



**EMC**  
**2-Gigabit Disk Processor Enclosure (DPE2)**  
**CX200-Series**

**HARDWARE REFERENCE**

**P/N 014003118**  
**REV A03**

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This manual explains how to install an EMC CX200 or CX200LC 2-gigabit disk processor enclosure (DPE2), and how to replace field-replaceable units (FRUs). It is intended for system administrators and other qualified technical personnel.

## How This Manual Is Organized

Chapter 1	Introduces the CX200-Series DPE2 components.
Chapter 2	Explains requirements and describes how to cable the DPE2 to the server and to other rackmounted disk enclosures.
Chapter 3	Describes how to replace FRUs such as disk modules, power supplies, and storage processors.
Chapter 4	Describes the standby power supply (SPS).
Appendix A	Lists the CX200-Series technical specifications.
Glossary	Defines terms used in the documentation.

## Related Documentation

This guide refers to various documents that provide detailed descriptions of each step. The most current versions of storage system documentation are available on the EMC Powerlink website, <http://powerlink.emc.com>. Once logged in to Powerlink, select **Support** (or **Services**), then **Document Library, CLARiiON, CLARiiON Fibre Channel Storage (FC)** and either **CLARiiON FC Hardware, CLARiiON FC Core Software, or CLARiiON FC Software** for lists and .pdf copies of relevant manuals, notes, and articles, including:

*40U Cabinet Setup Guide (P/N 014003099)*

*Site Preparation and Unpacking Guide for the 40U Cabinet (P/N 014003100)*

*EMC Rails and Enclosures Installation Guide for 19-Inch NEMA Cabinets (P/N 014003082)*

*EMC Storage Systems CX200-Series Initialization Guide (P/N 014003117)*

*EMC 2-Gigabit Disk Enclosure (DAE2) Setup Guide (P/N 014003104)*

*EMC 2-Gigabit Disk Enclosure (DAE2) Hardware Reference (P/N 014003048)*

*EMC Navisphere Manager Revision 6.X Administrator's Guide (P/N 069001161)*

*EMC Fibre Channel Storage System CX200-Series Configuration Planning Guide (P/N 014003115)*

*EMC Navisphere Version 6.X Security Administrator's Guide (P/N 069001124)*

*EMC Installation Roadmap for CX-Series and FC-Series Storage Systems (P/N 069001166)*

## Conventions Used in This Manual

EMC uses the following conventions for notes, cautions, warnings, and danger notices.

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A note presents information that is important, but not hazard-related.

---



### CAUTION

**A caution contains information essential to avoid damage to the system or equipment. The caution may apply to hardware or software.**

---



### **WARNING**

*A warning contains information essential to avoid a hazard that can cause severe personal injury, death, or substantial property damage if you ignore the warning.*



### **DANGER**

*A danger notice contains information essential to avoid a hazard that will cause severe personal injury, death, or substantial property damage if you ignore the warning.*

EMC uses the following type style conventions in this guide:

<b>This typeface</b>	Indicates text (including punctuation) that you type verbatim, all commands, pathnames, filenames, and directory names. It indicates the name of a dialog box, field in a dialog box, menu, menu option, or button.
<i>This typeface</i>	Represents variables for which you supply the values; for example, the name of a directory or file, your username or password, and explicit arguments to commands.
This typeface	Represents a system response (such as a message or prompt), a file or program listing.
x -> y	Represents a menu path. For example, <b>Operations -&gt; Poll All Storage Systems</b> tells you to select <b>Poll All Storage Systems</b> on the <b>Operations</b> menu.
[ ]	Encloses optional entries.
	Separates alternative parameter values; for example: <i>LUN-name   LUN-number</i> means you can use either the LUN-name or the LUN-number.

## Where to Get Help

For questions about technical support and service, contact your service provider.

If you have an EMC service contract, contact EMC Customer Service at:

**United States:** (800) 782-4362 (SVC-4EMC)

**Canada:** (800) 543-4782 (543-4SVC)

**Worldwide:** (800) 497-7901

Follow the voice menu prompts to open a service call, then select CLARiON Product Support.

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For the list of EMC sales locations, please access the EMC home page at:

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For additional information on the EMC products and services available to customers and partners, refer to the EMC Powerlink Web site at:

<http://powerlink.emc.com>

## Your Comments

Your suggestions will help us continue to improve the accuracy, organization, and overall quality of the user publications. Please send a message to **techpub\_comments@emc.com** with your opinions of this guide.

The following warnings and cautions pertain throughout this guide.



### **WARNING**

*Trained service personnel only.*

*This unit has two power supply cords. To reduce the risk of electric shock, disconnect both power supply cords before servicing.*

*Ground circuit continuity is vital for safe operation of the machine. Never operate the machine with grounding conductors disconnected. Remember to reconnect any grounding conductors removed for or during any installation procedure.*

*Reservé au personnel autorisé.*

*Cet appareil comporte plus d'un cordon d'alimentation. Afin de prévenir les chocs électriques, débrancher les deux cordons d'alimentation avant de faire le dépannage.*

*Un circuit de terre continu est essentiel en vue du fonctionnement sécuritaire de l'appareil. Ne jamais mettre l'appareil en marche lorsque le conducteur de mise à la terre est débranché.*

*Nur für Fachpersonal.*

*Das Gerät hat mehr als eine Anschlussleitung. Zur Vermeidung der Gefahr eines elektrischen Schlages sind vor dem Öffnen beide Anschlussleitungen vom Netz zu trennen.*

***STROMSTREUVERLUST:** Gerät muss geerdet werden, bevor es am Stromnetz angeschlossen wird.*



**CAUTION**

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Trained personnel are advised to exercise great care at all times when working on the unit. Remember to:

- ◆ Remove rings, watches, or other jewelry and neckties before you begin any procedures.
  - ◆ Use caution near any moving part and any part that may start unexpectedly such as fans, motors, solenoids, and so on.
  - ◆ Always use the correct tools for the job.
  - ◆ Always use the correct replacement parts.
  - ◆ Keep all paperwork, including incident reports, up to date, complete, and accurate.
- 

**Static Precautions**

EMC incorporates state-of-the-art technology in its designs, including the use of LSI and VLSI components. These chips are very susceptible to damage caused by static discharge and need to be handled accordingly.



**CAUTION**

---

Before handling printed-circuit boards or other parts containing LSI and/or VLSI components, observe the following precautions:

- ◆ Store all printed-circuit boards in antistatic bags.
  - ◆ Use a ground strap whenever you handle a printed-circuit board.
  - ◆ Unless specifically designed for nondisruptive replacement, never plug or unplug printed-circuit boards with the power on. Severe component damage may result.
- 

**Replacing the SP battery**

The storage processor includes a lithium battery. Only trained personnel should change or replace this battery.



**WARNING**

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*Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the equipment manufacturer. Discard used batteries according to manufacturer's instructions.*

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## About the CX200-Series DPE2

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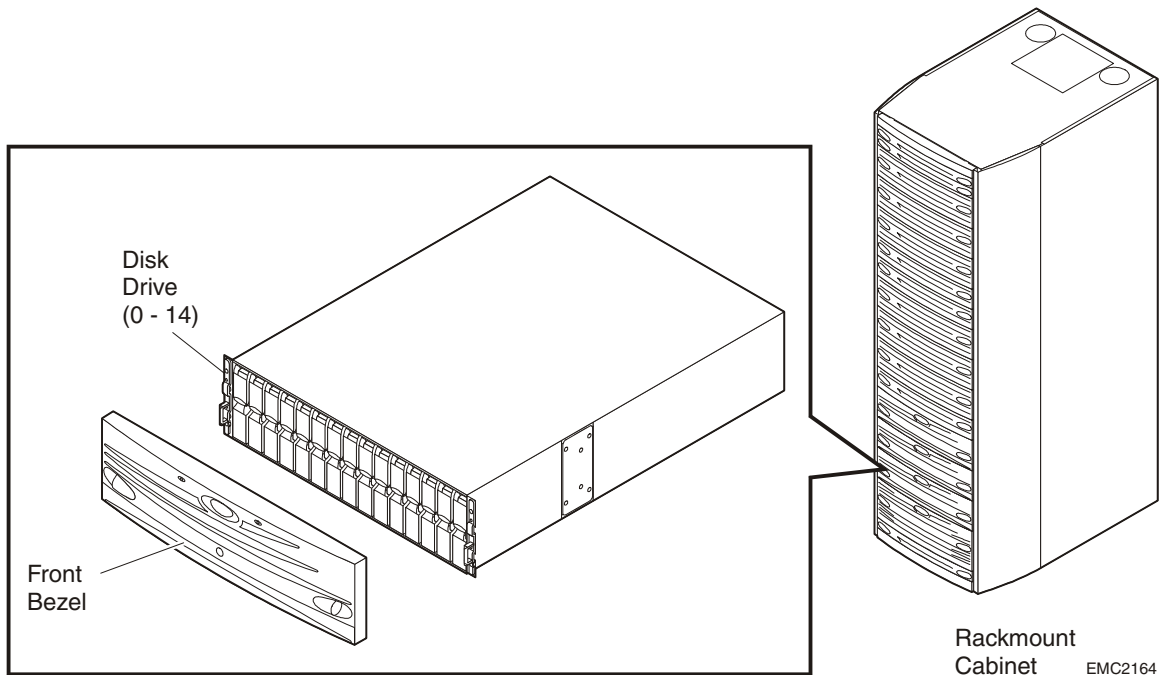
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This chapter describes the CX200 and CX200LC 2-gigabit disk processor enclosures (DPE2). Major topics include

- ◆ Overview ..... 1-2
- ◆ CX200-Series Components..... 1-3

## Overview

The Model CX200-Series of 2-gigabit disk processor enclosures (DPE2), shown in Figure 1-1, are intelligent, high-performance, high-capacity disk-array storage systems that use a Fibre Channel Arbitrated Loop (FC-AL) or fabric as their interconnect interface. Each enclosure is only 3U (5.25 inches) high, but can include 15 hard disk drives. The system's modular, scalable design provides additional disk storage as your needs increase. The examples and illustrations in this manual show the rackmounted DPE2 in a standard 40U EMC cabinet.



**Figure 1-1 Model CX200 Disk Processor Enclosure (DPE2)**

A standard CX200 can support one additional disk-array enclosure (DAE2, also called an array module). A DAE2 is a basic 15-disk enclosure without a storage processor (SP). The CX200 and DAE2 together support up to 30 disk modules in a single disk-array storage system.

Economical CX200LC systems do NOT support an additional DAE2.



You can place the DAE2 in the same cabinet as the CX200, or in a separate cabinet. The CX200-Series systems connect to the external Fibre Channel environment using small form factor SFF LC optical transceivers on the storage processor. High-availability features are standard. The EMC Access Logix™ software option provides Storage Group functionality for the CX200 and CX200LC.

---

## CX200-Series Components

The CX200-Series storage system includes:

- ◆ A CX200 DPE2 consisting of
  - A sheet-metal enclosure with a midplane and front bezel
  - Two storage processors (SPs)
  - Five to fifteen disk modules
  - A single standby power supply (SPS)
  - Two power supply/system cooling modules

---

Blowers integrated in the power/cooling modules cool the entire enclosure. The CX200 does not require discrete fan assemblies.

---

or

- ◆ A CX200LC DPE2 with
  - A sheet-metal enclosure with a midplane and front bezel
  - One storage processor
  - Three to fifteen disk modules
  - One power supply/system cooling (power/cooling) module
  - One blower module

Standard CX200 systems can support an optional single DAE2 with as many as fifteen disk modules.

Any unoccupied disk module slot has a filler module to maintain air flow.

The storage processors, disk modules, power/cooling modules, blower modules, and filler modules are field replaceable units (FRUs). You can add or replace them without tools and, in most cases, while the array is powered up.

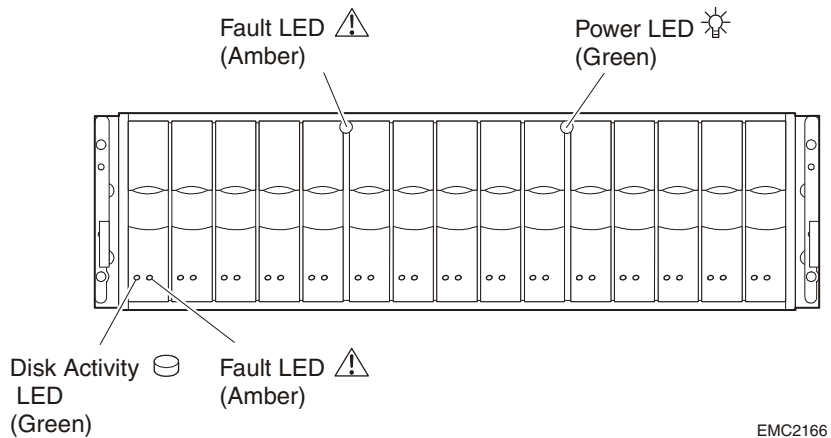
The disk modules are FC-AL compliant and support dual-port FC-AL interconnects through the storage processors and their cabling.

A CX200 system can continue running in a degraded mode with one operating power supply and one functioning SP. You should replace a failed FRU as soon as possible.

Figures 1-2 through 1-4 show the enclosure components. Where the enclosure provides slots for two identical components, the components are called *component-name A* or *component-name B*, as shown in the illustrations.

For increased clarity, the following figures 1-2 through 1-10 depict the DPE2 outside of the rack cabinet. Your enclosure may be installed in a rackmount cabinet as shown in Figure 1-1.

