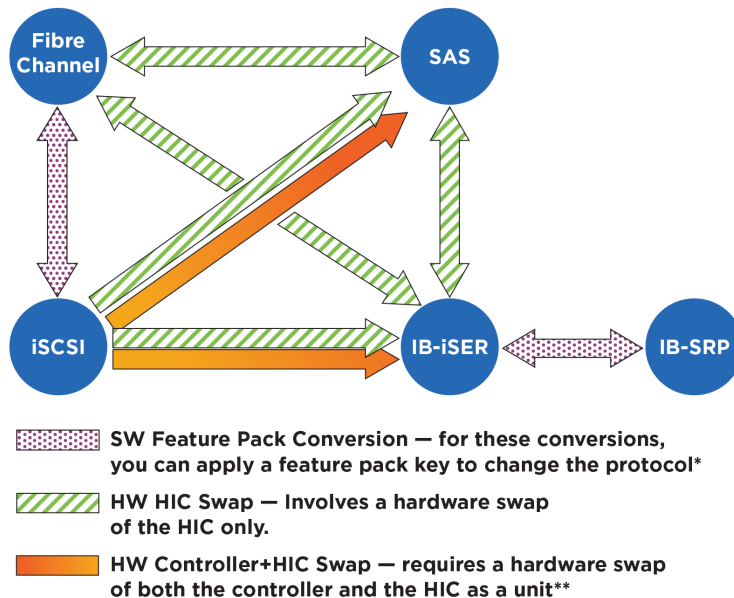# Changing the host protocol in the E5600 or EF560 by replacing hardware components

This documents applies to E5600 storage arrays, including the E5612, E5624, and E5660, and the EF560 flash arrays.

The following image shows all the protocol changes that are possible:

SW Feature Pack Conversion — for these conversions, you can apply a feature pack key to change the protocol*

HW HIC Swap — Involves a hardware swap of the HIC only.

HW Controller+HIC Swap — requires a hardware swap of both the controller and the HIC as a unit**

*If you are converting between Fibre Channel and iSCSI, you must use the host interface card (HIC) feature pack conversion documents, not the procedures in this document.

**If you are converting from iSCSI to SAS or InfiniBand (IB), you might need to swap only the HICs or the controllers and HICs as a unit, depending on your Replacement Part Number. You can find the instructions for determining the Replacement Part Number in this document.

For other changes to the HIC protocol, you might need to perform both a HIC hardware upgrade and a HIC feature pack conversion, or you might be able to perform a HIC feature pack conversion only. For example, if you want to change the protocol from Fibre Channel to IB, and you want to use iSCSI RDMA Protocol (SRP) instead of iSCSI Extensions for Remote Direct Memory Access (iSER), you must follow a two-step process:

1. Perform a HIC hardware upgrade to IB-iSER.

2. Perform a HIC feature pack conversion to convert the IB HICs from iSER to SRP.

   Note: This document describes how to perform HIC hardware upgrades only; for instructions for performing HIC feature pack conversions, see the list of related documents at the end of this topic.

Considerations for this procedure

Before starting the procedure, be aware of the following:

- Because the power is off, you must schedule a downtime maintenance window for this procedure, and you cannot access data on the storage array or flash array until you have successfully completed the upgrade.

- You must obtain any new cables, transceivers, switches, and host bus adapters (HBAs) needed for the new host protocol. You must install any new host hardware before you can connect the new HICs to the hosts. For information, see the SANtricity Express Guide for your operating system and protocol.

- After installing the new HICs, you must inform NetApp technical support about the change in hardware configuration by sending an upgrade notification. This notification ensures that you receive correct replacement parts if you need them later.

Steps

Related information

NetApp E-Series and EF-Series Systems Documentation Center
NetApp Downloads
NetApp Interoperability Matrix Tool
Converting a Fibre Channel Host Interface Card to iSCSI
Converting an iSCSI Host Interface Card to Fibre Channel
Converting an InfiniBand HIC from iSER to SRP
Replacing a Controller Canister in the E5612 or E5624 Controller-Drive Tray to Replace a Failed Host Interface Card
Replacing a Controller Canister in the E5660 Controller Drive-Tray to Replace a Failed Host Interface Card
SANtricity Storage Manager 11.20 FC Configuration and Provisioning for Linux Express Guide
SANtricity Storage Manager 11.20 FC Configuration and Provisioning for VMware Express Guide
SANtricity Storage Manager 11.20 FC Configuration and Provisioning for Windows Express Guide
SANtricity Storage Manager 11.20 Infiniband Configuration and Provisioning for Linux Express Guide
SANtricity Storage Manager 11.20 SAS Configuration and Provisioning for Linux Express Guide
SANtricity Storage Manager 11.20 SAS Configuration and Provisioning for VMware Express Guide
SANtricity Storage Manager 11.20 SAS Configuration and Provisioning for Windows Express Guide
SANtricity Storage Manager 11.20 iSCSI Configuration and Provisioning for Linux Express Guide
SANtricity Storage Manager 11.20 iSCSI Configuration and Provisioning for VMware Express Guide
SANtricity Storage Manager 11.20 iSCSI Configuration and Provisioning for Windows Express Guide

