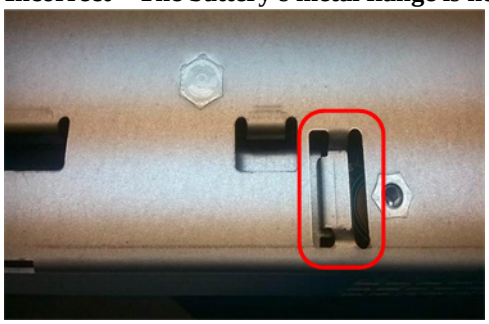
1 Battery release latch 2 Battery

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

   Attention: 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:**



After you finish

Go to *Install host interface card (simplex)* on page 58.

Install host interface card (simplex)

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

Before you begin

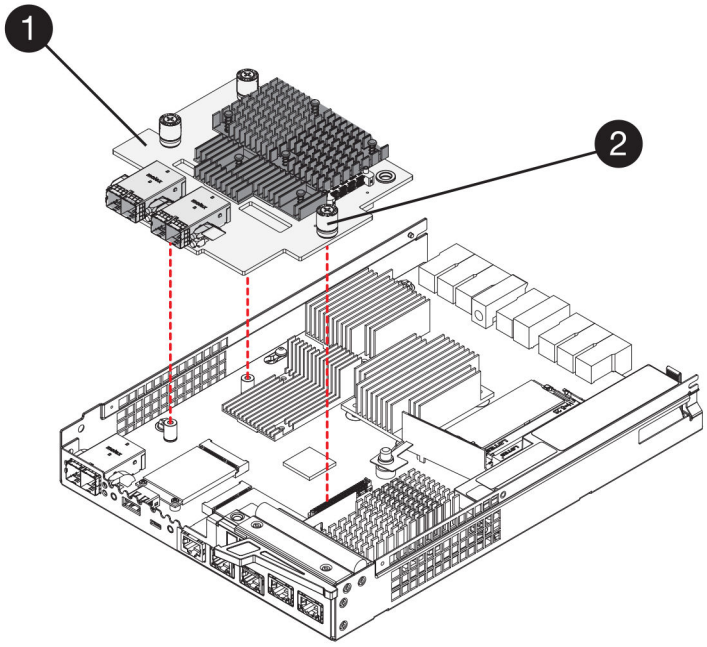
- You must have a #1 Phillips screwdriver.
- You have an ESD wristband, or you have taken other antistatic precautions.

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.

   Attention: Possible equipment damage – Be very careful not to pinch the gold ribbon connector for the controller LEDs between the HIC and the thumbscrews.

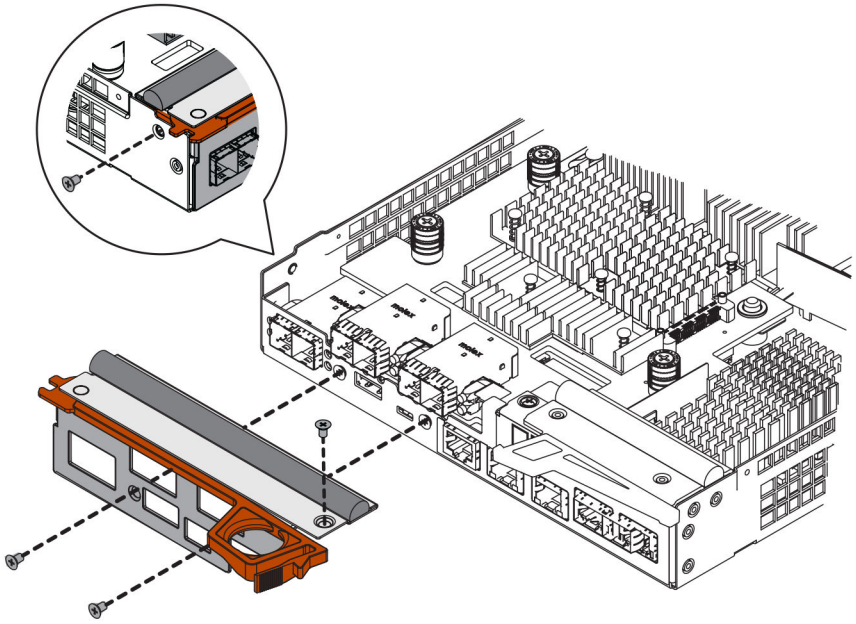


1 Host interface card (HIC) 2 Thumbscrews

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.



After you finish

Go to *Install new controller canister (simplex)* on page 60.

Install new controller canister (simplex)

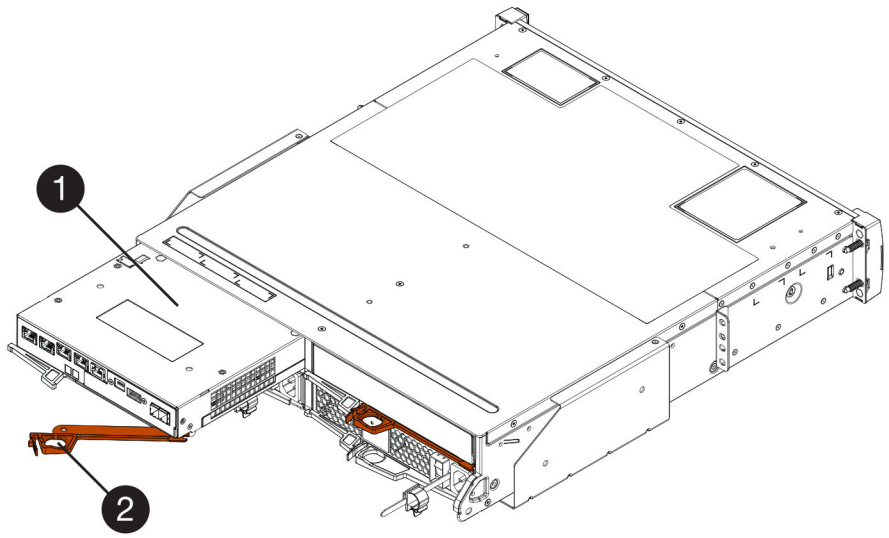
After installing the battery and the HIC, if one was initially installed, you can install the new controller canister into the controller shelf.

Before you begin

- You must have a replacement controller canister with the same part number as the controller canister you are replacing.

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.
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.

After you finish

Go to *Complete controller replacement (simplex)* on page 61.

Complete controller replacement (simplex)

You complete the controller replacement by powering on the controller shelf and confirming that it is working correctly. Then, you can collect support data and resume operations.

Before you begin

- You must have installed SANtricity Storage Manager on a management station, so you can use the storage array's command line interface (CLI).

About this task

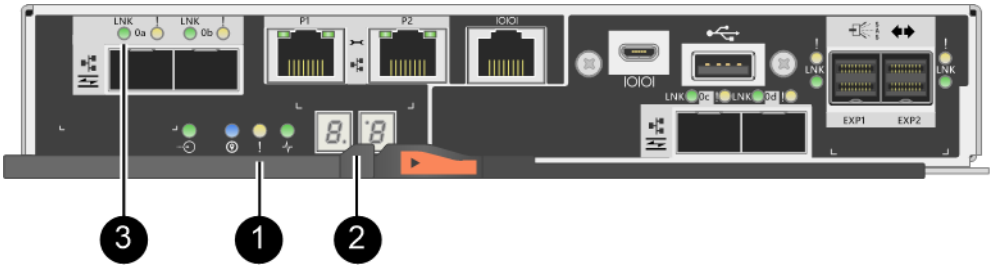
If all drives in your storage array are security enabled, you must use the Enterprise Management Window (EMW) in SANtricity Storage Manager to unlock the secured drives. You cannot access the storage array until you unlock the drives with the saved key.

Steps

1. 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.
2. 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.

  Note: 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.

   Note: If you cannot resolve the problem, contact technical support.

4. If the storage array has secured drives, import the drive security key; otherwise, go to the next step.

   If the storage array has only secured drives (no unsecured drives):

   a. Open the Enterprise Management Window (EMW) in SANtricity Storage Manager on your local host.

   b. From the EMW, access the new controller.

      - If you have a DHCP server, you must associate the MAC address on the label for the replacement controller with the DNS/network and IP address for the controller you removed.
      - If you use static IP addressing, you must set the IP address for the new controller.

   c. Select the storage array, and then select **Tools > Execute Script**.

   d. Type the following command in the text box to import the security key:

      ```
      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.

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

If the storage array has a mix of secured and unsecured drives:

a. Select **Settings > System**.

b. In the Security key management section, select **Create/Change Key** to create a new security key.

c. Select **Unlock Secure Drives** to import the security key you saved.

d. Run the `set allDrives nativeState` SMcli command.

e. Reset the controller using SANtricity System Manager.

f. Wait for the controller to boot up.

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

Note: *Unsecured 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 Drive Security. *Secured drives* are assigned drives that are a part of a secured volume group or disk pool using Drive Security.

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. 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`.

Result

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

Canisters

Canisters consist of three different types: power-fan canisters (power supplies) that supply a redundant power source and adequate cooling in a 12-drive or 24-drive controller shelf or drive shelf; power canisters that are used for power redundancy in a 60-drive controller shelf or drive shelf; and fan canisters that are used for cooling the 60-drive controller shelf or drive shelf.

Overview and requirements

Before you replace a canister, you need to be aware of canister types and requirements.

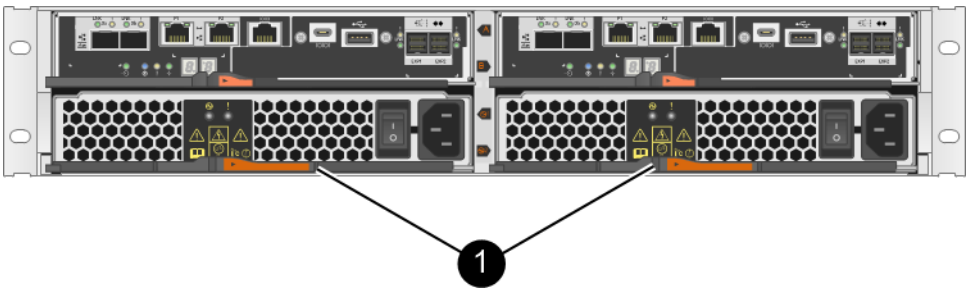
Power supply overview

Each 12-drive or 24-drive controller shelf or drive shelf includes two power supplies with integrated fans. These are referred to as *power-fan canisters* in SANtricity System Manager. If a power-fan canister fails, you must replace it as soon as possible to ensure that the shelf has a redundant power source and adequate cooling.

You replace a power supply in the following shelves:

- E2812 controller shelf
- E2824 controller shelf
- EF280 flash array
- DE212C drive shelf
- DE224C drive shelf

The following figure shows an example E2812 controller shelf, E2824 controller shelf, and EF280 flash array with two power supplies (power-fan canisters). The DE212C and DE224C drive shelves are identical, but they include I/O modules (IOMs) instead of controller canisters.



1 Controller shelf with two power supplies (power-fan canisters) below the controller canisters.

The *Replace power supply* topics do not describe how to replace a failed power-fan canister in a DE1600 or DE5600 drive tray, which might be connected to the E5700 or E2800 controller shelves. For instructions for those drive tray models, refer to *Replacing a Power-Fan Canister in the DE1600 Drive Tray or the DE5600 Drive Tray*, available from the *NetApp E-Series and SANtricity 11 Documentation Center*.

Power canister overview

Each 60-drive controller shelf or drive shelf includes two power canisters for power redundancy.

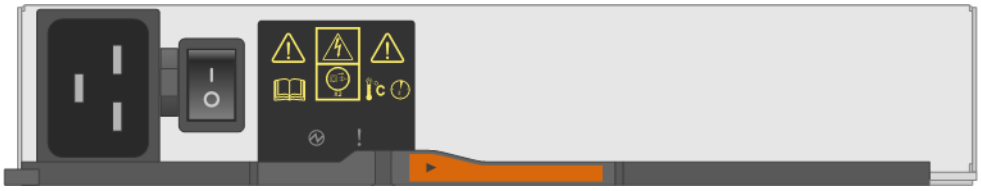
You can replace a power canister in the following shelves:

- E2860 controller shelves
- DE460C drive shelf

The *Replace power canister* topics do not describe how to replace a failed power canister in a DE6600 drive tray, which might be connected to the controller shelf.

The following figure shows the back of a DE460C drive shelf with the two power canisters:

The following figure shows a power canister:



Fan canister overview

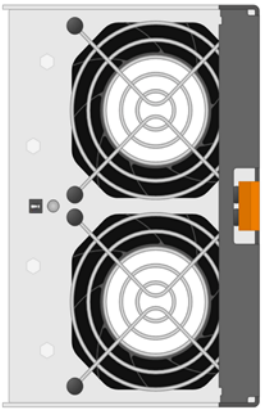
Each 60-drive controller shelf or drive shelf includes two fan canisters.

You can replace a fan canister in the following shelves:

- E2860 controller shelves
- DE460C drive shelf

The *Replace fan canister* topics do not describe how to replace a failed fan canister in a DE6600 drive tray, which might be connected to the controller shelf.

The following figure shows a fan canister:



The following figure shows the back of a DE460C shelf with two fan canisters:

Attention: Possible equipment damage — If you replace a fan canister with the power turned on, you must complete the replacement procedure within 30 minutes to prevent the possibility of overheating the equipment.

Requirements for replacing a power supply

If you plan to replace a power supply, keep the following requirements in mind.

- You must have a replacement power supply (power-fan canister) that is supported for your controller shelf or drive shelf model.
- You have an ESD wristband, or you have taken other antistatic precautions.
- You can replace a power supply (power-fan canister) while your storage array is powered on and performing host I/O operations, as long as the following conditions are true:
  - The second power supply (power-fan canister) in the shelf has an 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.

    Attention: If the second power supply (power-fan canister) in the shelf does not have Optimal status or if the Recovery Guru indicates that it is not OK to remove the power-fan canister, contact technical support.

Requirements for replacing a power canister

If you plan to replace a power canister, keep the following requirements in mind.

- You have a replacement power canister that is supported for your controller shelf or drive shelf model.
- You have one power canister that is installed and running.
- You have an ESD wristband, or you have taken other antistatic precautions.
- You can replace a power canister while your storage array is powered on and performing host I/O operations, as long as the following conditions are true:
  - The other power canister in the shelf has Optimal status.

    Note: While you perform the procedure, the other power canister supplies power to both fans to ensure that the equipment does not overheat.

  - 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.

    Attention: If the second power canister in the shelf does not have Optimal status or if the Recovery Guru indicates that it is not OK to remove the power canister, contact technical support.

Related concepts

Power canister overview on page 65
Requirements for replacing a power canister on page 67

Requirements for replacing a fan canister

If you plan to replace a fan canister, keep the following requirements in mind.

- You have a replacement fan canister (fan) that is supported for your controller shelf or drive shelf model.
- You have one fan canister that is installed and running.
- You have an ESD wristband, or you have taken other antistatic precautions.
- If you perform this procedure with the power turned on, you must complete it within 30 minutes to prevent the possibility of overheating the equipment.
- You can replace a fan canister while your storage array is powered on and performing host I/O operations, as long as the following conditions are true:
  - The second fan canister in the shelf has an 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.

    Attention: If the second fan canister in the shelf does not have Optimal status or if the Recovery Guru indicates that it is not OK to remove the fan canister, contact technical support.

Replace power supply (12-drive or 24-drive)

Each 12-drive or 24-drive controller shelf or drive shelf includes two power supplies with integrated fans. These are referred to as *power-fan canisters* in SANtricity System Manager. If a power-fan canister fails, you must replace it as soon as possible to ensure that the shelf has a redundant power source and adequate cooling.

Steps

1. Prepare to replace power supply on page 68
   You prepare to replace a power supply in a 12-drive or 24-drive controller shelf or drive shelf by collecting support data about your storage array and locating the failed component. The power supply is referred to as a power-fan canister in SANtricity System Manager.
2. Remove failed power supply on page 70
   You remove a failed power supply so you can replace it with a new one. When you remove a power supply (referred to in SANtricity System Manager as a *power-fan canister*), you turn off power, disconnect the power cord, and slide the part out of the shelf.
3. Install new power supply on page 71
   You install a new power supply to replace the failed one. When you install a power supply (referred to in SANtricity System Manager as a *power-fan canister*), you slide the part into the shelf, close the cam handle, reconnect the power cord, and reapply power.
4. Complete power supply replacement on page 72
   You complete the power supply replacement by confirming that the new power supply (referred to in SANtricity System Manager as a *power-fan canister*) is working correctly. Then, you can gather support data and resume normal operations.

Related concepts

Power supply overview on page 64
Requirements for replacing a power supply on page 66

Prepare to replace power supply

You prepare to replace a power supply in a 12-drive or 24-drive controller shelf or drive shelf by collecting support data about your storage array and locating the failed component. The power supply is referred to as a power-fan canister in SANtricity System Manager.

Before you begin

- You have reviewed 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.
- You have checked that the amber Attention LED on the power supply is on, indicating that the power supply or its integrated fan has a fault. Contact technical support for assistance if both power supplies in the shelf have their amber Attention LEDs on.

About this task

This task describes how to prepare to replace a power supply for the following controller shelves:

- E2812 controller shelf
- E2824 controller shelf

- EF280 flash array
- DE212C drive shelf
- DE224C drive shelf

You can replace a power supply while your storage array is powered on and performing host I/O operations, as long as the second power supply in the shelf has an Optimal status and the **OK to remove** field in the Details area of the Recovery Guru in SANtricity System Manager displays **Yes**.

Steps

1. 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`.
2. From SANtricity System Manager, determine which power supply has failed.

   You can find this information in the Details area of the Recovery Guru, or you can review the information displayed for the shelf.

   a. Select **Hardware**.
   b. Look at the power and fan icons to the right of the **Shelf** drop-down lists to determine which shelf has the failed power supply.

      If a component has failed, either or both of these icons are red.
   c. When you find the shelf with a red icon, select **Show back of shelf**.
   d. Select either power supply.
   e. On the **Power Supplies** and **Fans** tabs, look at the statuses of the power-fan canisters, the power supplies, and the fans to determine which power supply must be replaced.

      A component with a **Failed** status must be replaced.

      Attention: If the second power supply canister in the shelf does not have **Optimal** status, do not attempt to hot-swap the failed power supply. Instead, contact technical support for assistance.
3. From the back of the storage array, look at the Attention LEDs to locate the power supply you need to remove.

   You must replace the power supply that has its Attention LED on.

Power LED: If it is **solid green**, the power supply is functioning correctly. If it is **Off**, the power supply failed, the AC switch is turned off, the AC power cord is not properly installed, or the AC power cord input voltage is not within margin (there is a problem at the source end of the AC power cord).

- Attention LED: If it is **solid amber**, the power supply or its integrated fan has a fault.

After you finish

Go to *Remove failed power supply* on page 70.

Remove failed power supply

You remove a failed power supply so you can replace it with a new one. When you remove a power supply (referred to in SANtricity System Manager as a *power-fan canister*), you turn off power, disconnect the power cord, and slide the part out of the shelf.

Before you begin

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

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.

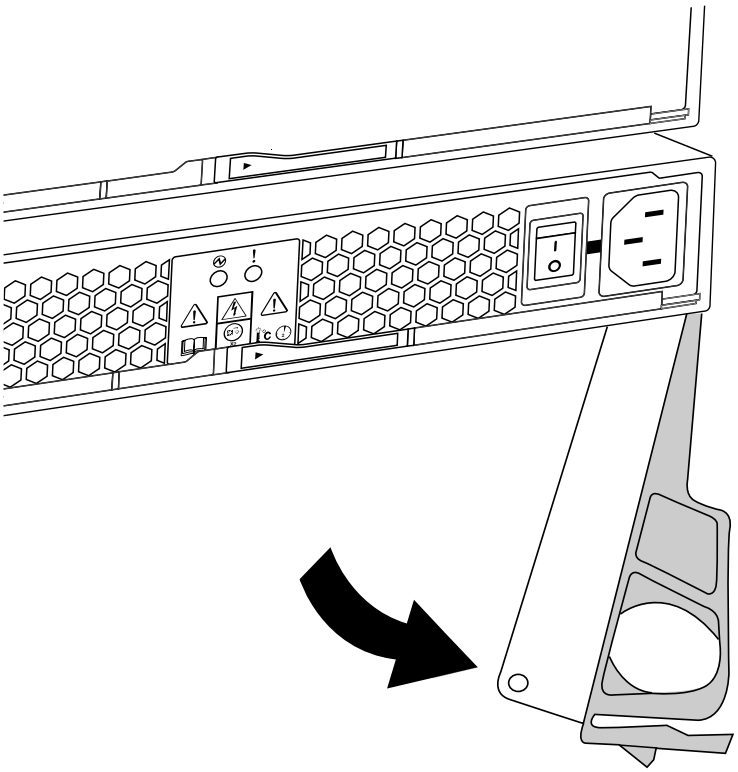
2. Turn off the power supply and disconnect the power cables:

   a. Turn off the power switch on the power supply.

   b. Open the power cord retainer, and then unplug the power cord from the power supply.

   c. Unplug the power cord from the power source.

3. Squeeze the latch on the power supply cam handle, and then open the cam handle to fully release the power supply from the mid plane.



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

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

   As you remove the power supply, a flap swings into place to block the empty bay, helping to maintain air flow and cooling.

After you finish

Go to *Install new power supply* on page 71.

Install new power supply

You install a new power supply to replace the failed one. When you install a power supply (referred to in SANtricity System Manager as a *power-fan canister*), you slide the part into the shelf, close the cam handle, reconnect the power cord, and reapply power.

Before you begin

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

Steps

1. Make sure that the on/off switch of the new power supply is in the **Off** position.

2. 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.

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

3. Close the cam handle so that the latch clicks into the locked position and the power supply is fully seated.
4. Reconnect the power supply cabling:
   a. Reconnect the power cord to the power supply and the power source.
   b. Secure the power cord to the power supply using the power cord retainer.
5. Turn on the power to the new power supply canister.

After you finish

Go to *Complete power supply replacement* on page 72.

Complete power supply replacement

You complete the power supply replacement by confirming that the new power supply (referred to in SANtricity System Manager as a *power-fan canister*) is working correctly. Then, you can gather support data and resume normal operations.

Steps

1. On the new power supply, check that the green Power LED is on and the amber Attention LED is OFF.
2. From the Recovery Guru in SANtricity System Manager, select **Recheck** to ensure the problem has been resolved.
3. If a failed power supply is still being reported, repeat the steps in *Remove power-fan canister* on page 70 and *Install power-fan canister* on page 71. If the problem continues to persist, contact technical support.
4. Remove the antistatic protection.
5. 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`.
6. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit.

Result

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

Replace power canister (60-drive)

Each 60-drive controller shelf or drive shelf includes two power canisters for power redundancy. If a power canister fails, you must replace it as soon as possible to ensure that the shelf has a redundant power source.

Steps

1. Prepare to replace power canister on page 73
   You prepare to replace a power canister in a 60-drive controller shelf or drive shelf by collecting support data about your storage array and locating the failed component.
2. Remove failed power canister on page 75
   You remove a failed power canister so you can replace it with a new one. When you remove a power canister, you turn off power, disconnect the power cord, and slide the component out of the shelf.
3. Install new power canister on page 75
   You install a new power canister to replace the failed one. When you install a power canister, you slide the component into the shelf, close the cam handle, reconnect the power cord, and reapply power.
4. Complete power canister replacement on page 76
   You complete the power canister replacement by confirming that the new power canister is working correctly. Then, you can gather support data and resume normal operations.

Related concepts

Power canister overview on page 65
Requirements for replacing a power canister on page 67

Prepare to replace power canister

You prepare to replace a power canister in a 60-drive controller shelf or drive shelf by collecting support data about your storage array and locating the failed component.

Before you begin

- From SANtricity System Manager, review the details in the Recovery Guru to confirm that there is an issue with the power canister and select **Recheck** from the Recovery Guru to ensure no other items must be addressed first.
- Check that the amber Attention LED on the power canister is on, indicating that the canister has a fault. Contact technical support for assistance if both power canisters in the shelf have their amber Attention LEDs on.

About this task

This task describes how to prepare to replace a power canister for the following controller shelves:

- E2860 controller shelf
- DE460C drive shelf

You can replace a power canister while your storage array is powered on and performing host I/O operations, as long as the second power canister in the shelf has an Optimal status and the **OK to remove** field in the Details area of the Recovery Guru in SANtricity System Manager displays **Yes**.

While you perform this task, the other power canister supplies power to both fans to ensure that the equipment does not overheat.

