

**EMC CLARiiON
CX700
Storage Processor Enclosure (SPE)**

HARDWARE REFERENCE

P/N 300-001-073

REV A03

EMC Corporation

Corporate Headquarters:
Hopkinton, MA 01748 -9103
1-508 -435 -1000
www.EMC.com

Copyright © 2004, 2005 EMC Corporation. All rights reserved.

Published August, 2005

EMC believes the information in this publication is accurate as of its publication date. The information is subject to change without notice.

THE INFORMATION IN THIS PUBLICATION IS PROVIDED "AS IS." EMC CORPORATION MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WITH RESPECT TO THE INFORMATION IN THIS PUBLICATION, AND SPECIFICALLY DISCLAIMS IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Use, copying, and distribution of any EMC software described in this publication requires an applicable software license.

Trademark Information

EMC², EMC, CLARiiON, Navisphere, and PowerPath are registered trademarks and Access Logix, FLARE, MirrorView, Powerlink, SAN Copy, and SnapView are trademarks of EMC Corporation.

All other trademarks used herein are the property of their respective owners.

Regulatory Notices

Product Type(s): XPE+S

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.

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

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 (CX700)

인증받은 자의 상호: EMC Corporation

제조년월일: 제품 상표를 보십시오

제조자/제조국가: 제품 상표를 보십시오

Chapter 1 About the CX700

Overview	1-2
CX700 Components and Features	1-3
Field-Replaceable Units (FRUs)	1-3
Storage Processor Enclosure	1-4
Storage Processors (SPs)	1-7
Power Supplies	1-9
Fan Module.....	1-11
Standby Power Supply (SPS)	1-12

Chapter 2 Setting Up and Starting a CX700 System

Requirements	2-2
Installing an SPE in a Cabinet	2-2
Warnings and Recommendations	2-2
Site Requirements	2-3
Cabling Requirements.....	2-4
Disk Requirements	2-5
CX700 Address Requirements	2-5
Cabling a CX700.....	2-7
Making Power Connections - ac Power Source	2-8
Making Power Connections - dc Power Source	2-11
Making Back-End Connections	2-12
Connecting Storage Processors to the External Environment.....	2-19
CX700 Powerup and Initialization	2-22
CX700 Powerdown	2-23
Turning Off the Power - ac Systems	2-23
Turning Off the Power - dc Systems.....	2-24

Chapter 3 **Servicing a CX700 SPE**

Monitoring CX700 Status.....	3-2
Handling FRUs	3-7
Power Issues and FRUs	3-7
Avoiding Electrostatic Discharge (ESD) Damage.....	3-8
Emergency Procedures (Without an ESD Kit)	3-9
Precautions When Removing, Installing, or Storing FRUs	3-9
Precautions When Handling Optical Cables.....	3-10
Replacing a Fan Module	3-11
Removing a Fan Module	3-11
Installing a Replacement Fan Module.....	3-12
Replacing a Power Supply	3-13
To Remove a Power-Supply Module	3-13
Installing the Replacement Power Supply.....	3-14
Attaching the Line Cord and Powering On.....	3-15
Replacing a Storage Processor (SP)	3-15
Removing a Storage Processor	3-15
Installing a Replacement Storage Processor	3-16

Chapter 4 **Standby Power Supply (SPS)**

About the SPS.....	4-2
--------------------	-----

Appendix A **Technical Specifications and Operating Limits**

SPE Technical Specifications	A-2
Power Requirements.....	A-2
Sizes and Weights	A-3
SP Optical Cabling to Switch or Server	A-4
SP to DAE2/DAE2P Copper Cabling.....	A-4
SP to SPS Interface Cabling.....	A-5
SPE Standards Certification and Compliance	A-6
CX700 - ac Power	A-6
CX700 - dc Power	A-7
Other Standards.....	A-7
Fibre Channel Related Standards.....	A-8
SPE Operating Limits	A-9
Environmental Recovery	A-9
SPE Shipping and Storage Requirements	A-10
Operational Behavior of dc Power over Voltage Range..	A-11
SPS Technical Specifications	A-13
SPS to SP Interface.....	A-13
SPS Power Specifications	A-13