Changing the host protocol in the E5600 or EF560 by replacing hardware components

Managing Data Assurance

If you are currently using the Data Assurance (DA) feature and want to upgrade the host interface cards (HICs) to iSCSI or IB-SRP, you must disable this feature on all volumes.

Steps

1. From the Array Management Window, select a volume, and then select **Storage > Volume > Advanced > Disable Data Assurance (DA)**.

2. In the **Volumes with Data Assurance (DA)** list box, select all volumes.

   You must permanently disable the Data Assurance feature on all volumes. In addition, you cannot select volume groups in this list, only individual volumes.

3. Click **Disable**.

   The **Confirm Disable Data Assurance** dialog box is displayed.

4. In the **Are you sure you want to disable Data Assurance on the selected volumes** field, type **yes**.

5. Click **OK**.

6. For each data volume or disk pool, confirm that Data Assurance has been disabled.

Managing Synchronous Mirroring

The Synchronous Mirroring feature (also referred to as RVM) is supported only for Fibre Channel.

About this task

If you are upgrading from Fibre Channel to any other protocol, you must delete any synchronous mirrored pairs and deactivate any synchronous mirroring relationships.

> **Attention:** If you do not deactivate these relationships before upgrading the HICs, your system loses data access and data loss might occur.

Steps

1. In the **Array Management Window**, select **Help > Contents**, and search for the topics related to Synchronous Mirroring.

2. Follow the guidelines and instructions in the online help to identify all synchronous mirroring volumes that might exist.

3. In the Logical pane, right-click a synchronous mirroring volume and select **Copy Services > Synchronous Mirroring > Remove Mirror Relationship**.

4. Select all volumes, and click **Remove**.

5. After you delete all mirroring relationships, deactivate Synchronous Mirroring by selecting **Copy Services > Mirroring > Deactivate**.

   If you do not delete all mirroring relationships before deactivating mirroring, you receive an error.

   In the pop-up window that appears asking you which feature to deactivate, select the synchronous mirroring checkbox.

Managing Asynchronous Mirroring

The Asynchronous Mirroring feature (also referred to as ARVM) is supported only for iSCSI and Fibre Channel.

About this task

If you are currently using asynchronous mirroring relationships and are upgrading your HICs to InfiniBand or SAS, you must delete the mirrored pairs and deactivate the asynchronous mirroring relationships.

Steps

1. In the **Array Management Window**, access the online help and search for the topics related to Asynchronous Mirroring.

2. Follow the guidelines and instructions in the online help to remove all asynchronous mirrored pairs from the asynchronous mirror groups.

    Note: When removing each pair, select the **Delete all repositories associated with this mirrored pair** check box.

3. Follow the guidelines and instructions in the online help to delete all asynchronous mirror groups.

Cabling considerations

Before you upgrade the HICs, ensure that your replacement cables and any SFPs or QSFPs are compatible with the connectors on the new HICs.

The following table lists the supported cables for E5600 and EF560 HICs:

HIC		Cable		
Data rate and protocol	**Number of connectors**	**Connector**	**Type**	**Length**
16 Gbps Fibre Channel	4	SFP+	OM2 SW optical	2, 3, 5, 10, 25m
		SFP+	OM3 SW optical	50-150m
		SFP+	OS2 LW optical	50-300m
12 Gbps SAS	4	MiniSAS-HD	Passive copper	1-5m
		MiniSAS-HD	Active copper	8-15m
		MiniSAS-HD	Optical	5-100m
		Fan-out cable type #2	Passive copper	2m
		Fan-out cable type #3	Passive copper	2m
56 Gbps InfiniBand	2	QSFP+	Passive copper	1-3m
		QSFP+	Optical	5-100m
10 Gbps iSCSI	4	SFP+	OM2 optical	2, 3, 5, 10, 25m
		SFP+	OM3 optical	50-150m
		Twin-Ax	Passive copper	2-7m
1 Gbps iSCSI		RJ-45	Passive copper	2-70m

Preparing to replace hardware

You must perform a number of steps to prepare your system for changing the host protocol by replacing hardware, including stopping host I/O operations and issuing a CLI command to remove any previously applied software feature packs.

