

# PS SERIES STORAGE ARRAYS HARDWARE MAINTENANCE

MODELS 50E TO 400E



Copyright © 2004 - 2006 EqualLogic, Inc.

September 2006

EqualLogic is a registered trademark of EqualLogic, Inc.

All trademarks and registered trademarks mentioned herein are the property of their respective owners.

Possession, use, or copying of the documentation or the software described in this publication is authorized only under the license agreement.

EqualLogic, Inc. will not be held liable for technical or editorial errors or omissions contained herein. Information in this document is subject to change.

Part Number: 110-0003-R6

# Table of Contents

---

<b>Preface</b> .....	<b>v</b>
Audience .....	v
Organization .....	vi
Conventions .....	vi
Documentation and Technical Support .....	vii
Warranty Information .....	viii
Restricted Access Requirement .....	viii
Regulatory Agency Notice and Notes .....	viii
<b>1 Basic Array Information</b> .....	<b>1-1</b>
Front and Back Panels .....	1-1
Interpreting LEDs .....	1-2
Using an Electrostatic Wrist Strap .....	1-5
Shutting Down and Restarting an Array .....	1-6
<b>2 Maintaining Disks</b> .....	<b>2-1</b>
Disk Handling Requirements .....	2-1
Identifying Failed Disks .....	2-2
Removing Disks .....	2-2
Installing Disks .....	2-3
<b>3 Maintaining Control Modules</b> .....	<b>3-1</b>
Control Module Handling Requirements .....	3-1
Identifying Control Module Failures .....	3-2
Understanding Failover Behavior .....	3-2
Maintaining Control Module Firmware .....	3-3
Connecting Network Cables .....	3-4
Installing a Control Module .....	3-7
Removing a Control Module .....	3-9
Replacing the Compact Flash Card .....	3-11
Replacing the Cache Battery .....	3-12
Replacing the NVRAM Coin Cell Battery .....	3-15
<b>4 Maintaining Power Supplies</b> .....	<b>4-1</b>
Identifying Power Supply Failures .....	4-1
Identifying the Power Supply Model .....	4-1
Removing a Power Supply .....	4-2
Installing a Power Supply .....	4-3

- 5 Maintaining Fan Trays..... 5-1**
  - Identifying Fan Tray Failures..... 5-1
  - Removing a Fan Tray ..... 5-1
  - Installing a Fan Tray..... 5-2
  
- A Environmental, Power, and Physical Requirements .....A-1**
  
- B Control Module Models.....B-1**
  - Model Face Plates ..... B-1
  - Model Differences ..... B-2
  - Setting Up a Serial Connection ..... B-2
  
- Index..... Index-1**

# Preface

---

This manual describes how to maintain the hardware for EqualLogic PS Series 50E to 400E storage arrays. Each array contains hot-swappable fans and power supplies, up to fourteen RAID-protected disks, and single or dual hot-swappable control modules, each with three Gigabit Ethernet interfaces.

With one or more PS Series storage arrays, you can create a PS Series group—a self-managing, iSCSI storage area network (SAN) that is affordable and easy to use, regardless of scale. To install the array hardware and set up a group, see the PS Series 50E to 400E *QuickStart*.

**Note:** For PS Series 50E to 400E storage arrays, PS Series Firmware Version 2.2 and higher firmware versions support the Type II control module, which can be identified by a blue face plate and single serial port. The figures in this manual show arrays installed with Type II control modules. However—unless otherwise noted—the information herein also applies to the functionally equivalent Type I control module, which can be identified by a dark gray face plate and two serial ports.

*Do not* mix different control module models in an array. However, a PS Series group can include arrays with Type II control modules and arrays with Type I control modules, if all the arrays are running compatible firmware, as described in the PS Series *Release Notes*.

## Audience

This manual is designed for the administrators responsible for maintaining PS Series 50E to 400E storage array hardware. Administrators are not required to have extensive network or storage system experience. However, it is useful to understand:

- Basic networking concepts
- Current network environment
- User disk storage requirements
- Disk storage management
- RAID configurations

**Note:** Although this manual provides examples of using PS Series storage arrays in some common network configurations, detailed information about setting up a network is beyond its scope.



## Organization

This manual is organized as follows:

- Chapter 1, *Basic Array Information*, describes the PS Series storage array front and back panels, how to interpret LEDs, how to use an electrostatic wrist strap, and how to shut down and restart an array.
- Chapter 2, *Maintaining Disks*, describes how to install and remove disks.
- Chapter 3, *Maintaining Control Modules*, describes how to install and maintain control modules and replace the cache battery, NVRAM coin cell battery, and compact flash card. It also describes the best way to connect network cables to control modules for high performance and availability.
- Chapter 5, *Maintaining Fan Trays*, describes how to install and remove fan trays in an array.
- Chapter 4, *Maintaining Power Supplies*, describes how to determine the type of power supply and how to install and remove a power supply in an array.
- Appendix A, *Environmental, Power, and Physical Requirements*, describes the requirements for an array.
- Appendix B, *Control Module Models*, explains the differences between a Type I control module and a Type II control module.

## Conventions

Conventions used in the manual are shown in the following table.

Convention	Usage
	When displayed, indicates that you must attach an electrostatic wrist strap to your wrist and a grounded device to prevent electrostatic discharge.
	When displayed, indicates a potential personal injury hazard.

## Documentation and Technical Support

For detailed information about PS Series storage arrays, groups, and volumes, see the following documentation:

- *Release Notes*. Provides the latest information about PS Series storage arrays.
- *QuickStart*. Describes how to set up PS Series 50E to 400E storage array hardware and create a PS Series group.
- *Group Administration*. Describes how to use the Group Manager graphical user interface (GUI) to manage a PS Series group. This manual provides comprehensive information about product concepts and procedures.
- *CLI Reference*. Describes how to use the Group Manager command line interface (CLI) to manage a PS Series group and individual arrays.
- *Hardware Maintenance*. Provides information about maintaining PS Series 50E to 400E storage array hardware.

The *QuickStart* and *Hardware Maintenance* manuals are printed and shipped with the product. They are also located on the documentation CD-ROM that is shipped with the product, along with the *Group Administration* and *CLI Reference* manuals and the Group Manager online help.

In addition, the Host Integration Tools for Windows<sup>®</sup> systems are available on the EqualLogic website and on a CD-ROM that is shipped with the product.

Technical support on EqualLogic products is available for customers with arrays under warranty and customers with a valid support contract. You can obtain technical support in the following ways:

- Visit the EqualLogic Customer Support website to download the latest documentation and firmware. Go to [www.equallogic.com](http://www.equallogic.com) and log in to your customer support account. If you do not have an account, create one.
- In the United States, call 877-887-7337. International customers should call +00 1 919-767-5729. If the issue is urgent, ask to speak with a member of the EqualLogic Customer Support team.
- From the EqualLogic Customer Support website, you can submit a service request.
- Send e-mail to [support@equallogic.com](mailto:support@equallogic.com) and clearly describe the issue or problem.

## Warranty Information

The PS Series storage array warranty is included in the shipping box. For information about registering a warranty, visit the EqualLogic website, [www.equallogic.com](http://www.equallogic.com).

## Restricted Access Requirement


PS Series storage arrays must be installed in a restricted access location, which is an area that is intended only for qualified or trained personnel.

## Regulatory Agency Notice and Notes

PS Series storage arrays have been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules and other international standards. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, which the user will be required to correct at their own expense.

### Regulatory Notes

<b>Service Note</b>	A PS Series storage array has more than one power supply cord. Disconnect both power supply cords before servicing to avoid electric shock.
<b>Warning</b>	When an approved SFP (small form factor pluggable) optical network connector is installed, a PS Series storage array is a Class 1 laser product. Using an unapproved SFP may void some safety certifications. See your PS Series array service provider for a list of approved SFPs, or purchase an SFP from EqualLogic.
	There is a danger of explosion if a PS Series storage array control module cache battery is incorrectly replaced. Replace a battery only with the same or equivalent battery, as recommended by the manufacturer, and use the instructions in this document. Discard used batteries according to the manufacturer's instructions.



# 1 Basic Array Information

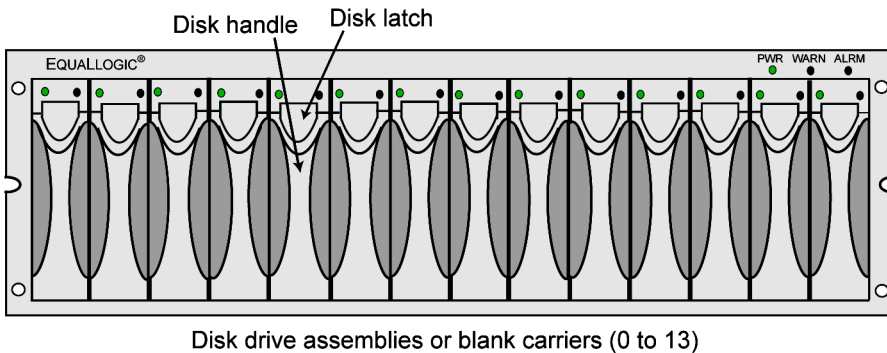
Basic information about PS Series 50E to 400E storage arrays include:

- *Front and Back Panels* on page 1-1
- *Interpreting LEDs* on page 1-2
- *Using an Electrostatic Wrist Strap* on page 1-5
- *Shutting Down and Restarting an Array* on page 1-6

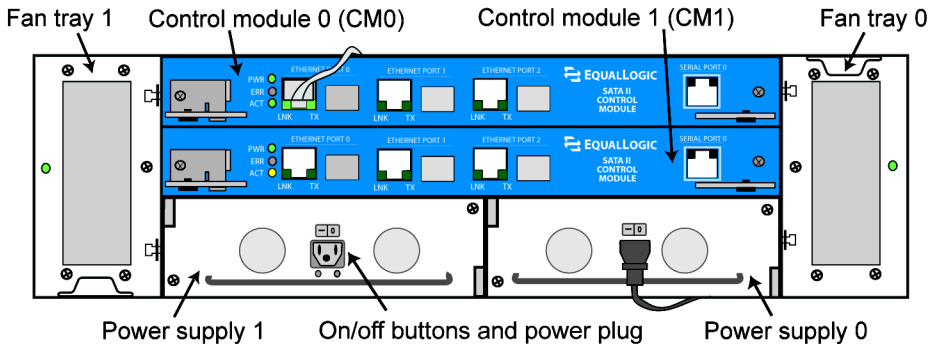
## Front and Back Panels

The front and back panels of a PS Series storage array are shown below.