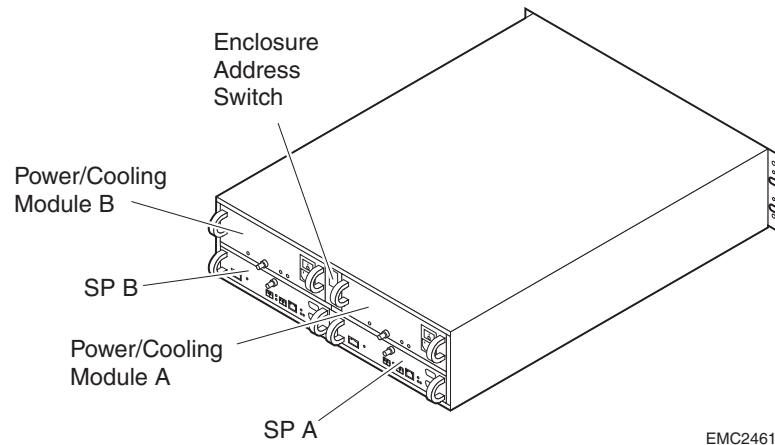
As shown in Figure 1-2, the front LED display contains two status lights for each disk module, and two disk enclosure status lights. The status lights are visible with the front bezel installed.



**Figure 1-2 CX200 DPE2 Front LED Display**

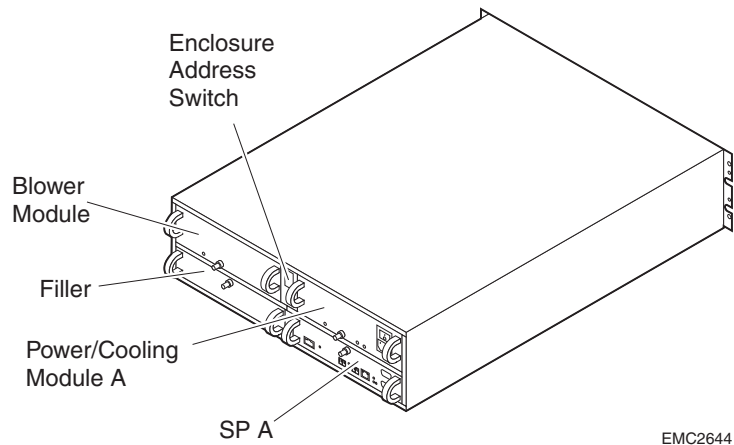
Figure 1-3 shows the DPE2 components visible from the rear of the cabinet.

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**Figure 1-3 CX200 DPE2 Rear View**

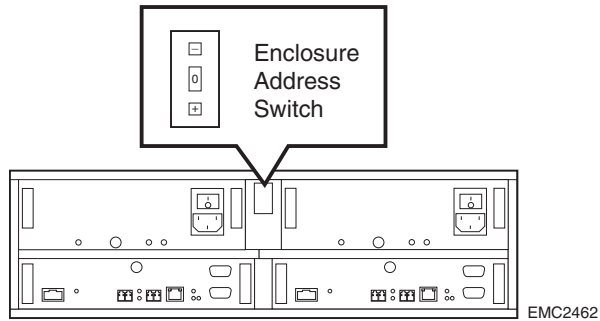
CX200LC systems include a filler module in place of SP B, and a blower-only module in place of power/cooling module B.



**Figure 1-4 CX200LC DPE2 Rear View**

As shown in Figure 1-5, an enclosure ID, or *enclosure address*, switch is located between the power/cooling modules at the rear of the disk enclosure.

*The enclosure address for the CX200-Series DPE2 is always 0.*



**Figure 1-5 CX200 DPE2 Enclosure Address Switch/Indicator**

The CX200-Series status lights are described in Chapter 3, *Servicing and Upgrading a CX200-Series DPE2*.

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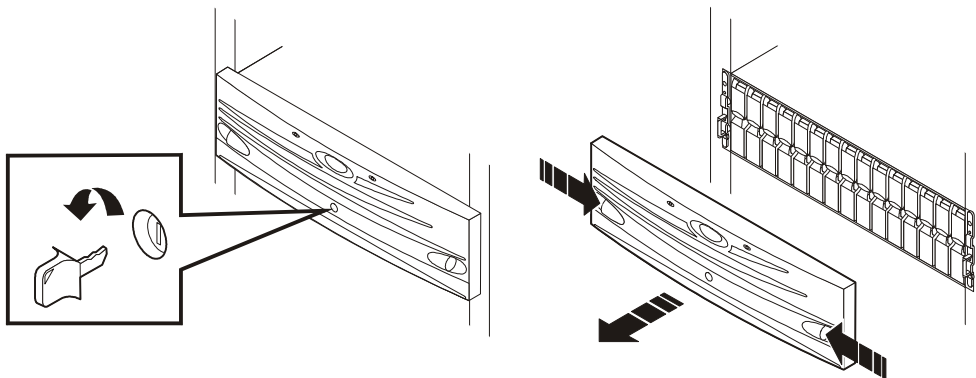
## Midplane

The midplane distributes power and signals to all the enclosure components. All FRUs plug directly into midplane connectors.

---

## Front Bezel

The front bezel has a locking latch and an electromagnetic interference (EMI) shield. You can remove the bezel to remove and install drive modules. EMI compliance requires a properly installed front bezel.



**Figure 1-6 Disk Processor Enclosure Front Bezel**

## Storage Processors

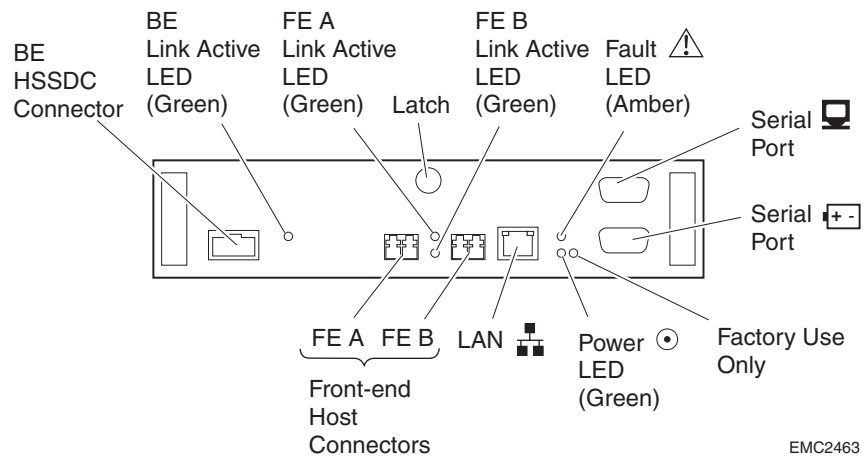
The SP is the CX200's intelligent component. It combines the functions of a typical storage processor circuit board and a disk enclosure link control card into a single module.

Full high availability with write caching requires two storage processors.

The CX200-Series SP has the following ports:

- ◆ COM 1 serial port
- ◆ COM 2 serial SPS port for communication with the standby power supply in a standard CX200 system
- ◆ Network port for storage-system management
- ◆ One high speed serial data connector (HSSDC) back-end (BE) port for the FC-AL loop to the disks in a DAE2 (not supported in CX200LC systems)
- ◆ Two fibre-optic front-end (FE) connectors, for connecting to the external Fibre Channel environment (switch or host).

Figure 1-7 shows the SP front panel, with connectors and status LEDs.



**Figure 1-7 CX200 Storage Processor**

The CX200-Series status lights are described in *Monitoring CX200-Series Status* in Chapter 3.

The storage processor communicates with internal disks through the midplane. It connects to external link control cards (LCCs) and disks via an external FC-AL loop (bus). The SP-LCC interface is called the SP back end.

On a highly available CX200 system, you can replace either storage processor module while the CX200 is running. Since a CX200LC system does not include redundant SPs, failure or removal of the single SP will cause a system failure.

You should never attempt to replace any of the SP's components.



### CAUTION

**Pulling out a CX200 SP will cause a failover. (A failover is the automatic transfer of one or more LUNS from one SP to another, if a failure occurs in the path of the original SP.)**

**CX200 SPs are paired. If you remove both storage processors simultaneously, neither SP can save cached data to disk.**

## Disk Modules

Each disk module, shown in Figure 1-8, consists of one 12-volt Fibre Channel disk drive in a carrier. You can add or remove a disk module while the CX200 is powered up, but you should exercise special care when removing drives while they are in use.

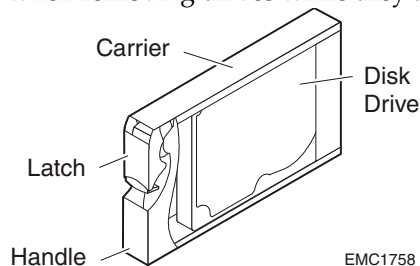


Figure 1-8 Disk Module

### Disk Drives

The disk drives are 3.5-inch (8.75 cm) by 1.0-inch (2.54 cm), 12-Volt, Fibre Channel drives that conform to the following standards:

- ◆ SFF-8045
- ◆ SCSI Enclosure Services (SES) portion of the SCSI 3 Standard
- ◆ FC-AL
- ◆ FC-AL Private Loop Direct Attach (PLDA) Profile
- ◆ 2-Gbit Fibre Channel interface

**Drive Carrier** The disk drive carrier is a metal and plastic assembly that provides smooth, reliable contact with the enclosure slot guides and midplane connectors. It has a handle with a latch and spring clips. The latch holds the disk module in place to ensure proper connection with the midplane. Disk drive Activity/Fault LEDs are integrated into the carrier.

---

Drive modules are extremely sensitive electronic components. Refer to the instructions on *Handling FRUs* and *Replacing or Adding a Disk Module* in Chapter 3 whenever you handle a disk module.

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## Power Supply/System Cooling Modules

The power supply/system cooling (power/cooling) modules are located above the SPs. The units integrate independent power supply and dual-blower cooling assemblies into a single module. CX200LC enclosures use one power\cooling assembly and a blower-only module that includes dual blowers but no power supply.

Each power supply is an auto-ranging, power-factor-corrected, multi-output, off-line converter with its own line cord and on/off switch. Each supply supports a fully configured DPE2 and shares load currents with the other supply. The drives and SPs have individual soft-start switches that protect the disk drives and SPs if you install them while the disk enclosure is powered up. A FRU (disk, SP, blower, or power/cooling module) with power-related faults will not adversely affect the operation of any other FRU.

The system cooling assembly includes two dual-blower modules. If one blower fails, the others will speed up to compensate. If two blowers in a system (both in one power/cooling or blower module, or one in each module) fail, the CX200 will go off line within two minutes.

Each power/cooling module has visible status lights. The rightmost LED indicates power to the supply; the LED adjacent to it indicates a power supply fault. The leftmost LED (the single LED in a CX200LC blower module) indicates a failure in one of the integrated blowers within that module. The status lights are described in *Monitoring CX200-Series Status* in Chapter 3.

Figure 1-9 shows a rear view of a CX200 power/cooling module; note that a CX200LC blower and power/cooling modules are externally identical except the blower module includes none of the power switch, connector, or LED components.

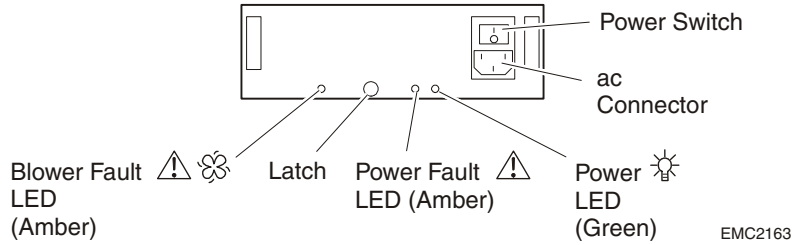


Figure 1-9 Power Supply/System Cooling Module

### Standby Power Supply (SPS)

Disk configurations that use write caching require a standby power supply (SPS) to prevent data loss during a power failure. The standard CX-Series SPS supports a variety of processor and disk enclosures similar to the CX200 and DAE2. See Figure 1-10.

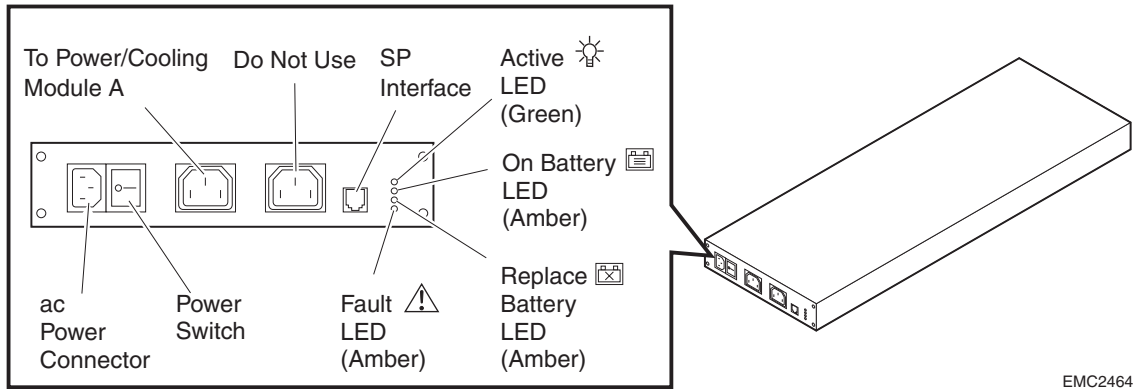


Figure 1-10 Standby Power Supply

See Chapter 4, *The Standby Power Supply (SPS)*, for detailed information about SPSs.



---

This chapter describes the CX200-Series DPE2 installation requirements and procedures. Major topics include

- ◆ Requirements.....2-2
- ◆ Installing a DPE2 in a Cabinet.....2-4
- ◆ Setting Up an Installed CX200-Series DPE2.....2-5
- ◆ DPE2 Powerup and Initialization.....2-14
- ◆ CX200-Series Powerdown.....2-15

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## Requirements

This section explains site, cabling, address, and disk requirements.

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### Site Requirements

For proper operation, the installation site must conform to certain environmental specifications. These are detailed below and in Appendix A.

#### Power

To determine an enclosure's power requirements, use the power rating on the enclosure label. This rating is the maximum power required for a fully loaded enclosure. The input current, power (VA), and dissipation per enclosure are based on the maximum capability of the power supplies and cooling system to provide internally regulated power. Typical values will be less than the maximum, depending on the number and manufacturer of disk drives. These values represent the sum of values shared by the line cords of two power supplies in the same enclosure. Power cords and supplies share the power load evenly. If one of the two power supplies in a standard CX200 fails, the remaining supply and cord support the full load. You must use a rackmount cabinet with ac power distribution, and have main branch ac distribution that can handle these values for the number of components that you will interconnect.

