EMC CLARiiON
CX500/CX500i
2-Gigabit Disk Processor Enclosure (DPE2)

HARDWARE REFERENCE

P/N 300-001-074
REV A05

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Trademark Information

Regulatory Notices — Product Type(s): X2E, X2E-I

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions:

(1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Testing was done with shielded cables. Therefore, in order to comply with the FCC regulations, you must use shielded cables with your installation. Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference 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 in which case the user will be required to correct the interference at his own expense.

This Class A digital apparatus complies with Canadian ICES-003

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada

Manufacturer's Declaration of Conformity - CE mark

This equipment has been tested and found to comply with the requirements of European Community Council Directives 89/336/EEC, 73/23/EEC, and 98/68/EEC relating to electromagnetic compatibility and product safety respectively.

This product complies with EN55022, CISPR22 and AS/NZS CISPR22 Class A.

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警告使用者：

這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

기기의 명칭(모델명) : Storage (CX500)
인증받은 자의 상호 : EMC Corporation
제조년월일 : 제품 상표를 보십시요
제조자/제조국가 : 제품 상표를 보십시요

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Preface

As part of an effort to improve and enhance the performance and capabilities of its product line, EMC from time to time releases revisions of its hardware and software. Therefore, some functions described in this guide may not be supported by all revisions of the software or hardware currently in use. For the most up-to-date information on product features, refer to your product release notes.

If a product does not function properly or does not function as described in this guide, please contact your EMC representative.

This guide is part of the EMC® CLARiiON® CX500-Series 2-gigabit disk processor enclosure (DPE2) documentation set, and is intended for use by system administrators and other qualified technical personnel during installation, setup, and maintenance of the storage system.

Readers of this guide are expected to be familiar with basic computer hardware installation and field-replaceable unit (FRU) installation.

How This Manual Is Organized

Chapter 1	Introduces the CX500-Series DPE2 components.
Chapter 2	Explains requirements and describes how to cable the CX500/CX500i to a 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 CX500-Series technical specifications.
Appendix B	Reviews the EMC process for detecting and resolving software problems, and provides essential questions that you should answer before contacting the EMC Customer Support Center.
Glossary	Defines terms used in the documentation.

Related Documentation

40U-C Cabinet Setup Guide (P/N 300-001-555)

Site Preparation and Unpacking Guide for the 40U-C Cabinet (P/N 300-001-556)

EMC Rails and Enclosures (CX-Series Storage Systems) Field Installation Guide (P/N 300-001-799)

CX500 2-Gigabit Fibre Channel Disk Processor Enclosure (DPE2) Setup Guide (P/N 300-001-275)

CX500i 2-Gigabit iSCSI Disk Processor Enclosure (DPE2) Setup Guide (P/N 300-001-924)

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

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

EMC CLARiiON 2-Gigabit Point-to-Point Disk Enclosure (DAE2P) Setup Guide (P/N 300-002-408)

EMC CLARiiON 2-Gigabit Point-to-Point Disk Enclosure (DAE2P) Hardware Reference (P/N 300-002-407)

EMC Navisphere Manager Administrator's Guide (P/N 069001125)

EMC CLARiiON CX300, CX300i, CX500, CX500i, and CX700 Storage Systems Configuration Planning Guide (P/N 300-001-273)

EMC Navisphere Security Administrator's Guide (P/N 069001124)

EMC Installation Roadmap for CX-Series, AX-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.

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.

Typographical Conventions

This manual uses the following format conventions:

This typeface	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.
This typeface	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, **Operations > Poll All Storage Systems** tells you to select **Poll All Storage Systems** on the **Operations** menu.
[ ]	Encloses optional entries.
|	Separates alternative parameter values; for example: *LUN-name* | *LUN-number* means you can use either the LUN-name or the LUN-number.

Finding Current Information

The most up-to-date information about the CX500-Series is posted on the EMC Powerlink™ website. We recommend that you download the latest information before you install or service your DPE2. If you purchased this product from an EMC reseller and you cannot access Powerlink, the latest product information should be available from your reseller.

To access EMC Powerlink, use the following link:

http://powerlink.emc.com

After you log in, select **Support > Document Library** and find the following:

- The FLARE™ release notes
- The latest version of this reference.
- *EMC Installation Roadmap for CX-Series, AX-Series, and FC-Series Storage Systems*, which provides a checklist of the tasks that you must complete to install your storage system in a storage area network (SAN) or direct attach configuration.

Where to Get Help

For questions about technical support, call your local sales office or service provider.

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

United States:	**(800) 782-4362 (SVC-4EMC)**
Canada:	**(800) 543-4782 (543-4SVC)**
Worldwide:	**(508) 497-7901**

Follow the voice menu prompts to open a service call and select the applicable product support.

Sales and Customer Service Contacts

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

http://www.EMC.com/contact/

For additional information on the EMC products and services available to customers and partners, refer to the EMC Powerlink™ website 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.

Warnings and Cautions

The following warnings and cautions pertain throughout this guide.

WARNING ***Trained service personnel only***

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.

僅限經訓練的人員進行服務。

持續接地供電對機器安裝操作很重要。接地導線未連接時，切勿操作機器。請記得將準備或安裝過程中拔除的接地導線重新接上。

ATTENTION ***Resérvé au personnel autorisé.***

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

WARNUNG ***Nur für Fachpersonal.***

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

WARNING

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.**

經訓練的人員處理 EMC 硬體時仍須隨時小心。
請務必記得：
- 在開始作業前拿掉戒指、手錶、其他珠寶以及領帶。
- 靠近任何會移動或未預警隨時啓動 (如風扇、馬達、電池閥等) 的零件時，請謹慎小心。
- 總是使用適合作業的工具。
- 總是使用正確的替換零件。
- 所有書面文件 (包括事故報告) 都要保持最新，內容完整詳盡，確實無誤。

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

A lithium battery on the storage processor powers the real-time clock (RTC) for three to four years in the absence of power. Only trained personnel should change or replace this battery.

WARNING

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.

電池替換不正確可能會引起爆炸。僅限採設備製造商建議之同樣或同款的電池進行替換。請遵照製造商指示處理使用過的電池。

1

About the CX500 and CX500i

This chapter discusses the EMC® CLARiiON® CX500 and CX500i 2-gigabit disk processor enclosures (DPE2). Major topics include

Overview

The CX500 and CX500i 2-gigabit disk processor enclosures (DPE2), shown in Figure 1-1, are intelligent, highly available, high-performance, high-capacity disk-array storage systems. The CX500-Series enclosure is only 3U (5.25 inches) high, but can include 15 high-performance Fibre Channel 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 DPE2 rackmounted in a standard 40U EMC cabinet.

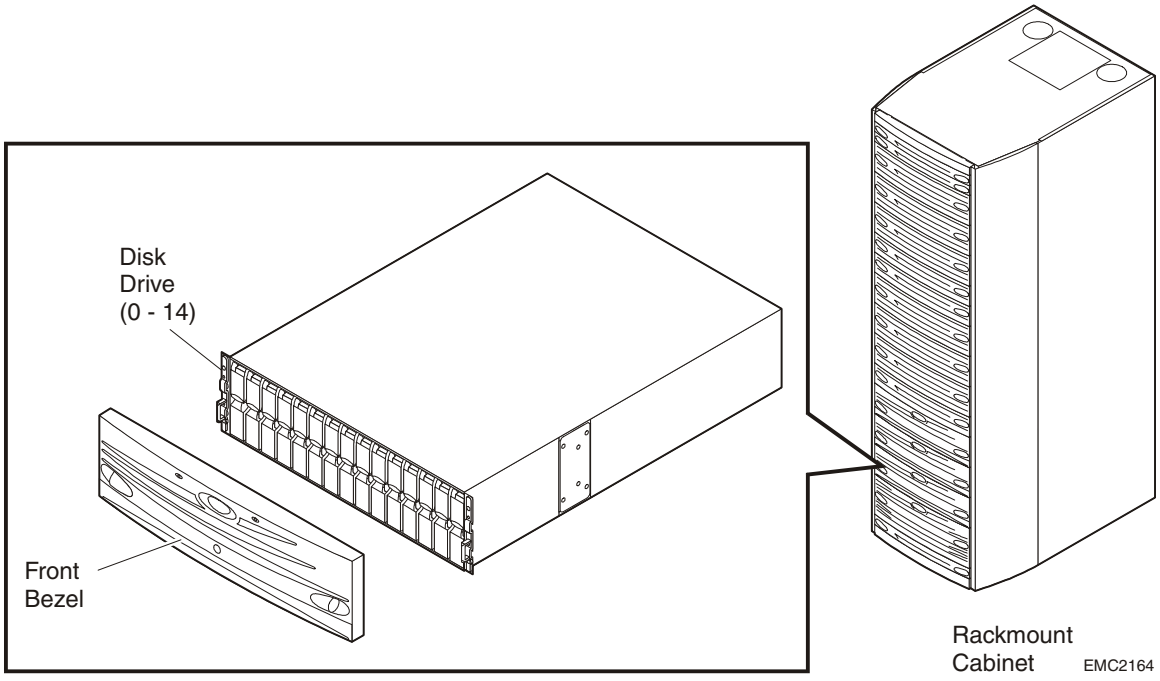


Figure 1-1 Model CX500/CX500i Disk Processor Enclosure (DPE2)

The CX500 uses a Fibre Channel arbitrated loop (FC-AL) or Fibre Channel switch (FC-SW) as its interconnect interface to arrayed disks and to servers that use the storage system. CX500i systems also use FC-AL within the storage system and attached optional disk array enclosures, but use the iSCSI (Internet Small Computer Systems Interface) protocol for server input/output.

A CX500/CX500i can support as many as 7 additional disk-array enclosures (DAEs, also called array modules). A DAE is a basic enclosure without a storage processor (SP) that includes either high-performance Fibre Channel or economical ATA disks. The CX500/CX500i and a maximum of 7 additional DAEs support up to 120 disk modules in a single disk-array storage system. You can place the DAEs in the same cabinet as the CX500/CX500i, or in one or more separate cabinets.

CX-Series storage systems support both 2-gigabit disk-array enclosures (DAE2s) and 2-gigabit point-to-point disk-array enclosures (DAE2Ps).

The CX500 connects to the external Fibre Channel environment using small form factor (SFF) LC optical transceivers on the storage processor. The CX500i connects to a 1-gigabit Ethernet environment using standard RJ45 LAN connectors and Ethernet cables. High-availability features are standard on both models.

Storage group features in the EMC Access Logix™ software option allow you to connect the CX500/CX500i to multiple hosts that may be running different operating systems.

CX500/CX500i Components

Each CX500-Series storage system includes a DPE2 consisting of:

- A sheet-metal enclosure with a midplane and front bezel
- Two storage processors (SPs)
- As many as 15 Fibre Channel disk modules
- Two power supply/system cooling modules

Blowers integrated in the power/cooling modules cool the entire enclosure. The CX500/CX500i does not require discrete fan assemblies.

Storage systems using ac source power require two standby power supplies (SPSs).

Systems with dc power are intended for use in environments with redundant and highly available power sources (for example, "Central Office" grade power within the telecommunications industry), and dc power provided by the site must meet this requirement. The sudden loss of all incoming dc power to a storage system may cause unexpected abnormal behavior of the storage system and loss of write-cache data.

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

The storage processors, disk modules, power supplies, and filler modules are field-replaceable units (FRUs), which you can add or replace without tools while the storage system is powered up.

The disk modules are FC-AL compliant and support dual-port FC-AL interconnections through the two SPs and their cabling.

The system can continue running in a degraded mode with one operating power supply and a single 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 depict the DPE2 outside of the rack cabinet. Your CX500/CX500i may be installed in a rackmount cabinet as shown in Figure 1-1.

As shown in Figure 1-2, the front LED (light) 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.

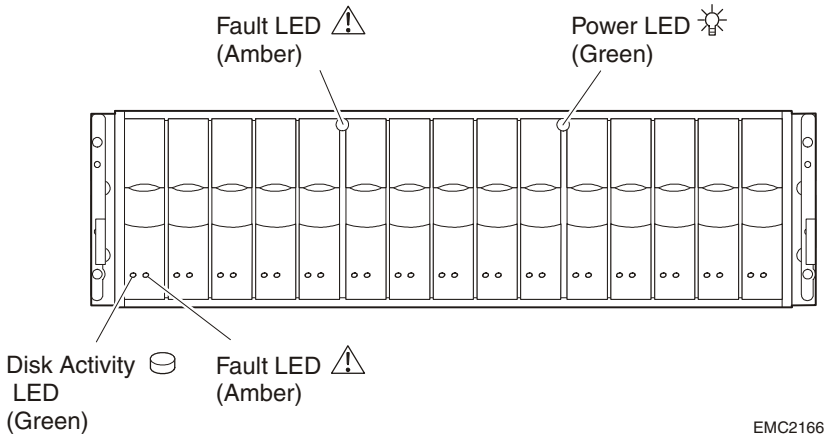


Figure 1-2 CX500/CX500i DPE2 Front LED Display

Figure 1-3 shows the DPE2 components visible from the rear of the cabinet. (Note that the figure shows CX500 Fibre Channel storage processors; component placement on CX500i systems is the same.)

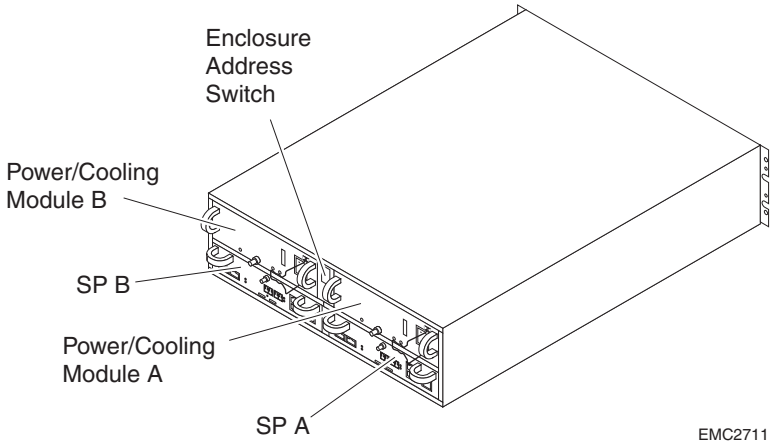


Figure 1-3 CX500 DPE2 Rear View

As shown in Figure 1-4, an enclosure ID, or *enclosure address*, switch is located between the power supplies at the rear of the disk enclosure.

