# E4000

## E-Series storage systems

NetApp
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# Table of Contents

# E4000

## Replace the battery - E4000

You must replace the affected battery in your E4000 if the Recovery Guru in SANtricity System Manager indicates a "Battery Failed" or "Battery Replacement Required" status. To protect your data, the battery must be replaced as soon as possible.

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.

**Before you begin**

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

- A replacement battery.
- An ESD wristband, or you have taken other antistatic precautions.
- Labels to identify each cable that is connected to the controller canister.
- A management station with a browser that can access SANtricity System Manager for the controller. (To open the System Manager interface, point the browser to the controller's domain name or IP address.)
- Verify that no volumes are in use or that you have a multipath driver installed on all hosts using these volumes.

### Step 1: 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 place the affected controller offline so you can safely remove the failed battery. The controller that you are not placing offline must be online (in the optimal state).

If you have a simplex configuration, power down the controller shelf so you can safely remove the failed battery.

**Power down the controller shelf (simplex)**

**Steps**

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

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

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

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

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

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

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

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

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

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

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

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

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

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.

**Place controller offline (duplex)**

**Steps**

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

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

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

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

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

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

4. Collect support data for your storage array using SANtricity System Manager.
5. If a problem occurs when you remove a controller, you can use the saved file to troubleshoot the issue. The system will save inventory, status, and performance data about your storage array in a single file.
   a. Select **Support › Support Center › Diagnostics**.
   b. Select **Collect Support Data**.
   c. Click **Collect**.

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

6. If the controller is not already offline, take it offline now using SANtricity System Manager.
   - From SANtricity System Manager:
     a. Select **Hardware**.
     b. If the graphic shows the drives, select **Controller & Components** to show the controllers.
     c. Select the controller that you want to place offline.

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

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

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

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

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

7. Wait for SANtricity System Manager to update the controller's status to offline.
8. Select **Recheck** from the Recovery Guru, and confirm that the **Okay to remove** field in the **Details** area displays **Yes**. This indicates that it is safe to proceed to removing the controller canister.

## Step 2: Remove E4000 controller canister

You need to remove the controller canister from the controller shelf, so you can remove the battery.

**Before you begin**

Make sure you have the following:

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

**Steps**

1. Disconnect all the cables from the controller canister.

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

2. If the host ports on the controller canister use SFP+ transceivers, leave them installed.
3. Confirm that the Cache Active LEDs on the back of the controller and the controller faceplate are off.

   If either LED is on, the controller is still using battery power. All LEDs must be off before you continue with this procedure.

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

## Step 3: Install the new battery

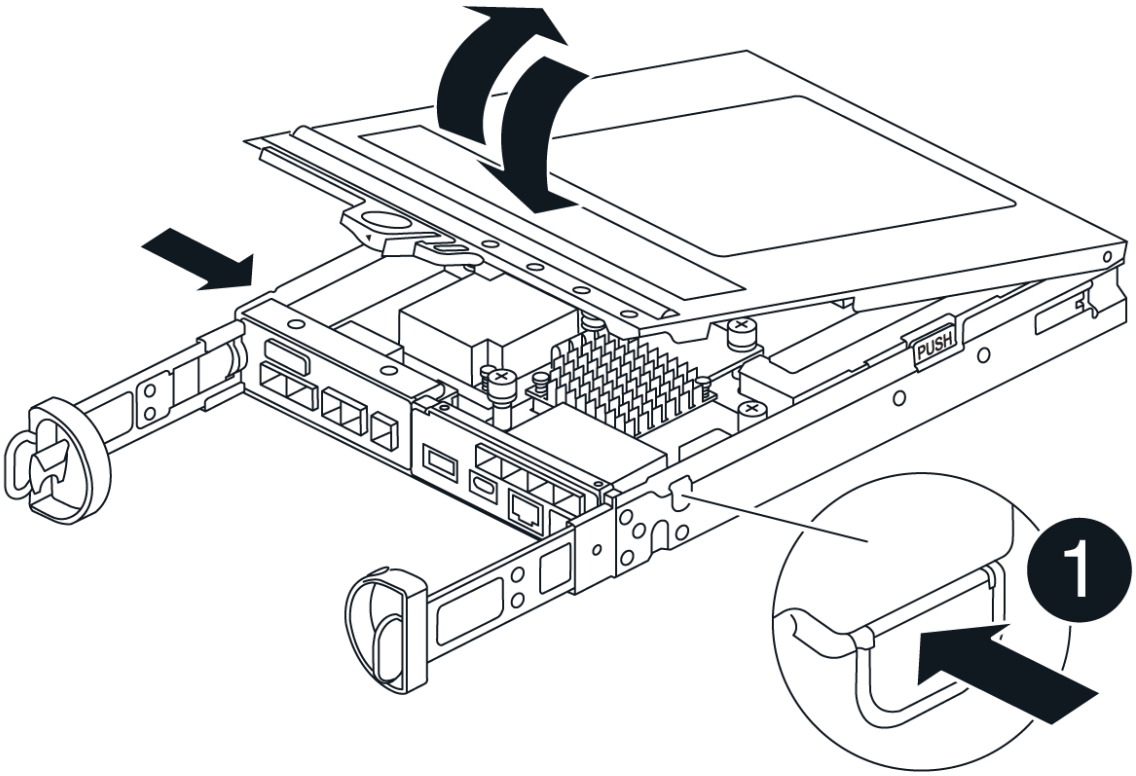
You must remove the failed battery and replace it.

**Steps**

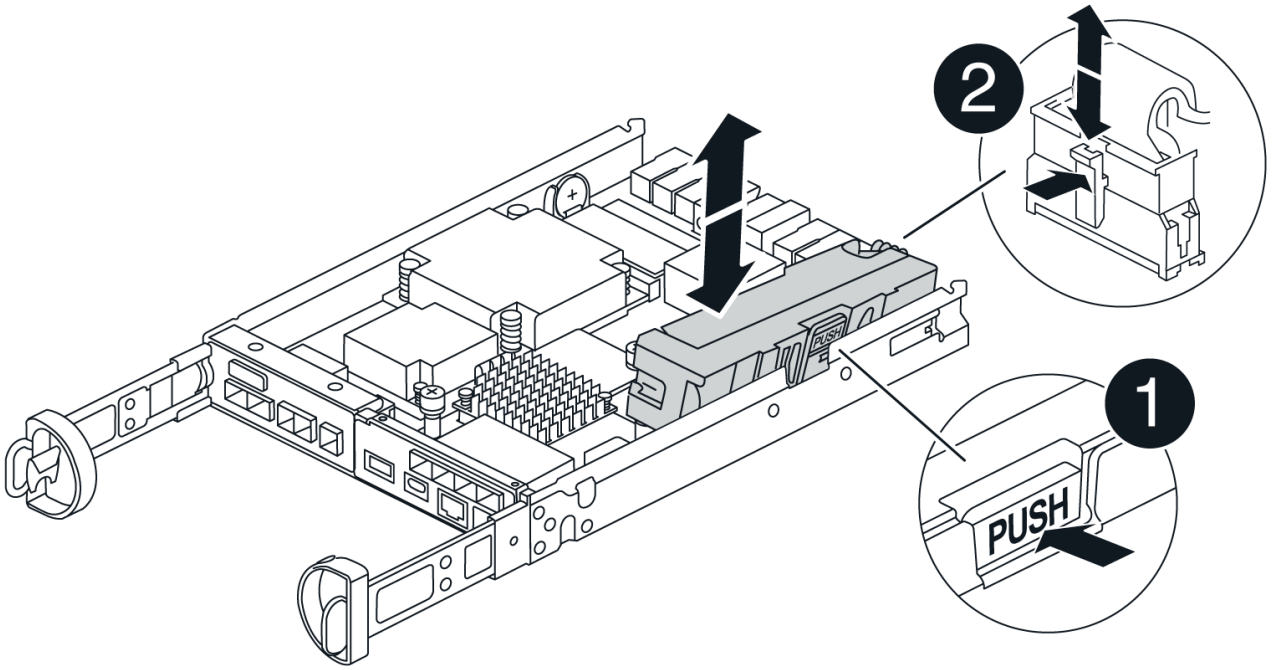
1. Unpack the new battery and place it on a flat, static-free surface.

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. If you are not already grounded, properly ground yourself.
3. Remove the controller canister from the chassis.
4. Turn the controller canister over and place it on a flat, stable surface.
5. Open the cover by pressing the blue buttons on the sides of the controller canister to release the cover, and then rotate the cover up and off of the controller canister.




6. Locate the battery in the controller canister.
7. Remove the failed battery from the controller canister:
   a. Push the battery release tab on the side of the controller canister.
   b. Slide the battery up until it clears the holding brackets, and then lift the battery out of the controller canister.
   c. Unplug the battery from the controller canister.




| | |
|---|---|
| 1 | Battery release tab |
| 2 | Battery power connector |

8. Remove the replacement battery from its package. Install the replacement battery:
   a. Plug the battery connector back into the socket on the controller canister.

      Make sure that the connector locks down into the battery socket on the motherboard.

   b. Align the battery with the holding brackets on the sheet metal side wall.
   c. Slide the battery release tab down until the battery latch engages and clicks into the opening on the side wall.
9. Reinstall the controller canister cover and lock it into place.

## Step 4: Reinstall the controller canister

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

**Steps**

1. If you are not already grounded, properly ground yourself.
2. If you have not already done so, replace the cover on the controller canister.
3. Turn the controller over, so that the removable cover faces down.
4. With the cam handle in the open position, slide the controller all the way into the shelf.
5. Replace the cables.

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

6. Bind the cables to the cable management device with the hook and loop strap.

## Step 5: Complete battery replacement

The steps to complete battery replacement depend on whether you have a duplex (two controllers) or simplex (one controller) configuration.

**Power up controller (simplex)**

**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. When the controller is back online, 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.

   If you cannot resolve the problem, contact technical support. If needed, collect support data for your storage array using SANtricity System Manager.
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**.

**Place controller online (duplex)**

**Steps**

1. Bring the controller online using SANtricity System Manager.
   - From SANtricity System Manager:
     a. Select **Hardware**.
     b. If the graphic shows the drives, select **Controller & Components**.
     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.
   - Alternatively, you can bring the controller back online by using the following CLI commands:

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

     **For controller B**: `set controller [b] availability=online;`
2. When the controller is back online, 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.

If you cannot resolve the problem, contact technical support. If needed, collect support data for your storage array using SANtricity System Manager.

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

**What's next?**

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

# Controllers

## Requirements to replace the controller - E4000

Before you replace or add an E4000 controller, review the requirements and considerations.

Each controller canister contains a controller card and a battery. You can add a second controller to a simplex configuration or replace a failed controller.

### Requirements for adding second controller

You can add a second controller canister to the simplex version of the E4000 controller shelf. Before you add a second controller, you must have:

- A new controller canister with the same part number as the currently installed controller canister.

  This is not applicable for a StorageGRID appliance.

- All cables, transceivers, switches, and host bus adapters (HBAs) needed to connect the new controller ports.

  For information about compatible hardware, refer to the NetApp Interoperability Matrix or the NetApp

Hardware Universe.

- Multipath driver installed on the host so that you can use both controllers. Refer to the Linux express configuration, Windows express configuration, or VMware express configuration for instructions.
- An ESD wristband, or you have taken other antistatic precautions.
- A #1 Phillips screwdriver.
- Labels to identify the new cables.
- A management station with a browser that can access SANtricity System Manager for the controller. (To open the System Manager interface, point the browser to the controller's domain name or IP address.)

  Optionally, you can use the command line interface (CLI) to perform some of the procedures. For SANtricity System Manager (version 11.60 and above), you can download the CLI package (zip file) from System Manager. To do so, go to **Settings > System > Add-ons > Command Line Interface** in System Manager. You can then issue CLI commands from an operating system prompt, such as the DOS C: prompt.

### Requirements for replacing controller

When you replace a failed controller canister, you must remove the battery, HIC, and DIMMs 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.

Before you replace a controller, you must have:

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

  Optionally, you can use the command line interface (CLI) to perform some of the procedures. For SANtricity System Manager (version 11.60 and above), you can download the CLI package (zip file) from System Manager. To do so, go to **Settings > System > Add-ons > Command Line Interface** in System Manager. You can then issue CLI commands from an operating system prompt, such as the DOS C: prompt.

#### Duplex configuration requirements

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

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

#### Simplex configuration requirements

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

## Add a second canister - E4000

You can add a second controller canister in the E4000 array.

#### About this task

Add a second controller canister to the simplex version of a E4012 controller shelf. This procedure is also referred to as a simplex-to-duplex conversion, which is an online procedure. You can access data on the storage array while you perform this procedure.

#### Before you begin

Make sure you have the following:

- A new controller canister with the same part number as the currently installed controller canister. (See step 1 to verify the part number.)
- An ESD wristband, or take other antistatic precautions.
- A #1 Phillips screwdriver.
- Labels to identify the new cables. For information about compatible hardware, refer to the NetApp Interoperability Matrix or the NetApp Hardware Universe.
- All cables, transceivers, switches, and host bus adapters (HBAs) needed to connect the new controller ports.
- A management station with a browser that can access SANtricity System Manager for the controller. (To open the System Manager interface, point the browser to the controller's domain name or IP address.)

#### Step 1: Verify the new controller's part number

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

#### Steps

1. Unpack the new controller canister, and set it on a flat, static-free surface. Save all packing materials to use when shipping the failed controller canister.
2. Locate the MAC address and FRU part number labels on the back of the controller canister.
3. From SANtricity System Manager, locate the replacement part number for the installed controller canister.
   a. Select **Hardware**.
   b. Locate the controller shelf, which is marked with the controller icon.
   c. Click the controller icon  .
   d. Select the controller, and click **Next**.
   e. On the **Base** tab, make a note of the **Replacement Part Number** for the controller.
4. Confirm that the replacement part number for the installed controller is the same as the FRU part number for the new controller.

**Possible loss of data access** — If the two part numbers are not the same, do not attempt this procedure. The presence of mismatched controllers will cause the new controller to lock down when you bring it online.

