FlashArray//M Service Guide

40-0086-08

purestorage.com

Pure Storage, Inc.
650 Castro Street
Mountain View, CA 94041
http://www.purestorage.com

Change Log

Document Version	Major Changes
40-0086-07 E0	Altered illos to remove physical port numbering from FC cards (to avoid confusion with Pure logical port naming)
40-0086-08	NVRAM module: Added note with maximum torque for locking screw (3 in-lbs, .339 Nm).

Contents

Conventions and Guidelines

The following symbols appear in Pure Storage documentation and might also be on the equipment.

Symbol	Meaning
	Best practice
	Supplementary instruction
	Potential for injury, physical damage, loss of data, or array configuration information
	Important information
	Indicates either a need for login access to an array or for Pure Storage Technical Support involvement in a procedure step.

Safety and Handling Guidelines

- If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment might be impaired.
- Avoid contact with backplane components and connectors.
- Disconnect all power cords before moving the chassis and shelves or performing any powered-off service operation.
- Verify that rack electrical distribution systems meet all safety requirements of UL 60950-1 and IEC 60950-1 when fully populated, and that they provide adequate 100-240V 50-60Hz AC power, overcurrent protection, and electrical ground for all installed equipment.
- If you use bifurcated ("Y") power cords, connect them to a 200-240V external power supply.
- Verify that all electrical connections are grounded before powering on.
- Do not open chassis or shelf enclosures, or any component such as a PSM, PSU, or drive carrier, unless you are a qualified service representative performing a service procedure in accordance with instructions published by Pure Storage.
- Do not use the handles on the controller, PSU, or storage shelf PCM handles to lift a chassis. Use chassis lift handles to lift a chassis.
- When servicing rack-mounted equipment, extend only one chassis at a time.
- Do not replace batteries due to risk of explosion if handled incorrectly. Dispose of batteries according to battery manufacturers' instructions.
- Do not insert anything into any FlashArray connector except as specified in installation or repair instructions.
- Be careful when disconnecting SAS cables. The connector casing might be hot.
- Ensure that all components, including PSMs, PSUs, and blank panels are in place before powering on or operating an array.
- Leave failed components (e.g., PSUs, SSDs, etc.) in place until replacements are available.

Procedure 1: Replacing an AC Power Supply Unit (PSU)

Introduction

This section describes how to replace a FlashArray//M AC power supply unit (PSU). When a PSU fails, you must replace the entire unit. Pure Storage does not support field disassembly or repair of PSUs.

PSU Replacement Steps

A ☎ icon indicates you need either login access or assistance from Pure Storage Technical Support.

Tools and Equipment (Provided by Pure Storage)

- Replacement PSU
- KVM cable (provided in the Accessory Kit that shipped with the FlashArray//M)

Required for Some Procedures (Not Provided by Pure Storage)

- Anti-static temporary work area with electrical power available
- ESD protection (e.g., wrist strap)
- A local console (either a VGA monitor and USB keyboard, or a computer equipped with a serial-to-USB converter and terminal emulation software set to communicate at 115,200 bps, no parity, 8 data bits, and one stop bit)

Return all replaced and unused parts and supplies to Pure Storage.

FlashArray Power During Replacement

You can replace this component while the array is operating; if, however, the customer wants you to power off the array during the procedure, follow the instructions in " Appendix A: Powering a FlashArray//M Off and On" on page 139.

Estimated Time for Replacement: 15 Minutes

Includes all necessary unpacking, replacement, and repacking tasks. Does not include any optional customer-requested operations such as array power off and on.

Video

For a video of this procedure, refer to Replacing a Power Supply Unit.

Step 1. Observe Failure Symptoms ☎

Ask the customer or a Pure Storage Support representative to verify the power supply failure. There are three indicators that help you determine if a power supply has failed:

- Use the Purity GUI. Select **System** > **System Health**. A red rectangle in the upper left corner of a power supply icon indicates a failure (see Figure 1-1).
- Use the Purity CLI. Enter the `purehw list --type pwr` command. A status of `critical` indicates a power supply failure (see Figure 1-2).
- Check the LED on the lower right corner of the PSU panel. Green indicates that the power supply is operating normally. Amber indicates a power supply failure (see Figure 1-3).

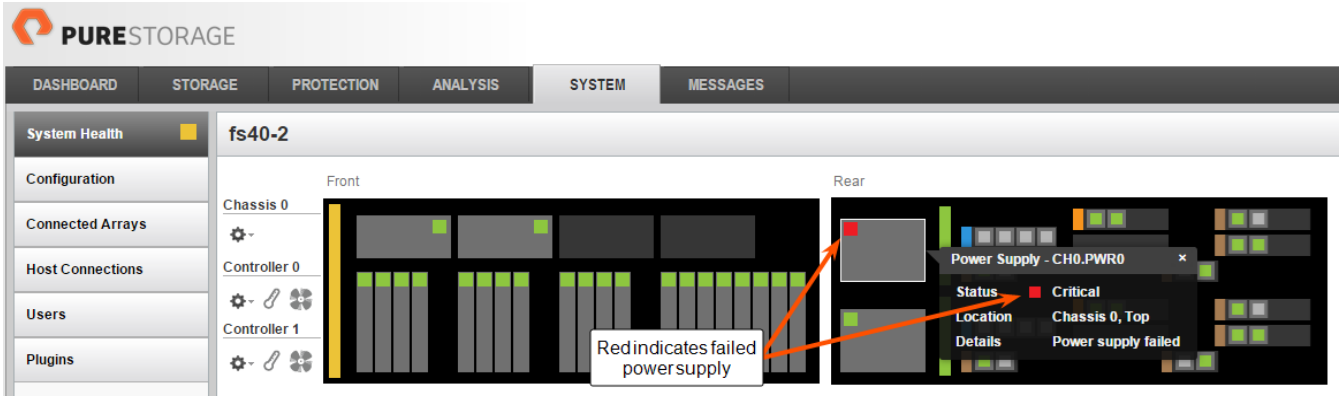

Figure 1-1. GUI Indication of Power Supply Failure

```
pureuser>purehw list --type pwr
Name       Status    Identify  Slot  Index  Speed  Temperature
CH0.PWR0   critical  -         -     0      -      -
CH0.PWR1   ok        -         -     1      -      -
```

Figure 1-2. CLI Indication of Power Supply Failure

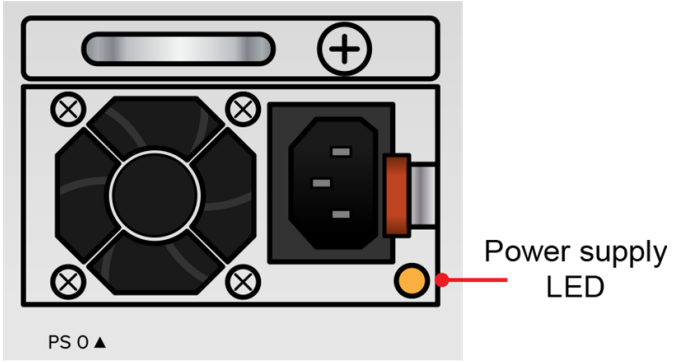

Figure 1-3. Power Supply LED – Faulty

Step 2. Power Off the Power Supply

1. Unwrap the captive strap. See Figure 1-4.
2. Remove the power plug from the PSU socket.

Do not unplug the power cord from the rack power distribution unit.

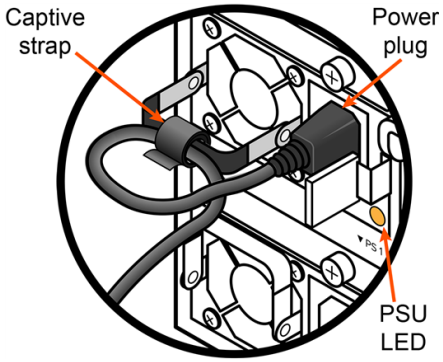

Figure 1-4. Removing the Power Plug

Step 3. Remove the Faulty PSU from the Chassis

1. Grasp the PSU handle with your index finger and press the PSU latch inward to release it from the power supply module (PSM). See Figure 1-5.
2. Pull the PSU by the handle and remove it completely from the FlashArray//M chassis.

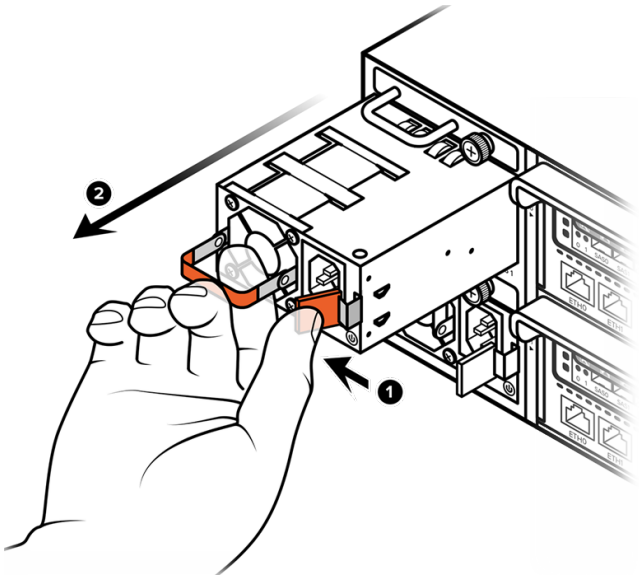

Figure 1-5. Remove PSU from Chassis

Step 4. Install the Replacement PSU and Power On

If the array was powered off for the PSU replacement, follow the instructions in " Appendix A: Powering a FlashArray//M Off and On" on page 139 to power it on.

1. Align the replacement PSU with the chassis bay and slide it completely in. See Figure 1-6.
2. Verify that the PSU retention mechanism is engaged by pulling the PSU handle gently until you feel resistance.

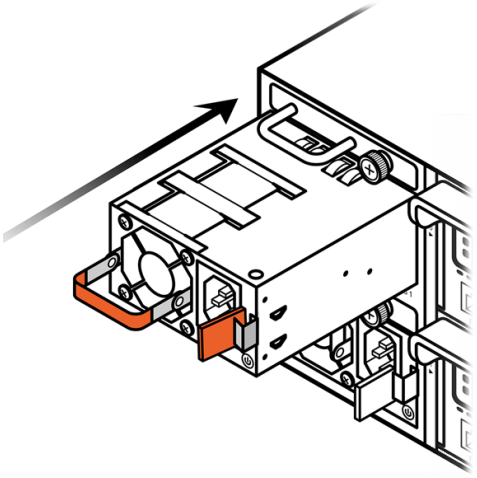

Figure 1-6. Installing the PSU

3. Lower the power supply handle, make a loop in the power cord near the plug, and wrap the captive strap around the loop, securing the cord to the handle. See Figure 1-7.
4. Insert the power plug into the power supply socket.

Securing the captive strap prevents you from accidentally disconnecting power to the array.

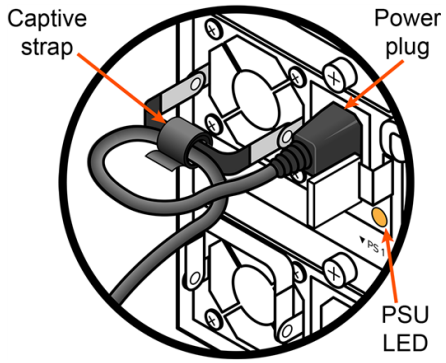

Figure 1-7. Connecting the Power

Step 5. Verify the Replacement ☎

1. Request that the customer or Pure Storage Technical Support representative use the Purity GUI or CLI to verify the replacement. See Figure 1-8 for an example of GUI indicators and Figure 1-9 for an example of CLI indicators that reflect an operational power supply.
2. Verify that the PSU LED is green. See Figure 1-10.

If the PSU replacement does not resolve the issue, contact Pure Storage Support for assistance. Power supply failure can also be caused by a faulty power supply module (PSM) or power cord.

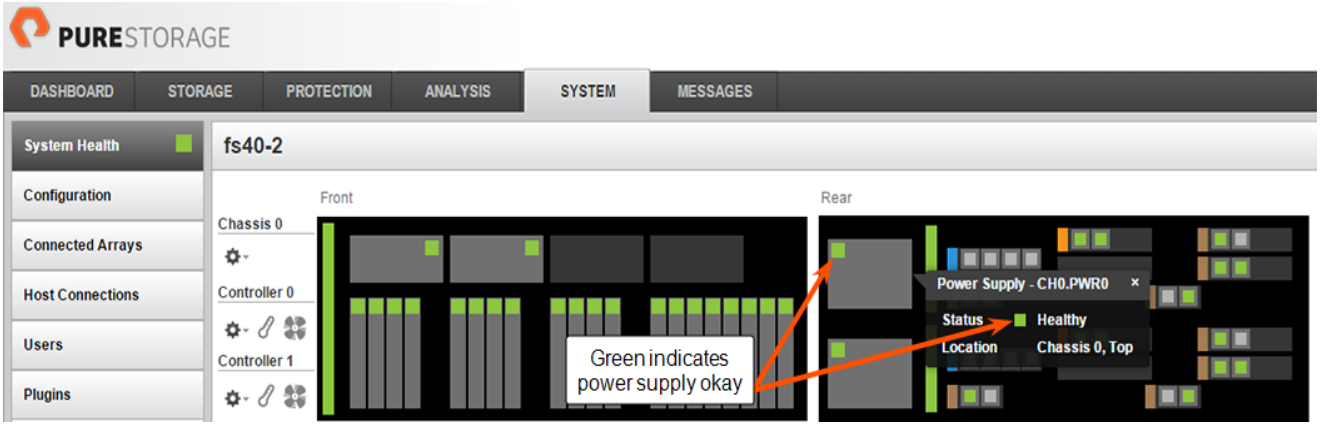

Figure 1-8. GUI Indication of Functional PSU

```
# purehw list --type pwr
Name       Status  Identify  Slot  Index  Speed  Temperature
CH0.PWR0   ok      -         -     0      -      - ◄
CH0.PWR1   ok      -         -     1      -      -
```

Figure 1-9. CLI Indication of Functional PSU

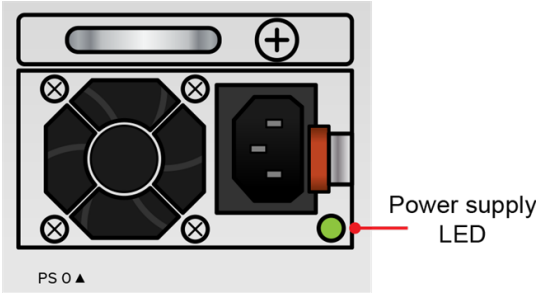

Figure 1-10. Power Supply LED – OK

This completes the PSU replacement procedure.

Procedure 2: Replacing a DC Power Supply Unit (PSU)

Introduction

This section describes how to replace a FlashArray//M DC power supply unit (PSU). When a PSU fails, you must replace the entire unit. Pure Storage does not support field disassembly or repair of PSUs.

PSU Replacement Steps

A ☎ icon indicates you need either login access or assistance from Pure Storage Technical Support.

Tools and Equipment (Provided by Pure Storage)

- Replacement PSU
- KVM cable (provided in the Accessory Kit that shipped with the FlashArray//M)

Required for Some Procedures (Not Provided by Pure Storage)

- Anti-static temporary work area with electrical power available
- ESD protection (e.g., wrist strap)
- A local console (either a VGA monitor and USB keyboard, or a computer equipped with a serial-to-USB converter and terminal emulation software set to communicate at 115,200 bps, no parity, 8 data bits, and one stop bit)

Return all replaced and unused parts and supplies to Pure Storage.

FlashArray Power During Replacement

You can replace this component while the array is operating; if, however, the customer wants you to power off the array during the procedure, follow the instructions in " Appendix A: Powering a FlashArray//M Off and On" on page 139.

Estimated Time for Replacement: 15 Minutes

Includes all necessary unpacking, replacement, and repacking tasks. Does not include any optional customer-requested operations such as array power off and on.

Step 1. Observe Failure Symptoms ☎

Ask the customer or a Pure Storage Support representative to verify the power supply failure. There are three indicators that help you determine if a power supply has failed:

- Use the Purity GUI. Select **System** > **System Health**. A red rectangle in the upper left corner of a power supply icon indicates a failure (see Figure 2-1).
- Use the Purity CLI. Enter the `purehw list --type pwr` command. A status of `critical` indicates a power supply failure (see Figure 2-2).
- Check the LED on the lower right corner of the PSU panel. Green indicates that the power supply is operating normally. Amber indicates a power supply failure (see Figure 2-3).

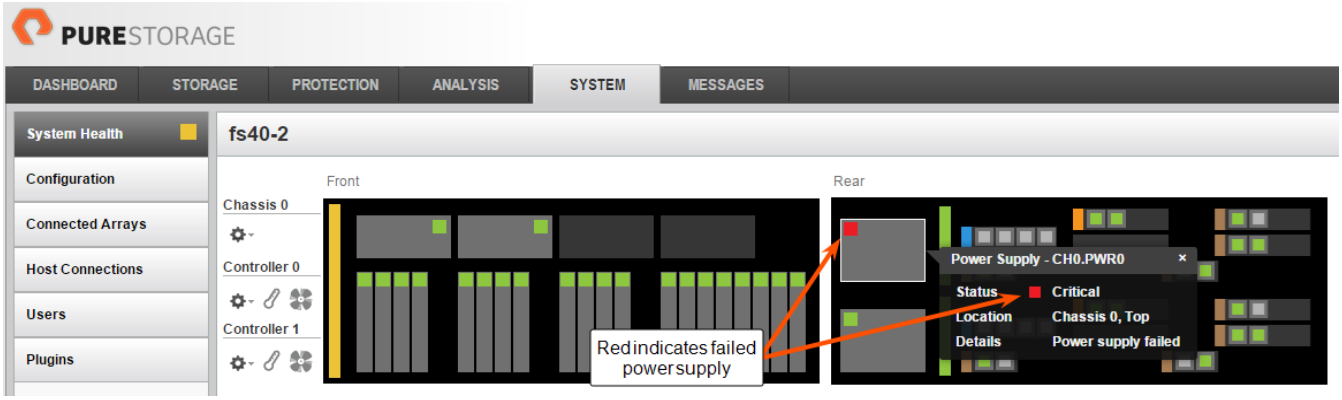

Figure 2-1. GUI Indication of Power Supply Failure

```
pureuser>purehw list --type pwr
Name       Status    Identify  Slot  Index  Speed  Temperature
CH0.PWR0   critical  -         -     0      -      -
CH0.PWR1   ok        -         -     1      -      -
```

Figure 2-2. CLI Indication of Power Supply Failure

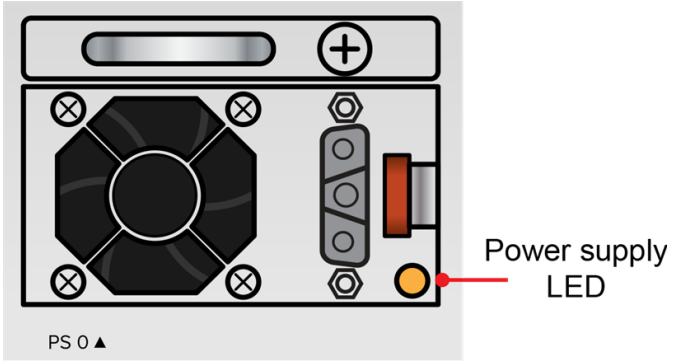

Figure 2-3. Power Supply LED – Faulty

Step 2. Disconnect DC Power Cable

1. Disconnect the cable from the DC power source.
2. Loosen the two captive screws on the DC power plug and disconnect it from the chassis. See Figure 2-4.

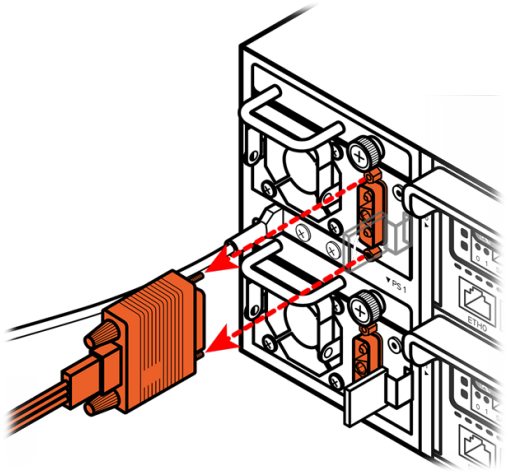

Figure 2-4. Removing a DC Power Cable

Step 3. Remove the Faulty PSU from the Chassis

1. Grasp the PSU handle with your index finger and press the PSU latch inward to release it from the power supply module (PSM). See Figure 2-5.
2. Pull the PSU by the handle and remove it completely from the FlashArray//M chassis.

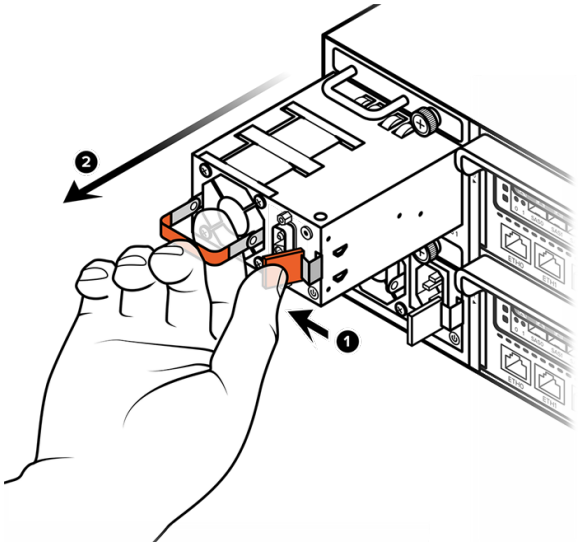

Figure 2-5. Remove PSU from Chassis

Step 4. Install the Replacement PSU and Power On

NEBS Cautions and Guidelines

- The minimum grounding wire for the FlashArray//M is 8 AWG. Screw-holes for a two-hole grounding lug are provided on the chassis between the two PSUs.
- The FlashArray//M is designed for a Common Bonding Network (CBN) installation.
- The FlashArray//M can be installed in network telecommunication facilities or locations where the National Electric Code is applied.
- An electrical conducting path shall exist between the product chassis and the metal surface of the enclosure or rack in which it is mounted or to a grounding conductor. Electrical continuity shall be provided by using thread-forming type mounting screws that remove any paint or nonconductive coatings and establish a metal-to-metal contact. Any paint or other nonconductive coatings shall be removed on the surfaces between the mounting hardware and the enclosure or rack. The surfaces shall be cleaned and an antioxidant applied before installation.
- The DC return connection to the FlashArray//M shall be isolated from the system frame and chassis (DC-I).

If the array was powered off for the PSU replacement, follow the instructions in "Appendix: Powering a FlashArray//M Off and On" on page 1 to power it on.

1. Align the replacement PSU with the chassis bay and slide it in completely. See Figure 2-6.
2. Verify that the PSU retention mechanism is engaged by pulling the PSU handle gently until you feel resistance.

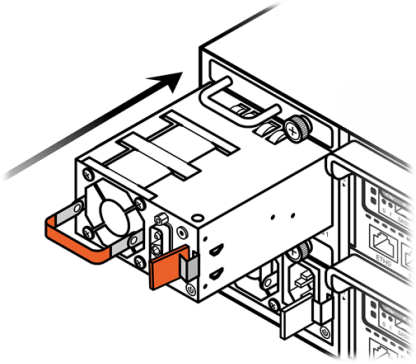

Figure 2-6. Installing the PSU

Make sure you connect the DC power cord to a different DC power source than the one connected to the other power supply to ensure redundancy.

1. Reconnect the power cord to the power source.
2. Reconnect the DC power cord to the PSU and tighten the two captive screws to secure it in place. See Figure 2-7.

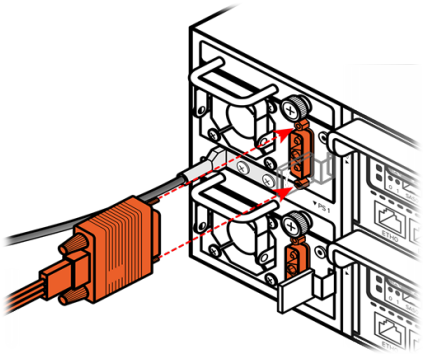

Figure 2-7. Securing the Power Cord

Step 5. Verify the Replacement ☎

1. Request that the customer or Pure Storage Technical Support representative use the Purity GUI or CLI to verify the replacement. See Figure 2-8 for an example of GUI indicators and Figure 2-9 for an example of CLI indicators that reflect an operational power supply.
2. Verify that the PSU LED is green. See Figure 2-10.

If the PSU replacement does not resolve the issue, contact Pure Storage Support for assistance. Power supply failure can also be caused by a faulty power supply module (PSM) or power cord.

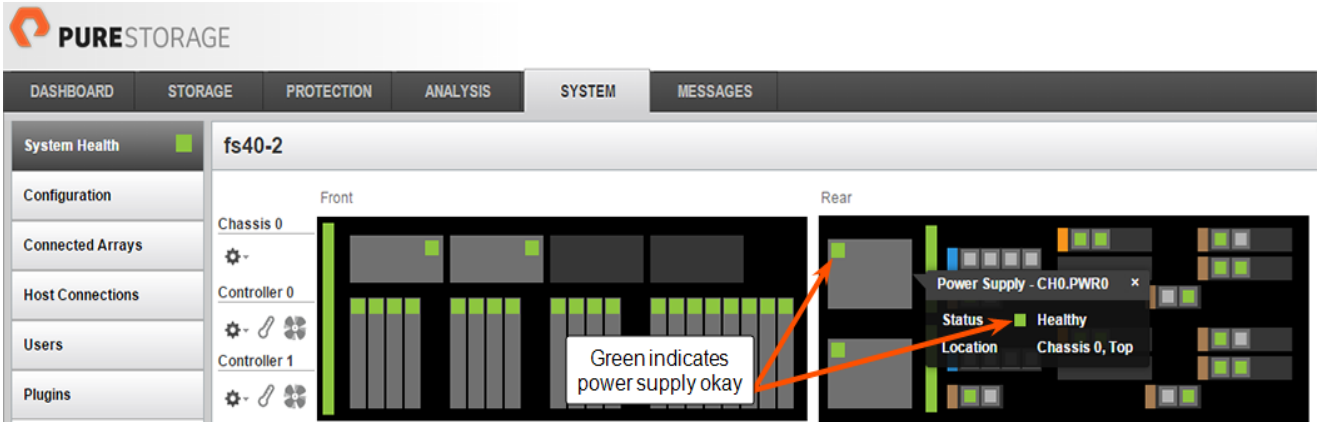

Figure 2-8. GUI Indication of Functional PSU

```
# purehw list --type pwr
Name       Status  Identify  Slot  Index  Speed  Temperature
CH0.PWR0   ok      -         -     0      -      - ◄
CH0.PWR1   ok      -         -     1      -      -
```

Figure 2-9. CLI Indication of Functional PSU

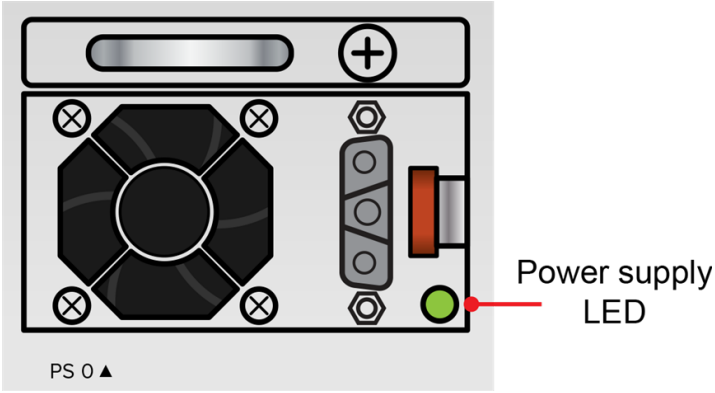

Figure 2-10. Power Supply LED – OK

This completes the PSU replacement procedure.

Procedure 3: Replacing a Power Supply Module (PSM)

Introduction

This section describes how to replace a FlashArray//M power supply module (PSM). When a PSM fails, you must replace the entire unit. Pure Storage does not support field disassembly or repair of PSMs.

PSM Replacement Steps

A ☎ icon indicates you need either login access or assistance from Pure Storage Technical Support.

Tools and Equipment (Provided by Pure Storage)

- Replacement PSM
- KVM cable (provided in the Accessory Kit that shipped with the FlashArray//M)

Required for Some Procedures (Not Provided by Pure Storage)

- Anti-static temporary work area with electrical power available
- A local console (either a VGA monitor and USB keyboard, or a computer equipped with a serial-to-USB converter and terminal emulation software set to communicate at 115,200 bps, no parity, 8 data bits, and one stop bit)
- Phillips screwdriver

Return all replaced and unused parts and supplies to Pure Storage.

FlashArray Power During Replacement

You can replace this component while the array is operating; if, however, the customer wants you to power off the array during the procedure, follow the instructions in " Appendix A: Powering a FlashArray//M Off and On" on page 139.

Estimated Time for Replacement: 15 Minutes

Includes all necessary unpacking, replacement, and repacking tasks. Does not include any optional customer-requested operations such as array power off and on.

Video

For a video of this procedure, refer to Replacing a Power Supply Module.

Step 1. Observe Failure Symptoms ☎

Ask the customer or a Pure Storage Support representative to verify the power supply failure. There are three indicators that help you determine if a power supply has failed:

- Use the Purity GUI. Select **System** > **System Health**. A red rectangle in the upper left corner of a power supply icon indicates a failure (see Figure 3-1).
- Use the Purity CLI. Enter the `purehw list --type pwr` command. A status of `critical` indicates a power supply failure (see Figure 3-2).
- Check the LED on the lower right corner of the PSU panel. Green indicates that the power supply is operating normally. Amber indicates a power supply failure (see Figure 3-3).

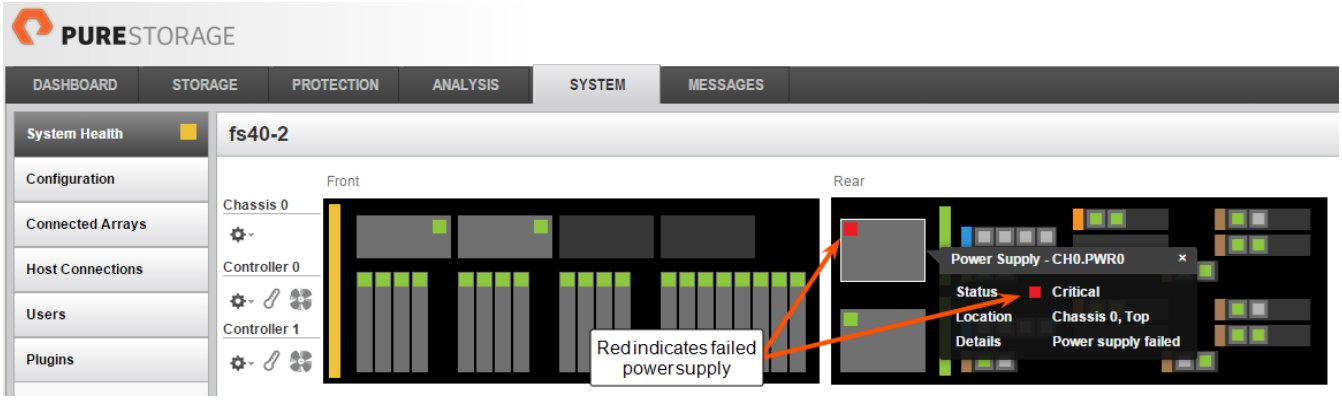

Figure 3-1. GUI Indication of Power Supply Failure

```
pureuser>purehw list --type pwr
Name       Status    Identify  Slot  Index  Speed  Temperature
CH0.PWR0   critical  -         -     0      -      -
CH0.PWR1   ok        -         -     1      -      -
```

Figure 3-2. CLI Indication of Power Supply Failure

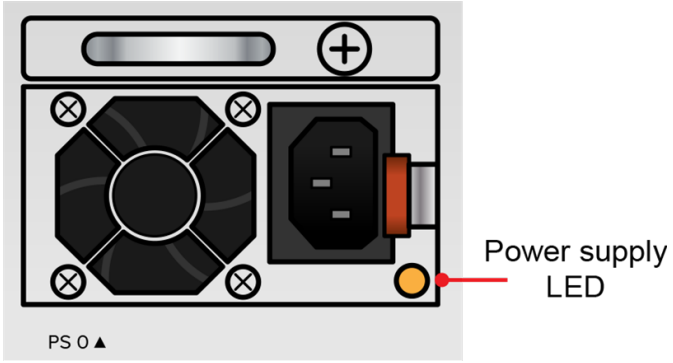

Figure 3-3. Power Supply LED – Faulty

Step 2. Power Off the Power Supply

1. Unwrap the captive strap. See Figure 3-4.
2. Remove the power plug from the PSU socket.

Do not unplug the power cord from the rack power distribution unit.

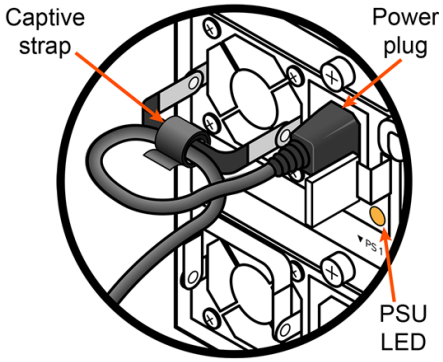

Figure 3-4. Removing the Power Plug

Step 3. Remove the PSM

To remove a PSM, you must first remove the PSU contained in the PSM.

1. Grasp the PSU handle with your index finger and press the PSU latch inward to release it from the power supply module (PSM). See Figure 3-5.
2. Pull the PSU by the PSU handle and remove it completely from the FlashArray//M chassis.

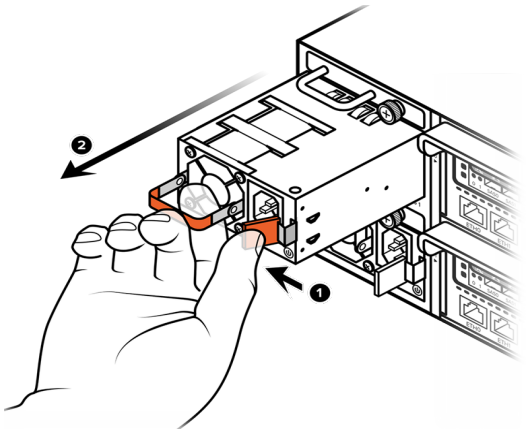

Figure 3-5. Remove PSU from Chassis

3. Loosen the captive screw.

Use a Phillips screwdriver to loosen the captive screw if it is too tight to loosen by hand.

4. Grip the PSM by the handle and carefully pull it from the chassis. See Figure 3-6.

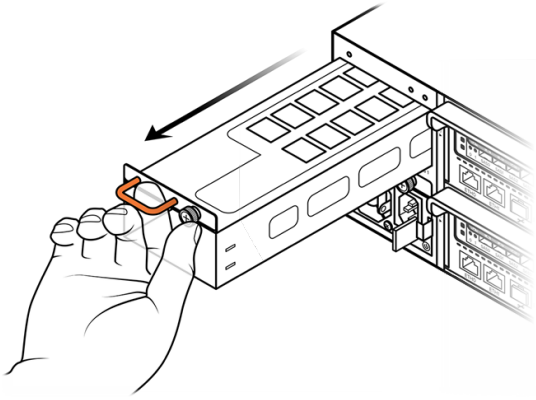

Figure 3-6. Removing a PSM

Step 4. Install the New PSM and Power On

1. Align the PSM with the slot and carefully slide it in until the retention mechanism engages. See Figure 3-7.
2. Verify that the retention mechanism is engaged by gently pulling the handle until you feel resistance.
3. Tighten the captive screw.

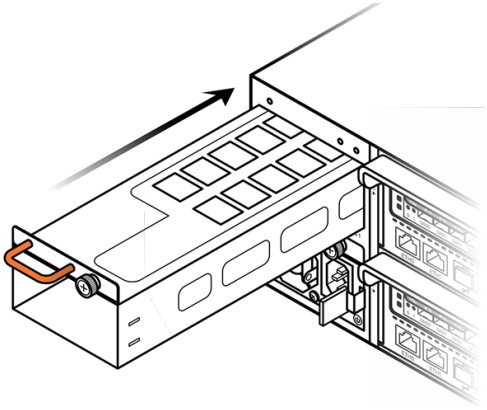

Figure 3-7. Installing a PSM

If the array was powered off for the PSM replacement, follow the instructions in " Appendix A: Powering a FlashArray//M Off and On" on page 139 to power it on.

1. Align the PSU with the chassis bay and slide it completely in. See Figure 3-8.
2. Verify that the PSU retention mechanism is engaged by pulling the PSU handle gently until you feel resistance.