The enclosure address for the CX500/CX500i DPE2 is always 0.

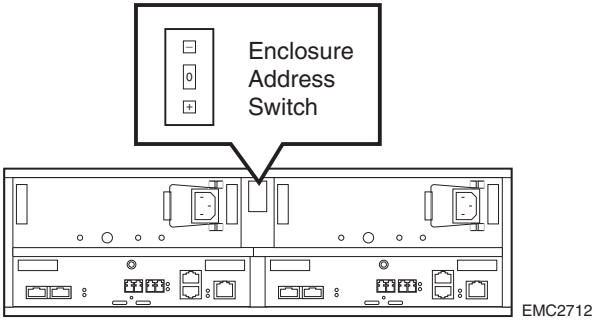


Figure 1-4 CX500/CX500i DPE2 Enclosure Address Switch/Indicator

The CX500/CX500i status lights are described in *Monitoring CX500/CX500i Status* on page 3-2.

Midplane

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

Front Bezel

The front bezel, shown in Figure 1-5, has a keylock, two latch release buttons, and an electromagnetic interference (EMI) shield. You can take off the bezel to remove and install drive modules, but EMI compliance requires a properly installed front bezel.

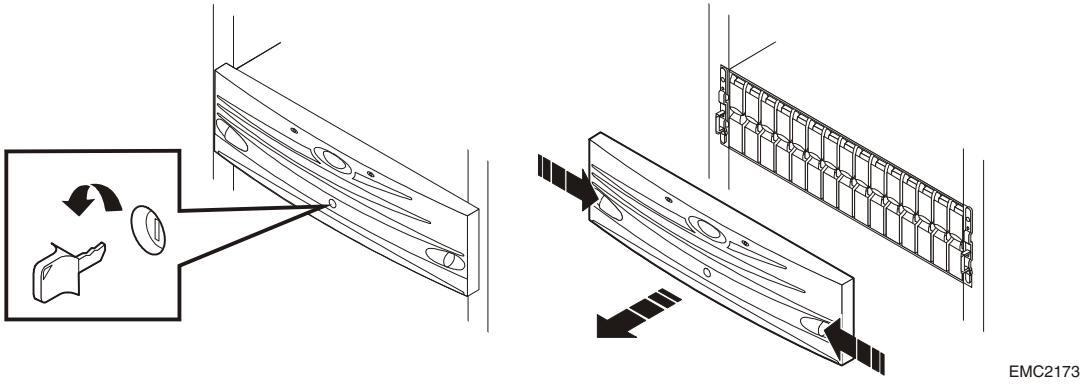


Figure 1-5 Disk Processor Enclosure Front Bezel

Storage Processors (SPs)

The SP is the CX500/CX500i'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.

The CX500/CX500i SP includes dual processors, 2 gigabytes of DDR DIMM (double data rate, dual in-line memory module) memory, and the following ports:

- COM 1 serial port for service.
- COM 2 serial SPS port for communication with the standby power supply.
- Network port for storage-system management.
- Two high-speed serial data connector (HSSDC) back-end (BE) ports for FC-AL loop to disks.
- **CX500 systems**: Two fibre-optic front-end (FE) ports, for connecting to the external Fibre Channel environment (switch or host).
- **CX500i systems**: Two 1-gigabit LAN front-end (FE) ports for connecting to the external Ethernet environment (switch or host); these ports are also called iSCSI data ports.

Figure 1-6 shows the CX500 SP front panel, with connectors and status LEDs.

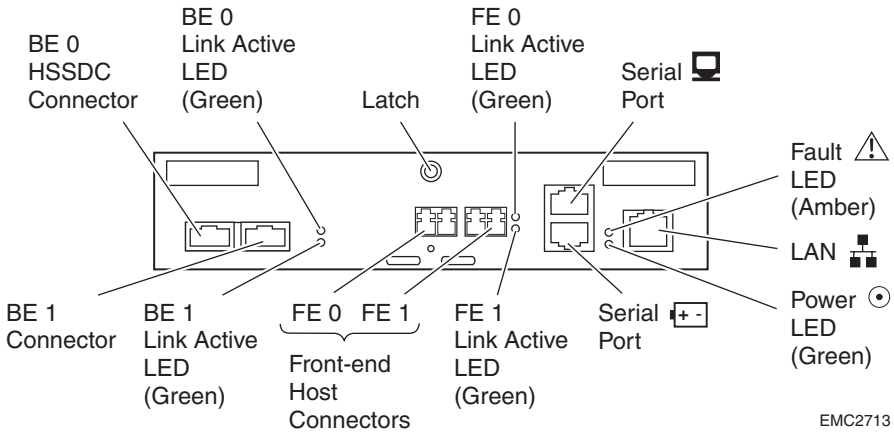


Figure 1-6 CX500 Storage Processor

Figure 1-7 shows the CX500i SP front panel, with connectors and status LEDs.

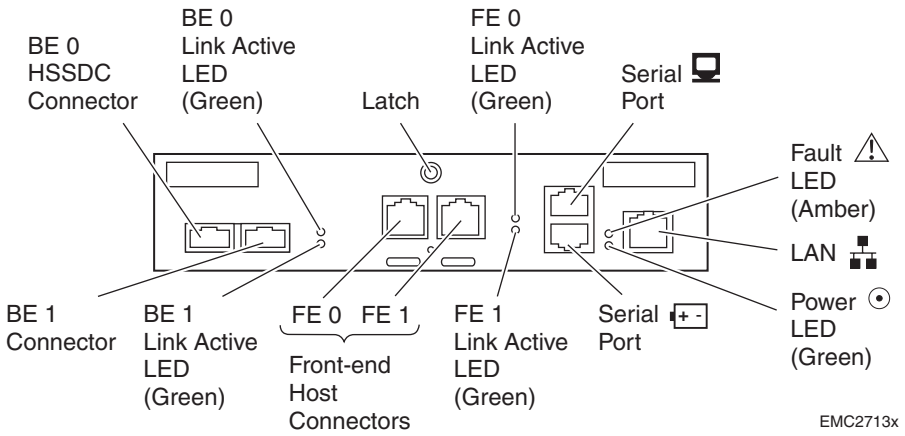


Figure 1-7 CX500i Storage Processor

The CX500/CX500i status lights are described in *Monitoring CX500/CX500i Status* on page 3-2.

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

When both storage processors are installed, you can replace either SP while the CX500/CX500i is running. You should never attempt to replace any of the SP's components.

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 CX500/CX500i is powered up, but you should exercise special care when removing drives while they are in use.

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.

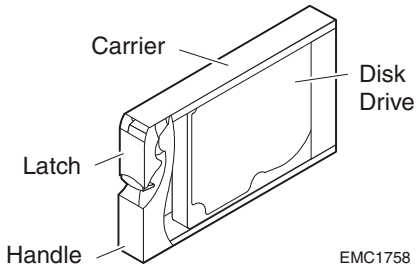


Figure 1-8 Disk Module

Disk Drives

The disk drives are 3.5-inch (8.75 cm) by 1.0-inch (2.54 cm) 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
- 12 volt only

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.

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.

The CX500 and CX500i use a unique power supply/system cooling module that is externally identical to other modules. *Do not attempt to use* a CX400 or DAE2 power/cooling module in a CX500 or CX500i enclosure.

Each power supply is an auto-ranging, power-factor-corrected, multi-output, off-line converter with its own line cord. 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, 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 module, or one in each module) fail, the CX500/CX500i will go off line within two minutes.

Each power/cooling module has visible status lights (LEDs), as shown inFigure 1-9. (Note that Figure 1-9 shows an ac power supply; LED placement on -48 V dc systems is the same.)The rightmost LED indicates power to the supply; the LED adjacent to it indicates a power supply fault. The leftmost LED indicates a failure in one of the integrated blowers within that module. The status lights are described in *Monitoring CX500/CX500i Status* on page 3-2.

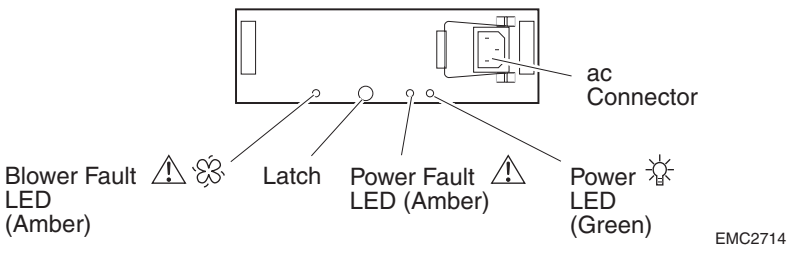


Figure 1-9 Power Supply/System Cooling Module

Standby Power Supply (SPS)

Disk configurations that use ac source power require standby power supplies (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 CX500/CX500i and DAEs. See Figure 1-10.

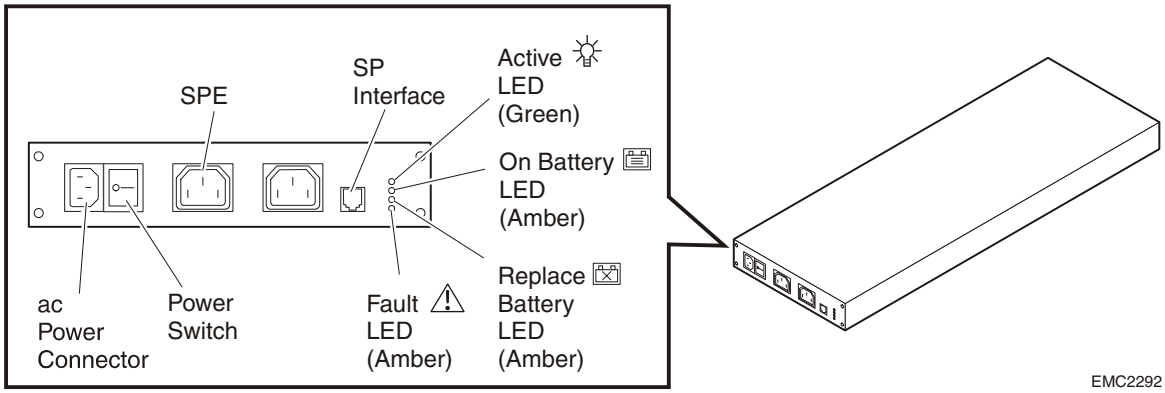


Figure 1-10 Standby Power Supply

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

Systems with dc power are intended for use in environments with redundant and highly available power sources (for example, "Central Office" grade power within the telecommunications industry), and dc power provided by the site must meet this requirement. The sudden loss of all incoming dc power to a storage system may cause unexpected abnormal behavior of the storage system and loss of write-cache data.

2

Installing a CX500/CX500i

This chapter describes the Model CX500 and Model CX500i DPE2 installation requirements and procedures. Major topics include

Requirements

This section explains site and cabling requirements.

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 a CX500/CX500i'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 the 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 fails, the remaining supply and cord support the full load. You must use a rackmount cabinet or other mounting standard, with appropriate power distribution, and have main branch ac or dc distribution that can handle these values for the number of components that you will interconnect.

The standard 40U EMC cabinet includes two 240-volt ac power cables and independent power distribution units (PDUs). To support all of the CX500/CX500i system's high-availability features, you must connect each power outlet to a different circuit.

Storage systems with -48 V dc power supplies also require separate circuits for each supply to maintain high availability.

Cooling

The temperature at the front bezel inlet must meet the ambient temperature specification described in Appendix A. The site must have air conditioning that can maintain the specified ambient temperature range. The air conditioning must be able to support the BTU requirements of the CX500/CX500i DPE2 and any additional disk enclosures.

Cabling Requirements

CX500 and CX500i DPE2s support copper cable for *back-end* (BE) connections to disks they control (for example, DAE disk enclosures). The CX500 uses optical cables for *front-end* (FE) connections to the

external Fibre Channel environment; CX500i systems use standard category 5 or category 6 LAN cables for front-end connections to the external Ethernet environment.

Any copper back-end 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 CX500/CX500i and disk enclosures should maintain consistency with the link controller cards (LCCs) in the additional disk enclosures. For example, in a two-loop (two-bus) configuration, one pair of Fibre Channel (FC) loops should interconnect SP A to all the LCC As, and the other Fibre Channel pair of loops should interconnect SP B with all (and only) LCC Bs.

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

The CX500/CX500i SPs process *front-end* I/O from servers (hosts), and *back-end* communication between disks and the enclosures that contain them. Each host bus adapter, storage processor, and disk requires a unique identifier, or *address*.

- Front-end (FE) addressing requirements vary depending on the environment.
  - Fibre Channel *fabric* (sometimes called *fibre port)* configurations include a Fibre Channel switch between the storage system and host bus adapters on connected servers. Fibre loop (FC-AL) front ends connect directly to a server.

    In a fabric environment, the switch assigns a unique fabric ID to each host bus adapter (HBA) and storage processor. In direct-attach configurations, the HBA and SP negotiate a default arbitrated loop physical address (ALPA).
  - iSCSI front-end addresses are internet protocol (IP) addresses that you manually assign when you configure the iSCSI ports with the Navisphere Storage System Initialization Utility.

- The CX500 and CX500i back end (BE) addresses each DPE2 and DAE using the FC-AL address (loop) identification and the DAE enclosure address (EA). You determine both the loop ID (sometimes called a *bus* ID) and the enclosure address during the hardware setup. Loop IDs (0, 1) correspond to the BE port numbers on the CX500/CX500i SP.

Enclosure Address (EA)

Each CX500/CX500i DPE2 and DAE on a back-end loop needs a unique enclosure address (EA), 0-3, that identifies the enclosure and determines the disk ALPA addresses. *Valid enclosure addresses for CX500-Series systems are 0, 1, 2, and 3.*

The CX500/CX500i DPE2 has a fixed EA of 0, which you should not change. The CX500/CX500i supports two loops and a maximum of four disk enclosures per Fibre Channel loop. For ease of use, we recommend that you keep the EAs sequential and that the loops correspond to each other; a maximum configuration would therefore include an EA 0, EA 1, EA 2 and an EA 3 for each loop. You specify enclosure addresses with a switch on each DPE2 and DAE.