#### Cooling

The temperature at the front bezel inlet must meet the ambient temperature specification described in Appendix A. The site must have air conditioning of the correct size and placement to maintain the specified ambient temperature range. The air conditioning must be able to handle the BTU requirements of the CX200-Series DPE2 and any additional disk enclosure.

---

### Cabling Requirements

The CX200 DPE2 supports copper cable for *back-end* (BE) connections to disks it controls (for example, DAE2 disk enclosures). CX200-Series systems use optical cables for *front-end* (FE) connections to the external Fibre Channel environment.

Any copper cables you use must meet the appropriate standards for 2-Gbit FC-AL. Such cables must be fully shielded, twin-axial, full-duplex cables with High Speed Serial Data Connector (HSSDC) connectors. Distances greater than 1 meter require equalized cables; unequalized 1-meter cables are adequate. The DPE2 does not support cables shorter than 1 meter or longer than 10 meters.

---

EMC supports and can provide 1-, 5-, and 10-meter cables. The 5- and 10-meter cables are equalized.

Interconnections between the CX200 and a disk enclosure should maintain consistency with the link controller cards (LCCs) in the additional disk enclosure. For example, SP A interconnects with LCC A, and SP B interconnects only to LCC B.

Do not leave an unused (that is dangling) cable connected to a host or enclosure port because it may cause excess noise on the loop.

---

## Addressing Requirements

Addressing requirements vary between fibre port (fabric) and fibre loop (FC-AL) environments.

Fabric environments use the Source\_ID (SID) and enclosure address (EA) to address each disk enclosure. A switch in the external Fibre Channel environment automatically assigns the Source\_ID.

FC-AL environments use the FC-AL address ID and the enclosure address (EA) to address each enclosure.

### Enclosure Address (EA)

Each CX200 DPE2 and DAE2 on a back-end loop needs a unique enclosure address (EA) that identifies the enclosure and determines disk module addresses.

*The CX200-Series DPE2 has a fixed EA of 0, which you should not change.* The standard CX200 supports one Fibre Channel loop and a maximum of two disk enclosures (including the CX200 DPE2 itself). The CX200LC supports a single, non-redundant, integrated loop and does not support a second disk enclosure. For ease of use, we recommend that you keep the EAs sequential; a maximum configuration would therefore include an EA 0 and an EA 1 for the single CX200 loop (loop 0).

---

## Disk Requirements

CX200 storage systems require at least five disk modules installed in slots 0, 1, 2, 3, and 4 (the leftmost slots) of the DPE2. Full high availability that includes write caching requires five disk modules and an SPS unit. CX200LC storage systems do not support write caching and require only three disk modules, in slots 0, 1, and 2. Disk module IDs are numbered left to right (facing the unit) and are contiguous throughout an array: enclosure 0 contains modules 0-14; enclosure 1 contains modules 15-29.

The disk modules in slots 0-3 (CX200 enclosure) or 0-2 (CX200LC) provide mirrored boot capability and are preloaded according to their slot assignment before shipment. **Do not move a preloaded module** from its assigned slot to another slot, and remove it only to replace the disk. For details on DAE2 disks and their configuration, refer to the *EMC 2-Gigabit Disk Enclosure (DAE2) Hardware Reference*.

## Installing a DPE2 in a Cabinet

CX200-Series DPE2s mount inside a cabinet on two L-shaped mounting rails connected to the cabinet's vertical channels. If you need to install a cabinet or CX200-Series chassis, refer to one of the following manuals:

- ◆ Installing the cabinet itself is explained in the cabinet installation manual shipped with the cabinet.
- ◆ Installing the universal mounting rails in the cabinet, and installing the 3U chassis on those rails, is explained in the *EMC Rails and Enclosures Installation Guide for 19-Inch NEMA Cabinets* that shipped with the rails.

### Warnings and Recommendations:

The cabinet in which you will install the CX200 must have a full earth ground to provide reliable grounding. Also, the cabinet should have its own switchable power distribution. We suggest that you use a cabinet that has dual power distribution units, one on each side.



#### WARNING

*The enclosure is heavy and should be installed into a rack by two people. To avoid personal injury and/or damage to the equipment, do not attempt to lift and install the enclosure into a rack without a mechanical lift and/or help from another person.*

*L'armoire étant lourde, sa mise en place sur une rampe nécessite deux personnes. Afin de ne pas vous blesser et/ou endommager le matériel, n'essayez pas de soulever et d'installer l'armoire sur une rampe sans avoir recours à un relevage mécanique et/ou à l'aide d'une autre personne.*

*Das Gehäuse ist schwer und sollte nur von zwei Personen in einem Rack installiert werden. Zur Vermeidung von körperlichen Verletzungen und/oder der Beschädigung des Gerätes, bitte das*

*Gehäuse nicht ohne die Hilfe einer zweiten Person anheben und einbauen.*

*Il contenitore è pesante e dev'essere installato nel rack da due persone. Per evitare danni personali e/o all'apparecchiatura, non tentare di sollevare ed installare in un rack il contenitore senza un sollevatore meccanico e/o l'aiuto di un'altra persona.*

*Debido a su considerable peso, la instalación del compartimento en el bastidor deben realizarla siempre dos personas. Para evitar daños personales o en el equipo, el compartimento no debe levantarse ni instalarse en el bastidor sin la ayuda de un elevador mecánico o de otra persona.*

We recommend that you use cabinet anti-tip devices, especially if you are installing or removing a storage system or disk enclosure in the upper half of the cabinet when the lower half is empty.

## Setting Up an Installed CX200-Series DPE2



### CAUTION

**Be sure the circuit breakers and any standby power supplies in your cabinet are switched off before you begin setting up the CX200 or CX200LC.**

### Setting Enclosure Addresses

Each disk enclosure in your system must have a unique enclosure ID (also called an enclosure address, or EA) that identifies the enclosure and determines disk module IDs. In most cases, the enclosure address has been set before shipment to coincide with the rest of the system; you need to reset the switch if you installed the enclosure into your rack independently. The EA can range from 0 through 7, though we recommend that you number them consecutively from 0. *The CX200-Series DPE2 is always enclosure 0.* An additional DAE2 disk enclosure is usually numbered 1, reflecting its position on the Fibre Channel loop (bus) connecting the array. You set the EA with the enclosure address switch, which has one push button for incrementing the address and another for decrementing it. To set the EA, you can use a pen, paper clip, or small screwdriver.



### CAUTION

Each drive reads its FC-AL physical address only at powerup or when the drive is reset. To avoid losing data, *you must set the EA when power is off; you cannot change the EA while power is on.*

1. Set the enclosure address for the CX200/CX200LC to 0. Refer to Figure 2-1.
2. Set the enclosure address for an additional disk enclosure (CX200 only) to 1.

See Figure 2-1 as necessary.

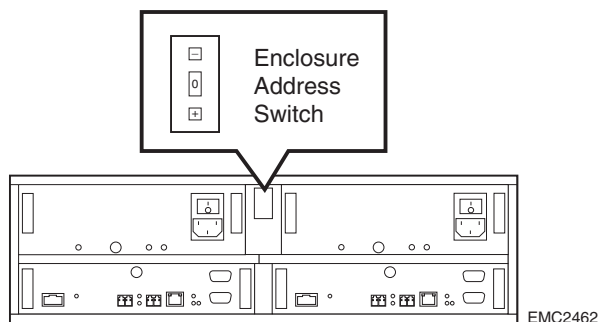
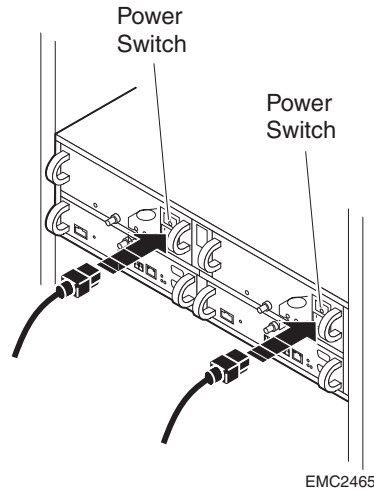


Figure 2-1 CX200-Series Enclosure Address Switch (CX200 Shown)

## Making Power Connections

1. Make sure the power switches are in the off position, and then plug an ac line cord into each power supply/cooling module. See Figure 2-2.

Make certain you secure the power cord with the wire bail strain reliefs at each connector. The strain reliefs prevent the power cord from pulling out of the connection.

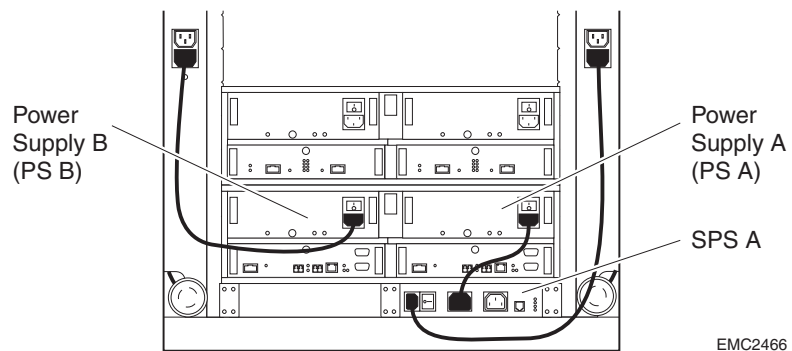


**Figure 2-2 ac Line Cord and the Power Switch (CX200 Shown)**

2. Connect enclosure power.

*CX200 systems:*

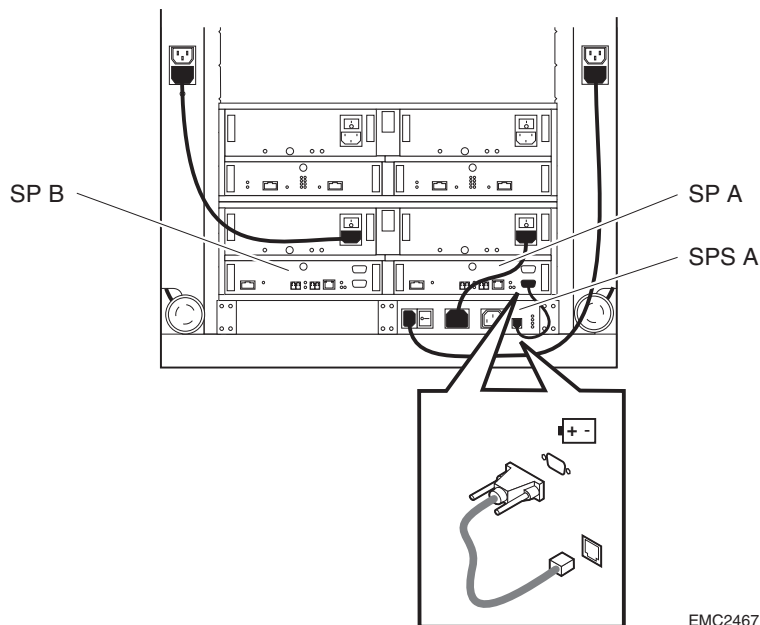
- Plug the ac line cord from power supply/cooling module (PS) A to the standby power supply (SPS). Plug the other end of the PS B power cord into the closest power strip. Whenever possible, connect the SPS and PS B to independent circuits. *Do not connect PS B and PS A to the same SPS.* Refer to Figure 2-3.



**Figure 2-3 Connecting CX200 Power Cords**

*CX200LC systems:*

- Plug the ac line cord from power supply /cooling module (PS) A to the closest power strip.
  - Skip the remaining steps in this section, and proceed with *Connecting the CX200-Series DPE2 to the External Environment* on page 2-11.
3. Connect storage processor A to the serial port on the standby power supply, as shown in Figure 2-4.



EMC2467

**Figure 2-4 Connecting the Standby Power Supply to SP A**

4. Connect DAE2s and other devices to the power strips in your cabinet. For high availability, connect dual power supplies in any component to separate power circuits (opposite strips in the cabinet).
5. Connect the SPS to the cabinet power strip.

Figure 2-5 shows typical power connections in a CX200 system.