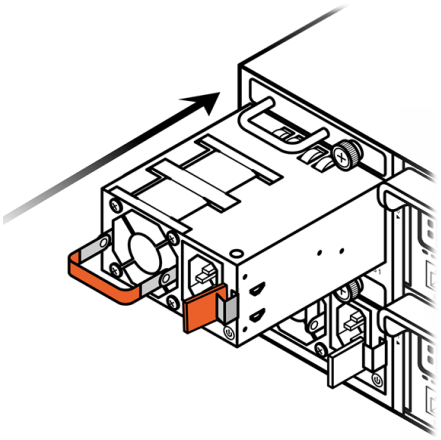

Figure 3-8. Installing the PSU

3. Lower the power supply handle, make a loop in the power cord near the plug, and wrap the captive strap around the loop, securing the cord to the handle. See Figure 3-9.
4. Insert the power plug in the power supply socket.

Securing the captive strap prevents you from accidentally disconnecting power to the array.

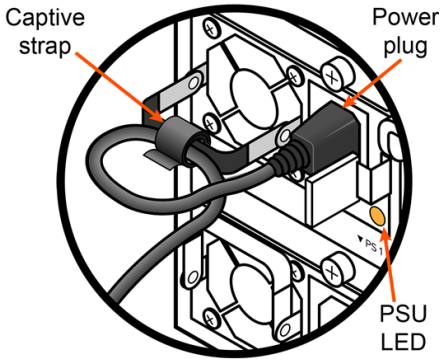

Figure 3-9. Connecting the Power

Step 5. Verify the Replacement ☎

1. Request that the customer or Pure Storage Technical Support representative use the Purity GUI or CLI to verify the replacement. See Figure 3-10 for an example of GUI indicators and Figure 3-11 for an example of CLI indicators that reflect an operational power supply.
2. Verify that the PSU LED is green. See Figure 3-12.

If the PSM replacement does not resolve the issue, contact Pure Storage Support for assistance. Power supply failure can also be caused by a faulty power supply unit (PSU) or power cord.

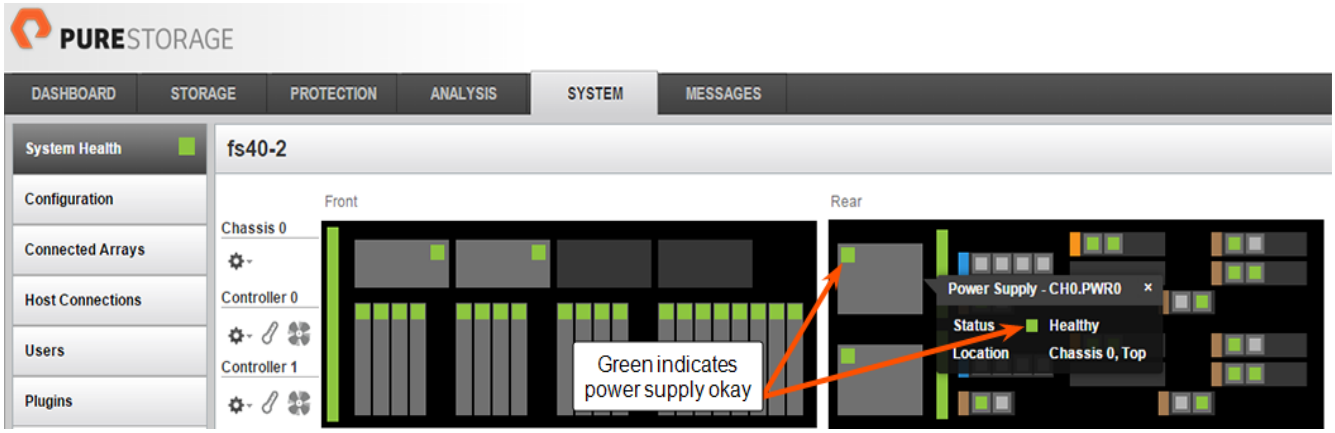

Figure 3-10. GUI Indication of Functional PSU

```
# purehw list --type pwr
Name       Status  Identify  Slot  Index  Speed  Temperature
CH0.PWR0   ok      -         -     0      -      - ◀
CH0.PWR1   ok      -         -     1      -      -
```

Figure 3-11. CLI Indication of Functional PSU

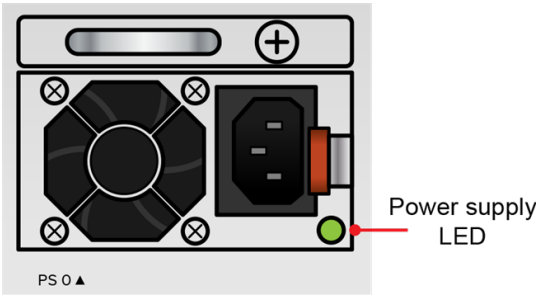

Figure 3-12. Power Supply LED – OK

This completes the PSM replacement procedure.

Procedure 4: Replacing a Power Cord

Introduction

This section describes how to replace one of the two power cords that connect a FlashArray//M controller to its rack power distribution systems.

Power Cord Replacement Steps

A ☎ icon indicates you need either login access or assistance from Pure Storage Technical Support.

Tools and Equipment (Provided by Pure Storage)

- Replacement power cord of the required type. The power cord replacement kit contains NEMA 5-15 and IEC C13/C14 cords. If a different type of cord is required, it must be supplied by the customer.
- KVM cable (provided in the Accessory Kit that shipped with the FlashArray//M)

Required for Some Procedures (Not Provided by Pure Storage)

- Anti-static temporary work area with electrical power available
- ESD protection (e.g., wrist strap)
- A local console (either a VGA monitor and USB keyboard, or a computer equipped with a serial-to-USB converter and terminal emulation software set to communicate at 115,200 bps, no parity, 8 data bits, and one stop bit)

Return all replaced and unused parts and supplies to Pure Storage.

FlashArray Power During Replacement

You can replace this component while the array is operating; if, however, the customer wants you to power off the array during the procedure, follow the instructions in " Appendix A: Powering a FlashArray//M Off and On" on page 139.

Estimated Time for Replacement: 15 Minutes

Includes all necessary unpacking, replacement, and repacking tasks. Does not include any optional customer-requested operations such as array power off and on.

Video

For a video of this procedure, refer to Replacing a Power Cord.

Step 1. Observe Failure Symptoms ☎

Ask the customer or a Pure Storage Support representative to verify the power supply failure. There are three indicators that help you determine if a power supply has failed:

- Use the Purity GUI. Select **System** > **System Health**. A red rectangle in the upper left corner of a power supply icon indicates a failure (see Figure 4-1).
- Use the Purity CLI. Enter the `purehw list --type pwr` command. A status of `critical` indicates a power supply failure (see Figure 4-2).
- Check the LED on the lower right corner of the PSU panel. Green indicates that the power supply is operating normally. Amber indicates a power supply failure (see Figure 4-3).

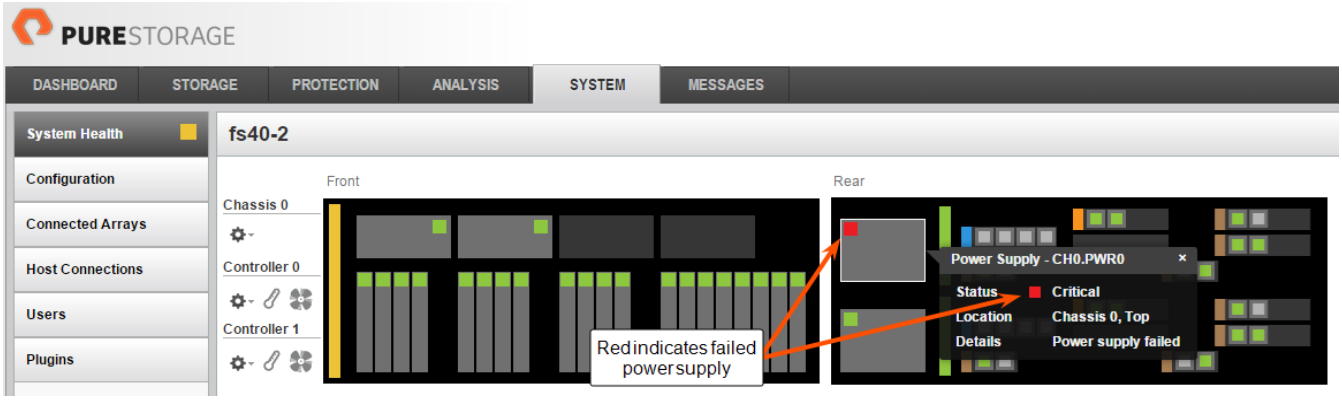

Figure 4-1. GUI Indication of Power Supply Failure

```
pureuser>purehw list --type pwr
Name       Status    Identify  Slot  Index  Speed  Temperature
CH0.PWR0   critical  -         -     0      -      -
CH0.PWR1   ok        -         -     1      -      -
```

Figure 4-2. CLI Indication of Power Supply Failure

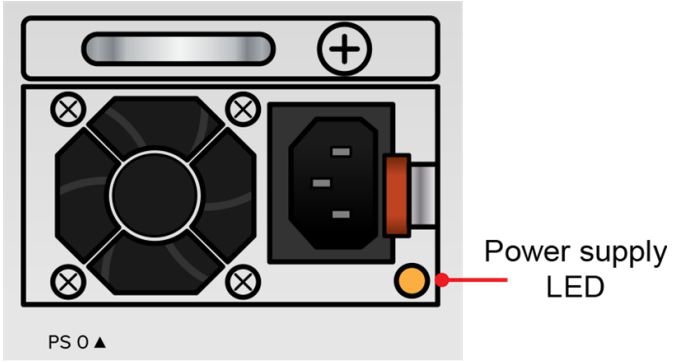

Figure 4-3. Power Supply LED – Faulty

Step 2. Disconnect the Faulty Power Cord

1. Unwrap the captive strap. See Figure 4-4.
2. Unplug the power cord from the rack power distribution system.
3. Remove the power plug from the PSU socket.

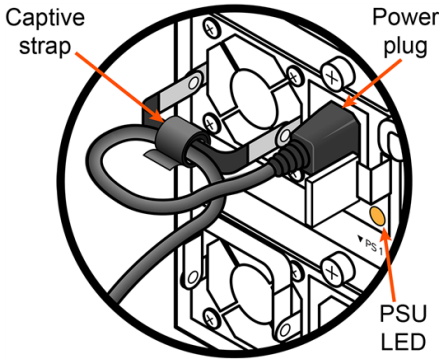

Figure 4-4. Removing the Power Plug

Step 3. Connect the Replacement Power Cord

1. Lower the power supply handle, make a loop in the replacement power cord near the plug, and wrap the captive strap around the loop, securing the cord to the handle. See Figure 4-4.

Securing the captive strap prevents you from accidentally disconnecting power to the array.

2. Connect the replacement power cord to the PSU socket (PS0 or PS1).
3. Connect the replacement power cord to the AC power distribution unit.

To ensure redundancy, connect the replacement power cord to a different AC power distribution unit than the already functional power cord.

Step 4. Verify the Replacement ☎

1. Request that the customer or Pure Storage Technical Support representative use the Purity GUI or CLI to verify the replacement. See Figure 4-5 for an example of GUI indicators and Figure 4-6 for an example of CLI indicators that reflect an operational power supply.
2. Verify that the PSU LED is green. See Figure 4-7.

If the power cord replacement does not resolve the issue, contact Pure Storage Support for assistance. Power supply failure can also be caused by a faulty PSU or PSM.

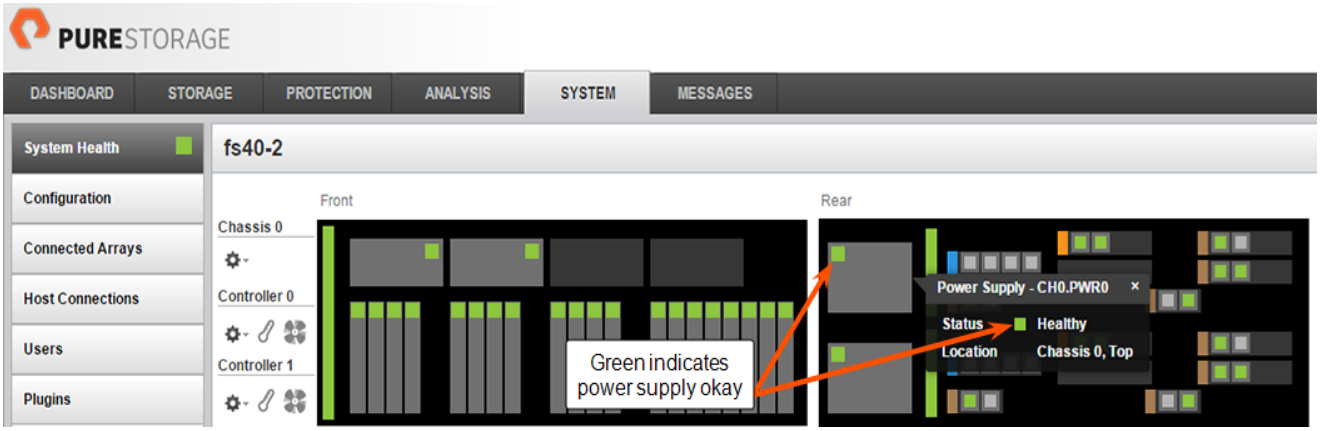

Figure 4-5. GUI Indication of Functional PSU

```
# purehw list --type pwr
Name       Status Identify Slot Index Speed Temperature
CH0.PWR0   ok     -        -    0     -     - ◀
CH0.PWR1   ok     -        -    1     -     -
```

Figure 4-6. CLI Indication of Functional PSU

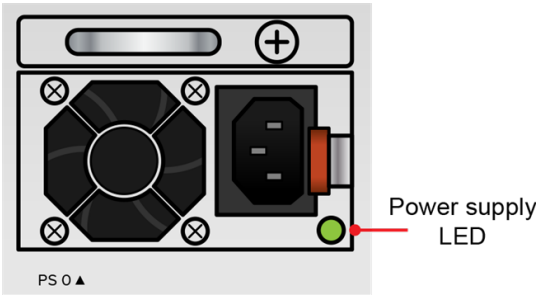

Figure 4-7. Power Supply LED – OK

This completes the power cord replacement procedure.

Procedure 5: Replacing a SAS Cable

Introduction

This section describes replacement of a single FlashArray//M SAS cable that is part of a pair.

SAS Cable Replacement Steps

A ☎ icon indicates you need either login access or assistance from Pure Storage Technical Support.

Tools and Equipment (Provided by Pure Storage)

- Replacement SAS cable (1 meter)
- Labels for replacement cable connectors and for new cable pair
- Two flexible tie wraps for binding new cable pair
- KVM cable (provided in the Accessory Kit that shipped with the FlashArray//M)

Required for Some Procedures (Not Provided by Pure Storage)

A wire cutter and a local console (either a VGA monitor and USB keyboard, or a computer equipped with a serial-to-USB converter and terminal emulation software set to communicate at 115,200 bps, no parity, 8 data bits, and one stop bit).

Return all replaced and unused parts and supplies to Pure Storage.

FlashArray Power During Replacement

You can replace this component while the array is operating; if, however, the customer wants you to power off the array during the procedure, follow the instructions in " Appendix A: Powering a FlashArray//M Off and On" on page 139.

Estimated Time for Replacement: 15 Minutes

Includes all necessary unpacking, replacement, and repacking tasks. Does not include any optional customer-requested operations such as array power off and on.

Video

For a video of this procedure, refer to Replacing a SAS Cable.

Step 1. Observe Failure Symptoms ☎

SAS cables are bound in pairs with tie wraps and sleeves. Use connector labels to match a cable with a corresponding port on a controller or storage shelf.

Request that the customer or Pure Storage Technical Support representative use the GUI or CLI to identify the potentially faulty cable. Symptoms that suggest SAS cable failure are:

- Storage shelf IOM port LEDs are not lit or partially lit. See Figure 5-1.
- SAS port with a status of **disconnected** (see Figure 5-2).
- Two interconnected SAS ports reporting a status of **Disconnected** (see Figure 5-3).
- Two interconnected SAS ports reporting **Ok** status with a speed other than 24 Gb/s.

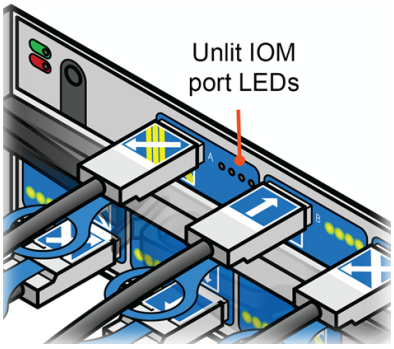

Figure 5-1. Unlit IOM Port LEDs

Figure 5-2. GUI Indication of Possible SAS Cable Failure

```
# purehw list --type sas
Name      Status       Identify Slot Index Speed      Temperature
CT0.SAS0  disconnected -          -    0     0.00 Gb/s  -
CT0.SAS1  ok           -          -    1     0.00 b/s   -
CT0.SAS2  ok           -          -    2     24.00 Gb/s -
     etc.
SH0.SAS1  ok           -          0    1     0.00 b/s   -
SH0.SAS2  ok           -          0    2     24.00 Gb/s -
SH0.SAS3  disconnected -          1    3     0.00 Gb/s  -
```

Figure 5-3. CLI Indication of Possible SAS Cable Failure

Step 2. Prepare Controller for Cable Removal

Before you remove a faulty cable, you must check the I/O balance of the FlashArray//M controllers and make sure that the controller with the faulty cable is the secondary controller in the array.

1. Sign into the FlashArray//M CLI from the controller with the faulty cable attached to it.
2. Enter the following command to make sure both controllers are online and in a ready state:

   ```
   purearray list --controller
   ```

   Sample output:

   ```
   Name  Mode       Model   Version  Status
   CT0   primary    FA-m20  4.7.x    ready
   CT1   secondary  FA-m20  4.7.x    ready
   ```

3. Make sure both controllers are serving I/O by entering the `iobalance` command. For example:

   ```
   iobalance --sampletime 200
   ```

4. If the controller with the faulty cable is the primary controller, enter the following command to perform a manual failover, and make sure that it becomes the secondary controller:

   ```
   puredb run giveback --safe
   ```

   If it is already secondary, the command will report that the controller is not in primary mode and exit.

Step 3. Separate Pair Containing Faulty Cable

1. View the Purity GUI or CLI to identify the ports connected by the faulty cable (see Figure 5-2 and Figure 5-3).
2. Use a wire cutter to cut the flexible tie wrap that binds the SAS cable pair. See Figure 5-4.
3. Remove the braided sleeve around the cables (if present) and save it for later reuse.

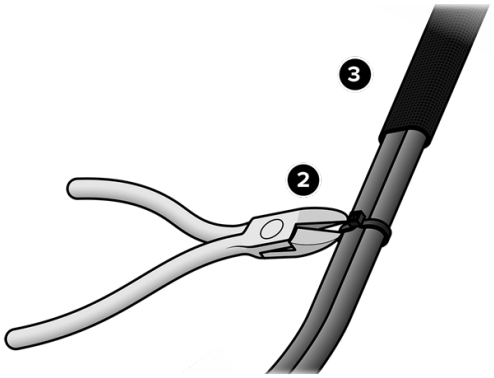

Figure 5-4. Cutting Tie Wrap and Removing Sleeve

Step 4. Disconnect the Faulty Cable

Type MR cable pairs interconnect storage shelves. Other cable pair types connect shelves with controllers.

1. At the storage shelf end of the faulty cable, pull the blue tab on the connector to release the latch. See Figure 5-5.
2. Maintaining tension on the blue tab, pull the connector outward to remove it from the I/O Module (IOM) port socket.

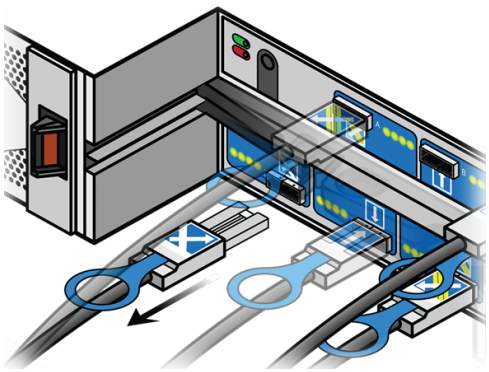

Figure 5-5. Removing a SAS Cable (Storage Shelf)

3. At the controller end of the faulty cable, pull the blue tab on the connector to release the latch. See Figure 5-6.
4. Maintaining tension on the blue tab, pull the connector outward to remove it from the controller port socket.

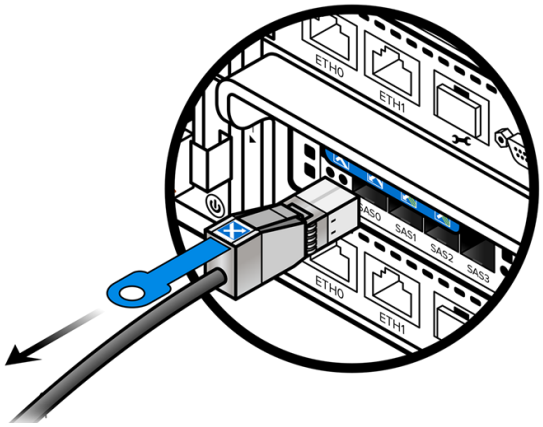

Figure 5-6. Removing a SAS Cable (Controller)

Step 5. Label the Replacement SAS Cable

Attach "arrow" labels from the replacement kit to both surfaces of each connector on the new SAS cable. Apply the label so the white strip is at the bottom, next to the blue tab and cable. See Figure 5-7.

Make sure the labels you attach to the replacement cable match those on the faulty cable.

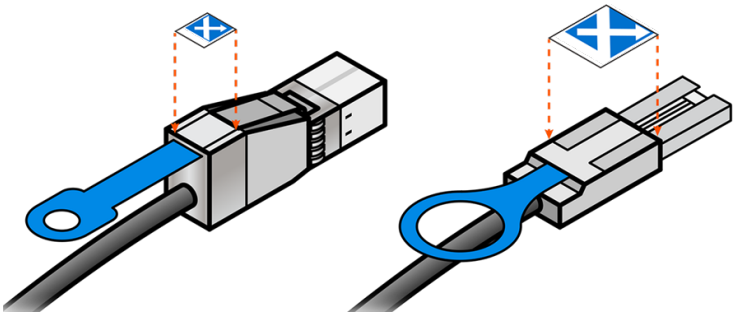

Figure 5-7. Labeling the Replacement Cable

Step 6. Connect the Replacement Cable

Both ends of a cable in a type-MR pair connect to storage shelf IOMs.

After disconnecting the faulty cable, wait at least 30 seconds before connecting the replacement cable.

1. Match the symbol and orientation of the label on the replacement cable with the corresponding label on the controller or IOM port socket.
2. Insert each connector into the corresponding port until the connector latches engage. See Figure 5-8 for a connection to a controller port and Figure 5-9 for an IOM port.
3. Verify that latches have engaged by pulling each cable connector gently until you feel resistance.
4. If you removed a braided sleeve from the faulty cable, wrap it around the middle thirds of the old and new cables.
5. Use flexible tie wraps from the replacement kit to bind the old and new cables into a pair. If a sleeve is used, position the tie wraps near the ends of the sleeve. Trim the tie wrap ends if necessary.
6. If no cable pair label (indicating the cable type BL, TR, etc.) is attached to the cable pair, attach a label indicating the pair type near one of the tie wraps.

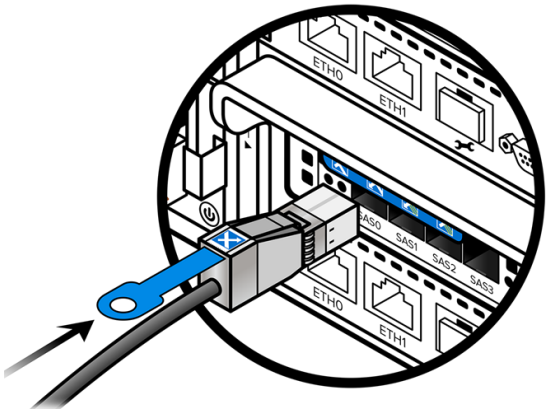

Figure 5-8. Connecting a SAS Cable to a Controller Port

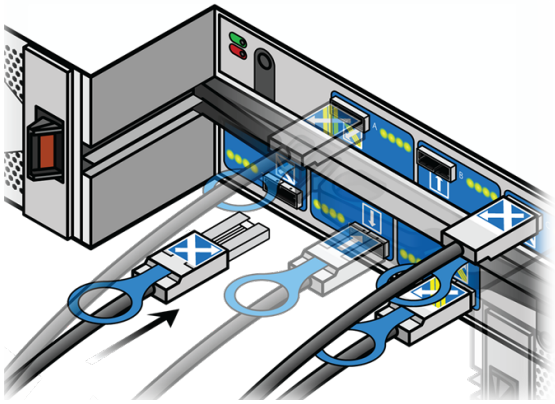

Figure 5-9. Connecting a SAS Cable to an IOM Port

Step 7. Verify the Replacement ☎

If the array was powered off for SAS cable replacement, follow the instructions in " Appendix A: Powering a FlashArray//M Off and On" on page 139 to power it on.

1. Check the LEDs on the controller and IOM ports. Controller port LEDs should illuminate green. On IOM ports, all four LEDs should illuminate green, and might blink if there is activity.
2. Request that the customer or a Pure Storage Technical Support representative use the GUI or CLI to verify that the entire SAS path is functioning. See Figure 5-10 for an example of GUI indicators and Figure 5-11 for an example of CLI indicators that reflect functioning SAS paths.

Allow about 30 seconds after replacing a SAS cable in a live array for display status to update.

If the GUI and CLI do not indicate a functioning SAS path, recheck all replacement steps before contacting Pure Storage Technical Support for further assistance.

3. Enter the following commands to check the SAS connections:

   ```
   sas_view.py config
   ```

   ```
   sas_view.py enclosures
   ```

   If the SAS cables are connected correctly, these commands return the following response:

   ```
   No errors detected.
   ```

   If errors are detected, the commands return a list of the affected SAS cables and the reason for the errors. Contact Pure Storage Technical Support for additional assistance.
4. Return the faulty cable to Pure Storage.

If the SAS cable replacement does not resolve the issue, contact Pure Storage Technical Support for assistance. SAS connection failure can also be caused by a faulty quad-port SAS card.

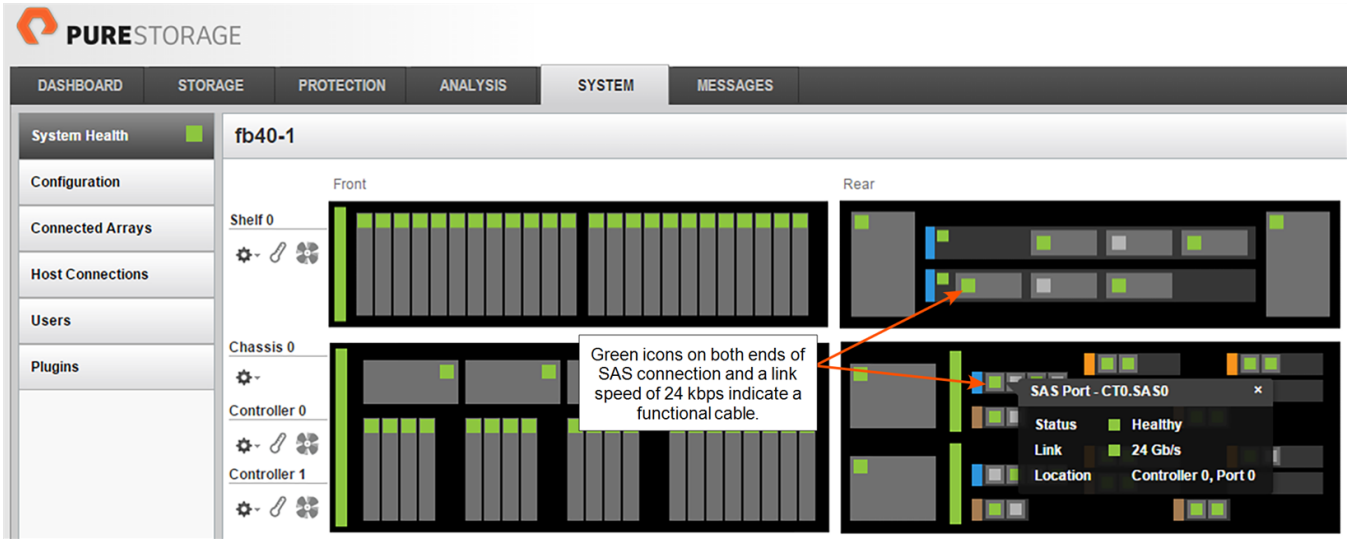

Figure 5-10. GUI Indication of Functional SAS Cable

Step 7. Verify the Replacement (Cont'd) ☎

```
# purehw list --type sas
Name       Status        Identify Slot Index Speed       Temperature
CT0.SAS0   ok            -          -    0     24.00 Gb/s  - ◄
CT0.SAS1   ok            -          -    1     0.00 b/s    -
CT0.SAS2   ok            -          -    2     24.00 Gb/s  -
                 etc.
SH0.SAS0   ok            -          0    0     24.00 Gb/s  -
SH0.SAS1   ok            -          0    1     0.00 b/s    -
SH0.SAS2   ok            -          0    2     24.00 Gb/s  -
SH0.SAS3   ok            -          1    3     24.00 Gb/s  - ◄
```

Figure 5-11. CLI Indication of Functional SAS Cable

This completes the SAS cable replacement procedure.

Procedure 6: Replacing an Optical Transceiver

Introduction

This section describes replacement of an optical transceiver on a FlashArray//M.

Optical Transceiver Replacement Steps

A ☎ icon indicates you need either login access or assistance from Pure Storage Technical Support.

Tools and Equipment (Provided by Pure Storage)

- One SFP or SFP+ optical transceiver. Transceiver type depends on link speed. Verify that the transceiver is the correct type for the Fibre Channel or 10-GbE host interface.
- KVM cable (provided in the Accessory Kit that shipped with the FlashArray//M).

Required for Some Procedures (Not Provided by Pure Storage)

- A local console (either a VGA monitor and USB keyboard, or a computer equipped with a serial-to-USB converter and terminal emulation software set to communicate at 115,200 bps, no parity, 8 data bits, and one stop bit)
- Incidental tools (e.g., pliers, flathead screwdriver)

Return all replaced and unused parts and supplies to Pure Storage.

FlashArray Power During Replacement

You can replace this component while the array is operating; if, however, the customer wants you to power off the array during the procedure, follow the instructions in " Appendix A: Powering a FlashArray//M Off and On" on page 139.

Estimated Time for Replacement: 15 Minutes

Includes all necessary unpacking, replacement, and repacking tasks. Does not include any optional customer-requested operations such as array power off and on.

Video

For a video of this procedure, refer to Replacing an Optical Transceiver.

Step 1. Observe Failure Symptoms ☎

Failure of an optical transceiver interrupts FlashArray communication with a Fibre-Channel or optical 10-GbE switch. Copper 10-GbE connections do not utilize transceivers. The software cannot distinguish between transceiver failures and other causes of communication interruption, such as broken cables and switch port faults.

The Purity GUI and CLI display hardware-related interruptions in host communication as disconnected ports (see Figure 6-1 and Figure 6-2). Assistance from Pure Storage Technical Support might be required to isolate the root cause of a port reporting disconnected or failed status to an optical transceiver.

Request that the customer or Pure Storage Technical Support representative use the GUI or CLI to identify the optical transceiver failure. A status of **`disconnected`** in the GUI (Select **System** > **System Health**), or of **`failed`** in the response to the **`purehw list --type fc`** (or **`--type eth`**) CLI command suggests possible optical transceiver failure.

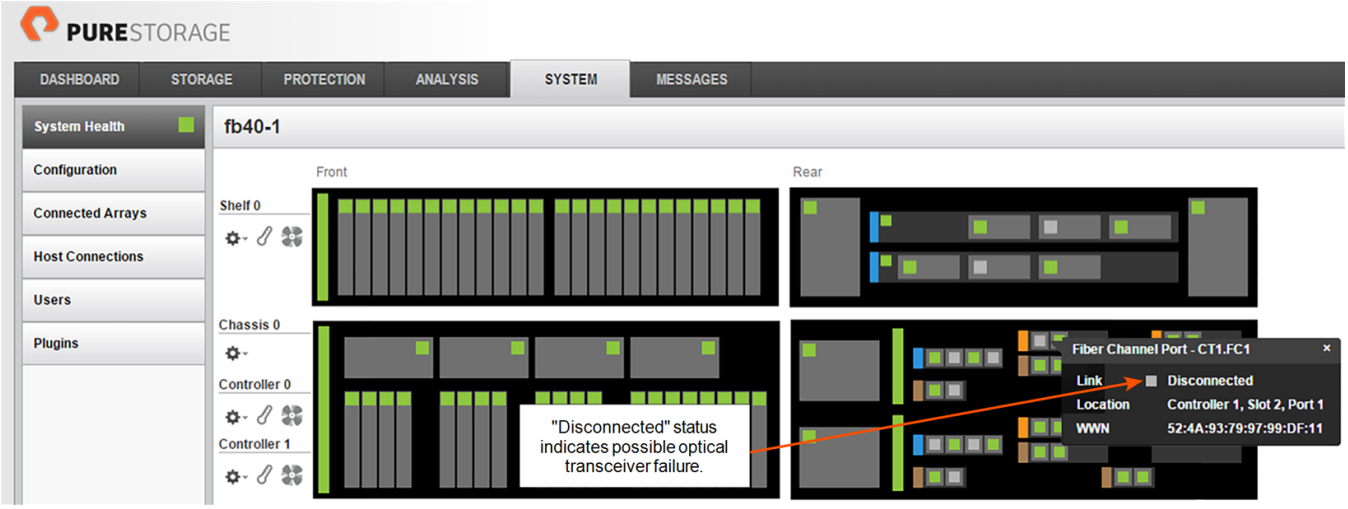

Figure 6-1. GUI Indication of Possible Optical Transceiver Failure

```
pureuser>purehw list --type fc
Name      Status        Identify  Slot  Index  Speed      Temperature
CT0.FC0   ok            -         2     0      8.00Gbps   -
CT0.FC1   ok            -         2     1      0.00bps    -
CT0.FC2   disconnected  -         0     0      0.00Gbps   - ◄
CT0.FC3   ok            -         0     1      8.00Gbps   -
     etc.
CT0.FC4   ok            -         1     1      8.00Gbps   -
CT0.FC5   ok            -         1     1      8.00Gbps   -
```

Figure 6-2. CLI Indication of Possible Optical Transceiver Failure

Step 2. Remove the Faulty Optical Transceiver

⚠ Disconnected Fibre Channel connectors might emit invisible laser radiation. Do not look directly into connectors.

1. Disconnect the Fibre Channel cable from the faulty optical transceiver.
2. Remove the faulty optical transceiver from the PCIe card port. See Figure 6-3.

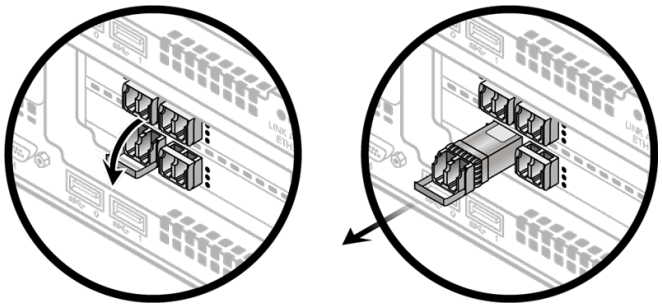

Figure 6-3. Removing Optical Transceivers

Step 3. Protect Optical Cable Tips

Install two protective caps on each optical cable connector as shown in Figure 6-4.

Pure Storage does not supply host cables or protective caps. Ethernet connectors do not use protective caps.

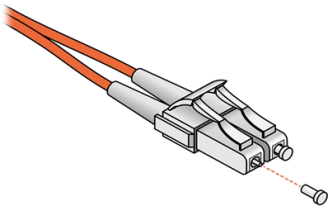

Figure 6-4. Protecting Optical Cable Tips

Step 4. Install the Replacement Optical Transceiver

1. Insert the optical transceiver into the port. See Figure 6-5.

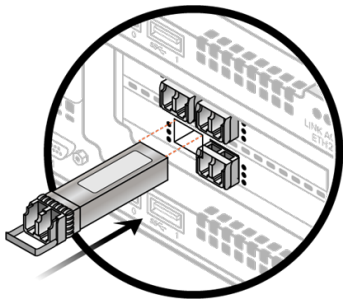

Figure 6-5. Inserting an Optical Transceiver

2. Close the optical transceiver latch to secure it in the port. See Figure 6-6.

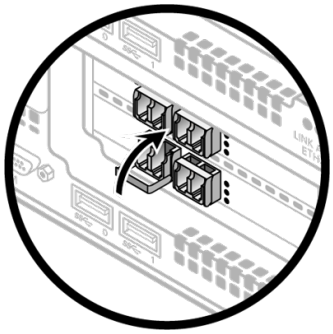

Figure 6-6. Closing the Latch

Step 5. Clean Optical Cable Tips

1. Remove the protective caps installed in Step 3 on page 10 from the optical cable connectors.
2. Use a cleaner approved by the cable manufacturer to clean the connector tips.
3. Pure Storage recommends “dry” optical connector cleaning systems.