Disk Requirements

CX500/CX500i storage systems require at least five disk modules installed in slots 0, 1, 2, 3 and 4 (the leftmost slots) of the enclosure. Disk module IDs are numbered left to right (facing the unit) and are contiguous throughout a storage system: enclosure 0 contains modules 0-14; enclosure 1 contains modules 15-29, and so on.

The disk modules in slots 0-4 provide recovery and 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. Remove it only to replace the disk.

For details on DAE disks and their configuration, refer to the *Hardware Reference* for your disk-array enclosure.

Installing a DPE2 in a Cabinet

The CX500/CX500i mounts inside a cabinet or rack on two L-shaped mounting rails connected to the cabinet's vertical channels.

- How to install the cabinet or rack is explained in the cabinet installation manual that shipped with the unit.
- How to install the universal mounting rails in the cabinet, and the 3U chassis on those rails, is explained in the *EMC Rails and Enclosures (CX-Series Storage Systems) Field Installation Guide* available on the EMC Powerlink website.

Warnings and Recommendations

The cabinet or rack in which you will install the CX500/CX500i must have a full earth ground to provide reliable grounding. Also, the cabinet/rack should have its own switchable power distribution. We suggest that you use a cabinet/rack 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.

本設備相當沉重，安裝置機架時應由兩人搬動。切勿在未經機械搬動車和 (或) 他人協助的情況下，獨自搬動和安裝本設備，以免受傷和 (或) 損壞設備。

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 CX500/CX500i or DAE in the upper half of the cabinet when the lower half is empty.

Setting Up an Installed CX500/CX500i DPE2

CAUTION

Be sure the standby power supplies and circuit breakers in your cabinet are switched off before you begin setting up the CX500/CX500i.

Setting Enclosure Addresses

Each disk enclosure in your system must have a unique enclosure address (EA, sometimes called an enclosure ID) that together with the loop ID 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 address if you installed the enclosure into your cabinet/rack independently. The EA can range from 0 through 3; we recommend that you number them consecutively from 0. ***The CX500/CX500i is always enclosure 0***. Additional DAE disk enclosures are numbered 0, 1, 2 or 3, depending on their position on the Fibre Channel loop (bus) connecting the storage system. You set the EA with the enclosure address switch. DPE2 and DAE2 EA switches have one push button for incrementing the address and another for decrementing it; DAE2Ps have a single push button that increments in an address loop. Use a pen, paper clip, or small screwdriver to set the EA as follows:

CAUTION

***DPE2 or DAE2* drives read their FC-AL physical address only at powerup or when the drive is reset. To avoid losing access to data, *you must set the EA in those enclosures when power is off*; you cannot change the EA while power is on.**

Set and read the EA for DAE2P enclosures when power is *on*. Refer to your DAE2P setup guide or hardware reference for instructions on changing a DAE2P enclosure address.

1. Make sure the enclosure address for the CX500/CX500i is set to 0. Refer to Figure 2-1.
2. Set the enclosure address for any additional disk enclosures.
   - Set the first DAE *on Loop 0* (BE 0) to EA 1.
   - Set the first DAE *on Loop 1* (BE 1)to EA 0, and the second to EA 1.
   - Set the EA on subsequent DAEs sequentially depending on the loop to which they connect; EA 2 on loop 0, EA 2 on loop 1, and so on.

Set EAs for DAE2P disk enclosures after the system is powered on.

See Figure 2-1 and Figure 2-8 as necessary.

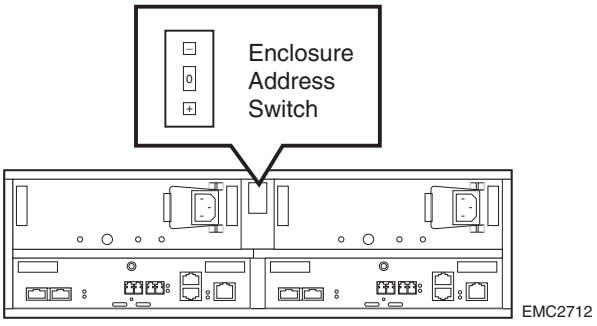


Figure 2-1 CX500-Series Enclosure Address Switch

Making Power Connections - ac Power Source

Follow these instructions to make power connections for CX500-Series systems with ac power supplies.

Note that the CX500/CX500i ac power supplies use retention bails to relieve strain on the power cords and to keep the cords seated in their connectors.

Refer to Figure 2-2 as you connect the ac line cord to the power supplies.

1. Plug an ac line cord into each power supply/cooling module.

2. Release the retention bail from its slot on the power/cooling module, and push the loop of the bail over the power cord to hold the cord in position.

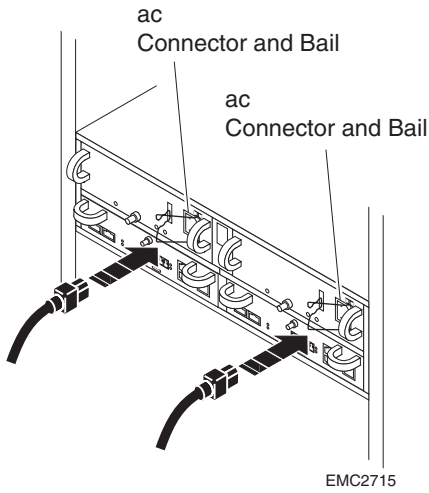


Figure 2-2 ac Line Cord and the Retention Bails

3. Plug the other end of the CX500/CX500i power cords into the standby power supply that corresponds to each power supply/cooling module (PS); for example, PS A to SPS A, PS B to SPS B. Refer to Figure 2-3.

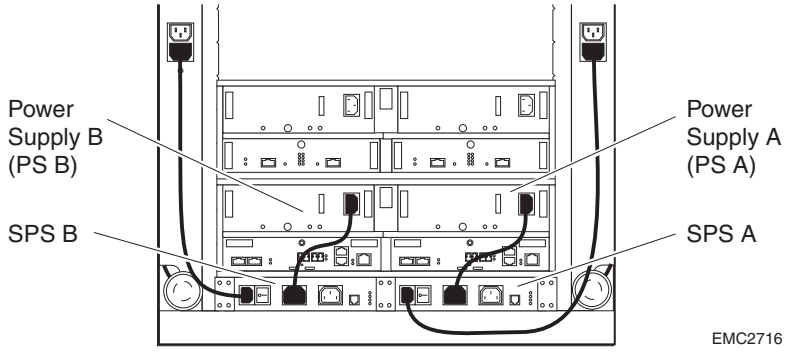


Figure 2-3 Connecting CX500/CX500i Power Cords to the Standby Power Supplies

Make certain you secure the power cords with the retention bails (strain reliefs) at each connector. The bails prevent the power cord from pulling out of the connections.

4. Connect each storage processor to its corresponding standby power supply; for example, SP A to SPS A, SP B to SPS B. Refer to Figure 2-4.

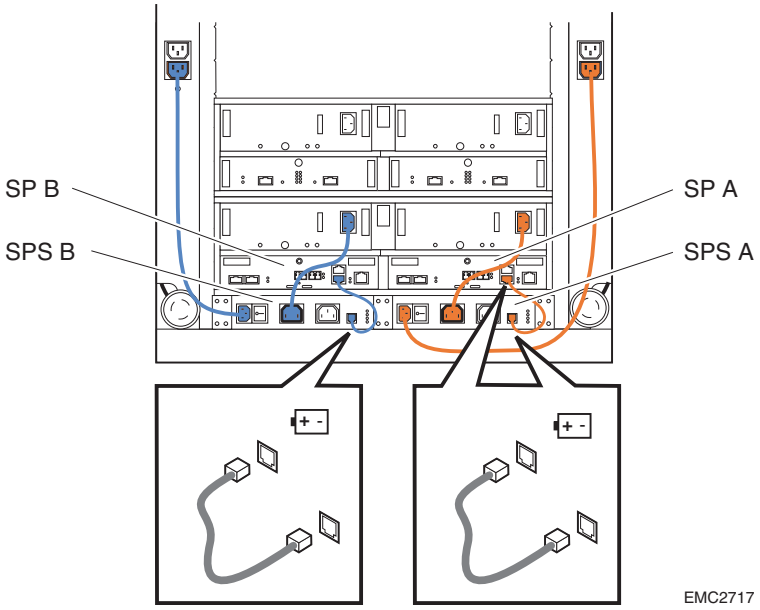


Figure 2-4 Connecting Standby Power Supplies to SPs

5. Connect DAEs 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).

6. Connect each SPS to a cabinet power strip. Note that each SPS connects to a different power strip. For high availability, you must connect each power strip to a separate circuit.

   Figure 2-5 shows typical ac power connections in a CX500/CX500i system. The 40U-C cabinet shown includes two power distribution panels (PDP) and two power distribution units (PDU) on separate 240-V circuits.

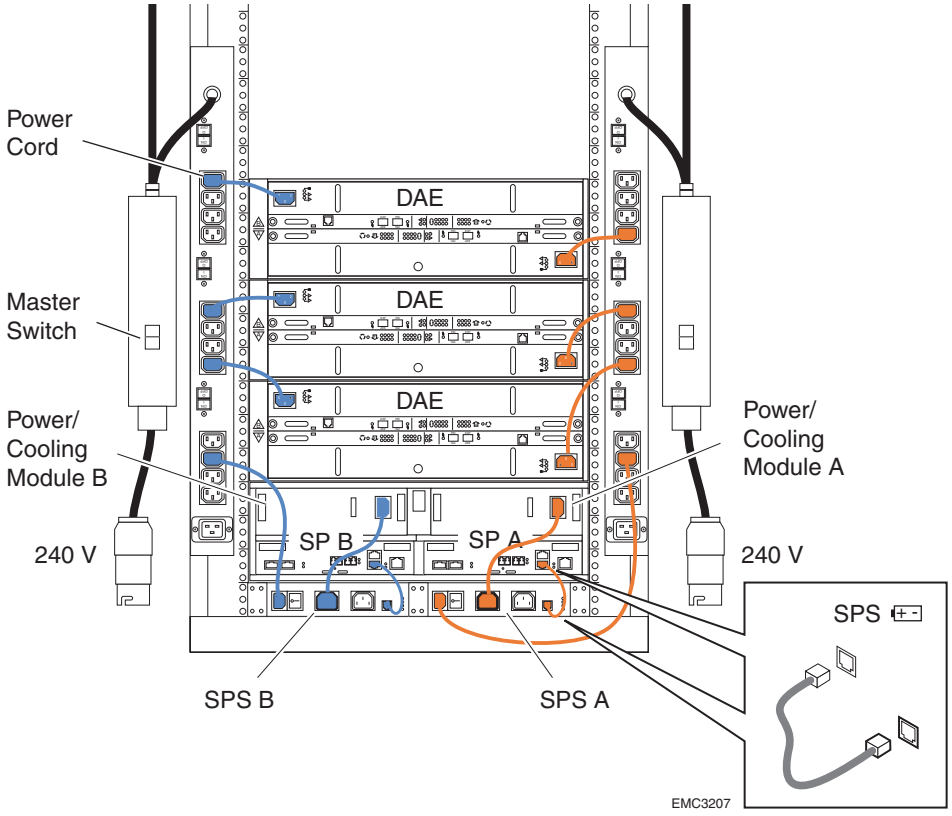


Figure 2-5 CX500/CX500i Power Connections

Making Power Connections - dc Power Source

Follow these instructions to make power connections for CX500 systems with dc power supplies.

1. Connect RJ45-RJ12 sense cables (sometimes called SPS emulator cables) between each power supply and the SPS serial connector on its corresponding storage processor, as shown in Figure 2-6 on page 2-12.

CAUTION

Be sure to connect the sense cables *before* you connect to a dc power source.

Make sure to connect storage processor A to power/cooling module A, and SP B to PS B.

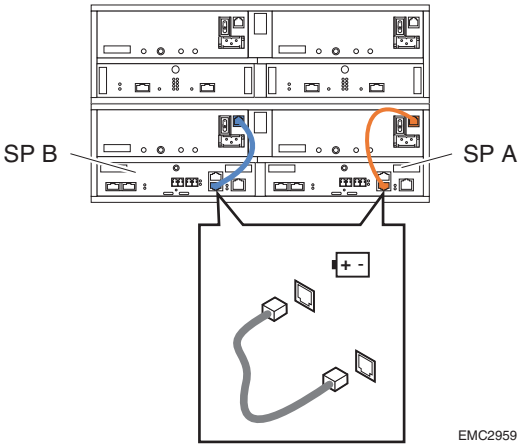


Figure 2-6 Connecting dc Power Supplies to the CX500 SPS Ports

2. Connect the dc power cables from power/cooling module A (PS A) and PS B to independent sources of dc power.
3. Connect DAEs and other devices to the power strips in your cabinet/rack. For high availability, connect dual power supplies in any component to separate power circuits (opposite strips in the cabinet/rack).

Making Back-End Connections

CAUTION

Before making any new back-end connections to or between DAEs, verify your enclosure addresses as follows:

- **Make sure the EA switch on each DAE2 indicates the correct enclosure address.**
- **Power up any DAE2Ps *before cabling to the PRI or EXP connectors*. If the enclosure address LEDs indicate an incorrect or invalid EA, reset the address to the correct value.**

The CX500/CX500i supports two redundant Fibre Channel back-end loops on each SP for a total of four independent loops. Loop 0 from SP A and loop 0 from SP B are paired, and share access to the same dual-port disk drives. Loops starting at the BE 1 connectors are also paired and share disks in the same way. Together, loops A0/B0 and A1/B1 act as two redundant loops, also called *buses*.