**Figure 1-1: PS Series 50E to 400E Storage Array Front Panel**

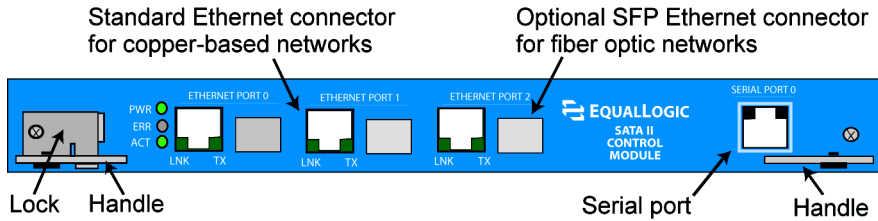


**Figure 1-2: PS Series 50E to 400E Storage Array Back Panel**



**Note:** The figures in this manual show Type II control modules (blue face plate), which are functionally equivalent to Type I control modules (dark gray face plate). See Appendix B, *Control Module Models*, for information.

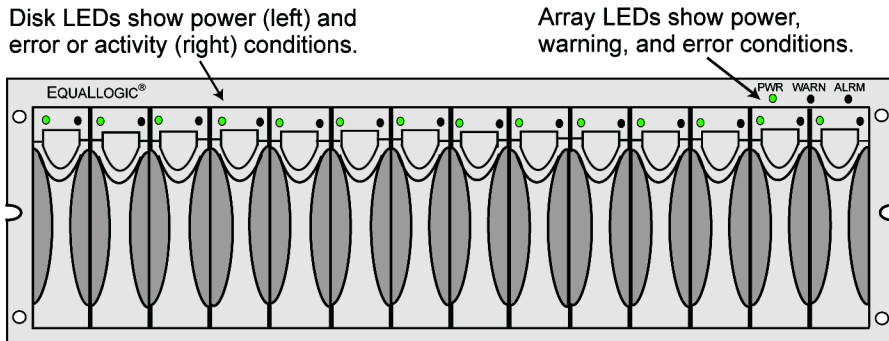
**Figure 1-3: Type II Control Module Details**



## Interpreting LEDs

The following figures and tables describe PS Series 50E to 400E storage array LEDs, which can alert you to errors and conditions that require your attention. Report serious errors to your PS Series array service provider.

**Figure 1-4: Front Panel LEDs**



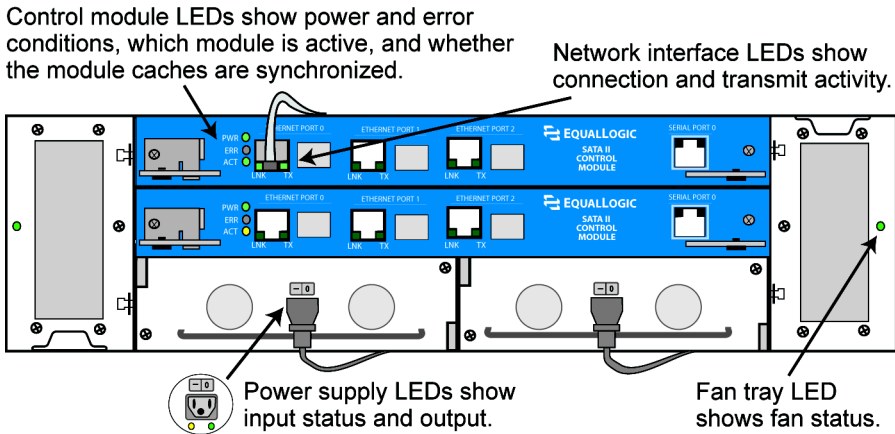
**Table 1-1: Front Panel LED Descriptions**

Disk LEDs	Color	Description
Left	Off	No power or error condition.
	Green	Power.
Right	Off	No power or normal condition.
	Red	Error condition.
	Flashing green	Disk activity.

**Table 1-1: Front Panel LED Descriptions (Continued)**

Array LEDs	Color	Description
PWR	Off	No power.
	Green	Power.
WARN	Off	No power or normal condition.
	Red	<p>One or more of the following has occurred:</p> <ul style="list-style-type: none"> <li>• RAIDset is degraded but still functioning.</li> <li>• RAIDset (volume) has lost blocks.</li> <li>• Temperature of a component is near upper limit.</li> <li>• Fan tray fan RPMs exceed upper or lower limit.</li> <li>• Power supply fan has failed.</li> <li>• Power supply is not installed or has no power.</li> <li>• Only one functioning control module.</li> <li>• Lock on secondary control module is open.</li> <li>• Active control module is syncing with secondary.</li> <li>• No communication between control modules.</li> <li>• No replication progress for 1 hour or more.</li> <li>• Installed spare disk does not have enough capacity to replace a disk in a RAIDset.</li> <li>• A non-critical hardware component has failed.</li> </ul>
ALRM	Off	No power or normal condition.
	Red	<p>One or more of the following has occurred:</p> <ul style="list-style-type: none"> <li>• RAIDset is not functioning.</li> <li>• Lost block table is full.</li> <li>• Array temperature exceeds upper limit.</li> <li>• Control module cache has lost data.</li> <li>• One or both fan trays are not installed.</li> <li>• Both fans on a fan tray have failed.</li> <li>• Cache battery has less than 72 hours of charge.</li> <li>• NVRAM coin cell battery has failed.</li> <li>• Cache contains data that does not belong to any of the installed disks.</li> <li>• More than one valid RAIDset exists in the array.</li> <li>• Control modules are different models.</li> <li>• A critical hardware component has failed.</li> </ul>

**Figure 1-5: Back Panel LEDs**



**Table 1-2: Back Panel LED Descriptions**

Control Module LEDs	Color	Description
PWR	Off	No power.
	Green	Power.
ERR	Off	No power or no error condition.
	Red	Array is starting up or error condition.
ACT	Off	No power. Secondary control module (only Type I). Secondary control module is not synchronized with active control module or error condition (only Type II).
	Green	Active control module (serving network I/O).
	Orange	Secondary control module is synchronized with active (only Type II).
Network Interface LEDs	Color	Description
LNK	Off	No power or not connected to network.
	Green	Connected to network switch.
TX	Off	No power or not transmitting.
	Green	Transmitting.

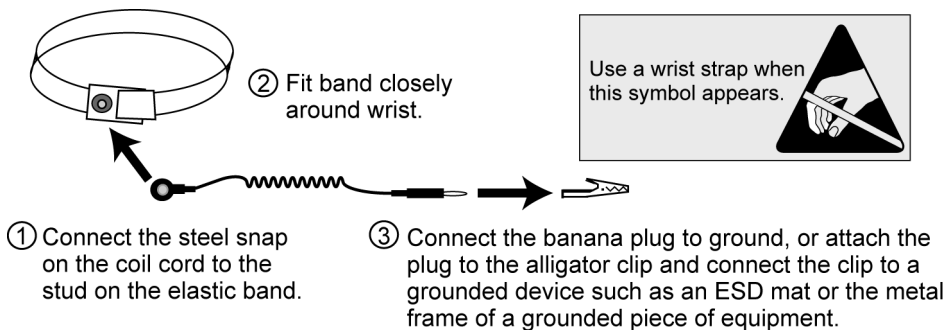
**Table 1-2: Back Panel LEDs (Continued)**

Fan Tray LED	Color	Description
Outside edge of fan tray	Off	No power.
	Green	Environmental Management Module (EMM) and fans on the fan tray are functioning.
	Red	EMM or a fan on the fan tray has failed.  The LED will be temporarily red when the array is first powered on or when the fan tray is installed.
	Flashing red	Fan RPMs exceed upper or lower limit.
Power Supply LEDs	Color	Description
Left (LED location may differ on some models)	Off	No power or error condition.
	Orange	Input power good (AC).
Right (LED location may differ on some models)	Off	No power or error condition.
	Green	Output power good (DC).

## Using an Electrostatic Wrist Strap

When handling the storage array chassis, disks, or control modules, you must use an electrostatic protection device to prevent electrostatic discharge.

An electrostatic wrist strap is included in the shipping box.

**Figure 1-6: Using an Electrostatic Wrist Strap**

## Shutting Down and Restarting an Array

PS Series 50E to 400E storage arrays include redundant, hot-swappable disks, fan trays, power supplies, and control modules (if a dual control module array). You can remove a redundant component without affecting operation if a functioning component is available. Otherwise, it is recommended that you cleanly shut down the array and turn off power before removing a component.

**Note:** When an array is shut down, any volumes with data on the array will be set offline until the array is successfully restarted. This may affect initiators connected to the volumes.

To shut down an array, follow these steps:

1. Do one of the following:
  - Use telnet or SSH to connect to a functioning IP address assigned to a network interface on the array. Do *not* connect to the group IP address.
  - Use the null modem cable shipped with the array to connect Serial Port 0 on the active control module (LED labeled ACT is green) to a console or a computer running a terminal emulator. See Appendix B, *Setting Up a Serial Connection* for more information.
2. Log in to an account with read-write access, such as the `grpadmin` account.
3. Enter the `shutdown` command, as shown next.

```
Login: grpadmin
Password: xxxxxxxx
          Welcome to Group Manager
          Copyright 2001-2006 EqualLogic, Inc.
> shutdown
```

If you are using a serial connection to shut down an array, it is safe to turn off power when the “press any key” message appears. (Pressing any key will restart both control modules.)

If you are using a network connection, the session will be disconnected before the array is fully shut down. Confirm that the ACT LED on each control module is off (not lit) before turning off power to the array.

After performing array maintenance, you can turn on power to the array. When the array restart completes, the member and volumes will be set online.