Step 6. Connect Optical Cable to New Transceiver

1. Insert the optical cable connector into the transceiver so that the latch engages. See Figure 6-7.
2. Verify that the connector latch is engaged by pulling the cable gently until you feel resistance.

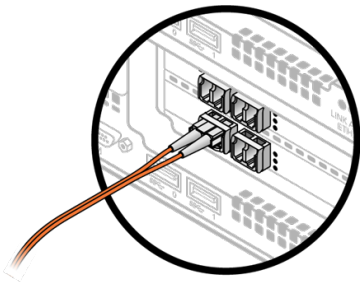

Figure 6-7. Connecting the Cable

Step 7. Verify the Replacement ☎

1. Request that the customer or Pure Storage Technical Support representative use the Purity GUI or CLI to verify the replacement. See Figure 6-8 for an example of GUI indicators and Figure 6-9 for an example of CLI indicators that reflect an operational power supply.
2. If the optical transceiver replacement does not resolve the issue, contact Pure Storage Support for further assistance.

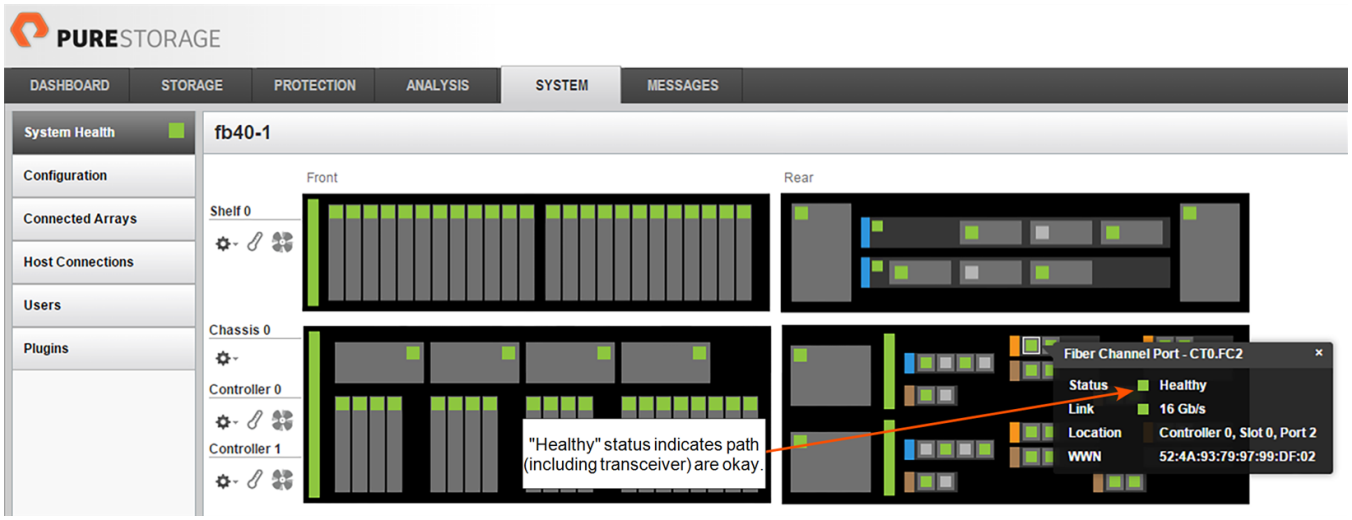

Figure 6-8. GUI Indication of a Functional Optical Transceiver

```
pureuser>purehw list --type fc
Name      Status  Identify  Slot  Index  Speed      Temperature
CT0.FC0   ok      -         2     0      8.00Gbps   -
CT0.FC1   ok      -         2     1      0.00bps    -
CT0.FC2   ok      -         0     0      8.00Gbps   - ◄
CT0.FC3   ok      -         0     1      8.00Gbps   -
CT0.FC4   ok      -         1     1      8.00Gbps   -
CT0.FC5   ok      -         1     1      8.00Gbps   -
CT0.FC0   ok      -         2     0      8.00Gbps   -
CT0.FC1   ok      -         2     1      0.00bps    -
CT0.FC2   ok      -         0     0      8.00Gbps   -
CT0.FC3   ok      -         0     1      8.00Gbps   -
CT0.FC4   ok      -         1     1      8.00Gbps   -
CT0.FC5   ok      -         1     1      8.00Gbps   -
```

Figure 6-9. CLI Indication of a Functional Optical Transceiver

This completes the optical transceiver replacement procedure.

Procedure 7: Replacing a Controller

Introduction

This chapter describes how to replace a FlashArray//M controller.

Arrange for Pure Storage Technical Support to prepare the array for controller replacement within 48 hours before the procedure.

Before you power off a controller in a dual-controller array for live replacement, make sure that either the customer or Pure Storage Technical Support has verified that the backup controller has the required host connections. Enter the `pureport list --initiator` CLI command to display the WWNs and IQNs of hosts that are visible to a controller.

Controller Replacement Steps

Introduction (Cont'd)

A ☎ icon indicates you need either login access or assistance from Pure Storage Technical Support.

Required Tools and Equipment (Provided by Pure Storage)

- FlashArray//M controller (see "Observe Failure Symptoms " on page 51 for package contents)
- KVM cable (provided in the Accessory Kit that shipped with the FlashArray//M)

Recommended Tools (Not Provided by Pure Storage)

- Anti-static work area large enough for the equipment, with electrical power available.
- ESD protection (e.g., wrist strap) for use while swapping PCIe cards.
- A local console (either a VGA monitor and USB keyboard, or a computer equipped with a serial-to-USB converter and terminal emulation software set to communicate at 115,200 bps, no parity, 8 data bits, and one stop bit).
- Incidental tools (e.g., pliers, Phillips screwdriver).

Return all replaced and unused parts to Pure Storage.

Connecting a Terminal

When instructed to connect a KVM cable to a terminal, use either a VGA monitor and USB keyboard combination or a computer equipped with a serial-to-USB converter set to 115,200 bps, N,8,1, and terminal emulation software.

FlashArray Power During Procedure

If you are installing or replacing a controller on an operating FlashArray//M system, you can perform this procedure while the FlashArray is operating; however, host connectivity might be affected. Pure Storage recommends that you perform all hot replacements during less-critical times when I/O activity to the FlashArray is low.

FlashArrays continue to operate during controller replacement by failing over to the second controller.

If a customer requires you to completely power the FlashArray off during the procedure, follow the instructions in " Appendix A: Powering a FlashArray//M Off and On" on page 139.

Estimated Time for Replacement: 90 Minutes

This includes all unpacking, repair, and repacking tasks. This does not include any optional customer-requested operations such as powering the FlashArray//M off and on.

Video

For a video of this procedure, refer to Replacing a Controller.

Step 1. Observe Failure Symptoms ☎

Request that the customer or Pure Storage Technical Support representative use the GUI or CLI to verify a controller failure. Do the following to determine if a controller has failed:

- In the GUI, select **SYSTEM > System Health**. Red rectangles on the controller icon and in the corresponding pop-up indicate controller failure (see Figure 7-1).
- Enter the **`purehw list --type ct`** CLI command (see Figure 7-2). A response of **`error`**, **`critical`**, **`failed`**, or **`not installed`** on either controller indicates a failure.

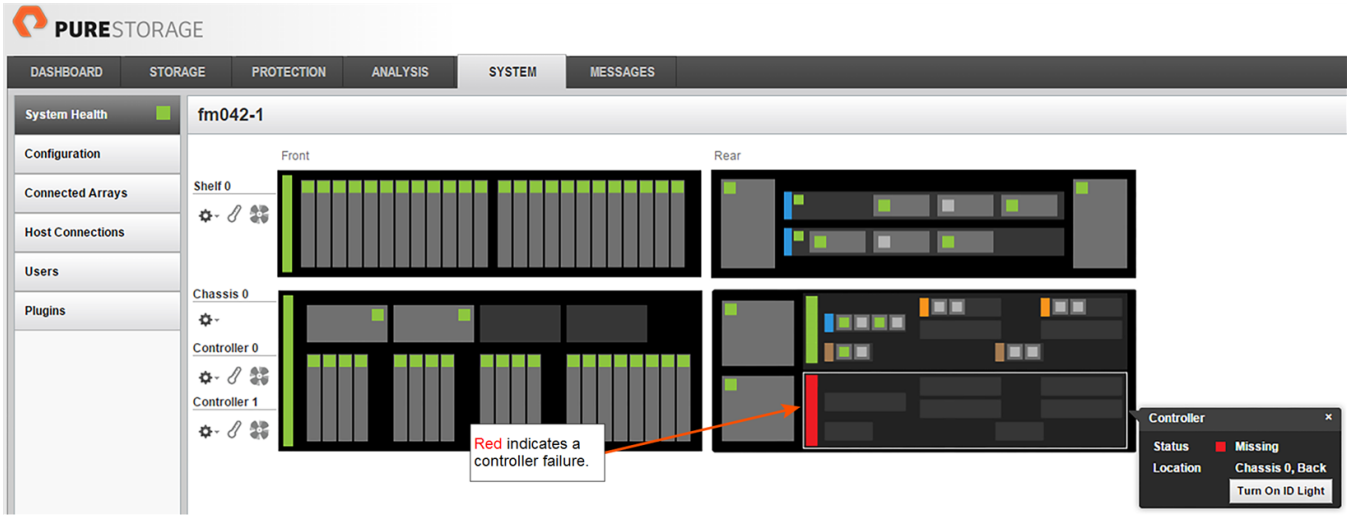

Figure 7-1. GUI Display Showing Failed Controller

```
pureuser> purehw list --type ct
Name  Status  Identify  Slot  Index  Speed  Temperature  Details
CT0   ok      off       -     0      -      -            -
Error on CT1: No such element exists.
```

Figure 7-2. CLI Display Showing Failed Controller

Step 2. Before You Begin

At least 48 hours before you begin, contact Pure Storage Support so they can make sure the array is ready for the procedure. See the *FlashArray//M Service Guide* page on the Pure1 Knowledge site for more information.

Step 3. Prepare Array for Replacement

1. Perform health checks as described in Doing a Health Check on a Pure Array.
2. Connect a terminal to the working controller and determine which controller is primary by entering the following command:

   puredb list mode

The following memory-check steps are necessary only for Purity versions earlier than 4.0.7. If the Purity version is 4.0.7 or later, skip to step 7.

3. If the controller you are replacing is secondary, make sure you have enough memory to facilitate taking the secondary controller offline by performing the following steps. If the controller you are replacing is the primary, skip to step 7.
4. Enter the following command:

   puredb list memory

   Example text:

```
$ puredb list memory
Foed Vsize Cap Bytes   Shm Bytes Logical    Cached Vsize Cap Bytes
217213275341            146028888064         190676415283
```

5. Enter the following command:

   zgrep vsize /var/log/purity/core.log

   Example command output:

```
Jun 13 18:19:42.706 7F28D27F9700 I      shmem.res 198.347GB total vsize
```

6. Take the **Foed Vsize Cap Bytes** from step 4 and the total vsize from step 5 to calculate the following equation:

   (Foed Vsize Cap Bytes / (1024^3) - total vsize)

   The answer is presented in GB.

   Example:

   (217213275341/(1024^3) - 198.347) = 3.94862683124

   So, in this example there is less than 5 GB of memory remaining.

   Alternatively, you can enter the following command to check in one line:

   echo `puredb list memory | awk '$1 < 2^99 {$1=$1/1024^3; print $1}'` - `zgrep vsize /var/log/purity/core.log | tail -1 | awk '{print $7}' | sed 's/GB//'` | bc -l

   If memory usage is <= 10 GB, enter the **puredb run giveback** command on the primary controller and proceed with the upgrade.

   If memory usage is <= 5 GB, enter the **puredb run giveback** command, proceed with the upgrade, and update ES-3473* that this array had less than 5 GB memory.

Partners only: If you see an array <= 5 GB in memory usage, notify Pure Storage Technical Support so they can set up an internal case for you.

Step 3. Prepare Array for Replacement (Cont'd)

7. Note the tunables set on the array by entering the following command:

   `puretune --list`

   You must set these again during the upgrade.

   For example:

```
rootuser:~# puretune --list
Consistently set tunables:
PS_EXAMPLE_TUNABLE : 0 (ES-9999)
PS_EXAMPLE_TUNABLE_AGAIN : 7 (ES-9999)
```

If Windows File Server (WFS) is enabled, refer to How to Move a File Server Role Between Two WFS VMs and contact [[[Undefined variable Variables.PureStorageTechSupport]]] before continuing. To check if WFS is running, run the command: **`pureapp list`**

Step 4. Turn On the ID Light

From the Purity CLI, enter the **`purehw setattr --identify`** command (**CT0** shown in the example):

```
pureuser> purehw setattr --identify on CT0
Name  Slot  Index  Identify
CT0   -     0      on
```

Turning on the identify LED helps you to replace the correct controller.

Alternatively, from the Purity GUI, select **System**, mouse over the faulty controller, and select the **Turn on ID Light** button.

Step 5. Set Alert Tags

1. Set an alert tag to notify users of expected failures. This should prevent people from filing unnecessary support cases. See How to suppress alerts for upgrades and maintenance activities for instructions.
2. Enter the following command to make sure the controller you are replacing is secondary:

   `puredb run giveback --safe`

Step 6. Unpack the Replacement Controller

Before you unpack a controller, inspect shipping cartons for external damage. If damage is present, photograph it and contact Pure Storage Technical Support before proceeding.

1. Verify that the controller package contains the items displayed in Figure 7-3.

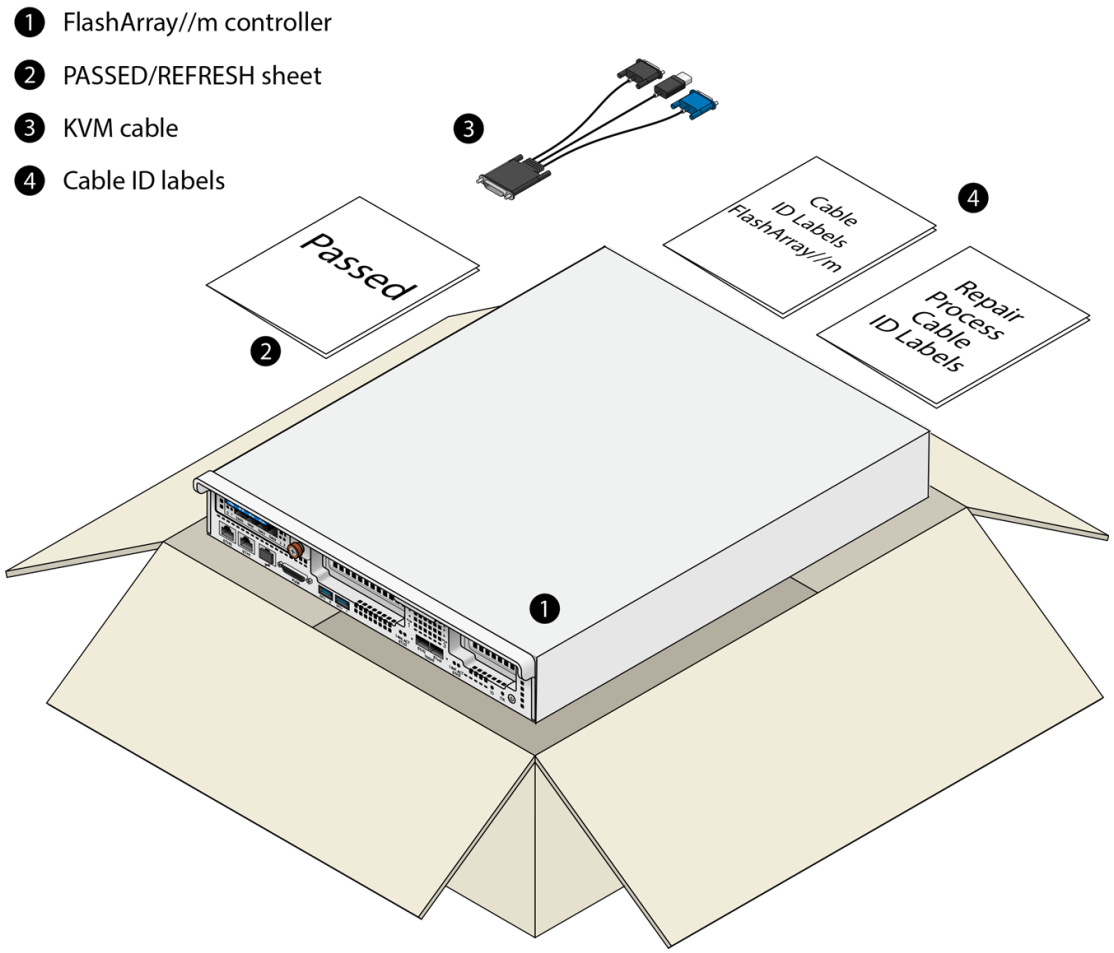

Figure 7-3. FlashArray//M Replacement Controller Package

2. Remove the packing material and move the controller and other package contents to a convenient working surface.

FlashArray//M replacement controllers do not include power cables, SAS cables, 1-GbE cables, or cabling for host and replication ports.

After you replace the controller, use the replacement controller shipping carton and packing material to pack the old controller for return to Pure Storage.

Disconnecting Cables

FlashArray//M Controller Ports

Disconnect the host, Ethernet, and FC cables (ETH0-ETH9 or FC0-FC9) and any other cables (e.g., KVM, USB) that are connected to the old controller ports (see Figure 7-4), as described in the following sections.

Do not refer to any port numbering stamped on add-on cards such as Fibre Channel cards. Refer to the logical port numbering shown below, which matches the GUI numbering.

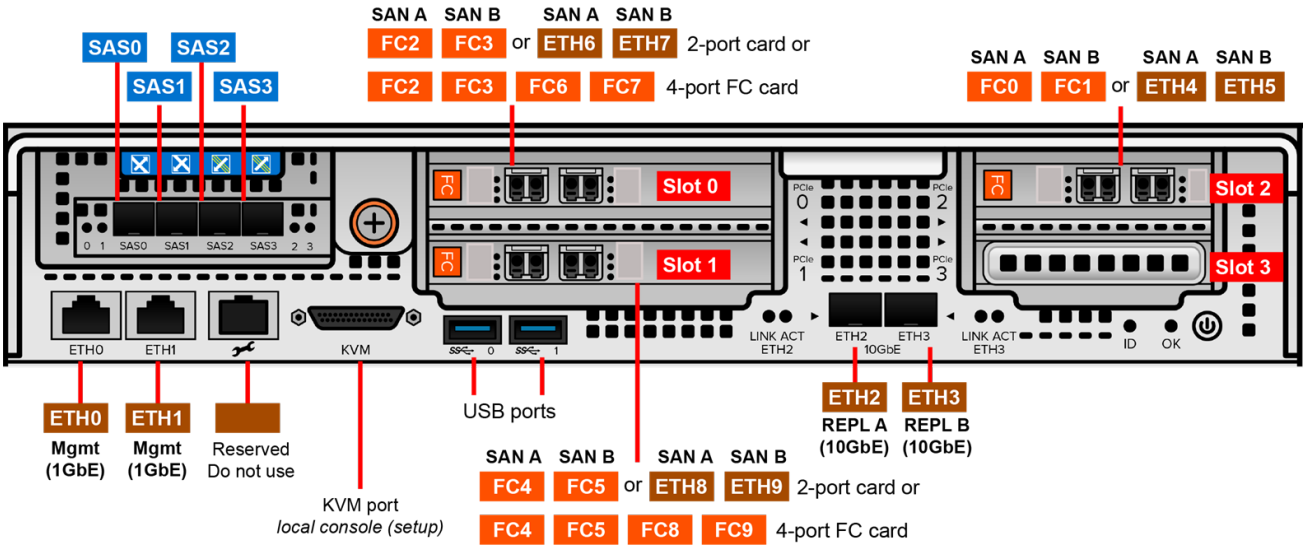

Figure 7-4. FlashArray//M Controller Ports (2-Port PCIe Cards Shown)

Step 7. Disconnect Host Cables

See Figure 7-5 and do the following for each host cable (Fibre Channel shown):

1. Attach a temporary label (included in the replacement kit) to each cable you disconnect, to indicate the number and type of the corresponding port (e.g., FC0).
2. Squeeze the connector latch to release the connector.
3. Pull the connector to remove the cable from the optical transceiver.

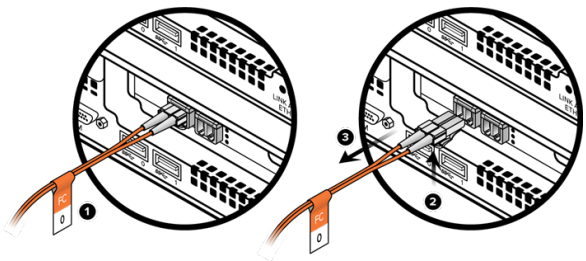

Figure 7-5. Disconnecting a Host Cable (Fibre Channel Shown)

Step 8. Protect Optical Cable Tips

Install two protective caps on each optical cable connector as shown in Figure 7-6.

Pure Storage does not supply host cables or protective caps. Ethernet connectors do not use protective caps.

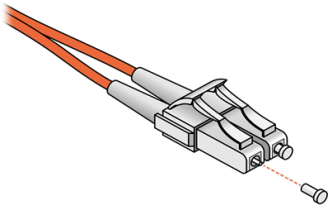

Figure 7-6. Protecting Optical Cable Tips

Step 9. Disconnect SAS Cables

SAS cables are only present on a controller if it is connected to one or more add-on shelves. If the system does not include add-on shelves, skip this step.

For each connected SAS port

1. Attach a temporary label (included in your replacement controller package) to each SAS cable you disconnect (SAS0 through SAS3), to indicate the number and type of the corresponding port. See Figure 7-7.

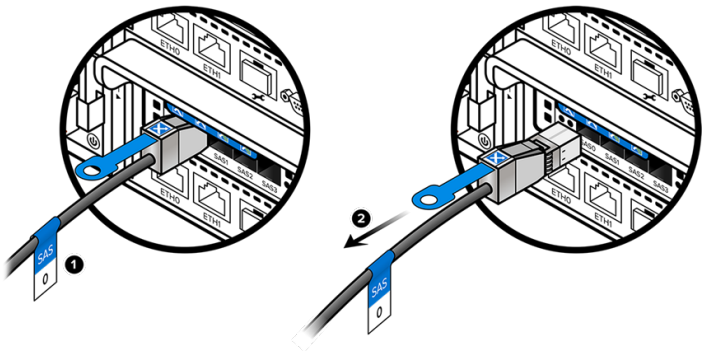

Figure 7-7. Disconnecting a SAS Cable

2. For each connector, pull the plastic tab to disengage the latch. Maintain pressure on the tab and disconnect the connector from the port.
3. Do not disconnect the other end of each SAS cable.

Be careful when labeling SAS cables. If you install SAS cables incorrectly on the replacement controller, the FlashArray//M might not operate at full performance.

Step 10. Disconnect 1-GbE Cables

1. Attach a temporary label to the 1-GbE cables in port ETH0 and ETH1. See Figure 7-8.
2. Press the cable latch to release the connector and pull the cable from the socket.

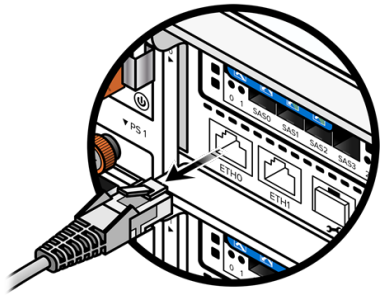

Figure 7-8. Disconnecting 1-GbE Cables

Step 11. Remove the Controller

Do not remove the power cords. The power cords supply power to the entire system and are independent of the controllers.

1. Loosen the orange captive screw on the rear panel of the controller. See Figure 7-9.

Use a Phillips screwdriver to loosen the screw if necessary.

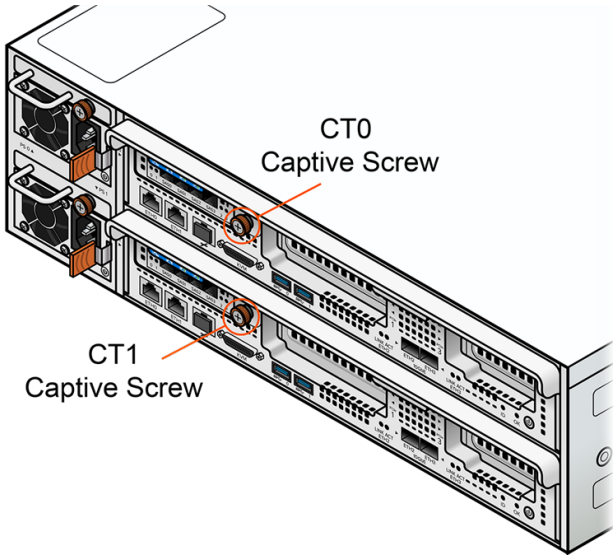

Figure 7-9. Loosening the Captive Screw

2. Rotate the controller retaining bar downward and pull the controller from the chassis. See Figure 7-10.

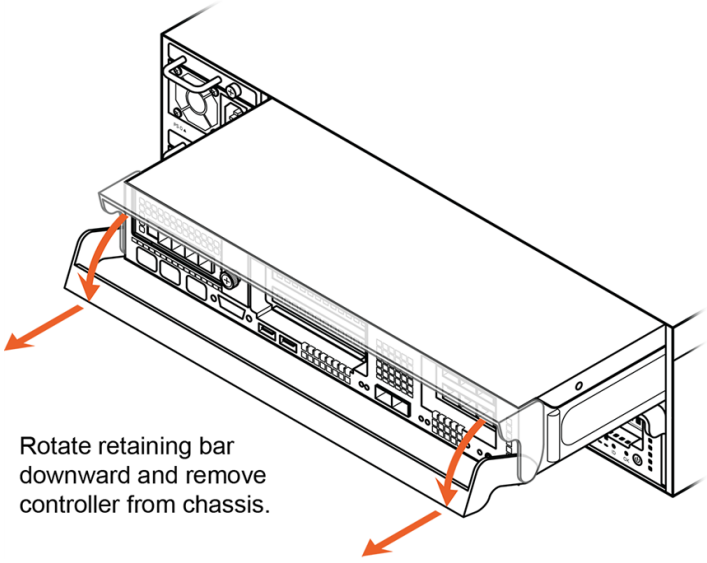

Figure 7-10. Removing the Controller

Step 12. Remove and Install PCIe Cards

FlashArray//M replacement controllers do not have PCIe cards installed in PCIe slots 0-3. You must remove cards from the old controller and install them in the new one. See "Replacing PCIe Cards" on page 118 for the installation procedure.

Step 13. Install the Replacement Controller

1. Align the replacement controller with the controller slot. See Figure 7-11.
2. Keeping the retaining bar in the unlocked position, slide the controller into the slot until the controller panel is flush with the FlashArray//M rear panel.
3. Slide the retaining bar upward until it latches into place.
4. Tighten the controller captive screw.

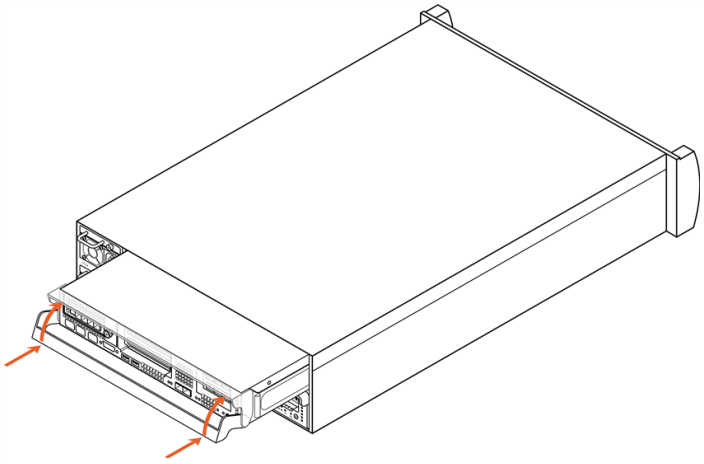

Figure 7-11. Installing a Controller

Step 14. Connect SAS Cables

For each SAS cable you removed

1. Insert the SAS cable connector into the controller port designated by the temporary label attached to the cable.
2. Verify that the label on the connector matches the label of the port (see Figure 7-12).

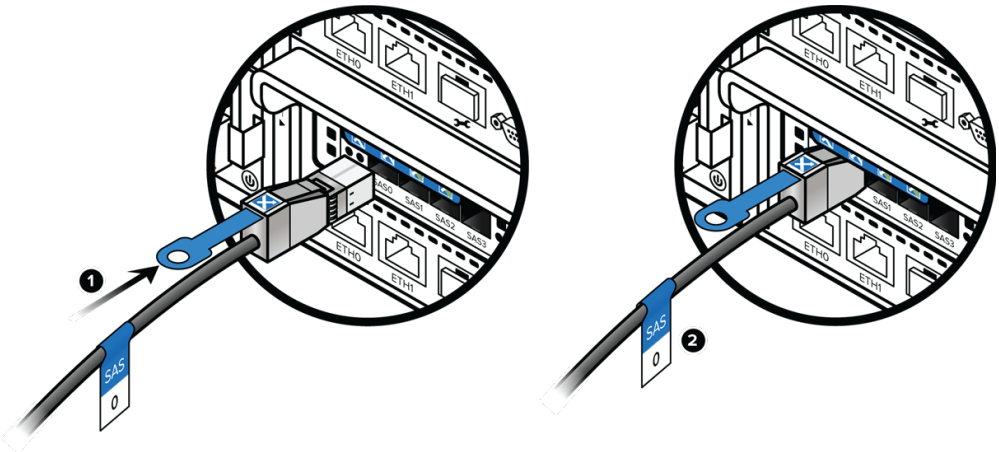

Figure 7-12. Connecting SAS Cables

3. Verify that the connector latch has engaged by pulling the cable gently until resistance is felt.

Do not remove temporary labels until the procedure is complete and you have tested both host I/O and CLI and GUI functionality. After testing, remove all temporary labels.

Step 15. Connect 1-GbE Cables

1. Connect the 1GbE management cable to the **ETH0** port on the controller. See Figure 7-13.
2. Verify that the connector latch is engaged by pulling the cable gently until you feel resistance.
3. Connect the 1GbE management cable to the **ETH1** port on the controller (if a cable was present) and verify it as well.

Do not remove temporary labels until the procedure is complete and you have tested both host I/O and CLI and GUI functionality. After testing, remove all temporary labels.

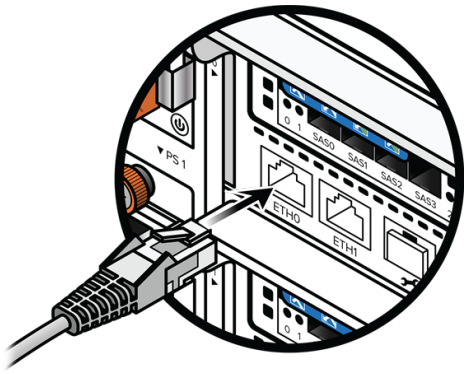

Figure 7-13. Connecting 1-GbE Cables

Step 16. Connect Host and Replication Cables

For each host and replication cable:

1. Make sure that the temporary label on the cable matches the port number.
2. Push the connector into the transceiver (optical) or port socket (10-GbE copper). See Figure 7-14.
3. Verify that the connector latch is engaged by pulling the cable gently until you feel resistance.

Do not remove temporary labels until the procedure is complete and you have tested both host I/O and CLI and GUI functionality. After testing, remove all temporary labels.

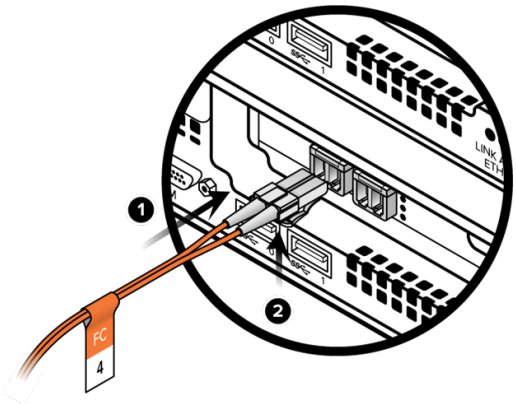

Figure 7-14. Connecting a Host Cable (FC Shown)

Step 17. Initializing the New Controller ☎

If you powered the FlashArray//M off before performing the controller replacement procedure, see " Appendix A: Powering a FlashArray//M Off and On" on page 139 before continuing to the next step.

Both FlashArray//M controllers must run the same customer-selected Purity version. If the versions do not match, change the version of Purity on the new controller to that of the working controller.

Step 17. Initializing the New Controller (Cont'd) ☎

Restart Chastity

If the customer is running a Purity version earlier than 5.3.x, you must restart the Chastity service. If the customer is running Purity 5.3.x or above, skip this step this section and proceed to "Tunable Check," below.

For more detailed information about when a Chastity restart is required, see the article, *Mastership and Chastity Service Overview*.

1. Connect a terminal (or SSH) to the controller you did not replace (i.e., If you replaced **CT0**, connect to **CT1**).
2. Enter the following command:

   `service chastity restart`

   Example output (process ID will vary):

```
# service chastity restart
chastity stop/waiting
chastity start/running, process 34232
```

On the Working Controller

1. Use the KVM cable to connect a local console to the working controller using the KVM port.
2. Open a Purity CLI session on the working controller and enter the following command to determine the Purity version.

   `purearray list --controller`

Alternatively, you can open a GUI session and look for the version number displayed in the bottom right-hand corner of any page.

3. Determine the model of the controller you are replacing by entering the following command:

   `hwconfig --model`

On the New Controller

1. Connect the KVM cable to the KVM port on the new controller, and open a Purity CLI session.
2. Determine the Purity version of the replacement controller by entering the **`pureversion -a`** command.
3. If the Purity version on the replacement controller is already the required version, skip to step 5.
4. If the Purity version on the replacement controller is not the required version, follow the procedure described in the Purity Upgrade topic at support.purestorage.com.

   Install the correct version of Purity on the new controller.

Step 17. Initializing the New Controller (Cont'd) ☎

5. Enter the following command to setup and start Purity:

   puresetup replace --from-controller=*controller model (from the working controller)*

   This command does the following:

   - Checks SAS connections
   - Synchronizes the GUI database
   - Prompts you to set the timezone
   - Starts Purity

The controller reboots after a time zone change.

After the new controller is initialized, it becomes the secondary controller in the array.

6. Enter the following command to make sure both controllers are online and in a ready state:

   purearray list --controller

   Sample output:

```
Name  Mode       Model   Version  Status
CT0   secondary  FA-m70  4.5.x    ready
CT1   primary    FA-m70  4.5.x    ready
```

Step 18. Check Tunables and Apps (if Present) ☎

1. Make sure that any applicable tunables (from the pre-upgrade list) are added back onto the controller. Refer to "Updating and Managing Tunable Recommendations" to ensure compliance with version-specific guidelines.
2. Reboot the controller by entering the following command:

   pureboot reboot --secondary

3. Perform the procedures in the following Support articles if Active Cluster and Purity Run are configured.

Refer to Confirm ActiveCluster Network Connections.

Refer to Confirm Purity Apps are Running after Controller Replacement.

Connecting to the Controller Using the Network

You can connect to the controller using the network instead of the recommended serial port. Since you have not yet connected to the network on the replacement controller, use the dedicated Ethernet interface that connects the FlashArray//M controllers. This process uses the Dynamic Root Process.

1. Sign into the network on the functioning controller (the one you did not replace).
2. Discover the address of the replacement controller by entering the following CLI command:

   ```
   ip neighbor | grep haeth0
   ```
3. Sign in using SSH by entering:

   ```
   ssh -l pureeng %haeth0
   ```

   Use the controller address obtained in step 2. There should be no space between the address and `%haeth0`.
4. Select option 2, Authenticate via command line.
5. In the CLI, enter the generate command to generate a challenge.
6. Copy the challenge key.
7. Contact Pure Storage Technical Support so they can sign into the challenge signer and get the challenge key.
8. Paste the challenge key in the dialog box and select Submit.
9. In the CLI, enter the verify command along with the challenge key to authenticate.

Step 19. Verify the Replacement ☎

If you have any difficulty connecting to the replacement controller using SSH, refer to "Unable to SSH to peer after controller replacement" for assistance.