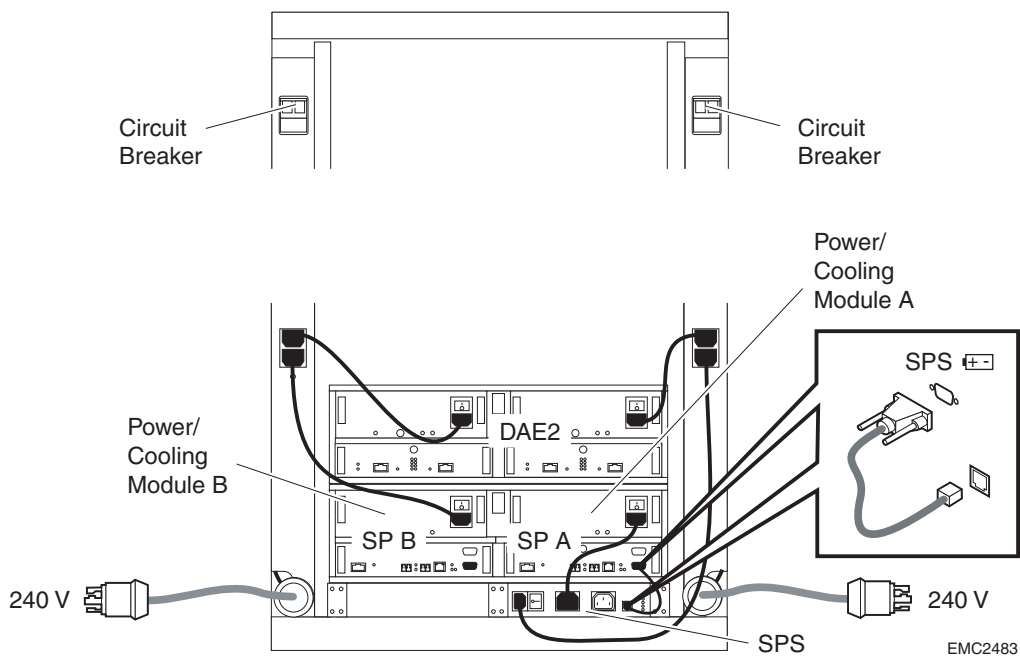
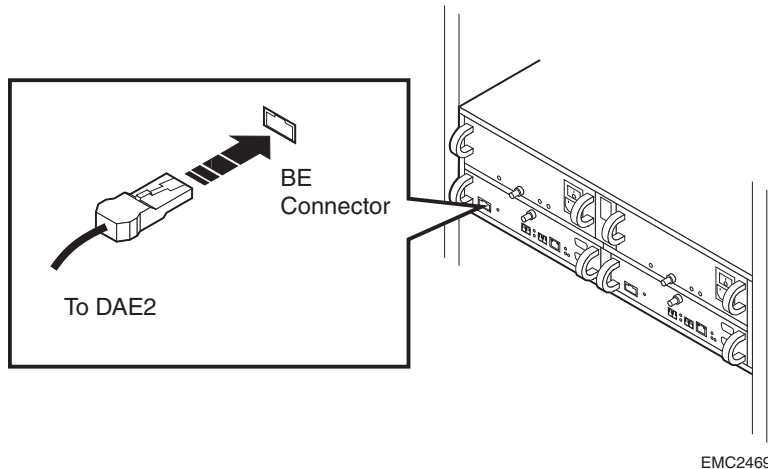


Figure 2-5 CX200 Power Connections

## Making Back End Connections

1. Attach copper cables from the CX200 DPE2 to additional disk enclosures, as shown in Figure 2-6.

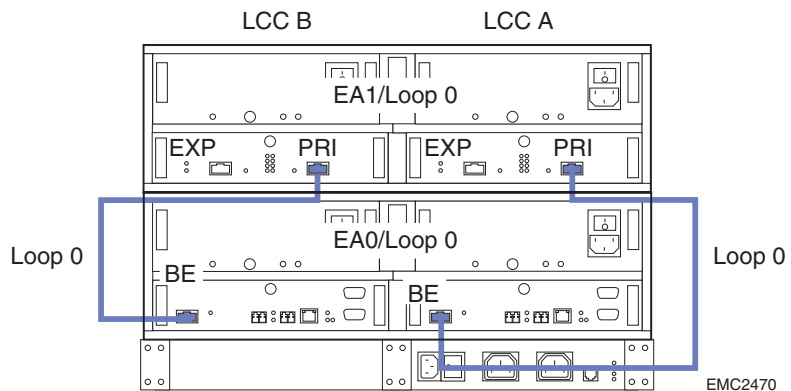


**Figure 2-6 Connecting a CX200 DPE2 to Another Disk Enclosure**

Connect the back end (BE) on the CX200 to the Primary (PRI) connector in any additional disk enclosure (EA 1).

2. Disk-array enclosures cabled together should appear as shown in Figure 2-7.

The example configuration in Figure 2-7 shows a CX200 below a DAE2 disk-array enclosure. The two devices support a redundant loop 0. Note that the CX200 connects to the *Primary* disk enclosure connectors.



**Figure 2-7 Cabling a CX200 and Disk Enclosure Together**

---

## Connecting the CX200-Series DPE2 to the External Environment

When working with optical cables, observe the following precautions:

- ◆ Keep the covers on all optical cables and optical connectors until you are ready to insert the cables. The covers protect the cables and connectors, and prevent foreign particles, such as dust, from entering and affecting the connection.
- ◆ Do not leave any unused (dangling) cables connected to an SP port.
- ◆ Avoid tight bends, particularly those 90° or more.
- ◆ Do not use optical cables to support weight, including long cable runs without support.
- ◆ Do not pull long runs of cable. It is best to lay the cable in place or pull only a few feet at a time.
- ◆ Run the cables so that they are not stepped on or rolled over by anything.

For each SP connection to the external environment, attach an optical cable from the front-end (FE) connector to the external environment. Follow the steps below to cable and connect the SPs.

1. Remove the protective covers from optical connector FE A and an optical cable, as shown in Figure 2-8.
2. Plug the cable into the FE A connector on the SP. See Figure 2-8.

---

Do not use the FE B host connector, except for a direct connection to a host bus adapter on a dual-node cluster.

---

Never connect both FE A and FE B to a switch.

---

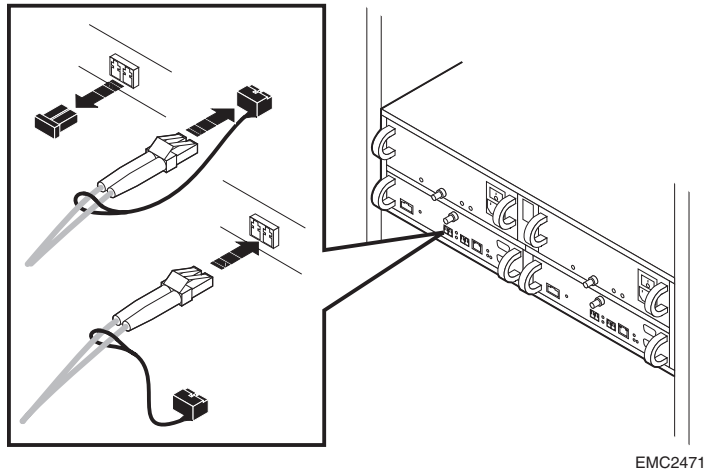


Figure 2-8 Attaching Fibre-Optic (Front-End) Cables to the SP (CX200 Shown)

3. Plug the other end of the FE A fibre-optic cable into the host bus adapter (HBA) or switch port.

CX200-Series systems do not support MirrorView™ or SnapView™ software applications, external hubs, or daisy-chained arrays.

## Making Management LAN Connections

Before you connect your system to a management Local Area Network, refer to the Navisphere 6.X Release Notes for the version of the Java 2 Runtime Environment (JRE) and web browser (Internet Explorer or Netscape) required to manage your system. With the proper browser and JRE, you can manage a CX200 Series system from any server that shares a LAN with your storage system's domain. (Note that Navisphere Manager is required on at least one system in the domain.)



### CAUTION

To manage the storage system in a NEBS (Network Equipment Building System) environment, use either of the following configurations:

- ◆ To connect a local client (a notebook or other server) to the SP LAN ports, use short Ethernet cables and a simple Ethernet hub.

- ◆ To connect the SP LAN ports to your intra-building network, you *must* use shielded cable and grounded connectors at both ends of the connection points.

Connect each SP to the LAN from which you will run Navisphere management, as shown in Figure 2-9 or Figure 2-10.

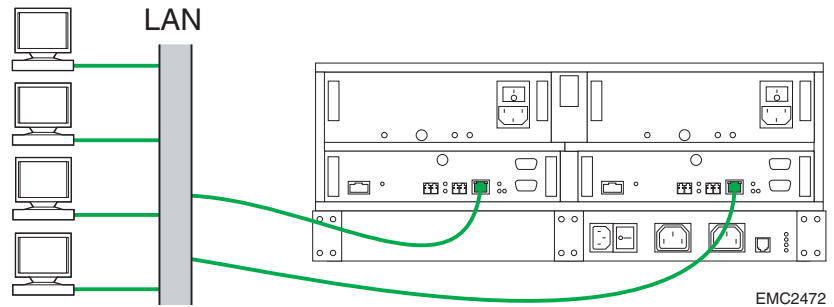


Figure 2-9 Connecting the CX200 to a Shared LAN

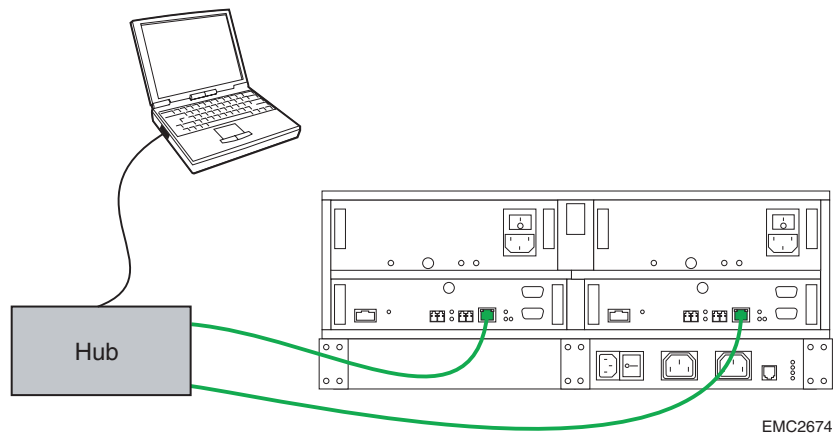


Figure 2-10 Connecting the CX200 to a Local Management Client

## DPE2 Powerup and Initialization

Before applying power to a storage system, make sure all the disk module slots in each disk enclosure contain either disk or filler modules, for proper cooling and normal operation.

---

Do not power up a disk enclosure without at least one SP or LCC installed.

---

To power up the CX200-Series system:

1. Turn on the power to any DAE2 connected to the CX200.
2. Turn the CX200/CX200LC power supply/cooling module switches to the on (I) position.
3. If present (CX200 systems only), turn the SPS power switch to the on position.
4. In the cabinet, set the main circuit breaker switches to the on position.

The CX200/CX200LC and any connected DAE2 in the cabinet will power up.

---

The only power switches on a DPE2 or DAE2 disk enclosure are those on the power supply, which are normally *on*. As a result, the units are *always active*.

---

When you initially apply ac power to a disk enclosure, the disk drives power up according to their specifications, and spin up in a specified sequence dictated by enclosure and loop id. The slot spin-up delays range from 0 to 84 seconds. The slots use the same delays when you insert a drive while the system is powered up.

The CX200-Series hardware monitor (FRU monitor) resets and begins its control loop. The port bypass circuits enter the states indicated by their associated drives. The monitor continues to run in this local mode until it receives commands that dictate otherwise. In local mode, the monitor maintains the port bypass circuits in the same states as the drive command signals. When a drive fault occurs, the corresponding drive fault light turns on. Firmware commands can take control of the port bypass circuits and the drive status lights.



### CAUTION

**The drives read their FC-AL physical address only at powerup or when the drive is reset. To avoid potential data loss, you must set the enclosure address when you install the disk enclosure and power is off; you cannot change the EA while power is on.**

For instructions on how to initialize your system after its first powerup, refer to the *EMC Storage Systems CX200-Series Initialization Guide* and the *EMC Installation Roadmap for CX-Series and FC-Series Storage Systems*.

## CX200-Series Powerdown

If a CX200 with an SPS is powered down abnormally (for example, a brownout or ac failure), cached data is saved to the storage-system vault disks. However, when the CX200 is powered back up again, it may take longer to come on line.

### Turning Off the Power

1. Stop all I/O activity to the DPE2.

Stopping the I/O allows the SP in a CX200 DPE2 to transfer cache data, and may take some time. The length of time will be based on criteria such as the amount of cache, the amount of data in the cache, the type of data in the cache, and the target location on the disks, but it is typically less than one minute. CX200LC systems do not support write-caching.

2. If the server connected to the CX200/CX200LC is running the UNIX® operating system, unmount file systems.
3. Use the power switch on an SPS to turn off power to the CX200 DPE2 and any other device connected to the SPS. If the power/cooling module is not connected to an SPS, turn off power with the power/cooling module power switch. See Figure 2-11.

You do not need to turn off power to a connected DAE2.

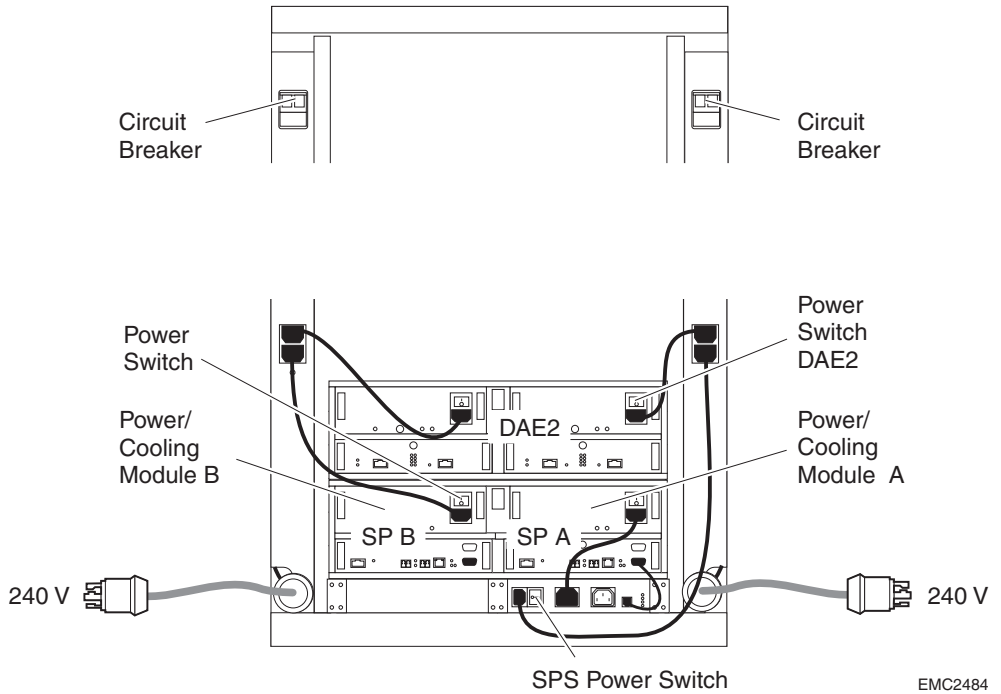


Figure 2-11 Powering Down (CX200 Shown)



**CAUTION**

Never shut off the power supply/cooling modules to shut down a CX200 power supply that is connected to an SPS. Bypassing the SPS in that manner prevents the system from saving write cache data to the vault drives, and results in data loss. You will lose access to data, and the storage processor event log will display an error message similar to the following:

```
Enclosure 0 Disk 5 0x90a (Can't Assign - Cache Dirty) 0  
0xafb40 0x14362c.
```

Contact your service provider if this situation occurs.