SPS Operating Limits A-14

SPS Shipping and Storage Requirements A-14

Dimensions and Battery Information..... A-14

SPS Standards Certification/Compliance A-16

Appendix B Customer Support

Overview of Detecting and Resolving Problems B-2

Troubleshooting the Problem B-3

Before Calling the Customer Support Center B-4

Documenting the Problem B-5

Reporting a New Problem B-6

Sending Problem Documentation B-7

Glossary.....g-1

Index.....i-1

Figure

1-1	CX700 with DAE2 Enclosures in a 40U Cabinet	1-2
1-2	CX700 Front View	1-4
1-3	CX700 Front View with Front Bezel Removed	1-5
1-4	CX700 Back View	1-5
1-5	CX700 Status LEDs	1-6
1-6	CX700 Front Bezel	1-6
1-7	Location of the SPs	1-7
1-8	SP A and SP B Connectors	1-8
1-9	SP A and SP B Status LEDs	1-9
1-10	Location of the Power Supplies	1-9
1-11	Power Supply	1-10
1-12	Fan Module (Front Bezel Removed)	1-11
1-13	Standby Power Supply	1-12
2-1	Sample CX700 Installation (Rear View with Four DAEs)	2-3
2-2	Enclosure Address (EA) Switch on a DAE2	2-7
2-3	Connecting the ac Line Cord to the Power Supply	2-8
2-4	Connecting the Power Cords to the SPSs (DAE2 as EA 0, Loop 0)	2-9
2-5	Connecting Power Cords to the SPSs (DAE2P as EA 0, Loop 0)	2-10
2-6	Connecting Storage Processors to the Standby Power Supplies	2-11
2-7	Connecting dc Power Supplies to the CX700 and DAE2 SPS Ports	2-12
2-8	Connecting the Copper Cable to the BE 0 SP port	2-14
2-9	Sample CX700 and DAE Cabling — One Cabinet with Two Loops ...	2-15
2-10	Sample CX700 and DAE Cabling — One Cabinet with Four Loops ..	2-16
2-11	Sample CX700 and DAE Cabling — Two Cabinets with Two Loops .	2-17
2-12	Sample CX700 and DAE Cabling — Two Cabinets with Four Loops	2-18
2-13	Attaching Optical Cables to the SP	2-19
2-14	Connecting to a 2-Gbit Switch or HBA	2-20
2-15	Connecting to a 1-Gbit Switch Port or HBA	2-21

2-16	Connecting CX700 SPs to an External (Management) LAN	2-21
2-17	Power Connections (ac System Shown)	2-22
2-18	Power Down Each SPS (ac Power)	2-24
3-1	Status Lights Visible from the Front of the CX700 SPE	3-2
3-2	Status LEDS, Front Bezel Removed	3-3
3-3	SP A and SP B Status LEDS	3-4
3-4	Power Supply and SPS Status LEDS	3-6
3-5	Removing the CX700 Front Bezel	3-11
3-6	Removing a Fan Module	3-12
3-7	Installing the Front bezel	3-12
3-8	Removing the Power Supply ac Line Cord	3-13
3-9	Disconnecting dc Power Cords	3-14
3-10	Removing the Power Supply	3-14
3-11	Removing a Storage Processor	3-16
3-12	Installing a Storage Processor	3-17
4-1	1000-Watt SPS Rear Panel	4-2
4-2	SPS Installation, Front and Rear Views	4-4
A-1	Typical SPS Self-Discharge Levels at Different Storage Temperatures	A-15
A-2	1000-Watt dc SPS	A-17
B-1	Problem Detection and Resolution Process	B-2

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® Model CX700 storage processor enclosure (SPE) documentation set, and is intended for use by system administrators and other qualified technical personnel during installation, setup, and maintenance of the CX700 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 CX700 components.
Chapter 2	Explains how to cable a CX700 system to the server, to disk-array enclosures (DAEs), and to SPS units.
Chapter 3	Describes how to replace FRUs such as power supplies, storage processors, and fans.
Chapter 4	Explains how to use a 1000-watt SPS.

Appendix A	Lists the CX700 SPE's 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)

CX700 2-Gigabit Fibre Channel Storage Processor Enclosure (SPE) Setup Guide (P/N 300-001-274)

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

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

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.

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.
<i>This typeface</i>	Represents variables for which you supply the values; for example, the name of a directory or file, your username or password, and explicit arguments to commands.
This typeface	Represents a system response (such as a message or prompt), a file or program listing.
x > y	Represents a menu path. For example, 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: <i>LUN-name</i> <i>LUN-number</i> means you can use either the LUN-name or the LUN-number.