1. From the console, verify that the status of the replacement controller is online by entering the `purearray list --controller` CLI command, or by viewing the GUI **SYSTEM** tab.
2. Generate I/O to the replacement controller from all previously connected hosts. Testing should ensure that all previously connected hosts can successfully perform I/O to the replacement controller, and that the replacement controller functions properly in both primary and secondary roles. If any host I/O fails, contact Pure Storage Technical Support for assistance before you proceed.
3. Enter the following commands to check the SAS connections:

   ```
   sas_view.py config
   ```

   ```
   sas_view.py enclosures
   ```

   If the SAS cables are connected correctly, these commands return the following response:

   ```
   No errors detected.
   ```

   If errors are detected, the commands return a list of the affected SAS cables and the reason for the errors. Contact Pure Storage Technical Support for additional assistance.

Step 19. Verify the Replacement (Cont'd) ☎

4. Verify that the Purity GUI or CLI (see Figure 7-15 and Figure 7-16, respectively) show healthy controller status.

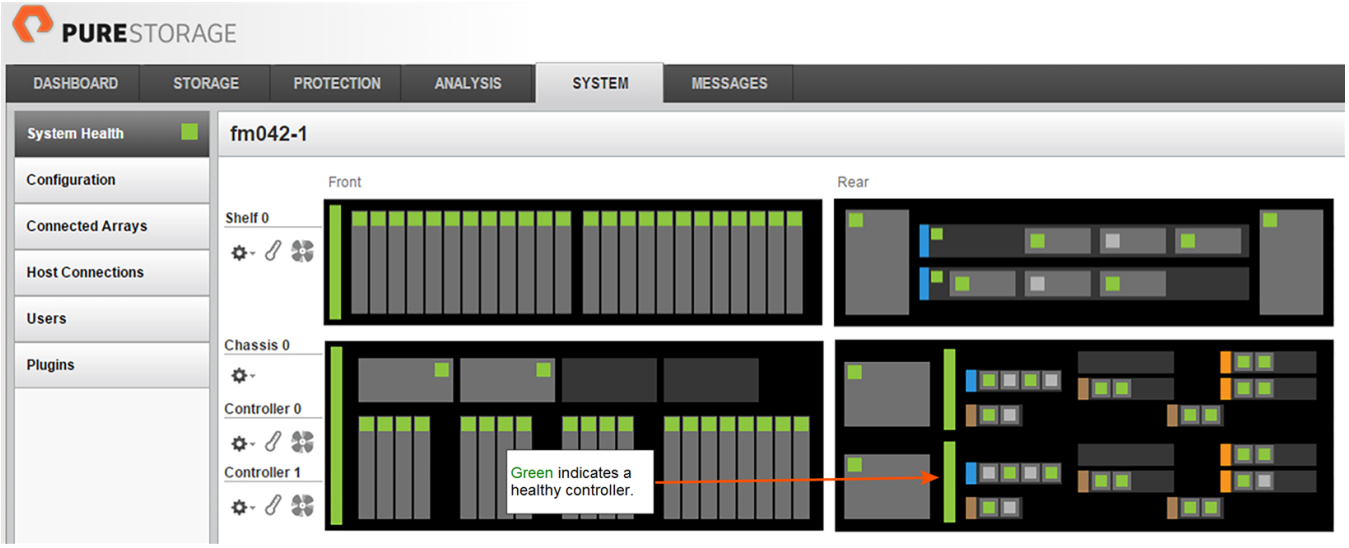

Figure 7-15. GUI Display Showing Healthy Controller

```
pureuser> purehw list --type ct
Name  Status  Identify  Slot  Index  Speed  Temperature  Details
CT0   ok      off       -     0      -      -            -
CT1   ok      off       -     1      -      -            - ◀
```

Figure 7-16. CLI Display Showing Healthy Controller

5. After testing is complete to the customer's satisfaction, remove all temporary labels attached during this procedure.
6. Disconnect the local console.
7. Use the replacement controller packing material to pack the old controller and any other unused equipment for return to Pure Storage.
8. Confirm the health of the array by performing the health checks described in Doing a Health Check on a Pure Array.
9. Contact Pure Storage Support and have them confirm that the array is operating properly before you proceed.
10. Remove the alert tags that you set in "Set Alert Tags" on page 53. Refer to How to suppress alerts for upgrades and maintenance activities for more information.
11. Return the faulty controller to Pure Storage.

This completes the controller replacement procedure.

Procedure 8: Replacing an NVRAM Module

Introduction

This section describes the replacement of a FlashArray//M NVRAM module. When an NVRAM module fails, you must replace the entire unit. Pure Storage does not support field disassembly or repair of NVRAM modules.

Be careful not to touch the exposed leads on the rear of the module after removal.

The LED on the top surface of the NVRAM module might blink slowly after removal. This indicates that the module supercaps are still charged.

NVRAM Module Replacement Steps

A ☎ icon indicates you need either login access or assistance from Pure Storage Technical Support.

Tools and Equipment (Provided by Pure Storage)

- NVRAM module
- Torx T10 driver
- KVM cable (provided in the Accessory Kit that shipped with the FlashArray//M)

Required for Some Procedures (Not Provided by Pure Storage)

- Anti-static temporary work area large enough for a chassis, with electrical power available
- ESD protection (e.g., wrist strap)
- A local console (either a VGA monitor and USB keyboard, or a computer equipped with a serial-to-USB converter and terminal emulation software set to communicate at 115,200 bps, no parity, 8 data bits, and one stop bit)
- Incidental tools (e.g., pliers)

Return all replaced and unused parts and supplies to Pure Storage.

Introduction (Cont'd)

FlashArray Power During Replacement

You can replace this component while the array is operating; if, however, the customer wants you to power off the array during the procedure, follow the instructions in " Appendix A: Powering a FlashArray//M Off and On" on page 139.

Estimated Time for Replacement: 15 Minutes

Includes all necessary unpacking, replacement, and repacking tasks. Does not include any optional customer-requested operations such as array power off and on.

Video

For a video of this procedure, refer to Replacing a NVRAM Module.

Step 1. Remove the Bezel

To release the bezel, press the Bezel latches inward and pull the bezel forward. See Figure 8-1.

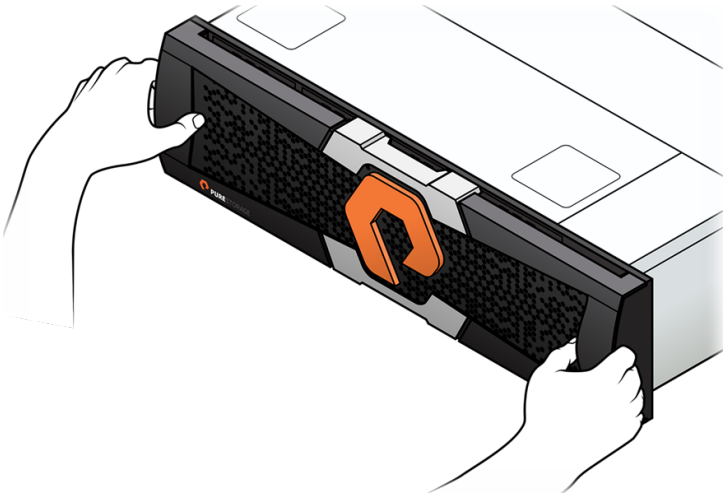

Figure 8-1. Removing the Bezel

Step 2. Observe Failure Symptoms ☎

Ask the customer or a Pure Storage Support representative to verify the NVRAM module failure. There are three indicators that help you determine if an NVRAM module has failed:

- On the Purity GUI, select **System** > **System Health**. Red NVRAM module and status icons indicate a failure (see Figure 8-2).
- On the Purity CLI, enter the **`purehw list --type nvb`** command. A status of **`critical`** indicates an NVRAM module failure (see Figure 8-3).
- Remove the bezel and check the LED on the NVRAM module panel. A green OK LED indicates that the NVRAM module is operating normally. An amber fault LED (⚠) indicates an NVRAM module failure (see Step 1). A blinking amber LED indicates the locater function is being used.

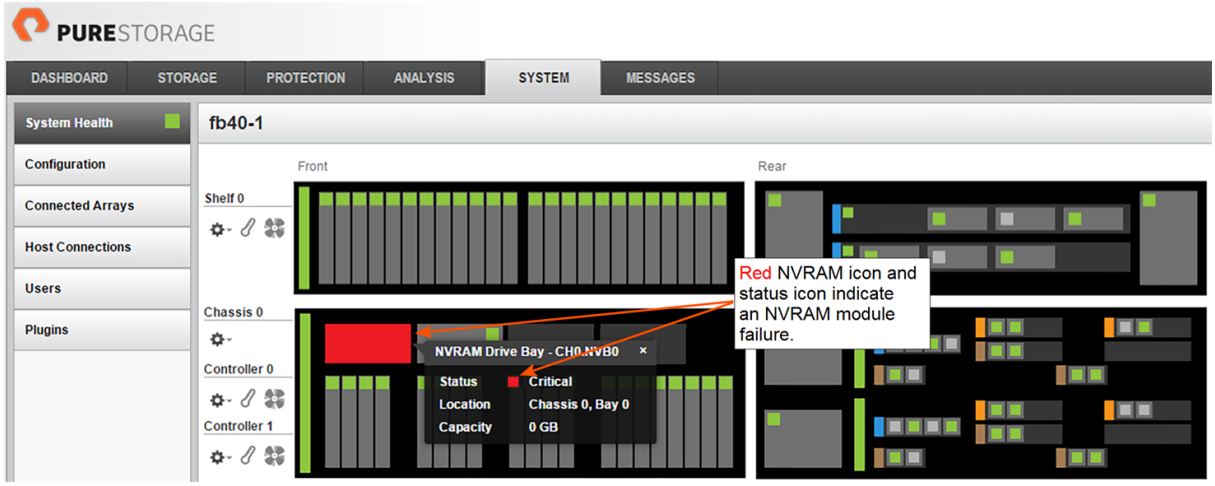

Figure 8-2. GUI Indication of NVRAM Module Failure

```
pureuser> purehw list --type nvb
Name      Status         Identify Slot Index Speed Temperature Details
CH0.NVB0  critical       off      -    0     -     -           -
CH0.NVB1  ok             off      -    1     -     -           -
CH0.NVB2  not_installed  off      -    2     -     -           -
CH0.NVB3  not_installed  off      -    3     -     -           -
```

Figure 8-3. CLI Indication of NVRAM Module Failure

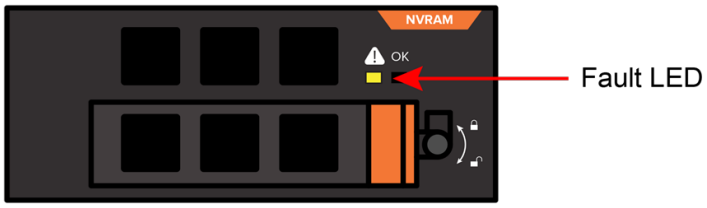

Figure 8-4. Faulty NVRAM Module LED Indicator

Step 3. Turn On the ID Light

From the Purity CLI, enter the **`purehw setattr --identify`** command:

```
pureuser> purehw setattr --identify on CH0.NVB0
Name       Slot  Index  Identify
CH0.NVB0   -     0      on
```

Turning on the identify LED helps you to replace the correct NVRAM module.

Alternatively, from the Purity GUI, select **System**, mouse over the faulty NVRAM and select the **Turn on ID Light** button.

Step 4. Remove the Faulty NVRAM Module

Unlock the NVRAM Module

Be careful to not overturn the NVRAM module locking mechanism. You can damage the lock by using excessive force.

To avoid damaging the module, turn the screw on the module to not more than maximum 3 in-lbs (.339 Nm).

Use a Torx T10 driver to unlock the NVRAM module by turning the lock in a clockwise direction. See Figure 8-5.

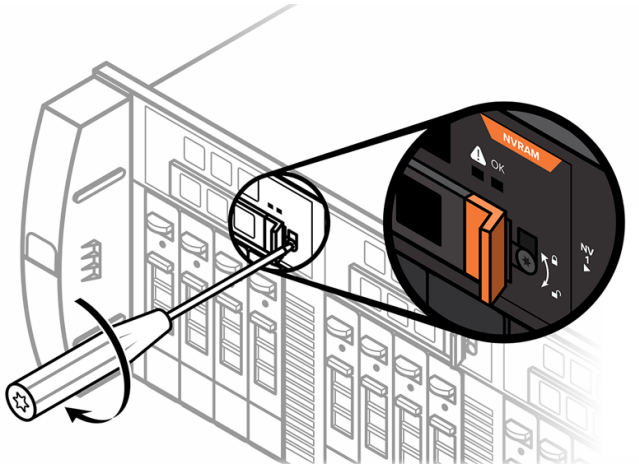

Figure 8-5. Unlocking the NVRAM Module

Unlatch the NVRAM Module

Press the NVRAM module latch to extend the handle. See Figure 8-6.

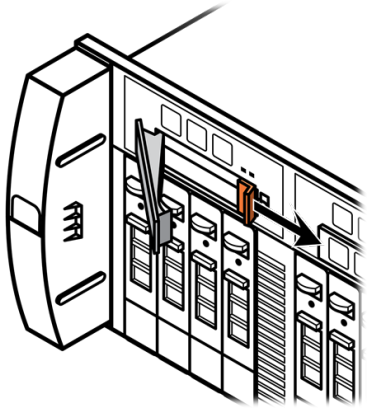

Figure 8-6. Pressing the NVRAM Module Latch

Step 4. Remove the Faulty NVRAM Module (Cont'd)

Remove the NVRAM Module

1. Pull the faulty NVRAM module by the handle while simultaneously supporting it with your other hand. See Figure 8-7.
2. Set the faulty NVRAM module aside for return to Pure Storage.

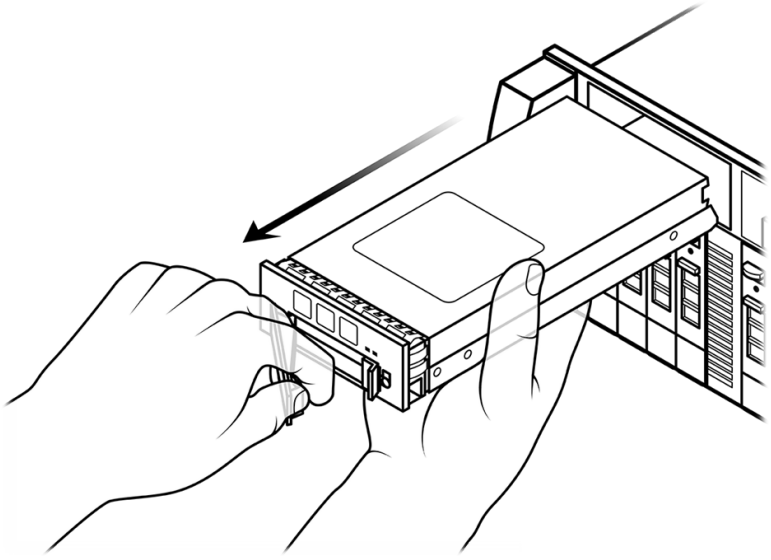

Figure 8-7. Removing the Faulty NVRAM Module

Step 5. Install the New NVRAM Module

1. Press the latch on the new NVRAM module (as shown on Figure 8-6) to extend the handle.
2. Align the new NVRAM module with the slot and carefully slide it in until it is fully seated in the slot and the front panel is flush with the FlashArray//M front panel. See Figure 8-8.

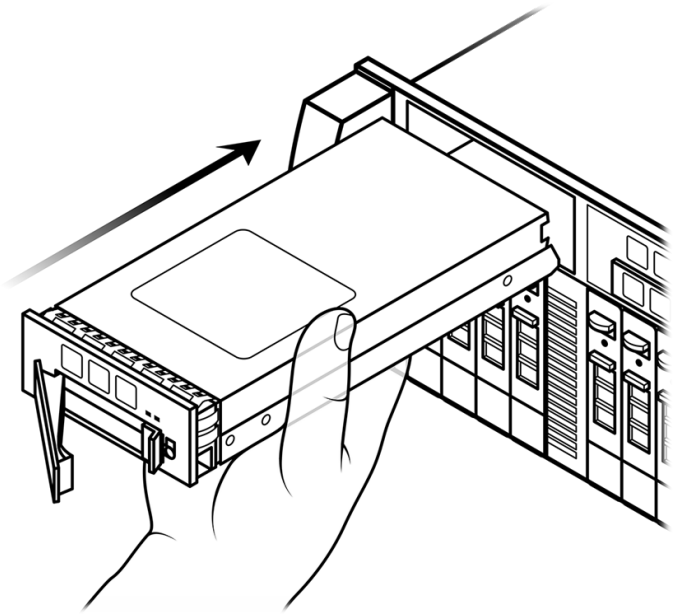

Figure 8-8. Inserting the Replacement NVRAM Module

Step 5. Install the New NVRAM Module (Cont'd)

Secure the New NVRAM Module

After the new NVRAM module is fully seated in the slot, close the handle until it clicks into place to secure the unit in the slot. See Figure 8-9.

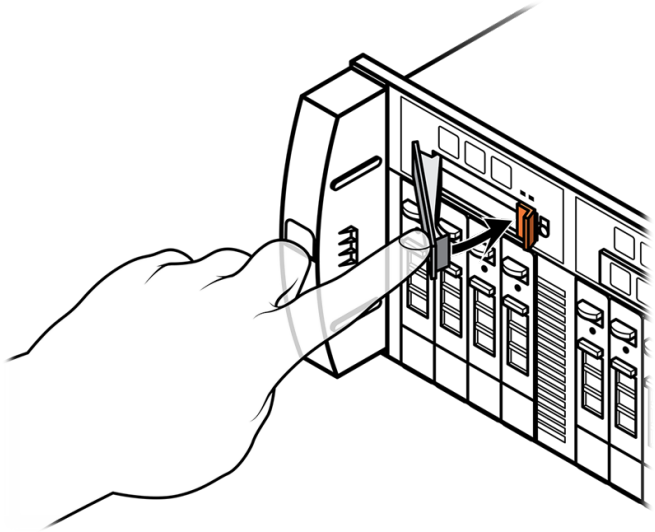

Figure 8-9. Latching the Replacement NVRAM Module

Tighten the NVRAM Module Lock

Be careful to not overturn the NVRAM module locking mechanism. You can damage the lock by using excessive force.

To avoid damaging the module, turn the screw on the module to not more than maximum 3 in-lbs (.339 Nm).

Use a Torx T10 driver to tighten the new NVRAM module lock by turning it counterclockwise. See Figure 8-10.

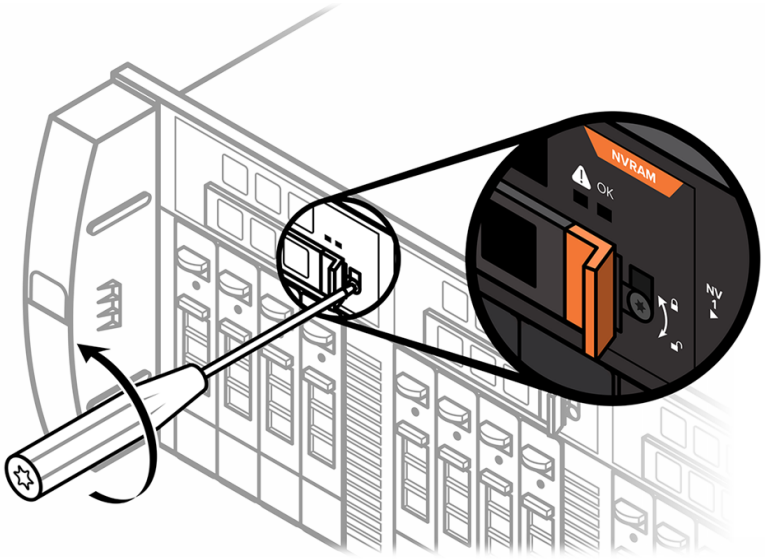

Figure 8-10. Tightening the NVRAM Module Lock

Step 6. Verify the Replacement ☎

Request that the customer or Pure Storage Support representative use the Purity GUI or CLI to verify the replacement. See Figure 8-11 for the GUI indicators of an operational NVRAM module, and see Figure 8-12 for the CLI command that you use to determine if the NVRAM module is functional or not.

After you install a new NVRAM module, it typically takes 2–4 minutes to display the status in the GUI or CLI or the LED to turn GREEN on the NVRAM module. This indicates that the replacement procedure was successful and no further action is required.
If a problem occurs, FlashArray//M attempts to reboot the NVRAM module for up to 10 minutes. If after 10 minutes the NVRAM module reboot attempts are not successful, it times out. If this occurs, contact Pure Storage Support for assistance.

Check that the NVRAM module OK LED is green and that the fault LED (⚠) is off. See Figure 8-13.

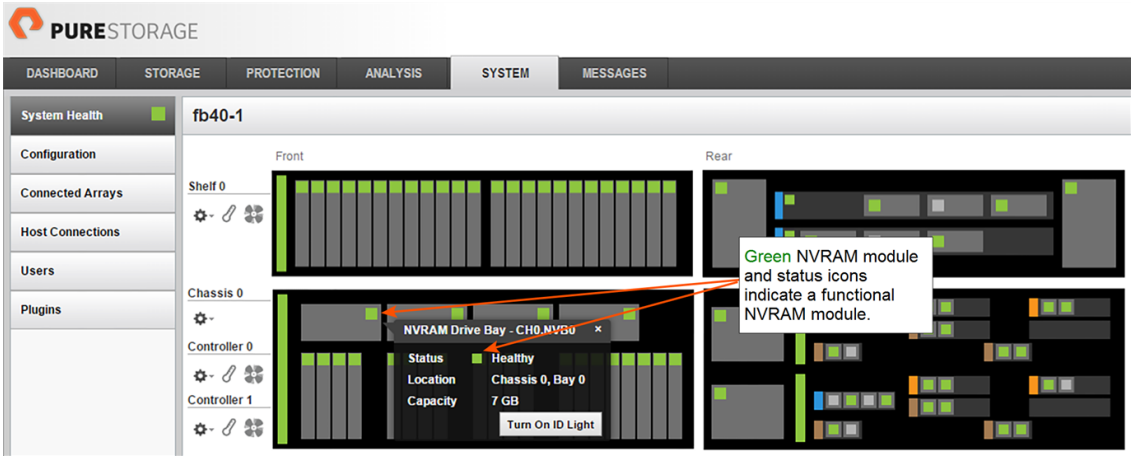

Figure 8-11. GUI Indication of a Functional NVRAM Module

```
pureuser> purehw list --type nvb
Name      Status        Identify Slot Index Speed Temperature Details
CH0.NVB0  ok            off      -    0     -     -           -
CH0.NVB1  ok            off      -    1     -     -           -
CH0.NVB2  not_installed off      -    2     -     -           -
CH0.NVB3  not_installed off      -    3     -     -           -
```

Figure 8-12. CLI Indication of a Functional NVRAM Module

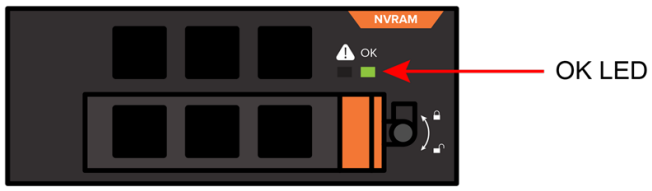

Figure 8-13. Functional NVRAM Module LED Indicator

This completes the NVRAM module replacement procedure.

Procedure 9: Replacing an NVRAM Blank

Introduction

This section describes the replacement of a FlashArray//M NVRAM blank. Pure Storage recommends that you always have blanks inserted in any unpopulated NVRAM slots.

Tools and Equipment (Provided by Pure Storage)

One NVRAM blank

Required for Some Procedures (Not Provided by Pure Storage)

- Anti-static temporary work area large enough for a chassis, with electrical power available
- ESD protection (e.g., wrist strap)

Return all replaced and unused parts and supplies to Pure Storage.

FlashArray Power During Replacement

You can replace a FlashArray//M NVRAM blank while an array is operating. Replacing a blank does not affect the operation of the array.

Estimated Time for Replacement: 5 Minutes

Video

For a video of this procedure, refer to Replacing a NVRAM Blank.

Installing an NVRAM Blank

NVRAM blanks do not have locks or a latching mechanism like NVRAM modules do.

Make sure to align the blank with the slot so that you do not damage the threads on the blank.

Align the NVRAM blank with the slot and slide into place. See Figure 9-1.

This completes the NVRAM blank replacement procedure.

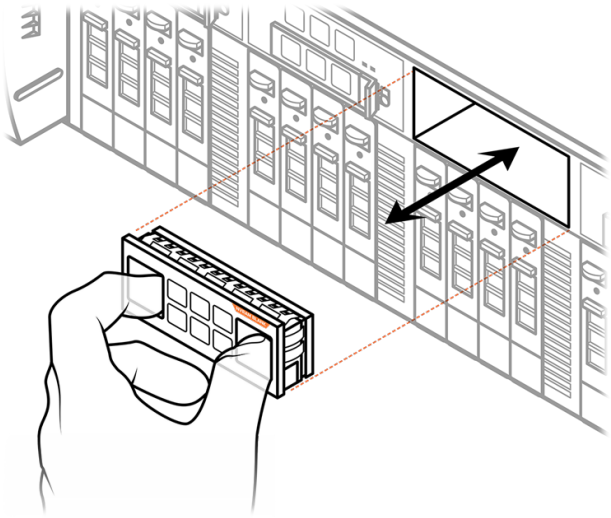

Figure 9-1. Installing an NVRAM Blank

Procedure 10: Replacing a Fan

Introduction

This section describes replacement of a fan on a FlashArray//M.

Fan Replacement Steps

A ☎ icon indicates you need either login access or assistance from Pure Storage Technical Support.

Tools and Equipment (Provided by Pure Storage)

- One replacement fan module
- Temporary labels for disconnected cables

Required for Some Procedures (Not Provided by Pure Storage)

- ESD protection (e.g., wrist strap)
- A local console (either a VGA monitor and USB keyboard, or a computer equipped with a serial-to-USB converter and terminal emulation software set to communicate at 115,200 bps, no parity, 8 data bits, and one stop bit)
- Incidental tools (e.g., pliers)

Return all replaced and unused parts and supplies to Pure Storage.

Introduction (Cont'd)

FlashArray Power During Replacement

You can replace this component while the array is operating; if, however, the customer wants you to power off the array during the procedure, follow the instructions in " Appendix A: Powering a FlashArray//M Off and On" on page 139.

Estimated Time for Replacement: 15 Minutes

Includes all necessary unpacking, replacement, and repacking tasks. Does not include any optional customer-requested operations such as array power off and on.

Video

For a video of this procedure, refer to Replacing a Fan.

Step 1. Observe Failure Symptoms ☎

Request that the customer or Pure Storage Technical Support representative use the GUI or CLI to identify the fan failure. There are two indicators that can help you determine if there is an optical transceiver failure:

- Use the Purity GUI. Select **System** > **System Health**. A red fan icon and red square indicating critical status indicate fan failure (see Figure 10-1).
- Use the Purity CLI. Enter the `purehw list --type fan` command. A status of `Critical` indicates a fan failure (see Figure 10-2).

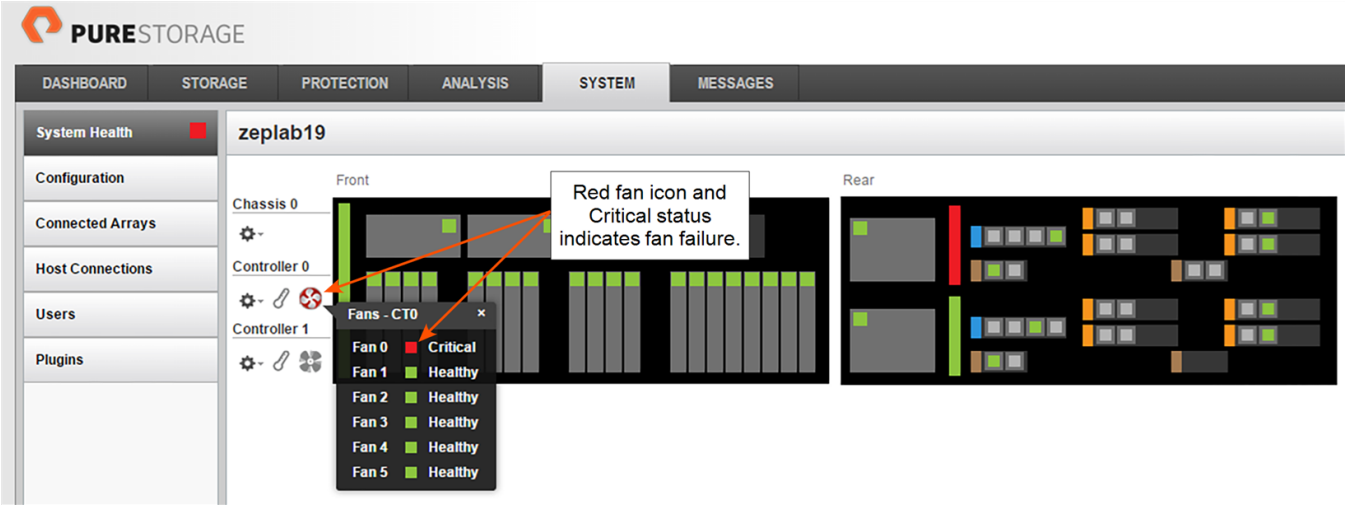

Figure 10-1. GUI Indication of Fan Failure

```
pureuser>purehw list --type fan
CT0.FAN0    critical    -   -   0   -   -   -
CT0.FAN1    ok          -   -   1   -   -   -
CT0.FAN2    ok          -   -   2   -   -   -
CT0.FAN3    ok          -   -   3   -   -   -
CT0.FAN4    ok          -   -   4   -   -   -
CT0.FAN5    ok          -   -   5   -   -   -
CT1.FAN0    ok          -   -   0   -   -   -
CT1.FAN1    ok          -   -   1   -   -   -
CT1.FAN2    ok          -   -   2   -   -   -
CT1.FAN3    ok          -   -   3   -   -   -
CT1.FAN4    ok          -   -   4   -   -   -
CT1.FAN5    ok          -   -   5   -   -   -
```

Figure 10-2. CLI Indication of Fan Failure

Disconnecting Cables

FlashArray//M Controller Ports

Disconnect the host, Ethernet, and FC cables (ETH0-ETH9 or FC0-FC9) and any other cables (e.g., KVM, USB) that are connected to the old controller ports (see Figure 10-3), as described in the following sections.

Do not refer to any port numbering stamped on add-on cards such as Fibre Channel cards. Refer to the logical port numbering shown below, which matches the GUI numbering.

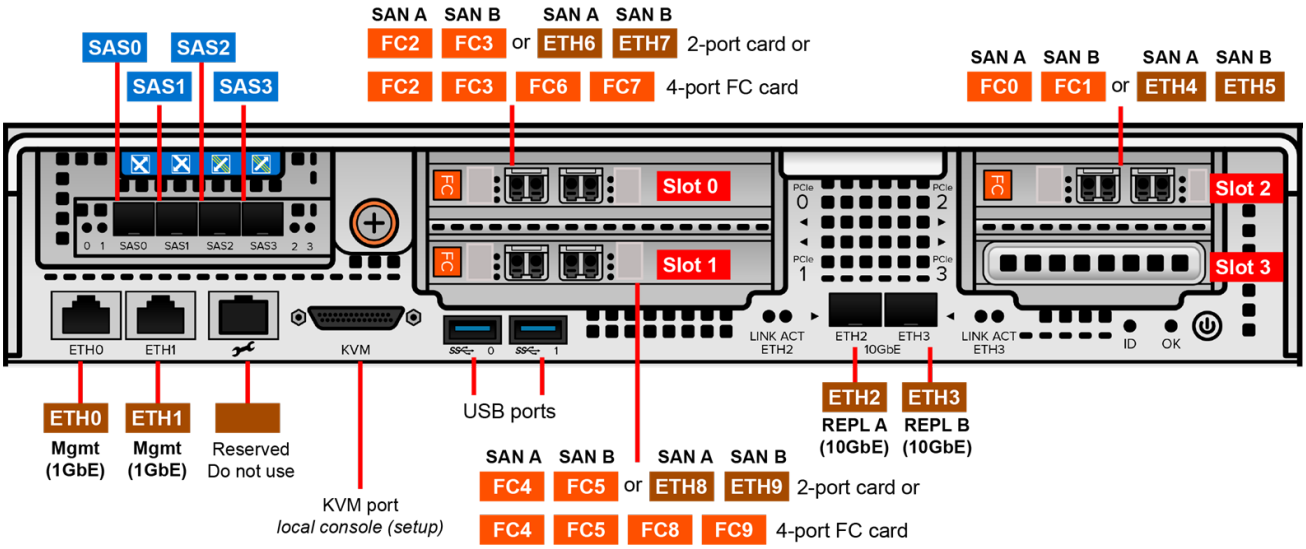

Figure 10-3. FlashArray//M Controller Ports (2-Port PCIe Cards Shown)

Step 2. Disconnect Fibre Channel Cables

See Figure 10-4 and do the following for each host cable (Fibre Channel shown):

1. Attach a temporary label (included in the replacement kit) to each cable you disconnect, to indicate the number and type of the corresponding port (e.g., FC0).
2. Squeeze the connector latch to release the connector.
3. Pull the connector to remove the cable from the optical transceiver.

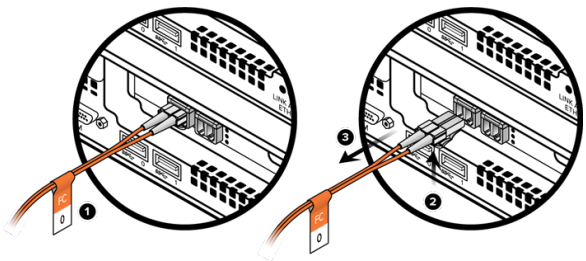

Figure 10-4. Disconnecting a Host Cable (Fibre Channel Shown)

Step 3. Protect Optical Cable Tips

Install two protective caps on each optical cable connector as shown in Figure 10-5.

Pure Storage does not supply host cables or protective caps. Copper connections do not use protective caps.

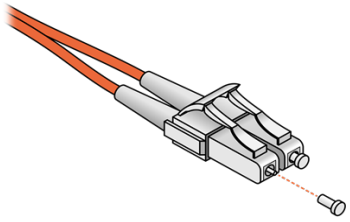

Figure 10-5. Protecting Optical Cable Tips

Step 4. Disconnect SAS Cables

SAS cables are only present on a controller if it is connected to one or more add-on shelves. If the system does not include add-on shelves, skip this step.

For each connected SAS port

1. Attach a temporary label (included in your replacement controller package) to each SAS cable you disconnect (**SAS0** through **SAS3**), to indicate the number and type of the corresponding port. See Figure 10-6.

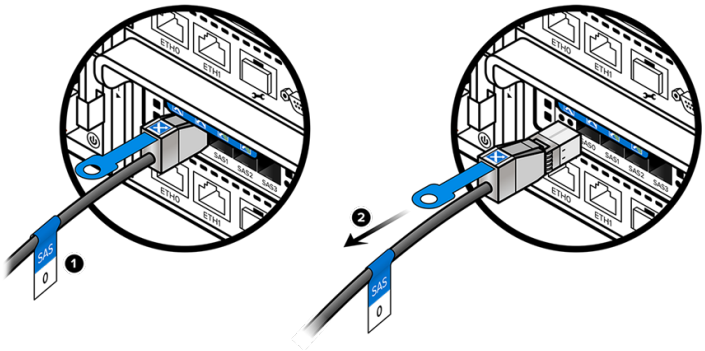

Figure 10-6. Disconnecting a SAS Cable

2. For each connector, pull the plastic tab to disengage the latch. Maintain pressure on the tab and disconnect the connector from the port.
3. Do not disconnect the other end of each SAS cable.

Be careful when labeling SAS cables. If you install SAS cables incorrectly on the replacement controller, the FlashArray//M might not operate at full performance.

Step 5. Disconnect 1-GbE Cables

1. Attach a temporary label to the 1-GbE cables in port **ETH0** and **ETH1**. See Figure 10-7.
2. Press the cable latch to release the connector and pull the cable from the socket.

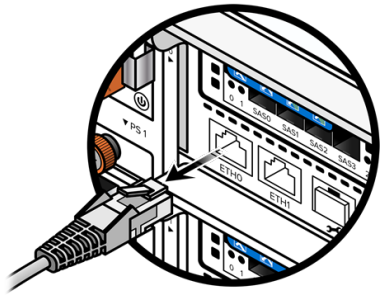

Figure 10-7. Disconnecting 1-GbE Cables

Step 6. Remove the Controller

Do not remove the power cords. The power cords supply power to the entire system and are independent of the controllers.

1. Loosen the orange captive screw on the rear panel of the controller. See Figure 10-8.

Use a Phillips screwdriver to loosen the screw if necessary.