Steps

1. 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`.
2. From SANtricity System Manager, determine which power canister has failed.
   a. Select **Hardware**.
   b. Look at the power icon to the right of the **Shelf** drop-down lists to determine which shelf has the failed power canister.

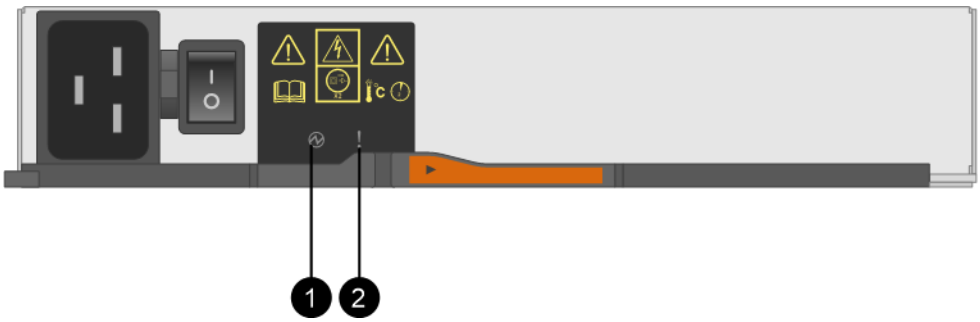
      If a component has failed, this icon is red.
   c. When you find the shelf with a red icon, select **Show back of shelf**.
   d. Select either power canister or the red power icon.
   e. On the **Power Supplies** tab, look at the statuses of the power canisters to determine which power canister must be replaced.

      A component with a **Failed** status must be replaced.

      Attention: If the second power canister in the shelf does not have **Optimal** status, do not attempt to hot-swap the failed power canister. Instead, contact technical support for assistance.

   Note: You can also find information about the failed power canister in the Details area of the Recovery Guru, or you can review the information displayed for the shelf, or you can review the Event Log under Support and filter by Component Type.
3. From the back of the storage array, look at the Attention LEDs to locate the power canister you need to remove.

   You must replace the power canister that has its Attention LED on.



1. Power LEDs. If it is **Solid green**, the power canister is functioning correctly. If it is **Off**, the power canister failed, the AC switch is turned off, the AC power cord is not properly installed, or the AC power cord input voltage is not within margin (there is a problem at the source end of the AC power cord).

2 Attention LED. If it is **Solid amber**, the power canister has a fault, or there is no input power to this power canister, but the other power canister is operating.

After you finish

Go to *Remove failed power canister* on page 75.

Remove failed power canister

You remove a failed power canister so you can replace it with a new one. When you remove a power canister, you turn off power, disconnect the power cord, and slide the component out of the shelf.

Before you begin

- You have one power canister that is installed and running.
- You have an ESD wristband, or you have taken other antistatic precautions.

Steps

1. Put on antistatic protection.
2. Unpack the new power canister, and set it on a level surface near the shelf.

   Save all packing materials for use when returning the failed power canister.
3. Turn off the power switch on the power canister that you need to remove.
4. Open the power cord retainer of the power canister that you need to remove, and then unplug the power cord from the power canister.
5. Press the orange latch on the power canister cam handle, and then open the cam handle to fully release the power canister from the mid plane.
6. Use the cam handle to slide the power canister out of the shelf.

   Attention: When removing a power canister, always use two hands to support its weight.

After you finish

Go to *Install new power canister* on page 75.

Install new power canister

You install a new power canister to replace the failed one. When you install a power canister, you slide the component into the shelf, close the cam handle, reconnect the power cord, and reapply power.

Before you begin

- You have a replacement power canister that is supported for your controller shelf or drive shelf model.
- You have checked that the on/off switch of the new power canister is in the Off position.

Steps

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

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

2. Close the cam handle so that the latch clicks into the locked position and the power canister is fully seated.
3. Reconnect the power cord to the power canister, and secure the power cord to the power canister using the power cord retainer.
4. Turn on the power to the new power canister.

After you finish

Go to *Complete power canister replacement* on page 76.

Complete power canister replacement

You complete the power canister replacement by confirming that the new power canister is working correctly. Then, you can gather support data and resume normal operations.

Steps

1. On the new power canister, check that the green Power LED is on and the amber Attention LED is OFF.
2. From the Recovery Guru in SANtricity System Manager, select **Recheck** to ensure the problem has been resolved.
3. If a failed power canister is still being reported, repeat the steps in *Remove failed power canister* on page 75 and *Install new power canister* on page 75. If the problem continues to persist, contact technical support.
4. Remove the antistatic protection.
5. 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`.
6. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit.

Result

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

Replace fan canister (60-drive)

Each 60-drive controller shelf or drive shelf includes two fan canisters. If a fan canister fails, you must replace it as soon as possible to ensure that the shelf has adequate cooling.

Steps

1. Prepare to replace fan canister on page 77
   You prepare to replace a fan canister in a 60-drive controller shelf or drive shelf by collecting support data about your storage array and locating the failed component.

2. Remove failed fan canister and install new one on page 78
   You remove a failed fan canister so you can replace it with a new one.
3. Complete fan canister replacement on page 80
   You complete the fan canister replacement by confirming that the new fan canister is working correctly. Then, you can gather support data and resume normal operations.

Related concepts

Fan canister overview on page 65
Requirements for replacing a fan canister on page 67

Prepare to replace fan canister

You prepare to replace a fan canister in a 60-drive controller shelf or drive shelf by collecting support data about your storage array and locating the failed component.

Before you begin

- From SANtricity System Manager, review the details in the Recovery Guru to confirm that there is an issue with the fan canister and select **Recheck** from the Recovery Guru to ensure no other items must be addressed first.
- Check that the amber Attention LED on the fan canister is on, indicating that the fan has a fault. Contact technical support for assistance if both fan canisters in the shelf have their amber Attention LEDs on.

About this task

This task describes how to prepare to replace a fan canister for the following controller shelves:

- E2860 controller shelf
- DE460C drive shelf

Attention: Possible equipment damage — If you perform this procedure with the power turned on, you must complete it within 30 minutes to prevent the possibility of overheating the equipment.

Steps

1. 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`.
2. From SANtricity System Manager, determine which fan canister has failed.
   a. Select **Hardware**.
   b. Look at the fan icon to the right of the **Shelf** drop-down lists to determine which shelf has the failed fan canister.

      If a component has failed, this icon is red.
   c. When you find the shelf with a red icon, select **Show back of shelf**.
   d. Select either fan canister or the red fan icon.

e. On the **Fans** tab, look at the statuses of the fan canisters to determine which fan canister must be replaced.

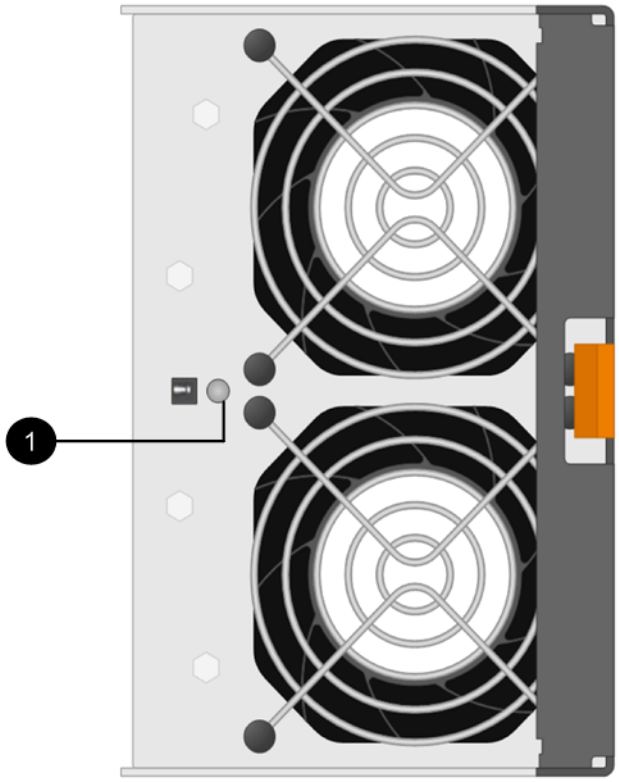
A component with a **Failed** status must be replaced.

Attention: If the second fan canister in the shelf does not have **Optimal** status, do not attempt to hot-swap the failed fan canister. Instead, contact technical support for assistance.

You can also find information about the failed fan canister in the Details area of the Recovery Guru, or you can review the Event Log under Support and filter by Component Type.

3. From the back of the storage array, look at the Attention LEDs to locate the fan canister you need to remove.

You must replace the fan canister that has its Attention LED on.



1 Attention LED. If this LED displays as **Solid amber**, then the fan has a fault.

After you finish

Go to *Remove failed power canister and install new one* on page 78.

Remove failed fan canister and install new one

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

Before you begin

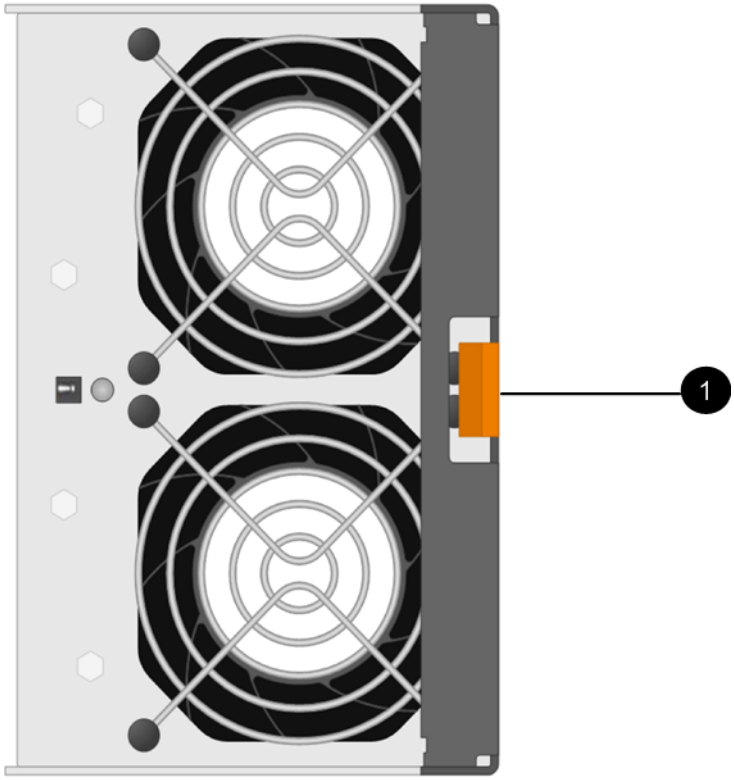
- If you do not turn off the power to your storage array, ensure that you remove and replace the fan canister within 30 minutes to prevent the system from overheating.
- You have an ESD wristband, or you have taken other antistatic precautions.

Steps

1. Unpack the new fan canister, and place it on a level surface near the shelf.

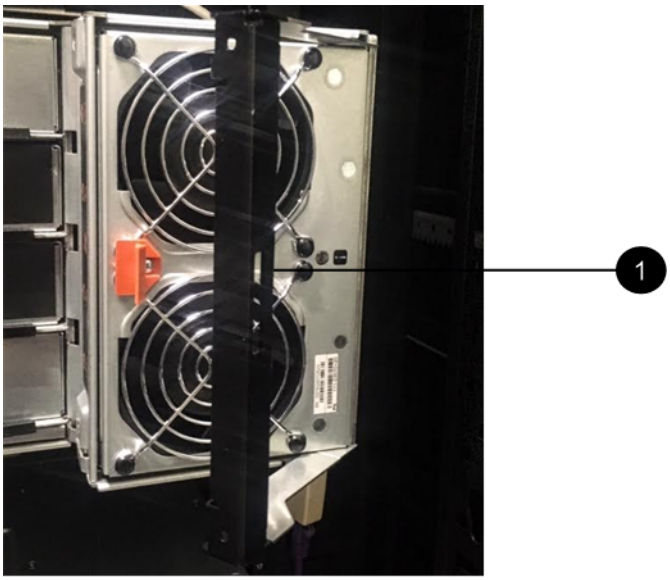
   Save all packing material for use when returning the failed fan.

2. Press the orange tab to release the fan canister handle.



1 Tab that you press to release the fan canister handle.

3. Use the fan canister handle to pull the fan canister out of the shelf.



1 Handle to pull the fan canister out.

4. Slide the replacement fan canister all the way into the shelf, and then move the fan canister handle until it latches with the orange tab.

After you finish

Go to *Complete fan canister replacement* on page 80.

Complete fan canister replacement

You complete the fan canister replacement by confirming that the new fan canister is working correctly. Then, you can gather support data and resume normal operations.

Steps

1. Check the amber Attention LED on the new fan canister.

   Note: After you replace the fan canister, the Attention LED stays on (solid amber) while the firmware checks that the fan canister was installed correctly. The LED goes off after this process is complete.

2. From the Recovery Guru in SANtricity System Manager, select **Recheck** to ensure the problem has been resolved.
3. If a failed fan canister is still being reported, repeat the steps in *Remove failed fan canister and install new one* on page 78. If the problem persists, contact technical support.
4. Remove the antistatic protection.
5. 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`.
6. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit.

Result

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

Drives

A drive is an electromagnetic mechanical device that provides the physical storage media for data.

Overview and requirements

Before you replace a drive, you need to be aware of certain requirements and considerations.

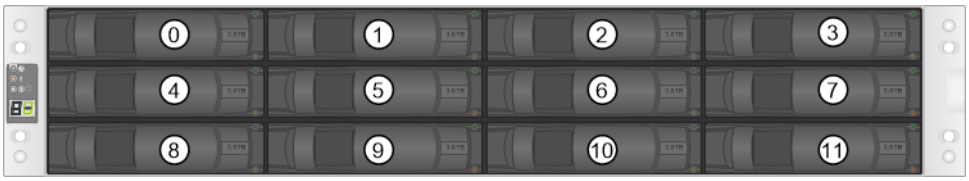
Drives overview

You can replace a drive in either a 12-drive, 24-drive, or 60-drive controller shelf or drive shelf.

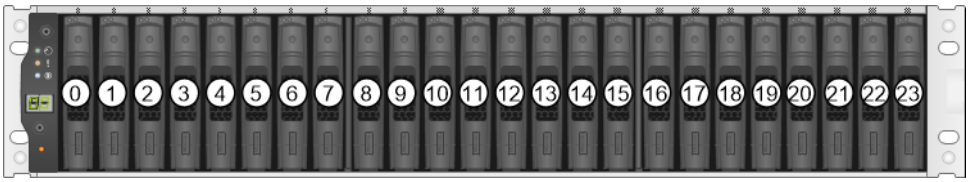
12-drive or 24-drive shelves

The figures show how the drives are numbered in each type of shelf (the shelf's front bezel or end caps have been removed).

Drive numbering in an E2812 controller shelf or DE212C drive shelf



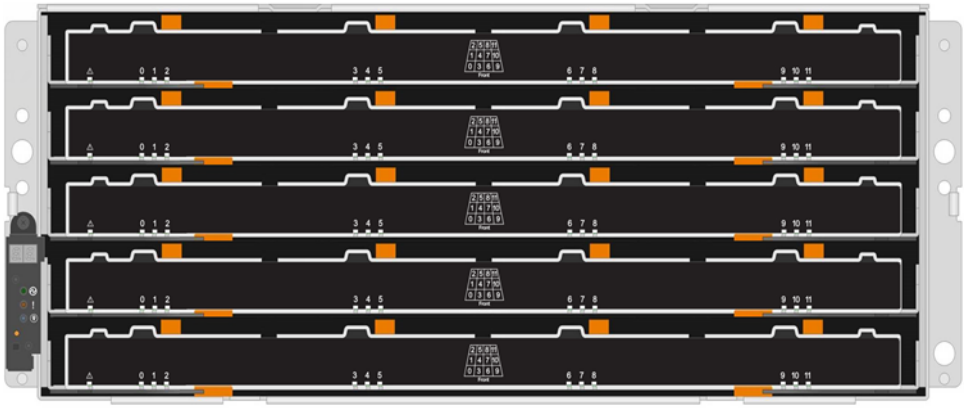
Drive numbering in an E2824 controller shelf, EF280 flash array, or DE224C drive shelf



Note: Your E2812, E2824, EF280 storage array might include one or more SAS-2 legacy expansion drive trays, including the DE1600 12-drive tray, the DE5600 24-drive tray, or the DE6600 60-drive tray. For instructions for replacing a drive in one of these drive trays, see *Replacing a Drive in E2660, E2760, E5460, E5560, or E5660 Trays* and *Replacing a Drive in E2600, E2700, E5400, E5500, and E5600 12-Drive or 24-Drive Trays*.

60-drive shelves

Both the E2860 controller shelf and the DE460C drive shelf consist of five drive drawers that each contain 12 drive slots. Drive drawer 1 is at the top, and drive drawer 5 is at the bottom.

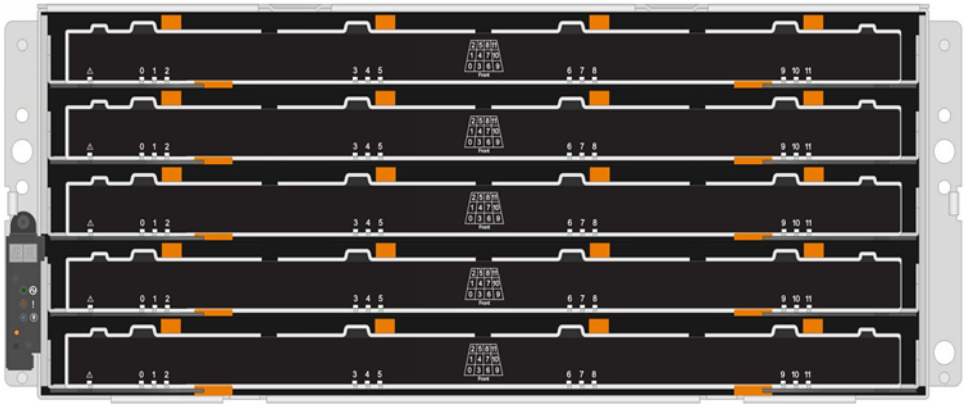


For both an E2860 controller shelf drawer and a DE460C drive shelf drawer, drives are numbered from 0 to 11 in each drive drawer within the shelf.

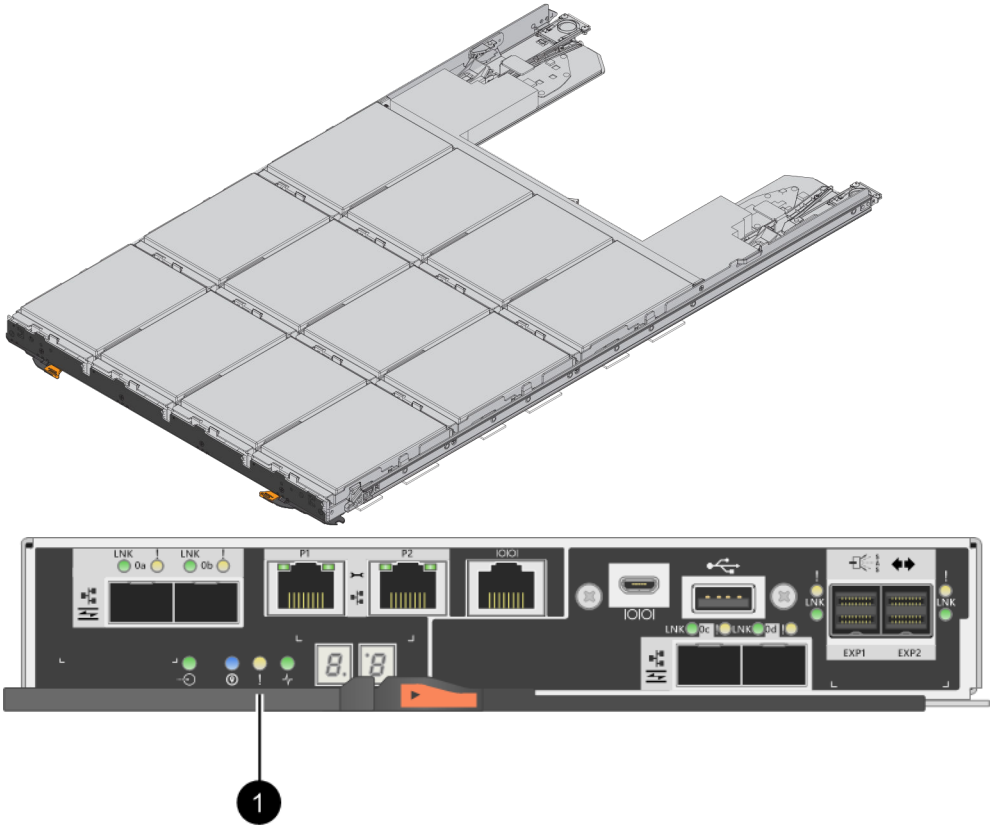
Note: Your E2860 storage array might include one or more SAS-2 legacy expansion drive trays, including the DE1600 12-drive tray, the DE5600 24-drive tray, or the DE6600 60-drive tray. For instructions for replacing a drive in one of these drive trays, see *Replacing a Drive in E2660, E2760, E5460, E5560, or E5660 Trays* and *Replacing a Drive in E2600, E2700, E5400, E5500, and E5600 12-Drive or 24-Drive Trays*.

Drive drawer overview

You can replace a drive drawer in a E2860 controller shelf and a DE460C drive shelf. Each of these 60-drive shelves has five drive drawers.



Each of the five drawers can hold up to 12 drives.



Requirements for handling drives

The drives in your storage array are fragile. Improper drive handling is a leading cause of drive failure.

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.

  - Do not insert a metal tool or knife into the ESD bag.
    Open the ESD bag by hand or cut the top off with a pair of scissors.
  - 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 30 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.

Replace drive (12-drive or 24-drive)

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.

Steps

1. Prepare to replace drive (12-drive or 24-drive) on page 85
   You 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.
2. Remove failed drive (12-drive or 24-drive) on page 85
   You remove a failed drive to replace it with a new one.
3. Install new drive (12-drive or 24-drive) on page 86
   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.
4. Complete drive replacement (12-drive or 24-drive) on page 87
   You complete the drive replacement to confirm that the new drive is working correctly.

Related concepts

Drives overview on page 81
Requirements for handling drives on page 83

Prepare to replace drive (12-drive or 24-drive)

You 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 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.

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

After you finish

Go to *Remove failed drive (12-drive or 24-drive)* on page 85.

Remove failed drive (12-drive or 24-drive)

You remove a failed drive to replace it with a new one.

Before you begin

- You have an ESD wristband, or you have taken other antistatic precautions.
- You have reviewed the *Requirements for handling drives* on page 83 topic.

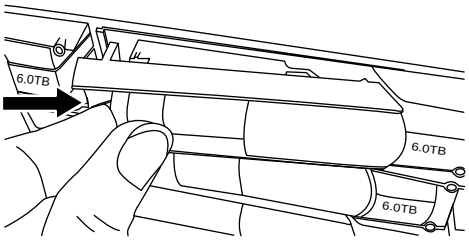
About this task

When you remove a drive, you must slide the drive partly out of the shelf and wait for the drive to spin down. Then, you can remove the drive completely.

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 E2812 controller shelves or DE212C drive shelves, the release button is located at the left of the drive.
- For drives in E2824 controller shelves, EF280 flash array, for 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 30 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 30 seconds for the software to recognize that the drive has been removed.

   Note: If you accidentally remove an active drive, wait at least 30 seconds, and then reinstall it. For the recovery procedure, refer to the storage management software.

After you finish

Go to *Install new drive (12-drive or 24-drive)* on page 86.

Install new drive (12-drive or 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.

Before you begin

- You have a replacement drive that is supported by NetApp for your controller shelf or drive shelf.

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.

   Note: 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.

After you finish

Go to *Complete drive replacement (12-drive or 24-drive)* on page 87.

Complete drive replacement (12-drive or 24-drive)

You 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 30 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:

   Note: 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.

Result

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

Replace drive (60-drive)

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.

Steps

1. Prepare to replace drive (60-drive) on page 88
   You 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.
2. Remove failed drive (60-drive) on page 90
   You remove a failed drive to replace it with a new one.

3. Install new drive (60-drive) on page 91
   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.
4. Complete drive replacement (60-drive) on page 92
   You complete the drive replacement to confirm that the new drive is working correctly.