Before you begin

- If you are converting to iSCSI or IB-SRP, you must have disabled Data Assurance on all volumes.

- If you were using Asynchronous Mirroring or Synchronous Mirroring, you have deleted all mirrored pairs and deactivated all mirroring relationships, where applicable.

Steps

1. Gather support data about your storage array by using one of these methods:

   - Use the storage management software to collect and save a support bundle of your storage array. From the Array Management Window toolbar, select **Monitor > Health > Collect Support Data Manually**. Then, name and specify a location on your system where you want to store the support bundle.

   - Use the command-line interface (CLI) to run the `save storageArray supportData` command. From the Enterprise Management Window, select the storage array and select **Tools > Execute Script**. In the upper half of the Script Editor dialog box that is displayed, enter the following command, and select **Tools > Verify and Execute** from the menu:

     `save storageArray supportData;`

   Note: Gathering support data can temporarily impact performance on your storage array.

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

   - Stop all processes that involve the LUNs mapped from the storage to the hosts.

   - Ensure that no applications are writing data to any LUNs mapped from the storage to the hosts.

   - Unmount all file systems associated with volumes on the array.

   Note: The exact steps to stop host I/O operations depend on the host operating system and the configuration, which are beyond the scope of these instructions. If you are not sure how to stop host I/O operations in your environment, consider shutting down the host.
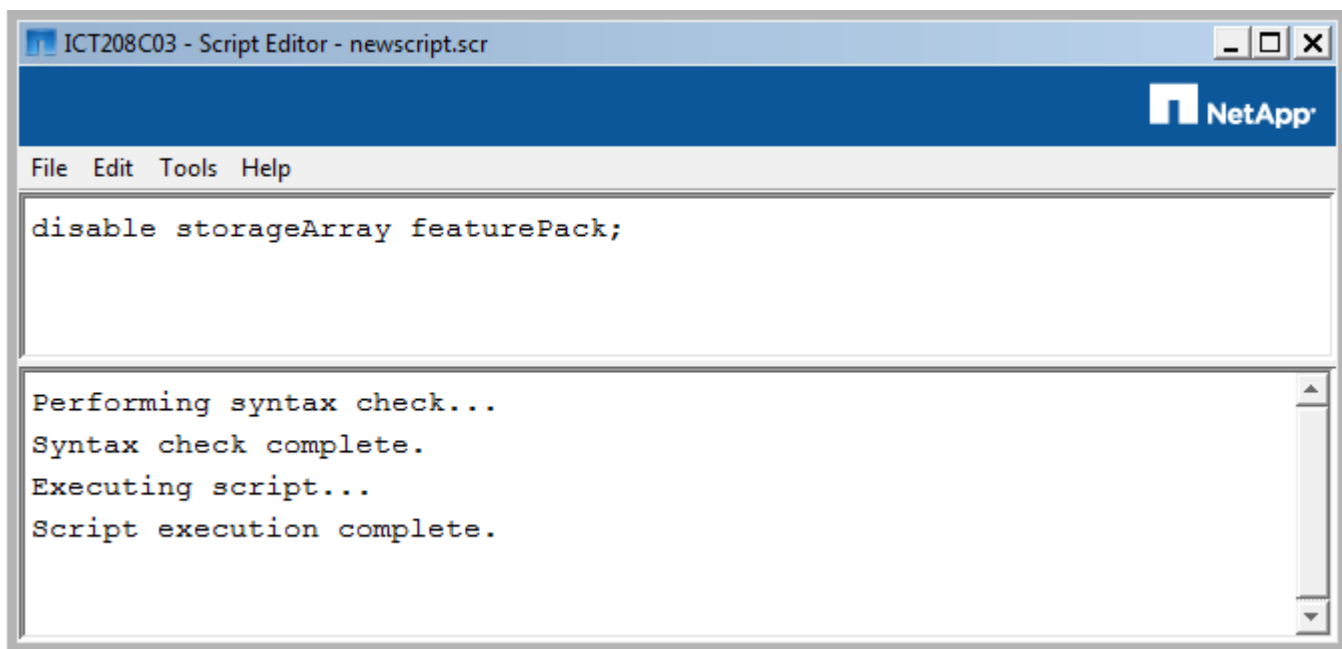
   Attention: Possible data loss – If you continue this procedure while I/O operations are occurring, you might lose data.

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

4. Wait for five minutes to allow any data in cache memory to be flushed to disk.

5. From the title bar of the **Array Management Window**, select **Monitor > Reports > Operations in Progress**.

6. Wait for all operations shown on the **Operations in Progress** window to complete before continuing with the next step.