## 2 Maintaining Disks

---

PS Series 50E to 400E storage arrays include up to 14 hot-swappable disks. Disk maintenance topics include:

- *Disk Handling Requirements* on page 2-1
- *Identifying Failed Disks* on page 2-2
- *Removing Disks* on page 2-2
- *Installing Disks* on page 2-3

### Disk Handling Requirements

You must adhere to the following disk handling requirements:

- **Store disks properly.** When not installed in an array, store a disk in the antistatic bag and foam insert in which the disk was shipped. Do not stack disks or place anything on top of a disk.
- **Protect disks from electrostatic discharge.** Wear an electrostatic wrist strap when handling a disk, unless it is in an antistatic bag.
- **Handle disks carefully.** Hold a disk only by the sides of the plastic carrier or by the handle. Do not drop or jolt a disk or force a disk into an array disk slot.
- **Warm disks to room temperature before installation.** For example, let disks sit overnight before installing them in an array.
- **Install disks after rack mounting the array.** Do not install disks until the array is completely mounted in its final location. The array must not be moved once disks are installed.
- **Do not leave disk slots empty.** Each disk slot in an array must contain a disk drive assembly or a blank carrier. Operating an array with an empty disk slot will void your warranty and support contract.
- **Do not remove a disk from its plastic carrier.** This action will void your warranty and support contract.
- **Keep shipping material for servicing.** To obtain service for a disk, it must be returned in the antistatic bag and foam insert in which the disk was shipped. Shipping disks in unauthorized packaging may void your warranty. Obtain authorized packaging from your PS Series array service provider.

## Identifying Failed Disks

Disks in PS Series 50E to 400E storage arrays are installed in slots numbered from 0 to 13 (from left to right). A disk failure is indicated by:

- The disk's right LED is red and the left LED is off. See *Interpreting LEDs* on page 1-2.
- A message on the console, in the event log, or in the Group Manager GUI Alarms panel describes a disk failure.
- The GUI Member Disks window or the CLI `member select show disks` command shows a disk failure.

## Handling Failed Disks

How an array handles a disk failure depends on whether a spare disk is available and whether the RAIDset containing the failed disk is degraded. For example:

- If a spare disk is available, it replaces the failed disk. Performance is normal.
- If a spare disk is not available and the failed disk is in a RAIDset with no previous disk failure, the RAIDset becomes degraded. Performance *may* be slightly impaired.
- If a spare disk is not available and the failed disk is in a RAIDset that is already degraded, data may be lost and must be recovered from a backup.

## Removing Disks

Before removing a disk or blank carrier from an array, attach an electrostatic protection device, as described in *Using an Electrostatic Wrist Strap* on page 1-5.

**Notes:** Replace a failed disk as soon as possible to ensure the highest availability.

Do not remove a disk from a slot, unless you have another disk or a blank carrier to replace it. Each slot *must* contain a disk or blank carrier.

Do not remove a functioning disk from an array, unless the disk is a spare. If you remove a spare, replace the disk as soon as possible.

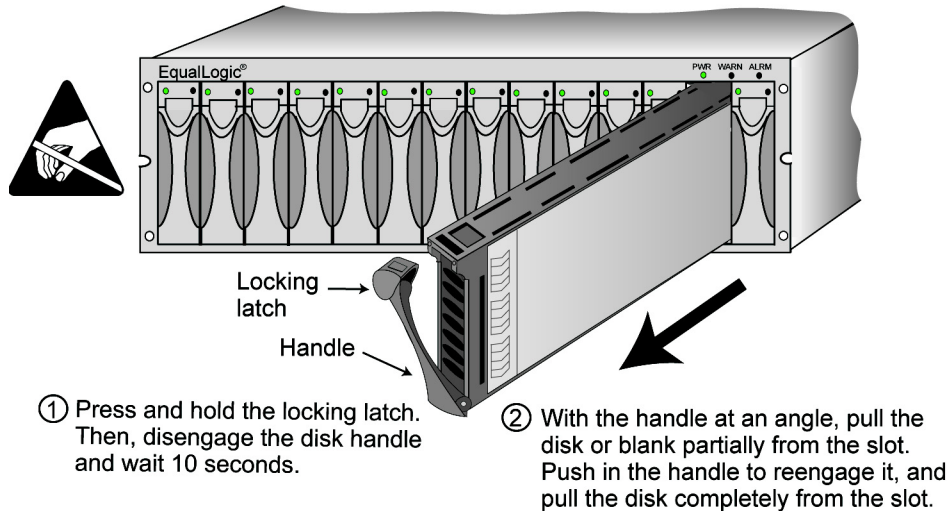
Before removing a disk, allow the disk to stop spinning and the heads to land. To do this, press and hold the disk locking latch. Then, pull out the handle and wait 10 seconds before removing the disk from the slot.

After removing a disk, store it in the antistatic bag and foam insert in which it was shipped.



Figure 2-1 shows how to remove a disk from a storage array. Instructions for removing a blank carrier are similar, except you do not have to wait 10 seconds.

**Figure 2-1: Removing a Disk**



## Installing Disks

Before installing a disk or blank carrier in a storage array, attach an electrostatic protection device, as described in *Using an Electrostatic Wrist Strap* on page 1-5.

**Notes:** You can use disks with different sizes in an array. However, the smallest disk in the array will determine how much space can be used on each disk. For example, if the smallest disk is 400GB, only 400GB of space will be available for use on each disk.

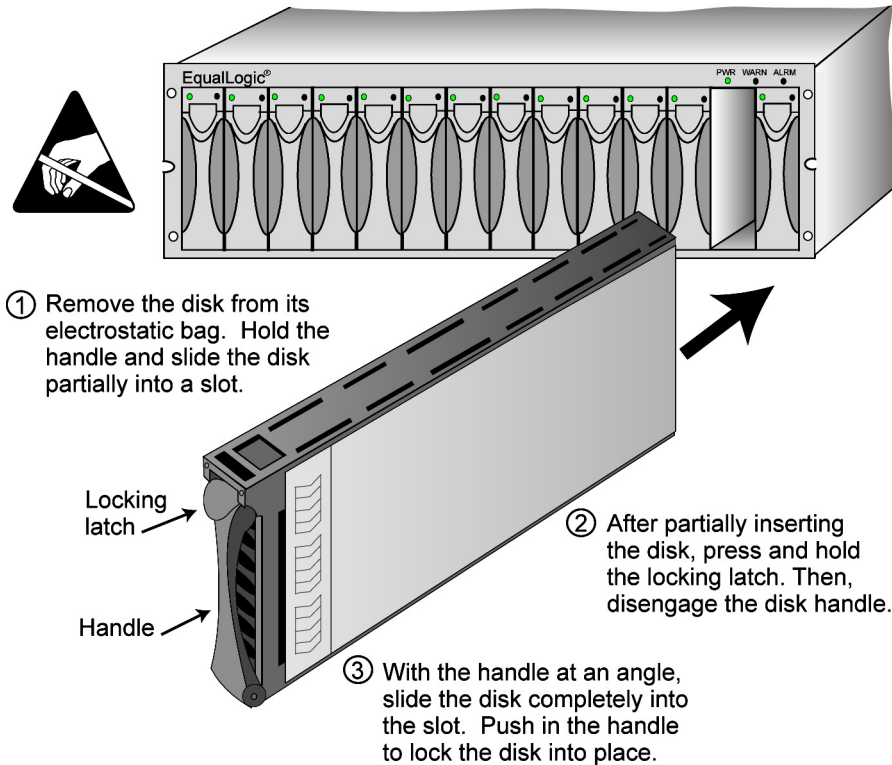
There is a two-minute delay between the time you insert a disk and the time the disk is automatically configured into a RAIDset. This time interval allows multiple disks to be simultaneously configured in an array, which is more efficient than installing a single disk, configuring it, and then repeating the process. For example, when you install a disk, the timer starts. If no other disks are installed, the disk is configured after a delay of two minutes. If you install another disk before two minutes have elapsed, the timer is restarted.

If you install a disk during RAID reconstruction or verification, the new disk will not be configured until the operation completes.

Figure 2-2 shows how to install a disk in an array. Use the same instructions for installing a blank carrier.

**Note:** Make sure the disk is oriented in the position shown below (that is, the locking latch is positioned upwards).

**Figure 2-2: Installing a Disk**



Verify that the new disk is operational by checking the LEDs on the front panel, as described in *Interpreting LEDs* on page 1-2. The left LED should be green, and the right LED should be off or flashing green.

In addition, the GUI Member Disks window and the CLI `member select show disks` command output should show that the new disk is operational.

## 3 Maintaining Control Modules

---

PS Series 50E to 400E storage arrays include one control module or two hot-swappable control modules, each with a replaceable compact flash card and battery-backed write cache. Type II control modules also include a replaceable coin cell battery to back up the NVRAM.

**Warning:** Only install control modules of the same type in a PS Series array. A Type II control module has a blue face plate and one serial port. A Type I control module has a dark gray face plate and two serial ports. See *Control Module Models* on page B-1.

Control module maintenance topics include:

- *Control Module Handling Requirements* on page 3-1
- *Identifying Control Module Failures* on page 3-2
- *Understanding Failover Behavior* on page 3-2
- *Maintaining Control Module Firmware* on page 3-3
- *Connecting Network Cables* on page 3-4
- *Installing a Control Module* on page 3-7
- *Removing a Control Module* on page 3-9
- *Replacing the Compact Flash Card* on page 3-11
- *Replacing the Cache Battery* on page 3-12
- *Replacing the NVRAM Coin Cell Battery* on page 3-15

### Control Module Handling Requirements

You must adhere to the following control module handling requirements:

- **Protect control modules from electrostatic discharge.** Always wear an electrostatic wrist strap when handling a control module, as described in *Using an Electrostatic Wrist Strap* on page 1-5. When not installed, store a control module in an antistatic bag or place it on a surface protected from electrostatic discharge. Be sure the cache battery is disconnected.
- **Do not remove a control module from an array while the control modules are synchronizing.** When synchronization completes, a console message will appear. Also, for Type II control modules (blue face plate), the ACT LED on the secondary control module will be orange.

- **The control module lock must be closed for proper operation.** If you open the lock (slide it to the right), it is recommended that you gently pull out (for example, by 0.5 inch) and then re-insert the control module and close the lock.
- **Do not toggle the control module lock.** Repeatedly sliding the lock back and forth in a short period of time and then immediately removing the control module may result in the loss of the battery-backed cache memory. If you toggle the lock, wait at least one minute before removing the control module.
- **Do not leave a control module slot empty.** In an array with one control module, always attach a blank face plate to the empty control module slot.

## Identifying Control Module Failures

A failure in a control module can be indicated by the following:

- A control module's ERR LED is red or the PWR LED is off but there is power to the array. See *Interpreting LEDs* on page 1-2.
- The ACT LED on one control module is green, but the ACT LED on the other control module is off instead of orange (only Type II control modules).
- A message on the console, in the event log, or in the Group Manager GUI Alarms panel describes a control module failure.
- The GUI Member Controllers window or CLI `member select show controllers` command shows the control module as not installed.

CM0 refers to the control module in the top slot (slot 0). CM1 refers to the control module in the bottom slot (slot 1).