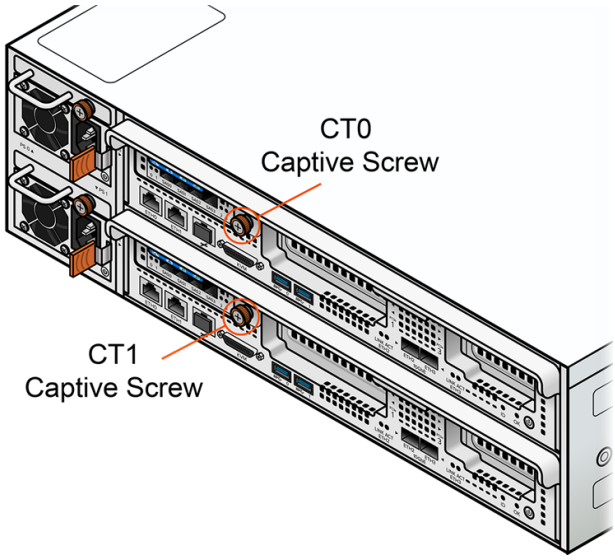

Figure 10-8. Loosening the Captive Screw

2. Rotate the controller retaining bar downward and pull the controller from the chassis. See Figure 10-9.

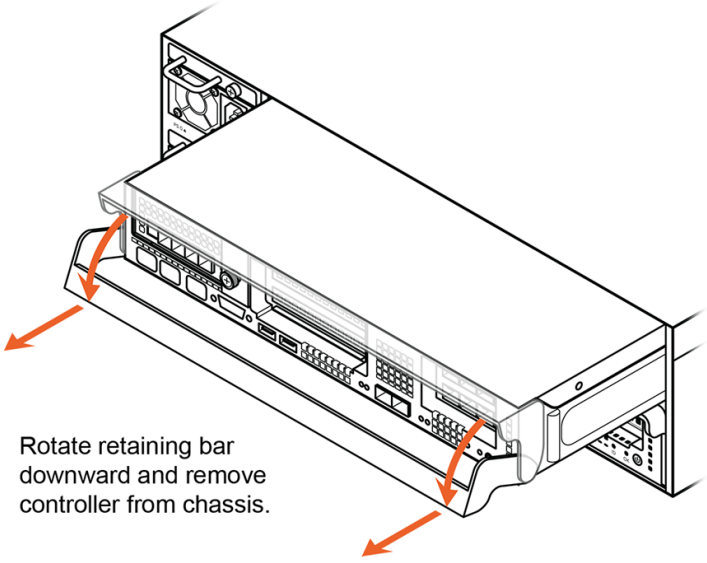

Figure 10-9. Removing the Controller

Step 7. Remove the Controller Lid

1. Place the controller on a clean, flat surface.
2. Press the controller cover pads, slide the cover toward the retaining bar about 1/2 inch, and then lift the cover off. See Figure 10-10.

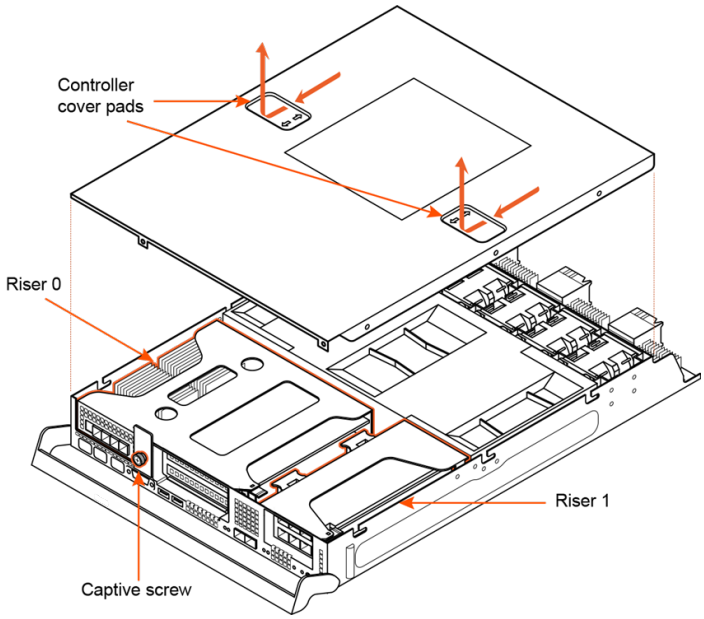

Figure 10-10. Removing the Controller Cover

Step 8. Replace the Faulty Fan

1. Grasp the faulty fan by its frame and gently pull it out of the controller chassis. See Figure 10-11.
2. Align the replacement fan with the empty fan slot and gently slide it into the slot. Make sure the fan connector fully engages with the controller connector.

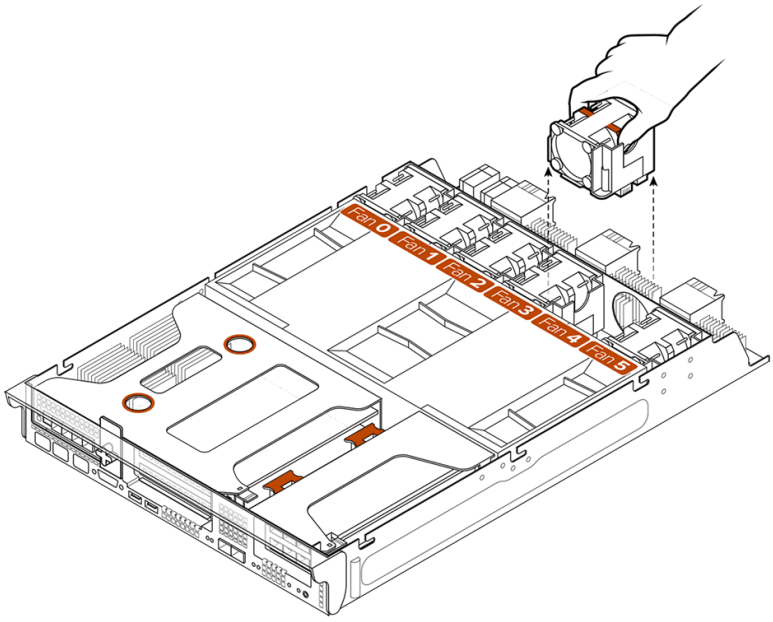

Figure 10-11. Replacing a Fan

Step 9. Reinstall and Restart the Controller

1. Align the pins on the left and right edges of the cover with the slots in the controller body, as shown in Figure 10-12.
2. Lower the cover onto the controller body.
3. Press down on the pads on the controller cover and slide the cover forward about ½" to lock it in place.

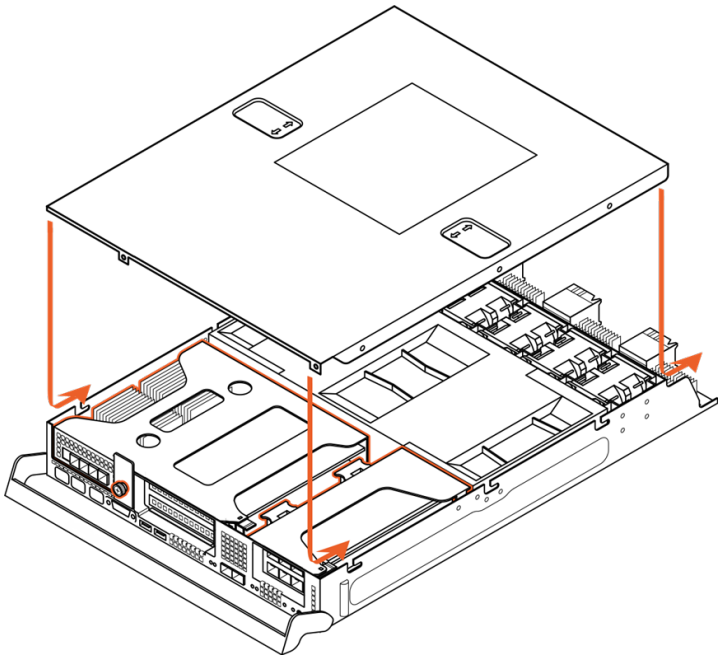

Figure 10-12. Replacing the Controller Cover

4. Align the controller with the controller slot. See Figure 10-13.
5. Keeping the retaining bar in the down position, slide the controller into the slot until the controller panel is flush with the FlashArray//M rear panel.
6. Slide the retaining bar upward until it latches into place.
7. Tighten the controller captive screw.

The controller automatically powers on if power is connected on the FlashArray//M.

8. Reconnect the cables that you labeled and disconnected.

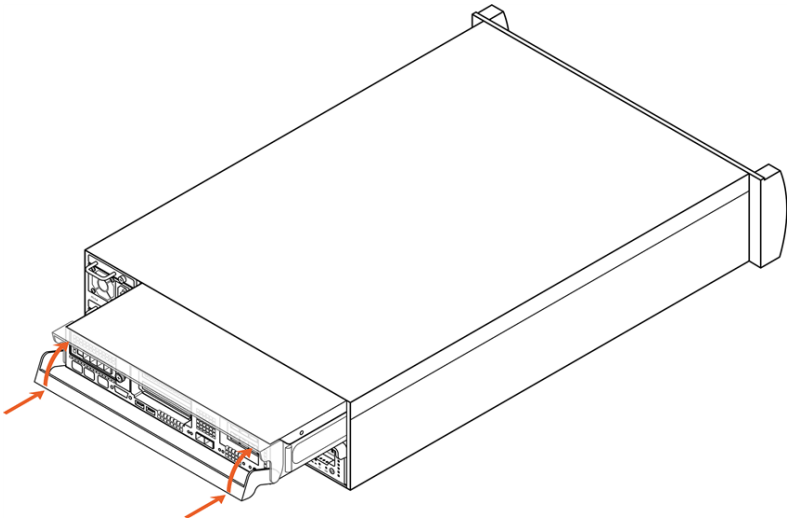

Figure 10-13. Reinstalling the Controller

Step 10. Verify the Replacement ☎

Request that the customer or Pure Storage Technical Support representative use the Purity GUI or CLI to verify the replacement. See Figure 10-14 for an example of GUI indicators and Figure 10-15 for an example of CLI indicators that reflect an operational fan.

If the fan replacement does not resolve the issue, contact Pure Storage Support for further assistance.

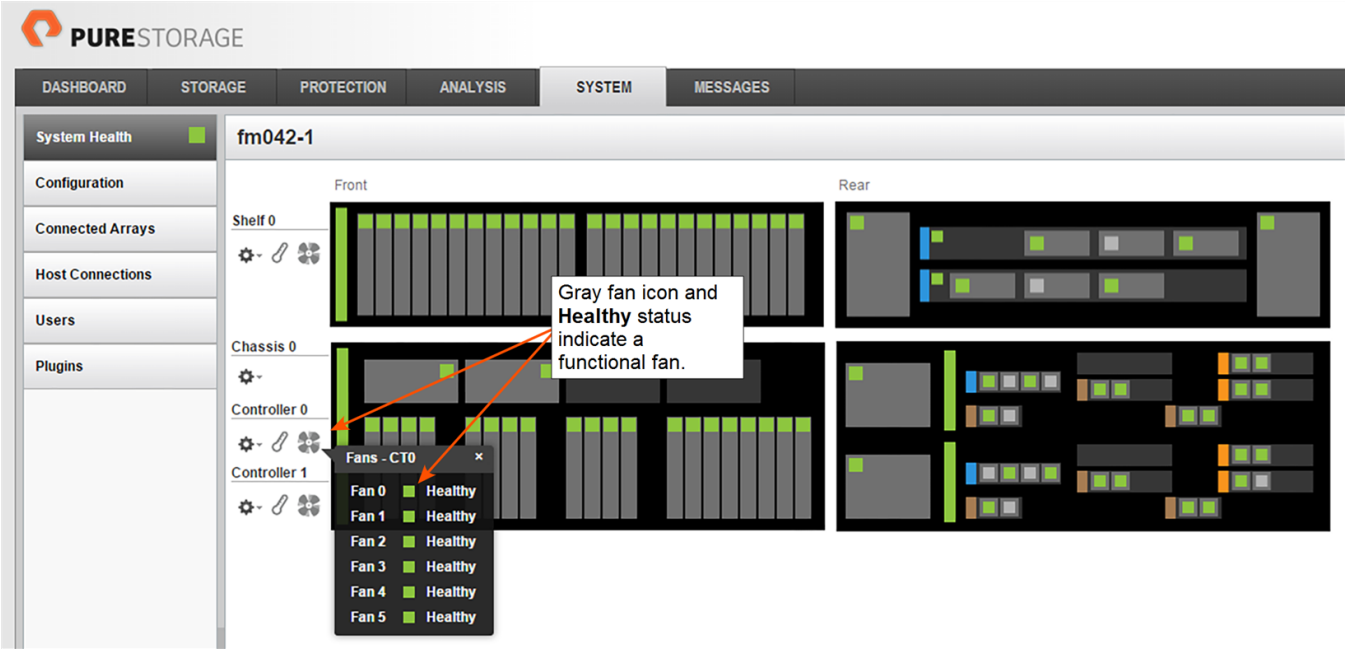

Figure 10-14. GUI Indication of an Operational Fan

```
pureuser>purehw list --type fan
CT0.FAN0    ok          -   -   0   -   -   - ◀
CT0.FAN1    ok          -   -   1   -   -   -
CT0.FAN2    ok          -   -   2   -   -   -
CT0.FAN3    ok          -   -   3   -   -   -
CT0.FAN4    ok          -   -   4   -   -   -
CT0.FAN5    ok          -   -   5   -   -   -
CT1.FAN0    ok          -   -   0   -   -   -
CT1.FAN1    ok          -   -   1   -   -   -
CT1.FAN2    ok          -   -   2   -   -   -
CT1.FAN3    ok          -   -   3   -   -   -
CT1.FAN4    ok          -   -   4   -   -   -
CT1.FAN5    ok          -   -   5   -   -   -
```

Figure 10-15. CLI Indication of an Operational Fan

This completes the fan replacement procedure.

Procedure 11: Replacing a Chassis

Introduction

This section describes the replacement of a FlashArray//M chassis.

Chassis Replacement Steps

A ☎ icon indicates you need either login access or assistance from Pure Storage Technical Support.

Introduction (Cont'd)

Tools and Equipment (Provided by Pure Storage)

- One FlashArray//M chassis (includes two power supplies and no other components)
- KVM cable (provided in the Accessory Kit that shipped with the FlashArray//M)
- Two sets of temporary cable labels.

Required for Some Procedures (Not Provided by Pure Storage)

- Anti-static temporary work area large enough for a chassis and all removable components, with electrical power available
- ESD protection (e.g., wrist strap)
- A local console (either a VGA monitor and USB keyboard, or a computer equipped with a serial-to-USB converter and terminal emulation software set to communicate at 115,200 bps, no parity, 8 data bits, and one stop bit)
- Incidental tools (e.g., pliers, flat head screwdriver, Phillips screwdriver)

Return all replaced and unused parts and supplies to Pure Storage.

FlashArray Power During Replacement

You must completely shut an array down to perform a chassis replacement. Pure Storage recommends that you perform this procedure during less critical times when I/O activity to the array is typically low.

Estimated Time for Replacement: 90 Minutes

Includes all necessary power-off, unpacking, replacement, repacking, and power-on tasks.

Video

For a video of this procedure, refer to Replacing a Chassis.

Step 1. Turn On the ID Light

From the Purity CLI, enter the **`purehw setattr --identify`** command:

```
pureuser> purehw setattr --identify on CH0
Name      Slot  Index  Identify
CH0       -     0      on
```

Turning on the identify LED helps you to replace the correct chassis.

Step 2. Disconnect Power

Power off the array before the procedure as described in " Appendix A: Powering a FlashArray//M Off and On" on page 139.

Step 3. Remove the Bezel

To release the bezel, press the Bezel latches inward and pull the bezel forward. See Figure 11-1.

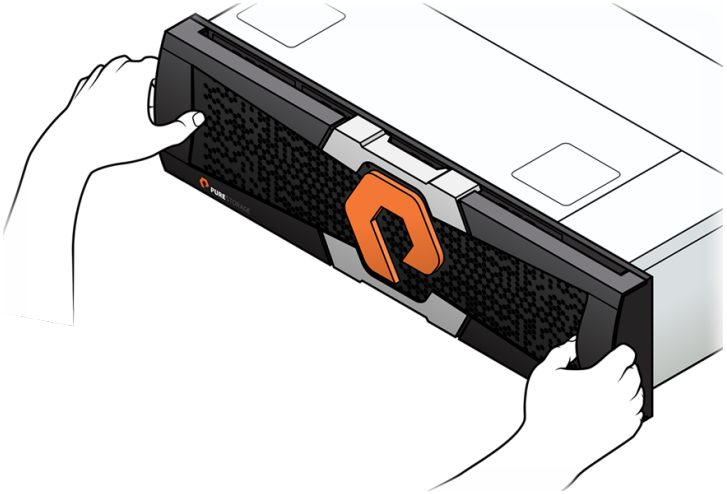

Figure 11-1. Removing the Bezel

Step 4. Remove NVRAM Modules

Remove all NVRAM modules and blanks from the FlashArray//M. See "Replacing an NVRAM Module" on page 64 or "Replacing an NVRAM Blank" on page 72. Set the NVRAM modules and blanks aside for later installation in the replacement chassis.

Step 5. Remove Flash Modules and Blanks

Remove all Flash Modules from the FlashArray//M as described in "Remove Flash Modules and Blanks" on page 132. Set the Flash Modules aside for later installation in the replacement chassis.

Step 6. Remove Power Supplies

Remove both power supply units (PSUs) as described in "Remove the PSM" on page 26 and remove both power supply modules as described in "Observe Failure Symptoms " on page 25. Set the PSUs and PSMs aside for later installation in the replacement chassis.

Step 7. Disconnect SAS Cables

Disconnect all SAS cables from each controller. See Figure 11-2.

SAS cables are only present on arrays that include storage shelves.

Do not disconnect the SAS cables from storage shelves in the array. You will reconnect each SAS cable to the controllers after installing them into the replacement chassis.

1. Attach a temporary label with the name of the port from which the cable is disconnected (e.g., SAS0).
2. Pull the blue tabs and withdraw the connectors from the sockets.

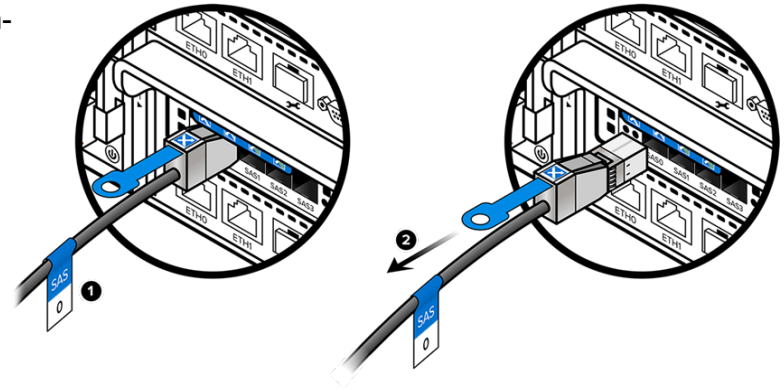

Figure 11-2. Disconnecting SAS Cables

Step 8. Disconnect Host and Replication Cables

For each host and replication cable connected to the faulty controller:

1. Attach a temporary label with the name of the port from which the cable is disconnected (e.g., FC4). See Figure 11-3.

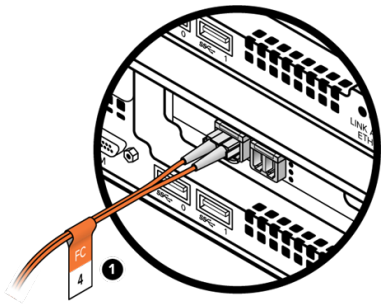

Figure 11-3. Attaching a Temporary Label to Host and Replication Cables

2. Disconnect the cable by releasing the connector latch. See Figure 11-4.
3. Remove the connector from the transceiver (Fibre Channel shown) or port socket (10-GbE copper—not shown).

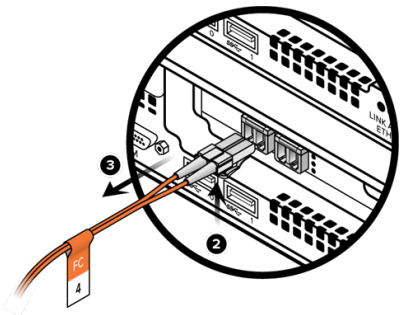

Figure 11-4. Disconnecting Host and Replication Cables (Fibre Channel Shown)

Step 9. Protect Optical Connectors

Install two protective caps on each optical cable connector as shown in Figure 11-5.

Pure Storage does not supply host cables or protective caps. Copper connections do not use protective caps.

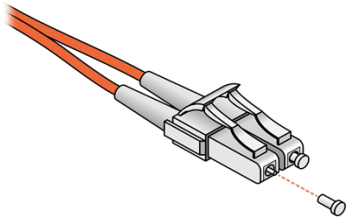

Figure 11-5. Protecting Optical Cable Tips

Step 10. Disconnect Management Cables

Attach a temporary label with the name of the port (e.g., **ETH0**).

Remove management cables from both controllers. See Figure 11-6.

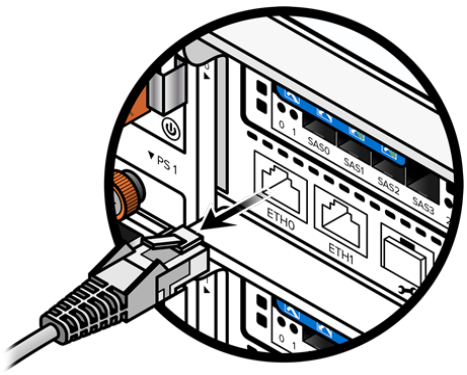

Figure 11-6. Disconnecting a Management Cable

Step 11. Remove Controllers

1. Loosen the orange captive screw on the rear panel of both controllers. See Figure 11-7

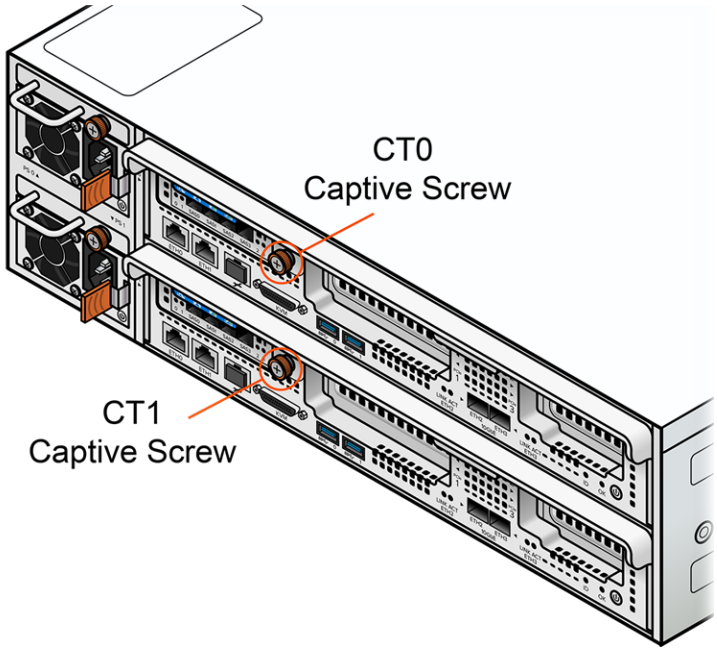

Figure 11-7. Loosening the Captive Screw

2. Rotate the CT0 retaining bar downward and remove the controller from the chassis. See Figure 11-8.
3. Rotate the CT1 retaining bar downward and remove the controller from the chassis.
4. Set the controllers on a clean, flat surface for later installation in the replacement chassis.

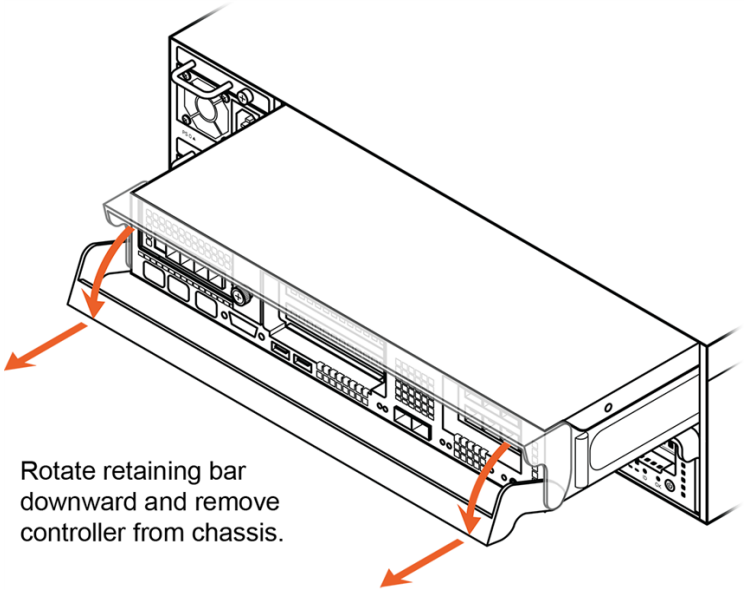

Figure 11-8. Removing a Controller (CT0 Shown)

Step 12. Remove the Chassis from the Rack

1. Open the slam latches on the front panel. See Figure 11-9.
2. Use a #2 Phillips screwdriver to remove the #10-32 screws from the slam latches.

There is one #10-32 screw on each rack post.

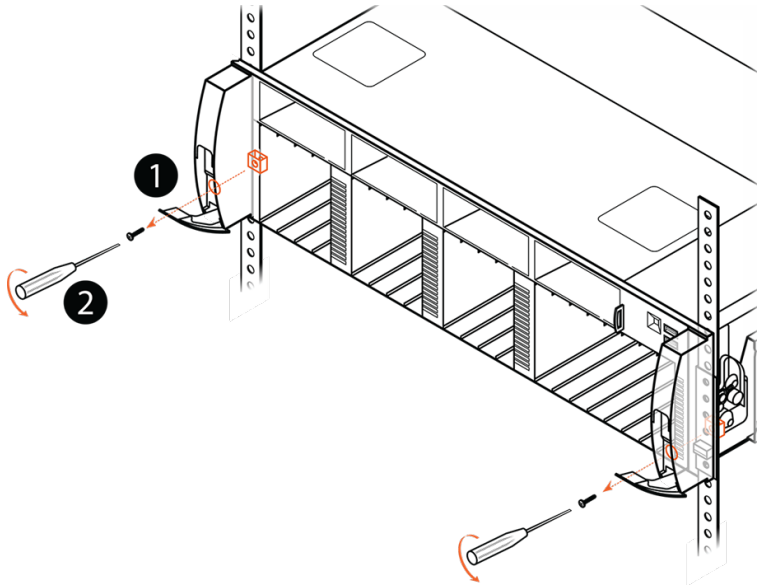

Figure 11-9. Removing Front Screws

3. After removing the screws, pull the chassis forward about two inches, and then close the slam latches. See Figure 11-10.
4. Set the screws aside for later use. You will use them to secure the replacement chassis in the rack.

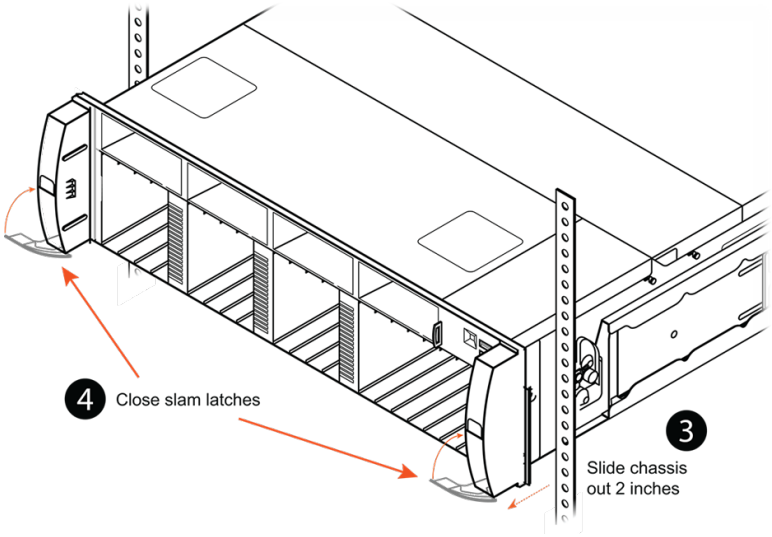

Figure 11-10. Close Slam Latches

Step 12. Remove the Chassis from the Rack (Cont'd)

The empty FlashArray//M chassis weighs 18.8 kg (41.5 lbs.). Make arrangements for safe lifting during removal. Pure Storage recommends two people for this procedure.

1. With one person on each side, slide the chassis along the rails until the first set of chassis handle standoffs are exposed. See Figure 11-11.
2. On each side of the chassis, slide a chassis handle onto the standoffs until the plunger latches into the mounting hole.

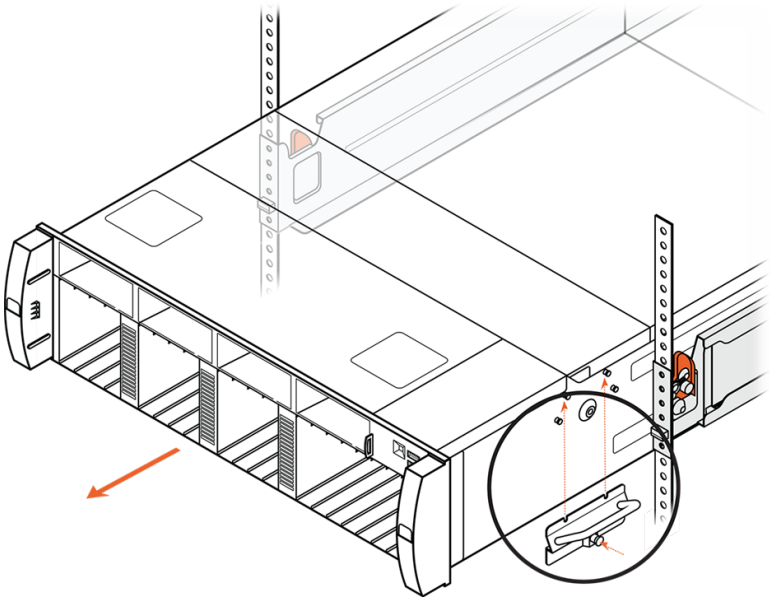

Figure 11-11. Sliding the Chassis on the Rails and Attaching the First Pair of Lift Handles

3. Grip the handles and slide the chassis along the rails until the second set of chassis handle standoffs are exposed. See Figure 11-12.
4. On each side of the chassis, slide a chassis lift handle onto the standoffs until the plunger latches into the mounting hole.
5. With one person on each side, grasp the handles and completely remove the chassis from the rack.
6. Set the chassis on a flat surface for later shipment to Pure Storage, and detach the handles from both sides of the chassis.

Leave the cage nuts (square-hole racks) or clip nuts (round-hole racks) in the rack. You will use them to secure the replacement chassis to the rack.

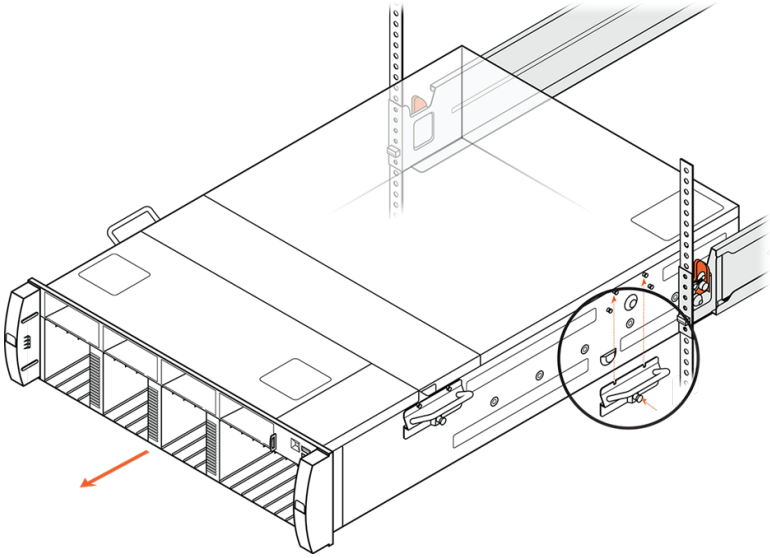

Figure 11-12. Sliding the Chassis on the Rails and Attaching the Second Pair of Lift Handles

Step 13. Install the New Chassis

⚠ The empty FlashArray//M chassis weighs 18.8 kg (41.5 lbs.) Make arrangements for safe lifting during installation. Pure Storage recommends two people for this procedure.

1. Install all four chassis handles on the new chassis. Slide each handle onto the standoffs until the plunger latches into the mounting hole. See Figure 11-13.

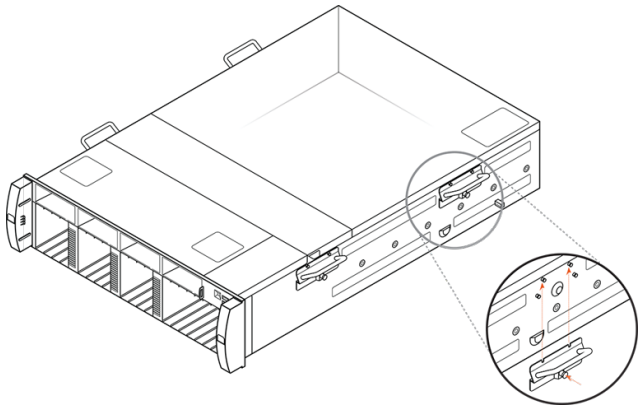

Figure 11-13. Installing Chassis Handles

2. With one person on each side, lift the chassis by the handles and slide it onto the rails until the rear handles are two inches from touching the rack.

   Resting the rear of the chassis on the rails, support the front of the chassis and remove each rear handle by pulling the plunger and sliding the handle downward. See Figure 11-14.

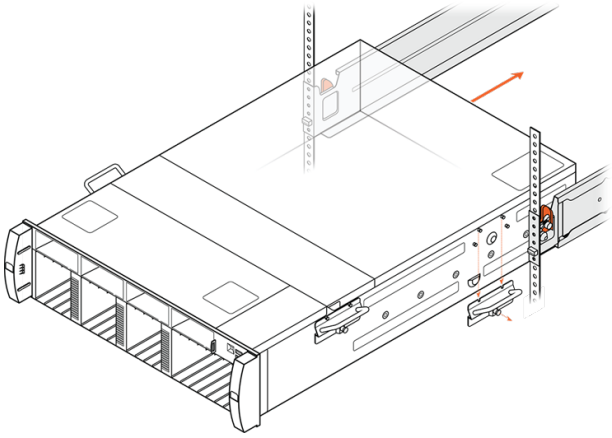

Figure 11-14. Installing the Replacement Chassis, Part 1

3. Slide the chassis on the rails until the front handles approach the rack. Continue to support the front of the chassis while you remove the front handles. See Figure 11-15.
4. Slide the chassis completely into the rack so that the chassis ears are flush with the front of the rack and the slam latches lock into place.

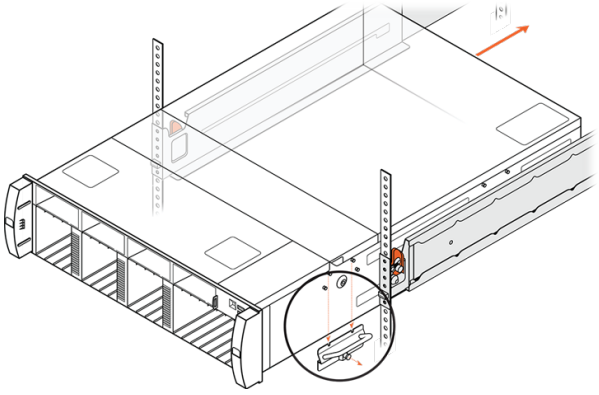

Figure 11-15. Installing the Replacement Chassis, Part 2

Step 14. Secure the Chassis in the Rack

1. (Square- and round-hole racks only) Secure the front of each rail to the rack and chassis with the two #10-32 screws that you saved when removing the faulty chassis.

   Open both slam latches on the chassis front panel and thread the screws through each slam latch hole. Tighten the screws, securing the chassis to the rack and the attached cage nut (square-hole racks) or clip nut (round-hole racks; not provided by Pure Storage), and then close the slam latches. See Figure 11-16.

   (Threaded-hole racks only) Secure the front of the rail kit to the rack with screws that fit the rack's threaded holes. Pure provides #10-32 screws. If the rack has threads of another size, you must obtain matching screws.