Related concepts

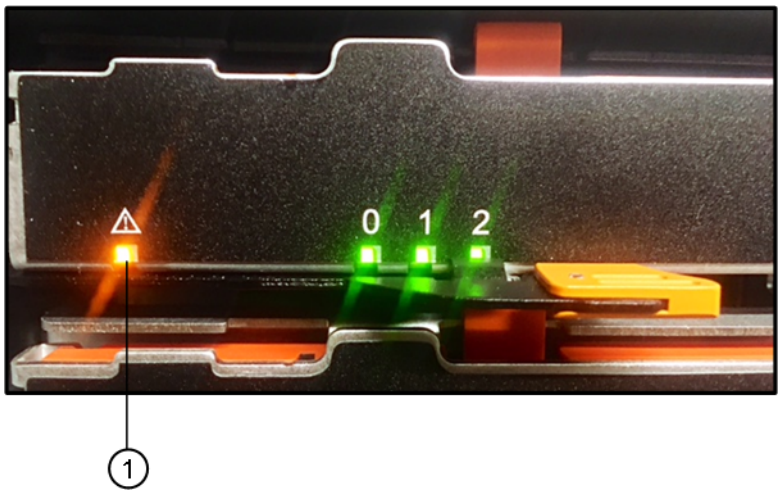
Drives overview on page 81
Requirements for handling drives on page 83

Prepare to replace drive (60-drive)

You 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

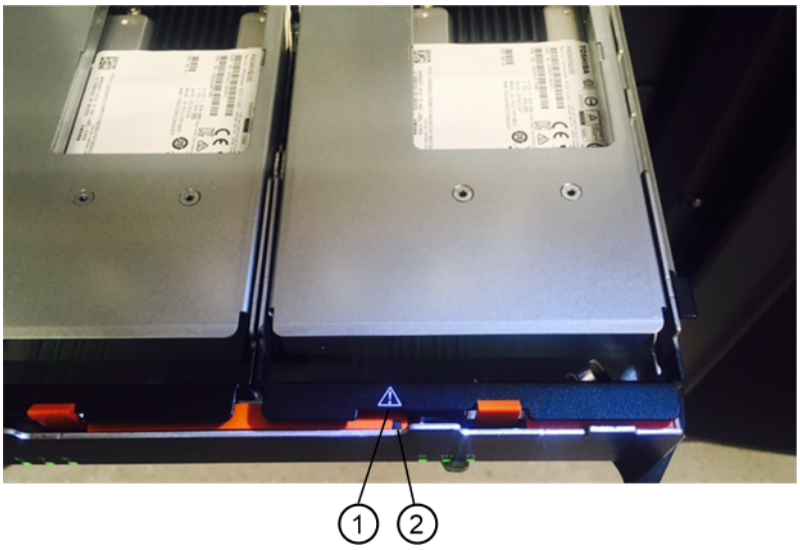
c. Unlatch the drive drawer by pulling on both levers.

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

After you finish

Go to *Remove failed drive (60-drive)* on page 90.

Remove failed drive (60-drive)

You remove a failed drive to replace it with a new one.

Before you begin

- You have an ESD wristband, or you have taken other antistatic precautions.
- You have reviewed the *Requirements for handling drives* on page 83 topic.

About this task

When you remove a drive from an E2860 controller shelf or a DE460C drive shelf, you must lift the drive partly out of the drawer and wait for the drive to spin down. Then, you can remove the drive completely.

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.

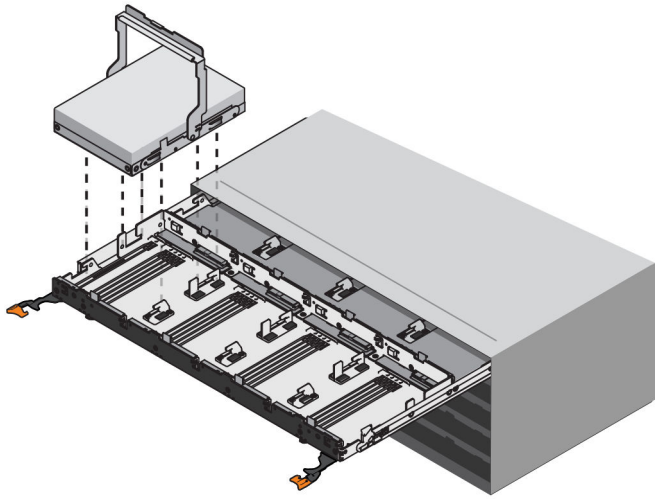
2. Release the drive drawer levers from the center of the appropriate drive drawer by pulling both towards the sides of the drawer.
3. Carefully pull on the extended drive drawer levers to pull out the drive drawer to its full extension without removing it from the enclosure.
4. Gently pull back the 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 30 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 30 seconds for the software to recognize that the drive has been removed.

   Note: If you accidentally remove an active drive, wait at least 30 seconds, and then reinstall it. For the recovery procedure, refer to the storage management software.

After you finish

Go to *Install new drive (60-drive)* on page 91.

Install new drive (60-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.

Before you begin

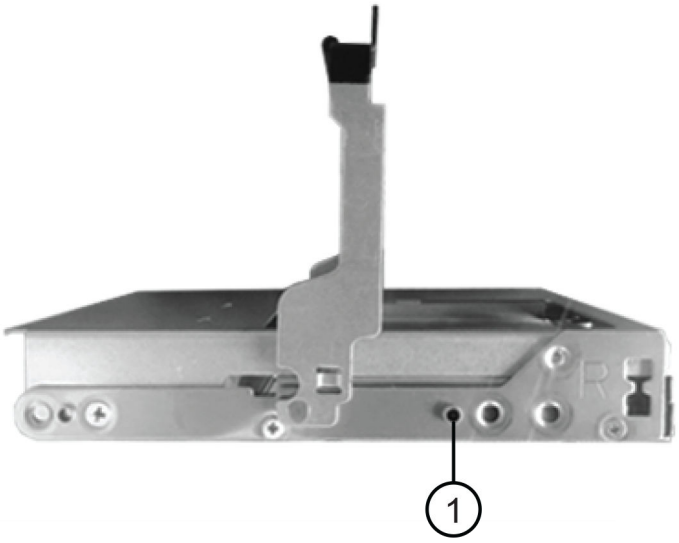
- You have a replacement drive that is supported by NetApp for your controller shelf or drive shelf.

About this task

Attention: 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.

After you finish

Go to *Complete drive replacement (60-drive)* on page 92.

Complete drive replacement (60-drive)

You 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 30 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:

   Note: 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.

Result

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

Replace drive drawer (60-drive)

The steps to replace a failed drive drawer in an E2860 controller shelf or a DE460C drive shelf depend on whether the volumes in the drawer are protected by Drawer Loss Protection. If all volumes in the drive drawer are in disk pools or volume groups that have Drawer Loss Protection, you can perform this procedure online. Otherwise, you must stop all host I/O activity and power off the shelf before replacing the drive drawer.

Steps

1. Prepare to replace drive drawer (60-drive) on page 94
   You prepare to replace a drive drawer by determining if you can perform the replacement procedure while the drive shelf is online or if you need to stop host I/O activity and power off any of the shelves that are powered on. If you are replacing a drawer in a shelf with Drawer Loss Protection, there is no need to stop host I/O activity and power off any of the shelves.
2. Remove cable chains on page 96
   You remove both cable chains so you can remove and replace a failed drive drawer. The left and right cable chains allow the drawers to slide in and out.
3. Remove failed drive drawer (60-drive) on page 101
   You remove a failed drive drawer to replace it with a new one. Removing a drive drawer entails sliding the drawer partially out, recording the locations of the drives, removing the drives, and removing the drive drawer.
4. Install new drive drawer (60-drive) on page 103
   You install a new drive drawer to replace the failed one. Installing a drive drawer into a drive tray entails sliding the drawer into the empty slot, installing the drives, and replacing the front bezel.
5. Attach cable chains on page 104
   You must attach the cable chains so you can safely re-install the drives in the drive drawer.
6. Complete drive drawer replacement on page 107
   You complete the drive drawer replacement by reinserting the drives and replacing the front bezel in the correct order.

Related concepts

Drive drawer overview on page 83
Requirements for handling drives on page 83

Prepare to replace drive drawer (60-drive)

You prepare to replace a drive drawer by determining if you can perform the replacement procedure while the drive shelf is online or if you need to stop host I/O activity and power off any of the shelves that are powered on. If you are replacing a drawer in a shelf with Drawer Loss Protection, there is no need to stop host I/O activity and power off any of the shelves.

Before you begin

- You must have installed SANtricity Storage Manager on a management station, so you can use the storage array's command line interface (CLI).
- The drive shelf must meet all of these conditions:
  - The drive shelf cannot be over temperature.
  - Both fans must be installed and have a status of Optimal.
  - All drive shelf components must be in place.
  - The volumes in the drive drawer cannot be in a Degraded state.

    Attention: Possible loss of data access – If a volume is already in a Degraded state, and you remove drives from the drive drawer, the volume can fail.

Steps

1. Determine if the drive shelf is powered on.
   - If the power is off, you do not need to issue the CLI command. Go to *Remove cable chains* on page 96.
   - If the power is on, go to the next step.
2. Type this command on the command line, and press **Enter**:

```
SMcli <ctlr_IP1> -p "array_password" -c "set tray [trayID] drawer
[drawerID]
serviceAllowedIndicator=on;"
```

   where:

   - *<ctlr_IP1>* is the identifier of the controller.
   - *array_password* is the password for the storage array. You must enclose the value for *array_password* in double quotation marks ("").
   - [*trayID*] is the identifier of the drive shelf that contains the drive drawer that you want to replace. Drive shelf ID values are 0 to 99. You must enclose the value for *trayID* in square brackets.
   - [*drawerID*] is the identifier of the drive drawer that you want to replace. Drawer ID values are 1 (top drawer) to 5 (bottom drawer). You must enclose the value for *drawerID* in square brackets.

Example

This command ensures you can remove the top-most drawer in drive shelf 10:

```
SMcli <ctlr_IP1> -p "safety-1" -c "set tray [10] drawer [1]
serviceAllowedIndicator=forceOnWarning;"
```

3. Determine if you need to stop host I/O activity, as follows:

   - If the command succeeds, you do not need to stop host I/O activity. All drives in the drawer are in pools or volume groups with Drawer Loss Protection. Go to *Remove cable chains* on page 96.

     Attention: Possible damage to drives – Wait 30 seconds after the command completes before you open the drive drawer. Waiting 30 seconds allows the drives to spin down, which prevents possible damage to the hardware.

   - If a warning is displayed indicating that this command could not be completed, you must stop host I/O activity before removing the drawer. The warning is displayed because one or more drives in the affected drawer are in pools or volume groups without Drawer Loss Protection. To avoid losing data, you must complete the next steps to stop host I/O activity and to power off the drive shelf and the controller shelf.

4. 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.

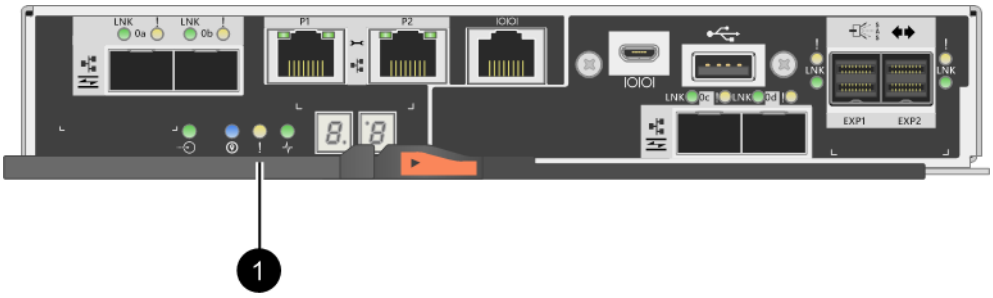
   Note: The exact steps to stop host I/O operations depend on the host operating system and the configuration, which are beyond the scope of these instructions. If you are not sure how to stop host I/O operations in your environment, consider shutting down the host.

5. If the storage array participates in a mirroring relationship, stop all host I/O operations on the secondary storage array.

   Attention: Possible data loss – If you continue this procedure while I/O operations are occurring, the host application might lose data because the storage array will not be accessible.

6. 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.



1 Cache Active LED

7. From the Home page of SANtricity System Manager, select **View Operations in Progress**.
8. Wait for all operations to complete before continuing with the next step.
9. Power off the shelves as follows:

   If you are replacing a drawer in a shelf **with** Drawer Loss Protection:

   There is NO need to power off any of the shelves.

   You can perform the replace procedure while the drive drawer is online, because the `Set Drawer Service Action Allowed Indicator` CLI command completed successfully.

   If you are replacing a drawer in a *controller* shelf **without** Drawer Loss Protection:

   a. Turn off both power switches on the controller shelf.

   Wait for all LEDs on the controller shelf to go dark.

   If you are replacing a drawer in an *expansion* drive shelf **without** Drawer Loss Protection:

   a. Turn off both power switches on the controller shelf.
   b. Wait for all LEDs on the controller shelf to go dark.
   c. Turn off both power switches on the drive shelf.

   Wait two minutes for drive activity to stop.

After you finish

Go to *Remove cable chains* on page 96.

Remove cable chains

You remove both cable chains so you can remove and replace a failed drive drawer. The left and right cable chains allow the drawers to slide in and out.

Before you begin

- You have issued the `Set Drawer Attention Indicator` CLI command, or you have stopped host I/O activity and powered off the drive shelf and controller shelf.
- You have an ESD wristband, or you have taken other antistatic precautions.
- You have a flashlight.

About this task

Each drive drawer has left and right cable chains. The metal ends on the cable chains slide into corresponding vertical and horizontal guide rails inside the enclosure, as follows:

- The left and right vertical guide rails connect the cable chain to the enclosure's midplane.
- The left and right horizontal guide rails connect the cable chain to the individual drawer.

Attention: Possible hardware damage — If the drive tray is powered on, the cable chain is energized until both ends are unplugged. To avoid shorting out the equipment, do not allow the unplugged cable chain connector to touch the metal chassis if the other end of the cable chain is still plugged in.

Steps

1. From the rear of the drive shelf, remove the right fan canister:

a. Press the orange tab to release the fan canister handle.

The figure shows the handle for the fan canister extended and released from the orange tab on the left.

1 Fan canister handle

b. Using the handle, pull the fan canister out of the drive tray, and set it aside.

c. If the tray is powered on, ensure that the left fan goes to its maximum speed.

Attention: Possible equipment damage due to overheating – If the tray is powered on, do not remove both fans at the same time. Otherwise, the equipment might overheat.

2. Determine which cable chain to disconnect:

- If the power is on, the amber Attention LED on the front of the drawer indicates the cable chain you need to disconnect.
- If the power is off, you must manually determine which of the five cable chains to disconnect.

The figure shows the right side of the drive shelf with the fan canister removed. With the fan canister removed, you can see the five cable chains and the vertical and horizontal connectors for each drawer.

The top cable chain is attached to drive drawer 1. The bottom cable chain is attached to drive drawer 5. The callouts for drive drawer 1 are provided.

❶ Cable chain ❷ Vertical connector (connected to midplane) ❸ Horizontal connector (connected to drawer)

3. For easy access, use your finger to move the cable chain on the right side to the left.
4. Disconnect any of the right cable chains from their corresponding vertical guide rail.
   a. Using a flashlight, locate the orange ring on the end of the cable chain that is connected to the vertical guide rail in the enclosure.

1 Orange ring on vertical guide rail 2 Cable chain, partially removed

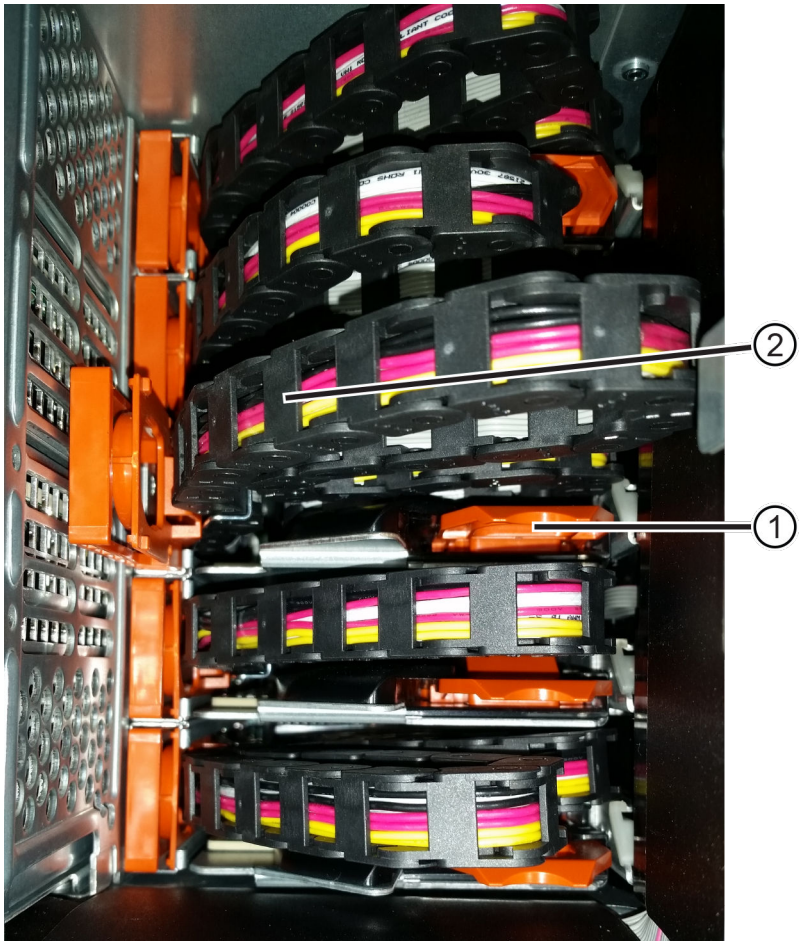
b. To unlatch the cable chain, insert your finger into the orange ring and press towards the middle of the system.

c. To unplug the cable chain, carefully pull your finger toward you approximately 1 inch (2.5 cm). Leave the cable chain connector within the vertical guide rail. (If the drive tray is powered on, do not allow the cable chain connector to touch the metal chassis.)

5. Disconnect the other end of the cable chain:

a. Using a flashlight, locate the orange ring on the end of the cable chain that is attached to the horizontal guide rail in the enclosure.

The figure shows the horizontal connector on the right and the cable chain disconnected and partially pulled out on the left side.



1	Orange ring on horizontal guide rail	2	Cable chain, partially removed

b. To unlatch the cable chain, gently insert your finger into the orange ring and push down.

   The figure shows the orange ring on the horizontal guide rail (see item 1 in the figure above), as it is pushed down so that the rest of the cable chain can be pulled out of the enclosure.

c. Pull your finger toward you to unplug the cable chain.

6. Carefully pull the entire cable chain out of the drive shelf.

7. Replace the right fan canister:

a. Slide the fan canister all the way into the shelf.

b. Move the fan canister handle until it latches with the orange tab.

c. If the drive shelf is receiving power, confirm that the amber Attention LED on the back of the fan is not illuminated and that air is coming out the back of the fan.

   The LED could remain on for as long as a minute after you reinstall the fan while both fans settle into the correct speed.

   If the power is off, the fans do not run and the LED is not on.

8. From the back of the drive shelf, remove the left fan canister.

9. If the drive shelf is receiving power, ensure that the right fan goes to its maximum speed.

Attention: Possible equipment damage due to overheating – If the shelf is powered on, do not remove both fans at the same time. Otherwise, the equipment might overheat.

10. Disconnect the left cable chain from its vertical guide rail:
    a. Using a flashlight, locate the orange ring on the end of the cable chain attached to the vertical guide rail.
    b. To unlatch the cable chain, insert your finger into the orange ring.
    c. To unplug the cable chain, pull toward you approximately 1 inch (2.5 cm). Leave the cable chain connector within the vertical guide rail.

       Attention: Possible hardware damage — If the drive tray is powered on, the cable chain is energized until both ends are unplugged. To avoid shorting out the equipment, do not allow the unplugged cable chain connector to touch the metal chassis if the other end of the cable chain is still plugged in.

11. Disconnect the left cable chain from the horizontal guide rail, and pull the entire cable chain out of the drive shelf.

    If you are performing this procedure with the power on, all LEDs turn off when you disconnect the last cable chain connector, including the amber Attention LED.

12. Replace the left fan canister. If the drive shelf is receiving power, confirm that the amber LED on the back of the fan is not illuminated and that air is coming out the back of the fan.

    The LED could remain on for as long as a minute after you reinstall the fan while both fans settle into the correct speed.

After you finish

Go to *Remove failed drive drawer (60-drive)* on page 101.

Remove failed drive drawer (60-drive)

You remove a failed drive drawer to replace it with a new one. Removing a drive drawer entails sliding the drawer partially out, recording the locations of the drives, removing the drives, and removing the drive drawer.

Before you begin

- You have an ESD wristband, or you have taken other antistatic precautions.
- You have removed the right and left cable chains for the drive drawer.
- You have replaced the right and left fan canisters.
- You have obtained a permanent marker to note the exact location of each drive as you remove the drive from the drawer.

About this task

Attention: Possible loss of data access – Magnetic fields can destroy all data on the drive and cause irreparable damage to the drive circuitry. To avoid loss of data access and damage to the drives, always keep drives away from magnetic devices.

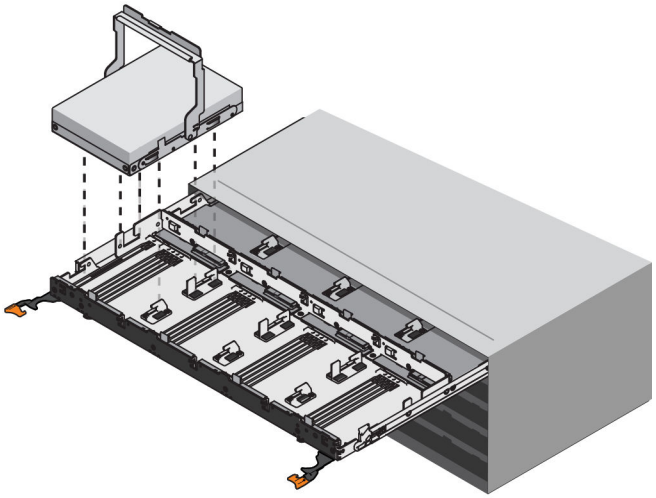
Steps

1. Remove the bezel from the front of the drive shelf.
2. Unlatch the drive drawer by pulling out on both levers.

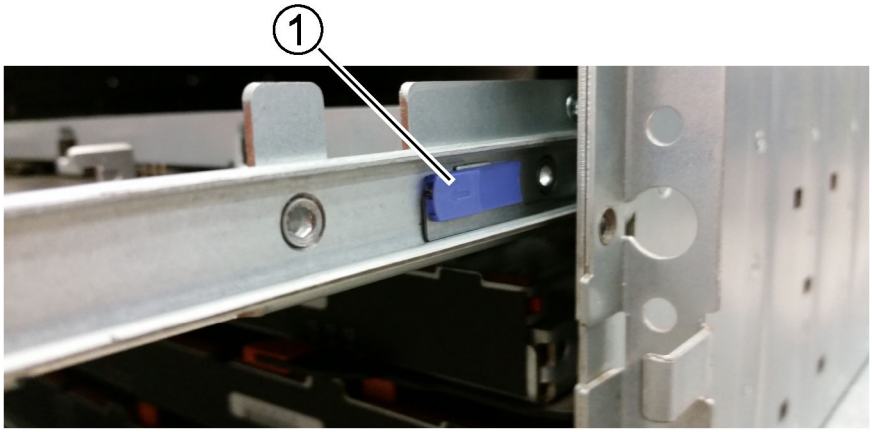
3. Using the extended levers, carefully pull the drive drawer out until it stops. Do not completely remove the drive drawer from the drive shelf.
4. If volumes have already been created and assigned, use a permanent marker to note the exact location of each drive. For example, using the following drawing as a reference, write the appropriate slot number on the top of each drive.

Attention: Possible loss of data access – Make sure to record the exact location of each drive before removing it.

5. Remove the drives from the drive drawer:
   a. Gently pull back the orange release latch that is visible on the center front of each drive.
   b. Raise the drive handle to vertical.
   c. Use the handle to lift the drive from the drive drawer.



   d. Place the drive on a flat, static-free surface and away from magnetic devices.
6. Remove the drive drawer:
   a. Locate the plastic release lever on each side of the drive drawer.



1 Drive drawer release lever

b. Disengage both release levers by pulling the latches toward you.

c. While holding both release levers, pull the drive drawer toward you.

d. Remove the drive drawer from the drive shelf.

After you finish

Go to *Install new drive drawer (60-drive)* on page 103.

Install new drive drawer (60-drive)

You install a new drive drawer to replace the failed one. Installing a drive drawer into a drive tray entails sliding the drawer into the empty slot, installing the drives, and replacing the front bezel.