7. Disable any feature packs that might have been applied to the storage array in manufacturing or after you received the system by performing the following steps:

   a. From the **Enterprise Management Window** in SANtricity Storage Manager, select the storage array.

   b. Select **Tools > Execute Script**.

      The Script Editor dialog box is displayed.

c. In the upper half of the dialog box, type the following command:

```
disable storageArray featurePack;
```

d. From the menu, select **Tools > Verify and Execute**.

The command syntax is verified, and the command is executed.

Recording the chassis serial number

In preparation for upgrading the HICs, you must record the chassis serial number for your storage array.

Steps

1. In the **Enterprise Management Window** tree view, double-click your storage array.

    The Array Management Window opens.

2. In the **Summary** tab of the **Array Management Window**, click the **View Storage Array Profile** link.

3. Copy the value for **Chassis Serial Number**, and paste it into a text file.

Deciding whether you need to replace only the HIC or the controller and HIC as a unit

You need to determine your Replacement Part Number to decide whether you need to replace only the HIC or the controller and the HIC as a unit.

Steps

1. In the **Array Management Window**, click the **Hardware** tab.

2. In the **Base Controller Properties** section, check the value for **Replacement Part Number**.

3. Decide whether you need to replace the entire controller canister or just the HICs, as follows:

   - If the Replacement Part Number is *E-X561206A-R6* or *EF-X561206A-R6*, you must replace the entire controller canister. You cannot replace just the HICs. Go to *Saving the drive security key* on page 7.

   - If the Replacement Part Number is **not** *E-X561206A-R6* or *EF-X561206A-R6*, you can replace just the HIC. Go to *Powering down*.

Saving the drive security key

If you need to replace the controller canisters and you are using the Drive Security feature, you must save the drive security key.

Steps

1. Go to the **Array Management Window**.

2. From the **Storage Array** menu, select **Security > Drive Security > Save Key**.

3. Save the security key to a location not on your storage array.

Powering down

After you have stopped I/O operations and verified the HIC protocol, you are ready to power down the storage array or flash array.

Before you begin

- You must have saved the chassis serial number to a file.

- You must have collected a support bundle.

- You must have stopped host I/O operations and confirmed that no operations are in process.

- You must have removed all feature packs.

- If you need to replace both the controller and HIC as a unit and you are using the Drive Security feature, you must have saved the drive security key.

Steps

1. Turn off both power switches on the controller-drive tray.

2. Wait for all LEDs on the controller-drive tray to go dark.

3. Turn off both power switches on any attached expansion drive trays.

4. Wait two minutes for drive activity to stop.

Removing the controller canisters

The controller canisters contain the controllers, HICs, and batteries. You must remove both controller canisters from the controller-drive tray or flash array.

About this task

If you are replacing the controller and HIC as a unit, you must reuse the batteries.

Steps

1. Put on antistatic protection.

   Attention: Possible hardware damage – To prevent electrostatic discharge damage, use proper antistatic protection when handling tray components.

2. Label each cable that is attached to the controller canisters.

   Labels make it easier to replace the host cables and to reconnect the power cables, any expansion drive cables, and the management cables after upgrading the HICs.

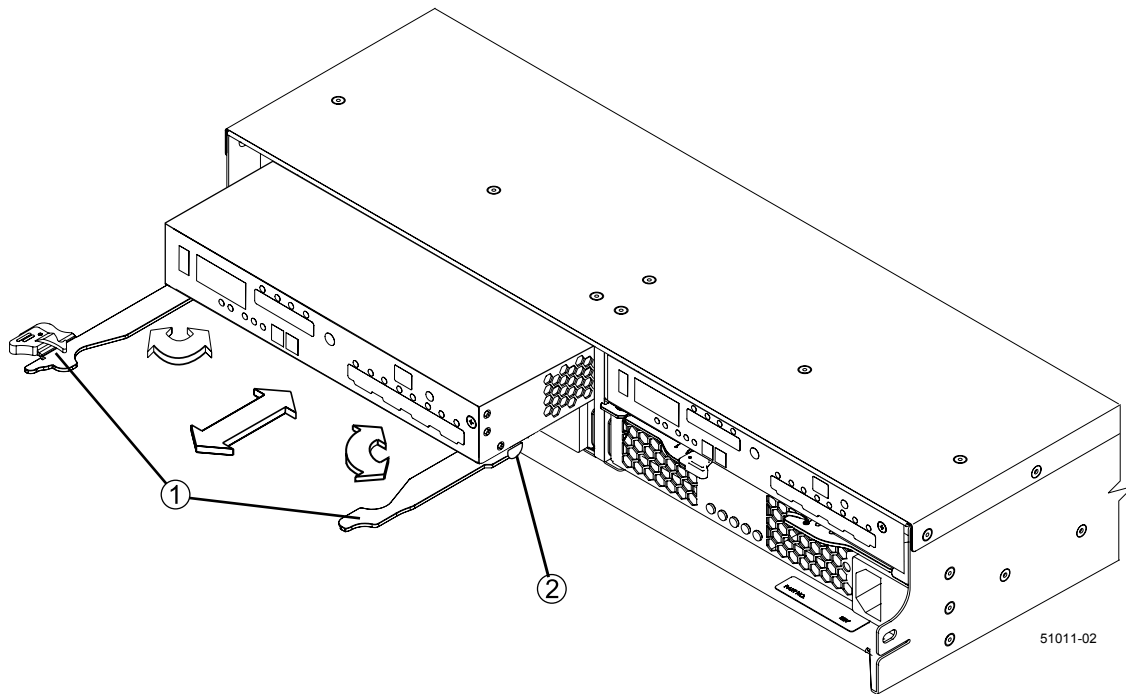3. Disconnect all of the cables from the controller canisters.