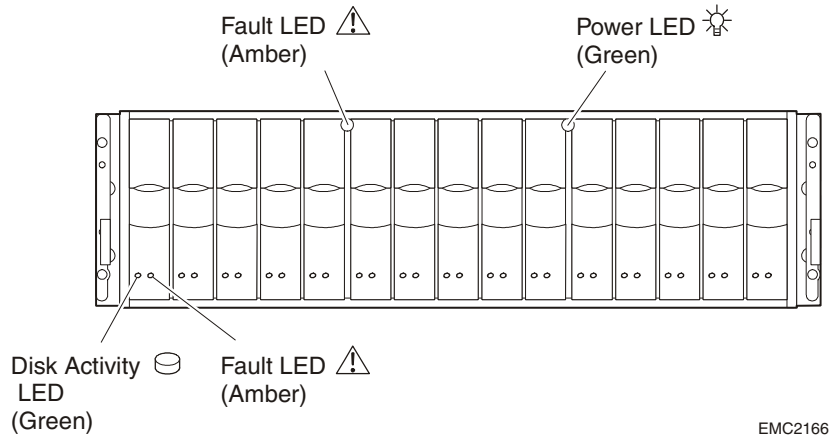


This chapter describes how to monitor disk enclosure status, handle Field-Replaceable Units (FRUs), and replace or add a FRU. Topics are

- ◆ Monitoring CX200-Series Status .....3-2
- ◆ Handling FRUs.....3-5
- ◆ Replacing or Adding a Disk Module .....3-9
- ◆ Replacing a Storage Processor (SP) .....3-15
- ◆ Replacing a Power Supply/System Cooling Module.....3-18

## Monitoring CX200-Series Status

Status lights on the CX200/CX200LC and its FRUs indicate error conditions. These lights are visible outside the enclosure. Some lights are visible from the front, and the others from the back. Figures 3-1 through 3-4 and Tables 3-1 through 3-2 describe the status lights.



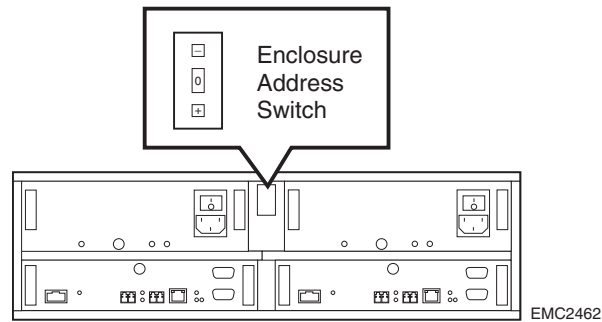
**Figure 3-1 Enclosure and Disk Module Status Lights (Front Bezel Removed)**

Table 3-1 describes the LEDs visible from the front of the CX200-Series DPE2.

**Table 3-1 Status Lights Visible from the Front of the CX200**

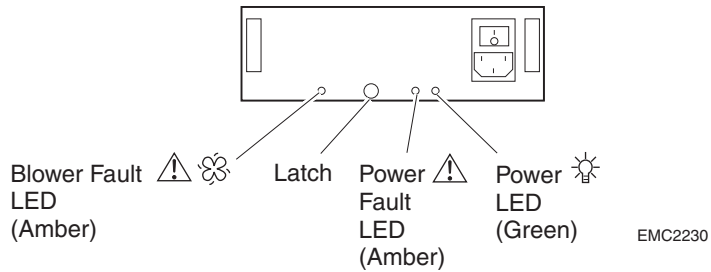
Light	Quantity	Color	Meaning
Enclosure Power	1	Green	Power to enclosure is ON.
Enclosure Fault	1	Amber	On when any fault condition exists; if the fault is not obvious from a disk module light, look at the back of the enclosure.
Disk Active	1 per disk module	Green	Off when the slot is empty or contains a filler module. Flashing ( <i>mostly off</i> ) when the drive is powered up but not spinning; this is a normal part of the spin-up sequence, occurring during the spin-up delay of a slot. Flashing ( <i>at a constant rate</i> ) when the disk drive is spinning up or spinning down normally. On when the drive is spinning but not handling any I/O activity (the ready state). Flashing ( <i>mostly on</i> ) when the disk drive is spinning and handling I/O activity.
Disk Fault	1 per disk module	Amber	On when the disk module is faulty, or as an indication to remove the drive.

Figure 3-2 shows the enclosure address switch. In CX200-Series configurations, the enclosure address will be 0; a subsequent DAE2 disk enclosure on that loop will use an incremental address (1).



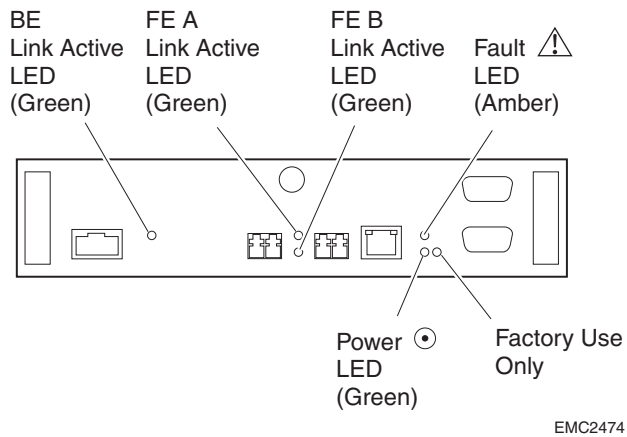
**Figure 3-2 Enclosure Address Switch (CX200 Shown)**

Figure 3-3 shows the status LEDs for the power supplies.



**Figure 3-3 Power Supply/Cooling Module Status Indicators**

Figure 3-4 shows the status LEDs for the SP.



**Figure 3-4 SP Status LEDs**

Table 3-2 describes the status LEDs visible from the rear of the disk enclosure.

**Table 3-2 Status Lights Visible from the Rear of the Disk Enclosure**

Light	Quantity	Color	Meaning
SP Power	1 per SP	Green	On when the SP is powered up.
SP Fault	1 per SP	Amber	Flashing indicates: once/4 seconds — BIOS activity. once/second — POST activity. four/second — booting. Steady indicates fault; refer to event log.
Link Active	3 per SP	Green	On when designated connection is active.
Power Supply Active	1 per supply	Green	On when the power supply is operating.
Power Supply Fault	1 per supply	Amber	On when the power supply is faulty or is not receiving ac line voltage. Flashing when either a multiple blower or ambient overtemperature condition has shut the dc power off to the system.
Blower Fault	1 per power supply	Amber	On when a blower in the cooling module is faulty.

If the enclosure Fault light is on, examine the other status lights to determine which FRU(s) is faulty. If a fault light on a FRU remains on, you should replace that FRU as soon as possible.

When a redundant FRU fails, high availability is compromised until you replace the faulty FRU.

## Handling FRUs

This section describes the precautions that you must take and the general procedures you must follow when removing, installing, and storing FRUs.

### Power Issues and FRUs

The CX200-Series DPE2 is designed to always be powered up and to be hot repairable. Its front bezel should be attached and each of its compartments should contain a FRU or filler panel to ensure EMI compliance and proper air flow over the FRUs.

While the CX200 is powered up, you can service or replace any FRU, although removing an active SP will affect operating system access to

the disks it controls. You should not remove a faulty FRU until you have a replacement available.

Since you can replace or add any FRU without sliding the enclosure out of the cabinet, you do *not* have to use cabinet anti-tip devices when you upgrade or service a CX200-Series DPE2.

If you need to power down a CX200-Series system, first shut down the storage processors (refer to your Navisphere Manager Administrator's Guide), and then shut off power to the SPS, if you have one. Shut off power to the power/cooling module(s) with the power switch. You do not need to shut down main ac lines to the disk enclosure unless you need to power down all the cabinet contents connected to that line.



### **CAUTION**

**Never shut off the power supplies to shut down a CX200 power supply that is connected to an SPS. Bypassing the SPS in that manner prevents the system from saving write cache data to the vault drives, and results in data loss. You will lose access to data, and the storage processor event log will display an error message similar to the following:**

```
Enclosure 0 Disk 5 0x90a (Can't Assign - Cache Dirty) 0
0xafb40 0x14362c.
```

**Contact your service provider if this situation occurs.**

### **Avoiding Electrostatic Discharge (ESD) Damage**

When you replace or install FRUs, you can inadvertently damage the sensitive electronic circuits in the equipment by simply touching them. Electrostatic charge that has accumulated on your body discharges through the circuits. If the air in the work area is very dry, running a humidifier in the work area will help decrease the risk of ESD damage. You must follow the procedures below to prevent damage to the equipment.

Read and understand the following instructions:

- ◆ Provide enough room to work on the equipment. Clear the work site of any unnecessary materials or materials that naturally build up electrostatic charge, such as foam packaging, foam cups, cellophane wrappers, and similar items.



- ◆ Do not remove replacement or upgrade FRUs from their antistatic packaging until you are ready to install them.
- ◆ Gather together the ESD kit and all other materials you will need before you service an enclosure. Once servicing begins, you should avoid moving away from the work site; otherwise, you may build up an electrostatic charge.
- ◆ Use the ESD kit when handling any FRU. If an emergency arises and the ESD kit is not available, follow the procedures in the *Emergency Procedures (Without an ESD Kit)* section.
- ◆ An ESD wristband is supplied with your storage system. To use it, attach the clip of the ESD wristband (strap) to any bare (unpainted) metal on the enclosure; then put the wristband around your wrist with the metal button against your skin.

---

### Emergency Procedures (Without an ESD Kit)

In an *emergency* when an ESD kit is not available, use the following procedures to reduce the possibility of an electrostatic discharge by ensuring that your body and the subassembly are at the same electrostatic potential.

These procedures are not a substitute for the use of an ESD kit. Follow them only in the event of an emergency.

- ◆ Before touching any FRU, touch a bare (unpainted) metal surface of the cabinet or enclosure.
- ◆ Before removing any FRU from its antistatic bag, place one hand firmly on a bare metal surface of the enclosure, and at the same time, pick up the FRU while it is still sealed in the antistatic bag. Once you have done this, *do not* move around the room or contact other furnishings, personnel, or surfaces until you have installed the FRU.
- ◆ When you remove a FRU from the antistatic bag, avoid touching any electronic components and circuits on it.
- ◆ If you must move around the room or touch other surfaces before installing a FRU, first place the FRU back in the antistatic bag. When you are ready again to install the FRU, repeat these procedures.

---

## Precautions When Removing, Installing, or Storing FRUs

Use the precautions listed below when you remove, handle, or store FRUs.

- ◆ Do not remove a faulty FRU until you have a replacement available.
- ◆ Handle a FRU only when using an ESD wristband as follows: attach the clip of the ESD wristband to the ESD bracket or bare metal on the enclosure, and put the wristband around your wrist with the metal button against your skin.
- ◆ Handle FRUs gently. A sudden jar, drop, or vibration can permanently damage a FRU and may not be immediately evident. Never place a FRU on a hard surface such as an unpadded cart, floor, or desktop, or stacked on top of another FRU.
- ◆ Never use excessive force to remove or install a FRU.
- ◆ Store a FRU in the antistatic bag and specially designed shipping container in which you received it. Use that container if you need to return the FRU for repair.
- ◆ Store FRUs in a location that is within the limits specified in Appendix A.
- ◆ Place the cables where no one can step on them or roll equipment over them.

## Replacing or Adding a Disk Module



### CAUTION

Disk modules are extremely sensitive electronic components. Always handle a disk module gently, and observe the following guidelines:

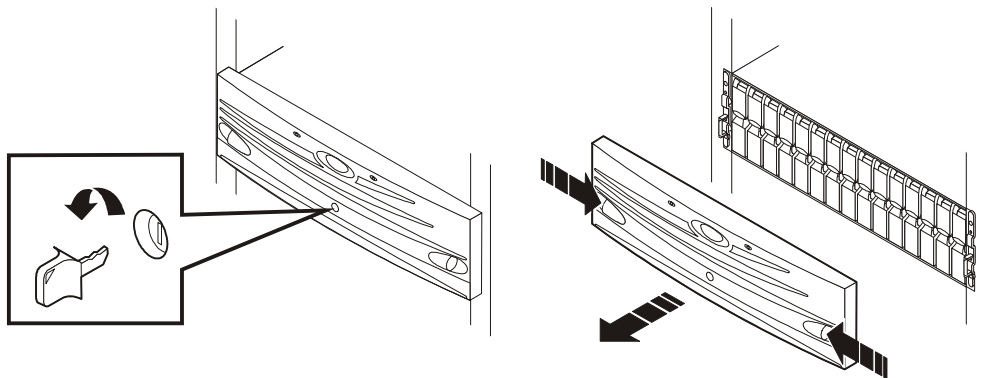
- ◆ Follow the instructions in the preceding section *Avoiding Electrostatic Discharge (ESD) Damage* on page 3-6.
- ◆ Always wear a properly attached ESD wristband when removing or replacing a disk module.
- ◆ When removing a disk module, pull the module partially out of the slot, then wait 30 seconds for the drive to spin down before removing it.
- ◆ Place modules on a soft, antistatic surface, such as an industry-standard antistatic foam pad or the container used to ship the module. Never place a disk module directly on a hard surface.
- ◆ Never hit modules, stack modules, or allow them to tip over or fall.
- ◆ Avoid touching any exposed electronic components and circuits on the disk module.
- ◆ Do not remove a faulty disk module until you have a replacement module (with the same part number) or a filler module available. The part number (PN005xxxxxx) appears on the top or bottom of the module. A replacement or add-on disk module should have the same format (bytes per sector) and the same capacity (size and speed) as the other modules in the enclosure.
- ◆ Before adding more disks to your DPE2, refer to the *EMC Storage Systems CX200-Series Configuration Planning Guide*, which contains guidelines for creating RAID groups with disks of varying sizes and speeds.

You must remove the DPE2 front bezel to gain access to the disk modules. The bezel is required for EMI compliance when the enclosure is powered up. Remove it only to replace or add a disk module.