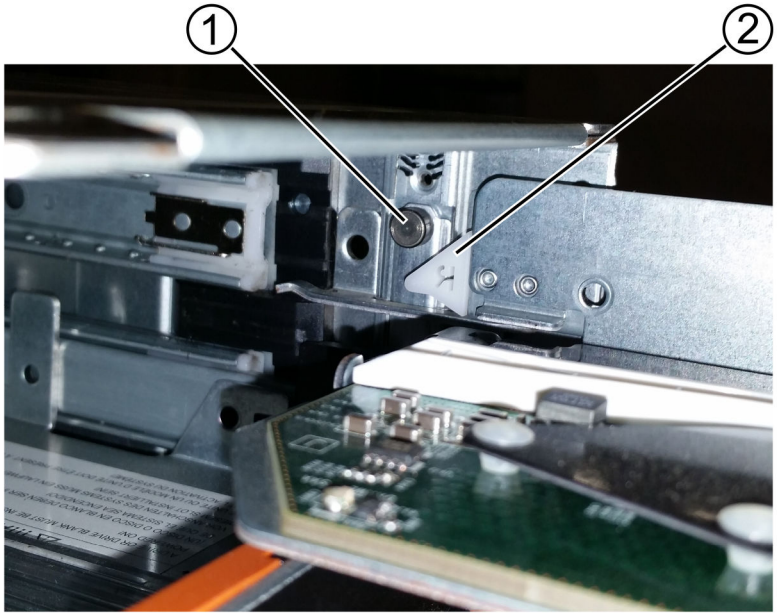
Before you begin

- You know where to install each drive.
- You must have a replacement drive drawer.
- You must have a flashlight.

Steps

1. From the front of the drive shelf, shine a flashlight into the empty drawer slot, and locate the lock-out tumbler for that slot.

   The lock-out tumbler assembly is a safety feature that prevents you from being able to open more than one drive drawer at one time.



1 Lock-out tumbler 2 Drawer guide

2. Position the replacement drive drawer in front of the empty slot and slightly to the right of center.

   Positioning the drawer slightly to the right of center helps to ensure that the lock-out tumbler and the drawer guide are correctly engaged.

3. Slide the drive drawer into the slot, and ensure that the drawer guide slides under the lock-out tumbler.

   Attention: Risk of equipment damage – Damage occurs if the drawer guide does not slide under the lock-out tumbler.

4. Carefully push the drive drawer all the way in until the latch fully engages.

   Experiencing a higher level of resistance is normal when pushing the drawer closed for the first time.

   Attention: Risk of equipment damage — Stop pushing the drive drawer if you feel binding. Use the release levers at the front of the drawer to slide the drawer back out. Then, reinsert the drawer into the slot, ensure the tumbler is above the rail, and the rails are aligned correctly.

After you finish

Go to *Attach cable chains* on page 104.

Attach cable chains

You must attach the cable chains so you can safely re-install the drives in the drive drawer.

Before you begin

- You have installed the new drive drawer.
- You have two replacement cable chains, marked as LEFT and RIGHT (on the horizontal connector next to the drive drawer).

About this task

When attaching a cable chain, reverse the order you used when disconnecting the cable chain. You must insert the chain's horizontal connector into the horizontal guide rail in the enclosure before inserting the chain's vertical connector into the vertical guide rail in the enclosure.

Steps

1. From the back of the drive shelf, remove the fan canister on the right side, and set it aside.
2. If the shelf is powered on, ensure that the left fan goes to its maximum speed.

   Attention: Possible equipment damage due to overheating – If the shelf is powered on, do not remove both fans at the same time. Otherwise, the equipment might overheat.

3. Attach the right cable chain:
   a. Locate the horizontal and vertical connectors on the right cable chain and the corresponding horizontal guide rail and vertical guide rail inside the enclosure.
   b. Align both cable chain connectors with their corresponding guide rails.
   c. Slide the cable chain's horizontal connector onto the horizontal guide rail, and push it in as far as it can go.

      Attention: Risk of equipment malfunction — Make sure to slide the connector into the guide rail. If the connector rests on the top of the guide rail, problems might occur when the system runs.

      The figure shows the horizontal and vertical guide rails for the second drive drawer in the enclosure.

1 Horizontal guide rail 2 Vertical guide rail

d. Slide the vertical connector on the right cable chain into the vertical guide rail.

e. After you have reconnected both ends of the cable chain, carefully pull on the cable chain to verify that both connectors are latched.

Attention: Risk of equipment malfunction — If the connectors are not latched, the cable chain might come loose during drawer operation.

4. Reinstall the right fan canister. If the drive shelf is receiving power, confirm that the amber LED on the back of the fan is now off and that air is now coming out of the back.

   The LED could remain on for as long as a minute after you reinstall the fan while the fan settles into the correct speed.

5. From the back of the drive shelf, remove the fan canister on the left side of the shelf.

6. If the shelf is powered on, ensure that the right fan goes to its maximum speed.

   Attention: Possible equipment damage due to overheating – If the shelf is powered on, do not remove both fans at the same time. Otherwise, the equipment might overheat.

7. Reattach the left cable chain:

a. Locate the horizontal and vertical connectors on the cable chain and their corresponding horizontal and vertical guide rails inside the enclosure.

b. Align both cable chain connectors with their corresponding guide rails.

c. Slide the cable chain's horizontal connector into the horizontal guide rail and push it in as far as it will go.

Attention: Risk of equipment malfunction — Make sure to slide the connector within the guide rail. If the connector rests on the top of the guide rail, problems might occur when the system runs.

d. Slide the vertical connector on the left cable chain into the vertical guide rail.

e. After you reconnect both ends of the cable chain, carefully pull on the cable chain to verify that both connectors are latched.

Attention: Risk of equipment malfunction — If the connectors are not latched, the cable chain might come loose during drawer operation.

8. Reinstall the left fan canister. If the drive shelf is receiving power, confirm that the amber LED on the back of the fan is now off and that air is now coming out of the back.

The LED could remain on for as long as a minute after you reinstall the fan while both fans settle into the correct speed.

After you finish

Go to *Complete drive drawer replacement* on page 107.

Complete drive drawer replacement

You complete the drive drawer replacement by reinserting the drives and replacing the front bezel in the correct order.

Before you begin

- You know where to install each drive.
- You have already replaced the drive drawer.
- The new drawer cables have been installed.

About this task

Attention: Possible loss of data access – You must install each drive in its original location in the drive drawer.

Steps

1. Reinstall the drives in the drive drawer:

a. Unlatch the drive drawer by pulling out on both levers at the front of the drawer.

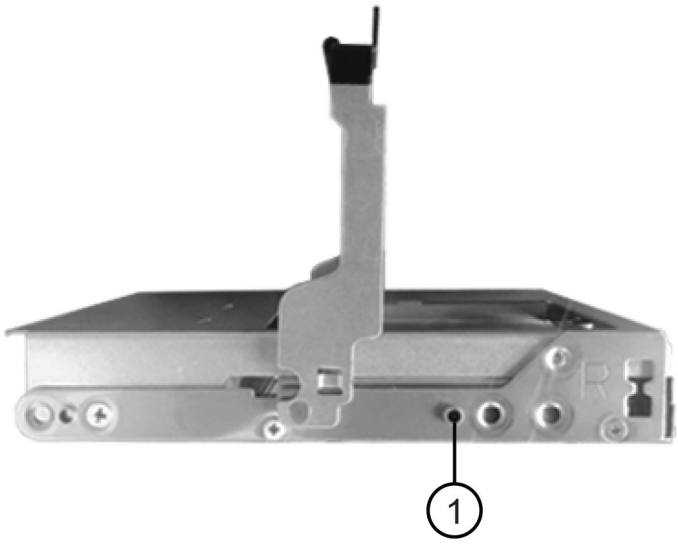
b. Using the extended levers, carefully pull the drive drawer out until it stops. Do not completely remove the drive drawer from the drive shelf.

c. Determine which drive to install in each slot by using the notes you made when removing the drives.

d. Raise the handle on the drive to vertical.

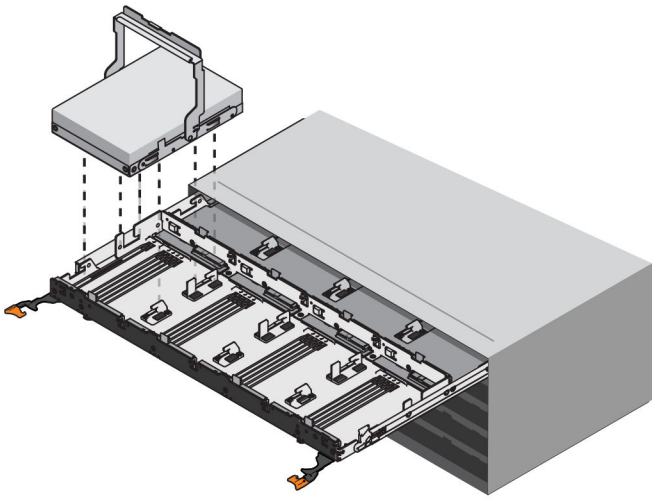
e. Align the two raised buttons on each side of the drive with the notches on the drawer.

   The figure shows the right side view of a drive, showing the location of the raised buttons.



1 Raised button on the right side of the drive

f. Lower the drive straight down, making sure the drive is pressed all the way down into the bay, and then rotate the drive handle down until the drive snaps into place.



g. Repeat these steps to install all the drives.

2. Slide the drawer back into the drive shelf by pushing it from the center and closing both levers.

   Attention: Risk of equipment malfunction – Make sure to completely close the drive drawer by pushing both levers. You must completely close the drive drawer to allow proper airflow and prevent overheating.

3. Attach the bezel to the front of the drive shelf.

4. If you have powered down one or more shelves, reapply power:

   If you replaced a drive drawer in a *controller* shelf without Drawer Loss Protection:

   a. Turn on both power switches on the controller shelf.

   b. Wait 10 minutes for the power-on process to complete.

   Confirm that both fans come on and that the amber LED on the back of the fans is off.

   If you replaced a drive drawer in an *expansion* drive shelf without Drawer Loss Protection:

   a. Turn on both power switches on the drive shelf.

   b. Confirm that both fans come on and that the amber LED on the back of the fans is off.

   c. Wait two minutes before applying power to the controller shelf.

   d. Turn on both power switches on the controller shelf.

   e. Wait 10 minutes for the power-on process to complete.

   Confirm that both fans come on and that the amber LED on the back of the fans is off.

Result

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

Host interface cards

A host interface card (HIC) can optionally be installed within a controller canister. The E2800 controller includes built-in host ports on the controller card itself, as well as host ports on the optional HIC. Host ports that are built into the controller are called baseboard host ports. Host ports that are built into the HIC are called HIC ports.

Overview and requirements

Before you add, upgrade or replace a host interface card, you need to be aware of certain requirements and considerations.

Host interface card overview

You can add, upgrade, or replace a HIC in the following controller shelves:

The steps to replace a HIC depend on whether you have one or two controllers, as follows:

If your storage array has...	You must...
One controller (E2812 or E2824 simplex)	**1.** Stop host I/O operations **2.** Power down the controller shelf **3.** Remove the controller canister **4.** Replace the battery **5.** Replace the controller canister **6.** Apply power to the controller shelf
Two controllers (E2860, E2812 or E2824 duplex)	**1.** Take the controller offline **2.** Remove the controller canister **3.** Replace the battery **4.** Replace the controller canister **5.** Bring the controller online

Requirements for adding, upgrading or replacing a HIC

If you plan to add, upgrade, or replace a host interface card (HIC), keep the following requirements in mind.

- You have scheduled a downtime maintenance window for this procedure. The power must be off when you install HICs, so you cannot access data on the storage array until you have successfully completed this procedure. (In a duplex configuration, this is because both controllers must have the same HIC configuration when they are powered on.)
- You have one or two HICs, based on whether you have one or two controllers in your storage array. The HICs must be compatible with your controllers.

If you have a duplex configuration (two controllers), the HICs installed in the two controller canisters must be identical. 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.
- You have installed SANtricity Storage Manager on a management station, so you can use the storage array's command line interface (CLI).
  If SANtricity Storage Manager has not yet been installed, follow the instructions in the *Linux express configuration*, *Windows express configuration*, or *VMware express configuration* to download and install the software.

Add host interface cards

You add host interface cards (HICs) to increase the number of host ports in your storage array and to provide additional host protocols. When you add HICs, you must power off the storage array, install the HIC, and reapply power. You can add HICs to E2800 controller canisters that only have baseboard host ports.

Steps

1. Prepare to add host interface cards on page 111
   You prepare to add host interface cards by backing up the storage array's configuration database, collecting support data, and stopping host I/O operations. Then, you can power down the controller shelf.
2. Add host interface card on page 113
   You add a host interface card (HIC) to increase the number of host ports in your storage array. If you are adding HICs to a duplex configuration, repeat all steps to remove the second controller canister, install the second HIC, and reinstall the second controller canister.
3. Complete adding a host interface card on page 120
   You complete the process of adding a host interface card (HIC) by checking the controller LEDs and seven-segment display, and then confirming that the controller's status is Optimal.

Related concepts

Host interface card overview on page 110

Requirements for adding, upgrading or replacing a HIC on page 110

Prepare to add host interface cards

You prepare to add host interface cards by backing up the storage array's configuration database, collecting support data, and stopping host I/O operations. Then, you can power down the controller shelf.

Before you begin

- You have scheduled a downtime maintenance window for this procedure. The power must be off when you install HICs, so you cannot access data on the storage array until you have successfully

completed this procedure. (In a duplex configuration, this is because both controllers must have the same HIC configuration when they are powered on.)

Steps

1. From the Home 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.

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

   a. Open the Enterprise Management Window (EMW) for SANtricity Storage Manager on your management station.

   b. Select the storage array.

   c. Select **Tools > Execute Script**.

   d. Type the following command in the text box.

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

   In this command, *`filename`* is the file path and file name to which you want to save the database. Enclose the file name in double quotation marks (" "). For example:

   ```
   file="C:\Program Files\CLI\logs\dbmdata.zip"
   ```

   This command does not automatically append a file extension to the saved file. You must specify a file extension when entering the file name.

   e. Select **Tools > Verify and Execute**.

3. 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`.

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

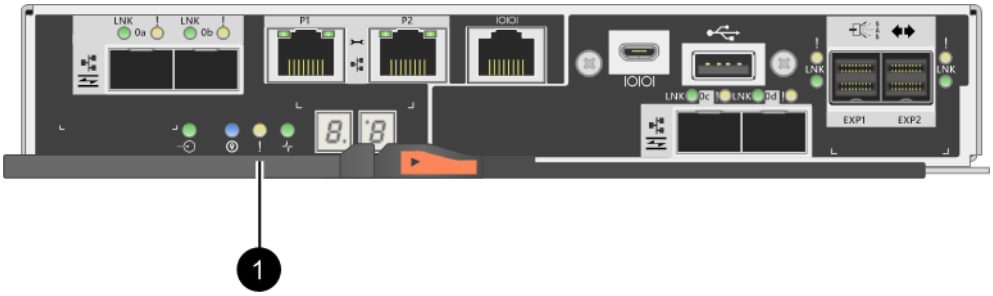
   - Stop all processes that involve the LUNs mapped from the storage to the hosts.
   - Ensure that no applications are writing data to any LUNs mapped from the storage to the hosts.
   - Unmount all file systems associated with volumes on the array.

   Note: 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.

Attention: 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.

5. If the storage array participates in a mirroring relationship, stop all host I/O operations on the secondary storage array.
6. 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.



1 Cache Active LED

7. 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.
8. Power down the controller shelf.
   a. Turn off both power switches on the controller shelf.
   b. Wait for all LEDs on the controller shelf to turn off.

After you finish

Go to *Add host interface card* on page 113.

Add host interface card

You add a host interface card (HIC) to increase the number of host ports in your storage array. If you are adding HICs to a duplex configuration, repeat all steps to remove the second controller canister, install the second HIC, and reinstall the second controller canister.

Steps

1. Step 1: Remove controller canister on page 114
   Remove the controller canister so you can add the new host interface card.
2. Step 2: Install host interface card on page 116
   Install the HIC to increase the number of host ports in your storage array.
3. Step 3: Reinstall controller canister on page 118
   Reinstall the controller canister into the controller shelf after installing the new HIC.

Remove controller canister

Remove the controller canister so you can add the new host interface card. When you remove a controller canister, you must disconnect all cables. Then, you can slide the controller canister out of the controller shelf.

Before you begin

- You must use labels to identify each cable that is connected to the controller canister.
- You have an ESD wristband, or you have taken other antistatic precautions.

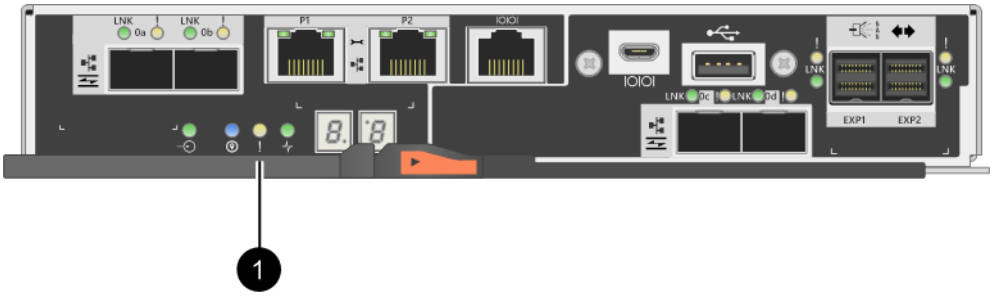
Steps

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

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

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

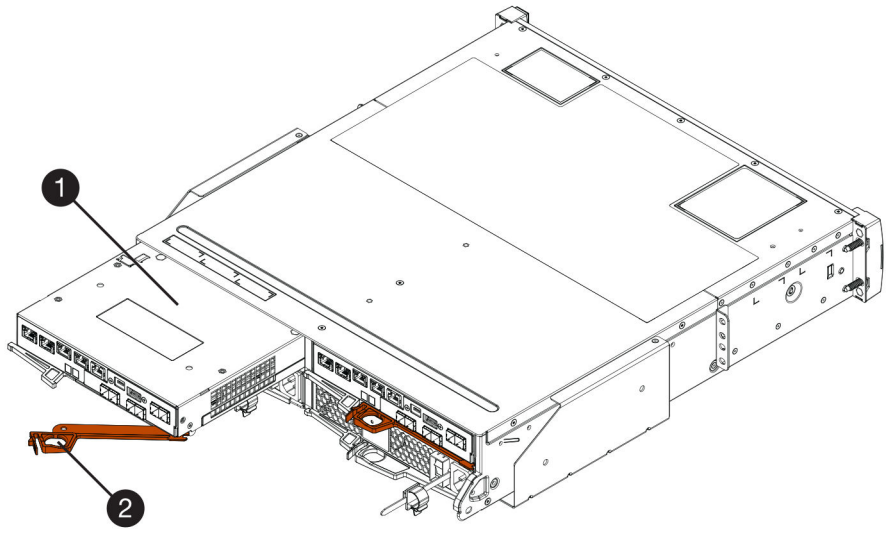
   The green Cache Active LED on the back of the controller is on when cached data needs to be written to the drives. You must wait for this LED to turn off before removing the controller canister.



1 Cache Active LED

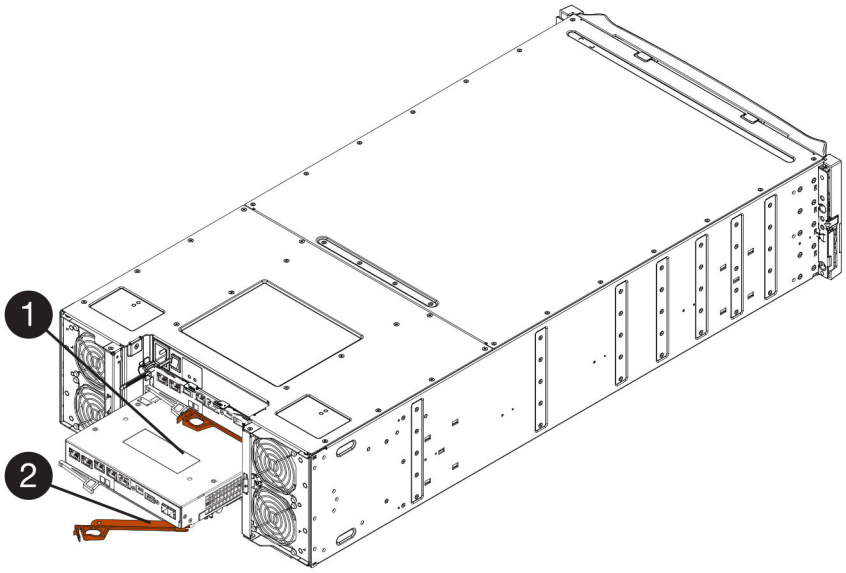
4. Squeeze the latch on the cam handle until it releases, and then open the cam handle to the right to release the controller canister from the shelf.

   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

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

   Attention: 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.

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

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

After you finish

Go to *Install host interface card* on page 116.

Install host interface card

Install the host interface card (HIC) to increase the number of host ports in your storage array.

Before you begin

- You have an ESD wristband, or you have taken other antistatic precautions.
- You have a #1 Phillips screwdriver.
- You have one or two HICs, based on whether you have one or two controllers in your storage array. The HICs must be compatible with your controllers.

About this task

Attention: Possible loss of data access – Never install a HIC in an E2800 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 will cause the controllers to lock down when you apply power.

Steps

1. Unpack the new HIC and the new HIC faceplate.
2. Press the button on the cover of the controller canister, and slide the cover off.
3. Confirm that the green LED inside the controller (by 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

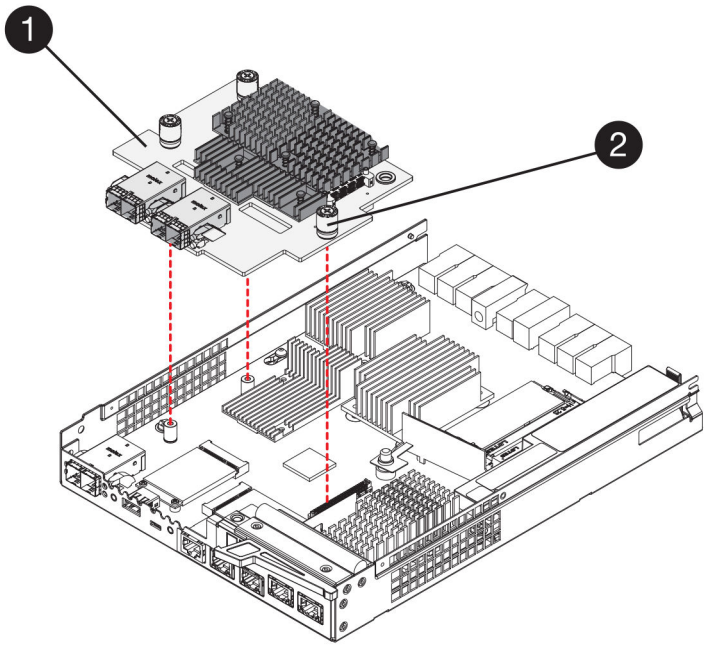
4. Using a #1 Phillips screwdriver, remove the four screws that attach the blank faceplate to the controller canister, and remove the faceplate.

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.

   Attention: Possible equipment damage – Be very careful not to pinch the gold ribbon connector for the controller LEDs between the HIC and the thumbscrews.

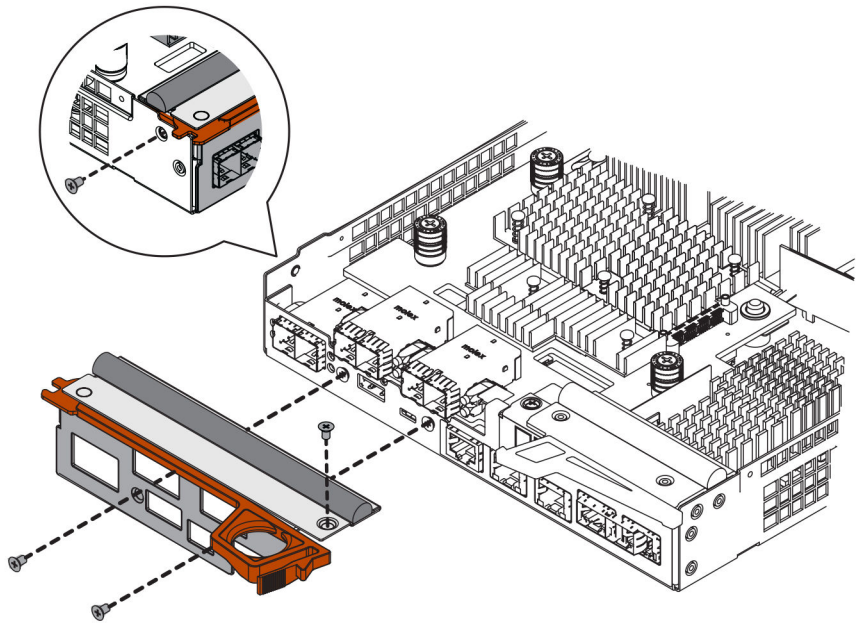


1 Host interface card (HIC) 2 Thumbscrews

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.