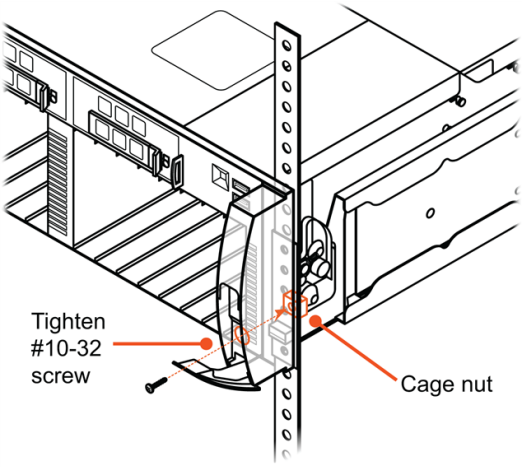

Figure 11-16. Securing the Chassis to the Front of the Rack

On round-hole racks, if you use #10-32 clip nuts, you can use the #10-32 screws provided in the Accessory Kit. If you use clip nuts of any other size, you must obtain matching screws. Clip nuts and alternate screws are not provided by Pure Storage.

Step 15. Install NVRAM Modules or Blanks

Reinstall the NVRAM modules or blanks that you removed from the faulty chassis using the installation procedure described in "Install the New NVRAM Module" on page 69.

Step 16. Install Flash Modules

Reinstall the Flash Modules that you removed from the faulty chassis using the installation procedure described in "Install Flash Modules" on page 133.

Step 17. Install Power Supplies

Reinstall the PSMs that you removed from the faulty chassis, and reinstall the PSUs into the PSMs as described in "Replacing a Power Supply Module (PSM)" on page 23.

Step 18. Install Controllers and Reconnect Cables

Reinstall the controllers you removed from the faulty chassis using the installation procedure described in "Install the Replacement Controller" on page 58.

Step 19. Connect SAS Cables

For each SAS cable you removed

1. Insert the SAS cable connector into the controller port designated by the temporary label attached to the cable.
2. Verify that the label on the connector matches the label of the port (see Figure 11-17).

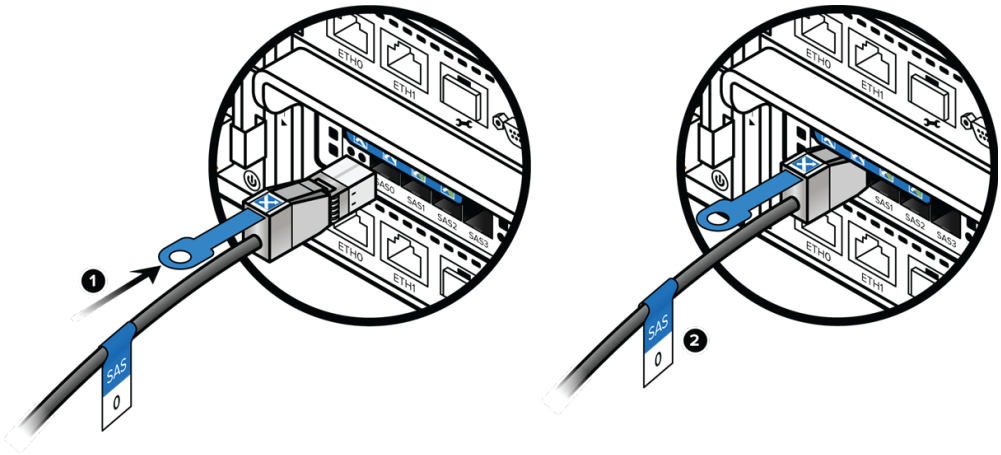

Figure 11-17. Connecting SAS Cables

3. Verify that the connector latch has engaged by pulling the cable gently until resistance is felt.

Do not remove temporary labels until the procedure is complete and you have tested both host I/O and CLI and GUI functionality. After testing, remove all temporary labels.

Step 20. Connect 1-GbE Cables

1. Connect the 1GbE management cable to the **ETH0** port on the controller. See Figure 11-18.
2. Verify that the connector latch is engaged by pulling the cable gently until you feel resistance.
3. Connect the 1GbE management cable to the **ETH1** port on the controller (if a cable was present) and verify it as well.

Do not remove temporary labels until the procedure is complete and you have tested both host I/O and CLI and GUI functionality. After testing, remove all temporary labels.

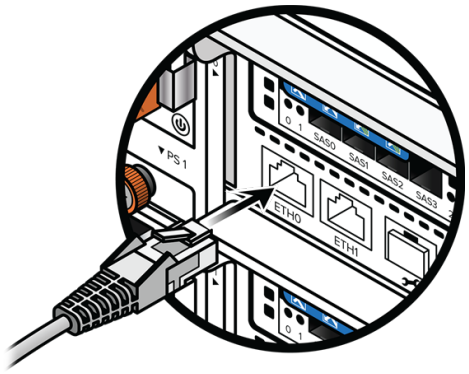

Figure 11-18. Connecting 1-GbE Cables

Step 21. Connect Host and Replication Cables

For each host and replication cable:

1. Make sure that the temporary label on the cable matches the port number.
2. Push the connector into the transceiver (optical) or port socket (10-GbE copper). See Figure 11-19.
3. Verify that the connector latch is engaged by pulling the cable gently until you feel resistance.

Do not remove temporary labels until the procedure is complete and you have tested both host I/O and CLI and GUI functionality. After testing, remove all temporary labels.

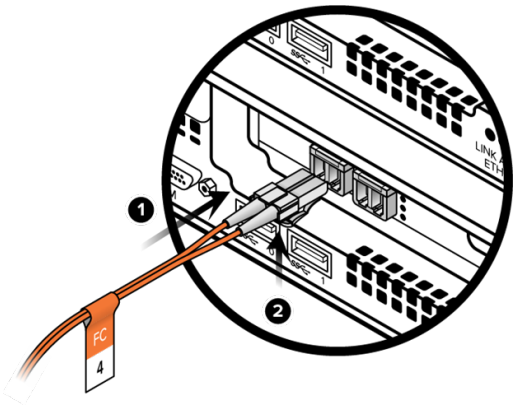

Figure 11-19. Connecting a Host Cable (FC Shown)

Step 22. Power On the FlashArray//M

See "Powering On a FlashArray//m" on page 142 for the power on procedure.

Step 23. Verify the Replacement ☎

1. Request that the customer or Pure Storage Technical Support representative use the Purity GUI or CLI to verify the replacement. See Figure 11-20 for an example of GUI indicators that indicate an operational FlashArray//M.
2. Enter the following commands to check the SAS connections:

   ```
   sas_view.py config
   ```

   ```
   sas_view.py enclosures
   ```

   If the SAS cables are connected correctly, these commands return the following response:

   ```
   No errors detected.
   ```

   If errors are detected, the commands return a list of the affected SAS cables and the reason for the errors. Contact Pure Storage Technical Support for additional assistance.

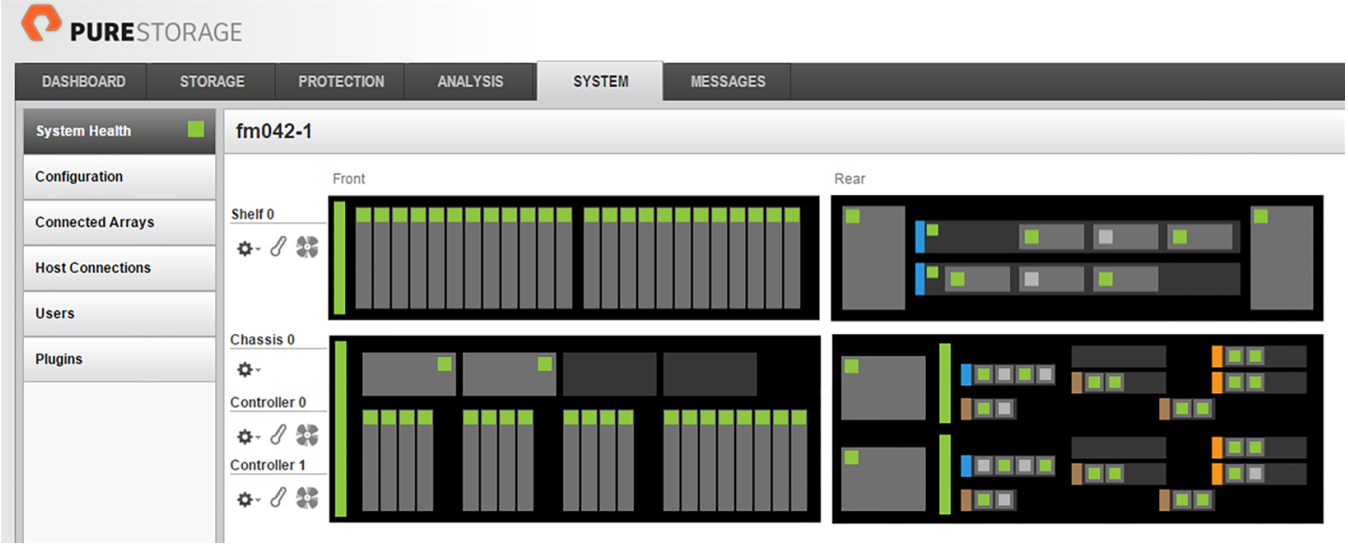

Figure 11-20. GUI Indicators of an Operational FlashArray//M

3. Return the faulty chassis and any other unused parts to Pure Storage. Leave the two power supplies in the faulty chassis for return to Pure Storage.

This completes the chassis replacement procedure.

Procedure 12: Replacing a Bezel

Introduction

This section describes the replacement of a FlashArray//M bezel.

Tools and Equipment

One FlashArray//M bezel

Return all replaced and unused parts and supplies to Pure Storage.

FlashArray Power During Replacement

You can replace a FlashArray//M bezel while an array is operating. Replacing a bezel does not affect the operation of the array.

Estimated Time for Replacement: 5 Minutes

Video

For a video of this procedure, refer to Replacing a Bezel.

Step 1. Remove the Bezel

To release the bezel, press the Bezel latches inward and pull the bezel forward. See Figure 12-1.

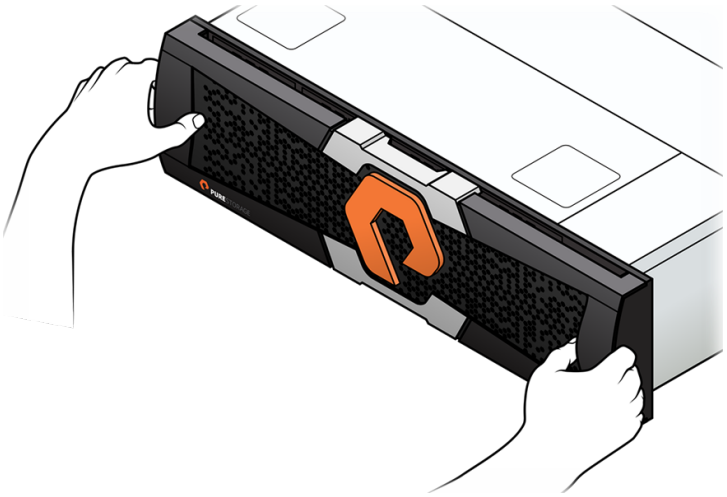

Figure 12-1. Removing the Bezel

Step 2. Install the Replacement Bezel

1. Remove the protective film on the front surface of the bezel.
2. Install the bezel, aligning the power connector with the logo illumination socket on the front panel. See Figure 12-2.

Make sure the asset tag is inserted all the way into its slot or you will be unable to install the bezel.

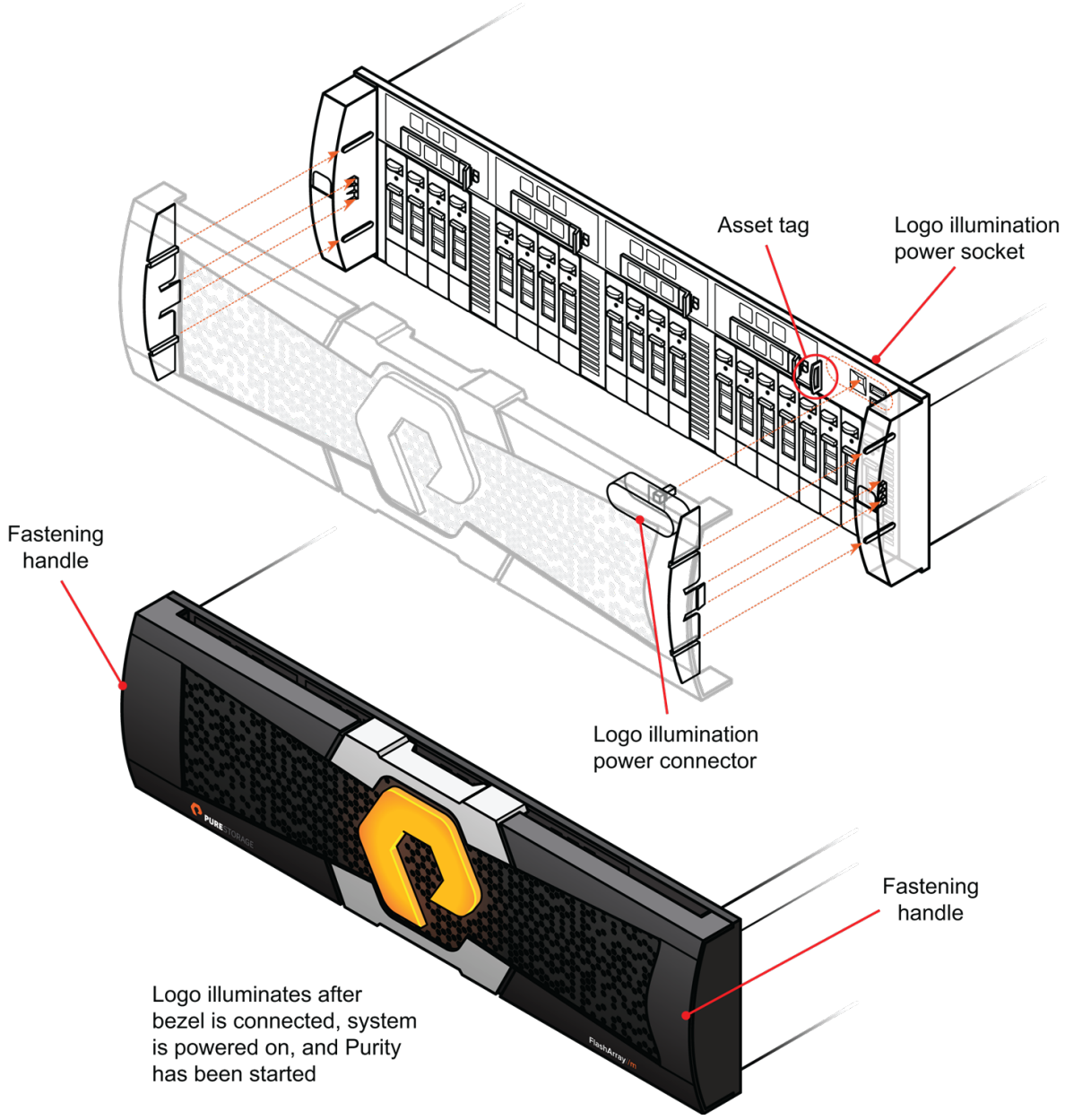

Figure 12-2. Installing the Bezel

This completes the bezel replacement procedure.

Procedure 13: Replacing a Quad-Port SAS Card

Introduction

This chapter describes how to replace a FlashArray//M quad-port SAS card. The card is contained in riser 0 of each FlashArray//M controller. See Figure 13-1 for the location of the quad-port SAS card in the riser.

Instead of removing and replacing the faulty quad-port SAS card, you install a new riser 0 that contains a working quad-port SAS card.

If there are one or more PCIe cards in the old riser, you must remove them and reinstall them in the new riser before installing the riser into the controller.

See below for a detailed description of the replacement procedure.

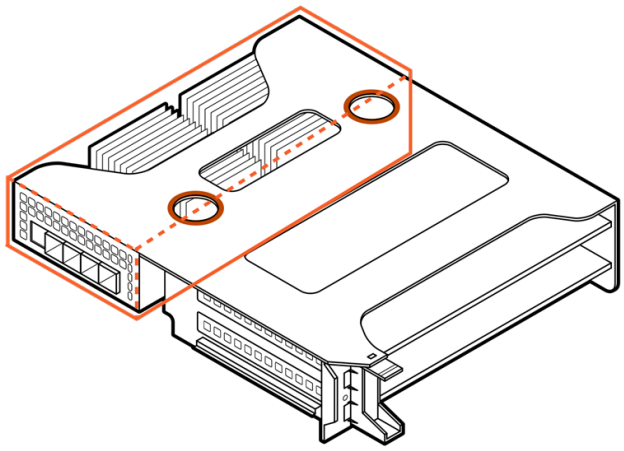

Figure 13-1. Location of Quad-Port SAS Card

- Arrange for Pure Storage Technical Support to prepare the array for controller replacement within 48 hours before the procedure.
- Before you power off a controller in a dual-controller array for live replacement, make sure that either the customer or Pure Storage Technical Support has verified that the backup controller has the required host connections. Enter the `pureport list --initiator` CLI command to display the WWNs and IQNs of hosts that are visible to a controller.

Introduction (Cont'd)

Quad-Port SAS Card Replacement Steps

A ☎ icon indicates you need either login access or assistance from Pure Storage Technical Support.

Introduction (Cont'd)

Required Tools and Equipment (Provided by Pure Storage)

- Replacement riser 0 containing a new quad-port SAS card
- Anti-static wrist strap
- KVM cable (provided in the Accessory Kit that shipped with the FlashArray//M)
- Temporary cable labels

Recommended Tools (Not Provided by Pure Storage)

- Anti-static work area large enough for the equipment, with electrical power available.
- A local console (either a VGA monitor and USB keyboard, or a computer equipped with a serial-to-USB converter and terminal emulation software set to communicate at 115,200 bps, no parity, 8 data bits, and one stop bit).
- Incidental tools (e.g., pliers, Phillips screwdriver).

Return all replaced and unused parts to Pure Storage.

Connecting a Terminal

When instructed to connect a KVM cable to a terminal, use either a VGA monitor and USB keyboard combination or a computer equipped with a serial-to-USB converter set to 115,200 bps, N,8,1, and terminal emulation software.

FlashArray Power During Procedure

If you are installing or replacing a controller on an operating FlashArray//M system, you can perform this procedure while the FlashArray is operating; however, host connectivity might be affected. Pure Storage recommends that you perform all hot replacements during less-critical times when I/O activity to the FlashArray is low.

FlashArrays continue to operate during controller replacement by failing over to the second controller.

If a customer requires you to completely power the FlashArray off during the procedure, follow the instructions in " Appendix A: Powering a FlashArray//M Off and On" on page 139.

Estimated Time for Replacement: 90 Minutes

This includes all unpacking, repair, and repacking tasks. This does not include any optional customer-requested operations such as powering the FlashArray//M off and on.

Step 1. Observe Failure Symptoms ☎

Request that the customer or Pure Storage Technical Support representative use the GUI or CLI to verify a quad-port SAS card failure. Do the following to determine if a controller has failed:

- In the GUI, select **SYSTEM > System Health**. Gray icons at both ends of a SAS connection and all gray icons on a controller that has connected SAS cables might indicate a failure (see Figure 13-2).
- Enter the `purehw list --type sas` CLI command (see Figure 13-3). A response with link speeds of `0.00 b/s` on SAS ports that have connected SAS cables might indicate a failure.

Figure 13-2. GUI Display Showing Quad-Port SAS Card Failure

```
pureuser> purehw list --type sas
Name      Status  Identify  Slot  Index  Speed     Temperature  Details
CT0.SAS0  ok      -         -     0      0.00 b/s  -            -
CT0.SAS1  ok      -         -     1      0.00 b/s  -            -
CT0.SAS2  ok      -         -     2      0.00 b/s  -            -
CT0.SAS3  ok      -         -     3      0.00 b/s  -            -
```

Figure 13-3. CLI Display Showing Quad-Port SAS Card Failure

The indicators above might also occur due to cable failure. Check for SAS cable failures before proceeding with a quad-port SAS card replacement. For more information, see "Replacing a SAS Cable" on page 34.

Step 2. Before You Begin

At least 48 hours before you begin, contact Pure Storage Support so they can make sure the array is ready for the procedure. See the *FlashArray//M Service Guide* page on the Pure1 Knowledge site for more information.

Step 3. Turn On the ID Light

From the Purity CLI, enter the **`purehw setattr --identify`** command (**CT0** shown in the example):

```
pureuser> purehw setattr --identify on CT0
Name  Slot  Index  Identify
CT0   -     0      on
```

Turning on the identify LED helps you to replace the correct controller.

Alternatively, from the Purity GUI, select **System**, mouse over the faulty controller, and select the **Turn on ID Light** button.

Step 4. Check the I/O Balance

Enter the following command to make sure both controllers are serving I/O:

`purehost monitor --balance`

If both controllers are not serving I/O or the controllers appear to have severely unbalanced I/O, contact Pure Storage Technical Support for assistance before you proceed.

Step 5. Set Alert Tags

1. Set an alert tag to notify users of expected failures. This should prevent people from filing unnecessary support cases. See How to suppress alerts for upgrades and maintenance activities for instructions.
2. Enter the following command to make sure the controller you are replacing is secondary:

   `puredb run giveback --safe`

Disconnecting Cables

FlashArray//M Controller Ports

Disconnect the host, Ethernet, and FC cables (ETH0-ETH9 or FC0-FC9) and any other cables (e.g., KVM, USB) that are connected to the old controller ports (see Figure 13-4), as described in the following sections.

Do not refer to any port numbering stamped on add-on cards such as Fibre Channel cards. Refer to the logical port numbering shown below, which matches the GUI numbering.

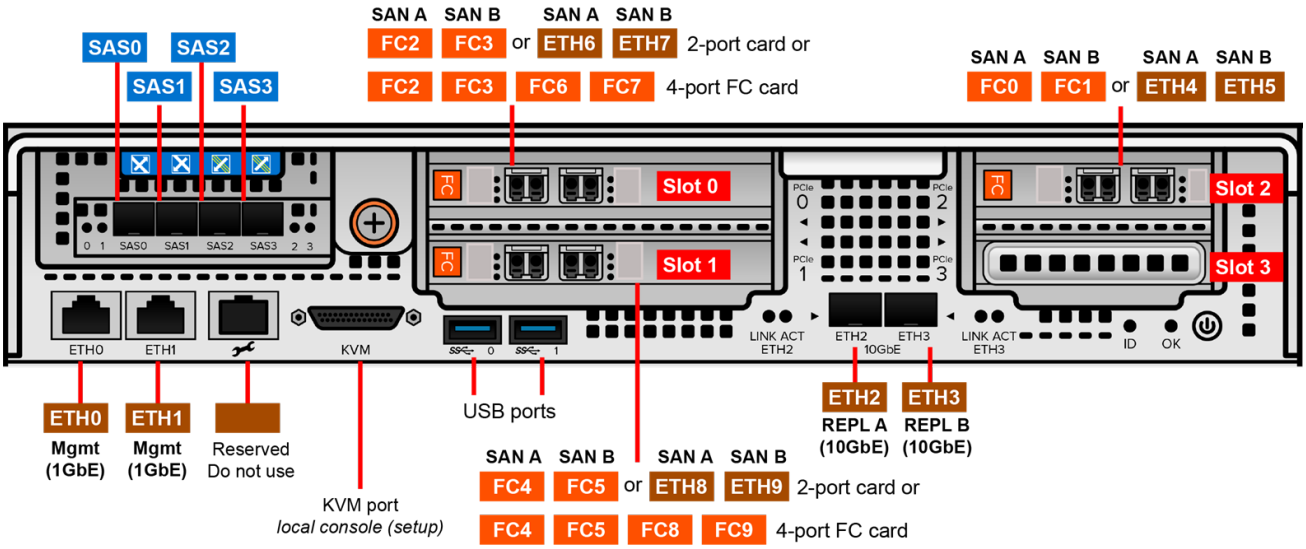

Figure 13-4. FlashArray//M Controller Ports (2-Port PCIe Cards Shown)

Step 6. Disconnect Host Cables

See Figure 13-5 and do the following for each host cable (Fibre Channel shown):

1. Attach a temporary label (included in the replacement kit) to each cable you disconnect, to indicate the number and type of the corresponding port (e.g., FC0).
2. Squeeze the connector latch to release the connector.
3. Pull the connector to remove the cable from the optical transceiver.

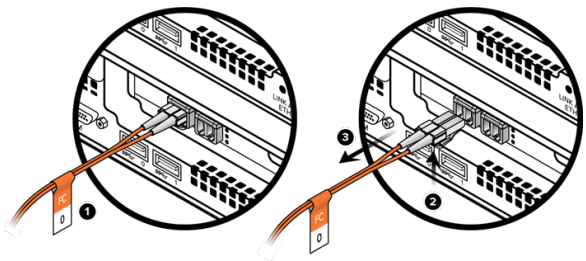

Figure 13-5. Disconnecting a Host Cable (Fibre Channel Shown)

Step 7. Protect Optical Cable Tips

Install two protective caps on each optical cable connector as shown in Figure 13-6.

Pure Storage does not supply host cables or protective caps. Ethernet connectors do not use protective caps.

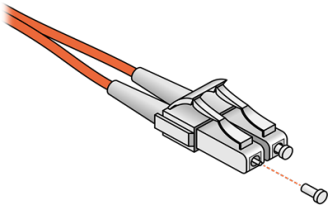

Figure 13-6. Protecting Optical Cable Tips

Step 8. Disconnect SAS Cables

For each connected SAS port

1. Attach a temporary label (included in your replacement kit) to each SAS cable you disconnect (SAS0 through SAS3), to indicate the number and type of the corresponding port. See Figure 13-7.
2. For each connector, pull the plastic tab to disengage the latch. Maintain pressure on the tab and disconnect the connector from the port.

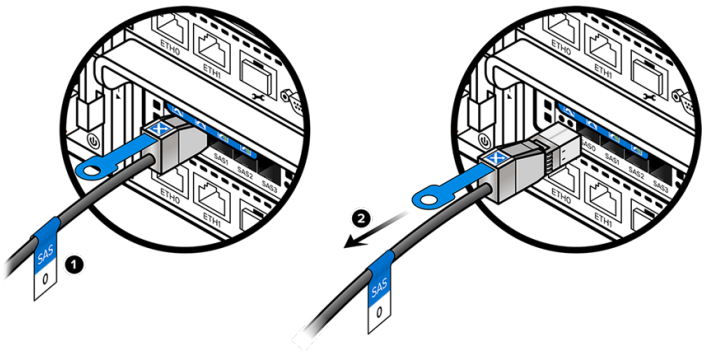

Figure 13-7. Disconnecting a SAS Cable

3. Do not disconnect the other end of each SAS cable.

Be careful when labeling SAS cables. If you install SAS cables incorrectly on the replacement controller, the FlashArray//M might not operate at full performance.

Step 9. Disconnect 1-GbE Cables

1. Attach a temporary label to the 1-GbE cables in port ETH0 and ETH1. See Figure 13-8.
2. Press the cable latch to release the connector and pull the cable from the socket.

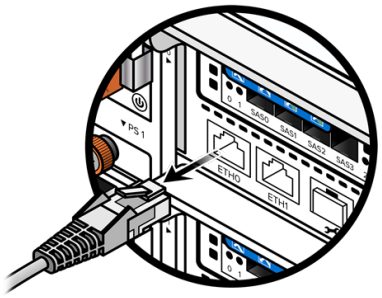

Figure 13-8. Disconnecting 1-GbE Cables

Step 10. Remove the Controller

Do not remove the power cords. The power cords supply power to the entire system and are independent of the controllers.

1. Loosen the orange captive screw on the rear panel of the controller. See Figure 13-9.

Use a Phillips screwdriver to loosen the screw if necessary.

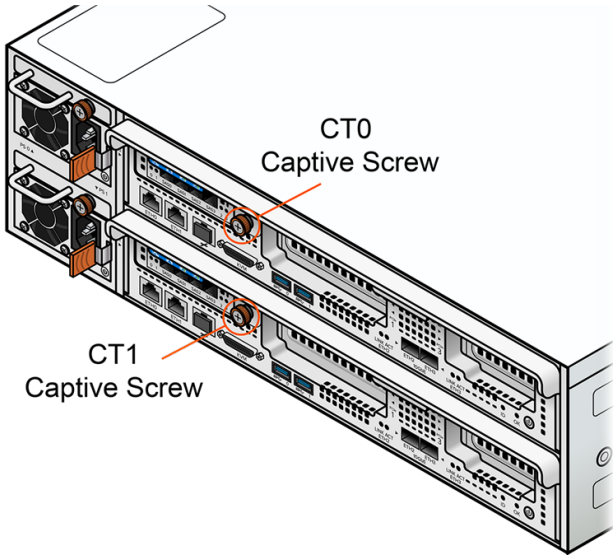

Figure 13-9. Loosening the Captive Screw

2. Rotate the controller retaining bar downward and pull the controller from the chassis. See Figure 13-10.

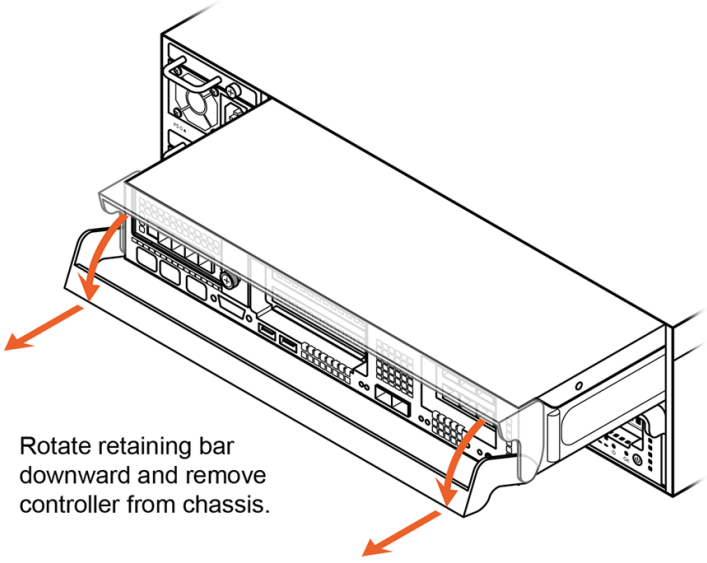

Figure 13-10. Removing the Controller

Step 11. Remove the Controller Lid

1. Place the controller on a clean, flat surface.
2. Press the controller cover pads, slide the cover toward the retaining bar about 1/2 inch, and then lift the cover off. See Figure 13-11.

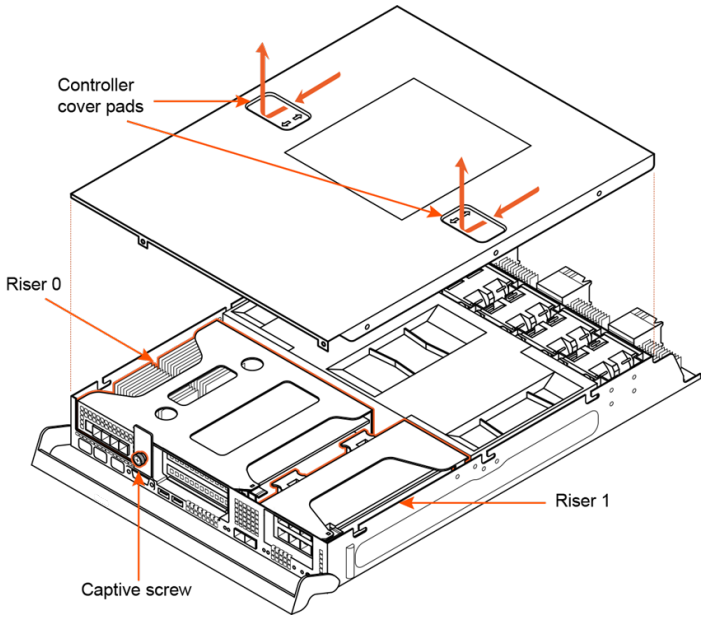

Figure 13-11. Removing the Controller Cover

Step 12. Remove Riser 0

1. Grip riser 0 by the two finger holes as shown in Figure 13-12 and pull it straight up to remove it from the chassis.
2. Set riser 0 aside for return to Pure Storage.

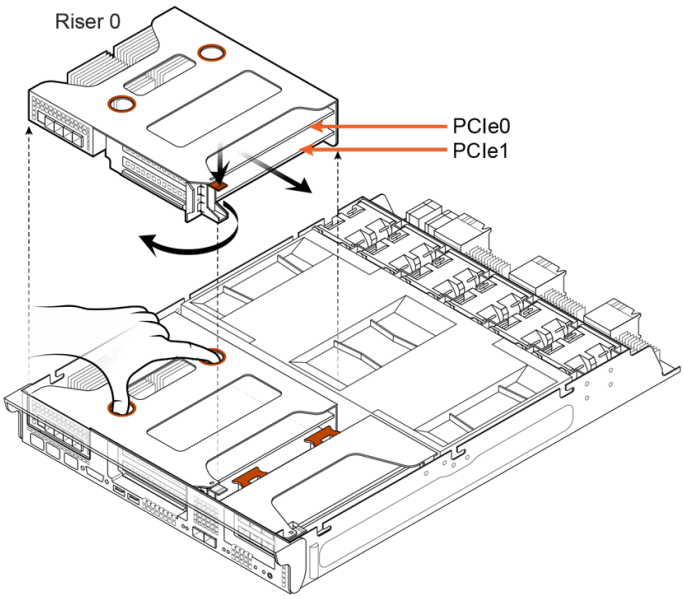

Figure 13-12. Removing Riser 0

Step 13. Remove PCIe Cards

If riser 0 has one or more PCIe cards installed, you must remove the cards and reinstall them into the new riser 0. If there are no PCIe cards in the old riser 0, skip to "Install New Riser 0" on page 113.

⚠ Make sure to observe proper electrostatic handling guidelines when handling PCIe cards. Refer to *FlashArray Safety and Compliance* for more information.

1. Put on the ESD wrist strap (included with the replacement package).
2. Open the retaining clip to remove the PCIe cards from the riser. See Figure 13-13.
3. Carefully remove each PCIe card.
4. Set the PCIe cards aside for reinstallation into the new riser 0.

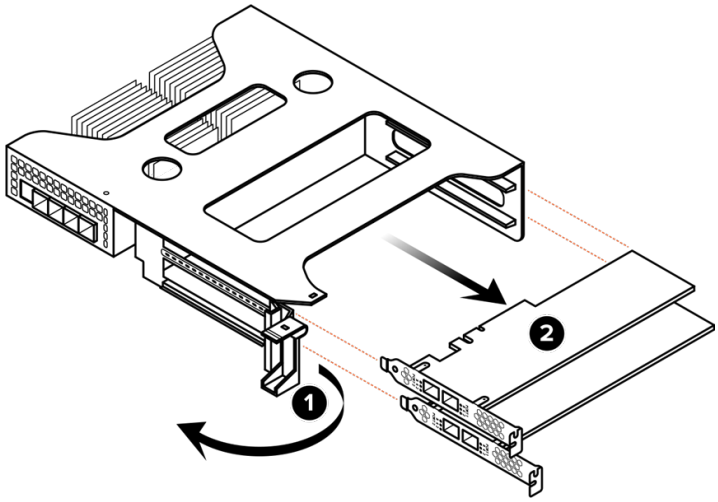

Figure 13-13. Removing PCIe Cards

Step 14. Reinstall PCIe Cards

If you are reinstalling an HBA, see "Appendix B: Reinstalling an HBA" on page 143 for the special steps that are required. Then return to this procedure.

Reinstall the PCIe cards into the same slots that they occupied on the riser you replaced.

1. Set the new riser 0 on a clean, flat surface and open the plastic retaining clip, as shown on Figure 13-14.
2. Remove the filler blanks that cover PCIe slots 0 and 1.
3. Discard the blanks. They are not reused.

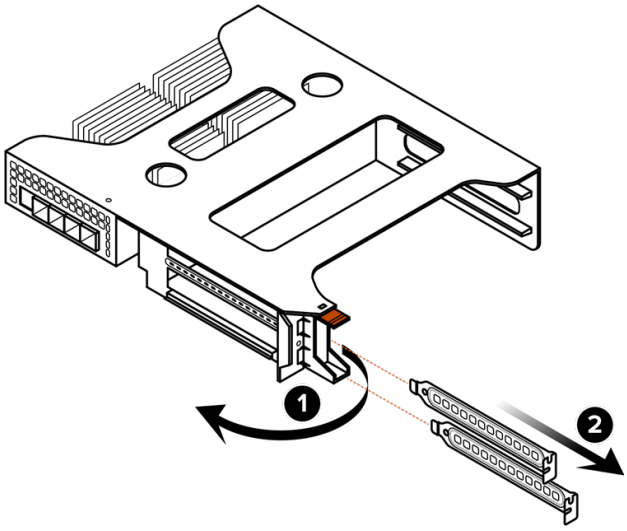

Figure 13-14. Removing Riser 0 Blanks

Step 14. Reinstall PCIe Cards (Cont'd)

4. On the new riser 0, carefully reinstall the PCIe cards, first in slot 1 (the bottom slot) and then in slot 0 (the top slot). Make sure that each card is fully seated in the slot and that its front panel is flush with the front panel of the riser. See Figure 13-15.
5. Close the plastic retaining clip to secure the cards in place.