## Understanding Failover Behavior

A PS Series storage array can have one to three active network connections. In a dual control module array, only one control module is active (actively serving I/O) at one time. Each control module includes a battery-backed write cache for storing recently-used data. For redundancy, the cache on the secondary control module mirrors the data that is stored in the cache on the active control module.

A control module has three ports, `eth0`, `eth1`, and `eth2`. A dual control module array provides three *pairs* of ports. For example, `eth0` on CM0 (top slot) and `eth0` on CM1 (bottom slot) are a pair. Only one port in a pair is used at one time.

In a dual control module PS Series 50E to 400E storage array, the `eth0` and `eth1` port pairs are redundant. Because the active control module can access both ports

in a redundant pair, you only need to connect a cable to one of the ports. For example, if you connect a cable to the `eth0` port on CM0, the `eth0` network interface can be used even if CM1 is the active control module (assuming ports are functional).

The `eth2` port pair is *not* redundant. The active control module can use the `eth2` network interface only if there is a cable connected to the `eth2` port on the active control module. Therefore, you should connect cables to both `eth2` ports to ensure that both control modules can access the `eth2` interface.

A PS Series 50E to 400E storage array provides three types of network failure protection:

- **Network connection failover.** If multiple network interfaces are connected to a network and one network interface fails, iSCSI initiators that were connected to the failed interface can reconnect to the group IP address and be redirected to a functioning interface. For example, in a single control module array, if `eth0` and `eth1` are connected to a network and `eth0` fails, initiators that were connected to `eth0` can be redirected to `eth1`.
- **Control module failover.** In a dual control module array, if the active control module fails, the secondary control module automatically takes over and becomes active. If a cable is connected to either port in a redundant pair (`eth0` or `eth1`), network I/O may be able to continue through that interface, depending on the type of failure. Control module failover is transparent to applications, but iSCSI initiators must reconnect to the group IP address.
- **Redundant port failover.** In a dual control module array, if both ports in a redundant pair (`eth0` or `eth1`) are connected to a network and a connection failure occurs (for example, a cable is disconnected, a port fails, or a network switch port fails), network I/O will fail over to the functioning port in the pair. Redundant port failover is transparent to iSCSI initiators and applications.

## Maintaining Control Module Firmware

PS Series 50E to 400E storage arrays include one or two control modules, each with a compact flash card running the storage array firmware. You should run the latest firmware version to take advantage of new product features and enhancements.

**Caution:** In a dual control module array, both control modules *must* be running the same firmware version; otherwise, only one control module will be functional. When you update firmware, both control modules are updated to the same firmware version.

Group members should run the same firmware version; otherwise, only functionality common to all versions will be available in the group. See the *PS Series Release Notes* for information about mixed-firmware groups.

If you are upgrading to a dual control module array or replacing a failed compact flash card, be sure to order the correct firmware version from EqualLogic. If you are replacing a failed control module, remove the compact flash card from the failed control module and install it in the replacement control module. This will ensure that you retain the correct firmware.

A *new* compact flash card will show the firmware version on the label. To display the firmware version running on an array, examine the GUI Member Controllers window or use the CLI `member select show controllers` command. If the firmware on a compact flash card does not match the firmware running on an array, do not install it. Instead, contact your PS Series array service provider.

## Connecting Network Cables

A PS Series storage array must have at least one and can have up to three active network connections at one time. Multiple network connections are recommended for performance and availability. See the *Group Administration* manual for information about using the Group Manager to assign IP addresses to interfaces.

You can use a combination of copper-based and fiber optic network connections:

- For copper-based networks, use Category 5E or Category 6 cables with RJ45 connectors. Use Category 5 cables if they meet the TIA/EIA TSB95 standard.
- For fiber optic networks, use cables with LC connectors. Fiber optic networks also require small form factor pluggable (SFP) connectors from EqualLogic.

See the PS Series networking Technical Report on the EqualLogic Customer Support website for requirements and recommendations.

Recommendations for connecting network cables are as follows:

- Connect network interfaces in the following order: `eth0`, `eth1`, and `eth2`, and connect the interfaces to different network switches.
- In a dual control module array, distribute network connections across control modules. For example, connect a cable to the `eth0` port on CM0 and connect a cable to the `eth1` port on CM1.

- In a dual control module array, to ensure connectivity to the non-redundant eth2 port pair (regardless of which control module is active), connect a cable to the eth2 port on both CM0 and CM1.
- In a dual control module array, to enable failover across a redundant port pair (eth0 or eth1) when a port or cable fails, connect cables to both ports. For example, connect a cable to eth0 on CM0 and eth0 on CM1.

Figure 3-1 shows how you can increase availability and performance by adding network connections to a PS Series 50E to 400E storage array with a single control module.

**Figure 3-1: Single Control Module Array Network Connections**

**Single network connection**

- Minimum configuration
- Requires one IP address
- Possible points of failure:
  - Disconnected cable
  - Port failure
  - Control module failure



**Recommended network configuration**

- Requires three IP addresses
- Provides highest network bandwidth
- Protects against:
  - Disconnected cables
  - Port failures



For example, if you connect cables as shown in Figure 3-2, and the eth0 port fails, initiators can be redirected to the IP address assigned to eth1 or eth2.

**Figure 3-2: Recommended Single Control Module Configuration**

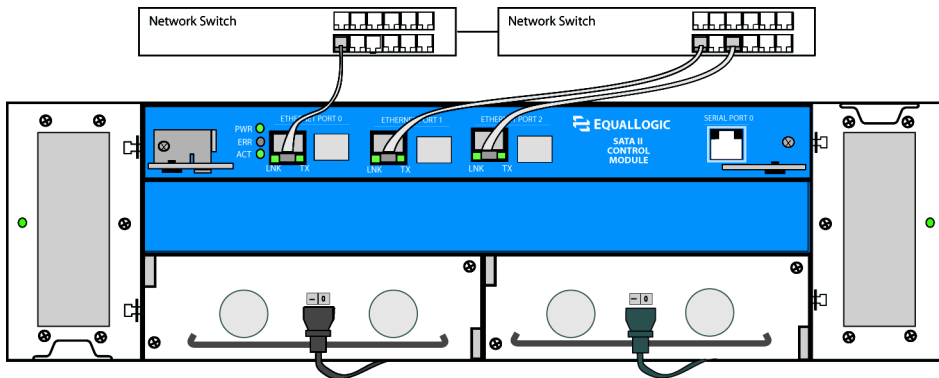
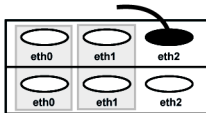


Figure 3-3 shows how you can increase availability and performance by adding network connections to a PS Series 50E to 400E storage array with dual control modules. Note that you can connect all six ports for guaranteed full bandwidth under all conditions.

**Figure 3-3: Dual Control Module Array Network Connections**

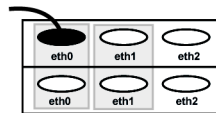
**Single network connection to the non-redundant port pair (eth2)**

- Requires one IP address
- Points of failure:
  - Disconnected cable
  - Port failure
  - Control module failure



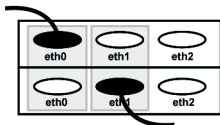
**Single network connection to a redundant port pair (eth0 or eth1)**

- Requires one IP address
- Protects against some control module failures



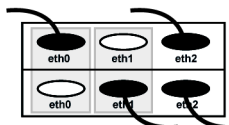
**Multiple network connections to redundant port pairs**

- Requires two IP addresses
- Increases network bandwidth
- Protects against:
  - Disconnected cable
  - Port failure
  - Some control module failures



**Recommended network configuration**

- Requires three IP addresses
- Provides maximum network bandwidth
- Protects against:
  - Disconnected cable
  - Port failure
  - Some control module failures



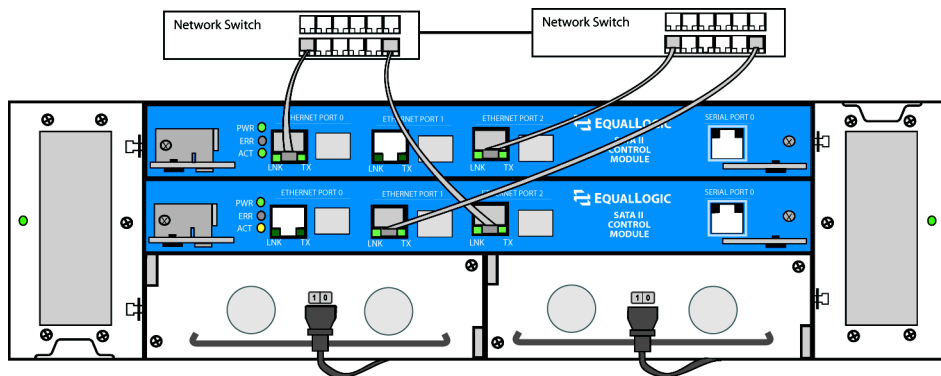
Referring to Figure 3-4 on page 3-7, assume that CM0 (top slot) is active and eth0, eth1, and eth2 are configured with unique IP addresses:

- If there are no failures, there will be three network connections (eth0, eth1, and eth2). Because eth1 is a redundant port, the active control module (CM0) can access it even though the cable is connected to the port on CM1.
- If the cable attached to the redundant eth0 port is disconnected, only eth1 and eth2 will remain as network connections. Note that, if a cable was also attached to the eth0 port on the secondary control module (CM1), redundant port failover would occur and the eth0 network interface would still be usable.



- If the cable attached to the eth2 port on the active control module (CM0) is disconnected, only eth0 and eth1 will remain as network connections. This is because the eth2 port is not redundant and does not support port failover.
- If the active control module (CM0) fails, CM1 will become the new active control module. After the control module failover, there will be two network connections (eth1 and eth2). In addition, depending on the type of failure, the eth0 network interface may also be available.

**Figure 3-4: Recommended Dual Control Module Configuration**



## Installing a Control Module

You may need to install a control module as part of an array upgrade or for control module maintenance, such as replacing a failed control module or a battery. You can upgrade to a dual control module array without shutting down the array.