Cable your back-end loops as follows:

1. Attach copper cables from the CX500/CX500i DPE2 to additional disk enclosures, as shown in Figure 2-7 and Figure 2-8.

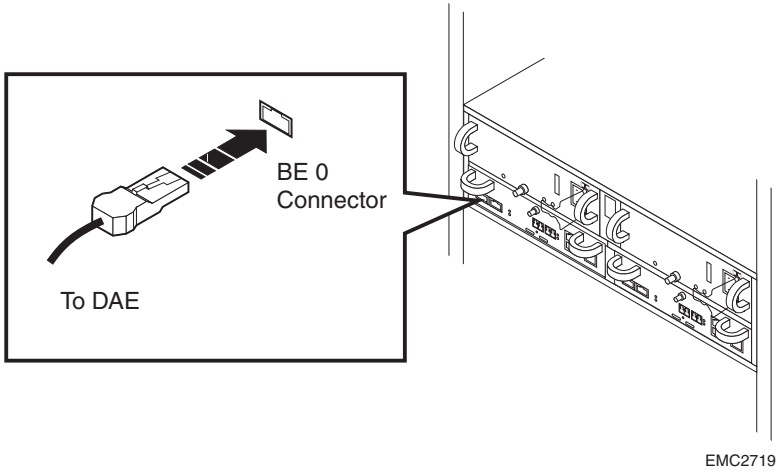


Figure 2-7 Connecting a CX500/CX500i DPE2 to Another Disk Enclosure

2. Connect BE 0 on each CX500/CX500i SP to the corresponding Primary (PRI) connector in the first additional disk enclosure (EA 1) in Loop 0.
3. Connect BE 1 on each SP to the first corresponding PRI connectors in Loop 1 (EA 0).
4. Cable the remaining disk enclosures together as shown in Figure 2-8.

The example configurations that follow show a CX500 below seven DAE disk-array enclosures. The eight devices support two completely redundant (four total) loops. Note that the DPE2 connects to the *Primary* disk enclosure connectors, and subsequent enclosures connect in an *Expansion*-to-Primary chain.

You can mix DAE2 and DAE2P enclosures in a storage system and along a loop.

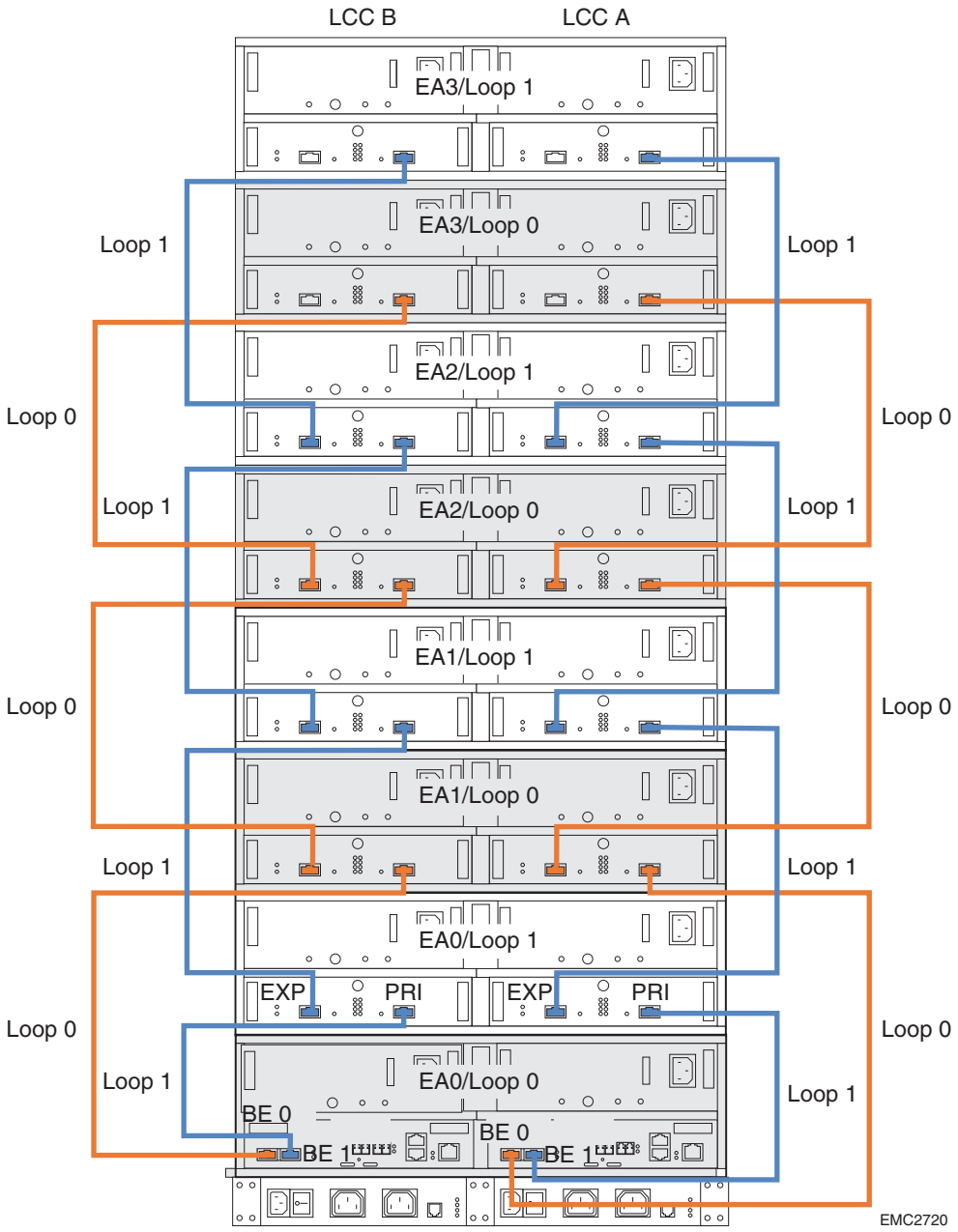


Figure 2-8 Cabling CX500/CX500i and DAE2 Disk-Array Enclosures Together

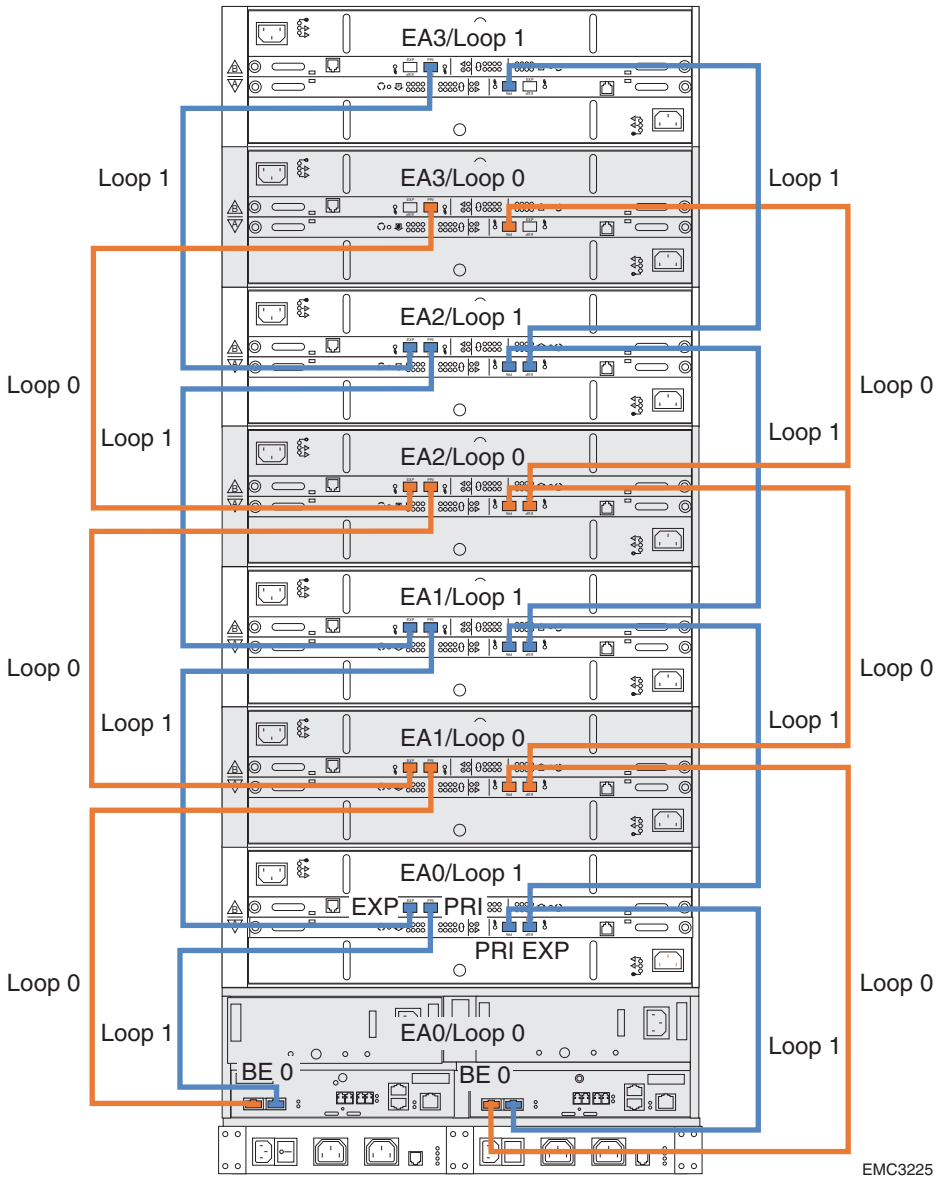


Figure 2-9 Cabling CX500/CX500i and DAE2P Disk-Array Enclosures Together

Connecting the CX500 to the External Environment

This section describes how to connect a Fibre Channel front end to its external environment (switches or direct attachment to a server). If you are installing a CX500i (iSCSI front end) system, skip this section and continue with *Connecting the CX500i to the External Environment* on page 2-19.

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. If you need to make a 90º bend, do it over 6 to 12 inches.
- 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.

Follow the steps below to cable the SPs and connect them to the external environment:

1. Remove the protective covers from each optical connector and each optical cable, as shown in Figure 2-10.
2. Plug the cable into a host port on the SP. See Figure 2-10.

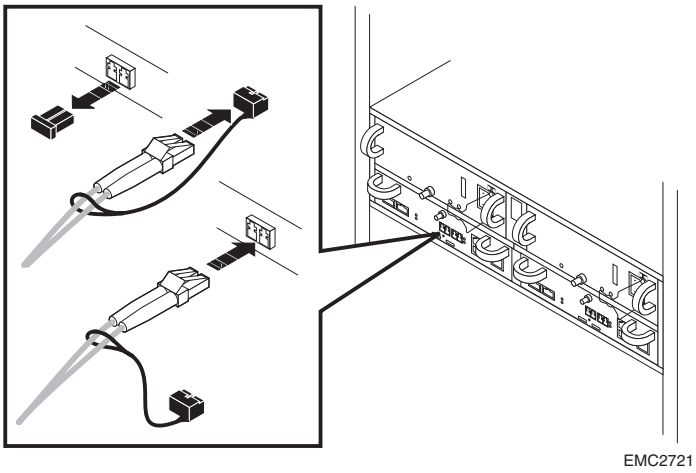


Figure 2-10 Attaching Fibre-Optic (Front-End) Cables to the SP

3. For each SP connection to the external environment, attach an optical cable from the front-end (FE) port to the external environment.

   a. For the FE 0 host port, plug the other end of the fibre-optic cable into the Host Bus Adapter (HBA) or switch port.

   b. For the FE 1 host port on a storage system *without MirrorView*™ software, plug the other end of the cable into the HBA or switch port.

      For the FE 1 host port on a storage system *with MirrorView*, plug the other end of the cable into the corresponding storage processor (SP) host port on the remote storage system, or into the switch port zoned to the corresponding SP.

Connecting the CX500i to the External Environment

This section describes how to connect an iSCSI front end to its external environment (switches or direct attachment to a server). If you are installing a CX500 (Fibre Channel front end) system, go to on page 2-16.

All iSCSI data port (front end) connections must be 1-gigabit LAN, even if the server NIC connection is 10/100; the CX500i supports 10/100 LAN connection to the management port only.

Data and host ports that are not physically connected together (directly or through a switch) must be on separate subnetworks. In direct-connect configurations, every data port must be on a separate subnet, and another subnet is required for the management ports.

Connect the storage system iSCSI data ports to the gigabit Ethernet network as follows:

1. Plug Ethernet cables into the two front-end iSCSI ports on each SP (FE 0 and FE 1). See Figure 2-11.

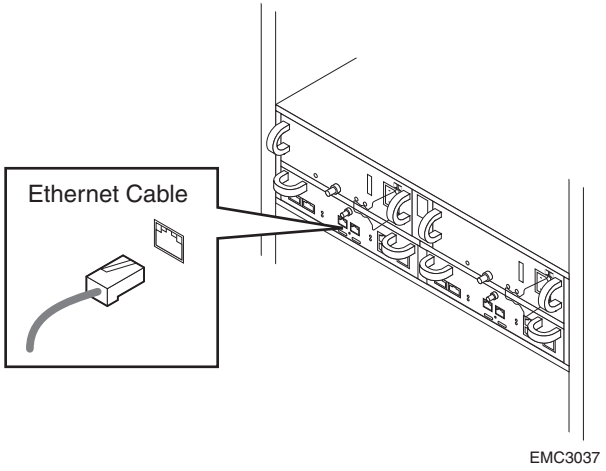


Figure 2-11 Connecting a Gigabit Ethernet Cable

EMC recommends category six (CAT 6) cables for the 1-gigabit Ethernet connection; CAT 5E and CAT 5 cables are supported.

2. Connect the free end of the data port cables to gigabit Ethernet ports as follows:
   - For a *storage area network (SAN)* configuration, connect the cables to gigabit Ethernet ports on network devices such as switches or routers.
   - For a *direct attach* configuration, connect the cables to the iSCSI initiator ports (gigabit Ethernet NICs or iSCSI HBAs). If the NICs or HBAs are not yet installed in the initiators, install them as described in the device-specific documentation.

Make Management LAN Connections

Before you connect 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 required to manage your system. With the proper browser and JRE, you can manage a CX500/CX500i from any server that shares a LAN with your storage system's domain. (Note that the Navisphere Manager User Interface is required on at least one system in the domain.)

Connect each SP to the 10/100 LAN from which you will run Navisphere management software, as shown in Figure 2-12 or Figure 2-13.