After you finish

Go to *Reinstall controller canister* on page 118.

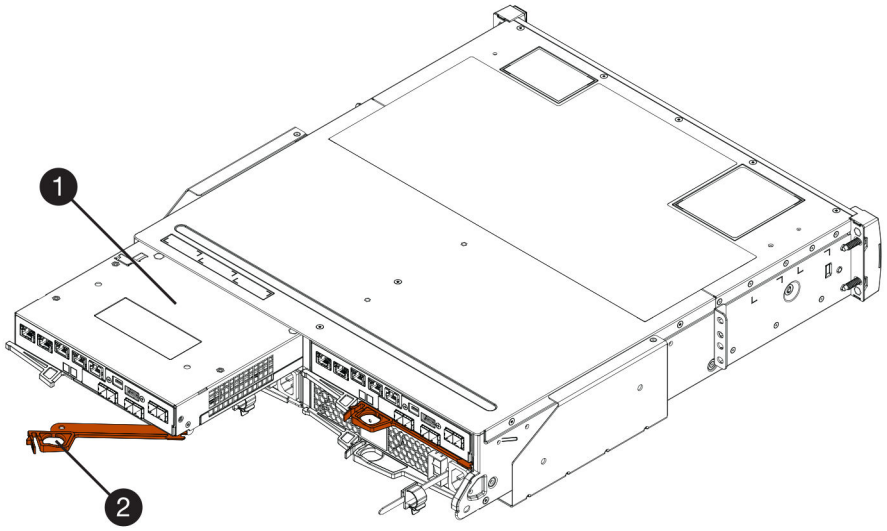
Reinstall controller canister

You reinstall the controller canister into the controller shelf after installing the new HIC.

Steps

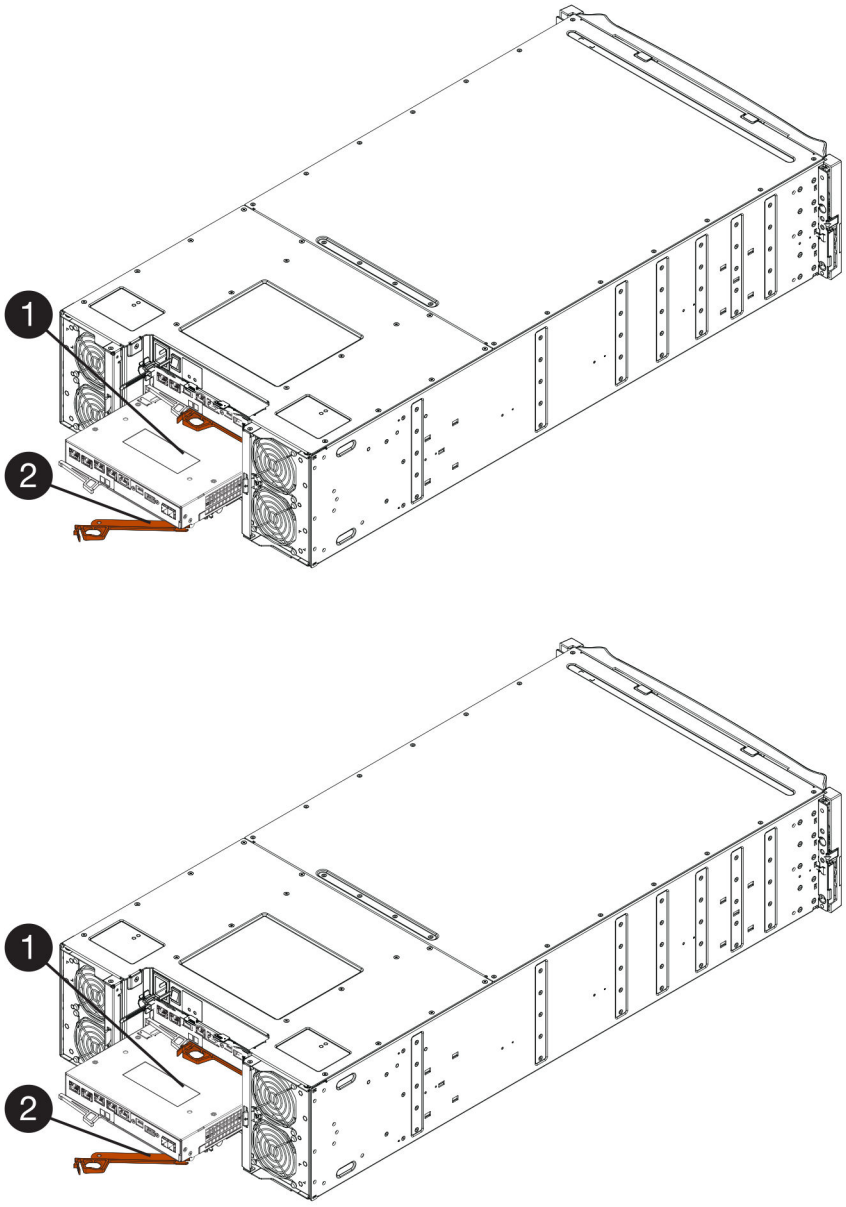
1. Turn the controller canister over, so that the removable cover faces down.
2. With the cam handle in the open position, slide the controller canister all the way into the controller shelf.

   The following figure is an example of an 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

3. Move the cam handle to the left to lock the controller canister in place.
4. Reconnect all the cables you removed.

   Attention: Do not connect data cables to the new HIC ports at this time.

5. (Optional) If you are adding HICs to a duplex configuration, repeat all steps to remove the second controller canister, install the second HIC, and reinstall the second controller canister.

After you finish

Go to *Complete adding a host interface card* on page 120.

Complete adding a host interface card

You complete the process of adding a host interface card (HIC) by checking the controller LEDs and seven-segment display, and then confirming that the controller's status is Optimal.

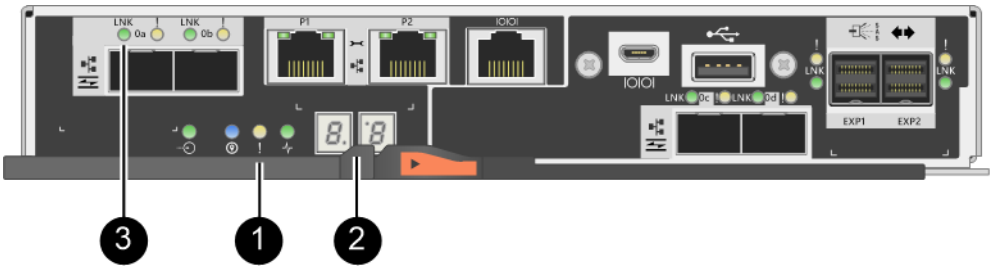
Before you begin

- You have installed any new host hardware needed for the new host ports, such as switches or host bus adapters (HBAs).
- 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* and the *NetApp Hardware Universe*.
- You have installed SANtricity Storage Manager on a management station, so you can use the storage array's command line interface (CLI).
  If this software has not yet been installed, follow the instructions in the *Linux express configuration*, *Windows express configuration*, or *VMware express configuration* to download and install it.

Steps

1. 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.
2. 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 remain off until you connect the host cables.

   Note: 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. 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 HIC and the controller canister are installed correctly. If necessary, remove and reinstall the controller canister and the HIC.

   Note: If you cannot resolve the problem, contact technical support.

4. If the new HIC ports require SFP+ transceivers, install these SFPs.

5. If you installed a HIC with SFP+ (optical) ports, confirm the new ports have the host protocol you expect.

   a. From SANtricity System Manager, select **Hardware**.

   b. If the graphic shows the drives, 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**.

   g. Review the details shown for the HIC ports (the ports labelled **e0*x*** or **0*x*** in HIC Location **slot 1**) to determine if you are ready to connect the host ports to the data hosts:

      If the new HIC ports have the protocol you expect:

      You are ready to connect the new HIC ports to the data hosts; go to the step below.

      If the new HIC ports do not have the protocol you expect:

      You must apply a software feature pack before you can connect the new HIC ports to the data hosts. See *Converting the Protocol of E2800 Host Ports*. Then, use the instructions in that document to connect the host ports to the data hosts and to resume operations.

6. Connect the cables from the controller's host ports to the data hosts.

   If you need instructions for configuring and using a new host protocol, refer to the *Linux express configuration*, *Windows express configuration*, or *VMware express configuration* .

Result

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

Upgrade host interface card

You upgrade a host interface card (HIC) to increase the number of host ports or to change host protocols. When you upgrade the HICs, you must power off the storage array, remove the existing HIC from each controller, install a new HIC, and reapply power.

Steps

1. Prepare to upgrade host interface cards on page 122
   You prepare to upgrade host interface cards (HICs) by backing up the storage array's configuration database, collecting support data, and stopping host I/O operations. Then, you can power down the controller shelf.

2. Upgrade host interface card on page 124

You upgrade a host interface card (HIC) to increase the number of host ports or to change host protocols. If you are upgrading HICs in a duplex configuration, repeat all steps to remove the other controller canister, remove the HIC, install the new HIC, and replace the second controller canister.

3. Complete host interface card upgrade on page 131
   You complete the process of upgrading a host interface card by checking the controller LEDs and seven-segment display and confirming that the controller's status is Optimal.

Related concepts

Host interface card overview on page 110
Requirements for adding, upgrading or replacing a HIC on page 110

Prepare to upgrade host interface cards

You prepare to upgrade host interface cards (HICs) by backing up the storage array's configuration database, collecting support data, and stopping host I/O operations. Then, you can power down the controller shelf.

Before you begin

- You have scheduled a downtime maintenance window for this procedure. The power must be off when you install HICs, so you cannot access data on the storage array until you have successfully completed this procedure. (In a duplex configuration, this is because both controllers must have the same HIC configuration when they are powered on.)
- You have installed SANtricity Storage Manager on a management station, so you can use the storage array's command line interface (CLI).

Steps

1. From the Home 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.

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

   a. Open the Enterprise Management Window (EMW) for SANtricity Storage Manager on your management station.

   b. Select the storage array.

   c. Select **Tools > Execute Script**.

   d. Type the following command in the text box.

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

   In this command, *filename* is the file path and file name to which you want to save the database. Enclose the file name in double quotation marks (" "). For example:

   ```
   file="C:\Program Files\CLI\logs\dbmdata.zip"
   ```

   This command does not automatically append a file extension to the saved file. You must specify a file extension when entering the file name.

e. Select **Tools > Verify and Execute**.

3. 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`.

4. 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.

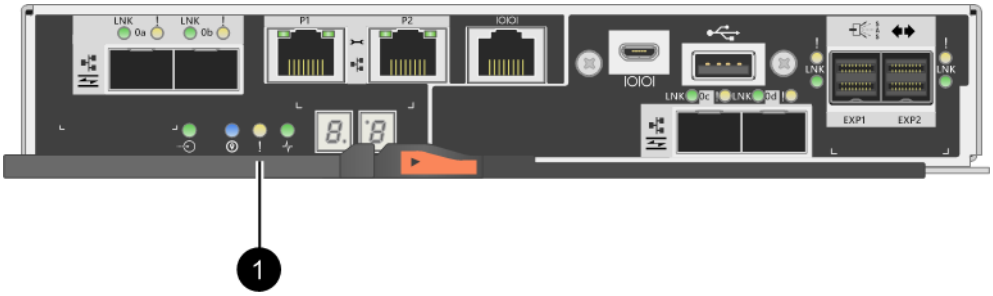
   Note: The exact steps to stop host I/O operations depend on the host operating system and the configuration, which are beyond the scope of these instructions. If you are not sure how to stop host I/O operations in your environment, consider shutting down the host.

   Attention: 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.

5. If the storage array participates in a mirroring relationship, stop all host I/O operations on the secondary storage array.

6. 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.



1 Cache Active LED

7. 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.

8. Power down the controller shelf.

   a. Turn off both power switches on the controller shelf.

   b. Wait for all LEDs on the controller shelf to turn off.

After you finish

Go to *Upgrade host interface card* on page 124.

Upgrade host interface card

You upgrade a host interface card (HIC) to increase the number of host ports or to change host protocols. If you are upgrading HICs in a duplex configuration, repeat all steps to remove the other controller canister, remove the HIC, install the new HIC, and replace the second controller canister.

Steps

1. Step 1: Remove controller canister on page 124
   Remove the controller canister so you can upgrade the new host interface card. When you remove a controller canister, you must disconnect all cables. Then, you can slide the controller canister out of the controller shelf.
2. Step 2: Remove a host interface card on page 126
   Remove the original host interface card so you can replace it with an upgraded one.
3. Step 3: Install host interface card on page 128
   Install the new HIC to increase the number of host ports in your storage array.
4. Step 4: Reinstall controller canister on page 129
   Reinstall the controller canister into the controller shelf.

Remove controller canister

You remove the controller canister so you can upgrade the new host interface card (HIC). When you remove a controller canister, you must disconnect all cables. Then, you can slide the controller canister out of the controller shelf.

Before you begin

- You have labels to identify each cable that is connected to the controller canister.
- You have an ESD wristband, or you have taken other antistatic precautions.

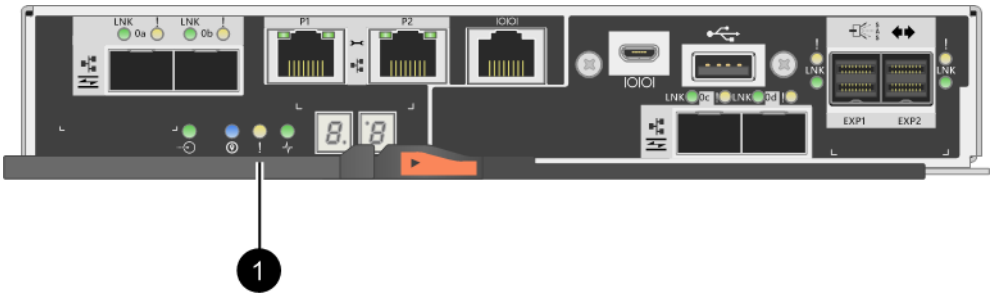
Steps

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

   Attention: 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.

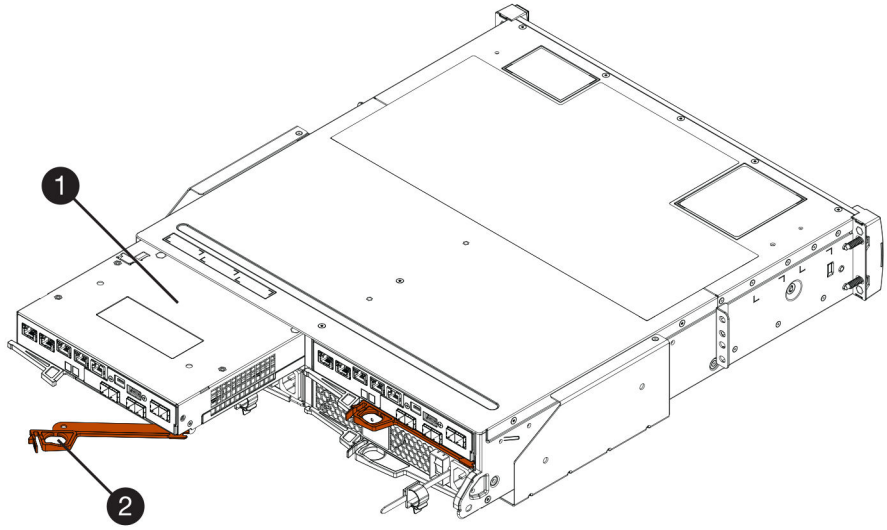
   The green Cache Active LED on the back of the controller is on when cached data needs to be written to the drives. You must wait for this LED to turn off before removing the controller canister.



1 Cache Active LED

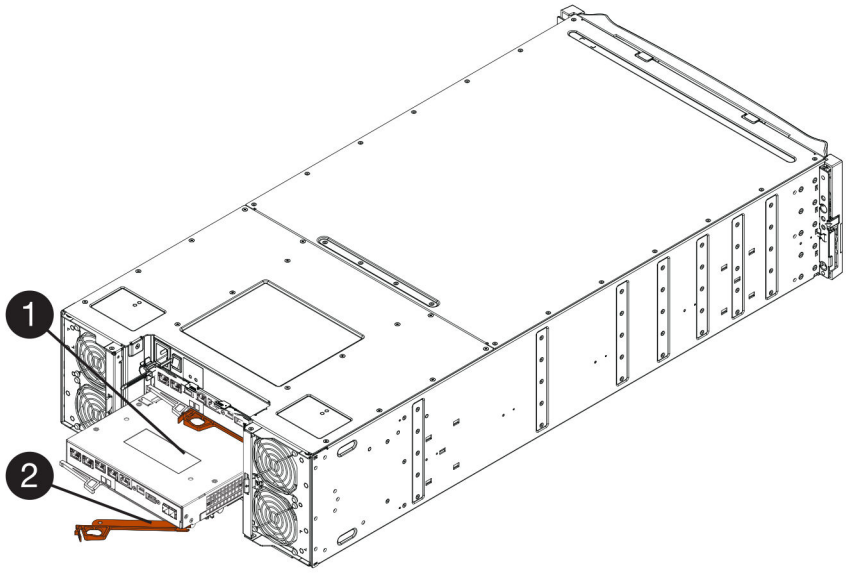
5. Squeeze the latch on the cam handle until it releases, and then open the cam handle to the right to release the controller canister from the shelf.

   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

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

   Attention: 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.

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

After you finish

Go to *Remove a host interface card* on page 126.

Remove a host interface card

You remove the original host interface card (HIC) so you can replace it with an upgraded one.

Before you begin

- You have a #1 Phillips screwdriver.

Steps

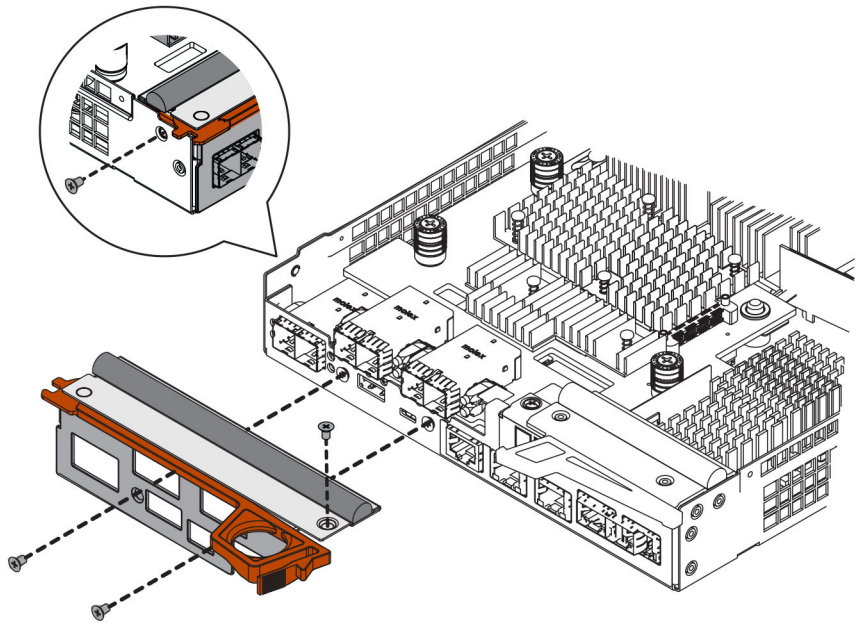
1. Remove the controller canister's cover by pressing down on the button and sliding the cover off.
2. Confirm that the green LED inside the controller (between the battery and the DIMMs) is off.

   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

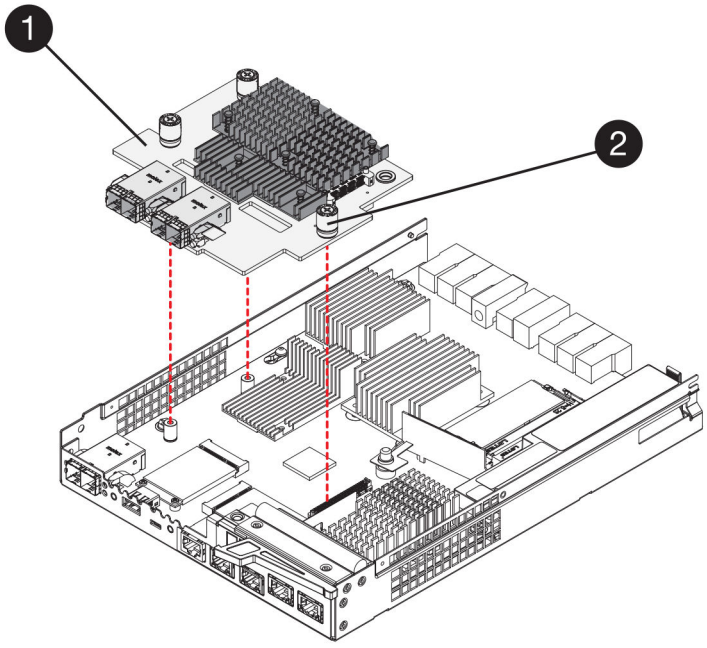
3. Using a #1 Phillips screwdriver, remove the screws that attach the HIC faceplate to the controller canister.

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



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

   Attention: 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

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

After you finish

Go to *Install host interface card* on page 128.

Install host interface card

Install the new host interface card (HIC) to increase the number of host ports in your storage array.

Before you begin

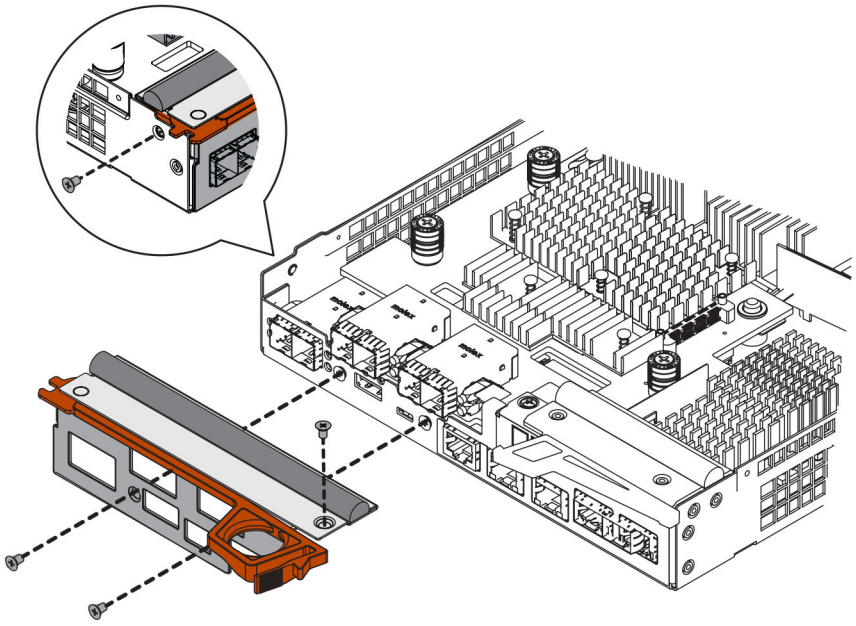
- You have an ESD wristband, or you have taken other antistatic precautions.
- You have a #1 Phillips screwdriver.
- You have one or two HICs, based on whether you have one or two controllers in your storage array. The HICs must be compatible with your controllers.

About this task

Attention: Possible loss of data access – Never install a HIC in an E2800 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 will cause the controllers to lock down when you apply power.

Steps

1. Unpack the new HIC and the new HIC faceplate.
2. Using a #1 Phillips screwdriver, remove the four screws that attach the HIC faceplate to the controller canister, and remove the faceplate.