Finding Current Information

The most up-to-date information about the CX700 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 manual.

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

Reservé au personnel autorisé.

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

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啟動 (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。

About the CX700

This chapter introduces the EMC® CLARiiON® Model CX700 storage processor enclosure (SPE). Major topics include

- ◆ Overview 1-2
- ◆ CX700 Components and Features..... 1-3

Overview

The CX700 is a highly available storage enclosure with redundant power and cooling. It is four U high (a U is a NEMA unit, each unit being 1.75 inches) and supports two storage processors (SPs). Each SP has four host I/O ports and four back-end disk ports.

The CX700 can provide storage in storage area network (SAN) configurations (using Fibre Channel switches), or direct attach configurations (without switches). The CX700 works in conjunction with one or more 15-disk disk-array enclosures (DAEs) to provide terabytes of highly available disk storage. A DAE is a basic enclosure without an SP. Each DAE connects to a CX700 or another DAE with simple FC-AL serial cabling.

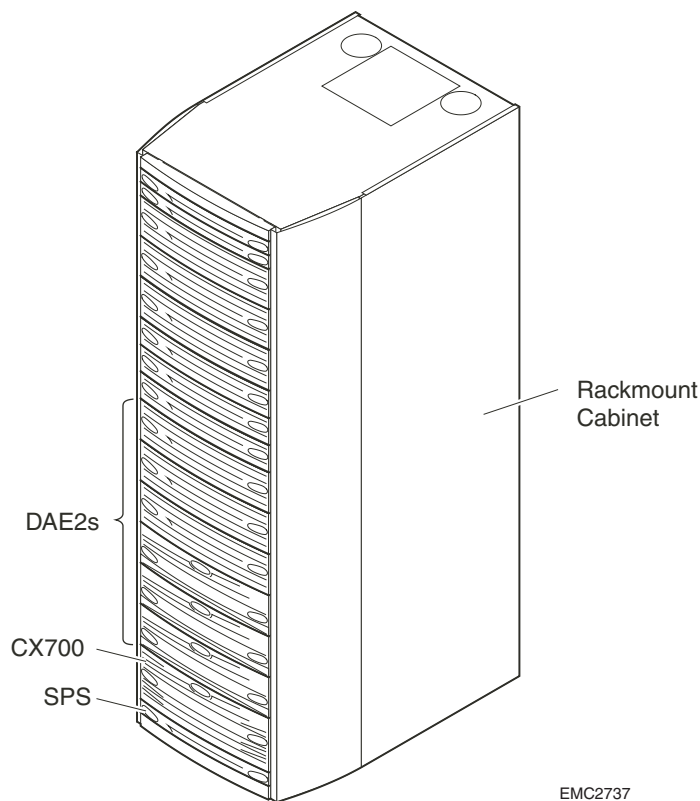


Figure 1-1 CX700 with DAE2 Enclosures in a 40U Cabinet

CX700 storage systems support both 2-gigabit disk-array enclosures (DAE2s) and 2-gigabit point-to-point disk-array enclosures (DAE2Ps).

A CX700 can support a total of 240 disks in a single disk-array storage system. A four-loop configuration (with maximum performance and availability) supports as many as 60 disks per back-end (BE) port; a two-loop configuration can support 120 disks per back-end port.

You can place the DAE enclosures in the same cabinet as the CX700 SPE, or in one or more separate cabinets. The first DAE in a CX700 system requires high-performance Fibre Channel disk drives. Additional DAEs can include either Fibre Channel or economical ATA disks.

High-availability features are standard.

CX700 Components and Features

The CX700 SPE components include

- ◆ A sheet-metal enclosure with a midplane, front bezel, and two storage processors (SPs)
- ◆ Two power supplies
- ◆ Three fan modules, with two fans per module

The high-availability features for a CX700 system include

- ◆ Standby power supplies (SPS) for systems using ac source power
- ◆ Redundant power supplies
- ◆ Redundant storage processors
- ◆ N + 1 cooling

Field-Replaceable Units (FRUs)

The following are field-replaceable units (FRUs), which you can add or replace while the CX700 is powered up:

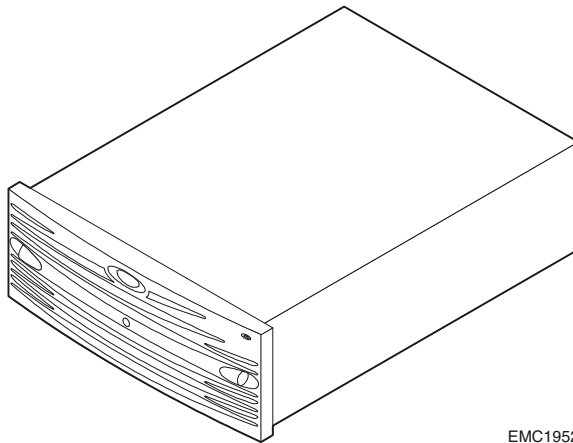
- ◆ Storage processor (SPs)
- ◆ Power supplies
- ◆ Fan modules
- ◆ SPS

Storage Processor Enclosure

The enclosure is a sheet-metal housing with a front panel, a midplane, front bezel, two SPs, two power supplies, and three fan modules.

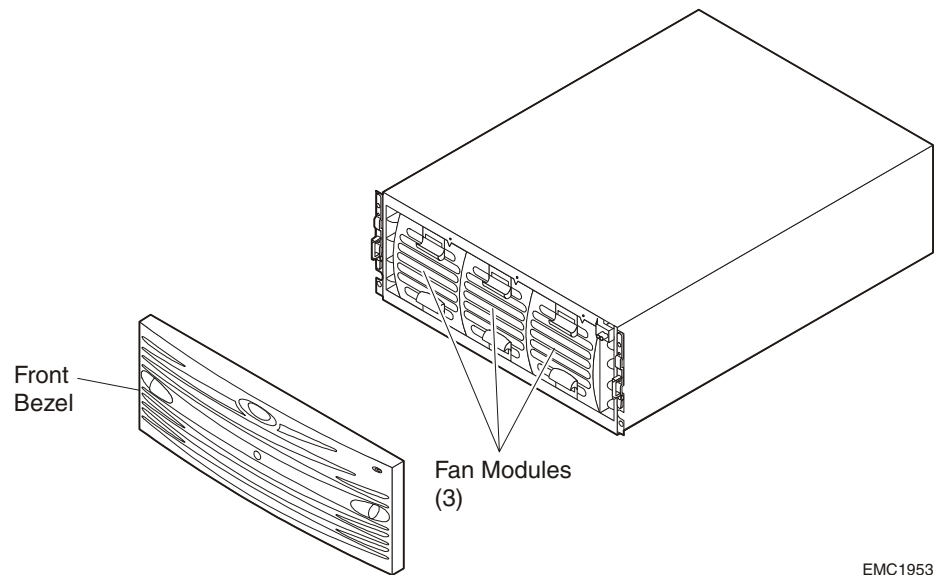
Figures 1-2, 1-3, and 1-4 show the CX700 components. Details on each component follow the figures. If the enclosure provides slots for two identical components, the component in slot A is called *component-name A*. The second component is called *component-name B*, as shown in the illustrations.

For increased clarity, the following figures depict the CX700 outside of the rack cabinet. Your SPE may be installed in a rackmount cabinet as shown in Figure 1-1.



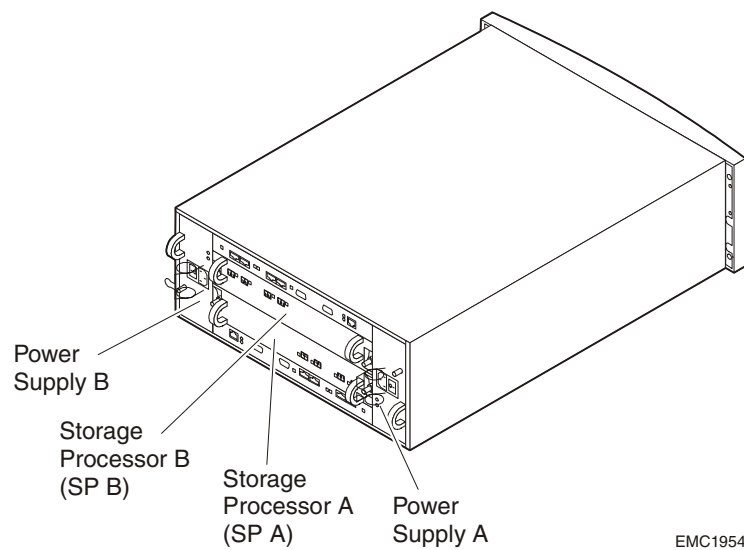
EMC1952

Figure 1-2 CX700 Front View



EMC1953

Figure 1-3 CX700 Front View with Front Bezel Removed



EMC1954

Figure 1-4 CX700 Back View

Front Panel The front panel contains two CX700 status lights. These lights are visible with the front bezel installed or removed.