   If fiber-optic cables are present, use the two release levers to partially remove the controller canister. Opening these release levers makes it easier to press down the fiber-optic cable release tab.

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

4. Follow these steps to remove controller A:

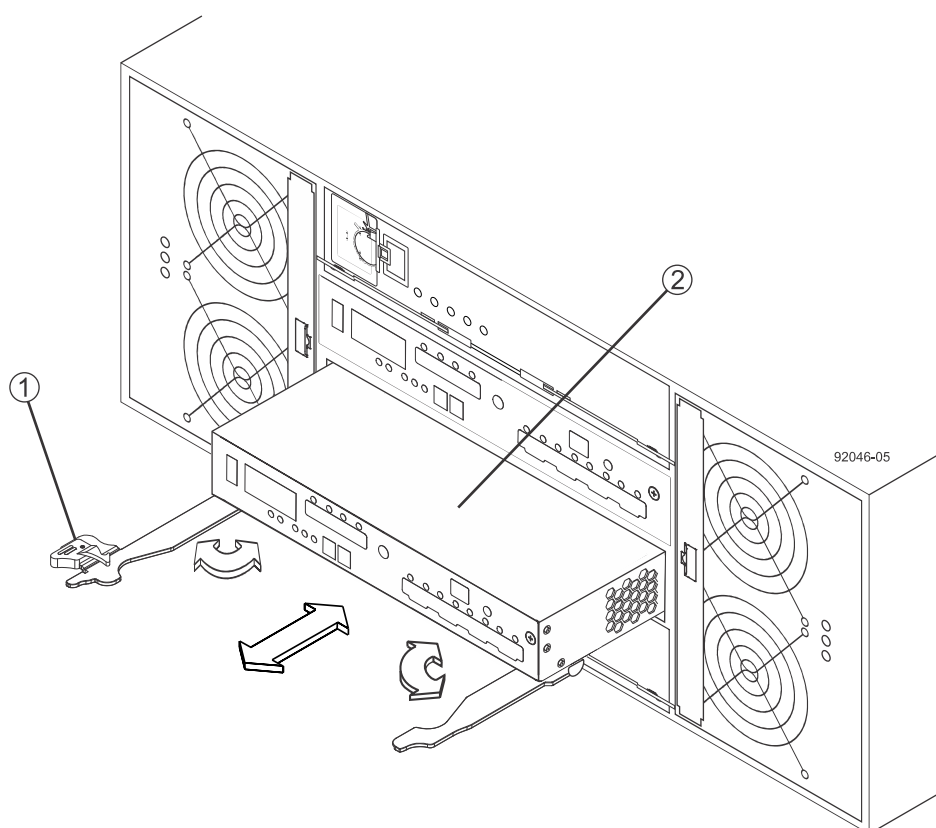   a. Unlock and rotate the release handles out to release the controller canister.

   b. Using the release handles and your hands, pull the controller canister out of the tray.

   Removing a controller canister from an E5612, E5624, or EF560 tray

1	Release handles
2	Controller canister

Changing the host protocol in the E5600 or EF560 by replacing hardware components