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

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

   a. Select **Support › Support Center › Diagnostics**.
   b. Select **Collect Configuration Data**.
   c. Click **Collect**.

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

### Step 2: Install host interface card

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

#### Steps

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

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

2. Remove the HIC card bezel by sliding it straight out from the controller module.
3. Take the HIC card and align it with the socket on the motherboard.
4. Gently push down on the card to seat it in the socket.
5. Tighten the three thumbscrews.

   Be careful not to over tighten the screws, as that may result in damage to the HIC card.

6. Reinstall the HIC card bezel.

### Step 3: Collect support data

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

#### Steps

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

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

2. Collect support data for your storage array using SANtricity System Manager.
   a. Select **Support › Support Center › Diagnostics**.
   b. Select **Collect Support Data**.
   c. Click **Collect**.

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

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

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

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

### Step 4: Change configuration to duplex

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

#### Steps

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

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

2. Upgrade the files using SANtricity System Manager.

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

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

   - From SANtricity System Manager:
     a. Under **SANtricity OS Software upgrade**, click **Begin Upgrade**.

b. Next to **Select Controller NVSRAM file**, click **Browse**, and then select the NVSRAM file you downloaded.

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

The upgrade begins and the following occurs:

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

◦ Alternatively, you can use the following CLI command to perform the upgrade:

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

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

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

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

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

◦ After upgrading controller NVSRAM, verify the following in SANtricity System Manager:

- Go to the Hardware page, and verify that all components appear.
- Go to the Software and Firmware Inventory dialog box (go to **Support › Upgrade Center**, and then click the link for **Software and Firmware Inventory**). Verify the new software and firmware versions.

◦ When you upgrade controller NVSRAM, any custom settings that you have applied to the existing NVSRAM are lost during the process of activation. You must apply the custom settings to the NVSRAM again after the process of activation is complete.

4. Change the storage array setting to duplex using CLI commands. To use CLI, you can open a command prompt if you downloaded the CLI package.

◦ From a command prompt:

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

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

b. Use the following command to reset the controller.

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

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

### Step 5: Remove the controller blank

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

**Steps**

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

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

### Step 6: Install the second controller canister

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

1. If you are not already grounded, properly ground yourself.
2. Turn the controller canister over, so that the removable cover faces down.
3. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.
4. With the cam handle in the open position, firmly push the controller module in until it meets the midplane and is fully seated, and then close the cam handle to the locked position.

   Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors. The controller begins to boot as soon as it is seated in the chassis.

5. If you have not already done so, reinstall the cable management device.
6. Bind the cables to the cable management device with the hook and loop strap.

### Step 7: Complete adding a second controller

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

**Steps**

1. Place controller online.
   a. In System Manager, navigate to the **Hardware** page.
   b. Select **Show back of controller**.
   c. Select the replaced controller.

d. Select **Place online** from the drop-down list.

2. As the controller boots, check the controller LEDs.

   When communication with the other controller is reestablished:

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

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

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

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 controller canister is installed correctly. If necessary, remove and reinstall the controller canister.

   If you cannot resolve the problem, contact technical support.

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

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

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

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

   a. Click **Hardware › Support › Upgrade Center** to ensure that the latest version of SANtricity OS is installed. As needed, install the latest version.
   b. In System Manager, go to the **Upgrade Center**.
   c. Under **SANtricity OS Software upgrade**, click **Begin Upgrade**.
   d. Click **Browse**, and select the SANtricity OS software file.
   e. Click **Browse**, and select the Controller NVSRAM file.
   f. Click **Start**, and confirm that you want to perform the operation.

      The transfer of control operation begins.

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

      The Change Ownership button is enabled.

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

e. Click **Change Ownership**.

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

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

a. Select **Support › Support Center › Diagnostics**.

b. Click **Collect**.

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

**What's next?**

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

## Replace the controller - E4000

You can replace a failed controller canister.

**Before you begin**

Make sure you have the following:

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

**Step 1: Prepare to replace controller**

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 place the controller offline or power it down.

**Power down the controller shelf (simplex)**

**Steps**

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

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

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

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

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

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

        The file is saved in the Downloads folder for your browser with the name, **configurationData-<arrayName>-<dateTime>.7z**.
   - Alternatively, you can back up the configuration database by using the following CLI command:

     ```
     save storageArray dbmDatabase sourceLocation=onboard contentType=all
     file="filename";
     ```
4. Collect support data for your storage array using SANtricity System Manager.

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

   a. **Select Support › Support Center › Diagnostics**.
   b. Select **Collect Support Data**.

c. Click **Collect**.

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

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

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

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

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

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

7. From the home page of SANtricity System Manager, select **View Operations in Progress**.
8. Confirm that all operations have completed before continuing with the next step.
9. Turn off both power switches on the controller shelf.
10. Wait for all LEDs on the controller shelf to turn off.
11. Select **Recheck** from the Recovery Guru, and confirm that the **OK to remove** field in the Details area displays **Yes**, indicating that it is safe to remove this component. Data on the storage array will not be accessible until you replace the controller canister.

**Place controller offline (duplex)**

**Steps**

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

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

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

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

   a. Select **Hardware**.
   b. Locate the controller shelf, which is marked with the controller icon.
   c. Click the controller icon.
   d. Select the controller, and click **Next**.

e. On the **Base** tab, make a note of the **Replacement Part Number** for the controller.

4. Confirm that the replacement part number for the failed controller is the same as the FRU part number for the replacement controller.

> **Possible loss of data access** — If the two part numbers are not the same, do not attempt this procedure. The presence of mismatched controllers will cause the new controller to lock down when you bring it online.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

### Step 2: Remove failed controller

Replace the failed canister with a new one.

**Steps**

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

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

   d. If needed, remove the SFPs transceivers.
   e. 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.

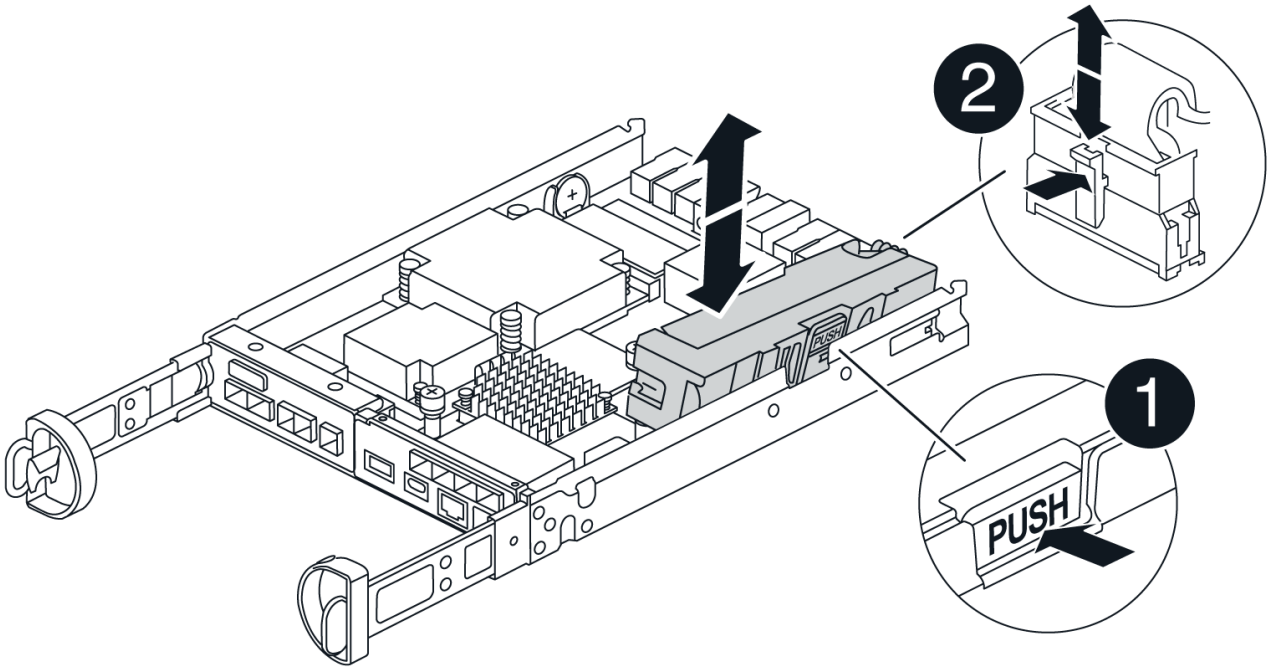
   f. Squeeze the latch on the cam handle until it releases, open the cam handle fully to release the controller canister from the midplane, and then, using two hands, pull the controller canister out of the chassis.
   g. Turn the controller canister over and place it on a flat, stable surface.
   h. Open the cover by pressing the blue buttons on the sides of the controller canister to release the cover, and then rotate the cover up and off of the controller canister.

### Step 3: Remove the battery

Remove the battery from the impaired controller and install it in the replacement controller.

**Steps**

1. Remove the battery from the controller canister:
   a. Press the blue button on the side of the controller canister.
   b. Slide the battery up until it clears the holding brackets, and then lift the battery out of the controller canister.
   c. Unplug the battery plug by squeezing the clip on the face of the battery plug to release the plug from the socket, and then unplug the battery cable from the socket.




| | |
|---|---|
| 1 | Battery release tab |
| 2 | Battery power connector |

2. Move the battery to the replacement controller canister and install it:
   a. Aligning the battery with the holding brackets on the sheet metal side wall.
   b. Slide the battery pack down until the battery latch engages and clicks into the opening on the side wall.

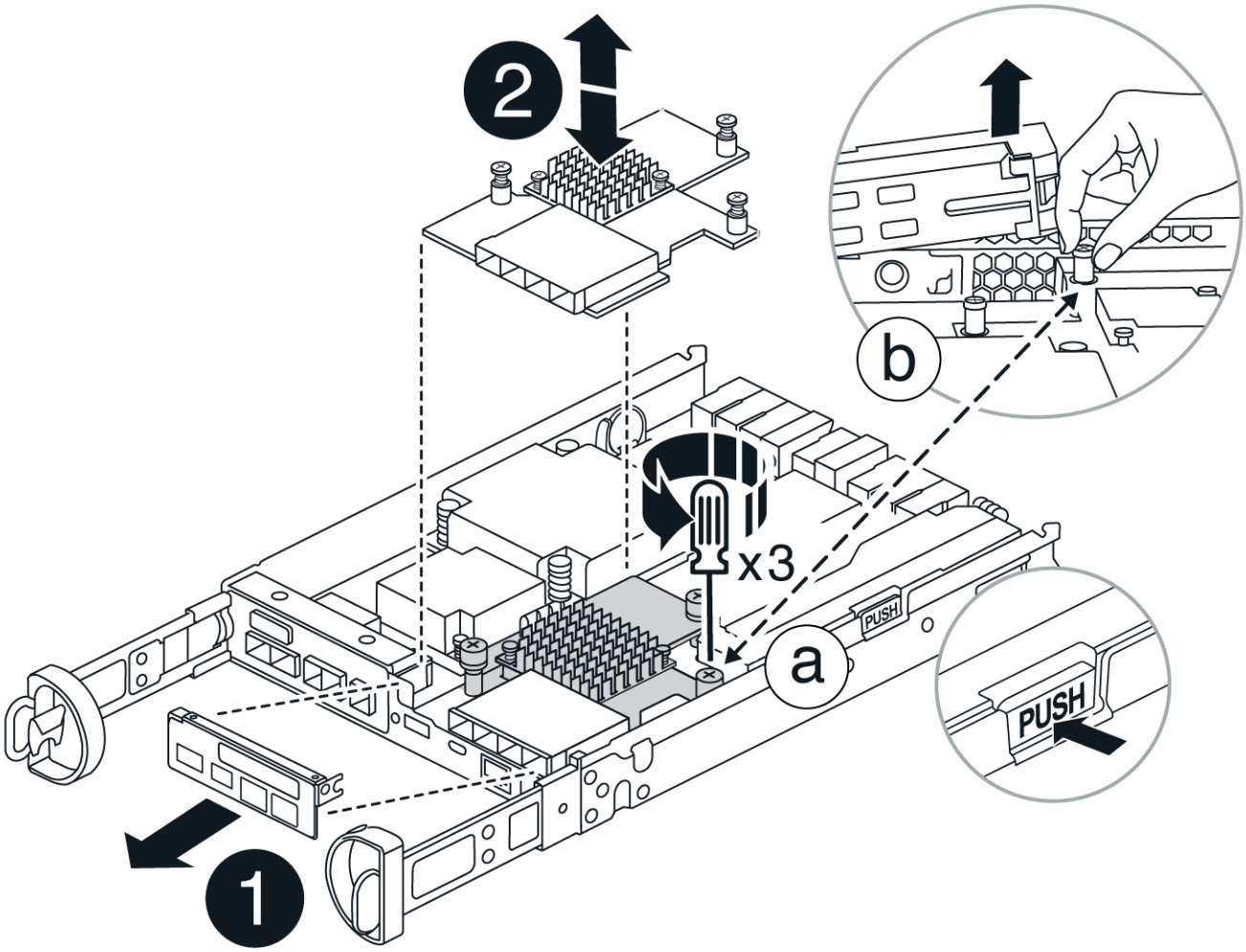
> Do not plug the battery in yet. You will plug it in once the rest of the components are moved to the replacement controller canister.

### Step 4: Remove the HIC

Remove the HIC bezel and PCIe HIC card from the impaired controller module.

#### Steps

1. Remove the HIC bezel by sliding it straight out from the controller module.




2. Loosen the thumbscrews on the HIC.

   You can loosen the thumbscrews with your fingers or a screwdriver.

3. Lift the HIC straight up and set it aside on an anti-static surface.

### Step 5: Move the DIMMs

Remove the DIMMs from the impaired controller canister and install them into the replacement controller canister.