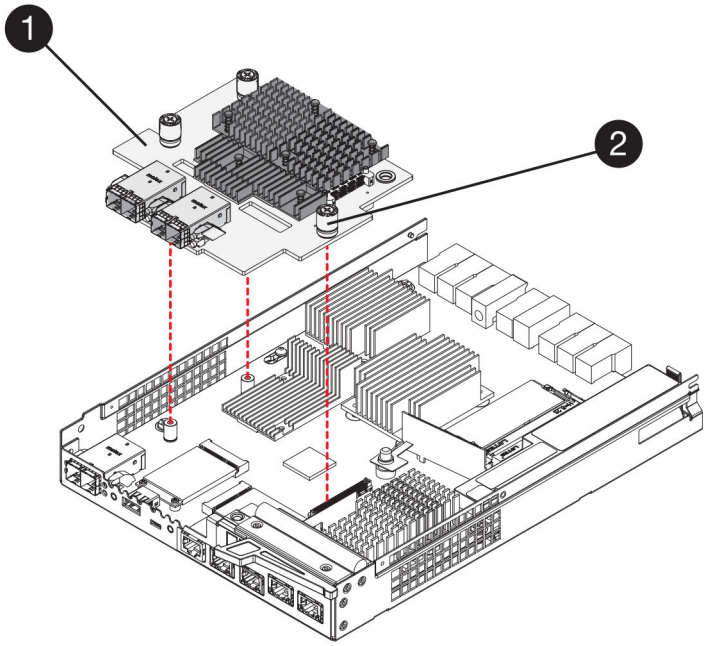


3. Align the three thumbscrews on the HIC with the corresponding holes on the controller, and align the connector on the bottom of the HIC with the HIC interface connector on the controller card.

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

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

   Attention: 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

5. Hand-tighten the HIC thumbscrews.

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

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

After you finish

Go to *Reinstall controller canister* on page 129.

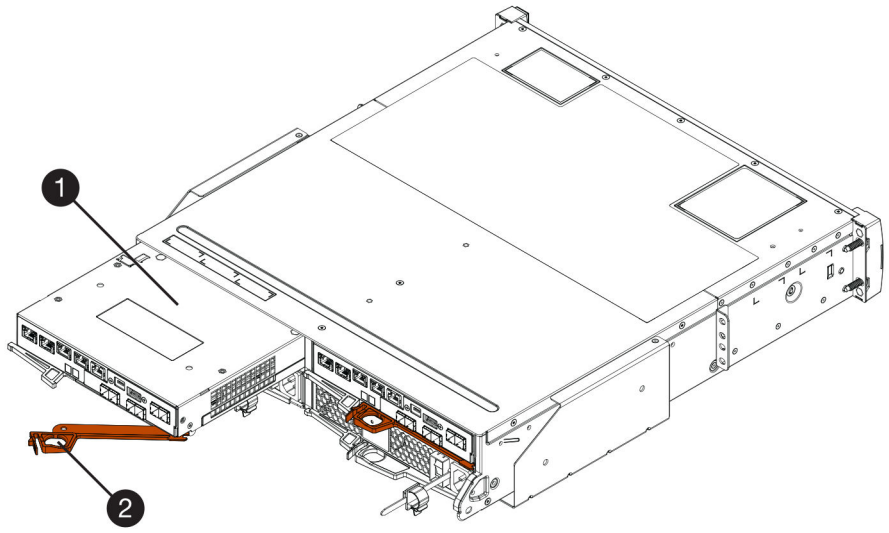
Reinstall controller canister

You reinstall the controller canister into the controller shelf after installing the new host interface card (HIC).

Steps

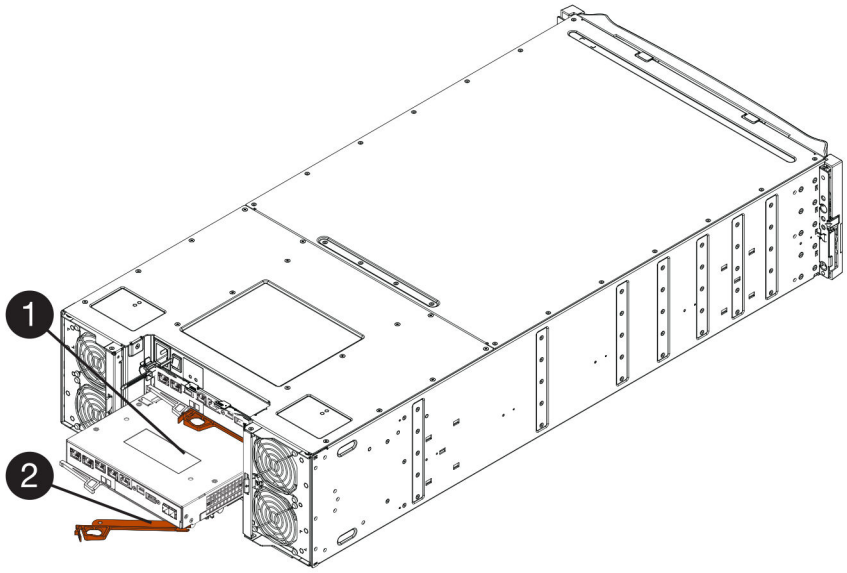
1. Reinstall the cover on the controller canister by sliding the cover from back to front until the button clicks.
2. Turn the controller canister over, so that the removable cover faces down.
3. With the cam handle in the open position, slide the controller canister all the way into the controller shelf.

   The following figure is an example of an 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

4. Move the cam handle to the left to lock the controller canister in place.
5. Reconnect all the cables you removed.

   Attention: Do not connect data cables to the new HIC ports at this time.

6. (Optional) If you are upgrading HICs in a duplex configuration, repeat all steps to remove the other controller canister, remove the HIC, install the new HIC, and replace the second controller canister.

After you finish

Go to *Complete upgrading a host interface card* on page 131.

Complete host interface card upgrade

You complete the process of upgrading a host interface card by checking the controller LEDs and seven-segment display and confirming that the controller's status is Optimal.

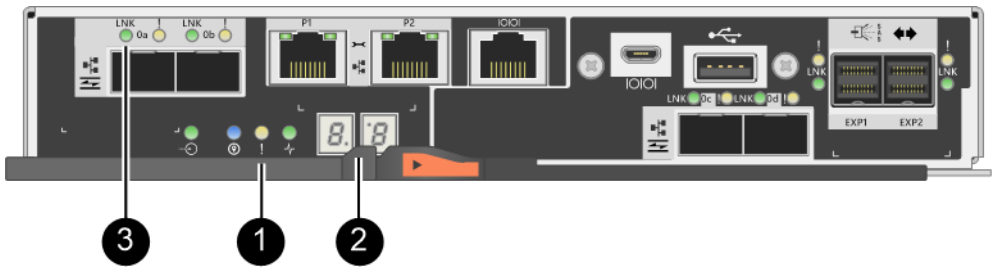
Before you begin

- You have installed any new host hardware needed for the new host ports, such as switches or host bus adapters (HBAs).
- 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*.

Steps

1. 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.
2. 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 remain off until you connect the host cables.

   Note: 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. 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 HIC and the controller canister are installed correctly. If necessary, remove and reinstall the controller canister and the HIC.

Note: If you cannot resolve the problem, contact technical support.

4. If the new HIC ports require SFP+ transceivers, install these SFPs.
5. Connect the cables from the controller's host ports to the data hosts.

Result

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

Replace host interface card

You replace a host interface card (HIC) that has failed. If two controllers are present, each controller must have identical HICs.

Steps

1. Prepare to replace host interface card on page 132
   The steps to prepare to replace a host interface card (HIC) depend on whether you have a duplex configuration (two controllers) or a simplex configuration (one controller). If you have a duplex configuration, you must take the affected controller offline or, if you have a simplex configuration, you must stop host I/O operations and power down the controller shelf.
2. Replace host interface card on page 136
   You replace a host interface card (HIC) to replace the failed HIC with a new one. If you are replacing HICs in a duplex configuration, repeat all steps to remove the second controller canister, install the second HIC, and reinstall the second controller canister.
3. Complete host interface card replacement on page 142
   The steps to complete a host interface card replacement depend on whether you have a duplex configuration (two controllers) or a simplex configuration (one controller). If you have a duplex configuration, you place the affected controller online or, if you have a simplex configuration, you apply power to the controller shelf and confirm that all components are working correctly. Then, you can collect support data and resume operations.

Related concepts

Host interface card overview on page 110
Requirements for adding, upgrading or replacing a HIC on page 110

Prepare to replace host interface card

The steps to prepare to replace a host interface card (HIC) depend on whether you have a duplex configuration (two controllers) or a simplex configuration (one controller). If you have a duplex configuration, you must take the affected controller offline or, if you have a simplex configuration, you must stop host I/O operations and power down the controller shelf.

Choices

- Place controller offline (duplex) on page 133
  If you have a duplex configuration, you must place the affected controller offline so you can safely remove the failed HIC. You must back up the configuration and collect support data first. Then, you can take the affected controller offline.
- Power down the controller shelf (simplex) on page 134

If you have a simplex configuration, you power down the controller shelf so you can safely remove the failed HIC. You must back up the configuration and collect support data first. Then, you can stop host I/O operations and power down the controller shelf.

Place controller offline (duplex)

If you have a duplex configuration, you must place the affected controller offline so you can safely remove the failed HIC. You must back up the configuration and collect support data first. Then, you can take the affected controller offline.

Before you begin

- Your storage array must have two controllers. The controller that you are not placing offline must be online (in the optimal state).
- Make sure that no volumes are in use or that you have a multipath driver installed on all hosts using these volumes.
- From SANtricity System Manager, review the details in the Recovery Guru to confirm that you have a failed HIC and to ensure no other items must be addressed before you can remove and replace the HIC.

About this task

Perform this task only if your storage array has two controllers (duplex configuration).

Steps

1. From the Details area of the Recovery Guru, determine which of the controller canisters has the failed HIC.
2. Back up the storage array's configuration database.

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

   a. Open the Enterprise Management Window (EMW) for SANtricity Storage Manager on your management station.

   b. Select the storage array.

   c. Select **Tools > Execute Script**.

   d. Type the following command in the text box.

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

   In this command, *filename* is the file path and file name to which you want to save the database. Enclose the file name in double quotation marks (" "). For example:

   ```
   file="C:\Program Files\CLI\logs\dbmdata.zip"
   ```

   This command does not automatically append a file extension to the saved file. You must specify a file extension when entering the file name.

   e. Select **Tools > Verify and Execute**.

3. 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`.

4. If the controller is not already offline, take it offline now using either SANtricity System Manager or the Enterprise Management Window's (EMW) script editor:

- To use 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.

Note: 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.

- To use script editor in the EMW:

a. Open the Enterprise Management Window (EMW) in SANtricity Storage Manager on your local host.

b. Select the storage array.

c. Select **Tools > Execute Script**.

d. Type one of the following commands in the text box.

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

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

e. Select **Tools > Verify and Execute**.

The system attempts to take the controller offline.

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

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

After you finish

Go to *Replace host interface card* on page 136.

Power down the controller shelf (simplex)

If you have a simplex configuration, you power down the controller shelf so you can safely remove the failed HIC. You must back up the configuration and collect support data first. Then, you can stop host I/O operations and power down the controller shelf.

About this task

Perform this task only if your storage array has one controller (simplex configuration).

Steps

1. From SANtricity System Manager, review the details in the Recovery Guru to confirm that you have a failed HIC and to ensure no other items must be addressed before you can remove and replace the HIC.
2. Back up the storage array's configuration database.

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

   a. Open the Enterprise Management Window (EMW) for SANtricity Storage Manager on your management station.

   b. Select the storage array.

   c. Select **Tools > Execute Script**.

   d. Type the following command in the text box.

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

   In this command, *`filename`* is the file path and file name to which you want to save the database. Enclose the file name in double quotation marks (" "). For example:

   ```
   file="C:\Program Files\CLI\logs\dbmdata.zip"
   ```

   This command does not automatically append a file extension to the saved file. You must specify a file extension when entering the file name.

   e. Select **Tools > Verify and Execute**.
3. 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`.
4. 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.

   Note: 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.

   Attention: Possible data loss – If you continue this procedure while I/O operations are occurring, you might lose data.
5. 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.

6. From the home page of SANtricity System Manager, select **View Operations in Progress**.
7. Confirm that all operations have completed before continuing with the next step.
8. Turn off both power switches on the controller shelf.
9. Wait for all LEDs on the controller shelf to turn off.

After you finish

Go to *Replace host interface card* on page 136.

Replace host interface card

You replace a host interface card (HIC) to replace the failed HIC with a new one. If you are replacing HICs in a duplex configuration, repeat all steps to remove the second controller canister, install the second HIC, and reinstall the second controller canister.

Steps

1. Remove controller canister on page 136
   You remove the controller canister so you can add the new host interface card (HIC). When you remove a controller canister, you must disconnect all cables. Then, you can slide the controller canister out of the controller shelf.
2. Install host interface card on page 138
   You install a host interface card (HIC) to replace the failed one with a new HIC.
3. Reinstall controller canister on page 141
   After installing the host interface card (HIC), you reinstall the controller canister into the controller shelf.

Remove controller canister

You remove the controller canister so you can add the new host interface card (HIC). When you remove a controller canister, you must disconnect all cables. Then, you can slide the controller canister out of the controller shelf.

Before you begin

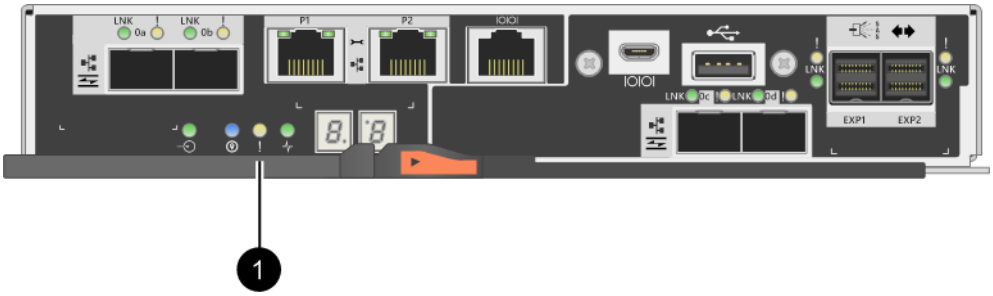
- You have scheduled a downtime maintenance window for this procedure. The power must be off when you install HICs, so you cannot access data on the storage array until you have successfully completed this procedure. (In a duplex configuration, this is because both controllers must have the same HIC configuration when they are powered on.)
- You must use labels to identify each cable that is connected to the controller canister.
- You have an ESD wristband, or you have taken other antistatic precautions.

Steps

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

   Attention: To prevent degraded performance, do not twist, fold, pinch, or step on the cables.
3. Confirm that the Cache Active LED on the back of the controller is off.

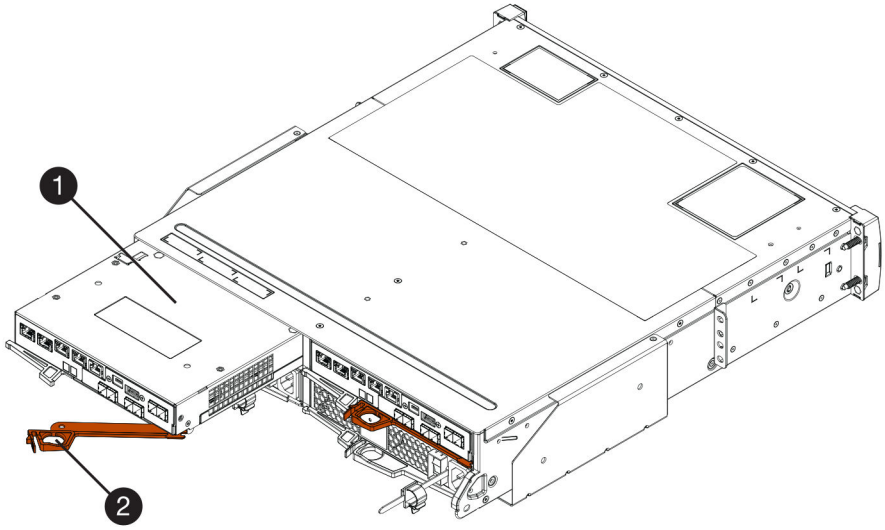
The green Cache Active LED on the back of the controller is on when cached data needs to be written to the drives. You must wait for this LED to turn off before removing the controller canister.



1 Cache Active LED

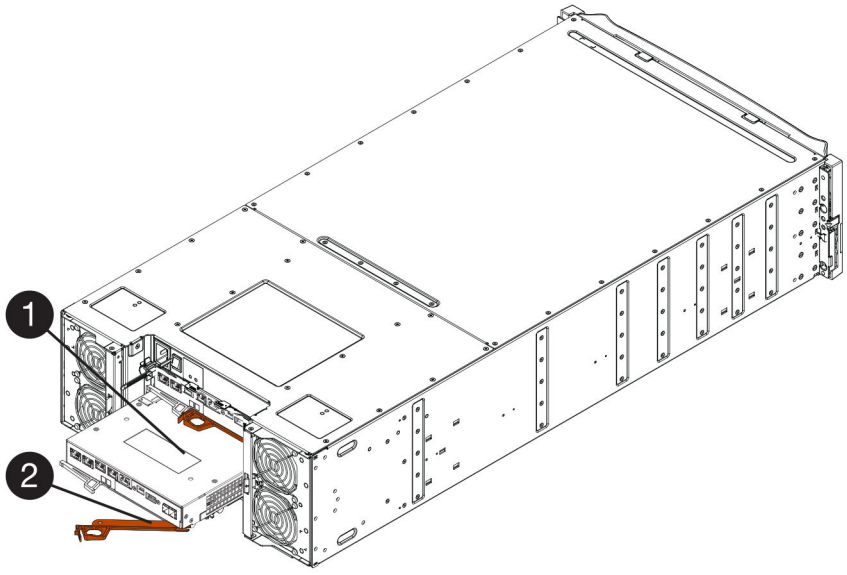
4. Squeeze the latch on the cam handle until it releases, and then open the cam handle to the right to release the controller canister from the shelf.

   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

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

   Attention: 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.

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

After you finish

Go to *Install host interface card* on page 138.

Install host interface card

You install a host interface card (HIC) to replace the failed one with a new HIC.

Before you begin

- You have an ESD wristband, or you have taken other antistatic precautions.
- You have a #1 Phillips screwdriver.
- You have one or two HICs, based on whether you have one or two controllers in your storage array. The HICs must be compatible with your controllers.

About this task

Attention: Possible loss of data access – Never install a HIC in an E2800 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 will cause the controllers to lock down when you apply power.

Steps

1. Unpack the new HIC and the new HIC faceplate.
2. Press the button on the cover of the controller canister, and slide the cover off.
3. Confirm that the green LED inside the controller (by the DIMMs) is off.

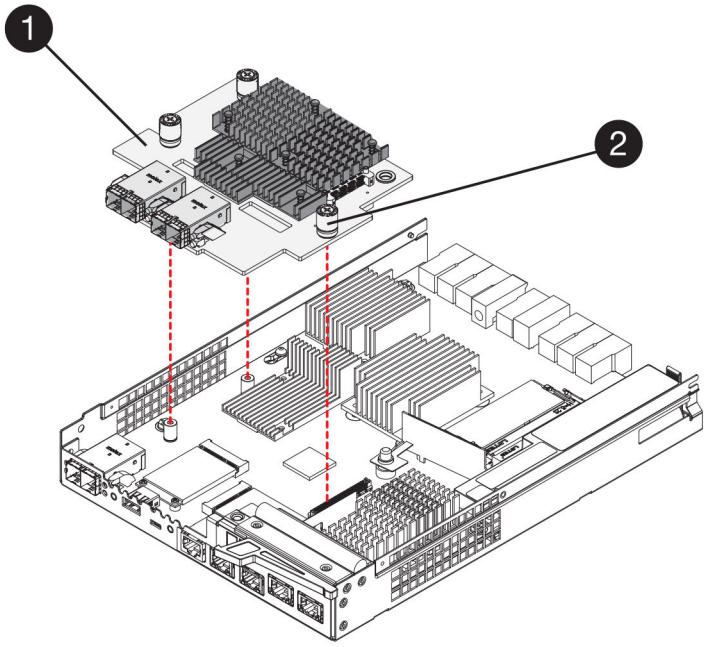
   If this green LED is on, the controller is still using battery power. You must wait for this LED to go off before removing any components.

1 Internal Cache Active LED 2 Battery

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.

   Attention: Possible equipment damage – Be very careful not to pinch the gold ribbon connector for the controller LEDs between the HIC and the thumbscrews.

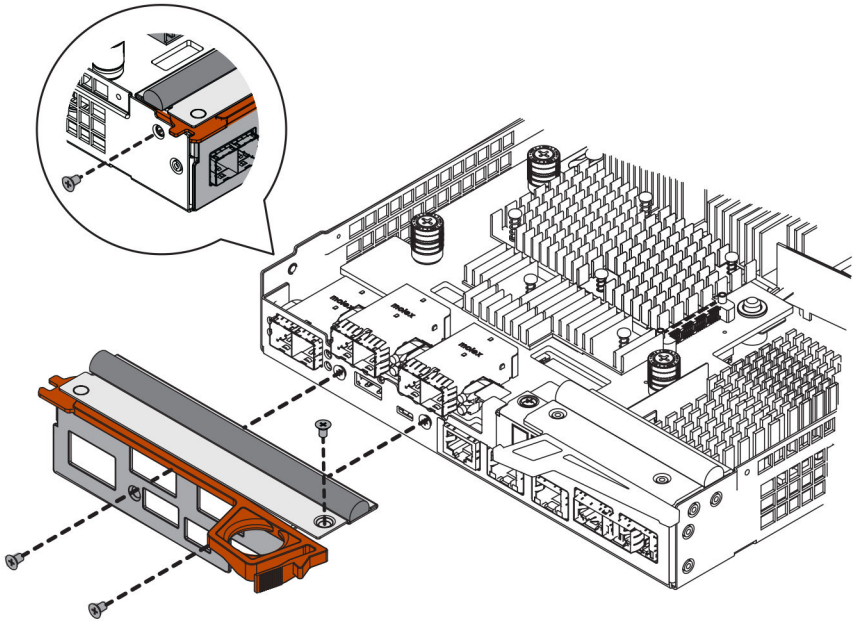


1 Host interface card (HIC) 2 Thumbscrews

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.



After you finish

Go to *Reinstall controller canister* on page 141

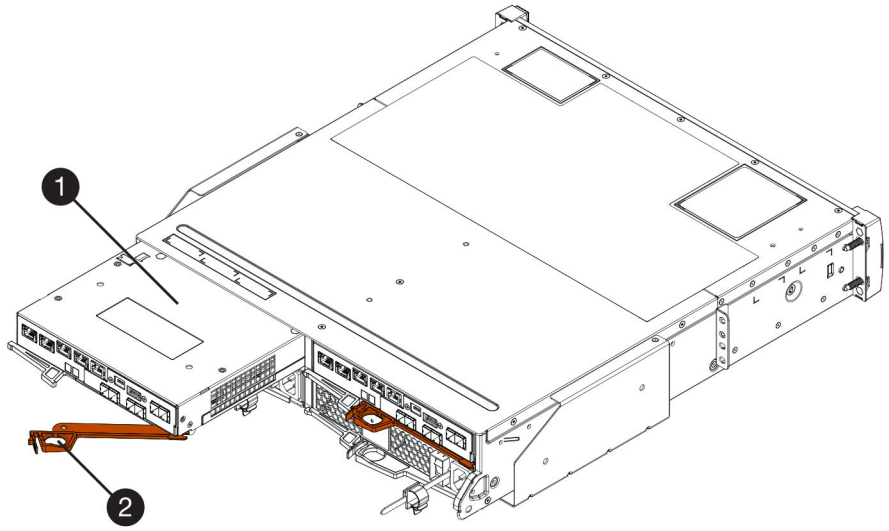
Reinstall controller canister

After installing the host interface card (HIC), you reinstall the controller canister into the controller shelf.

Steps

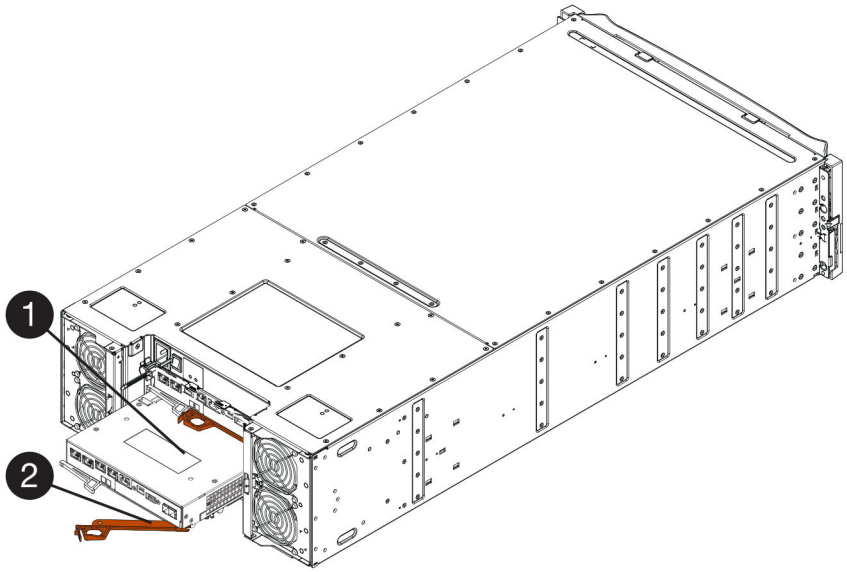
1. Turn the controller canister over, so that the removable cover faces down.
2. With the cam handle in the open position, slide the controller canister all the way into the controller shelf.