Figures 2-12 and 2-13 show a CX500 storage system; the management LAN connection for CX500i systems is identical. *You cannot manage a CX500i system through the 1-gigabit LAN iSCSI front-end ports.*

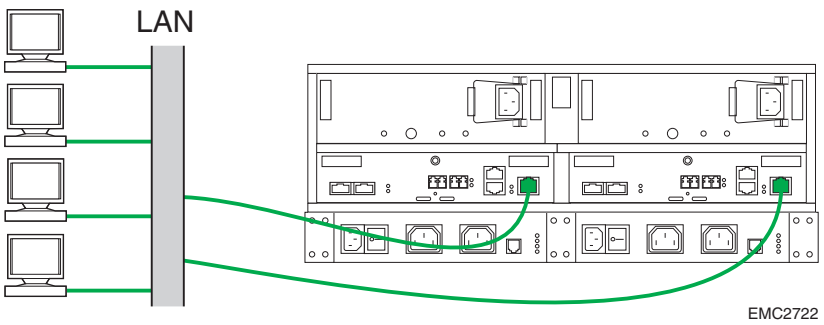


Figure 2-12 Connecting the CX500/CX500i to a Shared LAN

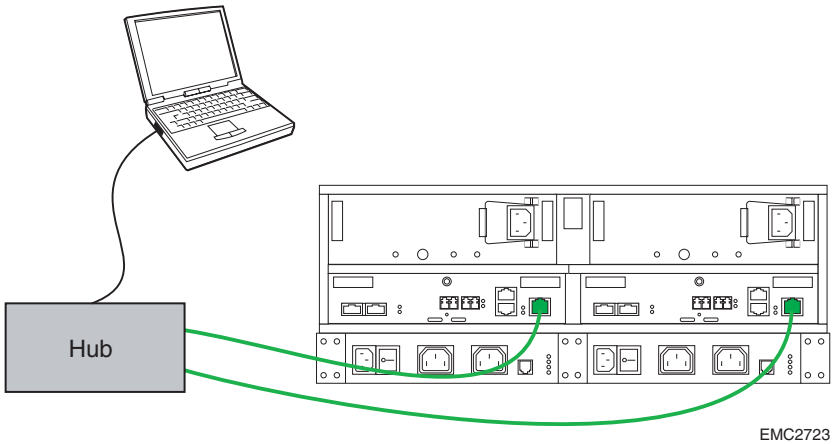


Figure 2-13 Connecting the CX500/CX500i to a Local Management Client

CX500/CX500i 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.

Power up the CX500/CX500i as follows:

1. Connect power to all DAEs connected to the CX500/CX500i. If any of the DAEs have power switches, turn them to the on position.
2. If present, turn the CX500/CX500i's power/cooling module switches to the on (l) position.
3. If present, turn the SPS power switches to the on position.
4. In the cabinet/rack, set the master switches (main circuit breaker switches on some older cabinets) to the on position.

   The CX500/CX500i and any DAEs in the cabinet/rack will power up.

The only power switches on most ac CX500/CX500i and DAE disk enclosures are those on the standby power supply and the cabinet circuit breakers, which are normally *on*. (Power switches on those power/cooling modules that include them are usually in the on position as well.) As a result, the units are *always active*.

When you initially apply 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 CX500/CX500i 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

***DPE2 or DAE2* drives read their FC-AL physical address only at powerup or when the drive is reset. To avoid losing access to data, *you must set the EA in those enclosures when power is off*; you cannot change the EA while power is on.**

Set and read the EA for DAE2P enclosures when power is *on*. Refer to your DAE2P setup guide or hardware reference for instructions on changing a DAE2P enclosure address.

For instructions on how to initialize your system after its first powerup, refer to the *CX500 Setup Guide* or the *CX500i Setup Guide*, and the *EMC Installation Roadmap for CX-Series, AX-Series, and FC-Series Storage Systems.*

CX500/CX500i Powerdown

CX500/CX500i storage systems with ac power require an SPS. If a properly configured ac system is powered down abnormally (for example, a brownout or ac/dc failure), cached data is saved to the storage-system vault disks. However, when the CX500/CX500i is powered back up, it may take longer to come on line.

Turning Off the Power - ac Systems

Follow these instructions to power down CX500-Series storage systems with ac power. For instructions on powering down dc-powered storage systems, go to *Turning Off the Power - dc Systems* on page 2-24.

1. Stop all I/O activity to the CX500/CX500i.

   Stopping the I/O allows the SP to destage cache data, and may take some time. The length of time will be based on criteria such as the size 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.

2. If the server connected to the CX500/CX500i is running the UNIX® operating system, unmount file systems.
3. Use the power switch on each SPS to turn off power to the CX500/CX500i DPE2 and any other device connected to the SPS. See Figure 2-14.

   You do not need to shut off or disconnect power from any of the connected DAEs.

CAUTION

Never disconnect the ac power supply/cooling modules to shut down a CX500/CX500i. 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.

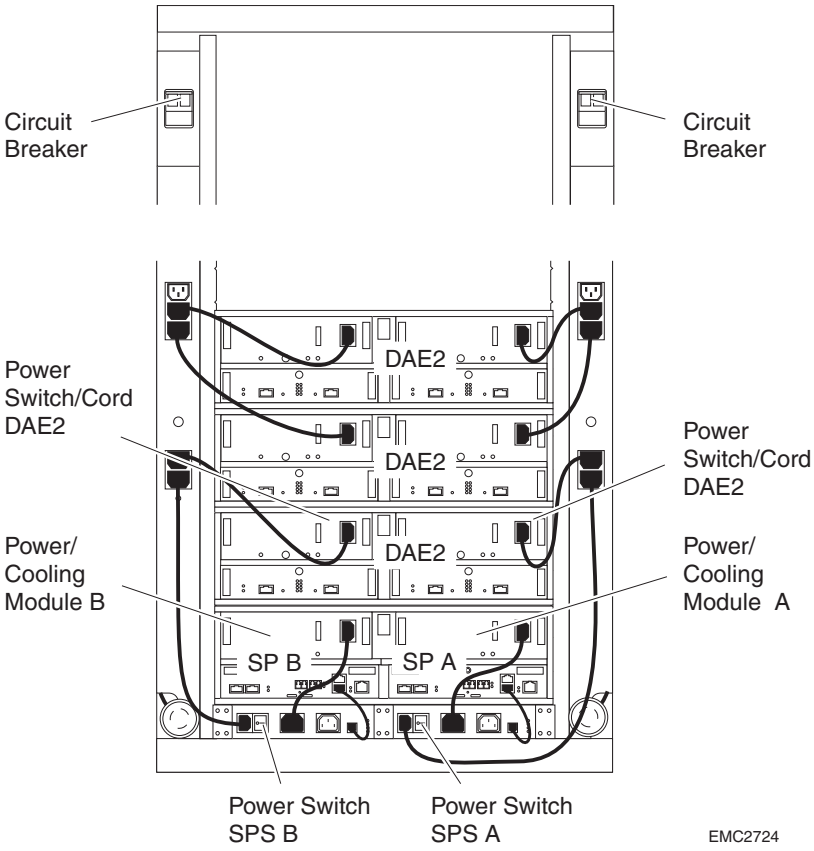


Figure 2-14 Powering Down a CX500 System with SPS (ac Power)

Turning Off the Power - dc Systems

Follow these instructions to power down CX500 storage systems with dc power. For instructions on powering down ac-powered storage systems, go to *Turning Off the Power - ac Systems* on page 2-23.

1. Stop all I/O activity to the CX500/CX500i.

   Stopping the I/O allows the SP to destage 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.

2. If the server connected to the CX500 is running the UNIX® operating system, unmount file systems.
3. On the DPE2, toggle each power supply's on/off switch to the Off position.

Allow the power supply to complete its shutdown sequence before removing the power source. An orderly shutdown that flushes all cache can take up to several seconds before the host sends a "STOP" to the power supply.

---

4. Power off the power strips A and B.

If you need to retain power to other systems in a rack/cabinet, leave the power strips powered on. You can either toggle the DAE power switches (if present) to the off position, or remove the DAE power cords.

3

Servicing and Upgrading a CX500 or CX500i

This chapter describes how to monitor CX500/CX500i status, handle field-replaceable units (FRUs), and replace or add a FRU. Topics are

Monitoring CX500/CX500i Status

Status lights made up of light-emitting diodes (LEDs) on the CX500/CX500i and its FRUs indicate error conditions. These lights are visible from outside the enclosure, some from the front, and the others from the back. Figures 3-1 through 3-3 and Tables 3-1 through 3-2 describe the status lights.

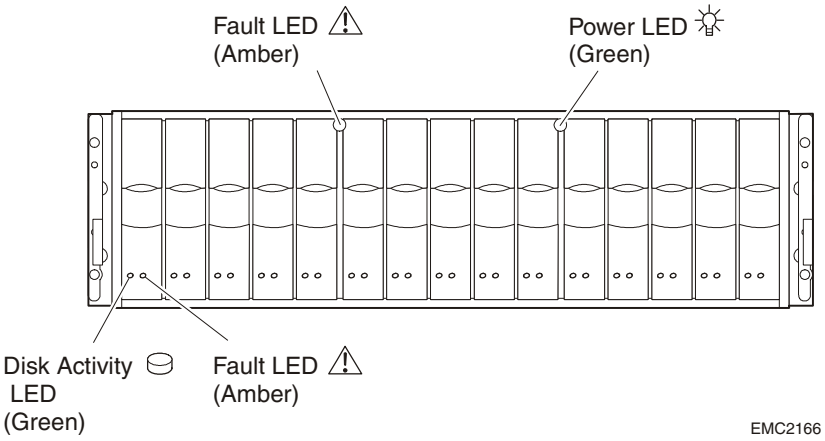


Figure 3-1 Enclosure and Disk Module Status Indicators (Front Bezel Removed)

Table 3-1 describes the lights visible from the front of the CX500/CX500i DPE.

Table 3-1 Status Lights Visible from the Front of the CX500

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 *(mostly off)* 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 *(at a constant rate)* 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 *(mostly on)* 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 status LEDs for the power supplies. (CX500 dc power supplies have the same LED configuration as the ac model shown.)

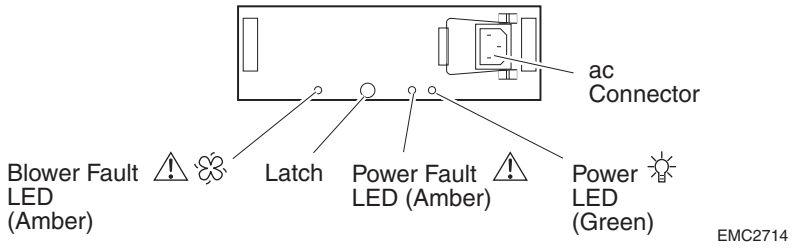


Figure 3-2 Power Supply Status Indicators

Figure 3-3 shows the status LEDs for the SP. (Note that the status LEDs for CX500 and CX500i storage processors are identical.)

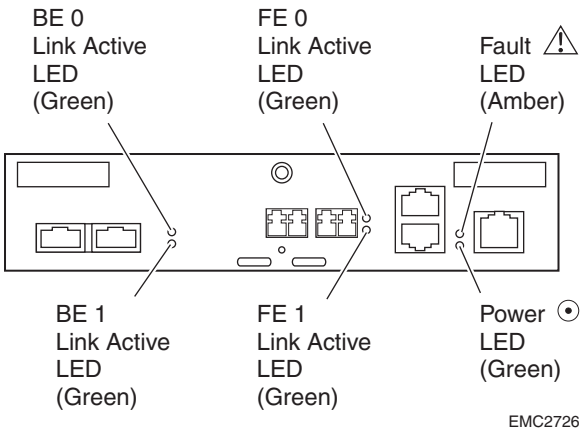


Figure 3-3 SP Status Indicators (CX500 Shown)

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. six fast flashes, long pause — rewriting BIOS/POST: DO NOT REMOVE AN SP IN THIS STATE Steady indicates fault; refer to event log.
Link Active	4 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. Flashing may also indicate incorrect (non-CX500) power supply
Blower Fault*	1 per cooling module	Amber	On when a single blower in the power/cooling module is faulty.

* The CX500/CX500i will continue running with a single power supply and three of its four blowers. Removing a power/cooling module constitutes a multiple blower fault condition, and will power down the system unless you replace a blower within two minutes.

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 will be 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 CX500/CX500i is designed to be powered up continually. Disks, storage processors, and power/cooling modules are *hot repairable*; that is, you can replace faulty units while the system is running. Front bezels should be attached and each compartment should contain a FRU or filler panel to ensure EMI compliance and proper air flow over the FRUs.

While the CX500/CX500i 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 CX500.

If you need to power down a CX500, first stop I/O to the storage processors. For systems using ac power, shut off power to each SPS. To turn off storage systems with dc power, use the On/Off toggle switch on dc power/cooling modules. You do not need to shut down main power lines to the disk enclosure unless you need to power down all the cabinet/rack contents connected to that line. (Refer to *CX500/CX500i Powerdown* on page 2-23 for more detail.)