#### Steps

1. Locate the DIMMs on your controller canister.

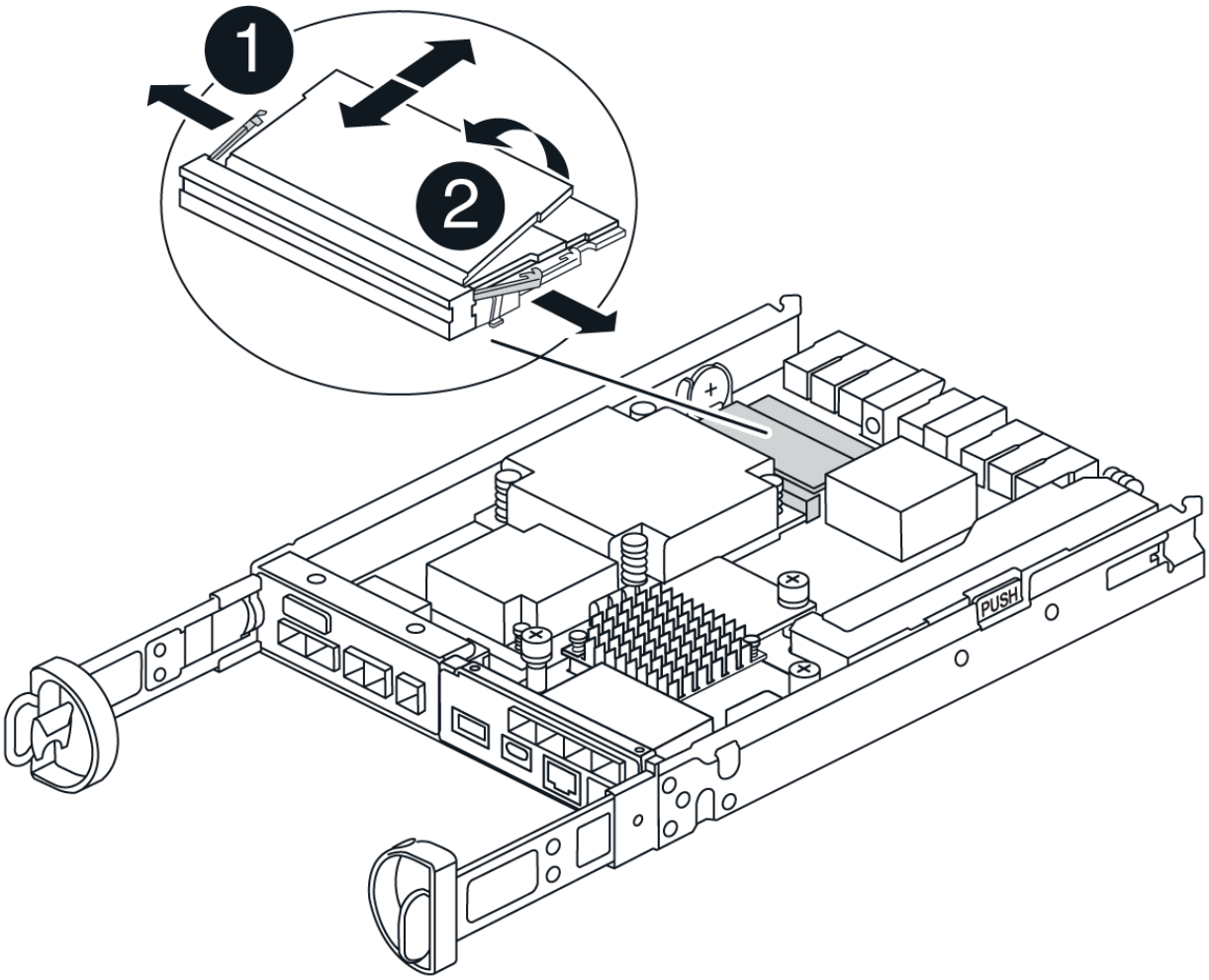
   Note the location of the DIMM in the sockets so that you can insert the DIMM in the same location in the replacement controller canister and in the proper orientation. Remove the DIMMs from the impaired controller canister:

   a. Eject the DIMM from its slot by slowly pushing apart the two DIMM ejector tabs on either side of the DIMM.

      The DIMM will rotate up a little.

b. Rotate the DIMM as far as it will go, and then slide the DIMM out of the socket.

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




| | |
|---|---|
| 1 | DIMM ejector tabs |
| 2 | DIMMS |

2. Verify that the battery is not plugged into the replacement controller canister.
3. Install the DIMMs in the replacement controller in the same place they were in the impaired controller:
   a. Push carefully, but firmly, on the top edge of the DIMM until the ejector tabs snap into place over the notches at the ends of the DIMM.

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

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

4. Repeat these steps for the other DIMM.

### Step 6: Install the HIC

Install the HIC into the replacement controller canister.

**Steps**

1. Align the socket on the replacement HIC plug with the socket on the motherboard, and then gently seat the card squarely into the socket.
2. Tighten the three thumbscrews on the HIC.
3. Reinstall the HIC faceplate.

### Step 7: Install the battery

Install the battery into the replacement controller canister.

**Steps**

1. Plug the battery plug back into the socket on the controller canister.

   Make sure that the plug locks down into the battery socket on the motherboard.

2. Aligning the battery with the holding brackets on the sheet metal side wall.
3. Slide the battery pack down until the battery latch engages and clicks into the opening on the side wall.
4. Reinstall the controller canister cover and lock it into place.

### Step 8: Complete controller replacement

Reestablish connection to the controller shelf, collect support data, and resume operations.

**Power on controller shelf (simplex)**

**Steps**

1. Install the replacement controller into the shelf.
   a. If you are not already grounded, properly ground yourself.
   b. Turn the controller over, so that the removable cover faces down.
   c. With the cam handle in the open position, slide the controller all the way into the shelf.
   d. Replace the cables.

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

   e. Bind the cables to the cable management device with the hook and loop strap.
   f. Power on the controller shelf.
   g. Wait for the E4000 controller to reboot.
   h. Determine how you will assign an IP address to the replacement controller.

      The steps for assigning an IP address to the replacement controller depend on whether you connected the management port to a network with a DHCP server and on whether all drives are secured.

      If management port 1 is connected to a network with a DHCP server, the new controller will obtain its IP address from the DHCP server. This value might be different than the original controller's IP address.

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

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

   - **Only secured drives (no unsecure drives)**:
     a. Access the storage array's command line interface (CLI).
     b. Load the appropriate simplex NVSRAM on the controller.

        For example: `download storageArray NVSRAM file=\"N4000-881834-SG4.dlp\" forceDownload=TRUE;`

     c. Confirm that the controller is **Optimal** after loading simplex NVSRAM.
     d. If using external security key management, setup external key management on the controller.
     e. If using internal security key management, enter the following command to import the security key:

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

where:

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

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

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

a. Collect the support bundle and open the storage array profile.

b. Find and record all the unsecure drives' locations, which are found in the support bundle.

c. Power off the system.

d. Remove the unsecure drives.

e. Replace the controller.

f. Power on the system.

g. From SANtricity System Manager, select **Settings › System**.

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

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

j. Run the `set allDrives nativeState` CLI command.

k. The controller will reboot automatically.

l. Wait for the controller to boot up and for the seven-segment display to show the tray number or a flashing L5.

m. Power off the system.

n. Reinstall the unsecure drives.

o. Reset the controller using SANtricity System Manager.

p. Power on the system and wait for the seven-segment display to show the tray number.

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

3. 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**.

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**.

**Place controller online (duplex)**

**Steps**

1. Install the replacement controller into the shelf.
   a. If you are not already grounded, properly ground yourself.
   b. If you have not already done so, replace the cover on the controller canister.
   c. Turn the controller over, so that the removable cover faces down.
   d. With the cam handle in the open position, slide the controller all the way into the shelf.
   e. Replace the cables.

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

   f. Bind the cables to the cable management device with the hook and loop strap.
   g. If the original controller used DHCP for the IP address, locate the MAC address on the label on the back of the replacement controller. Ask your network administrator to associate the DNS/network and IP address for the controller you removed with the MAC address for the replacement controller.

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

2. Place controller online.
   a. In System Manager, navigate to the **Hardware** page.
   b. Select **Show back of controller**.
   c. Select the replaced controller.
   d. Select **Place online** from the drop-down list.
3. As the controller boots, check the controller LEDs.
   - The amber Attention LED on the controller turns on and then turns off, unless there is an error.
   - The Host Link LEDs might be on, blinking, or off, depending on the host interface.
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 the controller canister is installed correctly. If necessary, remove and reinstall the controller canister.

   If you cannot resolve the problem, contact technical support.

5. If required, redistribute all volumes back to their preferred owner using SANtricity System Manager.
   a. Select **Storage › Volumes**.
   b. Select **More › Redistribute volumes**.
6. Click **Hardware › Support › Upgrade Center** to ensure that the latest version of SANtricity OS software (controller firmware) is installed.

   As needed, install the latest version.

7. Collect support data for your storage array using SANtricity System Manager.
   a. Select **Support › Support Center › Diagnostics**.
   b. Select **Collect Support Data**.
   c. Click **Collect**.

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

**What's next?**

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

# Canisters

## Replace the power supply - E4000

You can replace a power supply in an E4000.

**Before you begin**

- Review the details in the Recovery Guru to confirm that there is an issue with the power supply. Select **Recheck** from the Recovery Guru to ensure no other items must be addressed first.
- Check that the amber Attention LED on the power supply is on, indicating that the power supply or its integrated fan has a fault. Contact technical support for assistance if both power supplies in the shelf have their amber Attention LEDs on.
- Make sure you have the following:
  - A replacement power supply that is supported for your controller shelf or drive shelf model.

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

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

### Step 1: Prepare to replace power supply

Prepare to replace a power supply in a 12-drive or 24-drive controller shelf or drive shelf.

**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 **Controller & Components**.
   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.

      > 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.

### Step 2: Remove failed power supply

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

#### Steps

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

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

2. 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.

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

### Step 3: Install new power supply

Install a new power supply to replace the failed one.

**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.

   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.

### Step 4: Complete power supply replacement

Confirm that the new power supply is working correctly, 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 Step 2: Remove failed power supply, and in Step 3: Install new power supply. 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.

**What's next?**

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

## Replace the power canister - E4000 (60-drive)

You can replace a power canister in an E4000 array with a 60-drive shelf, which include the following shelf types:

- E4060 controller shelf
- DE460C drive shelf

**About this task**

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.

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.

**Before you begin**

- 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.
- Make sure you have the following:
  - A replacement power canister that is supported for your controller shelf or drive shelf model.
  - An ESD wristband, or you have taken other antistatic precautions.

### Step 1: Prepare to replace power canister

Prepare to replace a power canister in a 60-drive controller shelf or drive shelf.

**Steps**

1. Collect support data for your storage array using SANtricity System Manager.
   a. Select **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 **Controller & Components**.

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.

   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.

   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.

### Step 2: Remove failed power canister

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

**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.

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

### Step 3: Install new power canister

Install a new power canister to replace the failed one.

**Steps**

1. Make sure the on/off switch of the new power canister is in the Off position.
2. 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.

Do not use excessive force when sliding the power canister 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 canister is fully seated.
4. Reconnect the power cord to the power canister, and secure the power cord to the power canister using the power cord retainer.
5. Turn on the power to the new power canister.

#### Step 4: Complete power canister replacement

Confirm that the new power canister is working correctly, 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 Step 2: Remove failed power canister and in Step 3: Install new power canister. 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 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.

**What's next?**

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

## Replace the fan canister - E4000 (60-drive)

You can replace a fan canister in an E4000 array with a 60-drive shelf, which include the following shelf types:

- E4060 controller shelf
- DE460C drive shelf

**About this task**

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.

**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.

**Before you begin**

- 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.
- Make sure you have the following:
  - A replacement fan canister (fan) that is supported for your controller shelf or drive shelf model.
  - An ESD wristband, or you have taken other antistatic precautions.

### Step 1: Prepare to replace fan canister

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.

#### Steps

1. Collect support data for your storage array using SANtricity System Manager.
   a. Select **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 **Controller & Components**.
   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.

      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.

### Step 2: Remove failed fan canister and install new one

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

> 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.

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

### Step 3: Complete fan canister replacement

Confirm that the new fan canister is working correctly, gather support data, and resume normal operations.

**Steps**

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

   > 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 Step 2: Remove failed fan canister and install new one. 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 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.

**What's next?**

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

# Replace the DIMMs - E4000

You can replace a DIMM in the E4000 if a memory mismatch is present or you have a

failed DIMM.

**Before you begin**

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

## Step 1: Determine if you need to replace a DIMM

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

**Steps**

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

## Step 2: Prepare to replace a DIMM

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

**Power down the controller shelf (simplex)**

In a simplex configuration, power down the controller shelf so you can safely remove and replace the DIMMs.

**Steps**

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

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

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

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

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

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

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

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

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

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

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

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

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

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.

**Place controller offline (duplex)**

In a duplex configuration, place the controller offline so you can safely remove and replace the DIMMs.