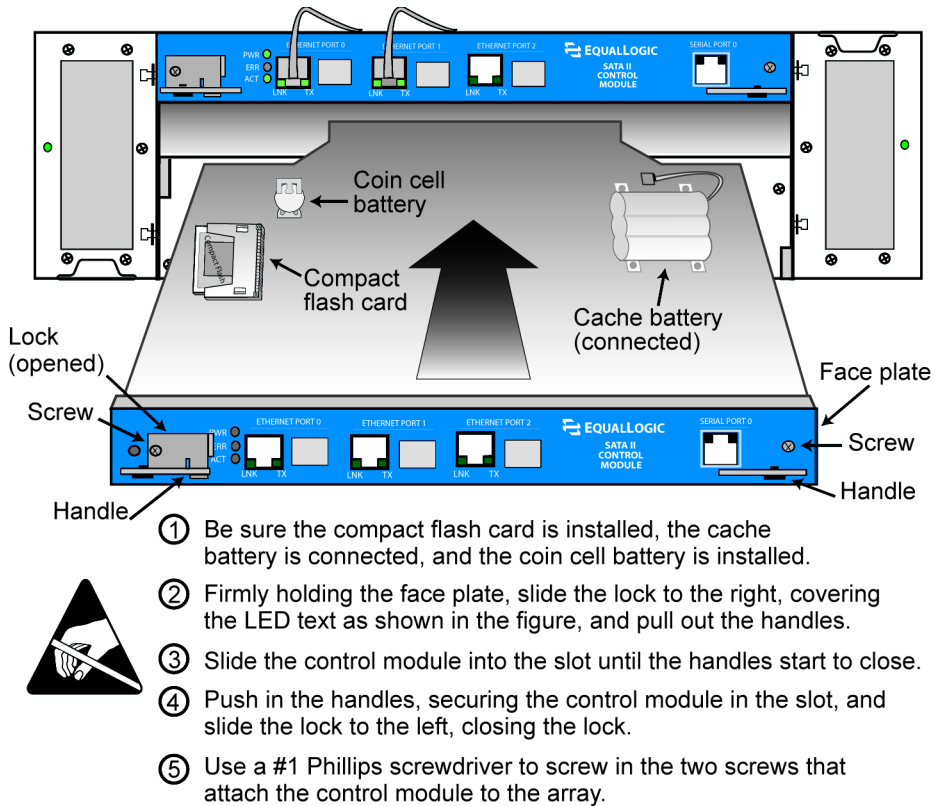
**Notes:** Only install control modules of the same type in an array. Figure 3-4 shows an array with two Type II control modules (blue face plate). See *Control Module Models* on page B-1 for more information.

Before upgrading to a dual control module array, make sure the firmware on the new control module's compact flash card matches the firmware running on the already-installed control module. See *Maintaining Control Module Firmware* on page 3-3. Use a #1 screwdriver to remove the two screws that attach the face plate to the empty control module slot.

If you are replacing a failed control module, be sure to remove the compact flash card from the failed control module and install it in the replacement control module. This will ensure that the replacement control module is running the same firmware as the failed control module. See *Replacing the Compact Flash Card* on page 3-11.

To install a control module, attach an electrostatic wrist strap, as described in *Using an Electrostatic Wrist Strap* on page 1-5. Then, remove the control module from its antistatic bag and refer to the instructions in Figure 3-5.

**Figure 3-5: Installing a Control Module**



After installing the control module, connect network cables to the control module, as described in *Connecting Network Cables* on page 3-4. Then, turn on power to the array if it was shut down.

To ensure that the control module is operational, check the LEDs on the front panel, as described in *Interpreting LEDs* on page 1-2. Also, check the GUI Member Controllers window or invoke the CLI `member select show controllers` command. The control module status will be either `active` (if there is only one control module) or `secondary`.

If two control modules are installed but only one appears in the GUI or CLI, a control module may not be properly installed. Re-seat the new control module; be sure to slide the lock completely to the left and push in the handles. If both control modules still do not appear in the GUI or CLI, they may not be running the same firmware version, and you should contact your PS Series array service provider.

**Note:** Once connected, a control module cache battery may begin to charge. If you have a dual control module array and the low-battery-safe cache policy is enabled (the default), the array will operate in write-through mode until the cache battery is fully charged. However, if you need optimal performance before the battery is fully charged, once the battery status is `good/charging`, you can *temporarily* disable the low-battery-safe policy and force the array to operate in write-back mode. Be sure to re-enable the low-battery-safe policy when the battery is fully charged. See the *Group Administration* manual for information about cache policies.

## Removing a Control Module

If a control module fails, you should remove it and replace it with a functioning control module. You also may need to temporarily remove a control module to replace a cache battery, NVRAM coin cell battery, or compact flash card.

In a dual control module PS Series 50E to 400E storage array, you can remove a control module without shutting down the array, if the remaining control module has at least one connected and functioning network interface. However, if you remove the active control module (the LED labeled ACT will be green), there will be a short interruption as failover to the secondary control module occurs.

**Caution:** Do not remove a control module from an array while the control modules are still synchronizing. A message will appear on the console when synchronization completes. On arrays with Type II control modules (blue face plate), the ACT LED on the secondary control module will be orange when synchronization completes.

With a single control module array, if possible, cleanly shut down the array before removing the control module. See *Shutting Down and Restarting an Array* on page 1-6.

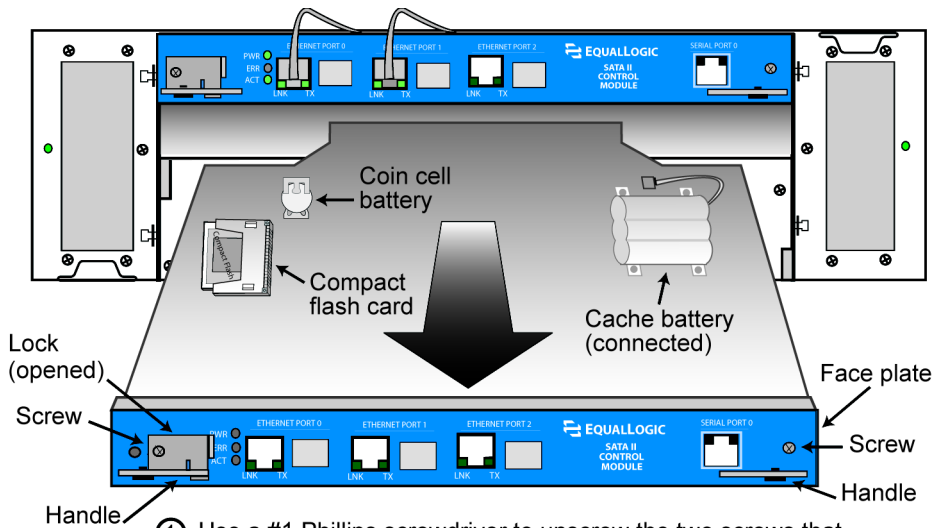
Before removing a control module, disconnect any serial or network cables attached to the control module. If you have a dual control module array, *quickly* re-attach the network cables to the corresponding configured network interfaces on the functioning control module to ensure uninterrupted access to data.

To remove a control module, attach an electrostatic wrist strap (see *Using an Electrostatic Wrist Strap* on page 1-5) and follow the instructions in Figure 3-6.

**Note:** If you are removing a failed control module for replacement purposes, you must remove the compact flash card from the failed control module, as described in *Replacing the Compact Flash Card* on page 3-11. Then, install the card in the replacement control module. This will ensure that the replacement control module is running the correct firmware.

Once removed, store the control module in an antistatic bag, or place it on a surface that is protected from electrostatic charge. If the array will permanently operate with only one control module, you must attach a blank face plate to the empty slot. You can order a blank face plate from your PS Series array service provider. Do not leave a control module slot empty.

**Figure 3-6: Removing a Control Module**



- ① Use a #1 Phillips screwdriver to unscrew the two screws that attach the control module to the array.
- ② Slide the lock to the right, so that it covers the LED text, and pull out both handles, disengaging the control module from the array.
- ③ Firmly hold the face plate and slide the control module out of the slot.
- ④ Place it on a surface protected from electrostatic discharge or in an antistatic bag. Remove and retain the compact flash card, if desired.



## Replacing the Compact Flash Card

Each control module includes a compact flash card running the PS Series storage array firmware. You must replace a compact flash card if the card fails on an otherwise functioning control module. Be sure to order a replacement card with the same firmware version as the failed card. See *Maintaining Control Module Firmware* on page 3-3 for information about identifying firmware.

If a control module fails, but the compact flash card is still functioning, remove the compact flash card from the failed control module and then install the card in the replacement control module. This will ensure that the replacement control module is running the correct firmware.

To access the compact flash card, you must partially or completely remove the control module from the array. You can remove a control module in a dual control module array without shutting down the array, if the remaining control module has at least one connected and functioning network interface. However, if you remove the active control module (the LED labeled ACT will be green), there will be a short interruption as failover to the secondary control module occurs.

With a single control module array, if possible, cleanly shut down the array before removing the control module to replace the compact flash card. See *Shutting Down and Restarting an Array* on page 1-6.

To replace a compact flash card, follow these steps and refer to the specified sections and figures:

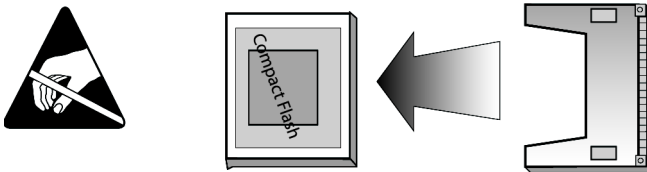
1. Attach an electrostatic wrist strap. See *Using an Electrostatic Wrist Strap* on page 1-5.
2. Remove the affected control module from the array, as described in *Removing a Control Module* on page 3-9, and place it on a surface that is protected from electrostatic discharge. If you are replacing a failed compact flash card, you can access the card by sliding the control module only partially from the slot.
3. Remove the compact flash card from the control module, as shown in Figure 3-7 on page 3-12. If you are moving the card to a replacement array, retain the card. Otherwise, properly dispose of the card.
4. If you are replacing a failed compact flash card, install the new card the control module, as shown in Figure 3-7 on page 3-12.

If you are moving the compact flash card, install the card in the replacement control module, as shown in Figure 3-7 on page 3-12.

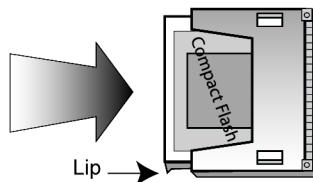
5. Install the control module in the array. See *Installing a Control Module* on page 3-7.

### Figure 3-7: Removing and Installing a Compact Flash Card

- ① To remove a compact flash card, grasp the sides of the card and slide it out of the slot. Be sure not to damage the card or board.