CAUTION

Never shut off or disconnect an SPS- connected power/cooling module to shut down a CX500/CX500i. Bypassing the SPS in that manner prevents the system from saving write cache data to the vault drives, and results in data loss. You lose access to data, and the storage processor event log displays 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:

- 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:
  1. attach the clip of the ESD wristband to the ESD bracket or bare metal on the enclosure
  2. then 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.
- Maintain the location where you store FRUs 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.**
- **Do not mix Fibre Channel and ATA components in the same enclosure. Refer to Figure 3-4 for a visual comparison of FC and ATA disk carriers.**

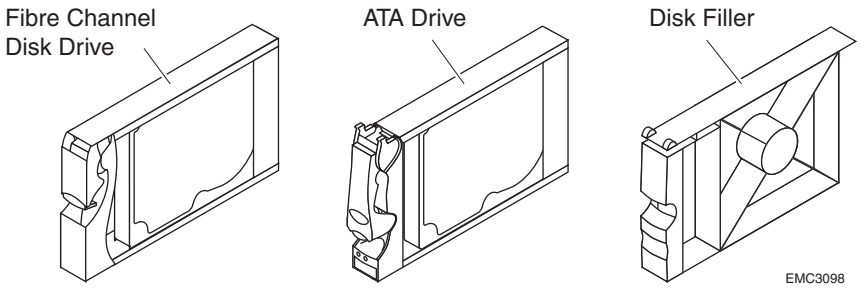


Figure 3-4 Disk Module Comparison

- **Always wear a properly attached ESD wristband when removing or replacing a disk module.**
- **Disk modules are sensitive to the extreme temperatures sometimes encountered during shipping. We recommend that you leave new disk modules in their shipping material and expose the package to ambient temperature for at least four hours before attempting to use the new modules in your system.**
- **When removing a disk module, pull the module part way out of the slot, then wait 30 seconds for the drive to spin down before removing it.**
- **When installing multiple disks in a powered up system, wait at least 6 seconds before sliding the next disk into position.**

- **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.**
- **Before adding more disks to your DPE2, refer to the *EMC CLARiiON® CX300, CX300i, CX500, CX500i, and CX700 Storage System Configuration Planning Guide*, which contains guidelines for creating RAID groups with disks of varying sizes and speeds.**
- **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 disk module should have the same format (bytes per sector) and the same capacity (size and speed) as the module it is replacing.**

Unlocking and Removing the Front Bezel

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.

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.

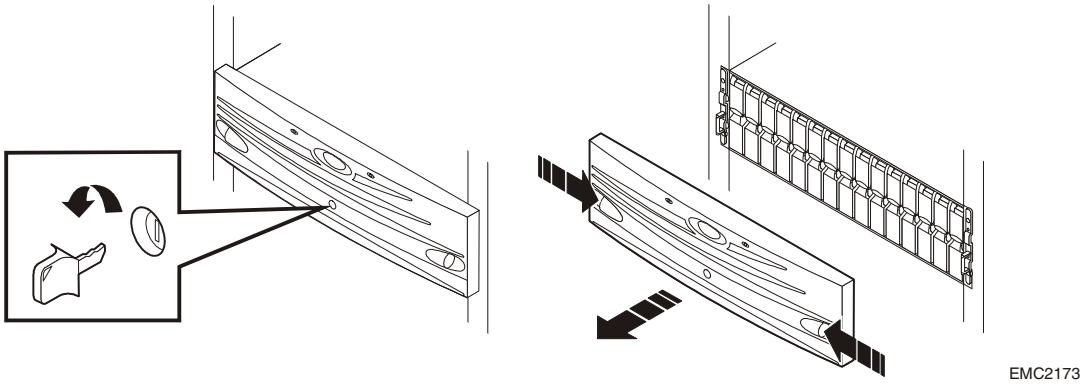


Figure 3-5 Unlocking and Removing the Front Bezel

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.

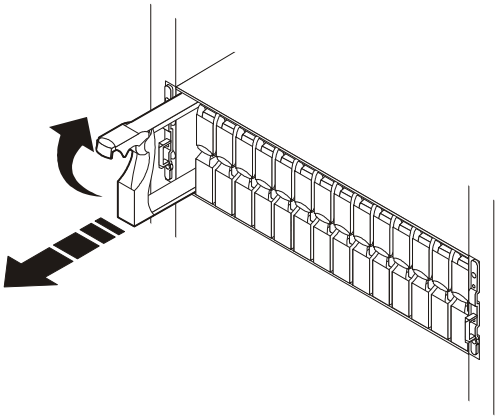


Figure 3-6 Removing a Disk Filler Module

Skip to the disk installation procedure (page 3-13) 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 0-4 provide recovery and 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).
2. If the active light is on steadily, pull the latch, and slowly pull the module about 1 in (3 cm) from its slot. Wait 30 seconds for the disk to stop spinning. Then remove the module as shown in Figure 3-7. 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.

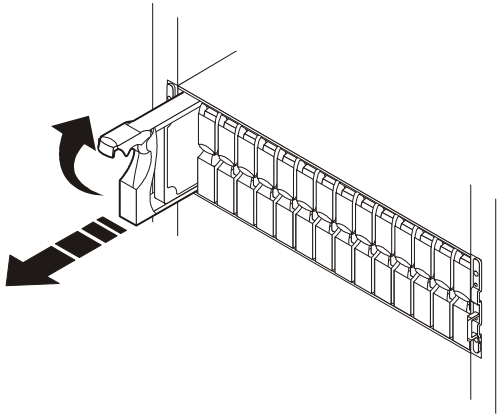


Figure 3-7 Removing a Disk Module

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

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).
2. Align the module with the guides in the slot.
3. Refer to Figure 3-8 as you insert the new disk module.
   a. With the disk module latch fully open, *gently* push the module into the slot.

b. The disk module latch will begin to rotate downward when its tabs meet the enclosure chassis.

c. Push the handle down to engage the latch. After the latch is engaged, push firmly on the bottom of the module to verify that the disk is properly seated.

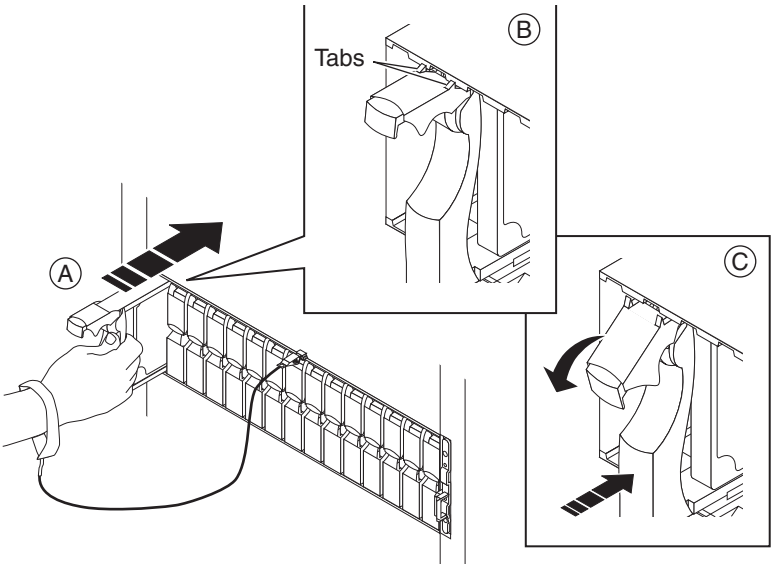


Figure 3-8 Installing a Disk or Filler Module

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

If you are installing multiple disks in a system that is powered up, wait at least 6 seconds before sliding the next disk into position.

---

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.

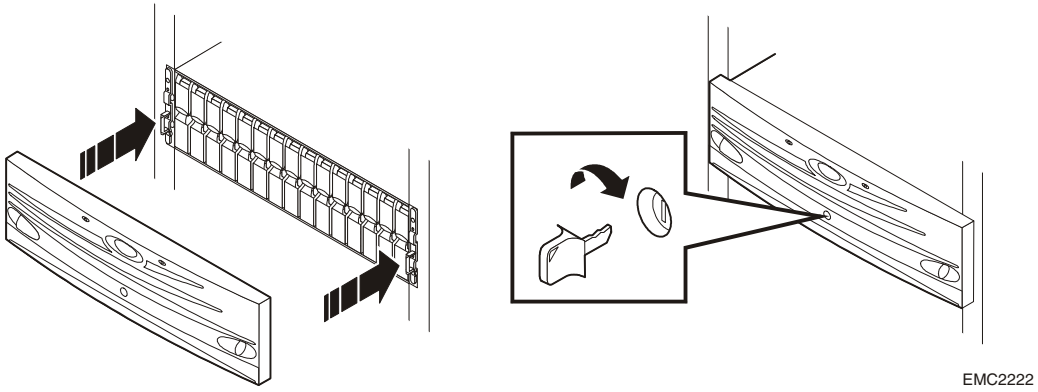


Figure 3-9 Installing and Locking the Front Bezel

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 CX500/CX500i 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. Gently release the connectors as you remove the optical, copper, LAN, and SPS cables connected to the 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.

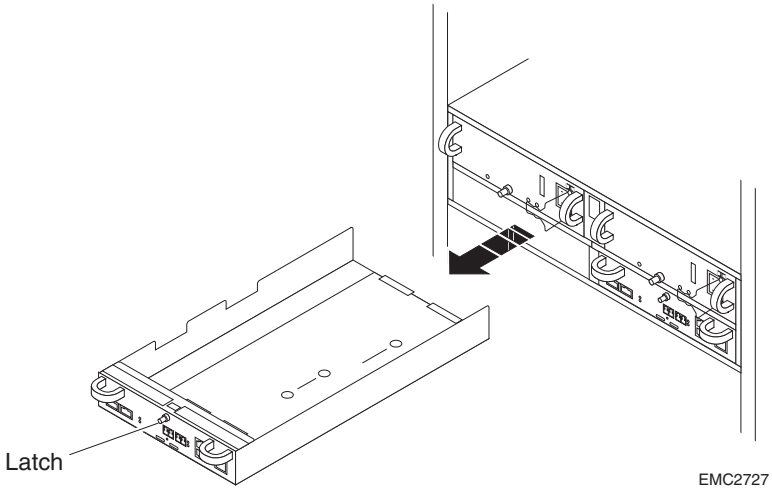


Figure 3-10 Removing an SP

Installing an SP

1. *Gently* insert the SP as shown in Figure 3-11. Be sure the module is completely seated in the CX500/CX500i midplane.

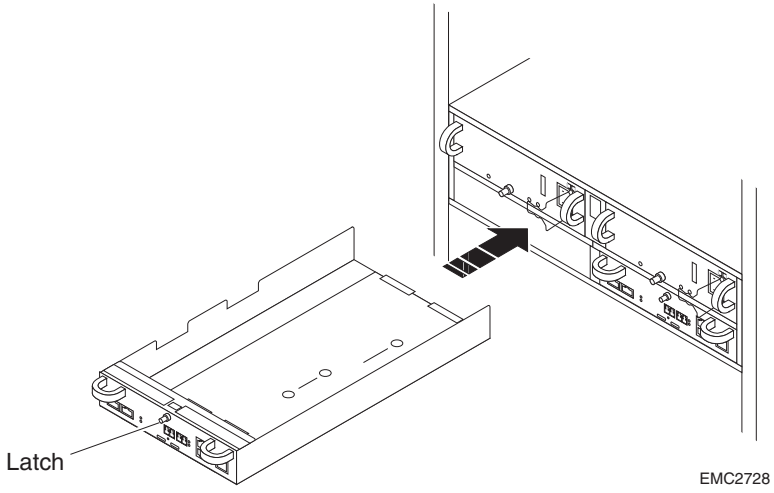


Figure 3-11 Installing an SP

The SP Power light turns on.

CAUTION

Depending on its state and configuration, your system may take several minutes to boot and integrate the new SP. Monitor the process patiently; pay particular attention to the SP fault LED codes described in Table 3-2 on page 3-5.

2. Turn the latch clockwise to secure the module.

   The CX500/CX500i 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 new SP.
4. Remove and store the ESD wristband.

Replacing a Power Supply/System Cooling Module

CAUTION

Handle a power supply/system cooling (power/cooling) module gently and use an ESD wristband. Do not remove a power/cooling module until you have a replacement module available.

Access to the disks in your enclosure will time out and the disks will spin down two minutes after you remove a power/cooling module from the system. While the CX500/CX500i 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*.

Be sure the replacement power/cooling module has the same part number as the faulty CX500/CX500i module (as noted on the bar code label) or is an authorized substitution for the CX500/CX500i module.

If the power/cooling module includes a power switch, turn the switch to the off position before unplugging the power cord from the module or cabinet/rack power strip.

When replacing a power/cooling module, make certain the green LED on one module has been steadily on for at least 5 seconds before removing power from the second module.

Removing a Power/Cooling Module

Follow these steps to replace a power/cooling module.

1. Turn any module power switch to off, then release any retention bail and unplug the ac/dc power cord. Figure 3-12 shows how to remove ac power cords; Figure 3-13 shows how to remove dc power cords.

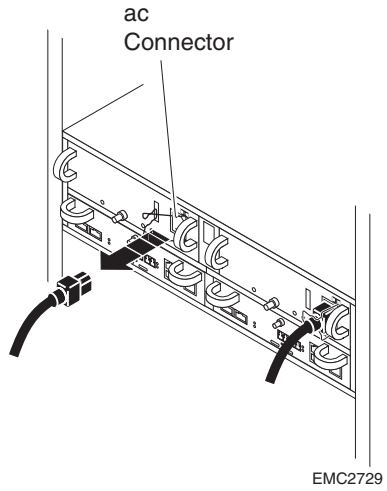


Figure 3-12 Unplugging the ac Power Cord

To protect a running system from overheating, the enclosure will time out unless you replace the power/cooling module within two minutes.

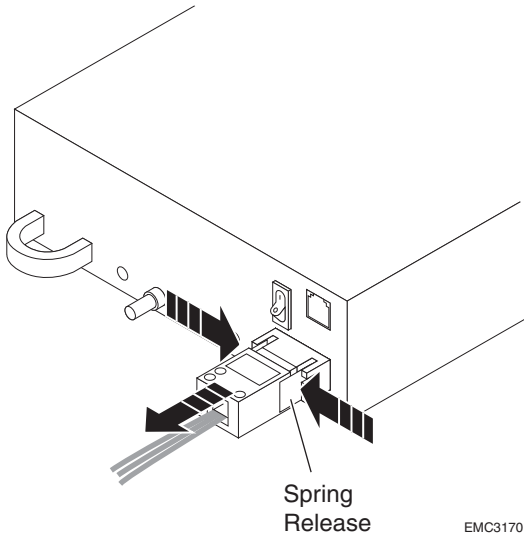


Figure 3-13 Unplugging the dc Power Cord

2. Turn the latch counterclockwise to release the module, and then remove it as shown in Figure 3-14.

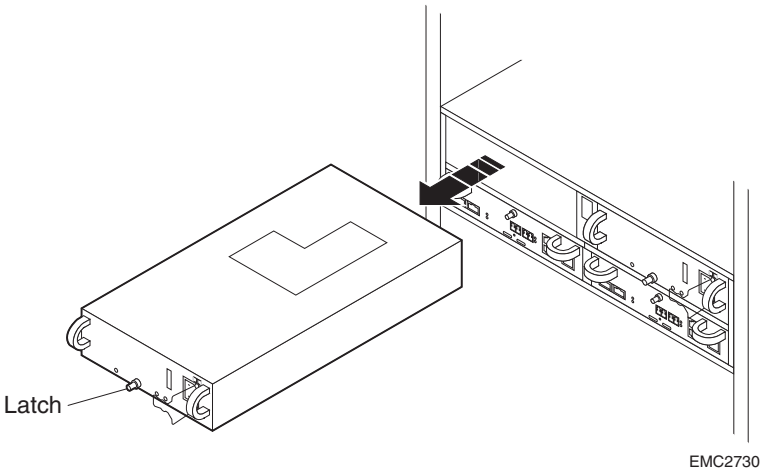


Figure 3-14 Removing a Power Supply/System Cooling Module

Continue to the next section to install the replacement module.