**Steps**

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

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

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

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

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

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

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

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

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

## Step 3: Remove controller canister

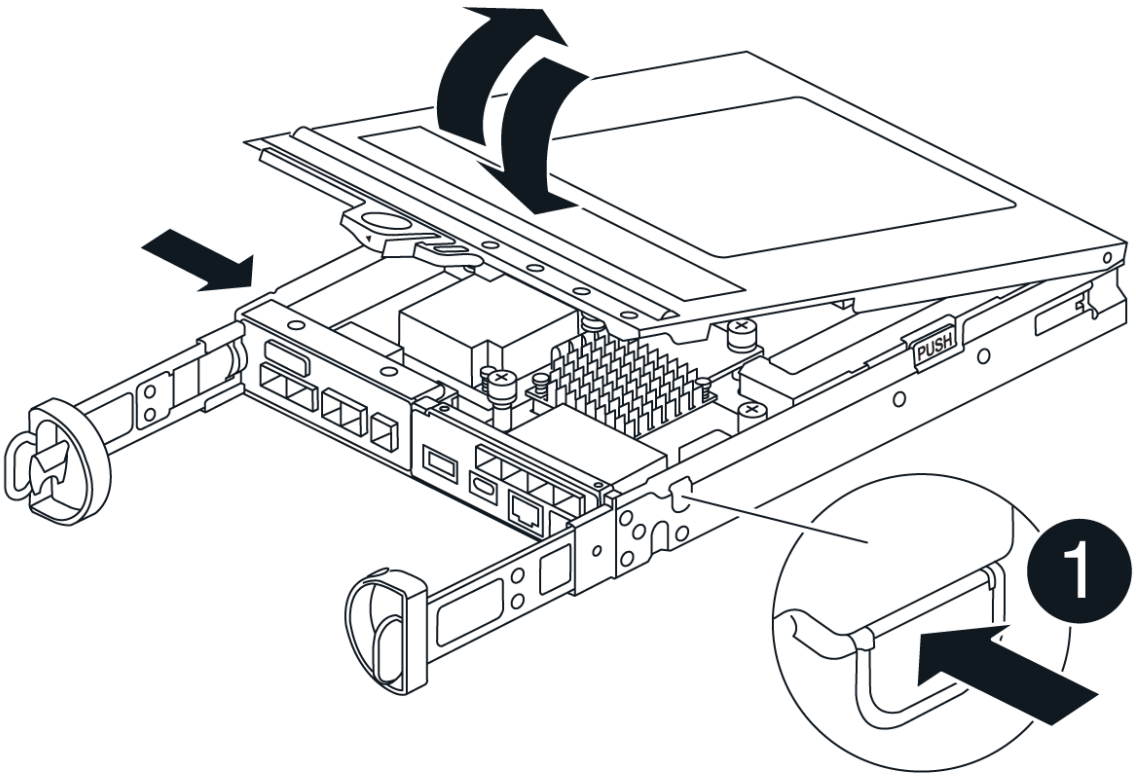
Remove the controller canister from the system and then remove the controller canister cover.

**Steps**

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

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

3. Remove and set aside the cable management devices from the left and right sides of the controller canister.
4. Squeeze the latch on the cam handle until it releases, open the cam handle fully to release the controller canister from the midplane, and then, using two hands, pull the controller canister out of the chassis.
5. Confirm that the Cache Active LED on the back of the controller is off.
6. Turn the controller canister over and place it on a flat, stable surface.
7. Open the cover by pressing the blue buttons on the sides of the controller canister to release the cover, and then rotate the cover up and off of the controller canister.



## Step 4: Replace the DIMMs

Locate the DIMM inside the controller, remove it, and replace it.

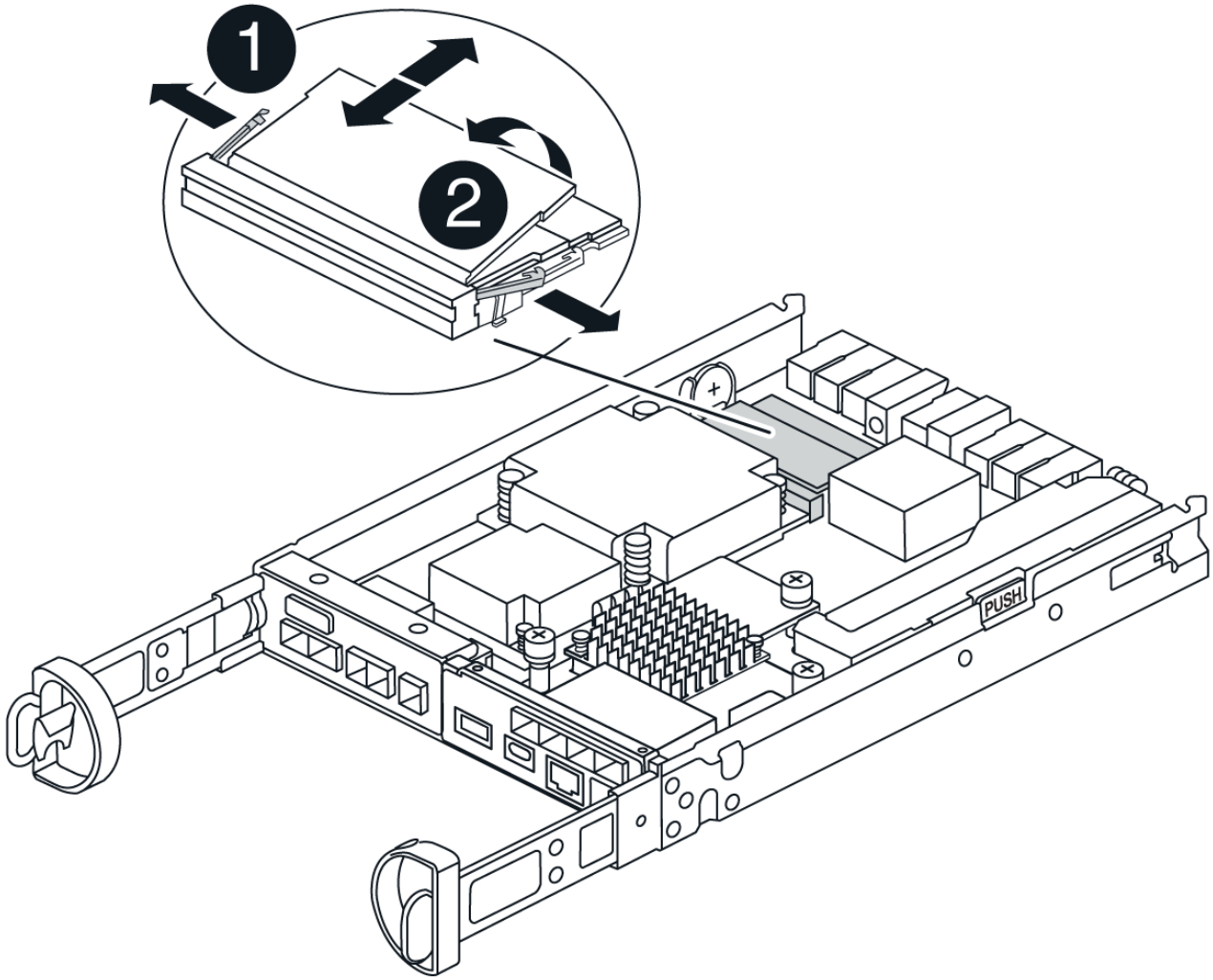
**Steps**

1. If you are not already grounded, properly ground yourself.
2. Locate the DIMMs on your controller canister.
3. Note the orientation and location of the DIMM in the socket so that you can insert the replacement DIMM in the proper orientation.
4. Eject the DIMM from its slot by slowly pushing apart the two DIMM ejector tabs on either side of the DIMM, and then slide the DIMM out of the slot.

   The DIMM will rotate up a little.

5. Rotate the DIMM as far as it will go, and then slide the DIMM out of the socket.

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



| | |
|---|---|
| 1 | DIMM ejector tabs |
| 2 | DIMMS |

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

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

7. Insert the DIMM squarely into the slot.

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

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

8. Push carefully, but firmly, on the top edge of the DIMM until the ejector tabs snap into place over the notches at the ends of the DIMM.
9. Reinstall the controller canister cover.

## Step 5: Reinstall the controller canister

Reinstall the controller canister into the chassis.

**Steps**

1. If you are not already grounded, properly ground yourself.
2. If you have not already done so, replace the cover on the controller canister.
3. Turn the controller over, so that the removable cover faces down.
4. With the cam handle in the open position, slide the controller all the way into the shelf.
5. Replace the cables.

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

6. Bind the cables to the cable management device with the hook and loop strap.

## Step 6: Complete DIMMs replacement

**Power up controller (simplex)**

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

**Steps**

1. As the controller boots, check the controller LEDs.

   When communication with the other controller is reestablished:

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

2. 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.

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**.

**Place controller online (duplex)**

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

**Steps**

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

   When communication with the other controller is reestablished:

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

3. When the controller is back online, confirm that its status is Optimal and check the controller shelf's Attention LEDs.

   If the status is not Optimal or if any of the Attention LEDs are on, confirm that all cables are correctly seated and the controller canister is installed correctly. If necessary, remove and reinstall the controller canister. NOTE: If you cannot resolve the problem, contact technical support.

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

a. Select **Storage › Volumes**. From the **All Volumes** page, verify that volumes are distributed to their preferred owners. Select **More › Change ownership** to view volume owners.

b. If volumes are all owned by preferred owner continue to Step 6.

c. If none of the volumes are returned, you must manually return the volumes. Go to **More › Redistribute volumes**.

d. If there is no Recovery Guru present or if following the Recovery Guru steps the volumes are still not returned to their preferred owners contact support.

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**.

# Drives

## Requirements to replace the drive - E4000

Before you replace an E4000 drive, review the requirements and considerations.

### Shelf types

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

Standard 24-drive shelves require drive staggering. When inserting fewer than 24 drives into an E4000 controller, you must alternate between the two halves of the controller. Beginning with the far left and then moving to the far right, place the drives in one at a time.

### Drive handling

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 60 seconds for the drive to spin down.
- Always use approved packaging when shipping drives.

- Avoid magnetic fields:
  - Keep drives away from magnetic devices.

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

## Replace drive

### Replace  the drive - E4000 (12-drive or 24-drive shelf)

You can replace a drive in an E4000 with a 12-drive or 24-drive shelf.

#### About this task

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

#### Before you begin

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

##### Step 1: Prepare to replace drive

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.

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

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

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

#### Step 2: Remove failed drive

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

**Steps**

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

   Save all packing materials.

2. Press the release button on the failed drive.
3. Open the cam handle, and slide out the drive slightly.
4. Wait 60 seconds.
5. Using both hands, remove the drive from the shelf.
6. Place the drive on an antistatic, cushioned surface away from magnetic fields.
7. Wait 30 seconds for the software to recognize that the drive has been removed before moving on to "Step 3: Install new drive."

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

#### Step 3: Install new drive

Install a new drive to replace the failed one.

Install the replacement drive as soon as possible after removing the failed drive. Otherwise, there is a risk that the equipment might overheat.

**Steps**

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

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

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

#### Step 4: Complete drive replacement

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

**Steps**

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

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

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

      When the drive reconstruction completes, the volume group is in an Optimal state.
4. As required, reinstall the bezel.
5. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit.

**What's next?**

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

### Replace the drive - E4000 (60-drive shelf)

You can replace a drive in an E4000 with a 60-drive shelf.

**About this task**

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

This procedure applies to DCM, DCM2, and DCM3 drive shelves.

**Before you begin**

- Review the drive handling requirements.
- Make sure you have the following:
  - A replacement drive that is supported by NetApp for your controller shelf or drive shelf.

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

#### Step 1: Prepare to replace drive

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

      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.

#### Step 2: Remove failed drive

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

**Steps**

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

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

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

5. Open the cam handle, and lift out the drive slightly.
6. Wait 60 seconds.
7. Use the cam handle to lift the drive from the shelf.
8. Place the drive on an antistatic, cushioned surface away from magnetic fields.
9. Wait 30 seconds for the software to recognize that the drive has been removed before moving on to "Step 3: Install new drive."

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

#### Step 3: Install new drive

Install a new drive to replace the failed one.

Install the replacement drive as soon as possible after removing the failed drive. Otherwise, there is a risk that the equipment might overheat.

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

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

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

#### Step 4: Complete drive replacement

Confirm that the new drive is working correctly.

**Steps**

1. Check the Power LED and the Attention LED on the drive you replaced. (When you first insert a drive, its Attention LED might be on. However, the LED should go off within a minute.)

- Power LED is on or blinking, and the Attention LED is off: Indicates that the new drive is working correctly.
- Power LED is off: Indicates that the drive might not be installed correctly. Remove the drive, wait 60 seconds, and then reinstall it.
- Attention LED is on: Indicates that the new drive might be defective. Replace it with another new drive.

2. If the Recovery Guru in SANtricity System Manager still shows an issue, select **Recheck** to ensure the problem has been resolved.
3. If the Recovery Guru indicates that drive reconstruction did not start automatically, start reconstruction manually, as follows:

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

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

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

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

**What's next?**

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

## Replace the drive drawer - E4000 (60-drive shelf)

You can replace a drive drawer in an E4060 controller shelf or a DE460C drive shelf.

**About this task**

The steps to replace a failed drive drawer in an E4060 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.

**Before you begin**

- Make sure the drive shelf meets 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.

    **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.

- Make sure you have the following:

- A replacement drive drawer.
- An ESD wristband, or you have taken other antistatic precautions.
- A flashlight.
- A permanent marker to note the exact location of each drive as you remove the drive from the drawer.
- Access to the storage array's command line interface (CLI). If you do not have access to the CLI, you can do one of the following:
  - **For SANtricity System Manager (version 11.60 and above)** — Download the CLI package (zip file) from System Manager. Go to **Settings › System › Add-ons › Command Line Interface**. You can then issue CLI commands from an operating system prompt, such as the DOS C: prompt.

If you need information on how to replace an E-Series DE460c expansion shelf, please refer to the NetApp Knowledge base.

### Step 1: Prepare to replace drive drawer

Determine 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.