Removing a controller canister from an E5660 controller-drive tray

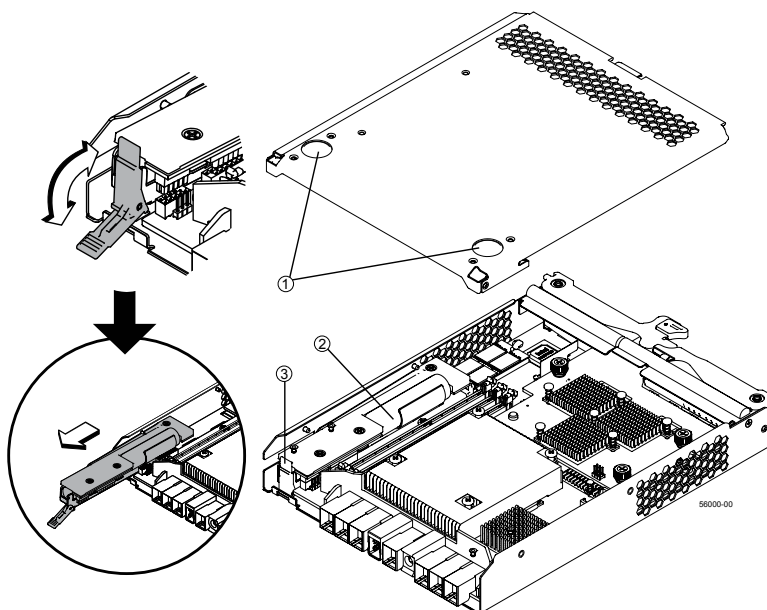| 1	Release handles
2	Controller canister

5. Set the controller canister on a flat, static-free surface.

6. Repeat these steps to remove controller B.

7. Determine if you need to remove the batteries as follows:

   - If you are replacing only the HICs, you will reuse the controller canisters so you do not need to remove the batteries. Go to *Removing the HICs (if replacing only the HICs)* on page 11.

   - If you are replacing the controller and HIC as a unit, you must remove the batteries from the original controller canisters and install them into the new controller canisters, as described in the next section.

Removing and replacing the battery (when replacing the controller and HIC as a unit)

If the Replacement Part Number is *E-X561206A-R6* or *EF-X561206A-R6*, and you are replacing both controller canisters (not just replacing the HICs), you must remove the batteries from the original controller canisters and install them into the new controller canisters.

Steps

1. Remove the battery from the controller canister A by performing the following steps:

   a. Press down on both of the top-cover latch buttons, and slide the top cover off the controller canister.

   b. Release the tab that secures the battery to the controller canister.

1	Top-cover latch buttons
2	Battery
3	Locking tab

   c. Remove the battery by sliding it towards the rear of the controller canister.

   d. Repeat these steps for controller B.

2. Install the batteries into the new controller canisters by performing the following steps:

   a. Unpack the new controller canister, and set it on a flat, static-free surface with the top cover up.

      Save the packing materials in case you need to return the old controller canisters.

   b. Press down on both of the top-cover latch buttons, and slide the top cover off the controller canister.

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

   d. Slide the battery into the canister, making sure it stays below the rivets on the wall of the canister.

   e. Keeping the locking handle at a 45-degree angle, align the connectors at the bottom of the battery with the connectors on the canister.

   f. Push the battery down until you hear it click, and move the locking handle up to secure the battery to the controller canister.

      Attention: To make sure that the battery is seated correctly, you might need to slide it out and insert it again. You will know it is secure when you hear it click into place and when the locking handle does not move out of its upright position when you wiggle it.

   g. Repeat these steps for the second controller canister.

3. Go to *Replacing the controller canisters* on page 12.

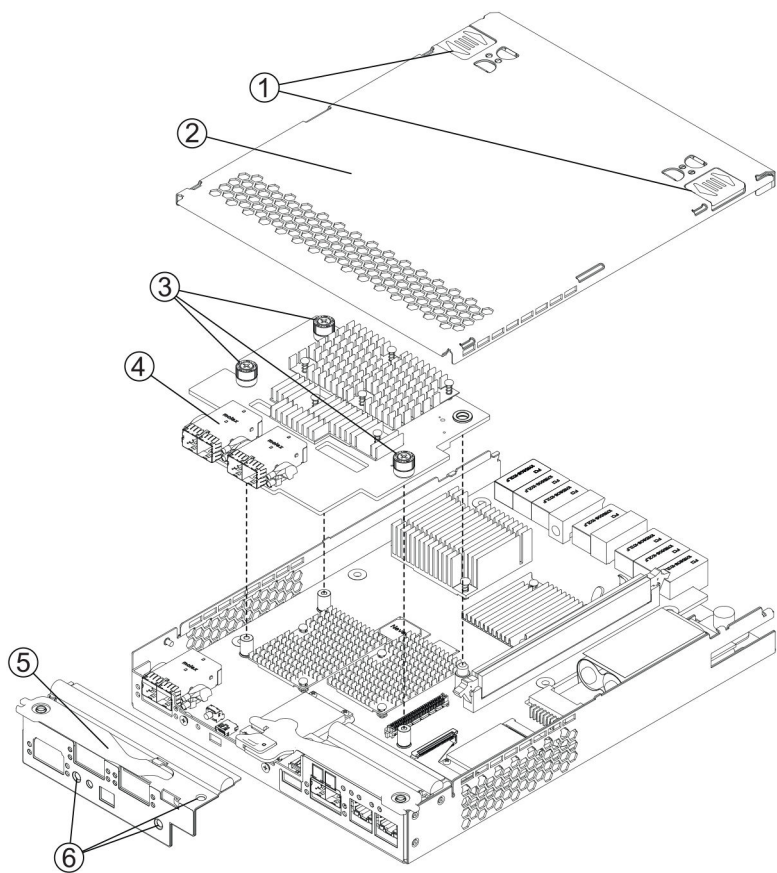# Removing the HICs (if replacing only the HICs)