Installing a Power/Cooling Module

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

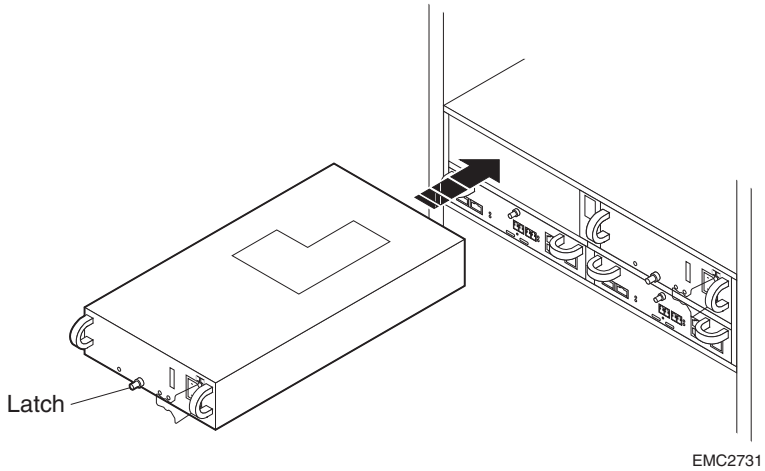


Figure 3-15 Installing a Power/Cooling Module

2. Turn the latch clockwise to secure the module.

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

3. Make sure any power switch on the replacement module is off before you plug the ac/dc power cord into the new supply. On ac modules, attach the wire retention bail for strain relief (see Figure 3-16). Turn a power switch to the on position after you plug in the power cord.

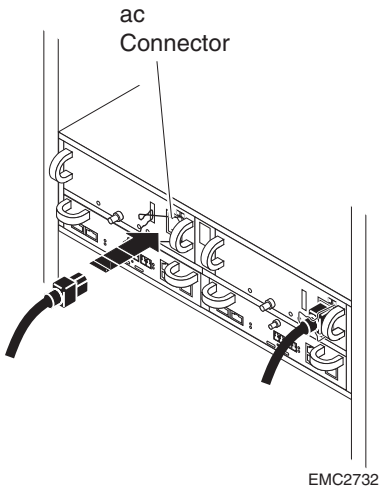


Figure 3-16 Plugging in the Power Cord

4

The Standby Power Supply (SPS)

The standby power supply (SPS) provides ac backup power required to protect the integrity of the CX500 or CX500i's storage processor write cache. This chapter describes the CX500/CX500i SPS and how to determine SPS status.

For instructions on installing or replacing an SPS, refer to the *EMC Rails and Enclosures (CX-Series Storage Systems) Field Installation Guide*.

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

Systems with dc power are intended for use in environments with redundant and highly available power sources (for example, "Central Office" grade power within the telecommunications industry), and dc power provided by the site must meet this requirement. The sudden loss of all incoming dc power to a storage system may cause unexpected abnormal behavior of the storage system and loss of write-cache data.

About the SPS

Two 1000-watt dc SPSs provide backup power for one ac-powered CX500 or CX500i. The two SPSs provide higher availability and allow write caching — which prevents data loss during a power failure — to continue. A faulted or not fully charged SPS disables write caching.

Each SPS rear panel has one ac inlet power connector with power switch, an ac outlet for the DPE2, another ac outlet which you should not use in CX500/CX500i configurations, one data connector to the storage processor, and status lights (LEDs).

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.

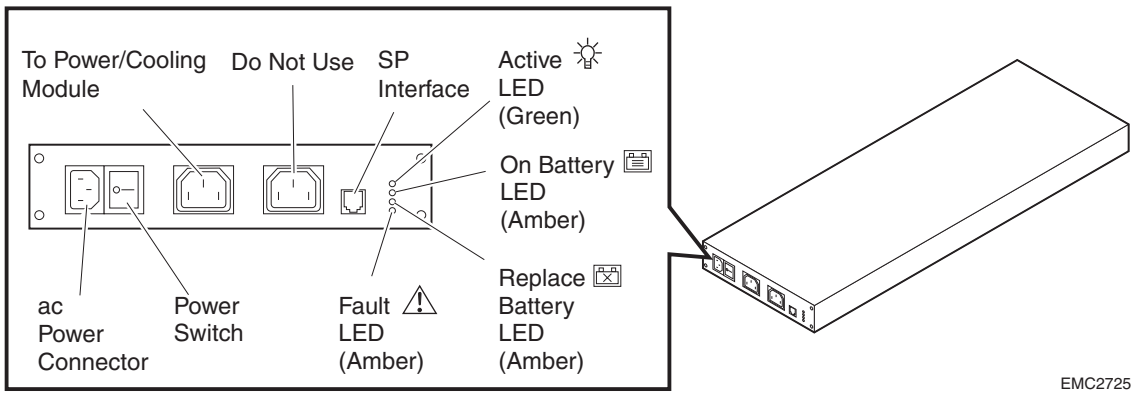


Figure 4-1 CX500/CX500i SPS Rear Panel

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

Table 4-1 SPS Status Lights (LEDs)

Light	Meaning When Lit
SPS fault - Amber	The SPS has an internal fault. The SPS may still be able to run online, 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 online SPS is connected to the CX500, 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 online SPS is connected to the CX500/CX500i, 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.

The two SPS units fit in a tray beneath the CX500/CX500i to which they connect. Figure 4-2 shows the SPS in a cabinet with a CX500.

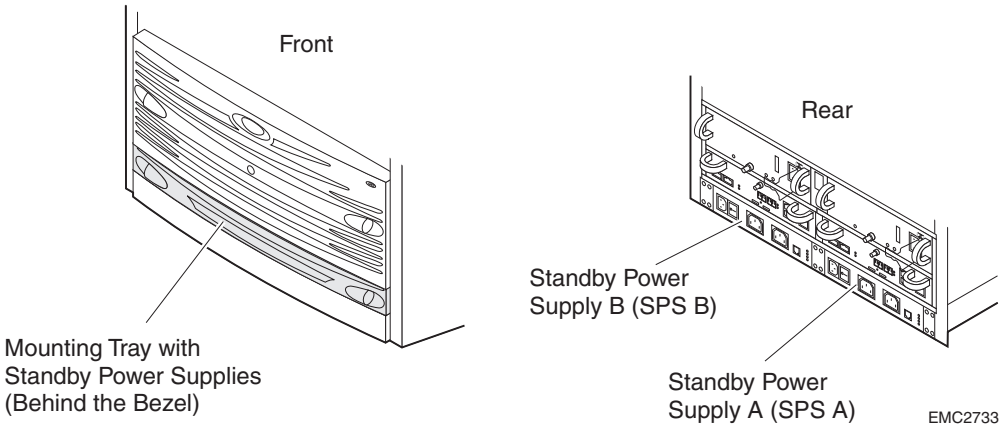


Figure 4-2 SPS Installation, Front and Rear Views

In the event of a power failure, an SPS provides backup power until the storage processor has flushed its write cache data to the CX500/CX500i disks. The storage processor then shuts the SPS power off. If the cache flush has not completed within 90 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 at least one 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.

A

Technical Specifications and Operating Limits

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

CX500/CX500i DPE2 Technical Specifications

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

Power Requirements

The input current, power (VA), and dissipation per CX500/CX500i 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 or rack with appropriate power distribution, and have main branch ac/dc distribution that can handle these values for each CX500/CX500i in the cabinet.

CX500/CX500i ac Ratings

Requirement	Description
ac line voltage	100 to 240 V ac ± 10%, single phase, 47 to 63 Hz
ac line current	5.9 A at 100 V ac, 2.9 A at 200 V ac
Power consumption	590 VA (578 W) max (fully configured)*
Power factor	0.98 min at full load, low voltage
Heat dissipation	2.08 10^6 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 Apk (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.

CX500 dc Ratings

Requirement	Description
dc line voltage	-36 V to -72 V dc (Nominal -48V or -60V power systems)
dc line current	16 A max at -36 V dc, 12 A typ at -48 V dc
Power consumption	580 W max
Heat dissipation	2.09 x 10^6 J/hr, (1,980 BTU/hr) max
In-rush current	30 A peak, per requirements in EN300 132-2 Sect. 4.7 limit curve
dc protection	30 A fuse on each power supply, both phases
dc inlet type	Positronic Industries PLB3W3M1000
Mating dc Connector	Positronic Industries PLB3W3F7100A1
Ride-through time	5 ms min
Current sharing	60% max, 40% min between power supplies

Summary of CX500 dc Power Supply Characteristics

Overall Output Power	575W			
Individual Output Ratings	Min Current	Max Current	Regulation	Ripple (p-p
12 V_1	1.5A	21A	+/-3%	120mV
12 V_2	1.5 A	21A	+/-3%	120mV
B_PWR_x_y (9V-13.2V out)	.4A	5.4A	+/-5%	120mV
+5V	0A	1.5A	+/-4%	75mV

Note: Total of all outputs combined not to exceed 575W

Size and Weight

Measurement	CX500/CX500i DPE2	SPS
Height	133.35 mm (5.25 in) 3 NEMA units including mounting hardware	4.02 cm (1.58 in) 1 U, including mounting rails
Width	450 mm (17.72 in)	20.96 cm (8.25 in) each
Depth	603.25 mm (23.75 in)	60.33 cm (23.75 in)
Weight	44.5 kg (98.3 lbs) maximum configuration 1.1 kg (2.4 lbs) per disk module 1.7 kg (3.8 lbs) per storage processor 4.1 kg (9 lbs) per power supply 12.7 kg (28 lbs) chassis and midplane	10.7 kg (23.65 lbs) each 4.5 kg (9.85 lbs) tray 25.9 kg (57.15 lbs) max total (2 SPS)

Measurement	DAE2	DAE2P
Height	133.35 mm (5.25 in) 3 NEMA units including mounting hardware	
Width	450 mm (17.72 in)	
Depth	603.25 mm (23.75 in)	355.6 mm (14 in)
Weight	43.2 kg (95.3 lbs) with rails (fully configured)	30.91 kg (68 lbs) maximum configuration;

Drive Type

Fibre Channel interface disk drives used in CX500/CX500i enclosures are

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

Drive module power is 16 W maximum per drive slot.

DPE2 FC-AL Interface

Connector - shielded HSSDC (High Speed Serial Data Connector).

Copper Cabling

The expansion port interface to the DPE2 is copper cable.

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

a. Refer to your DAE *Hardware Reference* for detailed back-end cable types and lengths.

Storage Processor Optical Cabling (CX500)

The CX500 uses optical cable from the SP's SFF (Small Form Factor) LC transceivers to the external Fibre Channel environment.

Type			50 µm or 62.5 µm, multi-mode, dual LC
Length	50 µm	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
Length	62.5 µm	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
Bend Radius			3 cm (1.2 in) min

The maximum length when using either the 62.5 µm or 50 µm 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 CLARiiON CX300, CX300i, CX500, and CX700 Storage Systems Configuration Planning Guide.*

CAUTION

EMC does not recommend mixing 62.5 µm and 50 µm optical cables in the same link. In certain situations you can add a 50 µm adapter cable to the end of an already installed 62.5 µm cable plant. Contact your EMC representative for details.

Storage Processor Ethernet Cabling (CX500i)

The CX500i uses standard Ethernet LAN cables from the 1-gigabit LAN ports (RJ45 connectors) on each SP to the external network environment. For distances up to 100 meters, Category 5E cables are the commonly used gigabit Ethernet standard; the system also

supports CAT 5 and CAT 6 cables. EMC recommends CAT 6 LAN cables whenever possible.

All iSCSI data port (front end) connections must be 1-gigabit LAN, even if the server NIC connection is 10/100; the CX500i supports 10/100 LAN connection to the management ports only.

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.

CX500/CX500i - ac Power

Safety Standards

Standard	Description
CSA 22.2 60950 3rd Edition	Safety of Information Technology Equipment including Electrical Business Equipment
TUV GS EN 60950-2000	
UL 60950 3rd Edition	
CB Scheme IEC 60950-1999	
GOST	
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 CISPR22	Class A, Electromagnetic Interference - Limits & Methods of Measurement of ITE
CNS13438	BSMI EMC Requirements

CX500 - dc Power

Stand-alone CX500 enclosures with dc power have been tested and certified for compliance with the international environmental and safety specifications listed below. Each enclosure is marked to indicate such compliance and certification as required.

Safety Standards

Standard	Description
CSA 22.2 60950 3rd Edition	Safety of Information Technology Equipment including Electrical Business Equipment
TUV GS EN 60950-2000	
UL 60950 3rd Edition	
CB Scheme IEC 60950-1999	
GOST	
CE Mark	European EMC Directive & Low Voltage Directive Requirements

Other Standards (CX500 only)

Standard	Description
GR-1089	Telcordia Technologies Generic Requirements
GR-63	Telcordia Technologies Generic Requirements
ETSI - 300 019-2-v2.12:2000-09	Storage Class 1.2
ETSI - 300 019 - 2-2 v2.12:1999-09	Transportation Class 2.3
ETSI - 300 019 -2-3 v2.12:1999-09	In Use Weather Protected Class 3.2
ETSI - 300 019 -2-3 v2.12:1999-09	Seismic
ETSI - 300 132-2	dc Voltage Input
ETSI - 300 386-2 2000-03	European Union

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 panel inlet. The site must have air conditioning of the correct size and placement to maintain the specified ambient temperature range and offset the CX500/CX500i heat dissipation listed on page A-2.