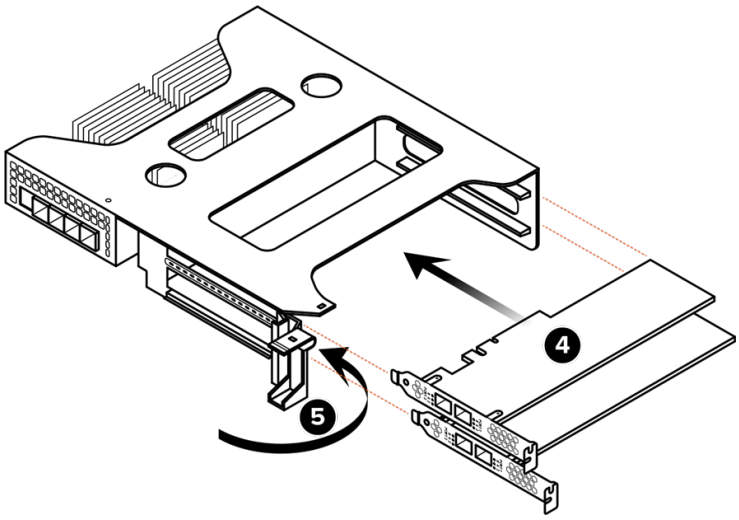

Figure 13-15. Installing PCIe Cards Into Riser 0

Step 15. Install New Riser 0

Install the new riser 0 by gently setting it in place in the chassis and then pressing it down evenly until it is fully seated in its connectors. See Figure 13-16.

Make sure you press the riser down evenly to prevent connecting the leads at an angle.

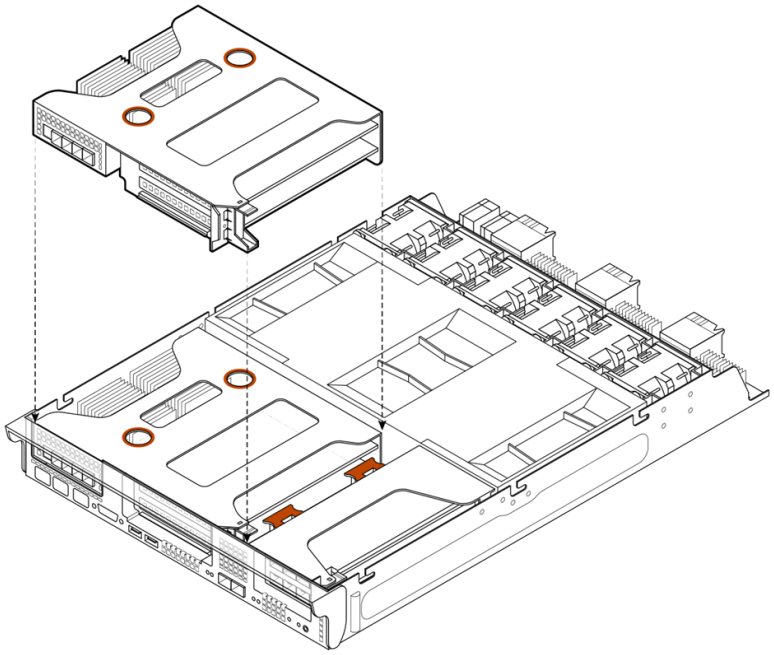

Figure 13-16. Install New Riser 0

Step 16. Reinstall and Restart the Controller

1. Align the pins on the left and right edges of the cover with the slots in the controller body, as shown in Figure 13-17.
2. Lower the cover onto the controller body.
3. Press down on the pads on the controller cover and slide the cover forward about ½" to lock it in place.

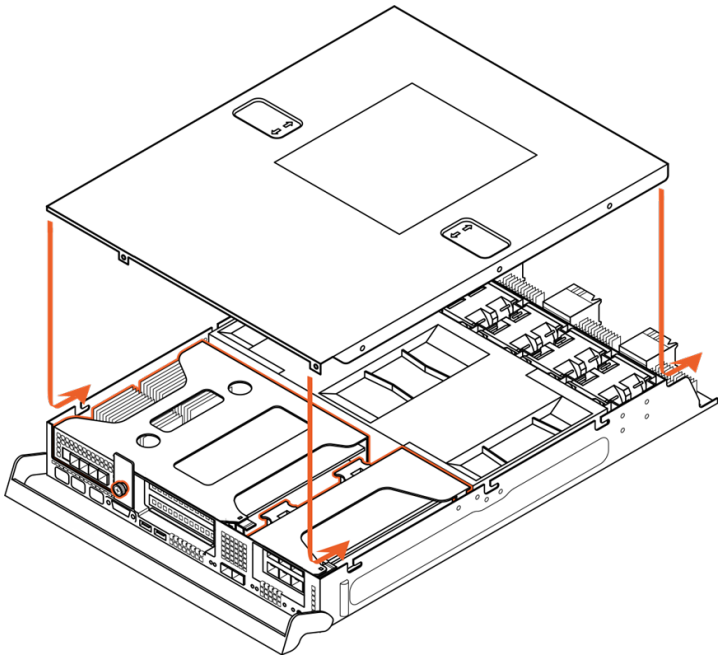

Figure 13-17. Replacing the Controller Cover

4. Align the controller with the controller slot. See Figure 13-18.
5. Keeping the retaining bar in the down position, slide the controller into the slot until the controller panel is flush with the FlashArray//M rear panel.
6. Slide the retaining bar upward until it latches into place.
7. Tighten the controller captive screw.

The controller automatically powers on if power is connected on the FlashArray//M.

8. Reconnect the cables that you labeled and disconnected.

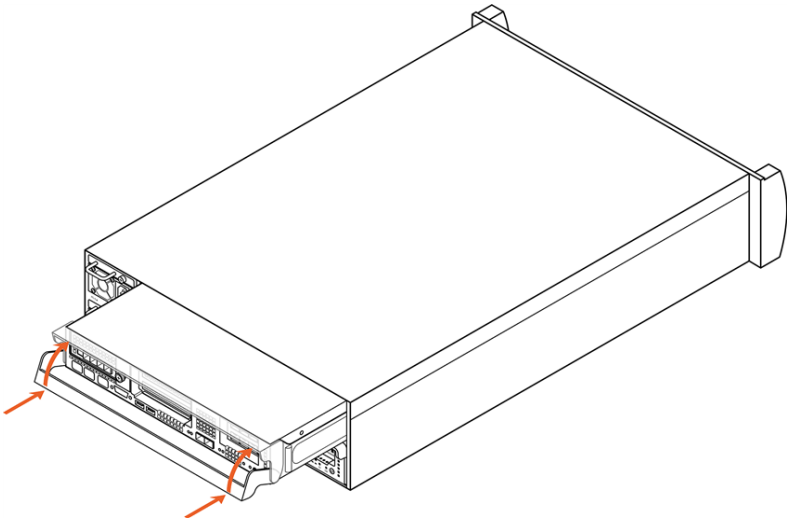

Figure 13-18. Reinstalling the Controller

Step 17. Connect SAS Cables

For each SAS cable you removed

1. Insert the SAS cable connector into the controller port designated by the temporary label attached to the cable.
2. Verify that the label on the connector matches the label of the port (see Figure 13-19).

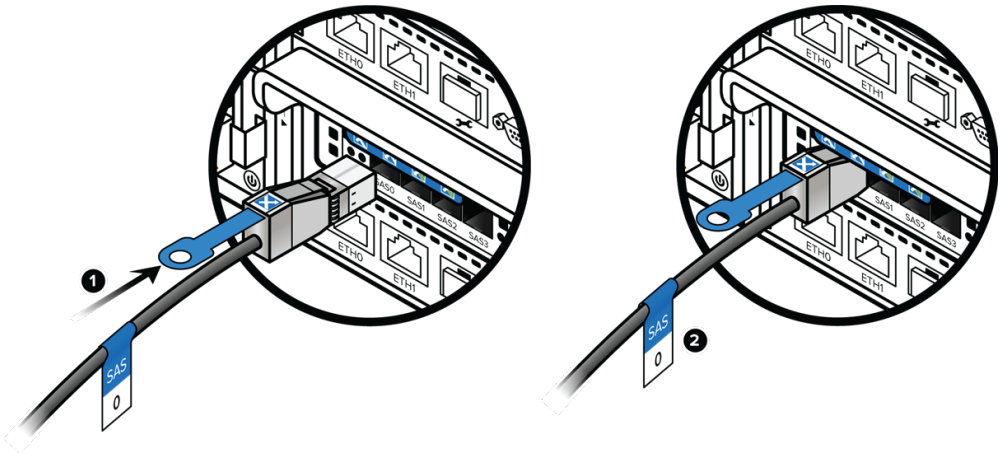

Figure 13-19. Connecting SAS Cables

3. Verify that the connector latch has engaged by pulling the cable gently until resistance is felt.

Do not remove temporary labels until the procedure is complete and you have tested both host I/O and CLI and GUI functionality. After testing, remove all temporary labels.

Step 18. Connect 1-GbE Cables

1. Connect the 1GbE management cable to the **ETH0** port on the controller. See Figure 13-20.
2. Verify that the connector latch is engaged by pulling the cable gently until you feel resistance.
3. Connect the 1GbE management cable to the **ETH1** port on the controller (if a cable was present) and verify it as well.

Do not remove temporary labels until the procedure is complete and you have tested both host I/O and CLI and GUI functionality. After testing, remove all temporary labels.

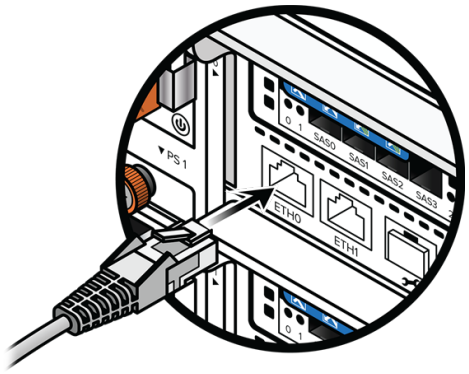

Figure 13-20. Connecting 1-GbE Cables

Step 19. Connect Host and Replication Cables

For each host and replication cable:

1. Make sure that the temporary label on the cable matches the port number.
2. Push the connector into the transceiver (optical) or port socket (10-GbE copper). See Figure 13-21.
3. Verify that the connector latch is engaged by pulling the cable gently until you feel resistance.

Do not remove temporary labels until the procedure is complete and you have tested both host I/O and CLI and GUI functionality. After testing, remove all temporary labels.

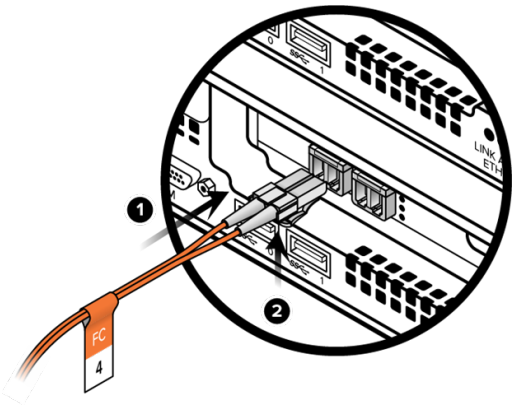

Figure 13-21. Connecting a Host Cable (FC Shown)

Step 20. Verify the Replacement ☎

Request that the customer or Pure Storage Technical Support representative use the Purity GUI or CLI to verify the replacement. See Figure 13-22 for an example of GUI indicators and Figure 13-23 for an example of CLI indicators that reflect an operational quad-port SAS card.

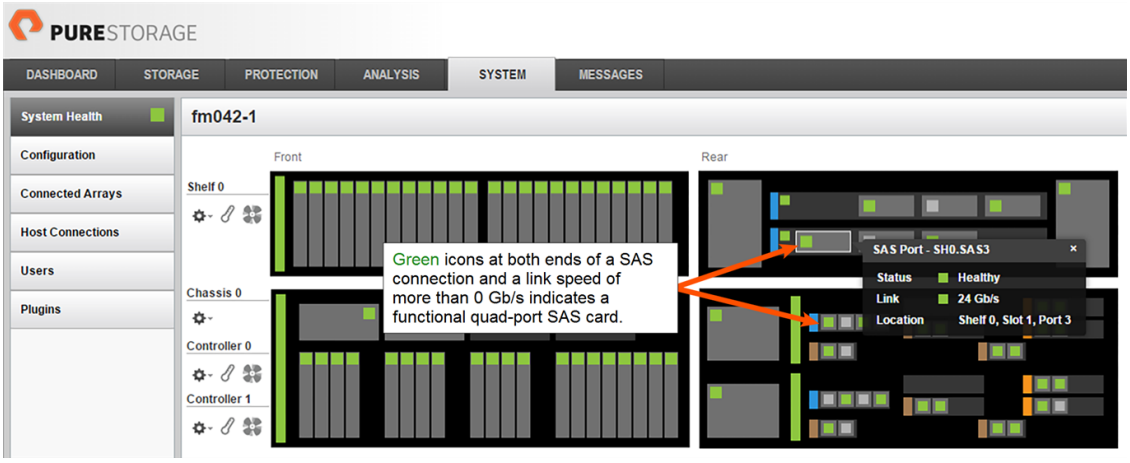

Figure 13-22. GUI Display Showing a Healthy Quad-Port SAS Card

```
pureuser> purehw list --type sas
Name      Status  Identify  Slot  Index  Speed      Temperature  Details
CT0.SAS0  ok      -         -     0      24.00 b/s  -            -
CT0.SAS1  ok      -         -     1      24.00 b/s  -            -
CT0.SAS2  ok      -         -     2      24.00 b/s  -            -
CT0.SAS3  ok      -         -     3      24.00 b/s  -            -
```

Figure 13-23. CLI Display Showing Quad-Port SAS Card Failure

Procedure 14: Replacing PCIe Cards

Introduction

PCIe card slots are installed in removable risers in FlashArray//M controllers. To install PCIe cards in a controller, you must remove the controller from the FlashArray//M chassis and then remove the appropriate riser. Riser 0 contains PCIe card slots 0 and 1. Riser 1 contains PCIe card slots 2 and 3. See "Replacing a Controller" on page 48 for more information on removing and reinstalling controllers.

Slot installation priority is PCIe slot 2, slot 0, and then slot 1. See Figure 14-1 for the slot locations.

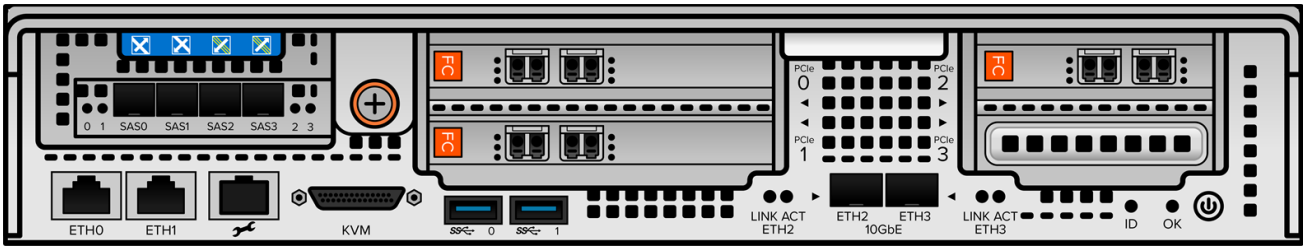

Figure 14-1. FlashArray//M Controller Panel

PCIe slot 3 only supports the InfiniBand card that is provided with FlashArray//M upgrade packages. Pure Storage does not support the installation of PCIe cards in this slot.

PCIe Card Installation Steps

Introduction (Cont'd)

Tools and Equipment (Provided by Pure Storage)

- PCIe cards and optical transceivers for the PCIe card slots. The transceiver types you use depend on the link speed required. Verify that the transceivers you are installing are the correct type for the Fibre Channel or 10-GbE host interface (request assistance from Pure Storage Technical Support if necessary).
- Phillips screwdriver (used if you must replace the PCIe card front bracket).

Recommended Tools (Not Supplied by Pure Storage)

- Anti-static work area large enough for the equipment, with electrical power available.
- ESD protection (e.g., wrist strap) for use while swapping PCIe cards.
- A local console (either a VGA monitor and USB keyboard, or a computer equipped with a serial-to-USB converter and terminal emulation software set to communicate at 115,200 bps, no parity, 8 data bits, and one stop bit).
- Incidental tools (e.g., pliers).

Return all replaced and unused parts to Pure Storage.

FlashArray Power During Replacement

You can replace this component while the array is operating; if, however, the customer wants you to power off the array during the procedure, follow the instructions in " Appendix A: Powering a FlashArray//M Off and On" on page 139.

Estimated Time for Replacement: 30 Minutes

This includes all necessary unpacking, repair, and repacking tasks. This does not include any optional customer-requested operations such as array power off and on.

Supported PCIe Cards

The FlashArray//M system supports the following PCIe cards:

- 2-port 10-Gb Ethernet card with optics
- 2-port 8-Gb Fibre Channel card with optics (not supported on FlashArray//M R2)
- 2-port 16-Gb Fibre Channel card with optics
- 4-port 16-Gb Fibre channel card with optics

Video

For a video of this procedure, refer to Replacing a PCIe Card.

Step 1. Change the PCIe Card Bracket

PCIe cards are shipped with a long bracket installed, which is compatible with PCIe slots 0 and 1 on a FlashArray//M controller. If you are installing a PCIe card in slot 2, you must remove the long bracket and replace it with a short bracket (provided with the PCIe card).

⚠ Make sure to observe proper electrostatic handling guidelines when handling PCIe cards. Refer to *FlashArray Safety and Compliance* for more information.

1. Remove the PCIe card from its antistatic bag and set it down on a clean, flat surface.
2. Being careful not to touch the exposed circuitry on the card, loosen and remove the screws that hold the front bracket to the PCIe card. Set the screws aside. You will use the screws to attach the short bracket. See Figure 14-2.

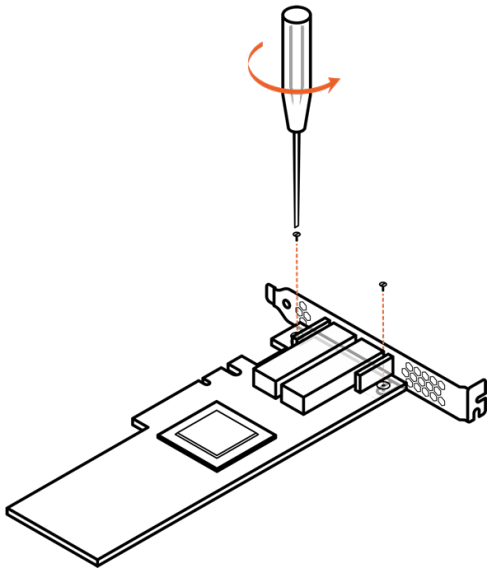

Figure 14-2. Removing the Long Bracket

3. Align the short bracket and tighten the screws into the PCIe card. Make sure that the ports align properly and that the base of the bracket aligns properly with the card. See Figure 14-3.

⚠ Be careful not to overtighten the screws or you might damage the PCIe card.

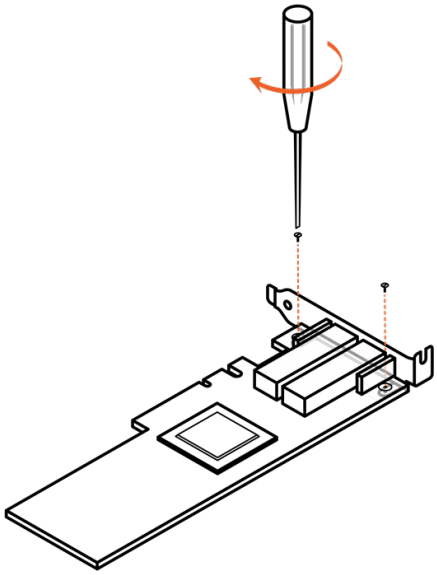

Figure 14-3. Installing the Short Bracket

Step 2. Remove the Controller

Do not remove the power cords. The power cords supply power to the entire system and are independent of the controllers.

1. Loosen the orange captive screw on the rear panel of the controller. See Figure 14-4.

Use a Phillips screwdriver to loosen the screw if necessary.

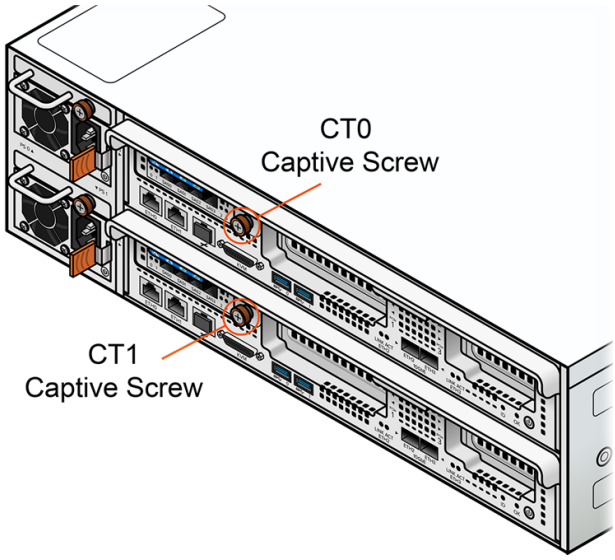

Figure 14-4. Loosening the Captive Screw

2. Rotate the controller retaining bar downward and pull the controller from the chassis. See Figure 14-5.

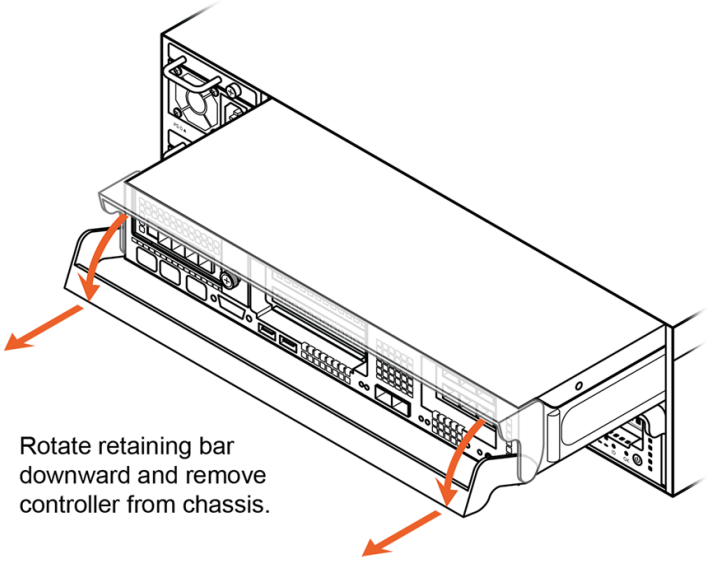

Figure 14-5. Removing the Controller

Step 3. Remove the Controller Lid

1. Place the controller on a clean, flat surface.
2. Press the controller cover pads, slide the cover toward the retaining bar about 1/2 inch, and then lift the cover off. See Figure 14-6.

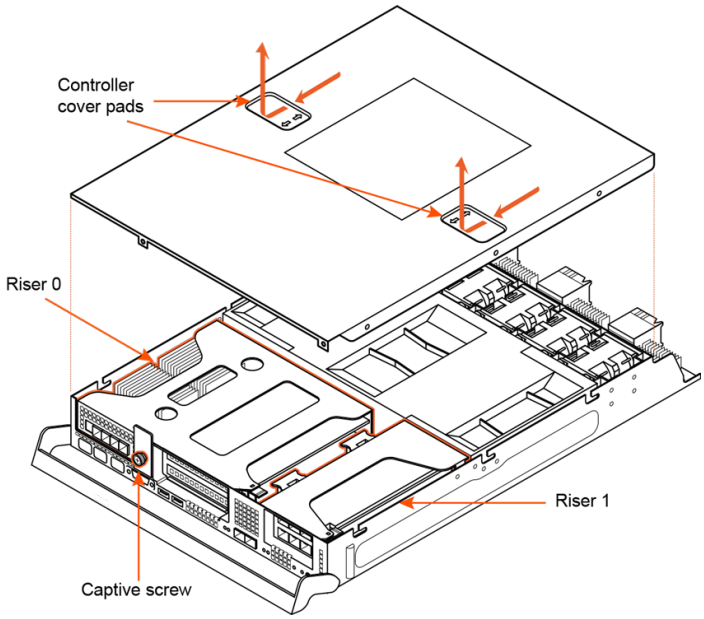

Figure 14-6. Removing the Controller Cover

Step 4. Remove Riser 1

Observe proper electrostatic handling guidelines when handling PCIe cards.

Make sure you remove the correct riser. Slots 0 and 1 are in Riser 0. Slots 2 and 3 are in Riser 1.

PCIe cards are shipped with a long or short front-panel bracket. For Riser 1, make sure the card has the short bracket installed before you begin. If necessary, replace the bracket, as described in "Change the PCIe Card Bracket" on page 121.

1. Use two hands to remove Riser 1. Grip the two finger holds as shown in Figure 14-7, grasp the riser frame, and pull it straight up to remove it from the chassis.
2. Set Riser 1 on a clean, flat surface.

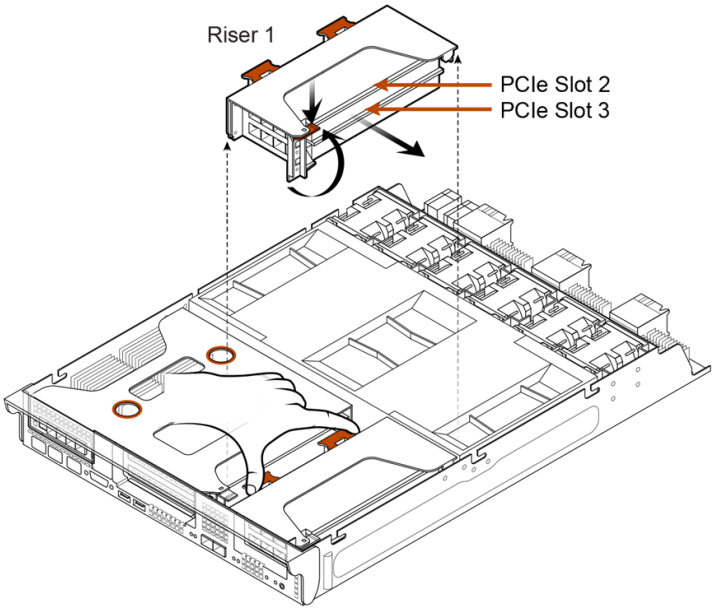

Figure 14-7. Removing Riser 1

Step 5. Remove Blank or PCIe Card from Riser 1

Make sure to observe proper electrostatic handling guidelines when handling PCIe cards. Refer to *FlashArray Safety and Compliance* for more information.

1. Open the plastic retaining clip on the riser.
2. Remove the blank (Figure 14-8) or PCIe card (Figure 14-9) in PCIe slot 2.

   If a blank is present in PCIe slot 3, leave it in place. This slot is reserved.
3. Discard blank. It is not reused. If you removed a PCIe card, set it aside for return to Pure Storage.

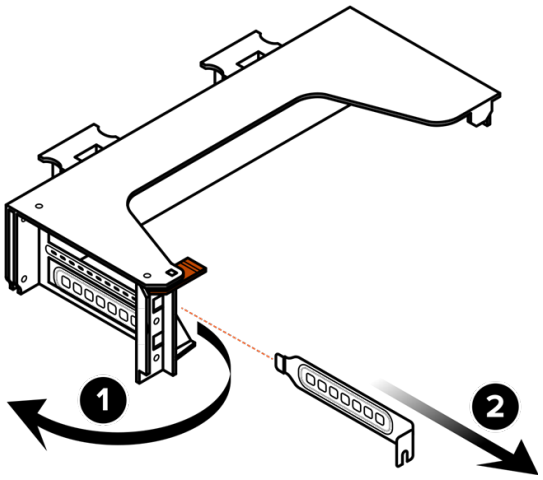

Figure 14-8. Removing Riser 1 Blank

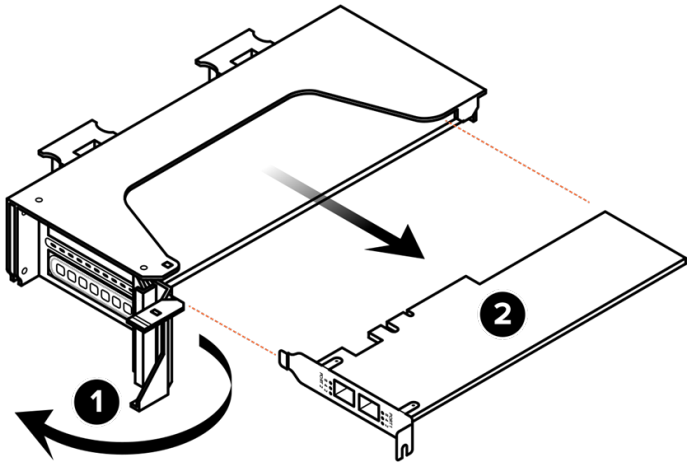

Figure 14-9. Removing Riser 1 Card

Step 6. Install PCIe Card into Riser 1

Make sure to observe proper electrostatic handling guidelines when handling PCIe cards. Refer to *FlashArray Safety and Compliance* for more information.

1. Carefully install the PCIe card. Make sure that the card is fully seated in its connector and that its front panel is flush with the front panel of the riser. See Figure 14-10.
2. Close the plastic retaining clip to secure the card in place.

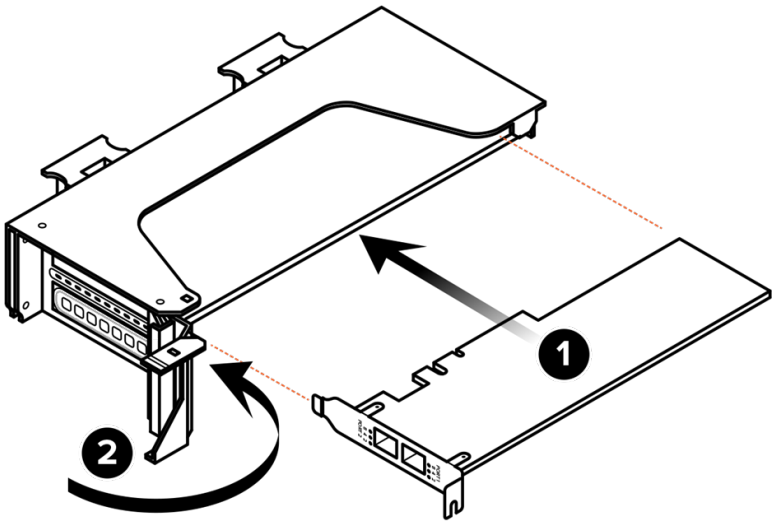

Figure 14-10. Installing a PCIe Card Into Riser 1

Step 7. Remove Riser 0

Make sure you remove the correct riser. Slots 0 and 1 are in Riser 0. Slots 2 and 3 are in Riser 1.

1. Grip Riser 0 by the two finger holes as shown in Figure 14-11 and pull it straight up to remove it from the chassis.
2. Set Riser 0 on a clean, flat surface.

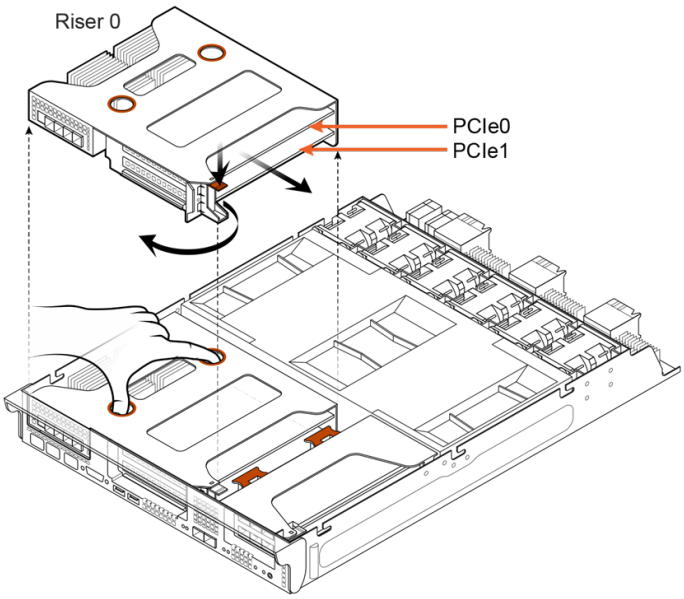

Figure 14-11. Removing Riser 0

Step 8. Remove Blanks or PCIe Cards from Riser 0

⚠ Make sure to observe proper electrostatic handling guidelines when handling PCIe cards. Refer to *FlashArray Safety and Compliance* for more information.

1. Open the plastic retaining clip on the left side of Riser 0.
2. Remove blanks (Figure 14-12) or PCIe cards (Figure 14-13) from PCIe slots 0 and 1.
3. Discard blanks. They are not reused. Set PCIe cards aside for return to Pure Storage.

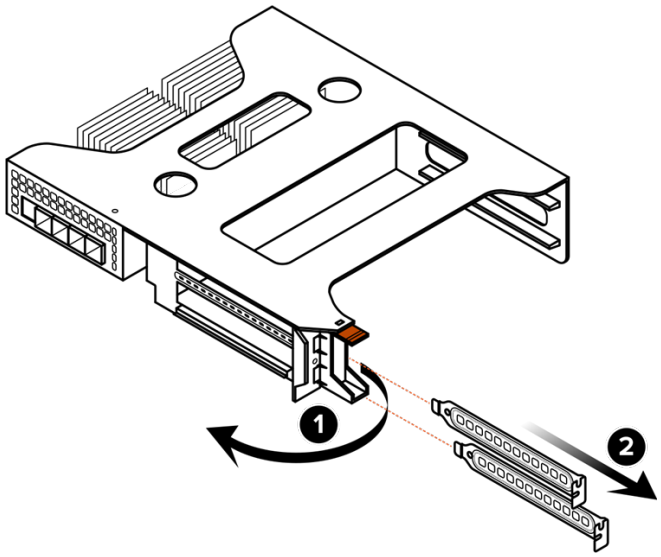

Figure 14-12. Removing Riser 0 Blanks

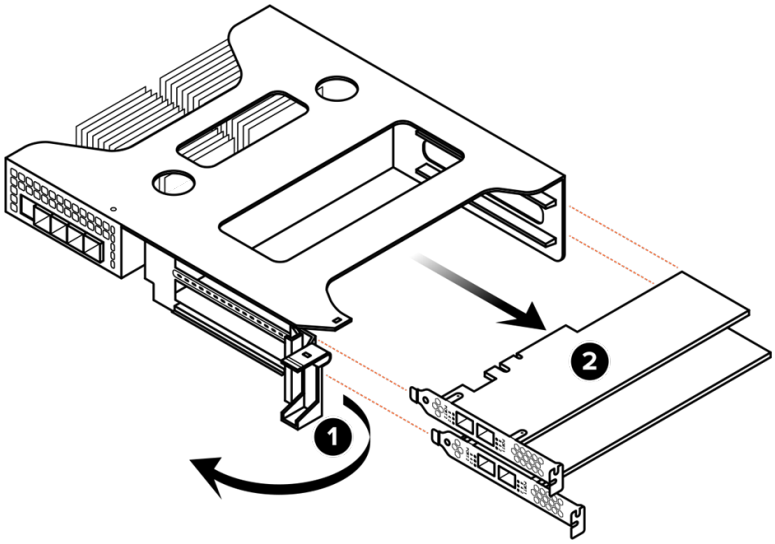

Figure 14-13. Removing PCIe Cards

Step 9. Install PCIe Cards into Riser 0

1. Carefully install the PCIe cards, first in slot 1 (the bottom slot) and then in slot 0 (the top slot). Make sure that each card is fully seated in the slot and that its front panel is flush with the front panel of the riser. See Figure 14-14.
2. Close the plastic retaining clip to secure the cards in place.

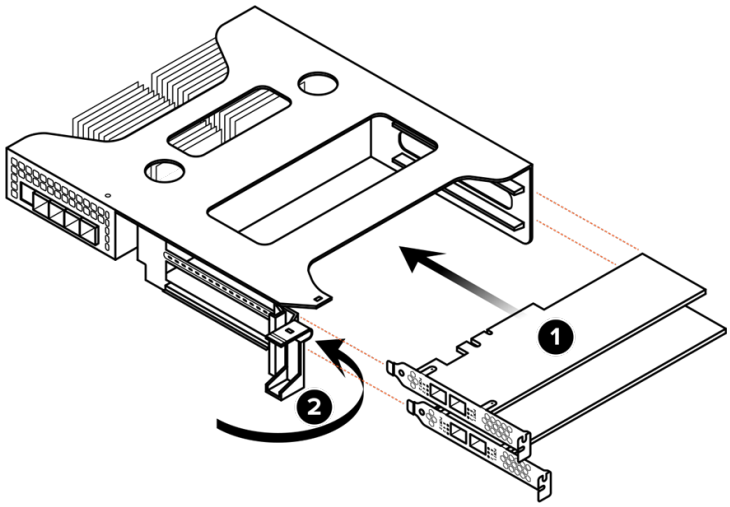

Figure 14-14. Installing PCIe Cards Into Riser 0

Step 10. Reinstall the Risers

Replace each riser by gently setting it in place in the chassis and then pressing it down until it is fully seated in its connectors. See Figure 14-15.