- ② To install a compact flash card, grasp the sides of the card and slide it completely into the slot. Be sure not to damage the card or board. Note the orientation of the card; the lip of the card must face down.



After installing the control module, if the array was shut down, turn on power to the array. To ensure that the control module is operational, check the LEDs on the front panel, as described in *Interpreting LEDs* on page 1-2. Also, check the GUI Member Controllers window or invoke the CLI `member select show controllers` command. The status will be either `active` or `secondary`.

## Replacing the Cache Battery

Each control module includes a write cache, backed by a rechargeable lithium-ion battery that can provide power for at least 72 hours. You must replace a cache battery when it fails or every three years, whichever comes first.

To determine the cache battery status, check the GUI Member Controllers window or invoke the CLI `member select show controllers` command. The cache battery status appears in the `Battery status` field. If the status is `low-voltage` or `failed`, contact your PS Series array service provider to obtain a replacement battery.

Control module behavior when a cache battery has low voltage (or fails) depends on whether you have a single or dual control module array and the cache mode

policy settings, as described in the PS Series *Group Administration* manual and summarized here:

- On a member with a single control module, if the low-battery-safe policy is enabled and the charge on the cache battery is low, the cache will be flushed and will operate in write-through mode until the cache battery is recharged or replaced.
- On a member with dual control modules, if the low-battery-safe policy is enabled and the single-controller-safe policy is disabled, the active control module cache will continue to operate in write-back mode if it has an adequate charge, even if the secondary control module's cache has a low battery charge. If both the low-battery-safe and single-controller-safe policies are enabled and the battery charge on either control module is low, the active control module cache will be flushed and will operate in write-through mode until the cache battery is recharged or replaced.

If the low-battery-safe policy is disabled, a cache will operate in write-back mode, regardless of cache battery charge. Disabling low-battery-safe mode is not recommended because of the risk of data loss.

When handling a cache battery, follow these requirements:

- Do not drop, crush, disassemble, or alter the battery or subject it to shock.
- Do not expose to heat or flame, leave in direct sunlight, or immerse in water.
- Do not short circuit or remove the battery protection circuit.
- Do not solder directly to a battery.
- Do not attempt to charge or discharge a battery outside of an array.

In addition, it is recommended that you store cache batteries in a cool, dry location that is between 32 and 77 degrees Fahrenheit (0 and 25 degrees Celsius).

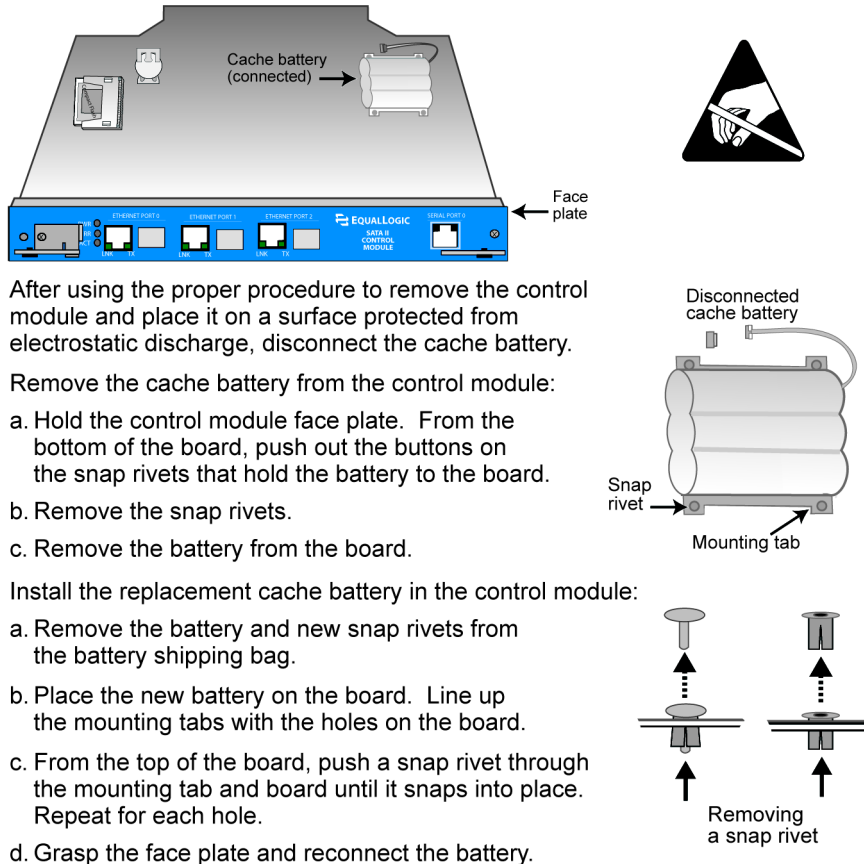
To access the cache battery, you must first completely remove the control module from the array. You can replace a battery in a dual control module array without shutting down the array, if the remaining control module has at least one connected and functioning network interface. However, if you remove the active control module (the LED labeled ACT will be green), there will be a short interruption as failover to the secondary control module occurs.

With a single control module array, if possible, cleanly shut down the array before removing the control module to replace the cache battery. See *Shutting Down and Restarting an Array* on page 1-6.

To replace a control module cache battery, follow these steps and refer to the specified sections and figures:

1. Attach an electrostatic wrist strap. See *Using an Electrostatic Wrist Strap* on page 1-5.
2. Remove the affected control module from its slot. See *Removing a Control Module* on page 3-9.
3. Replace the cache battery, as shown in Figure 3-8. Be sure to properly dispose of the failed battery.
4. Reinstall the control module. See *Installing a Control Module* on page 3-7.

**Figure 3-8: Replacing a Control Module Cache Battery**





After installing the control module, if the array was shut down, turn on power to the array. To ensure that the control module is operational, check the LEDs on the front panel, as described in *Interpreting LEDs* on page 1-2. Also check the GUI Member Controllers window or invoke the CLI `member select show controllers` command. The cache battery status, shown in the `Battery status` field, will be `good` (GUI) or `OK` (CLI) when fully charged.

**Note:** Once connected, the cache battery may begin to charge. If you have a dual control module array and the low-battery-safe cache policy is enabled, the array will operate in write-through mode until the battery is fully charged. However, if you need optimal performance before the battery is fully charged, once the battery status is `good/charging`, you can *temporarily* disable the low-battery-safe policy and force the array to operate in write-back mode. Be sure to re-enable the low-battery-safe policy when the battery is fully charged. See the *Group Administration* manual for details.

## Replacing the NVRAM Coin Cell Battery

A Type II control module (blue face plate) has a coin cell battery that backs up the NVRAM, which tracks writes that have not yet completed. If the coin cell battery on the active control module fails, the active control module will fail over to the secondary. If the array has only one control module and the battery fails, the write cache will operate in write-through mode.

You must replace the coin cell battery when it fails or every three years. To determine the coin cell battery status, check the GUI Member Controllers window or invoke the CLI `member select show controllers` command. The status appears in the `NVRAM Status` field (GUI) or `NVRAM Battery` field (CLI). Contact your PS Series array service provider to obtain a replacement battery.

**Note:** It is recommended that you *do not* replace a coin cell battery during a power failure. This is because the NVRAM may contain useful data.

When handling a coin cell battery, follow these requirements:

- Do not drop, crush, disassemble, or alter a battery or subject it to shock.
- Do not expose to heat or flame, leave in direct sunlight, or immerse in water.
- Do not short circuit the battery or attempt to charge or discharge the battery.

Also, it is recommended that you store coin cell batteries in a cool, dry location that is between 32 and 77 degrees Fahrenheit (0 and 25 degrees Celsius).

To access the coin cell battery, you must partially or completely remove the control module from the array. You can remove a control module in a dual control

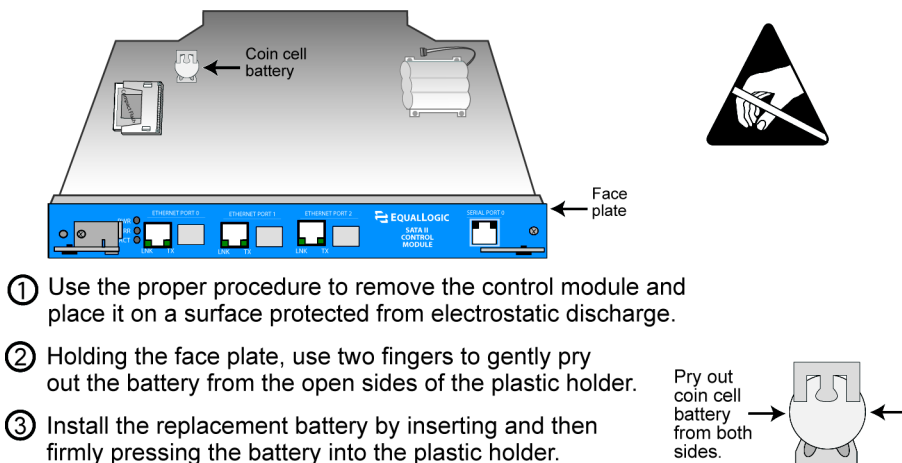
module array without shutting down the array, if the remaining control module has at least one connected and functioning network interface. However, if you remove the active control module (the LED labeled ACT will be green), there will be a short interruption as failover to the secondary control module occurs.

With a single control module array, if possible, cleanly shut down the array before removing the control module to replace the coin cell battery. See *Shutting Down and Restarting an Array* on page 1-6.

To replace an NVRAM coin cell battery, follow these steps and refer to the specified sections and figures:

1. Attach an electrostatic wrist strap. See *Using an Electrostatic Wrist Strap* on page 1-5.
2. Remove the affected control module from its slot. See *Removing a Control Module* on page 3-9.
3. Replace the coin cell battery, as described in Figure 3-9. Be sure to properly dispose of the failed battery.
4. Reinstall the control module. See *Installing a Control Module* on page 3-7.

**Figure 3-9: Replacing an NVRAM Coin Cell Battery**



After installing the control module, if the array was shut down, turn on power to the array. To ensure that the control module is operational, check the LEDs on the front panel, as described in *Interpreting LEDs* on page 1-2. Also, check the GUI Member Controllers window or invoke the CLI `member select show controllers` command. The NVRAM coin cell battery status should be good.

## 4 Maintaining Power Supplies

---

PS Series 50E to 400E storage arrays contain either two Model 20-0002 power supplies or two Model 20-0005 power supplies.

**Warnings:** Do not mix power supply types in an array or you risk losing data.

Power cables shipped with the array should only be used with this product.