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 (8000 ft) at 40°C 3077 m (10,000 ft) at 37°C

The operating limits listed above for temperature and humidity must not be exceeded inside the closed cabinet in which the CX500/CX500i is mounted. Mounting equipment in a cabinet directly above or below a CX500/CX500i does *not* restrict air flow to the DPE2; air flows through the storage system from front to back at a rate of approximately 120 cubic feet per minute. Cabinet doors must not impede the front to back air flow. Exhaust temperatures will rise approximately 12° C (21.6° F) above intake temperatures.

Environmental Recovery

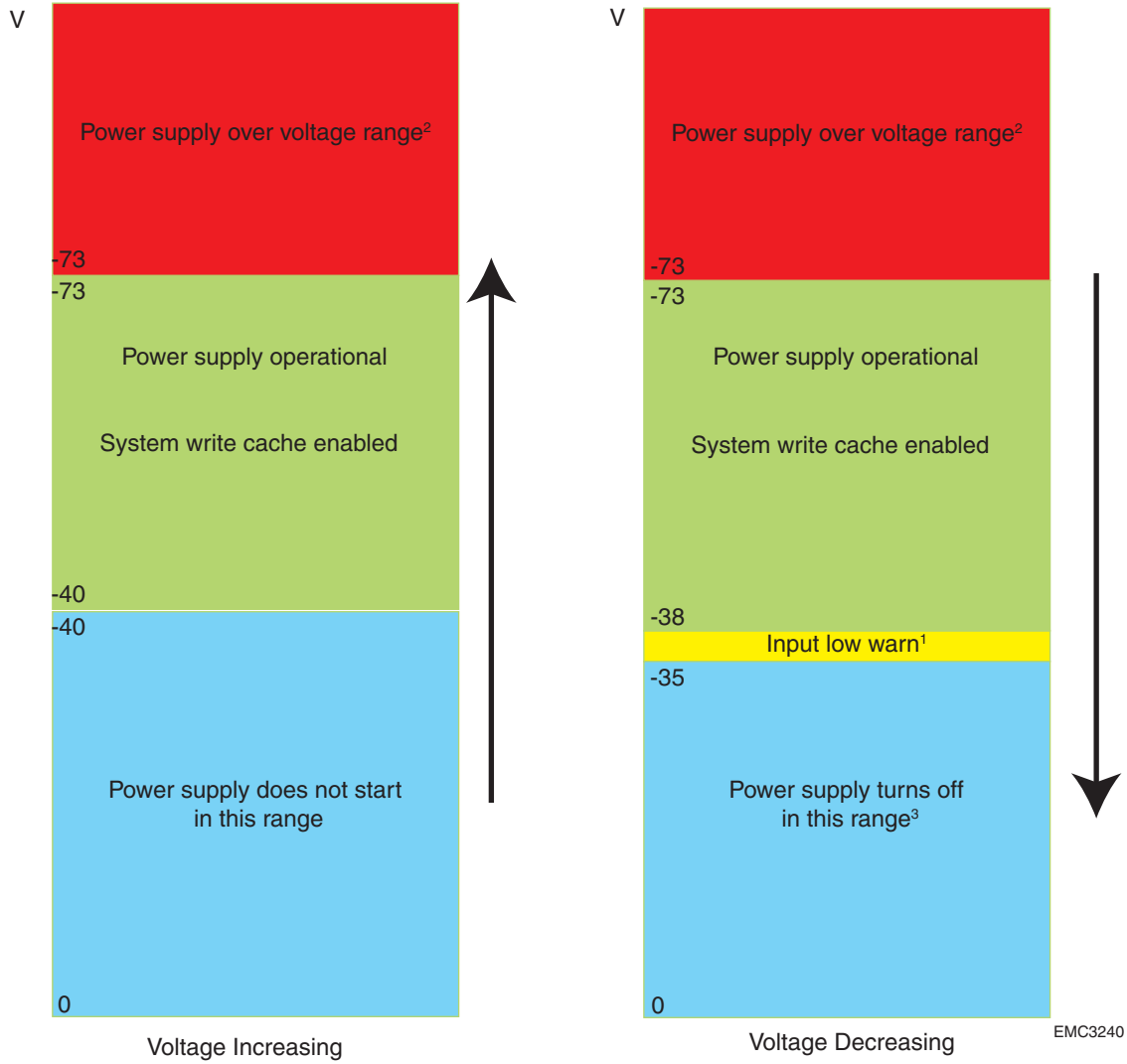
If the system exceeds maximum ambient temperature by approximately 10°C/18°F, the storage processors will begin an orderly shutdown that saves cached data, shuts off the SPs, and — in a DPE2 enclosure — powers down the disks. LCCs in each DAE will power down their disks but remain powered on. If the system detects that the temperature has dropped to an acceptable level, it restores power to the storage processors (which power up any disks in their enclosure) and the LCCs restore power to their disk drives.

Shipping and Storage Requirements

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

Operational Behavior of dc Power over Voltage Range

The following graphs describe operational behavior as a result of the input dc voltage on a storage system (CX500 or DAE). Voltages are approximate, within +/- 1V.



1 Whenever either power supply indicates operation in the ***input low*** range, system software disables write caching, clears the write cache, and operates in data write-through mode. The transition to write-through mode takes less than 90 seconds. The DPE2/DAE will continue to operate

in write-through mode while the power remains in input low range. This operating mode is intended to detect a slowly decaying battery bus and allows the enclosure to prepare for a possible shutdown, should input power be lost on both inputs. Write caching will automatically be re-enabled once both supplies return to the normal operational range.

2 Power supplies in the ***overvoltage*** range will continue to operate with no change in system behavior. Excessive overvoltage conditions may damage the unit and create a power supply fault for that supply. If the system recognizes a power supply fault condition, it disables write caching, clears the write cache, and operates in data write-through mode until the supply is replaced.

3 If both power supplies transition from the normal operational range to the ***off*** range in less than 90 seconds, write-cache memory may lose data and compromise the data in the storage system. ***Always disable write cache before removing power from both input busses.***

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 a 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 10^3 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

SPS 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.

SPS Shipping and Storage Requirements

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

Front 81.3 cm (32.0 in)

Rear 81.3 cm (32.0 in)

Battery Tests

Internal Within 60 minutes after powerup and approximately every 2 weeks thereafter, the SPS 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 storage system. 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 its entire 90-second period.

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 rechargable 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.

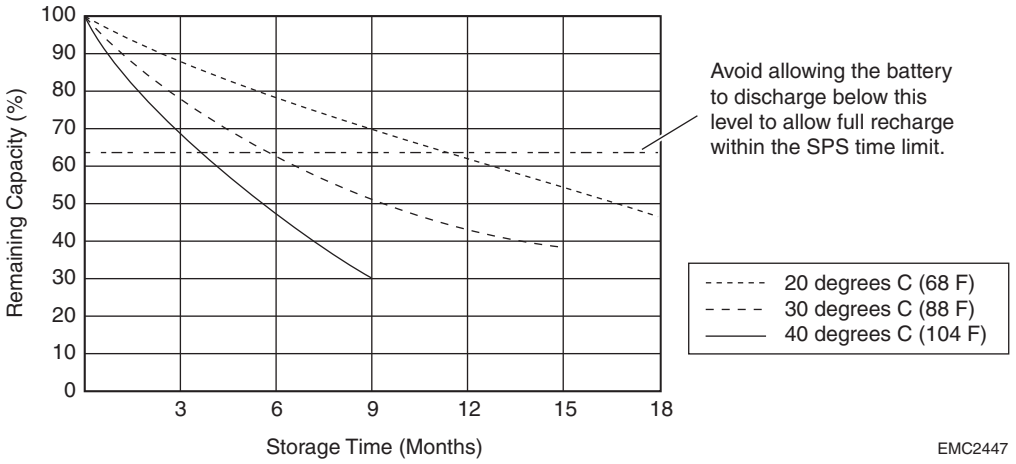


Figure A-1 Typical SPS Self-Discharge Levels at Different Storage Temperatures

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.

SPS 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	

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 CISPR22	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:

SP Interface Connector	
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

B

Customer Support

This appendix reviews the EMC process for detecting and resolving software problems, and provides essential questions that you should answer before contacting the EMC Customer Support Center.

This appendix covers the following topics:

Overview of Detecting and Resolving Problems

EMC software products are supported directly by the EMC Customer Support Center in the United States.

EMC uses the following process to resolve customer problems with its software products (Figure B-1).

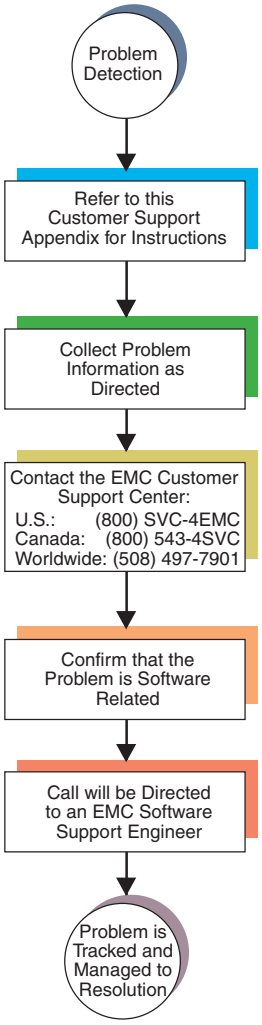


Figure B-1 Problem Detection and Resolution Process

Troubleshooting the Problem

Please perform the relevant diagnostic steps before you contact the EMC Customer Support Center:

1. Read the documentation carefully.
2. Reconstruct the events leading up to the problem and describe them in writing.
3. Run some test cases to reproduce the problem.

If you encounter a problem that requires technical programming or analysis, call the nearest EMC office or contact the EMC Customer Support Center at one of the following numbers:

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

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

Worldwide: **(508) 497-7901**

Please do not request a specific support representative unless one has already been assigned to your particular system problem.

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

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http://powerlink.EMC.com
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Before Calling the Customer Support Center

Have the following information available before calling the Customer Support Center or your support representative (if one has been assigned to you):

- ❑ Your company name
- ❑ Your name
- ❑ Your phone number
- ❑ Your site ID, if known
- ❑ For an existing problem, the problem tracking system ID, if one was previously assigned to the problem by a support representative

Documenting the Problem

If the EMC Customer Support Center requests information regarding the problem, please document it completely, making sure to include the following information:

- ❑ Your company name and address
- ❑ Your name
- ❑ Your telephone number
- ❑ Your site ID
- ❑ The importance of the problem, so that it can be assigned a priority level

To expedite the processing of your support request, you can photocopy this list and include it with the package.

Reporting a New Problem

For a new problem, please provide the following information:

- ❑ Release level of the software that you are running
- ❑ Software installation parameters
- ❑ Host type on which you are running
- ❑ Operating system you are running and its release number
- ❑ Functions of the software that you are running
- ❑ Whether you can reproduce the problem
- ❑ Previous occurrences of the problem
- ❑ Whether the software has ever worked correctly
- ❑ Time period that the software did work properly
- ❑ Conditions under which the software worked properly
- ❑ Changes to your system between the time the software worked properly and the problem began
- ❑ Exact sequence of events that led to the system error
- ❑ Message numbers and complete text of any messages that the system produced
- ❑ Log file dated near the time the error occurred
- ❑ Results from tests that you have run
- ❑ Other related system output
- ❑ Other information that may help solve the problem

Sending Problem Documentation

Use one of the following methods to send documentation of the problem to the EMC Customer Support Center:

- E-mail
- FTP
- U.S. mail to the following address:

  EMC Customer Support Center
  171 South Street
  Hopkinton, MA 01748-9103

  If the problem was assigned a number or a specific support representative, please include that information in the address as well.

Glossary

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.

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, LCCs, cooling modules, and power supplies. The 2-gigabit disk-array enclosures ((DAE2 and DAE2P)) supported in CX500/CX500i 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 3.

disk-drive module Another name for disk module.

disk module 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.

disk unit A short name for physical disk unit.

DPE (Disk Processor Enclosure) A storage device that includes an enclosure, disk modules, storage processors, cooling modules, and power supplies.

E

EA (enclosure address) A number, selectable on a DPE2 or DAE rear panel — fixed at 0 on a CX500/CX500i — that helps establish a unique address for each disk module on an FC-AL loop. You must set the EA on each DAE. Since the CX500/CX500i EA is 0, you might set the first DAE EA on loop 0 to 1, and loop 1 EAs to 0 and 1.

EMI (electromagnetic interference) Electronic radiation emitted by an electrical device. The levels of EMI are strictly controlled for data processing equipment. The EMI standards to which the CX500/CX500i complies are listed in Appendix A of this manual.

ESD (electrostatic discharge) 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 of this manual.

F

failover The transfer of one or more LUNs from one SP to another if a failure occurs in the path of the original SP. Unassisted failover requires properly configured paths between a host and each SP, and failover/multipath software such as EMC PowerPath®.

FC-AL (Fibre Channel arbitrated loop) An arrangement of Fibre Channel stations such that messages pass from one to the next in a ring.

Fibre Channel host bus adapter (FC adapter) The name for the printed-circuit board within the computer chassis that allows the server to access the Fibre Channel loop and thus the SP(s). Also called a host bus adapter (HBA).

FC-SW (Fibre Channel switch) An arrangement of Fibre Channel stations into a fabric. Switch devices in the fabric redirect incoming data out other ports.

field-replaceable unit See *FRU (field-replaceable unit)*.

FRU (field-replaceable unit) A hardware assembly that can be replaced by trained personnel on site, instead of at the point of manufacture.

G

GBIC Gigabit Interface Converter. A device for converting Fibre Channel signals from electrical to optical, and vice versa.

H

HBA (host bus adapter) Another name for Fibre Channel host bus adapter.

host See *server*.

hot repair See *replace under power*.

hub 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.

L

LCC (link control card) A FRU in DAE enclosures, integrated into the SP module in a CX500. 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.

LUN (logical unit) 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.

M

memory module See *SP memory module*.

N

node 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 a power supply under power, without interrupting applications.

R

replace under power The 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. You can replace an SPS under power, without interrupting applications.

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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