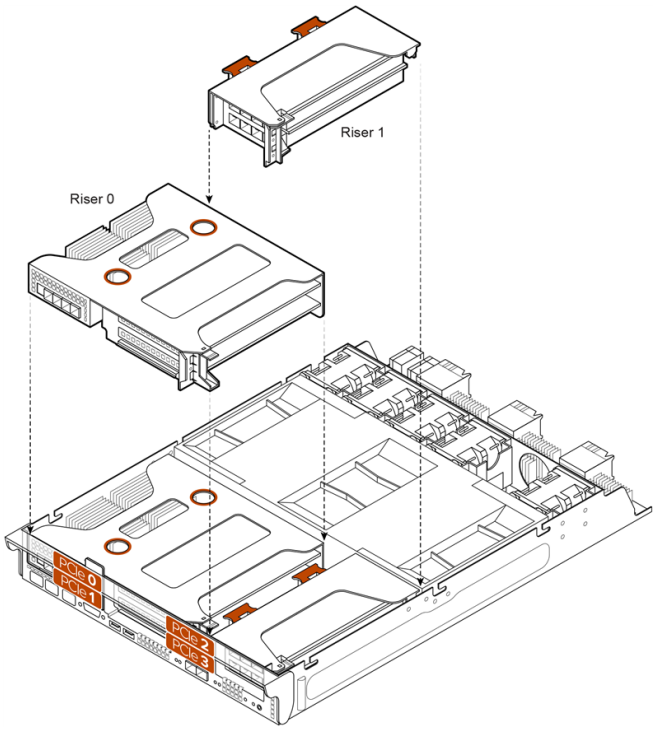

Figure 14-15. Reinstalling the Risers

Step 11. Install Optical Transceivers

Install optical transceivers into the PCIe card slots. See Figure 14-16.

⚠ Disconnected Fibre Channel connectors might emit invisible laser radiation. Do not look directly into connectors.

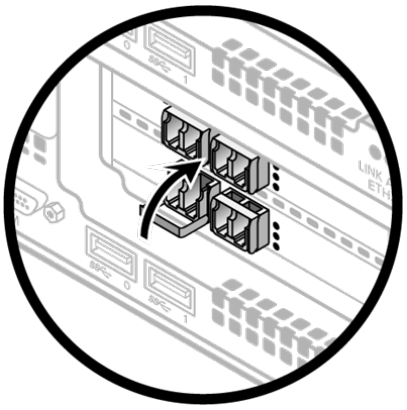

Figure 14-16. Installing Optical Transceivers and Connecting Cables

Step 12. Reinstall and Restart the Controller

1. Align the pins on the left and right edges of the cover with the slots in the controller body, as shown in Figure 14-17.
2. Lower the cover onto the controller body.
3. Press down on the pads on the controller cover and slide the cover forward about ½" to lock it in place.

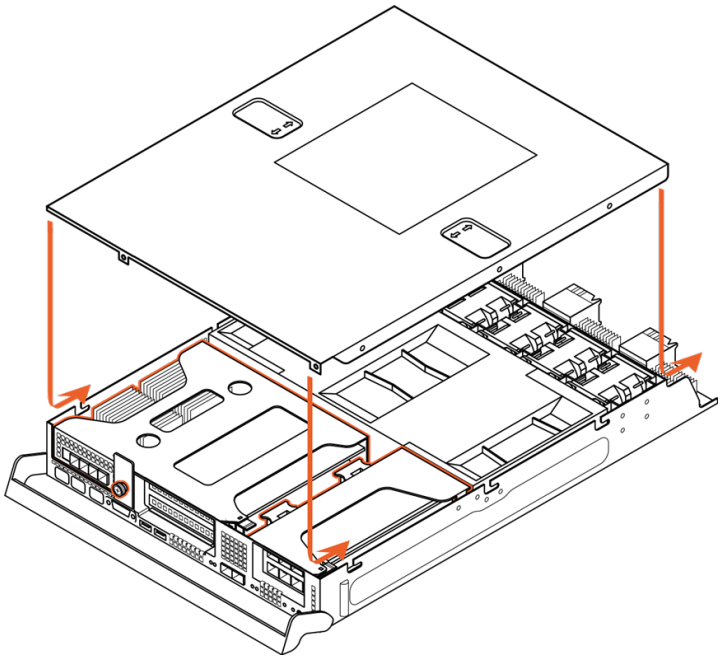

Figure 14-17. Replacing the Controller Cover

4. Align the controller with the controller slot. See Figure 14-18.
5. Keeping the retaining bar in the down position, slide the controller into the slot until the controller panel is flush with the FlashArray//M rear panel.
6. Slide the retaining bar upward until it latches into place.
7. Tighten the controller captive screw.

The controller automatically powers on if power is connected on the FlashArray//M.

8. Reconnect the cables that you labeled and disconnected.

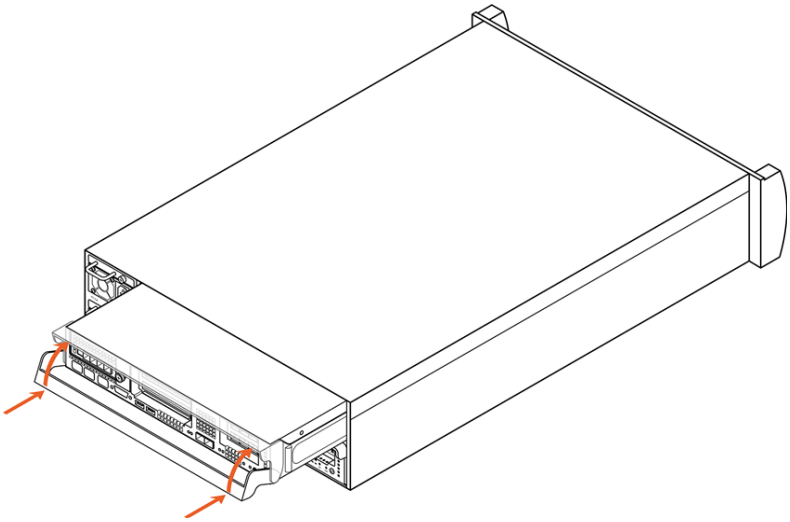

Figure 14-18. Reinstalling the Controller

This completes the PCIe card installation procedure.

Procedure 15: Installing Flash Modules

Introduction

Flash Modules and blanks are provided in 10-packs or as singles. Flash Module and blank 10-packs are included with the FlashArray//M chassis shipments. Flash Module and blank singles are shipped as replacements. See Table 15-1 for a complete listing.

Table 15-1. Flash Module Packages and Singles

Item	Part Number
Flash Modules, 512 GB, 12-pack	80-0393-00
Flash Modules, 1 TB, 12-pack	80-0388-00
Flash Modules, 2 TB, 12-pack	80-0327-00
Blank 12-pack	80-0325-00
Flash Modules, 512 GB, 10-pack	80-0219-00
Flash Modules, 1 TB, 10-pack	80-0220-00
Flash Modules, 2 TB, 10-pack	80-0221-00
Blank 10-pack	80-0222-00
Flash Module, 512 GB, single	80-0232-00
Flash Module, 1 TB, single	80-0233-00
Flash Module, 2 TB, single	80-0234-00
Blank, single	80-0238-00

Flash Module Installation Steps

Video

For a video of this procedure, refer to Replacing a Flash Module.

Step 1. Remove Flash Modules and Blanks

⚠ Make sure you only remove faulty Flash Modules. Leave the others in place.

1. To release the bezel, press the Bezel latches and pull forward. See Figure 15-1.
2. To remove a Flash Module, press the clip with your thumb to unseat the module, and then gently pull it from the slot. See Figure 15-2.

   To remove a blank, grasp it by the retaining clips using your thumb and index finger and gently pull it from the slot.
3. Set the old Flash Module aside for later shipment to Pure Storage.

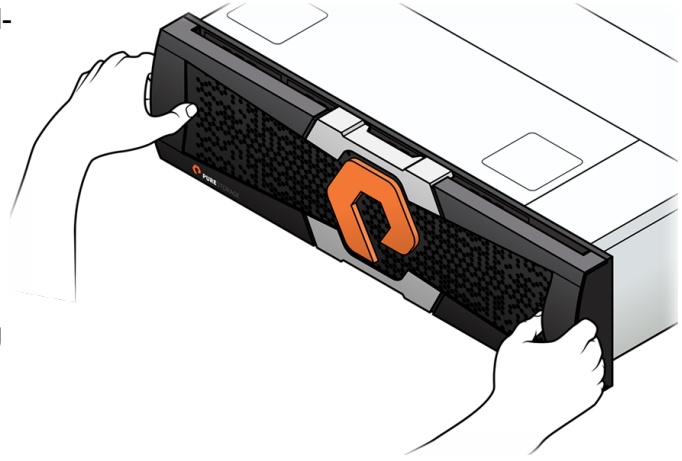

Figure 15-1. Removing the Bezel

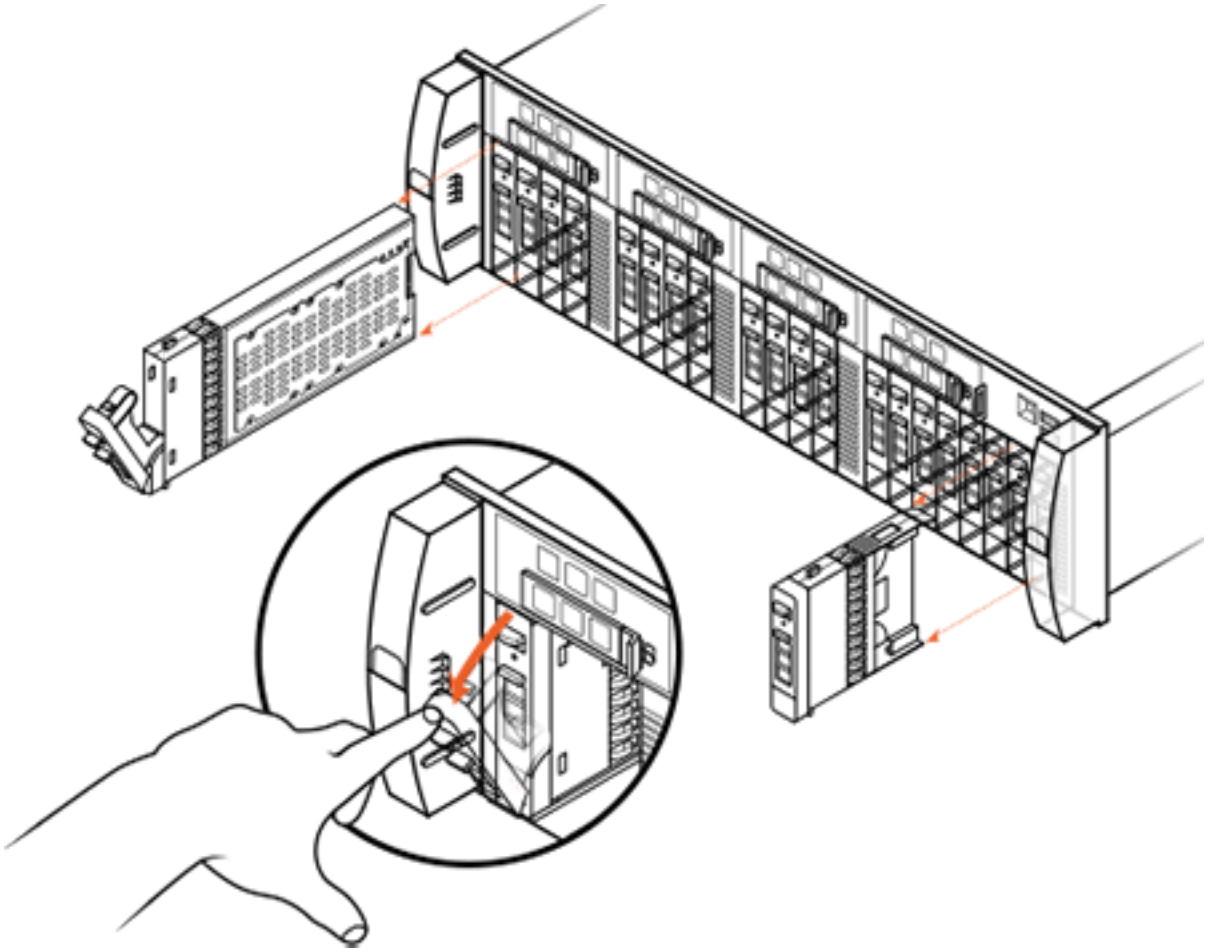

Figure 15-2. Removing Flash Modules and Blanks

Step 2. Install Flash Modules

⚠ Make sure you install compatible Flash Modules or blanks. The Flash Module label shows the density (i.e., 512 GB, 1 TB, or 2 TB) and the text "FM" (see Figure 15-3).

⚠ Flash Modules are packed in electrostatic safety bags. Make sure to observe proper electrostatic handling guidelines when removing and installing Flash Modules.

Make sure all unused slots are filled with blanks.

1. Remove the Flash Module or blank from the package.
2. To install a Flash Module, open the Flash Module latch with your thumb or index finger and slide the Flash Module into the slot, closing the latch after you seat it. See Figure 15-3.

   To install a blank, slide the blank into the slot until the blank front panel is flush with the chassis front panel. Blanks do not have a latching mechanism.

If you are installing multiple Flash Modules or blanks, install them from left to right, starting with the lowest open slot. Install all 10 Flash Modules or blanks in the pack.

3. Make sure that Flash Modules and blanks are fully inserted. You can verify that Flash Modules are seated by pulling gently until you feel resistance.

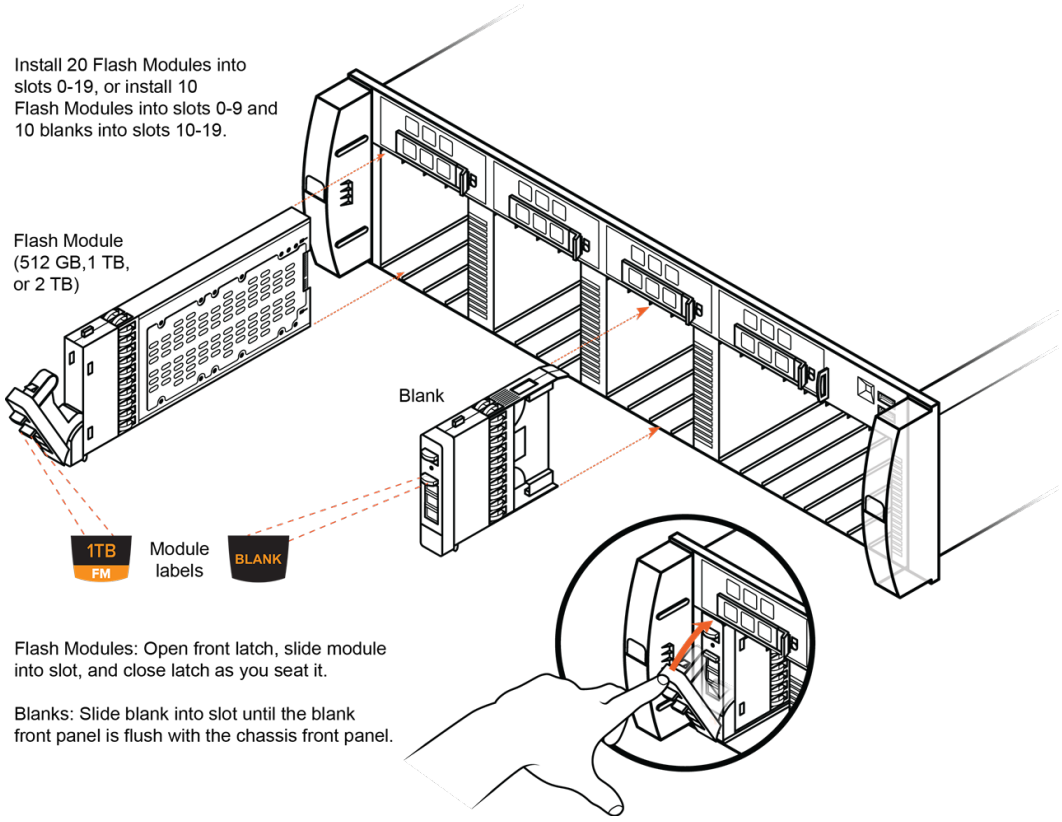

Figure 15-3. Installing Flash Modules

Step 3. Reinstall the Bezel

Reinstall the bezel, aligning the power connector with the logo illumination socket on the front panel. See Figure 15-4.

Make sure the asset tag is inserted all the way into its slot or you will be unable to install the bezel.

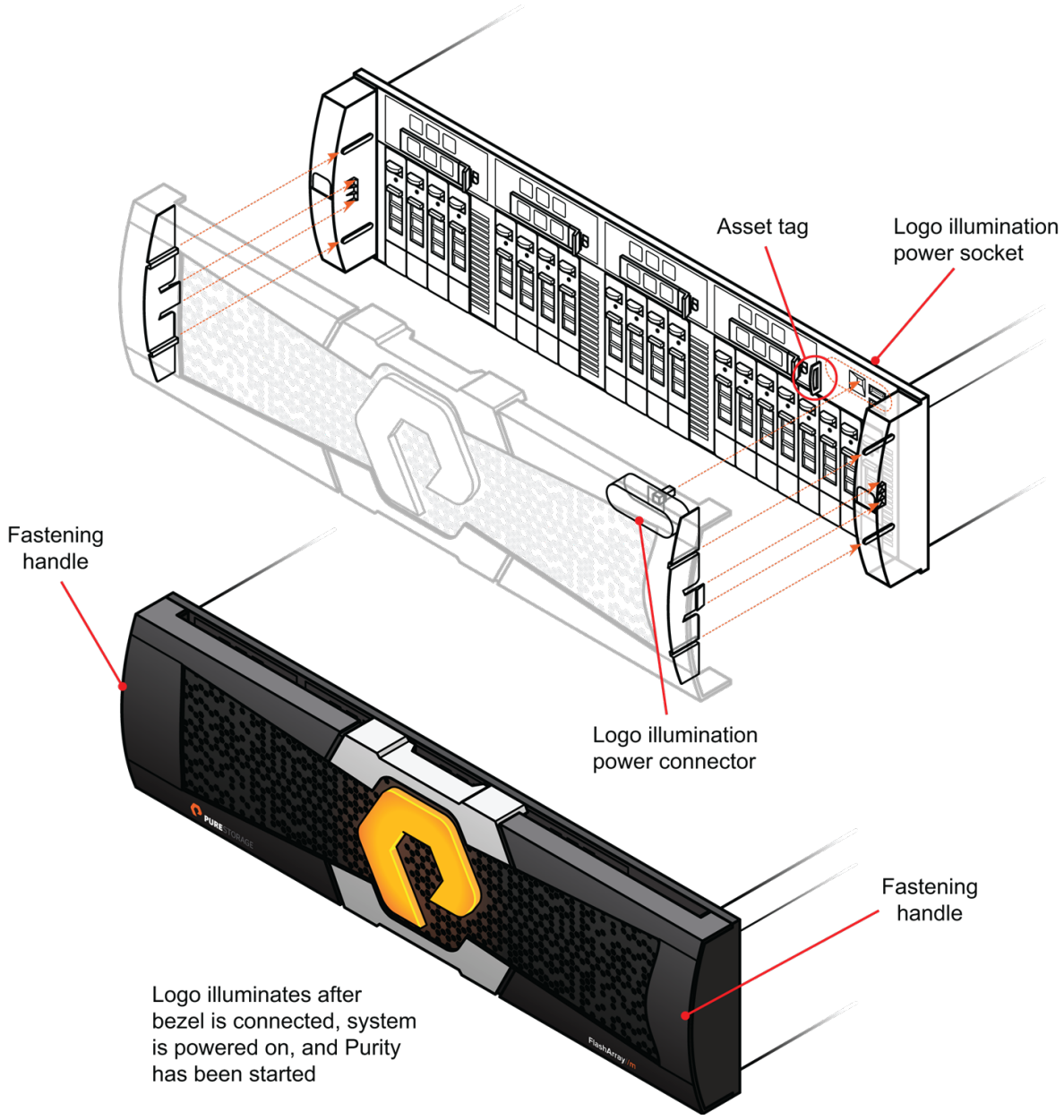

Figure 15-4. Reinstalling the Bezel

This completes the Flash Module installation procedure.

Procedure 16: Installing Rails

Introduction

FlashArray//M includes two rails, labeled right and left. The rails have locating pins (for square- and round-hole racks) or positioning studs (visible if you unscrew and remove the locating pins for threaded-hole racks) that you align with the holes in the rack.

Install all rails before mounting controllers and storage shelves.

Four screws and two cage nuts are required for the installation of the rails and chassis. One spare screw and one spare cage nut are provided.

Install Rails

1. (Square-hole racks only) Install the #10-32 cage nuts (from the Accessory Kit) on the front of the rack, as shown in Figure 16-1.

On round-hole racks, use clip nuts (not provided by Pure Storage) instead of cage nuts.

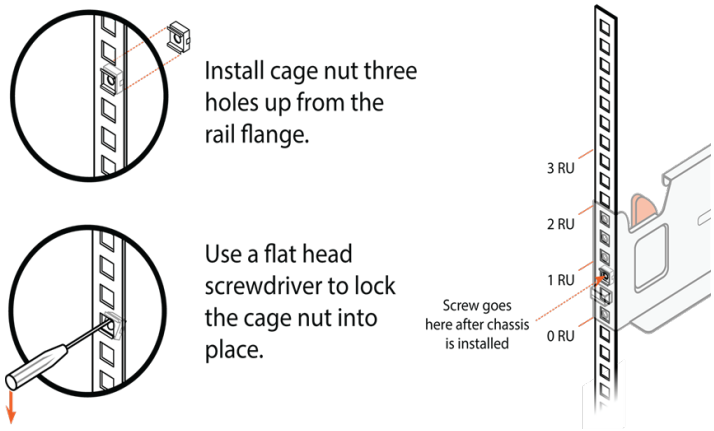

Figure 16-1. Installing Cage Nuts

2. Install one of the two rails (the installation order does not matter) by pulling the spring-loaded lever back and inserting the locating pins or positioning studs in the front mounting post at the desired height. Release the lever once the rail is in place. See Figure 16-2.

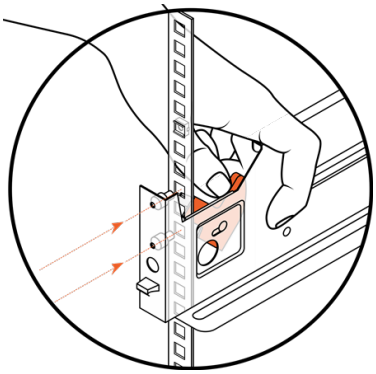

Figure 16-2. Installing a Rail (Front Post)

Step 0. Install Rails (Cont'd)

3. Extend the rear of the rail until the locating pins or positioning studs reach the rear mounting post, and press the rail into the rear post until the latch engages. See Figure 16-3 (left rail shown).
4. Install the second rail.

⚠ Make sure to install the rear of each rail into the post holes that are at the same height as the holes being used on the front post. Otherwise, the chassis might slide off the rails causing personal injury and damage to the FlashArray//M.

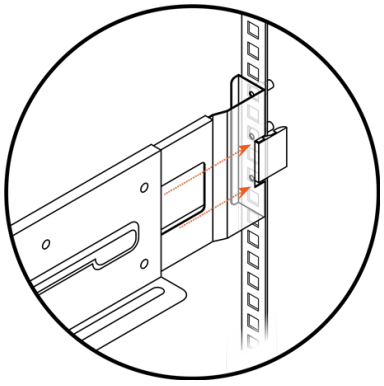

Figure 16-3. Installing a Rail (Rear Post)

This completes the rail installation procedure.

Appendix A: Powering a FlashArray//M Off and On

Appendix A: Powering a FlashArray//M Off and On

You can perform most FlashArray service operations while the FlashArray is online. For some procedures, you might have to remove an affected controller or power a FlashArray off. In addition, a customer might want FlashArrays powered off for service, whether or not this is actually required. To power off a FlashArray for service, perform the procedure below.

When powering off a FlashArray//M, power off the chassis before powering off add-on shelves.

When powering on a FlashArray//M, power on add-on shelves and wait 10 seconds before powering on the FlashArray//M chassis.

Powering Off Arrays and Shelves

Power off the FlashArray//M before powering off any add-on shelves (if any are installed).

Powering Off a FlashArray//M

1. Unwrap the captive strap from each power plug. See Figure 17-1.
2. Remove power plug from PSU socket 0.
3. Remove power plug from PSU socket 1.

You are not required to shut Purity down or switch a controller off before removing the power plug.

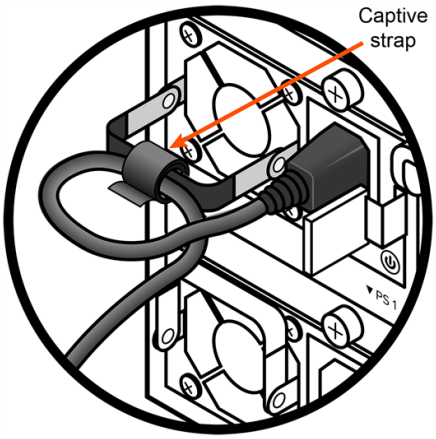

Figure 17-1. Removing the Captive Strap

Powering Off a Storage Shelf

Turn both PCM power switches to the off (O) position. See Figure 17-2.

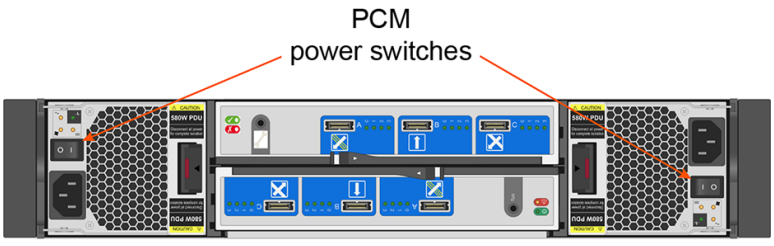

Figure 17-2. PCM Power Switches

Powering On Arrays and Shelves

Power on add-on shelves (if any are installed) before you power on the FlashArray//M.

Powering On an Add-on Shelf

Power on add-on shelves, starting with the lowest ID number and proceeding to the highest.

1. Plug power cords into add-on shelf PCMs, secure with wrap-around collars (see Figure 17-3), and connect cords to rack power.
2. Connect all SAS cables from the shelf to the FlashArray//M. See the FlashArray//M SAS Cabling diagram in the *Add-on Shelf Quick Installation Guide* for cabling instructions.
3. Switch the PCM power switch on (—) and wait 10 seconds before proceeding.
4. Verify that the four LEDs next to the shelf IOM SAS ports on each shelf that is connected to a cable are illuminated. LEDs might blink due to I/O activity. See Figure 17-4.

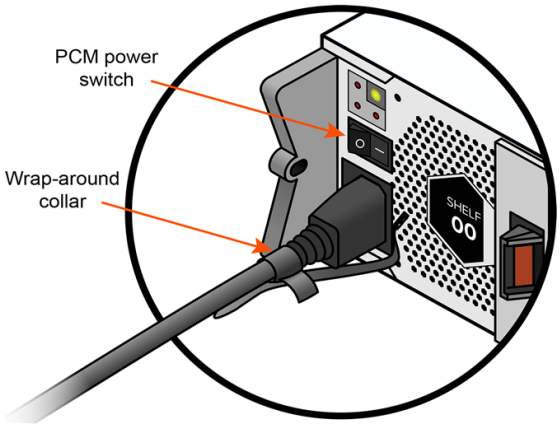

Figure 17-3. Powering On the Add-on Shelf

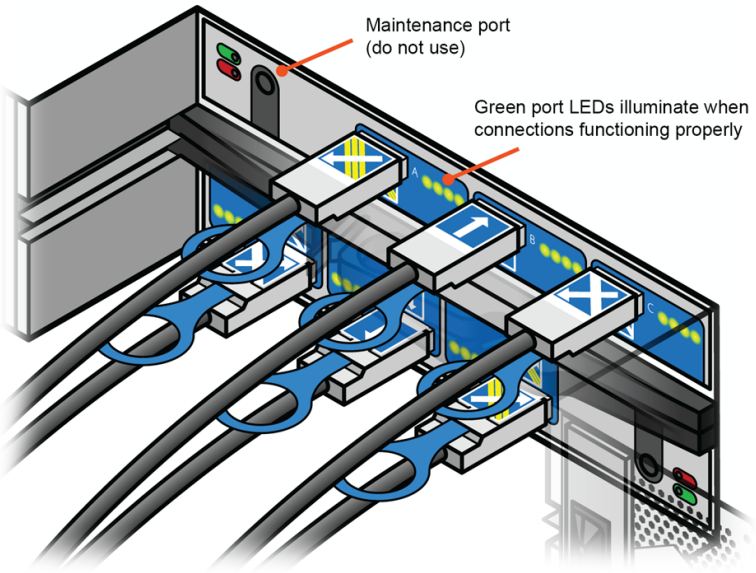

Figure 17-4. Checking SAS Connections

Power on Arrays and Shelves (Cont'd)

Powering On a FlashArray//m

Power on PS0 and PS1 as follows (Figure 17-5 shows PS0):

1. Connect the PS0 power cord to the PS0 power connector and secure the connector to the chassis as follows:
   - Lower the power supply handle.
   - Make a loop in the power cord near the plug and wrap the captive strap around the loop.
   - Insert the plug into the power supply socket.

Securing the captive strap prevents you from accidentially disconnecting power to the system.

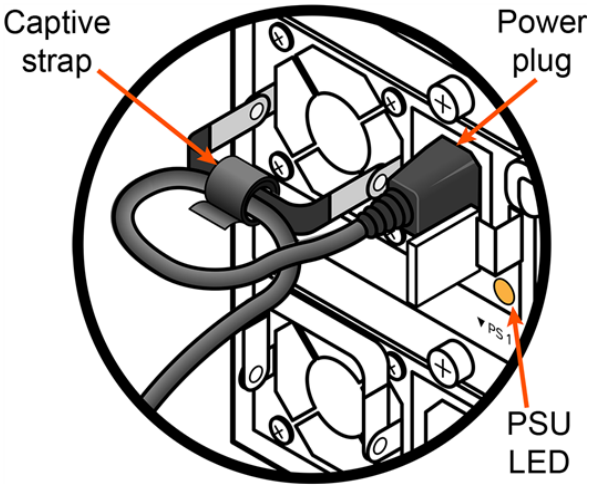

Figure 17-5. Securing the Power Cord

2. Connect and secure the PS1 power cord as described in step 1.
3. Connect the PS0 power cord to the AC power distribution unit (PDU). After you connect the power, the controller LEDs illuminate and the controller fans start.
4. Connect the PS1 power cord to a separate AC PDU to ensure redundancy.
5. Refer to the Pure Storage software documentation for information on configuring and starting the Purity software.

If LEDs do not illuminate, make sure that the add-on shelves and FlashArray//M are powered on, and check SAS connections before contacting Pure Storage Technical Support for assistance.

Appendix B: Reinstalling an HBA

Appendix A: Reinstalling SAS HBAs

During a quad-port SAS card replacement, if the old riser 0 contains an HBA, there are special instructions for reinstalling it into a quad-port SAS card. After you remove the old riser 0, perform the following steps to reinstall the HBA into the quad-port SAS card, and then resume installing the new riser 0 at "Install New Riser 0" on page 113.

Install the HBA into PCIe Slot 1

1. Open the plastic retaining clip on the left side of riser 0, as shown on Figure 18-1.
2. Rotate the plastic retaining clip outward.
3. Remove the filler blanks that cover PCIe ports 0 and 1 and discard them. They are not reused.
4. Turn riser 0 upside down and set it down on the working surface.

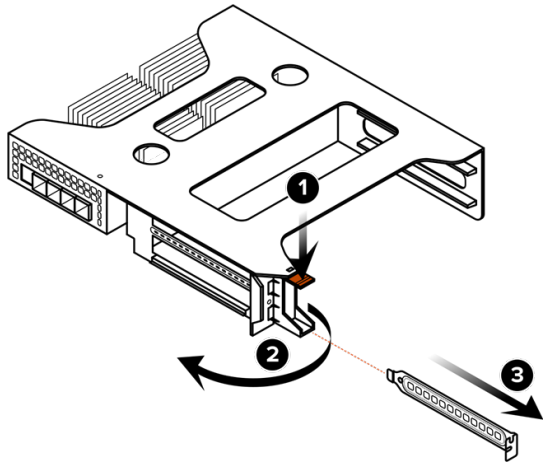

Figure 18-1. Removing Riser 0 Blanks

5. Tip the HBA slightly and extend the ports of the card through the slot 1 aperture on riser 0. Do not insert the card into the slot yet. See Figure 18-2.

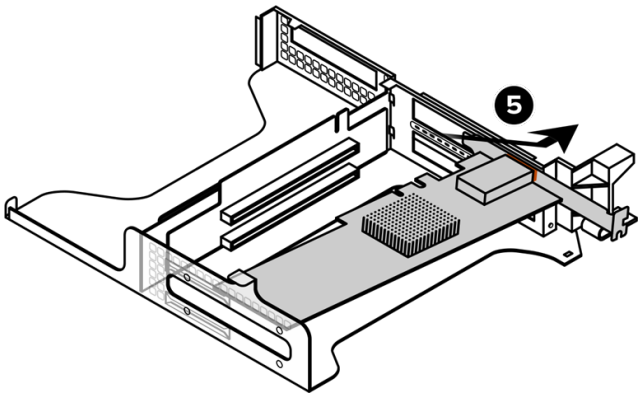

Figure 18-2. Inserting Ports Through Aperture

Install the HBA into PCIe Slot 1 (Cont'd)

6. Lower the rear of the HBA and align the edge with the plastic guides. See Figure 18-3.

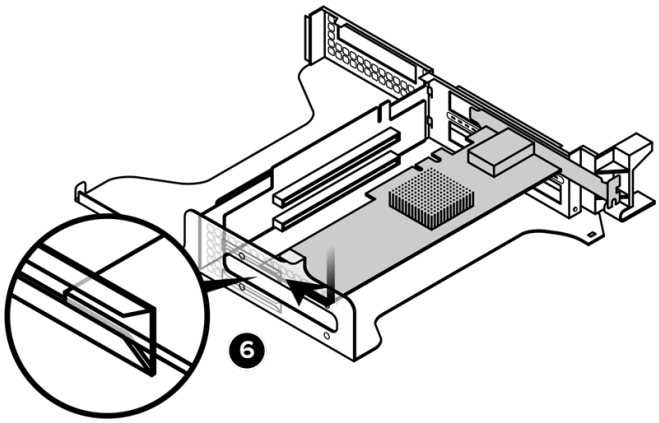

Figure 18-3. Aligning HBA with Guides

7. Slide the HBA between the plastic guides and into the slot. See Figure 18-4. Make sure that you do the following:
   - Fully engage the HBA connector leads.
   - Fully seat the HBA front bracket, with the tab inserted and the outer edge of the card flush with the outer edge of the riser (next to the retaining clip).

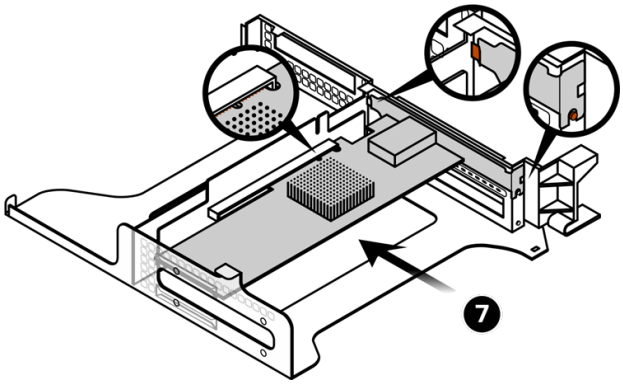

Figure 18-4. Inserting the HBA

Pure Storage, Inc.
Twitter: @purestorage

650 Castro Street, Suite 260
Mountain View, CA 94041
T: 650-290-6088
F: 650-625-9667

Sales: sales@purestorage.com
Support: support@purestorage.com
Media: pr@purestorage.com
General: info@purestorage.com