You must remove the HICs from both controller canisters before installing new ones.

Before you begin

You must be wearing an ESD wristband or have taken other antistatic precautions.

Steps

1. Remove the top cover from controller A.

   Press down on both the top-cover latch buttons, and slide the top cover to the rear.

2. Unscrew the faceplate screws using a Phillips screwdriver, and remove the faceplate from the controller canister.

3. Unscrew the thumbscrews that secure the HIC to the controller card.

   If the thumbscrews are overly tightened, use a Phillips screwdriver.

4. Detach the HIC from the controller card by lifting it up and gently sliding back.

1	Top-cover latch buttons
2	Top cover
3	Thumbscrews
4	Host interface card

5	Faceplate
6	Faceplate screws

5. Place the HIC in an antistatic bag.

6. Repeat these steps to remove the HIC from controller B.

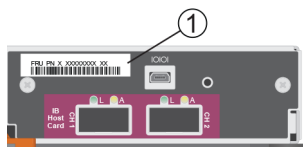# Installing the new HICs (if replacing only the HICs)

After you remove the original HICs, you must install new HICs and new HIC faceplates.

Steps

1. Unpack the new HICs and HIC faceplates.

2. Write down the part number printed on the controller field-replaceable unit (FRU) label (located in the upper-left corner of the faceplate).

   You need this number for the last step of this procedure when you send an upgrade notification to NetApp technical support. The upgrade notification alerts NetApp that you have changed the HIC protocol and helps to ensure that you receive correct replacement parts if you need them later.

   For example, if you have an InfiniBand HIC, the new part number is on the FRU label as shown in the following image:

1	FRU label

3. Gently connect the new HIC to the HIC interface connector on the controller card.

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

4. Hand-tighten the HIC thumbscrews.

   If you use a screwdriver, you might overtighten the screws.

5. Attach the HIC faceplate to the controller canister by tightening the screws with a Phillips screwdriver.

6. Repeat these steps to install a HIC in controller B.

Replacing the controller canisters

You must replace the controller canisters before you can reconnect cables to the controller and HICs.

Steps

1. Reinstall the top cover on controller A by sliding it forward until the top cover latch buttons click.

2. Slide the controller canister all the way into the controller-drive tray or flash array.

3. Rotate the release levers towards the center of the controller canister to lock it into place.

4. Repeat these steps for controller B.

Reconnecting the cables

After you replace the controller canisters in the controller-drive tray or flash array, you can reconnect cables to the controller and HICs.

Before you begin

Verify that you have installed the appropriate host bus adapters (HBAs) in your host.

Steps

1. As needed, install SFP+ or QSFP transceivers into the new HIC ports.

2. Connect cables between HIC ports and the hosts.

3. Reconnect the cables between the controller-drive tray and any expansion drive trays.

4. Reconnect the cables between the management ports and the management station.

5. Reconnect the power cords to each controller canister.

Applying power

After you replace the controller canisters, you must apply power to the E5600 storage arrays or EF560 flash arrays.

Steps

1. If you have expansion drive trays, turn on the two power switches at the back of each tray.

2. Wait two minutes.

3. Turn on the two power switches at the back of the controller-drive tray.

   • Do not turn off the power switches during the power-on process.

   • The fans in each tray are very loud when they first start up. The loud noise during start-up is normal.

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

5. Confirm that none of the amber LEDs on the front or back of any trays are illuminated.

   Note: If an amber LED is on, there is a problem with a component. Use SANtricity Storage Manager to help resolve the problem.

6. Depending on the type of hardware upgrade you performed, do one of the following:

   • If you replaced only the HICs, go to *After upgrading the HICs* on page 14.

   • If you replaced both controller canisters and HICs as a unit, and you use the Drive Security feature, you must restore the drive security key. Go to *Restoring the drive security key (when replacing the controller and HIC as a unit)* on page 14.