**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 Step 2: Remove cable chains.
   - If the power is on, go to the next step.
2. Access the CLI, and then enter the following command:

```
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.

     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 Step 2: Remove cable chains.

     **Possible damage to drives** — Wait 60 seconds after the command completes before you open the drive drawer. Waiting 60 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.

     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.

   **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.
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, using one of the following procedures:
   - *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.
     b. 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.
  d. Wait two minutes for drive activity to stop.

### Step 2: Remove cable chains

Remove both cable chains so you can remove and replace a failed drive drawer.

#### About this task

Each drive drawer has left and right cable chains. The left and right cable chains allow the drawers to slide in and out.

The metal ends on the cable chains slide into corresponding vertical and horizontal guide rails inside the enclosure, as follows:

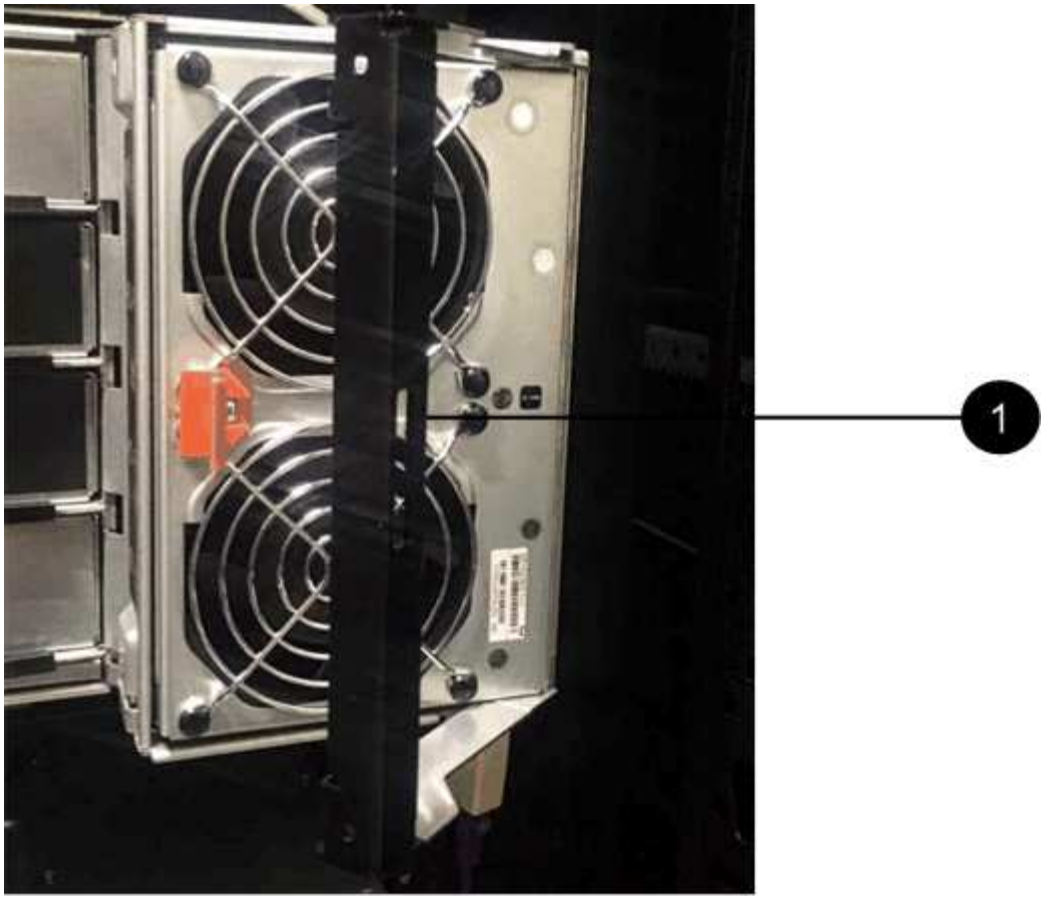
- The left and right vertical guide rails connect the cable chain to the enclosure's midplane.
- The left and right horizontal guide rails connect the cable chain to the individual drawer.

**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. Make sure that the drive shelf and controller shelf no longer has I/O activity and is powered off, or you have issued the `Set Drawer Attention Indicator` CLI command.
2. 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.

> **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.

3. 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.


2
1
3

**(1)** *Cable chain*

**(2)** *Vertical connector (connected to midplane)*

**(3)** *Horizontal connector (connected to drawer)*

4. For easy access, use your finger to move the cable chain on the right side to the left.
5. 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*

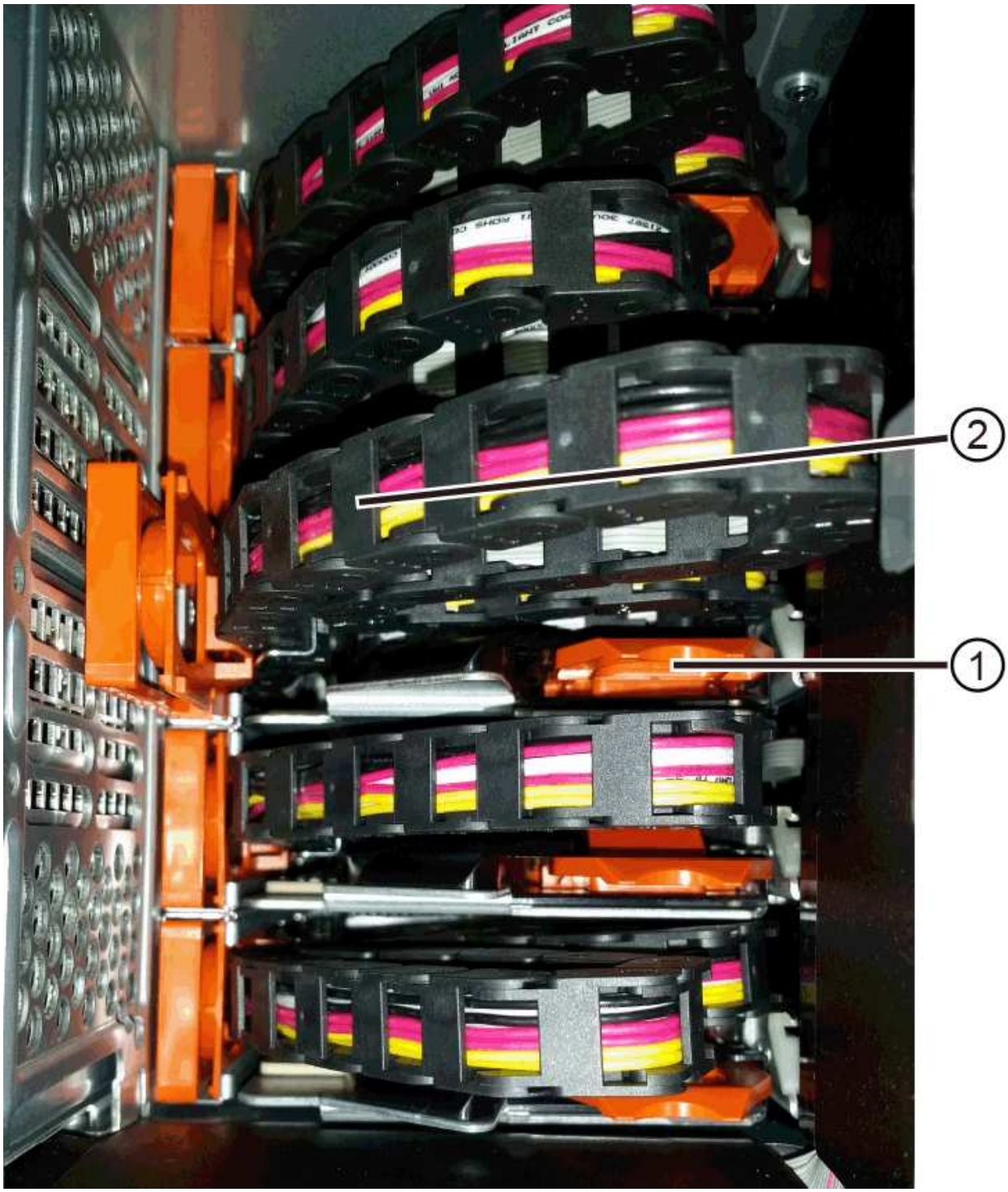
b. To unlatch the cable chain, insert your finger into the orange ring and press towards the middle of the system.

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.)

6. 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.

7. Carefully pull the entire cable chain out of the drive shelf.
8. 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.
9. From the back of the drive shelf, remove the left fan canister.
10. If the drive shelf is receiving power, ensure that the right fan goes to its maximum speed.

> **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.

11. 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.

> **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.

12. 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.

13. 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.

### Step 3: Remove failed drive drawer

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

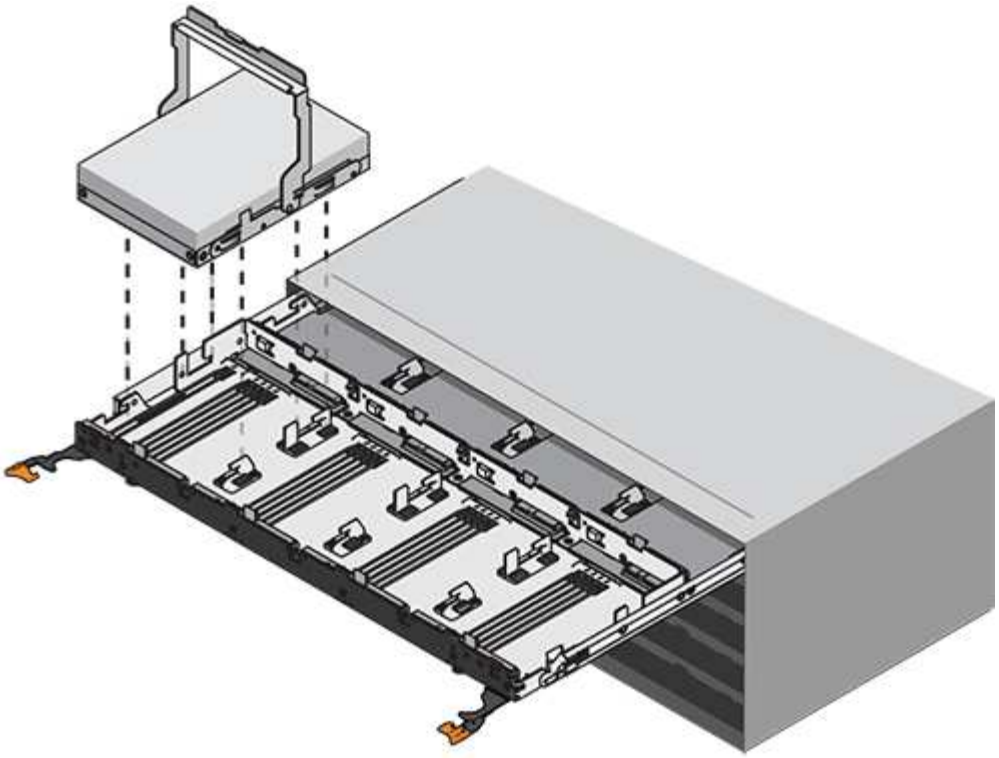
**Possible loss of data access** — Magnetic fields can destroy all data on the drive and cause irreparable damage to the drive circuitry. To avoid loss of data access and damage to the drives, always keep drives away from magnetic devices.

#### Steps

1. Make sure that:
   - The right and left cable chains are disconnected.
   - The right and left fan canisters are replaced.
2. Remove the bezel from the front of the drive shelf.
3. Unlatch the drive drawer by pulling out on both levers.
4. Using the extended levers, carefully pull the drive drawer out until it stops. Do not completely remove the drive drawer from the drive shelf.
5. 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.


**Possible loss of data access** — Make sure to record the exact location of each drive before removing it.

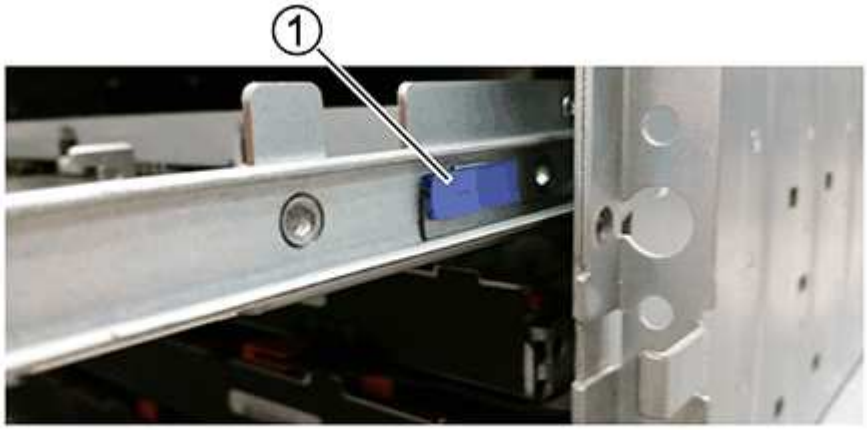
6. Remove the drives from the drive drawer:
   a. Gently pull back the orange release latch that is visible on the center front of each drive.
   b. Raise the drive handle to vertical.
   c. Use the handle to lift the drive from the drive drawer.



d. Place the drive on a flat, static-free surface and away from magnetic devices.

7. 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.

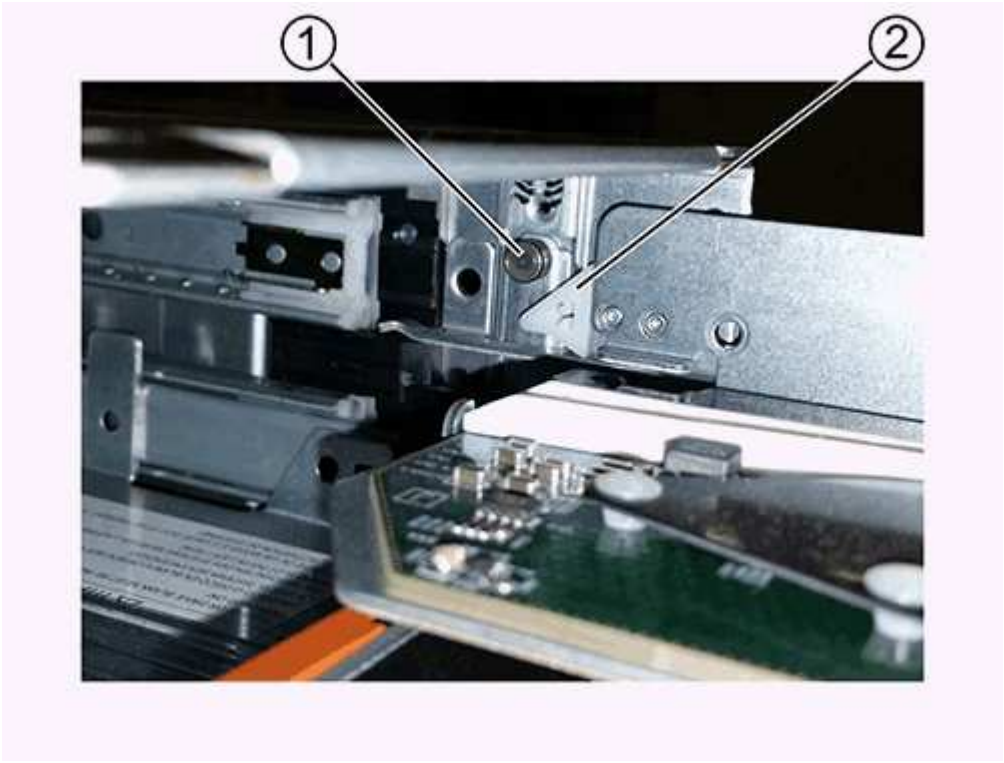
**Step 4: Install new drive drawer**

Install a new drive drawer to replace the failed one.

**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.

   **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.

   **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.

### Step 5: Attach cable chains

Attach the cable chains so you can safely re-install the drives in 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

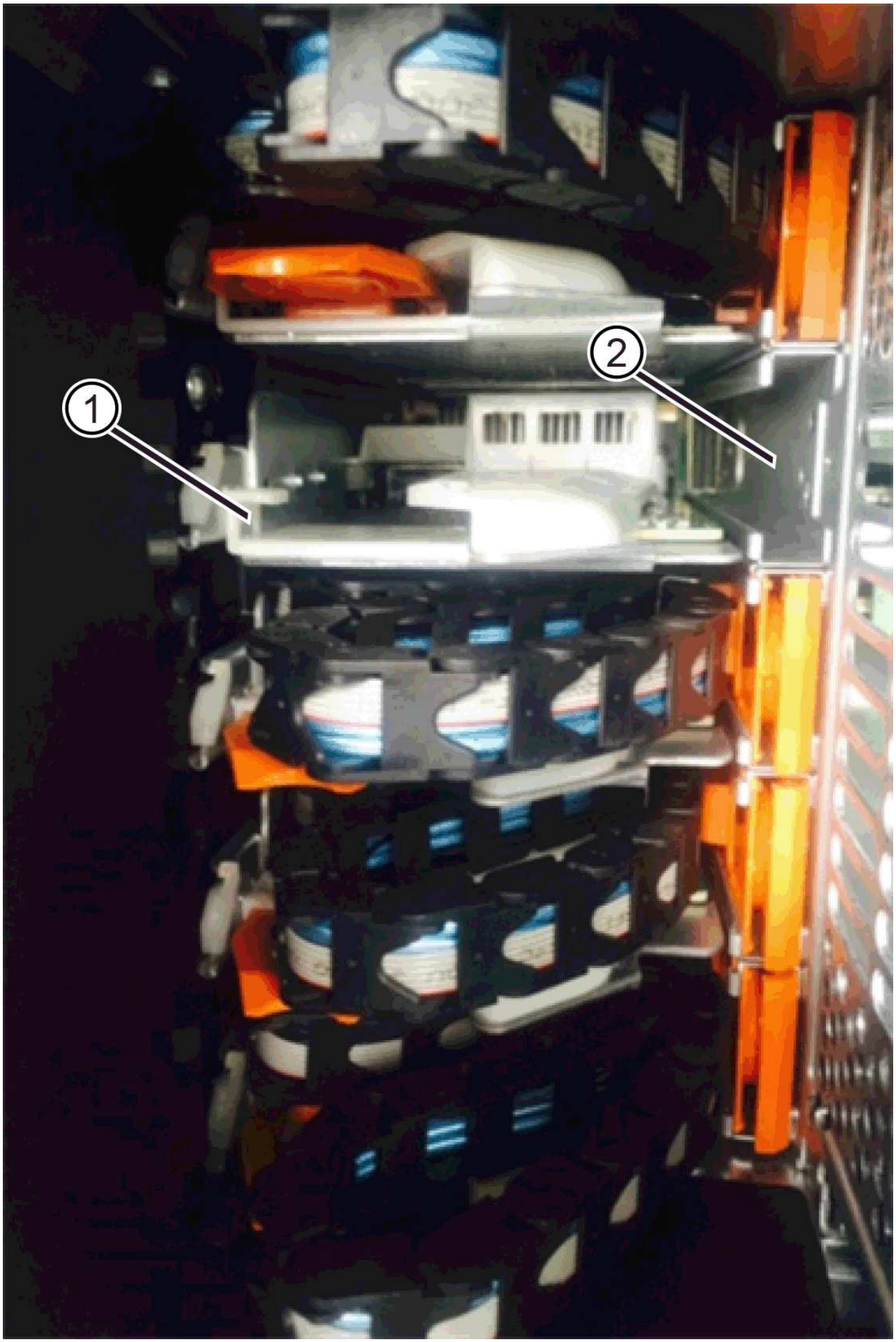
1. Make sure that:
   - A new drive drawer installed.
   - You have two replacement cable chains, marked as LEFT and RIGHT (on the horizontal connector next to the drive drawer).
2. From the back of the drive shelf, remove the fan canister on the right side, and set it aside.
3. If the shelf is powered on, ensure that the left fan goes to its maximum speed.

   **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.

4. 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.

      **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
2

**(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.

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

5. 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.

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

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

> **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.

8. 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.

> **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.

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

9. 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.

### Step 6: Complete drive drawer replacement

Reinsert the drives and replace the front bezel in the correct order.