## Unlocking and Removing the Front Bezel

Refer to Figure 3-5 as you follow these steps to remove the front bezel and gain access to the disk modules.

1. Insert the key that shipped with your enclosure into the bezel lock, and turn it to release the lock.
2. Press the two latch buttons on the bezel surface toward each other to release the bezel from the cabinet.
3. Pull the bezel off the cabinet and put it on a clean, static-free surface.



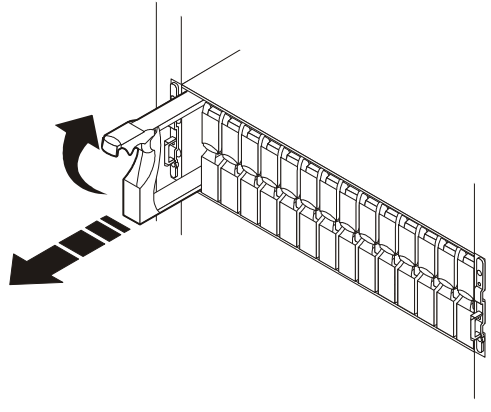
EMC2173

**Figure 3-5** Unlocking and Removing the Front Bezel

If you are adding a new disk module, continue to the disk filler module removal procedure that follows. If you are replacing a faulty disk module, proceed to the disk module removal procedure.

## Removing a Disk Filler Module

Locate the slot where you want to install the disk module, and remove the filler module, as shown in Figure 3-6.



EMC2210

**Figure 3-6** Removing a Disk Filler Module

Skip to the disk installation procedure (page 3-12) to install the add-on disk in the slot you just emptied.

## Removing a Disk Module



### CAUTION

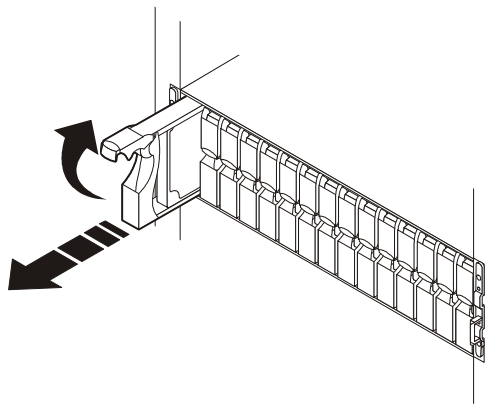
If a disk module has been bound into a LUN, do not move it to another slot unless you do not care about the data on the LUN. Each module has LUN-identifying information written when it is bound. Moving it to another slot can make information on the original LUN inaccessible.

The disk modules in slots 0-3 (CX200 enclosure) or 0-2 (CX200LC) provide mirrored boot capability and are preloaded according to their slot assignment before shipment. Do not move a preloaded module from its assigned slot to another slot, and remove it only to replace the disk.

Generally, you should not remove a disk module unless its amber fault light is on. See Table 3-1.

1. Attach an ESD wristband to your wrist and the enclosure (see the precautions on page 3-7 and page 3-8).
2. If the active light is on steadily, pull the latch, and slowly pull the module about 3 cm (1 inch) from its slot. Wait 30 seconds for the disk to stop spinning. Then remove the module and place it on a padded, static-free surface.

If the active light is off or mostly off you do not need to wait for the disk to stop spinning. Pull the latch and slowly pull the module from its slot, as shown in Figure 3-7. Place it on a padded, static-free surface.



EMC2174

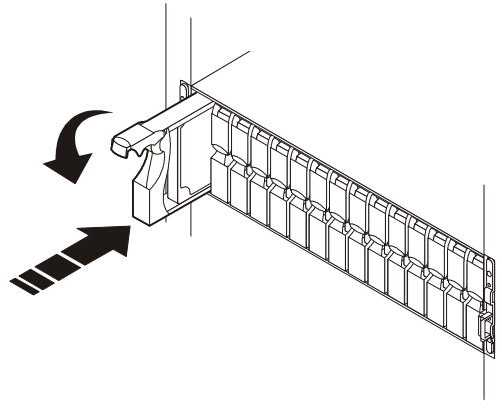
**Figure 3-7 Removing a Disk Module**

Continue to the next section to install the replacement disk module.

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### Installing a Disk or Filler Module

1. Make sure an ESD wristband is attached to your wrist and the enclosure (see the precautions on page 3-7 and page 3-8).
2. Align the module with the guides in the slot.
3. *Gently* push the module completely into the slot, and then engage the latch. See Figure 3-8.



EMC2211

**Figure 3-8** Installing a Disk or Filler Module

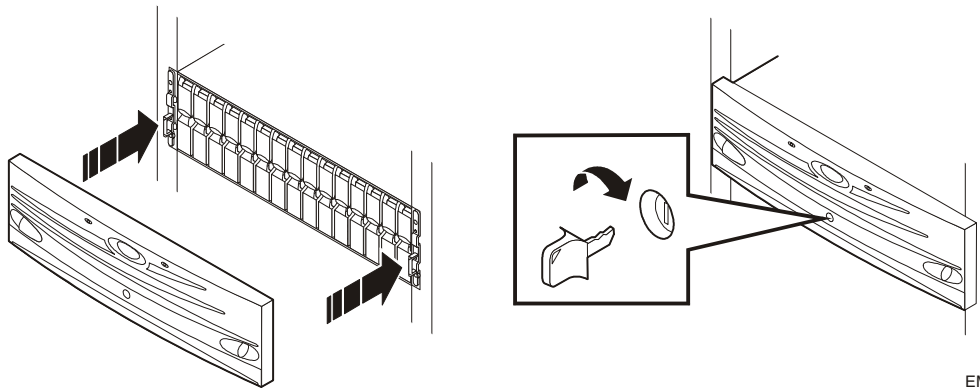
The disk module's Active light flashes to reflect the disk's spin-up sequence.

4. Remove and store the ESD wristband and continue to the next section to install the front bezel.

## Installing and Locking the Front Bezel

Refer to Figure 3-9 as you do the following:

1. Align the bezel with the disk enclosure.
2. Gently push the bezel into place on the cabinet until it latches.
3. Secure the bezel by turning the key in the lock.



EMC2222

Figure 3-9 Installing and Locking the Front Bezel



## Replacing a Storage Processor (SP)



### CAUTION

Handle an SP gently and use an ESD wristband. Do not remove a faulty SP until you have a replacement module available.

A CX200 disk enclosure must have at least one SP installed while it is powered up. Do not remove both SPs while the disk enclosure is powered up.

### Removing an SP

1. Before replacing a storage processor, gently release the connectors as you remove the optical, copper, LAN, and SPS cables connected to that SP.

Note where the cable(s) connect to the SP. You will need to reconnect them correctly to the replacement SP.

2. Turn the latch counterclockwise to release the module, and then remove the SP from its slot, as shown in Figure 3-10.

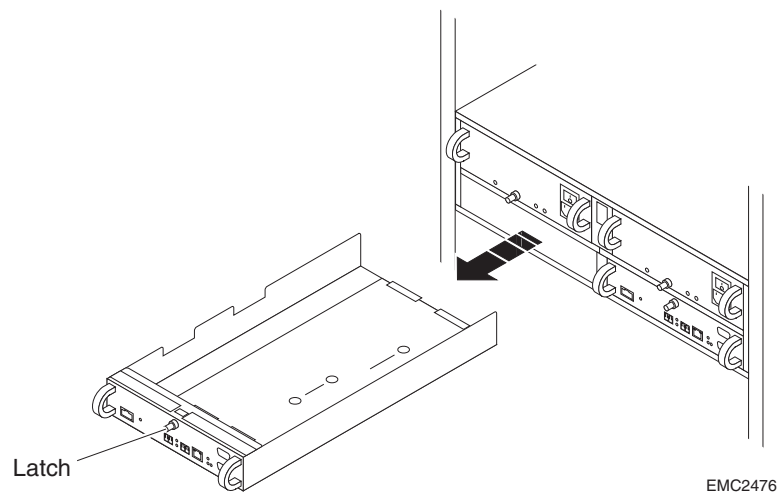
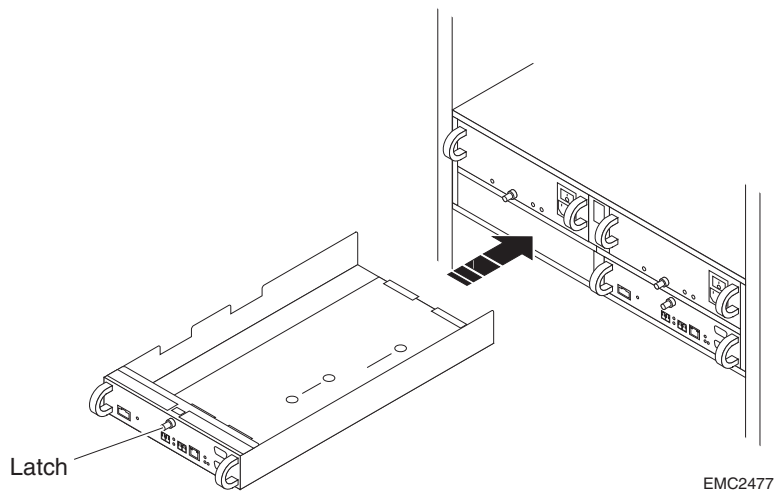


Figure 3-10 Removing an SP (CX200 Shown)

## Installing an SP

1. Gently insert the SP as shown in Figure 3-11. Be sure the module is completely seated in the CX200 midplane.



**Figure 3-11 Installing an SP (CX200 Shown)**

The SP Power light turns on.

2. Turn the latch clockwise to secure the module.

The CX200-Series SP latch holds the module in an established position. It does not pull or otherwise help to seat the SP.

3. Reattach the cables to the same connectors from which you removed them.
4. Remove and store the ESD wristband.

The example configuration in Figure 3-12 shows a CX200 below a DAE2 disk enclosure. Note that the CX200 connects to the *Primary* disk enclosure connectors.

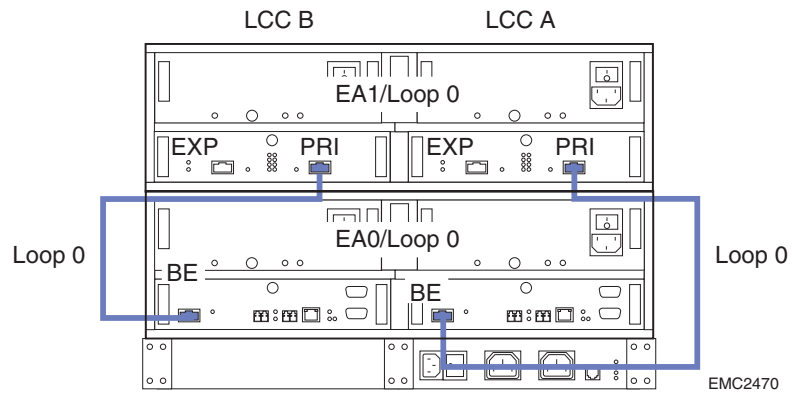


Figure 3-12 Connecting SPs and Disk Enclosures Together with Copper Cable

## Replacing a Power Supply/System Cooling Module

This section explains how to replace a power supply/system cooling module, and a CX200LC blower module.



### CAUTION

**Handle the modules gently and use an ESD wristband. Do not remove a power/cooling or blower module until you have a replacement module available.**

**If one power supply is off and the other is on, do *not* turn one on and immediately turn off the other. Instead, turn one on and wait five seconds after the green LED lights before turning the other off.**

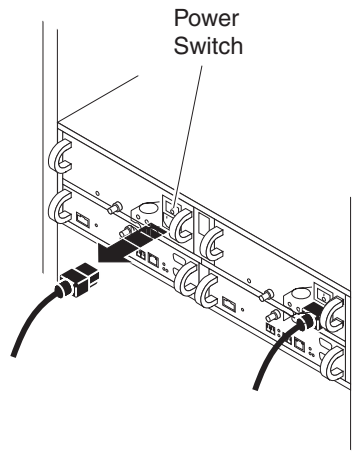
**Turn off the power supply before unplugging the power cord from a module or cabinet power strip.**

### Removing a Power Supply/System Cooling Module

Access to the disks in your enclosure will time out two minutes after you remove a power supply/system cooling module or a blower module from the system. While the system can continue operating on a single power supply, *the loss of a module's two blowers will cause a time-out unless you replace the module within two minutes.*

Follow these steps to replace a power supply/system cooling module or a blower module.

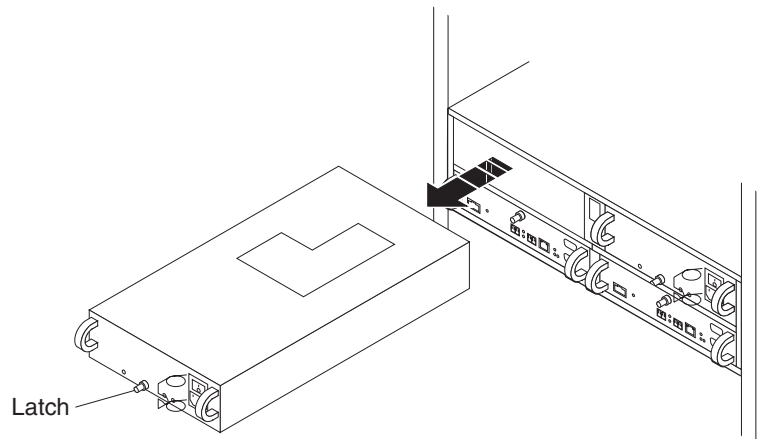
1. If you are replacing a power/cooling module, turn off the power supply and unplug its ac line cord. Figure 3-13 shows the power switch and line cord location on a CX200.



EMC2478

**Figure 3-13 Turning Off a Supply's Power and Unplugging Its ac Power Cord**

2. Turn the latch counterclockwise to release the module, and then remove the power/cooling or blower module as shown in Figure 3-14.