Restoring the drive security key (when replacing the controller and HIC as a unit)

If you are using the Drive Security feature and you replaced the controller and HIC as a unit, you must restore the drive security key.

Steps

1. If the storage array includes a mix of secured and unsecured drives, create a new Drive Security key. (From the **Storage Array** menu, select **Security > Drive Security > Create Key**.)

   Unsecured drives are unassigned drives, Global Hot Spare (GHS) drives, or drives that are part of a volume group or a disk pool that is not secured by Drive Security. Secured drives are assigned drives that are a part of a secured volume group or disk pool using Drive Security.

2. Import the Drive Security key you saved when preparing to remove the controllers. (From the **Storage Array** menu, select **Security > Drive Security > Import Key**.)

   If the storage array has secured drives only (no unsecured drives), the controllers automatically reboot to complete the import operation.

3. Wait for the controllers to boot up.

   When a controller finishes booting, its icon appears in the Enterprise Management Window (EMW).

4. If the Drive Security feature is enabled, and the storage array has a mix of secured and unsecured drives, follow these steps:

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

   b. Reset all controllers using SANtricity Storage Manager.

   c. Wait for all controllers to boot up. When a controller has finished booting, its icon appears in the EMW.

After upgrading the HICs

After upgrading the HICs to the new protocol, you must perform any additional steps for the new protocol.

Steps

1. Download the appropriate *SANtricity Express Guide* for the new host protocol and your operating system.

2. Follow the instructions in the Express Guide to perform additional steps.

   You might need to perform the following steps:

   - Update the host mappings to replace the host ports.

   - Configure the controller's iSCSI settings.

Related information

[SANtricity Storage Manager 11.20 FC Configuration and Provisioning for Linux Express Guide](#)
[SANtricity Storage Manager 11.20 FC Configuration and Provisioning for VMware Express Guide](#)
[SANtricity Storage Manager 11.20 FC Configuration and Provisioning for Windows Express Guide](#)
[SANtricity Storage Manager 11.20 Infiniband Configuration and Provisioning for Linux Express Guide](#)
[SANtricity Storage Manager 11.20 SAS Configuration and Provisioning for Linux Express Guide](#)
[SANtricity Storage Manager 11.20 SAS Configuration and Provisioning for VMware Express Guide](#)

SANtricity Storage Manager 11.20 SAS Configuration and Provisioning for Windows Express Guide

SANtricity Storage Manager 11.20 iSCSI Configuration and Provisioning for Linux Express Guide

SANtricity Storage Manager 11.20 iSCSI Configuration and Provisioning for VMware Express Guide

SANtricity Storage Manager 11.20 iSCSI Configuration and Provisioning for Windows Express Guide

Sending an upgrade notification to NetApp

Whenever you upgrade the HICs or controllers in your E-Series storage array or EF-Series flash array, you must notify NetApp technical support that you have changed the configuration. The upgrade notification alerts NetApp that you have changed the configuration and helps to ensure that you receive correct replacement parts if you need them later.

Before you begin

- You have obtained the chassis serial number for the controller-drive tray or the flash array.

- If you performed only a HIC upgrade, you have obtained the new FRU part number from the controller FRU labels on the HIC faceplates.

Steps

1. Go to the Give Us Feedback page on the NetApp Support Site.

   NetApp Support: Give Us Feedback

2. Log in to the site with your user name and password.

   The **Give Us Feedback** page is displayed.

   Note: If the **Give Us Feedback** page is not displayed automatically, select **Contact Us > Report an Issue** from the top menu bar.

3. Enter your name and email address.

4. From the **Category 1** drop-down list, select **Product Registration**.

5. Depending on the type of hardware upgrade, perform one of the following steps:

   - If you replaced the controller and HIC as a unit, copy and paste the following text into the **Comments** text box. Replace <serial number> with the chassis serial number.

     ```
     Create an alert against Serial Number: <serial number>. The alert name should be "E-
     Series Upgrade." The alert text should read as follows: "Attention: The controllers in
     this system have been upgraded from the original configuration. Verify the controller
     configuration before ordering replacement controllers and notify dispatch that the
     system has been upgraded."
     ```

   - If you replaced only the HICs, copy and paste the following text into the **Comments** text box. Replace <serial number> with the chassis serial number. Replace <FRU part number> with the number you copied from the controller FRU label on the new HIC faceplates.

     ```
     Create an alert against Serial Number: <serial number>. The alert name should be "E-
     Series Upgrade." The alert text should read as follows: "Attention: The HICs in this
     system have been upgraded from the original configuration. The new controller FRU
     number is <FRU part number>. Verify the configuration before ordering replacement
     controllers and notify dispatch that the system has been upgraded."
     ```

6. Click **Submit**.

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