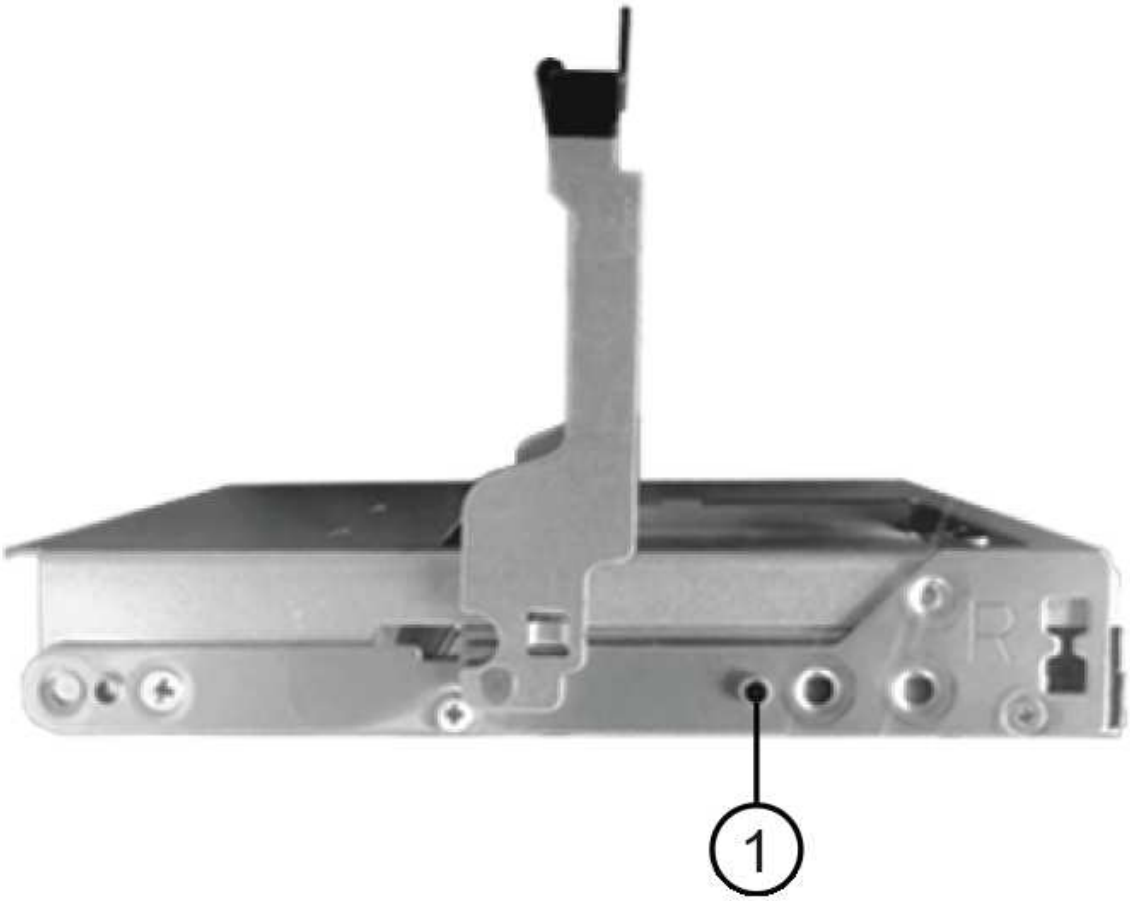
**Possible loss of data access** — You must install each drive in its original location in the drive drawer.

#### Steps

1. Make sure that:
   - You know where to install each drive.
   - You have replaced the drive drawer.
   - You have installed the new drawer cables.
2. 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.

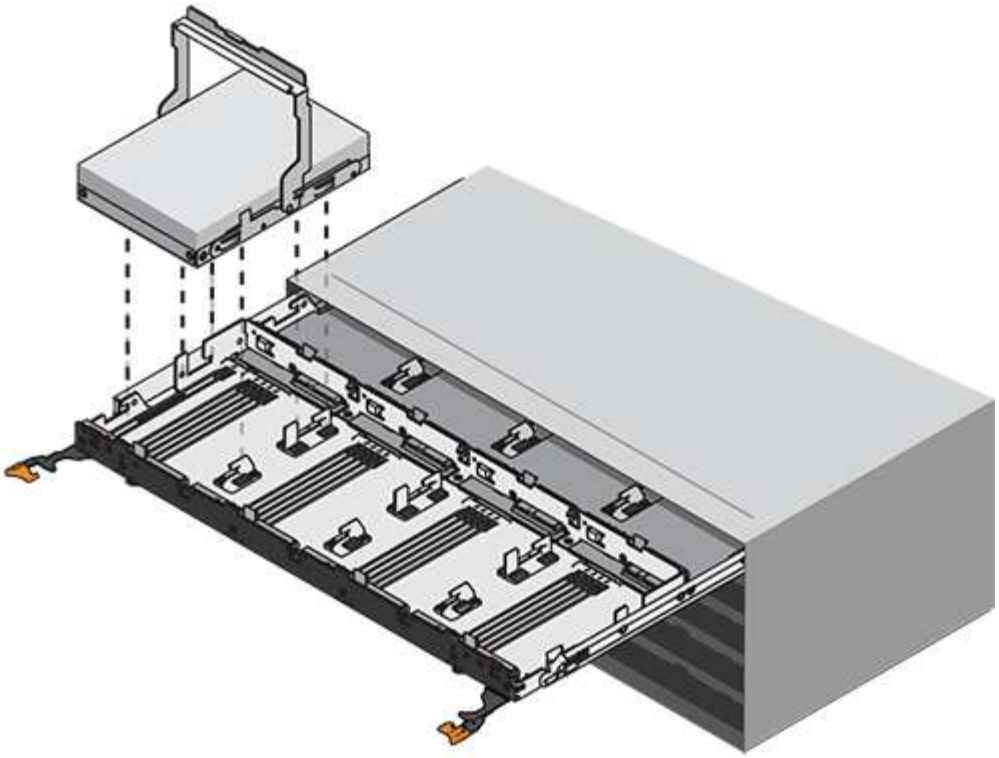

   d. Raise the handle on the drive to vertical.
   e. Align the two raised buttons on each side of the drive with the notches on the drawer.

      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.

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

> **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.

4. Attach the bezel to the front of the drive shelf.
5. If you have powered down one or more shelves, reapply power using one of the following procedures:
   - *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.

**What's next?**

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

## Hot-add a drive shelf - IOM12 or IOM12B modules - E4000

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

### Before you begin

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

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

### About this task

This procedure applies to hot adding a DE212C, DE224C, or DE460C drive shelf to an E4000 controller shelf.

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

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

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

### Step 1: Prepare to add the drive shelf

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

#### Before you begin

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

#### Steps

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

   The Collect Support Data dialog box appears.

3. Click **Collect**.

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

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

   The Event Log page displays the event data.

5. Select the heading of the **Priority** column to sort critical events to the top of the list.

6. Review the system critical events for events that have occurred in the last two to three weeks, and verify that any recent critical events have been resolved or otherwise addressed.

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

7. If you have IOMs connected to your hardware, complete the following steps. Otherwise, go to Step 2: Install the drive shelf and apply power.
   a. Select **Hardware**.
   b. Select the **IOMs (ESMs)** icon.

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

   c. Make sure that the status shown for each IOM/ESM is *Optimal*.
   d. Click **Show more settings**.
   e. Confirm that the following conditions exist:
      - The number of ESMs/IOMs detected matches the number of ESMs/IOMs installed in the system and that for each drive shelf.
      - Both of the ESMs/IOMs show that communication is OK.
      - The data rate is 12Gb/s for DE212C, DE224C, and DE460C drive shelves or 6 Gb/s for other drive trays.

### Step 2: Install the drive shelf and apply power

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

#### Steps

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

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

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

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

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

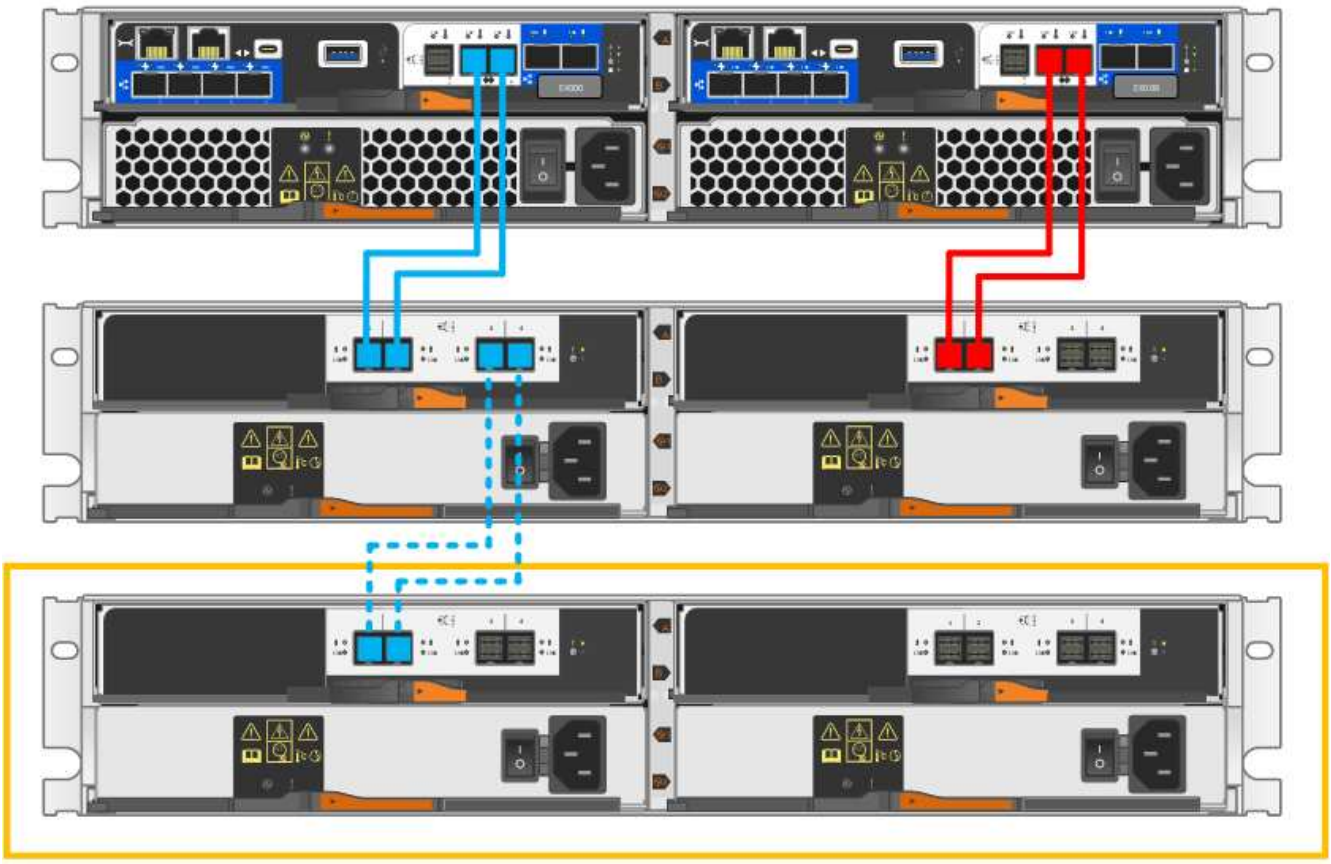
### Step 3: Cable your system

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

**Steps**

1. Connect the drive shelf to controller A.

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



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

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

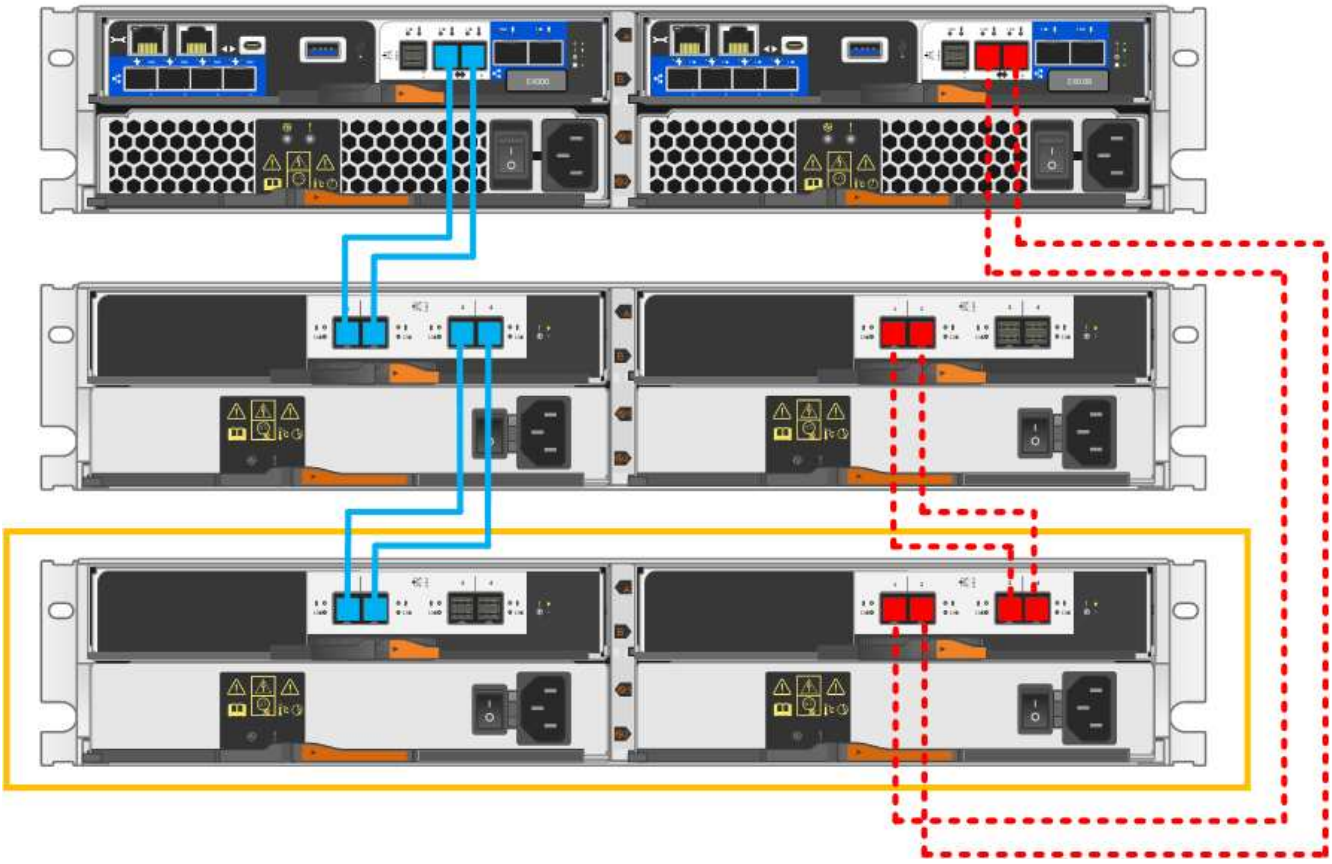
3. Scroll down, as necessary, to see all the drive shelves in the new storage system. If the new drive shelf is not displayed, resolve the connection issue.
4. Select the **ESMs/IOMs** icon for the new drive shelf.

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

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

8. Connect the drive shelf to controller B.

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



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

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

### Step 4: Complete hot add

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

#### Steps

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

   When a drive is recognized by the storage system, the representation of the drive slot in the **Hardware**

page displays as a blue rectangle.

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

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

7. If necessary, upgrade the drive firmware.

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

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

# Host interface cards

## Upgrade the host interface card (HIC) - E4000

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

### About this task

- When you upgrade HICs, you must power off the storage array, upgrade the HICs, and reapply power.
- When upgrading HICs in an E4000 controller repeat all steps to remove the second controller, upgrade the second controller's HICs, and reinstall the second controller before reapplying power to the controller shelf.

### Before you begin

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

**Possible loss of data access** — Never install a HIC in an E4000 controller canister if that HIC was designed for another E-Series controller. In addition, both controllers and both HICs must be identical. The presence of incompatible or mismatched HICs causes the controllers to lock down when you apply power.

### Step 1: Place controller shelf offline

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

**Steps**

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

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

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