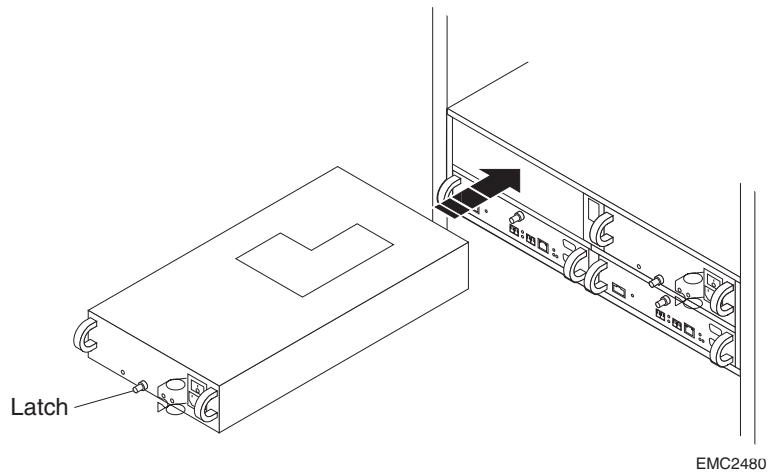
EMC2479

**Figure 3-14 Removing a Power/Cooling or Blower Module (CX200 Shown)**

Continue to the next section to install the replacement module.

## Installing a Power Supply/System Cooling Module or Blower Module

1. Gently insert the new module into the enclosure, as shown in Figure 3-15. Be sure the module is completely seated.



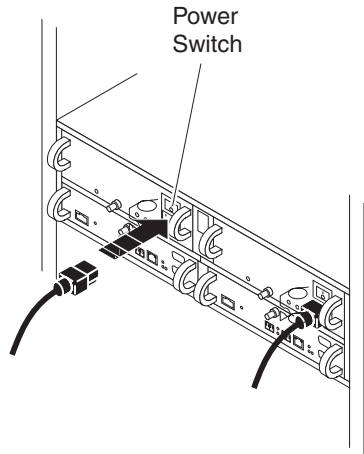
**Figure 3-15** Installing a Power/Cooling or Blower Module (CX200 Shown)

2. Turn the latch clockwise to secure the module.

The latch holds the module in an established position. It does not pull or otherwise help to seat the module.

3. If you replaced a power/cooling module, plug the ac power cord into the new supply, and turn on the power supply. See Figure 3-16.

Make certain you secure the power cord with the wire bail strain reliefs at each connector. The strain reliefs prevent the power cord from pulling out of the connection.



EMC2481

**Figure 3-16 Plugging in the Power Cord and Turning on Power (CX200 Shown)**





## The Standby Power Supply (SPS)

The standby power supply (SPS) provides backup power required to protect the integrity of the CX200's storage processor write cache. This chapter describes the CX200 SPS and how to determine SPS status.

For instructions on installing or replacing an SPS, refer to the *EMC Rails and Enclosures Installation Guide for 19-Inch NEMA Cabinets*.

**IMPORTANT:** The SPS is intended to provide backup power for DAE2 and CX-Series enclosures only.

CX200LC systems do not include an SPS, and do not support write-caching.

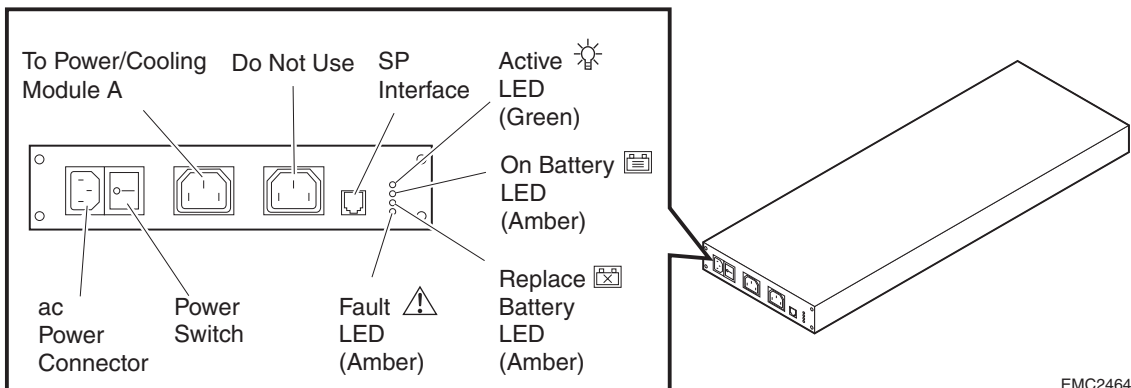
## About the SPS

A 1000-watt dc SPS can provide backup power for one CX200 power supply and storage processor. The SPS provides higher availability and allows write caching — which prevents data loss during a power failure — to continue. A faulted or not fully charged SPS disables write caching.

The SPS rear panel has one ac inlet power connector with a power switch, an ac outlet for the CX200, another ac outlet which you should not use in CX200 configurations, one data connector to the storage processor, and status lights.

**IMPORTANT:** Improper storage and handling of an SPS will render the warranty null and void. Please see Appendix A for appropriate SPS storage requirements.

Figure 4-1 shows the SPS unit, removed from its cabinet mounting.



EMC2464

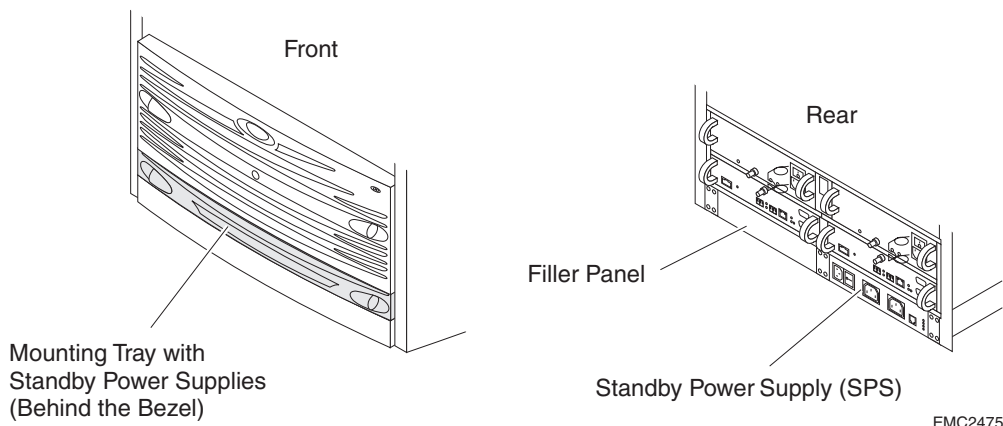
**Figure 4-1** CX200 SPS

See Table 4-1 for the meanings of the SPS status LEDs.

Table 4-1 DC SPS Status LEDs

Light	Meaning When Lit
SPS fault - Amber	The SPS has an internal fault. The SPS may still be able to run on line, but write caching cannot occur. Replace the SPS as soon as possible.
Replace battery - Amber	The SPS battery pack can no longer support loads. When the battery reaches this state, and no other on-line SPS is connected to the CX200, the processor flushes all cache data to disk and disables caching. This LED stays active until the SPS completes a successful power test. Replace the SPS as soon as possible.
On battery - Amber	The ac line power is no longer available and the SPS is supplying dc output power from its battery. When battery power comes on, and no other on-line SPS is connected to the CX200, the processor writes all cached data to disk; and the event log records the event.
Active - Green	When this LED is steady, the SPS is ready and operating normally. When this LED blinks, the SPS is charging. In either case, ac line input supplies the output from the SPS.

In rackmount installations, an SPS unit fits in a tray beneath the CX200 to which it connects. Figure 4-2 shows the SPS in a cabinet with a CX200.



**Figure 4-2 SPS Installation, Front and Back Views**

In the event of a power failure, an SPS provides backup power until the storage processor has flushed its write cache data to the CX200 disks. The storage processor then shuts the SPS power off. If the cache flush has not completed within 60 seconds — more than enough time to flush a full cache — or if the storage processor has failed, then the SPS shuts itself down to prevent deep discharge. If there is no ac inlet power and the SPS is shut down, all status lights will be off.

When power returns, the SPS starts recharging. It may reach a state of full charge relatively quickly. If power remains off for a long period — days or weeks — the battery may require more time to charge fully. The storage processor will not use the write cache unless it detects a fully charged SPS.

Battery lifetime depends on the number of discharge cycles and depth of discharge. In a typical environment, a battery pack can last 3 to 5 years. Battery pack lifetime is shorter in locations that have frequent ac outages.

**Technical  
Specifications and  
Operating Limits**

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This appendix describes the disk processor enclosure technical specifications, operating limits, and shipping and storage requirements. Major topics are

- ◆ CX200-Series DPE2 Technical Specifications .....A-2
- ◆ Operating Limits .....A-6
- ◆ SPS Technical Specifications .....A-7

## CX200-Series DPE2 Technical Specifications

Technical specifications include power requirements, size, drive, interface, and standards information.

### ac Power Requirements

The input current, power (VA), and dissipation per DPE2 are based on the maximum capability of the power supplies and cooling system to provide internal regulated power. Typical values will be less, depending on the number and manufacturer of disk modules. These values represent either

- ◆ the values for a single power supply line cord, or
- ◆ the sum of the values shared by the line cords of two power supplies in the same enclosure, with the division between the line cords and supplies at the current sharing ratio (approximately 50% each).

A failure of one of the two power supplies in the DPE2 results in the remaining supply and cord supporting the full load. You must use a rackmount cabinet with ac power distribution, and have main branch ac distribution that can handle these values for each CX200 in the cabinet.

Requirement	Description
ac line voltage	100 to 240 V ac $\pm$ 10%, single phase, 47 to 63 Hz
ac line current	5.9 A at 100 V ac, 2.9 A at 200 Vac
Power consumption	590 VA (578 W) max (fully configured)*
Power factor	0.98 min at full load, low voltage
Heat dissipation	2.08 10 <sup>6</sup> J/hr (1,975 BTU/hr) max *
In-rush current	25 A max for 1/2 line cycle, per power supply at 240 V ac 15 A max for 1/2 line cycle, per power supply at 120 V ac
Startup surge current	15 A pk (10.6 Arms) max for 100 ms, at any line voltage
ac protection	10 A fuse in each power supply, both phases
ac receptacle type	IEC320-C14 appliance coupler, per power supply
Ride-through time	30 ms min
Current sharing	60% max, 40% min, between power supplies

\* A *fully configured* DPE2 includes 2 power supplies, 2 SPs, and 15 disk drives.

## Size and Weight

Measurement	CX200-Series DPE2	SPS	DAE2
Height	133.35 mm (5.25 in) 3 NEMA units including mounting hardware	4.02 cm (1.58 in) 1 U, including mounting rails	133.35 mm (5.25 in) 3 NEMA units including mounting hardware
Width	450 mm (17.72 in)	20.96 cm (8.25 in) each	450 mm (17.72 in)
Depth	603.25 mm (23.75 in)	60.33 cm (23.75 in)	603.25 mm (23.75 in)
Weight	44.5 kg (98.3 lbs) maximum configuration 1.1 kg (2.4 lbs) per disk module 1.6 kg (3.6 lbs) per storage processor 4.1 kg (9 lbs) per power/cooling module 2.8 kg (6.2 lbs) per blower module 12.7 kg (28 lbs) chassis and midplane	10.7 kg (23.65 lbs) SPS 4.5 kg (9.85 lbs) tray	43.2 kg (95.3 lbs) (fully configured with FC drives)

## Drive Type

Fibre Channel interface disk drives used in CX200-Series systems are

- ◆ 8.75 cm (3.5-inches) wide
- ◆ 2.54 cm (1.0-inch) tall
- ◆ 12 Volt only

The drive module power is 16 W maximum per drive slot.

## DPE2 FC-AL Interface

The CX200 back end (BE) Fibre Channel interface is shielded HSSDC (High Speed Serial Data Connector).

### Copper Cabling

The expansion port interface to the DPE2 is copper cable that meets the following specifications:

- ◆ Shielded, 150Ω differential, shield bonded to HSSDC plug connector shell (360°)
- ◆ FC-PI Standard, Revision 13 or higher
- ◆ 1 meter (3.3 feet) unequalized;
- ◆ 5 meters (16.5 feet) and 10 meters (33 feet) equalized

## Storage Processor Optical Cabling

The CX200 uses optical cable from the SP's SFF (Small Form Factor) LC transceivers to the external Fibre Channel environment.

<b>Type</b>		50 $\mu\text{m}$ or 62.5 $\mu\text{m}$ , multi-mode, dual LC	
<b>Length</b>	50 $\mu\text{m}$	1.0625 Gbit	2 m (6.6 ft) minimum to 500 m (1,650 ft) maximum
		2.125 Gbit	2 m (6.6 ft) min to 300 m (985 ft) maximum
<b>Length</b>	62.5 $\mu\text{m}$	1.0625 Gbit	2 m (6.6 ft) min to 300 m (985 ft) maximum
		2.125 Gbit	2 m (6.6 ft) min to 150 m (492 ft) maximum
<b>Bend Radius</b>		3 cm (1.2 in) min	

The maximum length when using either the 62.5  $\mu\text{m}$  or 50  $\mu\text{m}$  cable (noted in the table above) includes two connections or splices between the source and destination. For a detailed overview of cable types, connections, and lengths, refer to the *EMC Storage System CX200-Series Configuration Planning Guide*.



### CAUTION

**EMC does not recommend mixing 62.5  $\mu\text{m}$  and 50  $\mu\text{m}$  optical cable in the same link. In certain situations you can add a 50  $\mu\text{m}$  adapter cable to the end of an already installed 62.5  $\mu\text{m}$  cable plant. Contact your EMC service representative for details.**



**Standards Certification and Compliance**

Rackmount disk enclosures are tested and certified for compliance with the international environmental and safety specifications listed below and marked to indicate such compliance and certification as required.