Power supply maintenance topics include:

- *Identifying Power Supply Failures* on page 4-1
- *Identifying the Power Supply Model* on page 4-1
- *Removing a Power Supply* on page 4-2
- *Installing a Power Supply* on page 4-3

### Identifying Power Supply Failures

A failure in a power supply can be indicated by the following:

- One or both power supply LEDs are off but there is power to the array. See *Interpreting LEDs* on page 1-2.
- Message on the console, in the event log, or in the Group Manager GUI Alarms panel describes a failure.
- The GUI Member Enclosure window or the CLI `member select show enclosure` command shows a failure.

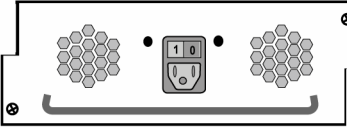
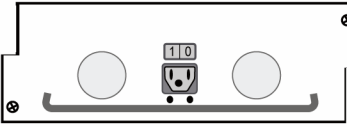
Power supply 1 refers to the power supply on the left side of the array (when viewed from the back of the array). Power supply 0 refers to the power supply on the right side of the array. See Figure 1-2 on page 1-1 for details.

### Identifying the Power Supply Model

If a power supply fails, you must replace it with the *same* power supply model. When ordering a power supply, be sure to provide the correct model number to your PS Series array service provider.

To identify the model number, examine the power supply face plate. Table 4-1 shows the power supply face plates and their corresponding model numbers.

**Table 4-1: Power Supply Model Numbers**

Face Plate	Model Number
	20-0002
	20-0005

## Removing a Power Supply

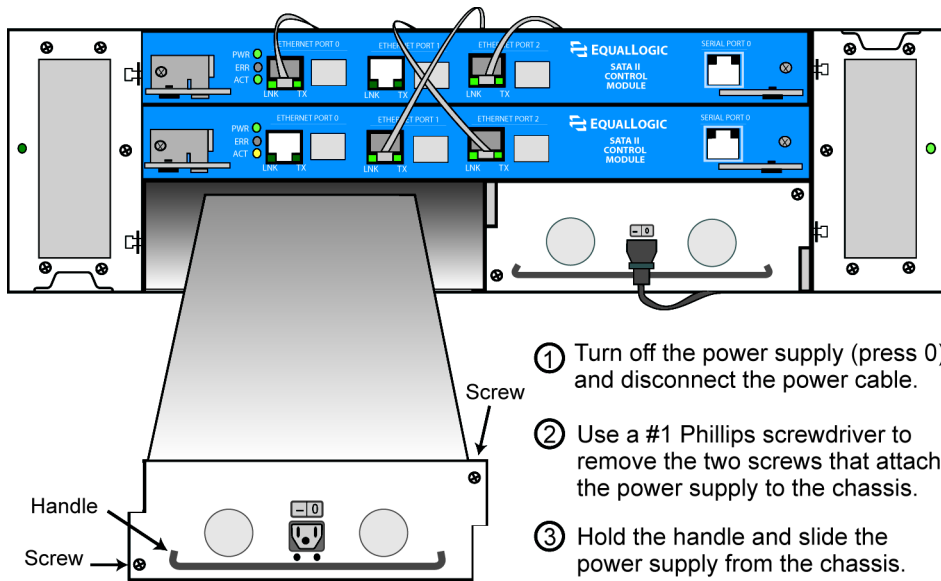
If a power supply fails, you must replace it as soon as possible.

Each array includes two hot-swappable power supplies. You can remove a power supply from an array without affecting array operation if the second power supply is installed and continues to function. Otherwise, before removing the power supply, cleanly shut down the array as described in *Shutting Down and Restarting an Array* on page 1-6.

**Note:** Always turn off power to a power supply and disconnect the power cable before removing the power supply.

Figure 4-1 shows how to remove a power supply from an array.

Once you have removed a power supply, you can verify its part number by examining the power supply identification label on the power supply enclosure. This label displays the part number as the first six digits in the string: either 200002 (part number 20-0002) or 200005 (part number 20-0005).

**Figure 4-1: Removing a Power Supply**

## Installing a Power Supply

To install a power supply, refer to Figure 4-1 and follow these steps:

1. Ensure that you have the right power supply model, as described in *Identifying the Power Supply Model* on page 4-1.
2. Slide the new power supply into the chassis slot.
3. Re-attach the power supply to the chassis, using the two screws on the power supply.
4. Reconnect the power cable and turn on power to the power supply (press -).

After installing the power supply, turn on power to the array if it was shut down.

Ensure that the new power supply is operational. Check the power supply LEDs, as described in *Interpreting LEDs* on page 1-2. One LED should be green, and one should be orange. Also, check the GUI Member Enclosure window or invoke the CLI member `select show enclosure` command.



## 5 Maintaining Fan Trays

---

PS Series 50E to 400E storage arrays include two hot-swappable fan trays, each with two fans. Fan tray maintenance topics include the following:

- *Identifying Fan Tray Failures* on page 5-1
- *Removing a Fan Tray* on page 5-1
- *Installing a Fan Tray* on page 5-2

### Identifying Fan Tray Failures

A failure on a fan tray can be indicated by the following:

- Fan tray LED is red. See *Interpreting LEDs* on page 1-2.
- Message on the console, in the event log, or in the Group Manager GUI Alarms panel describes a fan tray failure.
- GUI Member Enclosure window or the CLI `member select show enclosure` command shows a fan tray failure.

Fan Tray 1 refers to the fan tray on the left side of the array back panel (when facing the back of the array). Fan Tray 0 refers to the fan tray on the right side. See Figure 1-2 on page 1-1 for details.

### Removing a Fan Tray

If a fan tray fails, you must replace the fan tray as soon as possible, although an array can operate with only one working fan tray. For proper air flow, do not remove a failed fan tray until you are ready to replace it.

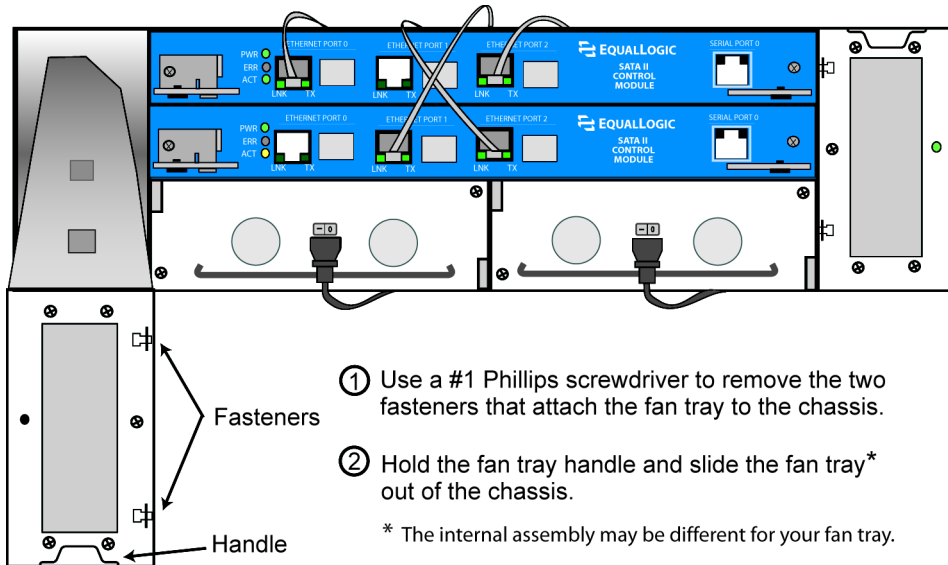
You can remove a fan tray from an array without affecting array operation if the second fan tray is installed and functioning. Otherwise, if possible, cleanly shut down the array before removing the fan tray, as described in *Shutting Down and Restarting an Array* on page 1-6.

**Caution:** If you have recently installed a fan tray, wait until the new fan tray initializes before removing the other fan tray. Fan tray initialization generally can take from one to ten seconds. Examine the event log for a message to ensure that initialization has completed.

Figure 5-1 shows how to remove a fan tray from an array.

**Caution:** The fans may still be rotating after the fan tray is removed, so handle the exposed fan tray with care.

**Figure 5-1: Removing a Fan Tray**



## Installing a Fan Tray

To install a fan tray in an array, refer to Figure 5-1 and follow these steps:

1. Slide the new fan tray completely into the chassis slot. Be sure to orient the handle correctly. Fan tray 1 (on the left when facing the back of the array) is installed with the handle at the bottom. Fan tray 0 (on the right) is installed with the handle at the top.
2. Re-attach the fan tray to the chassis using the two fasteners.

After installing a fan tray, turn on power to the array if it was shut down. Fan tray initialization generally can take from one to ten seconds; completion is indicated by an event message.

To ensure that the new fan tray is operational, check that the fan tray LED is green. Also, check the GUI Member Enclosure window or invoke the CLI `member select show enclosure` command.



# A Environmental, Power, and Physical Requirements

---

Table A-1 describes the environmental, power, and physical requirements for PS Series 50E to 400E storage arrays.

**Table A-1: Storage Array Requirements**

Component	Requirement
Weight of fully-loaded array (14 disks and two control modules)	92 pounds or 41.82 kilograms
Operating temperature	41 to 104 degrees F / 5 to 40 degrees C
Storage temperature	-22 to 140 degrees F / -30 to 60 degrees C
Maximum altitude	10,000 feet
Operational relative humidity	8 to 90% non-condensing
Thermal output of fully-loaded array	1500 BTU/hour, 450 watts
Shock	30 G for 2 ms
Vibration	.1 G @ 10 to 100 hertz
Input voltage	90 to 264 VAC (auto-sensing)
Input current	4.0 amperes (maximum, single power supply) @ 115 volts
Input frequency	50 to 60 hertz
Input power	450 VA
Power supplies	Dual, 400 watts DC output
Height/Width/Depth	5.25" x 17 5/8" x 25" 13.33 cm x 44.77 cm x 63.5 cm



## B Control Module Models

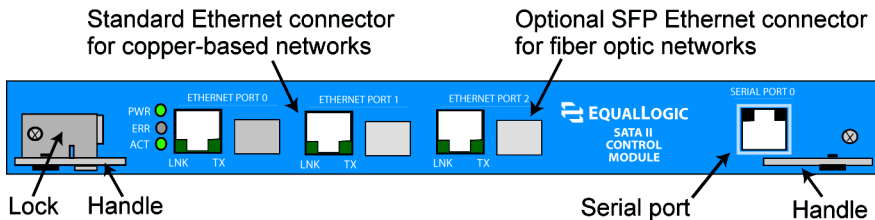
PS Series Firmware Version 2.2 and later firmware versions support the Type II control module for PS Series 50E to 400E storage arrays. This control module is functionally equivalent to a Type I control module, but has a few physical differences, as described in this appendix.