   As needed, install the latest version.

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

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

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

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

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

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

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

5. 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.

6. 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.
7. Power down the controller shelf.
   a. Label and then unplug both power cables from controller shelf.

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

### Step 2: Remove controller canister

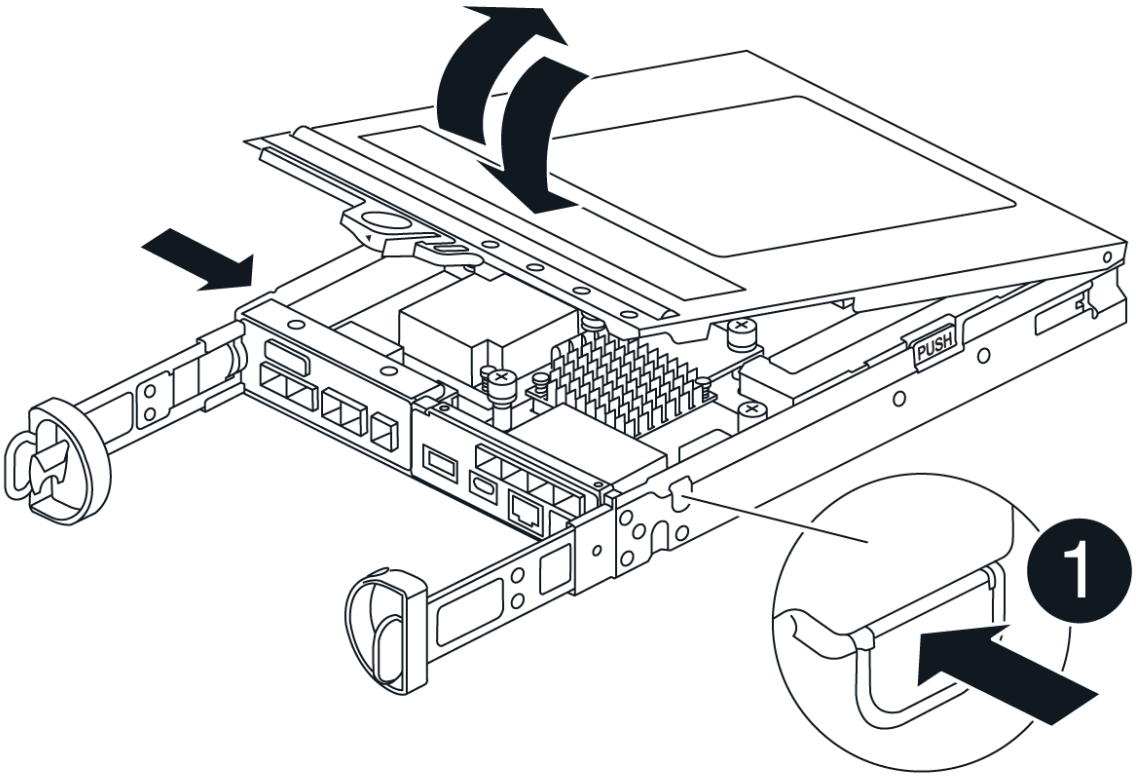
Remove the controller canister from the system and then remove the controller canister cover.

**Steps**

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

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

3. Remove and set aside the cable management devices from the left and right sides of the controller canister.
4. Squeeze the latch on the cam handle until it releases, open the cam handle fully to release the controller canister from the midplane, and then, using two hands, pull the controller canister out of the chassis.
5. Turn the controller canister over and place it on a flat, stable surface.
6. Open the cover by pressing the blue buttons on the sides of the controller canister to release the cover, and then rotate the cover up and off of the controller canister.

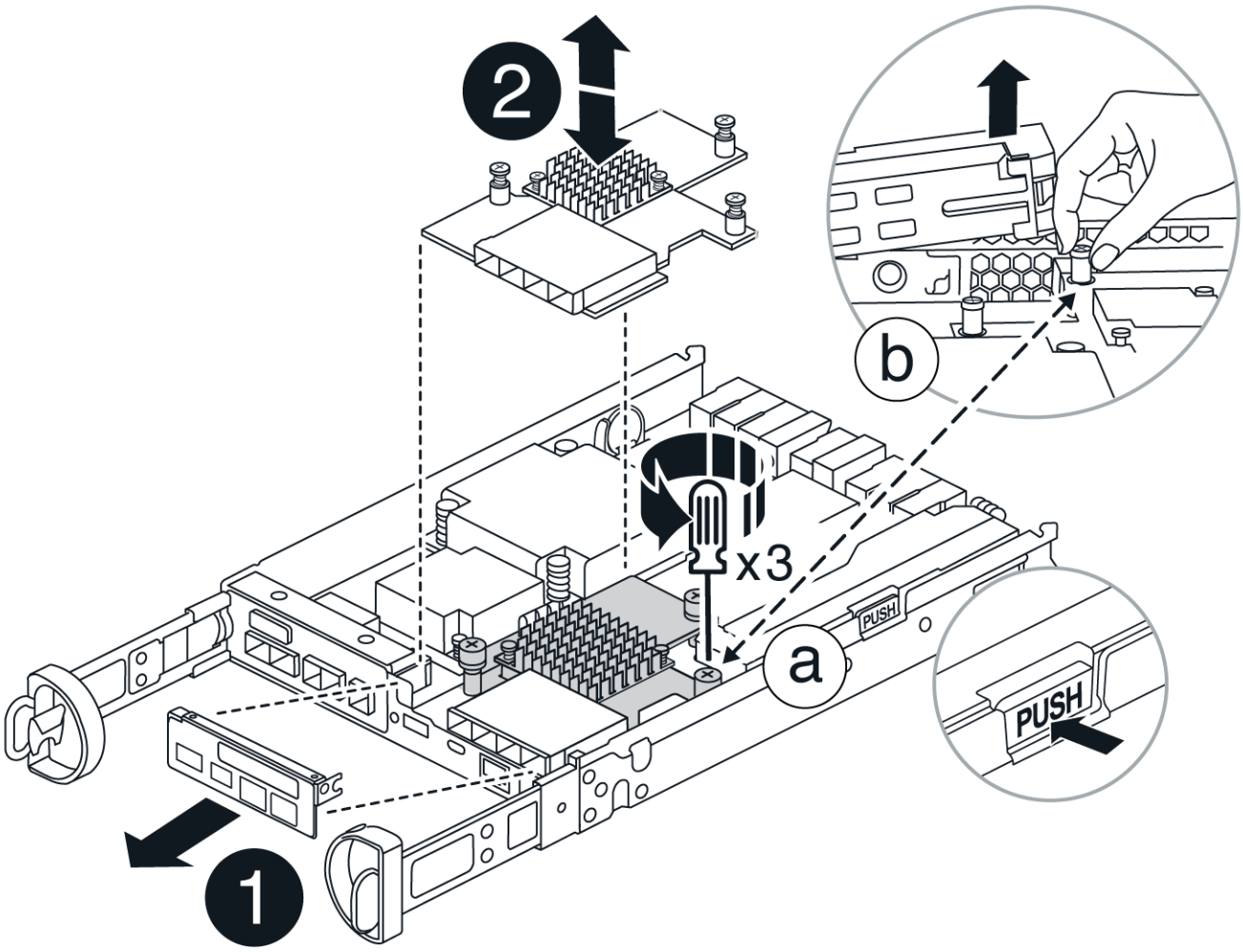


### Step 3: Upgrade the HIC

Remove and replace the HIC.

**Steps**

1. If you are not already grounded, properly ground yourself.
2. Remove the HIC:




   a. Remove the HIC faceplate by loosening all screws and sliding it straight out from the controller module.
   b. Loosen the thumbscrews on the HIC and lift the HIC straight up.
3. Reinstall the HIC:
   a. Align the socket on the replacement HIC plug with the socket on the motherboard, and then gently seat the card squarely into the socket.
   b. Tighten the three thumbscrews on the HIC.
   c. Reinstall the HIC faceplate.
4. Reinstall the controller module cover and lock it into place.

### Step 4: Reinstall controller canister

Reinstall the controller canister into the chassis.

**Steps**

1. If you are not already grounded, properly ground yourself.
2. If you have not already done so, replace the cover on the controller canister.
3. Turn the controller over, so that the removable cover faces down.
4. With the cam handle in the open position, slide the controller all the way into the shelf.
5. Replace the cables.

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

6. Bind the cables to the cable management device with the hook and loop strap.
7. Repeat Step 2: Remove controller canister, Step 3: Upgrade the HIC, and Step 4: Reinstall controller canister for the second controller.

### Step 5: Complete the HIC upgrade

Place both controllers online, collect support data, and resume operations.

**Steps**

1. Place controllers online.
   a. Plug in power cables.
2. As the controllers boot, check the controller LEDs.
   - The amber Attention LED remains on.
   - The Host Link LEDs might be on, blinking, or off, depending on the host interface.
3. When the controllers are back online, confirm that their 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 canisters are installed correctly. If necessary, remove and reinstall the controller canisters.

   If you cannot resolve the problem, contact technical support.

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

**What's next?**

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

## Replace the host interface card (HIC) - E4000

Follow this procedure to replace a failed host interface card (HIC) in an E4000 array.

**About this task**

When you replace a failed HIC, you must power off the storage array (simplex) or place affected controller offline (duplex), replace the HIC, and reapply power (simplex) or bring controller online (duplex).

**Before you begin**

- If you have a simplex configuration, schedule a downtime maintenance window for this procedure. You cannot access data on the storage array until you have successfully completed this procedure.
- Make sure you have the following:
  - HICs that are compatible with your controller(s).
  - An ESD wristband, or you have taken other antistatic precautions.
  - A flat, static free work area.
  - Labels to identify each cable that is connected to the controller canister.
  - A #1 Phillips screwdriver.
  - A management station with a browser that can access SANtricity System Manager for the controller. (To open the System Manager interface, point the browser to the controller's domain name or IP address.)

**Possible loss of data access** — Never install a HIC in an E4000 controller canister if that HIC was designed for another E-Series controller. In addition, both controllers and both HICs must be identical in a duplex configuration. The presence of incompatible or mismatched HICs causes the controllers to lock down when you apply power.

**Step 1: Prepare to replace HIC**

Power down the controller shelf (simplex) or place the affected controller offline (duplex) so you can safely replace the HICs.

**Power down the controller shelf (simplex)**

**Steps**

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

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

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

   a. From SANtricity System Manager, select **Settings › System**.
   b. Under **Security key management**, select **Back Up Key**.
   c. In the **Define a pass phrase/Re-enter pass phrase** fields, enter and confirm a pass phrase for this backup copy.
   d. Click **Backup**.
   e. Record your key information in a secure location, and then click **Close**.
3. Back up the storage array's configuration database using SANtricity System Manager.

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

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