Standard	Description
CSA 22.2 No. 950	Safety of Information Technology Equipment including Electrical Business Equipment
EN 60950	
UL 1950	
CE Mark	European EMC Directive & Low Voltage Directive Requirements

**EMI Standards**

Standard	Description
FCC Part 15	Class A, Radio Frequency Device Requirements
ICES-003	Class A, Interference-Causing Equipments Standard - Digital Apparatus
CE Mark	European EMC Directive & Low Voltage Directive Requirements.
VCCI	Class A, Voluntary Control Council for Interference
AS/NZS 3548	Class A, Electromagnetic Interference - Limits & Methods of Measurement of ITE
CNS13438	BSMI EMC Requirements

**Fibre Channel Related Standards**

Standard	Description
Fibre Channel	Physical and signaling interface, FC-PI, draft Rev. 13
Fibre Channel	Arbitrated Loop (FC-AL), Revision 4.5
Fibre Channel	Private Loop Direct Attach (PLDA), Revision 2.1
SCSI III	SCSI Enclosure Services (SES), Revision 8a

Note: In some cases, the DPE2 uses functions from later revisions of specifications.

## Operating Limits

The ambient temperature specification is measured at the front bezel inlet. The site must have air conditioning of the correct size and placement to maintain the specified ambient temperature range. The air conditioning must be able to handle the BTU requirements of the disk enclosures.

Requirement	Description
Ambient temperature	10°C to 40°C (50°F to 104°F)
Temperature gradient	10°C/hr (18°F/hr)
Relative humidity	20% to 80% noncondensing
Elevation	2438 m (8,000 ft) at 40°C, 3077 m (10,000 ft) at 37°C

The operating limits for temperature and humidity must not be exceeded inside the closed cabinet in which the DPE2 is mounted. Mounting equipment in a cabinet directly above or below a DPE2 does not restrict air flow to the disk enclosure, because air flows through the enclosure from front to back. Cabinet doors must not impede the front-to-back air flow.

## Environmental Recovery

If the system exceeds maximum ambient temperature by more than 10°C/18°F (that is, to 50° C or 122°F), the processor(s) will begin an orderly shutdown that saves cached data, powers down the disks, and then powers off the SP(s). If the system detects that the temperature has dropped to an acceptable level, it restores power to the SP(s) and disks.

## Shipping and Storage Requirements

Requirement	Description
Ambient temperature	-40°C to 65°C (-40°F to 149°F)
Temperature gradient	25°C/hr (45°F/hr)
Relative humidity	10% to 90% noncondensing
Elevation	7625 m (25,000 ft)

## SPS Technical Specifications

This section lists the technical specifications and operating limits for the standby power supply (SPS).

### SPS to SP Interface

Type:	Half-duplex RS-232
Baud rate:	9600, 8-bit
Parity:	None

### Power Specifications

Requirement	Description (All Ratings Assume Fully Configured System)
ac line voltage	100 V ac to 240 V ac -10%/+10% single-phase, 47 Hz to 63 Hz; auto-ranging
ac line current, internal and pass-through	0.2 A max @ 100 V ac, internal current consumption (up to 10 A max at 100 V ac, pass-through to ac outlets) 0.1 A max @ 200 V ac, internal current consumption (up to 5 A max @ 200 V ac, pass-through to ac outlets)
Internal power consumption	60 VA (40 W) peak in hi-charge mode 10 VA (6 W) float charge mode
Power factor	NA for pass-through load. .67 pf for internal 10 VA load
Heat dissipation	21.6 x 10 <sup>3</sup> J/hr, (21 BTU/hr) steady state
In-rush current	6 A max for 1/2 line cycle @ 240 V ac
ac protection	15 A fuse, both phases
Chassis power inlet	IEC 320-C14 Appliance Connector (panel mount)
Chassis power outlet	EC 320-C13 Appliance Connector (panel mount) (2)
Charge times	After full power outage, 75 minutes maximum (45 minutes typically) After off-line storage, 2 hours approximately
ac failure detect time	12 ms max
Transfer time	28 ms maximum

## Operating Limits

Requirement	Description
Ambient temperature	10°C to 40°C (50°F to 104°F)
Relative humidity	20% to 80% noncondensing
Elevation	2439 m (8000 ft)

**IMPORTANT:** The operating limits listed above for temperature and humidity must not be exceeded inside the closed cabinet in which the SPS is mounted.

## Nonoperating Limits (Shipping and Storing)

Requirement	Description
Ambient temperature	-40°C to 65°C (-40°F to 149°F)
Gradient, maximum	25°C/hr (45°F/hr)
Relative humidity	10% to 90% noncondensing
Elevation	7625 m (25,000 ft)

## Dimensions and Battery Information

### Service Clearance

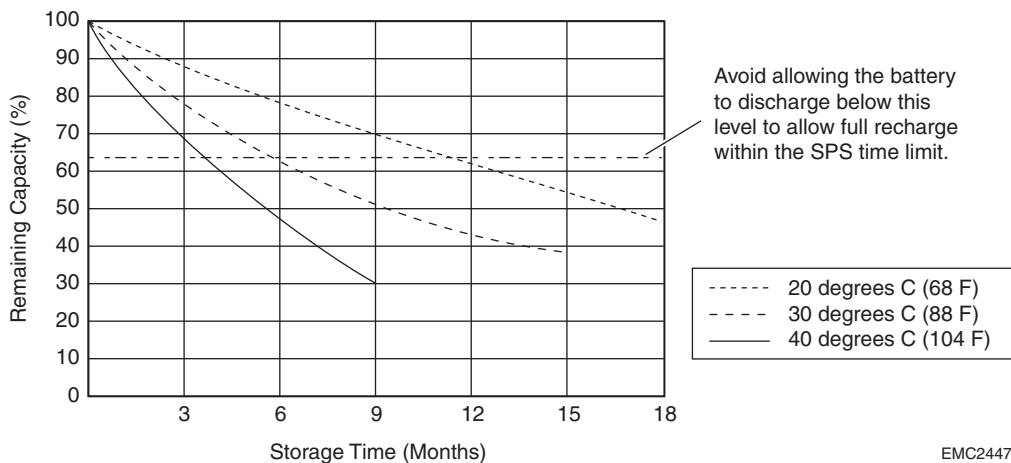
<b>Front</b>	81.3 cm (32.0 in)
<b>Rear</b>	81.3 cm (32.0 in)

## Battery Tests

- Internal** Within 60 minutes after powerup and approximately every 2 weeks thereafter, the SPS itself performs a light test on the batteries. This test lasts less than one second. It does not verify battery capacity but does check connectivity and functionality. This test is transparent to other components in the array. If an actual power failure occurs during the test, the test is terminated and the unit goes into On-Battery mode.
- Full** At each storage-system startup, the system software initiates a full power test. During the test, the system disables write cache and allows the SPS to stay on for a full 90 seconds.  
The system initiates a full test when the SPS is online and fully charged. If the batteries are charging at test time, the system defers the test until the next programmed time.

## Battery Self-Discharge Times

When you store an SPS, the battery charge level naturally decreases over time. This is characteristic of all rechargeable batteries. The rate of self-discharge depends on temperature. Lower storage temperatures are desirable since the self-discharge rate is lower. The following graph shows how the remaining charge decreases over time at different temperatures.



**Figure A-1 Typical SPS Self-Discharge Levels at Different Storage Temperatures**

**IMPORTANT:** If you are storing an SPS, do not store it longer than 6 months or at a temperature exceeding 30° C without recharging it. When you retrieve an SPS unit from storage, you should charge it by connecting it to ac power, with its power switch in the on position, for at least 12 hours before putting it into service or returning it to storage.

## Standards Certification/Compliance

A stand-alone SPS has been tested and certified for compliance with the international environmental and safety specifications listed below. The SPS is marked to indicate such compliance and certification as required.

### Safety Standards

Standard	Description
EN 60950	Safety of Information Technology Equipment including Electrical Business Equipment.
UL 1950	
CSA 22.2 No. 950	
CE Mark	European EMC Directive & Low Voltage Directive Requirements.

### EMI Standards

Standard	Description
FCC Part 15	Class B, Radio Frequency Device Requirements
ICES-003	Class B, Interference-Causing Equipments Standard - Digital Apparatus
CE Mark	European EMC Directive & Low Voltage Directive Requirements.
VCCI	Class B, Voluntary Control Council for Interference
AS/NZS 3548	Class B, Electromagnetic Interference - Limits & Methods of Measurement of ITE
CNS13438	BSMI EMC Requirements

## Cable Pinout Information

The SPS interface serial connector pinouts are as follows:

Pin	Function
1	Ground
2	ENABLED_OUT
3	AC_FAIL_OUT
4	ANY_FAULT_OUT
5	SPS transmit to SP
6	SPS receive from SP





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The terms defined here are important to installing and maintaining a storage system.

### A

**ALPA (arbitrated loop physical address)**

An 8-bit address that uniquely identifies an SP (or other device) on an FC-AL loop.

### B

**bind**

In the context of a disk-array storage system, the procedure by which you format one or more disk modules into one LUN (logical unit) — usually as one of several types of RAID group.

### C

**cache**

See *storage-system caching*.

**CRU (customer-replaceable unit)**

A hardware component, such as a disk module, that anyone can replace.

### D

**DAE (disk array enclosure)**

A storage device that includes an enclosure, disk modules, two LCCs, and two power supplies. The 2-gigabit disk array enclosures (DAE2) supported in CX200 systems can hold 0-15 disks.

**DIMM (dual in-line memory module)**

A type of memory module used in SP memory for caching or RAID.

<b>disk-drive module</b>	Another name for disk module.
<b>disk module</b>	A self-contained disk drive that slides into one of the slots in the front of the enclosure. The carrier assembly holds the disk drive.
<b>disk unit</b>	A short name for physical disk unit.
<b>DPE (disk processor enclosure)</b>	A storage device that includes an enclosure, disk modules, Fibre Channel storage processors, power supplies, and cooling modules.
<b>E</b>	
<b>EA (enclosure address)</b>	A number, selectable on a CX200 or DAE2 rear panel — fixed at 0 on a DPE2 — that helps establish a unique address for each disk module on an FC-AL loop. You must set the EA on each DAE2. Since the CX200 EA is 0, you should set the DAE2 EA on the single loop (0) to 1.
<b>EMI (electromagnetic interference)</b>	Electronic radiation emitted by an electrical device. The levels of EMI are strictly controlled for data processing equipment. The EMI standards to which the CX200-Series complies are listed in Appendix A of this manual.
<b>ESD (electrostatic discharge)</b>	The discharge of an accumulated electrical charge (static). This can severely damage delicate electronic circuits so you should take steps to prevent this, as explained in Chapter 3, <i>Servicing and Upgrading a CX200-Series DPE2</i> .
<b>F</b>	
<b>failover</b>	The automatic transfer of one or more LUNs from one SP to another if a failure occurs in the path of the original SP.
<b>FC-AL (Fibre Channel Arbitrated Loop)</b>	An arrangement of Fibre Channel stations such that messages pass from one to the next in a ring.
<b>Fibre Channel host bus adapter (FC adapter)</b>	The name for the printed-circuit board within the computer chassis through which the server gains access to the Fibre Channel loop and thus the SP(s).
<b>field-replaceable unit</b>	See <i>FRU (field-replaceable unit)</i> .

<b>FRU (field-replaceable unit)</b>	A hardware assembly that can be replaced on site, instead of at the point of manufacture, by trained personnel.
<b>G</b>	
<b>GBIC (Gigabit Interface Converter)</b>	A device for converting Fibre Channel signals from electrical to optical, and vice versa.
<b>H</b>	
<b>HBA (host-bus adapter)</b>	Another name for Fibre Channel adapter.
<b>host</b>	See <i>server</i> .
<b>hot repair</b>	See <i>replace under power</i> .
<b>hub</b>	An FC-AL switching device that allows multiple servers and targets such as storage systems to connect at a central point. A single hub configuration appears as a single loop.
<b>L</b>	
<b>LCC (link control card)</b>	A FRU in DAE2 enclosures, integrated into the SP module in a CX200-Series DPE2. An LCC connects Fibre Channel signalling to the disk modules, and provides Fibre Channel connectivity between the SP, disks, and other enclosures. It also provides bypass capability for faulted or missing units, and monitors and controls enclosure elements.
<b>LUN (logical unit)</b>	One or more disk modules (each having a head assembly and spindle) bound into a group — usually a RAID group. The operating system sees the LUN, which includes one or more disk modules, as one contiguous span of disk space.
<b>M</b>	
<b>memory module</b>	See <i>SP memory module</i> .
<b>N</b>	
<b>node</b>	Any device with a Fibre Channel interface (such as an HBA in a server or a storage system's SP) that connects to a Fibre Channel loop.

**P****PDU (power distribution unit)**

A device for the distribution of ac line power from one inlet to multiple outlets. Multiple PDUs in a rackmount cabinet provide higher availability since the power continues if one PDU (or its ac source, if the PDUs use separate ac sources) loses power.

**power supply**

A device to connect ac main power to low voltage dc power for the system components. A storage system can have two power supplies, PS A and PS B. With two, it can survive failure of one supply. You can replace one of two power supplies under power, without interrupting applications.

**R****replace under power**

The storage system provides replace under power capability that allows you to replace a FRU (for example, a disk module or a fan module) without powering down the storage system. Applications continue while you replace the failed module.

**S****SCSI (small computer system interface)**

A well-known protocol and standard for connecting computers and peripheral devices. Some Fibre Channel SPs use a Fibre Channel FC-AL front end to the server and a SCSI back end to the disk modules. The SPs used in DPEs use the Fibre Channel protocol throughout. The array uses SCSI protocol over Fibre Channel.

**server**

In the context of storage systems, a processor that runs an operating system and uses a disk-array storage system for data storage and retrieval.

**SP (storage processor)**

A printed-circuit board with processor memory modules and control logic that manages the storage-system I/O between the server FC adapter and the disk modules.

**SP memory module**

A memory module that provides the local storage for an SP.

**SPS (standby power supply)**

A unit that provides temporary backup power in case of a power outage. An SPS is required for storage-system write caching. If power fails, the SPS allows the SP to write the data from its cache to disk.

**storage processor (SP)** See *SP (storage processor)*.

**storage-system caching** The procedure of temporarily storing disk-based data in SP memory to save time if the data is needed again soon.



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