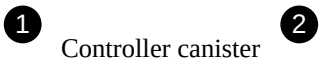
   The following figure is an example of an E2824 controller shelf or EF280 flash array:



(1) Controller canister (2) Cam handle

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





3. Move the cam handle to the left to lock the controller canister in place.
4. Reconnect all the cables you removed.

   Attention: Do not connect data cables to the new HIC ports at this time.

5. (Optional) If you are adding HICs to a duplex configuration, repeat all steps to remove the second controller canister, install the second HIC, and reinstall the second controller canister.

After you finish

Go to *Complete host interface card replacement* on page 142.

Complete host interface card replacement

The steps to complete a host interface card replacement depend on whether you have a duplex configuration (two controllers) or a simplex configuration (one controller). If you have a duplex configuration, you place the affected controller online or, if you have a simplex configuration, you apply power to the controller shelf and confirm that all components are working correctly. Then, you can collect support data and resume operations.

Choices

- Place controller online (duplex) on page 142
  You bring the controller online to confirm the storage array is working correctly. Then, you can collect support data and resume operations.
- Power up controller (simplex) on page 144
  You apply power to the controller shelf to confirm that it is working correctly. Then, you can collect support data and resume operations.

Place controller online (duplex)

You bring the controller online to confirm the storage array is working correctly. Then, you can collect support data and resume operations.

About this task

Perform this task only if your storage array has two controllers.

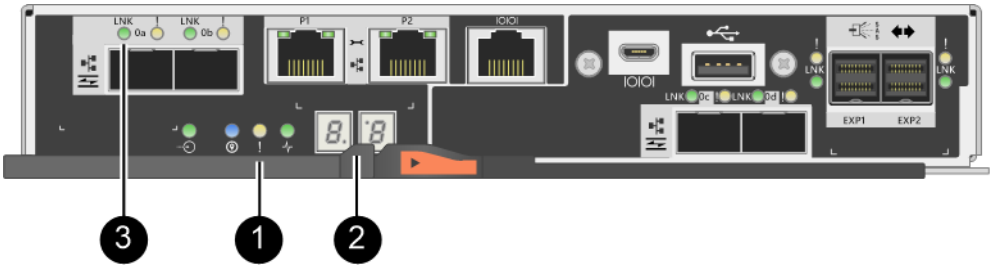
Steps

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

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

   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 lit.
   - 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. Bring the controller online using either SANtricity System Manager or the Enterprise Management Window's (EMW) script editor:

   - To use SANtricity System Manager:

     a. Select **Hardware**.

     b. If the graphic shows the drives, select **Show back of shelf**.

     c. Select the controller you want to place online.

     d. Select **Place Online** from the context menu, and confirm that you want to perform the operation.

     The system places the controller online.

   - To use script editor in the EMW:

     a. Open the Enterprise Management Window (EMW) in SANtricity Storage Manager on your local host.

     b. Select the storage array.

     c. Select **Tools > Execute Script**.

     d. Type one of the following commands in the text box.

     ```
     For controller A: set controller [a] availability=online;
     ```

     ```
     For controller B: set controller [b] availability=online;
     ```

     e. Select **Tools > Verify and Execute**.

     The system places the controller online.

3. Check the codes on the controller's seven-segment display as it comes back 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)

   Attention: 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.

4. 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 check that the HIC and the controller canister are installed correctly. If necessary, remove and reinstall the controller canister and the HIC.

Note: If you cannot resolve the problem, contact technical support.

5. 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`.

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

   Contact technical support at *NetApp Support*, 888-463-8277 (North America), 00-800-44-638277 (Europe), or +800-800-80-800 (Asia/Pacific) if you need the RMA number.

Result

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

Power up controller (simplex)

You apply power to the controller shelf to confirm that it is working correctly. Then, you can collect support data and resume operations.

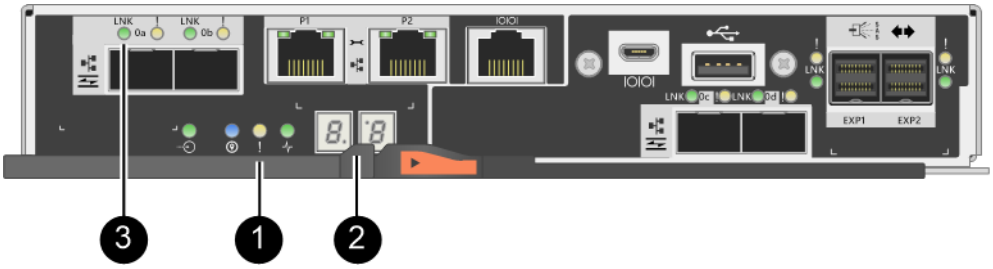
About this task

Perform this task only if your storage array has one controller.

Steps

1. 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.
2. 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.

     Note: 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. Confirm that the controller's 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 check that the HIC and the controller canister are installed correctly. If necessary, remove and reinstall the controller canister and the HIC.

   Note: If you cannot resolve the problem, contact technical support.

4. 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`.

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

   Contact technical support at *NetApp Support*, 888-463-8277 (North America), 00-800-44-638277 (Europe), or +800-800-80-800 (Asia/Pacific) if you need the RMA number.

Result

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

Host port protocol conversion

You can convert the protocol of a host to a different protocol so that compatibility and communication can be established.

Steps

1. Overview and requirements on page 146
2. Change host protocol on page 152

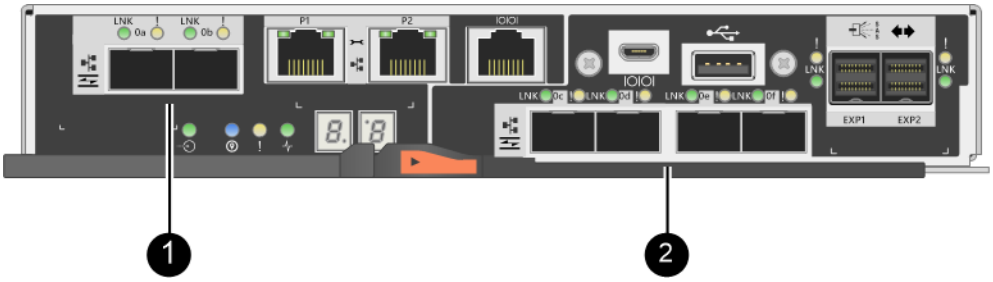
Overview and requirements

Learn about the E2800 baseboard host ports and the requirements you need to know about before converting the host protocol.

Host protocol overview

You can convert the host port protocol of the baseboard host ports in the E2800 controller shelf.

The following figure shows the back of an E2800 controller that has two SFP+ (optical) baseboard host ports (1) and four SFP+ (optical) HIC ports (2).



Note: A two-port HIC is also available.

Which host ports can you change

The E2800 controller or controllers in your storage array might have different types of baseboard host ports and different types of HIC ports. The table shows which host ports can be changed with a feature pack.

If you have...		**You can change...**
These baseboard host ports...	**And these HIC ports...**	
Two SFP+ (optical) ports	None	Only the baseboard host ports
	Four SFP+ (optical) ports	All of the ports
	Two SFP+ (optical) ports	All of the ports
	Two or four SAS ports	Only the baseboard host ports
	Two RJ-45 (base-T) ports	Only the baseboard host ports
Two RJ-45 (base-T) ports	None	None of the ports
	Two RJ-45 (base-T) ports	

The baseboard host ports and the HIC ports can use the same host protocol or different host protocols.

Requirements for changing the host protocol

Learn about the requirements you need to keep in mind when changing the host port protocol.

- You have scheduled a downtime maintenance window for this procedure.
- You must stop host I/O operations when you perform the conversion, and you will not be able to 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. Your NetApp Sales Representative can help you determine what hardware you need and help you order the correct parts.
- If you are attempting to change the baseboard host ports of your storage array, and it currently uses dual-protocol (also referred to as *unified*) SFP transceivers that you purchased from NetApp, you do not need to change your SFP transceivers.
- Dual-protocol SFP transceivers support both FC (at 4 Gbps, 16 Gbps,) and iSCSI (at 10 Gbps), but they do not support 1 Gbps iSCSI. See *Determine whether you have dual-protocol SFPs* on page 152 to determine what type of SFP transceivers are installed.

Considerations for changing the host protocol

The considerations for changing the host protocol depend on the starting and ending protocols of the baseboard host ports and the HIC ports.

If you use a Mirroring feature or the Data Assurance (DA) feature, you must understand what happens to these features when you change the host port protocol.

Note: The following considerations apply only if you are converting a storage array that has already been in use. These considerations do not apply if you are converting a new storage array that does not yet have hosts and volumes defined.

Converting from FC to iSCSI

- If your configuration contains SAN Boot hosts connected to the FC baseboard ports, check the *NetApp Interoperability Matrix Tool* to ensure that the configuration is supported on iSCSI. If it is not, you cannot convert the host protocol to iSCSI.
- The DA feature is not supported for iSCSI.
  - If you are currently using DA and you want to convert FC host ports to iSCSI, you must disable DA on all volumes.
  - If you do not deactivate DA before converting to iSCSI, the storage array will be out of compliance after the conversion.
- The Synchronous Mirroring feature is not supported for iSCSI.
  - If you are currently using Synchronous Mirroring relationships and you want to convert FC host ports to iSCSI, you must deactivate Synchronous Mirroring.
  - Refer to the online help for SANtricity System Manager to remove all synchronous mirrored pairs, which removes mirror relationships on the local storage array and on the remote storage array. In addition, follow the instructions in the online help to deactivate Synchronous Mirroring.

    Attention: If you do not deactivate Synchronous Mirroring relationships before converting to iSCSI, your system will lose data access and data loss might occur.
- Asynchronous Mirroring requires both the local storage array and the remote storage array to use the same protocol.
  - If you are currently using Asynchronous Mirroring and you want to convert all host ports from FC to iSCSI, you must deactivate Asynchronous Mirroring before applying the feature pack.
  - Refer to the online help for SANtricity System Manager to delete all mirror consistency groups and remove all mirrored pairs from the local and remote storage arrays. In addition, follow the instructions in the online help to deactivate Asynchronous Mirroring.

Converting from iSCSI to FC

- Asynchronous Mirroring requires both the local storage array and the remote storage array to use the same protocol. If you are currently using Asynchronous Mirroring with the baseboard ports, you must deactivate Asynchronous Mirroring before changing the protocol.
- Refer to the online help for SANtricity System Manager to delete all mirror consistency groups and remove all mirrored pairs from the local and remote storage arrays. In addition, follow the instructions in the online help to deactivate Asynchronous Mirroring.

Converting from FC to FC/iSCSI

Mirroring considerations

- If a storage array used for mirroring currently has only FC ports, and you want to convert some of them to iSCSI, you must determine which ports are used for mirroring.
- You do not need to convert the ports on the local storage array and the remote storage array to the same protocol as long as both storage arrays have at least one active FC port after the conversion.

- If you plan to convert the ports that are being used for mirrored relationships, you must deactivate any synchronous or asynchronous mirror relationships before applying the feature pack.
  Synchronous Mirroring is not supported for iSCSI.
- If you plan to convert the ports that are *not* being used for mirroring, asynchronous mirroring operations will be unaffected.
- Before applying the feature pack, you should confirm that all mirror consistency groups are synchronized. After applying the feature pack, you should test the communication between the local storage array and the remote storage array.

Data Assurance considerations

- The Data Assurance (DA) feature is not supported for iSCSI.
  To ensure that data access remains uninterrupted, you might need to remap or remove DA volumes from host clusters before applying the feature pack.

If you have...	**You must...**
DA volumes in the default cluster	Remap all the DA volumes in the default cluster. ◦ If you do not want to share DA volumes between hosts, follow these steps: **1.** Create a host partition for each set of FC host ports (unless this has already been done). **2.** Remap the DA volumes to the appropriate host ports. ◦ If you want to share DA volumes between hosts, follow these steps: **1.** Create a host partition for each set of FC host ports (unless this has already been done). **2.** Create a host cluster that includes the appropriate host ports. **3.** Remap the DA volumes to the new host cluster. **Note:** This approach eliminates volume access to any volumes that remain in the default cluster.
DA volumes in a host cluster that contains FC-only hosts, and you want to add iSCSI-only hosts	Remove any DA volumes belonging to the cluster, using one of these options. **Note:** DA volumes cannot be shared in this scenario. ◦ If you do not want to share DA volumes between hosts, remap all DA volumes to individual FC hosts within the cluster. ◦ Segregate the iSCSI-only hosts into their own host cluster, and keep the FC host cluster as is (with shared DA volumes). ◦ Add an FC HBA to the iSCSI-only hosts to allow for sharing of both DA and non-DA volumes.

If you have...	You must...
DA volumes in a host cluster that contains FC-only hosts, or DA volumes that are mapped to an individual FC host partition	No action is needed before applying the feature pack. DA volumes will remain mapped to their respective FC host.
No partitions defined	No action is needed before applying the feature pack because no volumes are currently mapped. After converting the host protocol, follow the proper procedure to create host partitions and, if desired, host clusters.

Converting from iSCSI to FC/iSCSI

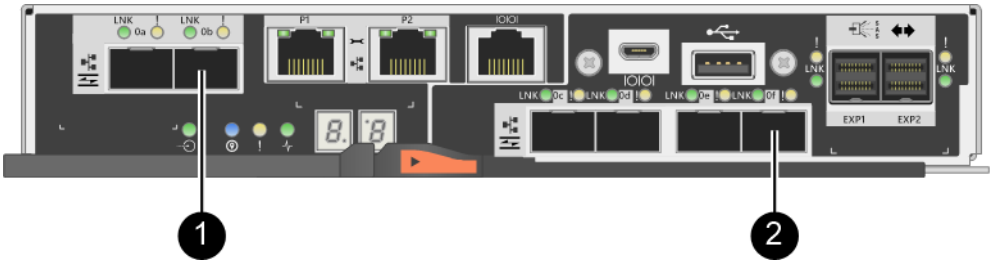
- If you plan to convert a port that is being used for mirroring, you must move the mirroring relationships to a port that will remain iSCSI after the conversion.
  Otherwise, the communication link might be down after the conversion because of a protocol mismatch between the new FC port on the local array and the existing iSCSI port on the remote array.
- If you plan to convert the ports that are not being used for mirroring, asynchronous mirroring operations will be unaffected.
  Before applying the feature pack, you should confirm that all mirror consistency groups are synchronized. After applying the feature pack, you should test the communication between the local storage array and the remote storage array.

Converting from FC/iSCSI to FC

- When converting all host ports to FC, keep in mind that asynchronous mirroring over FC must occur on the highest-numbered FC port.
- If you plan to convert the ports being used for mirrored relationships, you must deactivate these relationships before applying the feature pack.

  Attention: Possible data loss – If you do not delete the asynchronous mirroring relationships that occurred over iSCSI before converting the ports to FC, the controllers might lock down, and you might lose data.

- If the storage array currently has iSCSI baseboard ports and FC HIC ports, asynchronous mirroring operations will be unaffected.
  Before and after the conversion, mirroring will occur on the highest-numbered FC port, which will remain the HIC port labeled **2** in the figure. Before applying the feature pack, you should confirm that all mirror consistency groups are synchronized. After applying the feature pack, you should test the communication between the local storage array and the remote storage array.
- If the storage array currently has FC baseboard ports and iSCSI HIC ports, you must delete any mirroring relationships that occur over FC before applying the feature pack.
  When you apply the feature pack, mirroring support will move from the highest-numbered baseboard host port (labeled **1** in the figure) to the highest-numbered HIC port (labeled **2** in the figure).



Before the conversion			After the conversion			Required steps
Baseboard ports	**HIC ports**	**Port used for mirroring**	**Baseboard ports**	**HIC ports**	**Port used for mirroring**	
iSCSI	FC	2	FC	FC	2	Synchronize mirror consistency groups before and test communications after
FC	iSCSI	1	FC	FC	2	Delete mirroring relationships before and re-establish mirroring after

Converting from FC/iSCSI to iSCSI

- Synchronous Mirroring is not supported for iSCSI.
- If you plan to convert the ports that are being used for mirrored relationships, you must deactivate mirroring relationships before applying the feature pack.

  Attention: Possible data loss – If you do not delete the mirroring relationships that occurred over FC before converting the ports to iSCSI, the controllers might lock down, and you might lose data.

- If you do not plan to convert the ports that are being used for mirroring, mirroring operations will be unaffected.
- Before applying the feature pack, you should confirm that all mirror consistency groups are synchronized.
- After applying the feature pack, you should test the communication between the local storage array and the remote storage array.

Same host protocol and mirroring operations

Mirroring operations are not affected if the host ports being used for mirroring keep the same protocol after you apply the feature pack.

Even so, before applying the feature pack, you should confirm that all mirror consistency groups are synchronized.

After applying the feature pack, you should test the communication between the local storage array and the remote storage array. Refer to the online help for SANtricity System Manager if you have questions on how to do this.

Change host protocol

If you have an E2800 storage array with SFP+ (optical) host ports, you can change the host port protocol from Fibre Channel (FC) to iSCSI or from iSCSI to FC. You can change the protocol used by the host ports built into the controller (*baseboard host ports*), the protocol used by the host ports on the host interface card (*HIC ports*), or the protocol of all host ports.

Steps

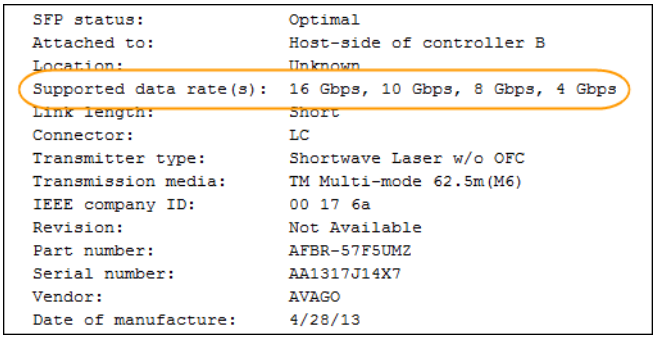
1. Determine whether you have dual-protocol SFPs on page 152
   Use SANtricity System Manager to determine what type of SFP transceivers you have. Because these SFPs can be used with both FC and iSCSI protocols, they are referred to as *dual-protocol* or *unified* SFPs.
2. Obtain the feature pack on page 153
   To obtain the feature pack, you need the serial number from the controller shelf, a Feature Activation Code, and the Feature Enable Identifier for the storage array.
3. Stop host I/O on page 157
   You must 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.
4. Change the feature pack on page 158
   You change the feature pack to convert the host protocol of the baseboard host ports, the IB HIC ports, or both types of ports.
5. Complete host protocol conversion on page 159
   After converting the protocol of the host ports, you need to perform additional steps before you can use the new protocol. The steps you might need to complete depend on the starting and ending protocols of the baseboard host ports and the HIC ports.

Determine whether you have dual-protocol SFPs

Use SANtricity System Manager to determine what type of SFP transceivers you have. Because these SFPs can be used with both FC and iSCSI protocols, they are referred to as *dual-protocol* or *unified* SFPs.

Steps

1. From SANtricity System Manager, select **Support**.
2. Select the **Support Center** tile.
3. On the **Support Resources** tab, locate and select the **Storage Array Profile** link.
4. Type **SFP** in the text box, and click **Find**.
5. For each SFP listed in the Storage Array Profile, locate the entry for **Supported data rate(s)**.



6. Refer to the table to determine whether you can reuse the SFPs, as follows:

Supported data rate(s)	SFP type	Supported protocol
16 Gbps, 10 Gbps, 4 Gbps	Dual-protocol	• **FC:** 16 Gbps, 4 Gbps • **iSCSI:** 10 Gbps
25 Gbps, 10 Gbps	25 Gbps. 10 Gbps,	iSCSI only
32 Gbps, 16 Gbps, 8 Gbps, 4 Gbps	32 Gbps, 16 Gbps	FC only

- If you have dual-protocol SFPs, you can continue using them after you convert the protocol.

  Note: The dual-protocol SFPs do not support 1 Gb iSCSI. If you are converting host ports to iSCSI, be aware that the dual-protocol SFPs support only a 10 Gb link to the connected port.

- If you have 16 Gbps SFPs, and you are converting host ports to iSCSI, you must remove the SFPs and replace them with dual-protocol or 10 Gbps SFPs after converting the protocol. As needed, you can also use 10 Gbps iSCSI copper by using a special Twin-Ax cable with SFPs.

  Note: 8Gbps FC SFPs are NOT supported in the E28xx or E57xx controllers. ONLY 16Gbps and 32 Gbps FC SFPs are supported.

- If you have 10 Gbps SFPs, and you are converting host ports to FC, you must remove the SFPs from these ports and replace them with dual-protocol or 16 Gbps SFPs after converting the protocol.

After you finish

Go to *Obtain the feature pack key* on page 153.

Obtain the feature pack

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

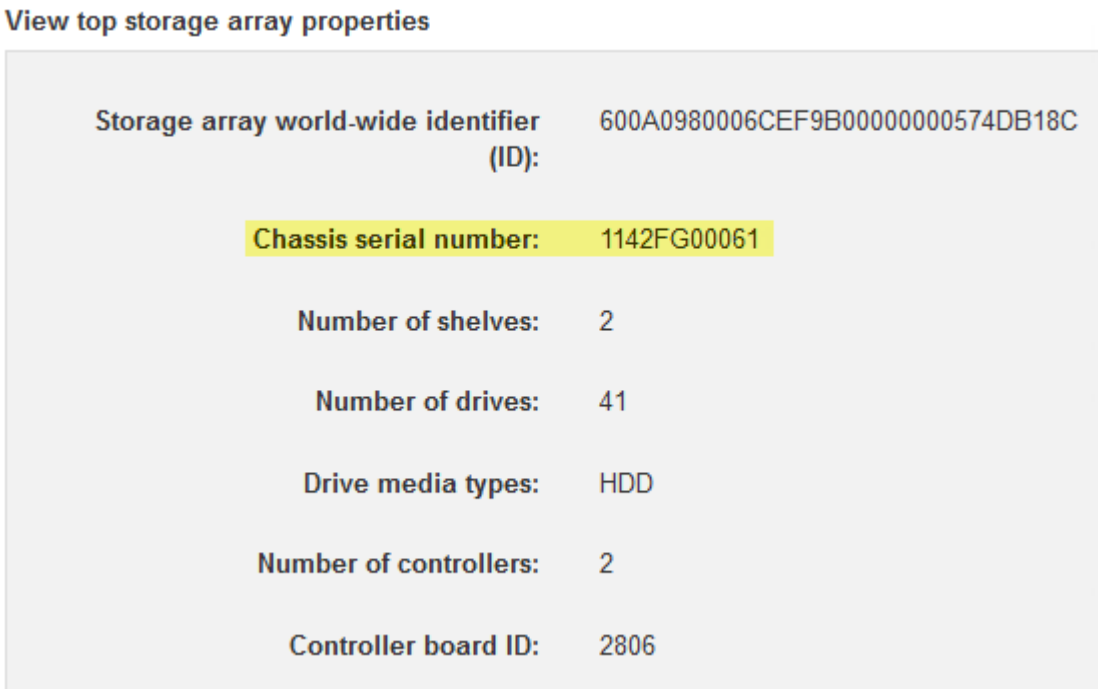
Steps

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.



2. Locate the **feature pack submodel ID**.

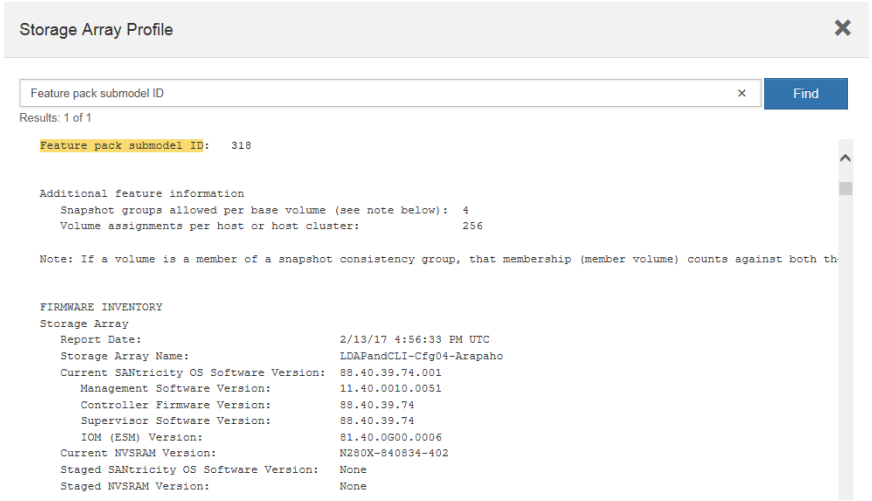
   a. From the SANtricity System Manager, select **Support**.