        The file is saved in the Downloads folder for your browser with the name, **configurationData-<arrayName>-<dateTime>.7z**.
   - Alternatively, you can back up the configuration database by using the following CLI command:

     ```
     save storageArray dbmDatabase sourceLocation=onboard contentType=all
     file="filename";
     ```
4. Collect support data for your storage array using SANtricity System Manager.

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

   a. **Select Support › Support Center › Diagnostics**.
   b. Select **Collect Support Data**.

c. Click **Collect**.

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

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

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

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

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

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

7. From the home page of SANtricity System Manager, select **View Operations in Progress**.
8. Confirm that all operations have completed before continuing with the next step.
9. Turn off both power switches on the controller shelf.
10. Wait for all LEDs on the controller shelf to turn off.
11. Select **Recheck** from the Recovery Guru, and confirm that the **OK to remove** field in the Details area displays **Yes**, indicating that it is safe to remove this component. Data on the storage array will not be accessible until you replace the controller canister.

**Place controller offline (duplex)**

**Steps**

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

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

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

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

   a. Select **Hardware**.
   b. Locate the controller shelf, which is marked with the controller icon.
   c. Click the controller icon.
   d. Select the controller, and click **Next**.

e. On the **Base** tab, make a note of the **Replacement Part Number** for the controller.

4. Confirm that the replacement part number for the failed controller is the same as the FRU part number for the replacement controller.

> **Possible loss of data access** — If the two part numbers are not the same, do not attempt this procedure. The presence of mismatched controllers will cause the new controller to lock down when you bring it online.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

### Step 2: Remove controller canister

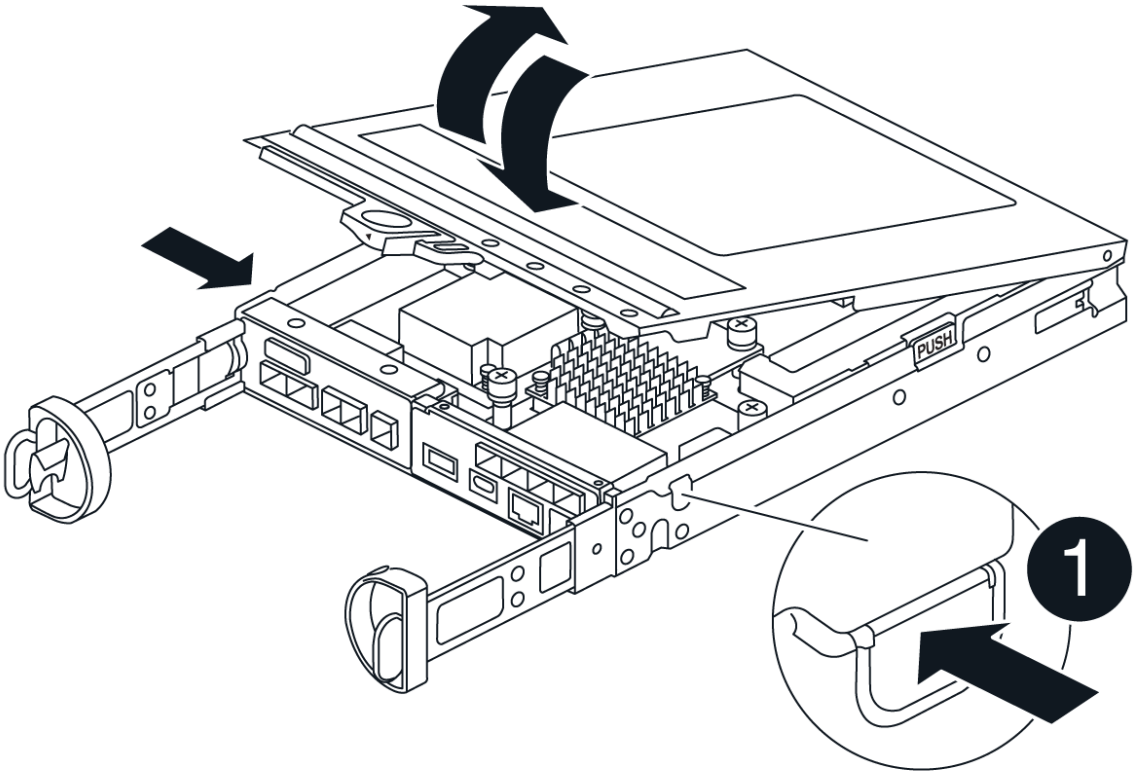
Remove the controller canister from the system and then remove the controller canister cover.

#### Steps

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

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

3. Remove and set aside the cable management devices from the left and right sides of the controller canister.
4. Squeeze the latch on the cam handle until it releases, open the cam handle fully to release the controller canister from the midplane, and then, using two hands, pull the controller canister out of the chassis.
5. Turn the controller canister over and place it on a flat, stable surface.
6. Open the cover by pressing the blue buttons on the sides of the controller canister to release the cover, and then rotate the cover up and off of the controller canister.

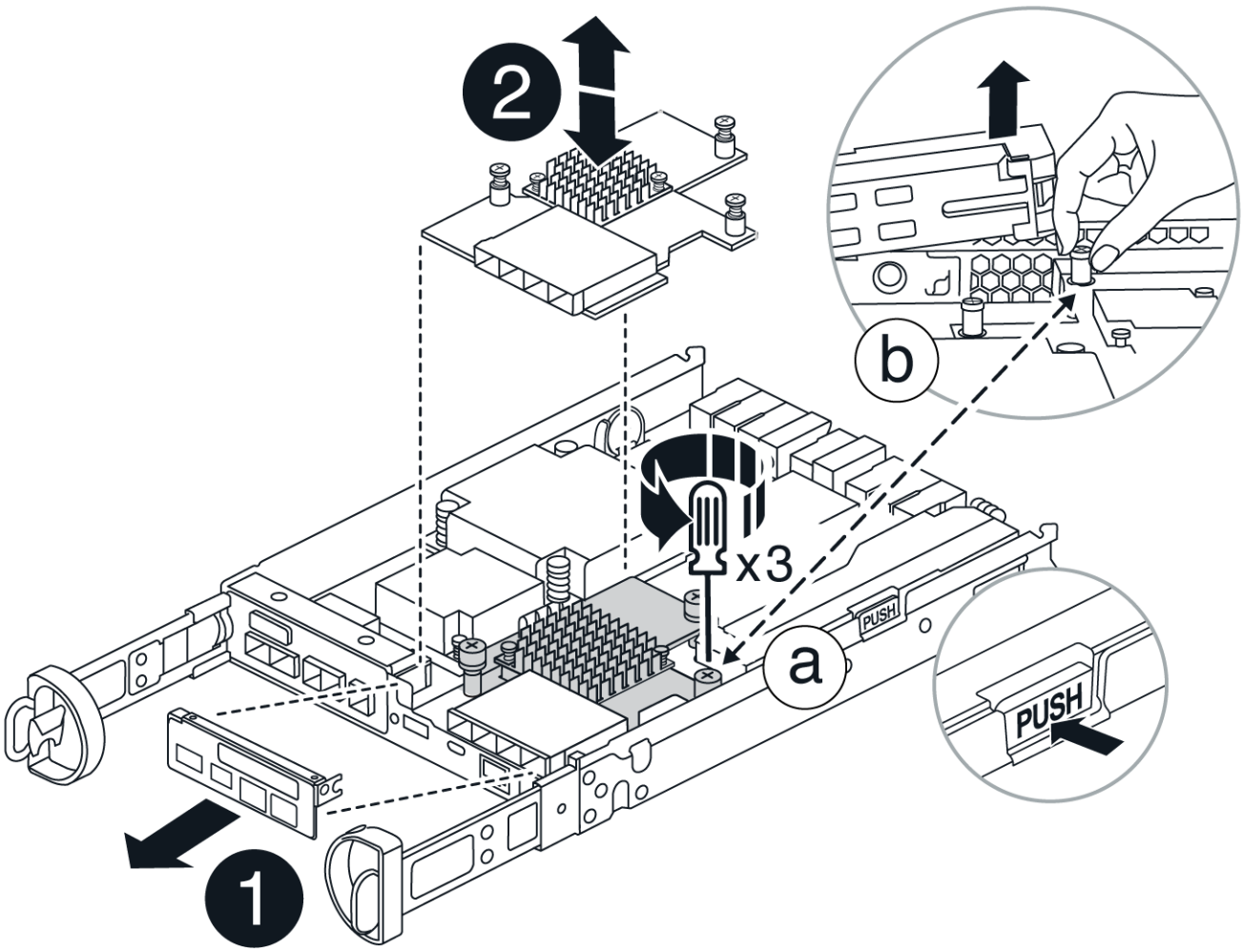



**Step 3: Replace the HIC**

Replace the HIC.

**Steps**

1. If you are not already grounded, properly ground yourself.
2. Remove the HIC:




a. Remove the HIC faceplate by sliding it straight out from the controller module.

b. Loosen the thumbscrews on the HIC and lift it straight up.

> If you are using your fingers to the loosen the thumbscrew, you may need to press the battery release tab and rotate the battery up for better access.

3. Reinstall the HIC:

   a. Align the socket on the replacement HIC plug with the socket on the motherboard, and then gently seat the card squarely into the socket.

   b. Hand-tighten the three thumbscrews on the HIC.

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

   c. Reinstall the HIC faceplate.

4. Reinstall the controller module cover and lock it into place.

### Step 4: Reinstall controller canister

Reinstall the controller canister into the chassis.

**Steps**

1. If you are not already grounded, properly ground yourself.
2. If you have not already done so, replace the cover on the controller canister.
3. Turn the controller over, so that the removable cover faces down.
4. With the cam handle in the open position, slide the controller all the way into the shelf.
5. Replace the cables.

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

6. Bind the cables to the cable management device with the hook and loop strap.

**Step 5: Complete HIC replacement**

Power up the controller (simplex) or place the controller online (duplex), collect support data, and resume operations.

**Power up controller (simplex)**

**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. When the controller is back online, 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.

   If you cannot resolve the problem, contact technical support. If needed, collect support data for your storage array using SANtricity System Manager.

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**.

**Place controller online (duplex)**

**Steps**

1. Bring the controller online using SANtricity System Manager.
   - From 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.
   - Alternatively, you can bring the controller back online by using the following CLI commands:

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

     **For controller B**: `set controller [b] availability=online;`
2. When the controller is back online, 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.

If you cannot resolve the problem, contact technical support. If needed, collect support data for your storage array using SANtricity System Manager.

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

**What's next?**

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

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