**Warning:** You cannot install different control module types in a PS Series storage array. However, a PS Series group can include arrays with different control modules.

### Model Face Plates

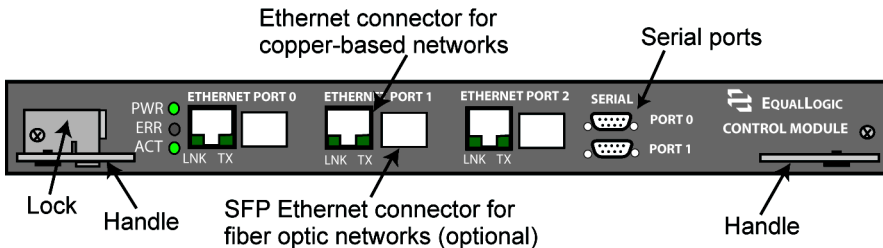
A Type II control module can be identified by its blue face plate and single serial port, as shown in Figure B-1. Type II control modules also have an NVRAM coin cell battery on the back plane.

**Figure B-1: Type II Control Module Details**



A Type I control module can be identified by its dark gray face plate and two serial ports, as shown in Figure B-2.

**Figure B-2: Type I Control Module Details**



## Model Differences

Type I and Type II control module models have equivalent functionality and design, with these exceptions:

- Type II can only run PS Series Firmware Version 2.2 or a higher firmware version. Type I supports all firmware versions.
- Type II has a single serial port (Port 0). Type I has two serial ports (Port 0 and Port 1).
- Type II needs only a null model cable with an RJ45 and a 9-pin female connector to set up a serial connection. A Type I control module requires a Micro-D serial adapter cable and a null modem cable with two 9-pin female connectors to set up a serial connection. An array is shipped with the cable or cables required for a serial connection.
- For arrays with a Type II control module installed, the completion of control module cache synchronization is indicated by the orange ACT LED on the secondary control module.
- Type II includes an NVRAM coin cell battery, in addition to the write cache battery. The status of the NVRAM coin cell battery appears in the Group Manager GUI Member Controllers window and in the output of the CLI `member select show controllers` command.

## Setting Up a Serial Connection

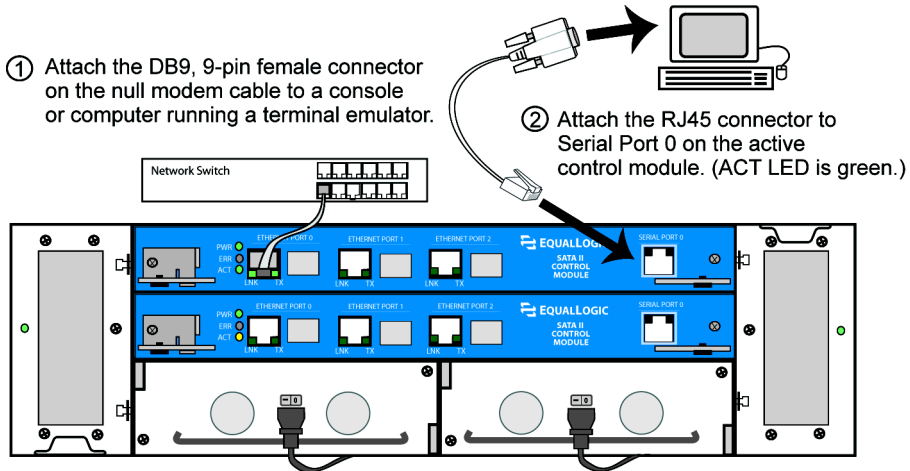
Figure B-3 shows how to set up a serial connection from a console or a computer running a terminal emulator to Type II control module.

Figure B-4 shows how to make a serial connection from a console or a computer running a terminal emulator to a Type I control module.

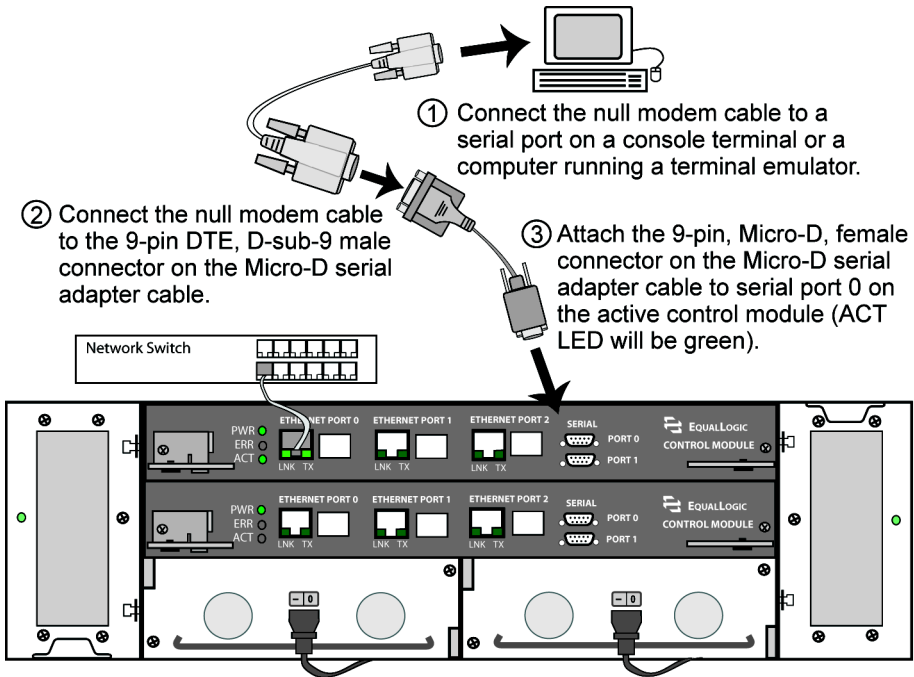
Serial line characteristics are as follows:

- 9600 baud
- One STOP bit
- No parity
- 8 data bits
- No hardware flow control

**Figure B-3: Serial Connection to a Type II Control Module**



**Figure B-4: Serial Connection to a Type I Control Module**





# Index

---

## A

### array

- back panel 1-1
- battery, cache 3-12
- battery, coin cell 3-15
- control module models B-1
- control module restriction 3-7
- control modules 3-1
- disks 2-1
- environmental requirements A-1
- fan trays 5-1
- firmware 3-3
- front panel 1-1
- LEDs 1-2
- power supplies 4-1
- protecting from discharge 1-5
- serial connection B-2
- shutdown procedure 1-6

## B

### battery, cache

- charging 3-9, 3-15
- monitoring charge 3-13
- protecting 3-13
- replacing 3-12
- requirements for handling 3-13
- status 3-12
- storing 3-13

### battery, coin cell

- monitoring charge 3-15
- protecting 3-15
- replacing 3-15
- requirements for handling 3-15
- status 3-15
- storing 3-15

## C

### cables (network)

- connecting 3-4
- copper-based networks 3-4
- fibre optic networks 3-4

### cables (serial), connecting 1-6, B-2

### cache, battery 3-12

### compact flash card

- firmware requirements 3-3
- identifying firmware 3-3
- moving 3-7, 3-11
- replacing 3-3, 3-4, 3-11

### control modules

- cache battery replacement 3-12
- cache battery status 3-12
- charging cache battery 3-9
- checking proper installation 3-9
- coin cell battery replacement 3-15
- coin cell battery status 3-15
- compact flash card moving 3-7, 3-10, 3-11
- compact flash card replacement 3-3, 3-4, 3-11
- details of 1-2
- failover behavior 3-2
- failure indications 3-2
- firmware identification 3-3
- firmware requirements 3-3, 3-7, 3-11
- handling requirements 3-1
- installing in array 3-7
- mixing types B-1
- model descriptions 3-1, B-1

- model differences B-2
  - port redundancy 3-2
  - protecting 3-1
  - removing from array 3-9
  - restriction 3-1, 3-7
  - serial connection B-2
  - synchronizing 1-4, 3-1
  - toggle lock prohibition 3-2
  - verifying operational status 3-8
- copper-based networks, cables 3-4
- D**
- disks
- failure behavior 2-2
  - failure indications 2-2
  - handling requirements 2-1
  - installing in array 2-4
  - locating 2-2
  - protecting 2-1
  - removing from array 2-2
  - verifying operational status 2-4
- E**
- electrostatic protection device 1-5
- environmental requirements A-1
- F**
- failover
- control module 3-2, 3-3
  - network connection 3-3
  - port 3-3
- failure indications
- cache battery 3-12
  - coin cell battery 3-15
  - control modules 3-2
  - disks 2-2
  - fans 5-1
  - power supplies 4-1
- fans
- indications of failure 5-1
  - initialization 5-1
  - installing fan tray in array 5-2
  - locating 5-1
  - removing fan tray from array 5-1, 5-2
  - verifying operational status 5-2
- fiber optic networks, cables 3-4
- firmware
- identifying 3-3, 3-4
  - requirements 3-3, 3-11
- L**
- LEDs, interpreting 1-2
- N**
- network
- cable connections 3-4
  - failure protection 3-3
  - increasing availability 3-4
  - increasing performance 3-4
  - recommendations 3-4
  - requirements 3-4
- NVRAM, battery 3-15
- P**
- physical requirements A-1
- power requirements A-1
- power supplies
- failure indications 4-1
  - identifying type of 4-1
  - installing in array 4-3
  - locating 4-1



- model restriction 4-1
- removing from array 4-2
- verifying operational status 4-3

## **R**

### requirements

- cache battery 3-13
- coin cell battery 3-15
- control modules 3-1
- environmental A-1
- firmware 3-3
- handling disks 2-1
- network 3-4
- physical A-1
- power A-1
- power supplies 4-1

## **S**

- serial connection, making 1-6, B-2
- shutting down an array 1-6
- synchronizing control modules 1-4, 3-1

## **U**

- upgrading to a dual control module array 3-3

## **W**

- wrist strap, using for protection 1-5
- write cache, battery 3-12





9 Townsend West, Nashua, NH 03063  
Tel 603.579.9762 / Fax 603.579.6910 / [www.equallogic.com](http://www.equallogic.com)