   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.



3. 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 table below. Then, copy that Feature Activation Code to a text file.

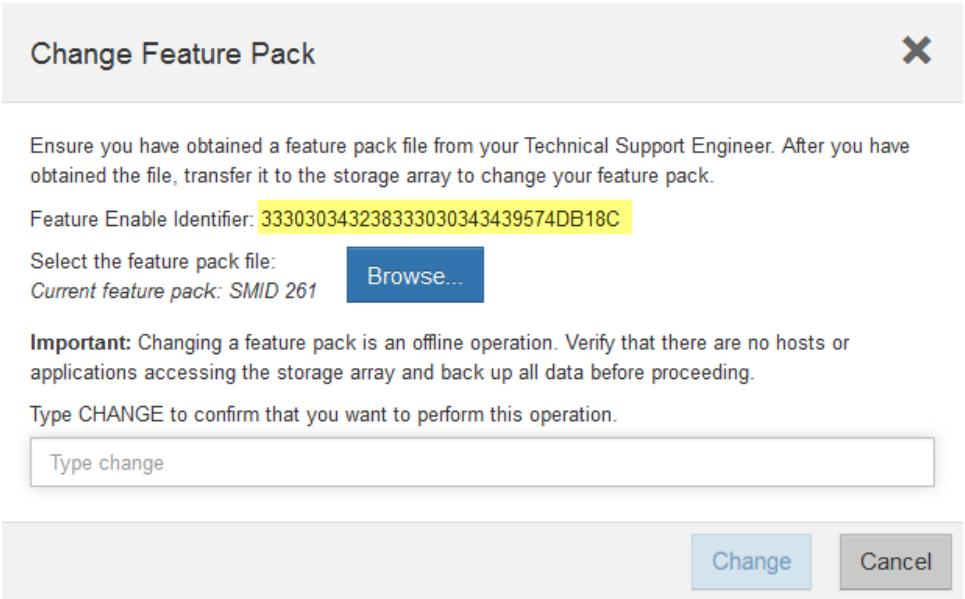
Starting configuration			Ending configuration			Feature Activation Code
Controller submodel ID	**Baseboard ports**	**HIC ports**	**Controller submodel ID**	**Baseboard ports**	**HIC ports**	
318	FC	FC	319	FC	iSCSI	ZGW-4L2-Z36IJ
			320	iSCSI	FC	4GZ-NL2-Z4NRP
			321	iSCSI	iSCSI	TG2-7L2-Z5485
		no HIC or not an optical HIC	321	iSCSI	*no HIC or not an optical HIC*	TG2-7L2-Z5485
319	FC	iSCSI	318	FC	FC	1G5-QL2-Z7LFC
			320	iSCSI	FC	FG7-AL2-Z82RW
			321	iSCSI	iSCSI	5G7-0K2-Z0G8X
320	iSCSI	FC	318	FC	FC	4GP-HL2-ZYRKP
			319	FC	iSCSI	PGU-KL2-Z1P7I
			321	iSCSI	iSCSI	BGA-8K2-ZQWM5
321	iSCSI	iSCSI	318	FC	FC	SGH-UK2-ZUCJG
			319	FC	iSCSI	1GK-EK2-ZVSW1
			320	iSCSI	FC	AGM-XL2-ZWA8A
		no HIC or not an optical HIC	318	FC	*no HIC or not an optical HIC*	SGH-UK2-ZUCJG

Starting configuration			Ending configuration			Feature Activation Code
Controller submodel ID	**Baseboard ports**	**HIC ports**	**Controller submodel ID**	**Baseboard ports**	**HIC ports**	
338	FC	FC	339	FC	iSCSI	PGC-RK2-ZREUT
			340	iSCSI	FC	MGF-BK2-ZSU3Z
			341	iSCSI	iSCSI	NGR-1L2-ZZ8QC
		no HIC or not an optical HIC	341	iSCSI	*no HIC or not an optical HIC*	NGR-1L2-ZZ8QC

Starting configuration			Ending configuration			Feature Activation Code
Controller submodel ID	**Baseboard ports**	**HIC ports**	**Controller submodel ID**	**Baseboard ports**	**HIC ports**	
339	FC	iSCSI	338	FC	FC	DGT-7M2-ZKBMD
			340	iSCSI	FC	GGA-TL2-Z9J50
			341	iSCSI	iSCSI	WGC-DL2-ZBZIB
340	iSCSI	FC	338	FC	FC	4GM-KM2-ZGWS1
			339	FC	iSCSI	PG0-4M2-ZHDZ6
			341	iSCSI	iSCSI	XGR-NM2-ZJUGR
341	iSCSI	iSCSI	338	FC	FC	3GE-WL2-ZCHNY
			339	FC	iSCSI	FGH-HL2-ZDY3R
			340	iSCSI	FC	VGJ-1L2-ZFFEW
		no HIC or not an optical HIC	338	FC	*no HIC or not an optical HIC*	3GE-WL2-ZCHNY

Note: 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.



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

   Important: 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.

After you finish

Go to *Stop host I/O* on page 157.

Stop host I/O

You must 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.

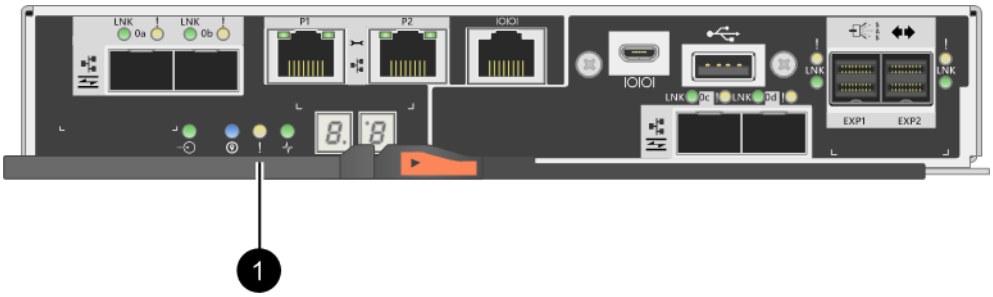
Steps

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.

   Note: 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.

   Attention: 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.
2. If the storage array participates in a mirroring relationship, stop all host I/O operations on the secondary storage array.
3. 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.



Callout	Type of host ports
1	Cache Active LED

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

After you finish

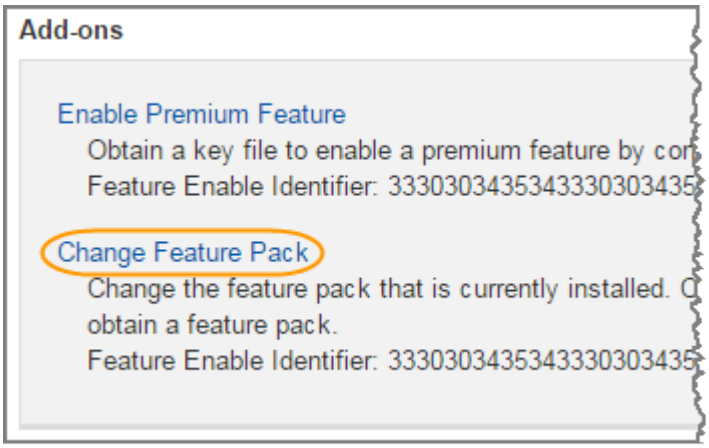
Go to *Change the feature pack* on page 158

Change the feature pack

You change the feature pack to convert the host protocol of the baseboard host ports, the IB HIC ports, or both types of 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**.
   g. Review the details shown for the baseboard ports and the HIC ports (labeled “slot 1”), and confirm that each type of port has the protocol you expect.

After you finish

Go to *Complete host protocol conversion* on page 159.

Complete host protocol conversion

After converting the protocol of the host ports, you need to perform additional steps before you can use the new protocol. The steps you might need to complete depend on the starting and ending protocols of the baseboard host ports and the HIC ports.

Choices

- Complete FC to iSCSI conversion on page 159
  If you converted all host ports from FC to iSCSI, you must configure iSCSI networking.
- Complete iSCSI to FC conversion on page 161
  If you converted all host ports from iSCSI to FC, you must configure FC networking.
- Complete FC to FC/iSCSI conversion on page 162
  If you previously had all FC host ports and you converted some of them to iSCSI, you might need to modify your existing configuration to support iSCSI.
- Complete iSCSI to FC/iSCSI conversion on page 163
  If you previously had all iSCSI host ports and you converted some of them to FC, you might need to modify your existing configuration to support FC.
- Complete FC/iSCSI to FC conversion on page 164
  If you previously had a combination of FC host ports and iSCSI host ports and you converted all ports to FC, you might need to modify your existing configuration to use the new FC ports.
- Complete FC/iSCSI to FC conversion on page 165
  If you previously had a combination of FC host ports and iSCSI host ports and you converted all ports to iSCSI, you might need to modify your existing configuration to use the new iSCSI ports.

Complete FC to iSCSI conversion

If you converted all host ports from FC to iSCSI, you must configure iSCSI networking.

Steps

1. Configure the switches.

You should configure the switches used to transport iSCSI traffic according to the vendor's recommendations for iSCSI. These recommendations might include both configuration directives as well as code updates.

2. From SANtricity System Manager, select **Hardware > Configure iSCSI ports**.
3. Select the port settings.

   You can set up your iSCSI network in many ways. Consult your network administrator for tips on selecting the best configuration for your environment.
4. Update the host definitions in SANtricity System Manager.

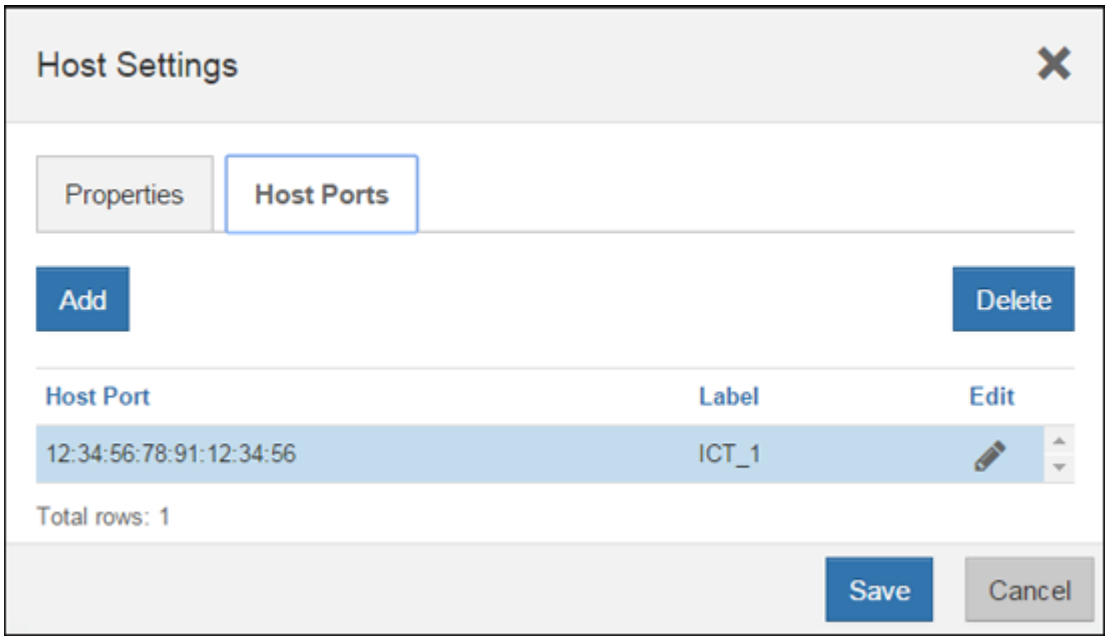
   Note: If you need instructions for add hosts or host clusters, refer to the online help for SANtricity System Manager.

   a. Select **Storage > Hosts**.

   b. Select the host to which the port will be associated, and click **View/Edit Settings**.

      The Host Settings dialog box appears.

   c. Click the **Host Ports** tab.



   d. Click **Add**, and use the **Add Host Port** dialog box to associate a new host port identifier to the host.

      The length of the host port identifier name is determined by the host interface technology. FC host port identifier names must have 16 characters. iSCSI host port identifier names have a maximum of 223 characters. The port must be unique. A port number that has already been configured is not allowed.

   e. Click **Delete**, and use the **Delete Host Port** dialog box to remove (unassociate) a host port identifier.

      The **Delete** option does not physically remove the host port. This option removes the association between the host port and the host. Unless you remove the host bus adapter or the iSCSI initiator, the host port is still recognized by the controller.

   f. Click **Save** to apply your changes to the host port identifier settings.

g. Repeat these steps to add and remove any additional host port identifiers.

5. Reboot the host or perform a rescan so that the host properly discovers the LUNs.
6. Remount volumes or start using block volume.

Complete iSCSI to FC conversion

If you converted all host ports from iSCSI to FC, you must configure FC networking.

Steps

1. Install the HBA utility and determine initiator WWPNs.
2. Zone the switches.

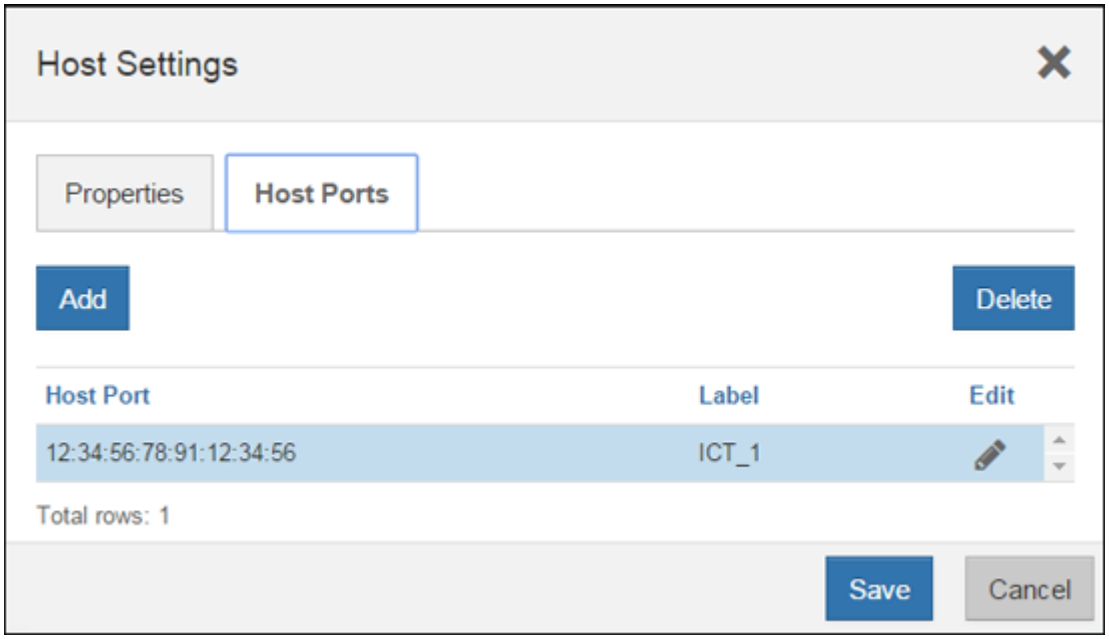
   Zoning the switches enables the hosts to connect to the storage and limits the number of paths. You zone the switches using the management interface of the switches.
3. Update the host definitions in SANtricity System Manager.

   a. Select **Storage** > **Hosts**.

   b. Select the host to which the port will be associated, and click **View/Edit Settings**.

   The Host Settings dialog box appears.

   c. Click the **Host Ports** tab.



   d. Click **Add**, and use the **Add Host Port** dialog box to associate a new host port identifier to the host.

   The length of the host port identifier name is determined by the host interface technology. FC host port identifier names must have 16 characters. iSCSI host port identifier names have a maximum of 223 characters. The port must be unique. A port number that has already been configured is not allowed.

   e. Click **Delete**, and use the **Delete Host Port** dialog box to remove (unassociate) a host port identifier.

   The **Delete** option does not physically remove the host port. This option removes the association between the host port and the host. Unless you remove the host bus adapter or the iSCSI initiator, the host port is still recognized by the controller.

f. Click **Save** to apply your changes to the host port identifier settings.

g. Repeat these steps to add and remove any additional host port identifiers.

4. Reboot the host or perform a rescan so that the host properly discovers mapped storage.
5. Remount volumes or start using block volume.

Complete FC to FC/iSCSI conversion

If you previously had all FC host ports and you converted some of them to iSCSI, you might need to modify your existing configuration to support iSCSI.

About this task

You can use either of the following options to use the new iSCSI ports. The exact steps depend on your current and planned network topologies.

Option 1 assumes that you want to attach new iSCSI hosts to the array. Option 2 assumes that you want to convert the hosts connected to the converted ports from FC to iSCSI.

Option 1: Move FC hosts and add new iSCSI hosts

Steps

1. Move any FC hosts from the new iSCSI ports to the ports that remain FC.
2. If you are not already using dual-protocol SFPs, remove any FC SFPs.
3. Attach new iSCSI hosts to these ports, either directly or by using a switch.
4. Configure iSCSI networking for the new hosts and ports. For instructions, refer to the *Linux express configuration*, *Windows express configuration*, or *VMware express configuration*.

Option 2: Convert FC hosts to iSCSI

Steps

1. Shut down the FC hosts connected to the converted ports.
2. Provide an iSCSI topology for the converted ports. For example, convert any switches from FC to iSCSI.
3. If you are not already using dual-protocol SFPs, remove the FC SFPs from the converted ports, and replace them with iSCSI SFPs or dual-protocol SFPs.
4. Attach cables to the SFPs in the converted ports, and confirm they are connected to the correct iSCSI switch or host.
5. Power on the hosts.
6. Use the *NetApp Interoperability Matrix Tool* to configure the iSCSI hosts.
7. Edit the host partition to add the iSCSI host port IDs and remove the FC host port IDs.
8. After the iSCSI hosts reboot, use the applicable procedures on the hosts to register the volumes and to make them available to your operating system.
   - Depending on your operating system, two utilities are included with the storage management software (`hot_add` and `SMdevices`). These utilities help register the volumes with the hosts and also show the applicable device names for the volumes.

- You might need to use specific tools and options that are provided with your operating system to make the volumes available (that is, assign drive letters, create mount points, and so on). Refer to your host operating system documentation for details.

Complete iSCSI to FC/iSCSI conversion

If you previously had all iSCSI host ports and you converted some of them to FC, you might need to modify your existing configuration to support FC.

About this task

You can use either of the following options to use the new FC ports. The exact steps depend on your current and planned network topologies.

Option 1 assumes that you want to attach new FC hosts to the array. Option 2 assumes that you want to convert the hosts connected to the converted ports from iSCSI to FC.

Option 1: Move iSCSI hosts and add new FC hosts

Steps

1. Move any iSCSI hosts from the new FC ports to the ports that remain iSCSI.
2. If you are not already using dual-protocol SFPs, remove any FC SFPs.
3. Attach new FC hosts to these ports, either directly or by using a switch.
4. Configure FC networking for the new hosts and ports. For instructions, refer to the *Linux express configuration*, *Windows express configuration*, or *VMware express configuration*.

Option 2: Convert iSCSI hosts to FC

Steps

1. Shut down the iSCSI hosts connected to the converted ports.
2. Provide an FC topology for the converted ports. For example, convert any switches from iSCSI to FC.
3. If you are not already using dual-protocol SFPs, remove the iSCSI SFPs from the converted ports, and replace them with FC SFPs or dual-protocol SFPs.
4. Attach cables to the SFPs in the converted ports, and confirm they are connected to the correct FC switch or host.
5. Power on the hosts.
6. Use the *NetApp Interoperability Matrix Tool* to configure the FC hosts.
7. Edit the host partition to add the FC host port IDs and remove the iSCSI host port IDs.
8. After the new FC hosts reboot, use the applicable procedures on the hosts to register the volumes and to make them available to your operating system.
   - Depending on your operating system, two utilities are included with the storage management software (`hot_add` and `SMdevices`). These utilities help register the volumes with the hosts and also show the applicable device names for the volumes.
   - You might need to use specific tools and options that are provided with your operating system to make the volumes available (that is, assign drive letters, create mount points, and so on). Refer to your host operating system documentation for details.

Complete FC/iSCSI to FC conversion

If you previously had a combination of FC host ports and iSCSI host ports and you converted all ports to FC, you might need to modify your existing configuration to use the new FC ports.

About this task

You can use either of the following options to use the new FC ports. The exact steps depend on your current and planned network topologies.

Option 1 assumes that you want to attach new FC hosts to the array. Option 2 assumes that you want to convert the hosts connected to ports 1 and 2 from iSCSI to FC.

Option 1: Remove iSCSI hosts and add FC hosts

Steps

1. If you are not already using dual-protocol SFPs, remove any iSCSI SFPs, and replace them with FC SFPs or dual-protocol SFPs.
2. If you are not already using dual-protocol SFPs, remove any FC SFPs.
3. Attach new FC hosts to these ports, either directly or by using a switch
4. Configure FC networking for the new hosts and ports. For instructions, refer to the *Linux express configuration*, *Windows express configuration*, or *VMware express configuration*.

Option 2: Convert iSCSI hosts to FC

Steps

1. Shut down the iSCSI hosts connected to the ports you converted.
2. Provide an FC topology for these ports. For example, convert any switches connected to those hosts from iSCSI to FC.
3. If you are not already using dual-protocol SFPs, remove the iSCSI SFPs from the ports, and replace them with FC SFPs or dual-protocol SFPs.
4. Attach cables to the SFPs, and confirm they are connected to the correct FC switch or host.
5. Power on the hosts.
6. Use the *NetApp Interoperability Matrix Tool* to configure the FC hosts.
7. Edit the host partition to add the FC host port IDs and remove the iSCSI host port IDs.
8. After the new FC hosts reboot, use the applicable procedures on the hosts to register the volumes and to make them available to your operating system.
   - Depending on your operating system, two utilities are included with the storage management software (`hot_add` and `SMdevices`). These utilities help register the volumes with the hosts and also show the applicable device names for the volumes.
   - You might need to use specific tools and options that are provided with your operating system to make the volumes available (that is, assign drive letters, create mount points, and so on). Refer to your host operating system documentation for details.

Complete FC/iSCSI to FC conversion

If you previously had a combination of FC host ports and iSCSI host ports and you converted all ports to iSCSI, you might need to modify your existing configuration to use the new iSCSI ports.

About this task

You can use either of the following options to use the new iSCSI ports. The exact steps depend on your current and planned network topologies.

Option 1 assumes that you want to attach new iSCSI hosts to the array. Option 2 assumes that you want to convert the hosts from FC to iSCSI.

Option 1: Remove FC hosts and add iSCSI hosts

Steps

1. If you are not already using dual-protocol SFPs, remove any FC SFPs, and replace them with iSCSI SFPs or dual-protocol SFPs.
2. Attach new iSCSI hosts to these ports, either directly or by using a switch.
3. Configure iSCSI networking for the new hosts and ports. For instructions, refer to the *Linux express configuration*, *Windows express configuration*, or *VMware express configuration*.

Option 2: Convert FC hosts to iSCSI

Steps

1. Shut down the FC hosts connected to the ports you converted.
2. Provide an iSCSI topology for these ports. For example, convert any switches connected to those hosts from FC to iSCSI.
3. If you are not already using dual-protocol SFPs, remove the FC SFPs from the ports, and replace them with iSCSI SFPs or dual-protocol SFPs.
4. Attach cables to the SFPs, and confirm they are connected to the correct iSCSI switch or host.
5. Power on the hosts.
6. Use the *NetApp Interoperability Matrix Tool* to configure the ISCSI hosts.
7. Edit the host partition to add the iSCSI host port IDs and remove the FC host port IDs.
8. After the new iSCSI hosts reboot, use the applicable procedures on the hosts to register the volumes and to make them available to your operating system.
   - Depending on your operating system, two utilities are included with the storage management software (`hot_add` and `SMdevices`). These utilities help register the volumes with the hosts and also show the applicable device names for the volumes.
   - You might need to use specific tools and options that are provided with your operating system to make the volumes available (that is, assign drive letters, create mount points, and so on). Refer to your host operating system documentation for details.

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