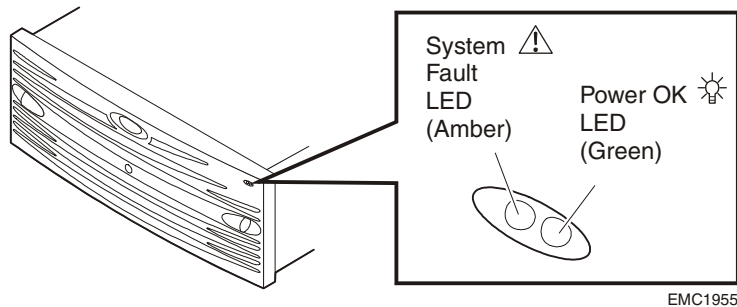


Figure 1-5 CX700 Status LEDs

The CX700 status lights are described in Chapter 3.

Front Bezel The front bezel has a keylock and two latch release buttons. Pressing the latch release buttons releases the bezel from the enclosure.

The front bezel inhibits electromagnetic interference (EMI). You can take off the bezel to remove and install fan modules, but EMI compliance requires a properly installed front bezel.

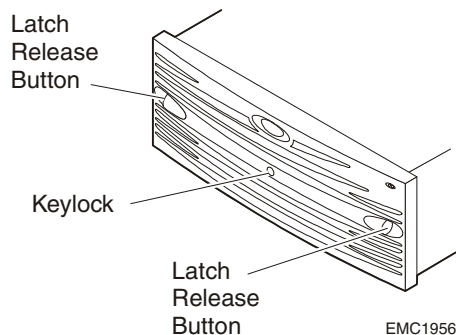


Figure 1-6 CX700 Front Bezel

Midplane The midplane distributes power and signals to all the enclosure components. The power supplies, fan modules, and SPs plug directly into midplane connectors.

Storage Processors (SPs)

The SP is the CX700 SPE's intelligent component and acts as the control center. An SP is a printed-circuit board and an airdam with status lights and securing latches. Each SP includes

- ◆ Dual Pentium IV processors
- ◆ 4 Gbytes of DDR DIMM (double data rate, dual in-line memory module) memory
- ◆ Four SFF (small form factor) shielded Fibre Channel connectors (optical) for server I/O (connect to a switch or server HBA)
- ◆ Two HSSDC (high speed serial data connect) shielded Fibre Channel connectors (copper) for disk connections (BE 0 and BE 1)
- ◆ Two HSSDC shielded fibre channel connectors (copper) for additional loops and other options (BE 2/Aux 0 and BE 3/Aux 1)
- ◆ One serial port (COM 1) for RS-232 connection to a service console
- ◆ One serial port (COM 2) for connection to a standby power supply (SPS)
- ◆ One 10/100 Ethernet LAN port (01) for management and backup

Figure 1-7 shows a rear view of the CX700:

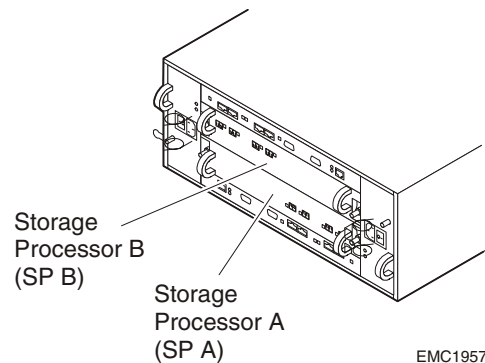
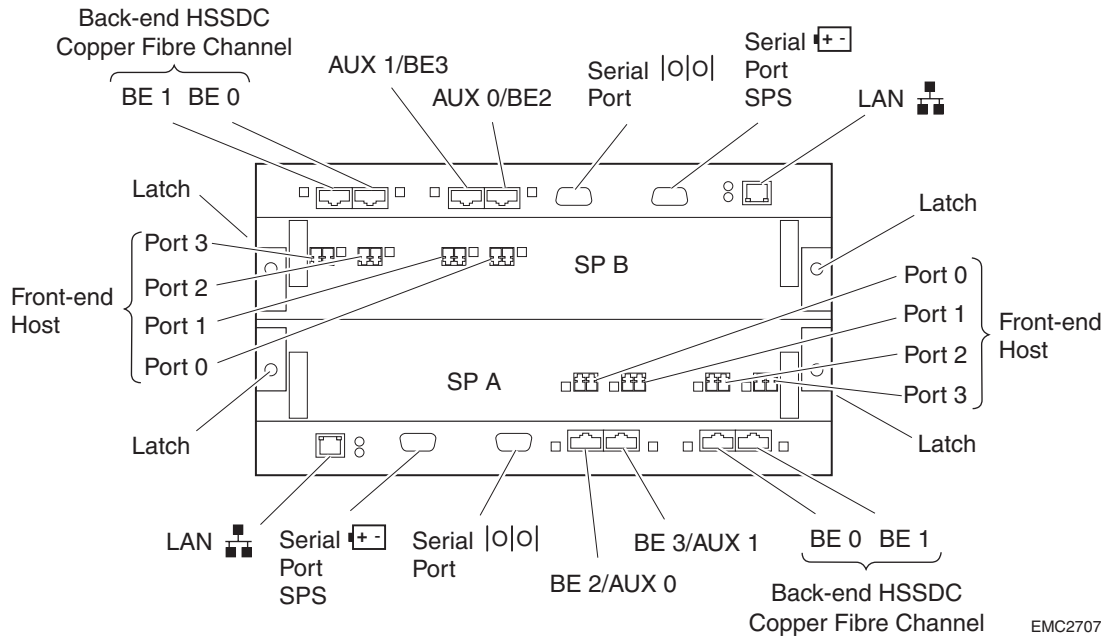


Figure 1-7 Location of the SPs

Figure 1-8 shows the connectors on the rear of SP A and SP B.



EMC2707

Figure 1-8 SP A and SP B Connectors

The storage processors have several status LEDs visible from the back of the enclosure. See Figure 1-9.

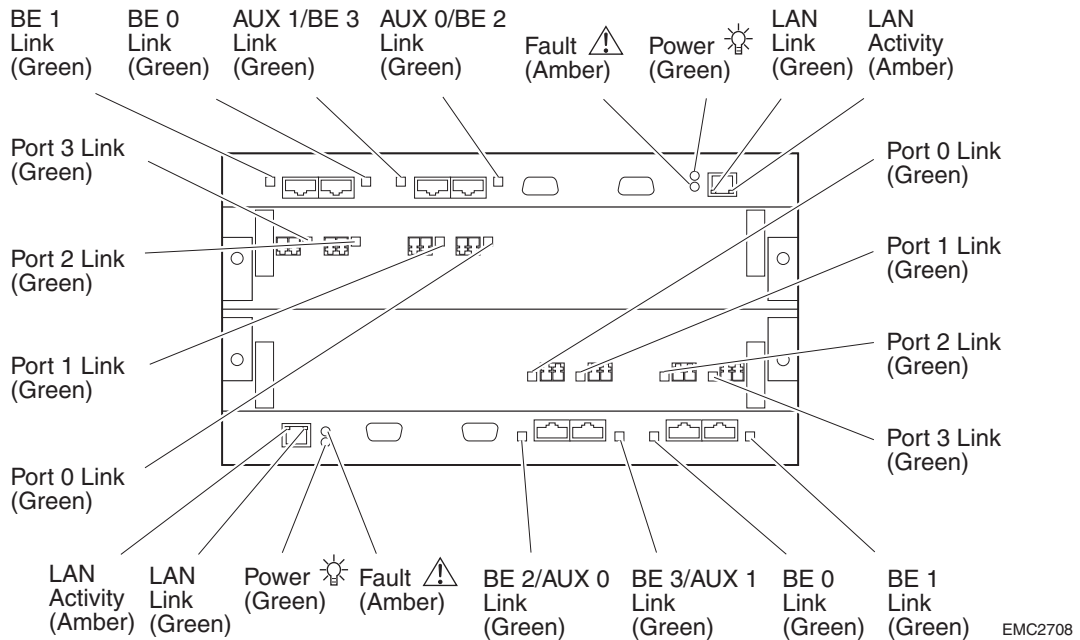


Figure 1-9 SP A and SP B Status LEDs

Refer to Chapter 3 for the definition of these LEDs.

Power Supplies

The power supplies are located on the left and right sides of the chassis, as shown in Figure 1-10.

The power supplies are inverted in relation to each other.

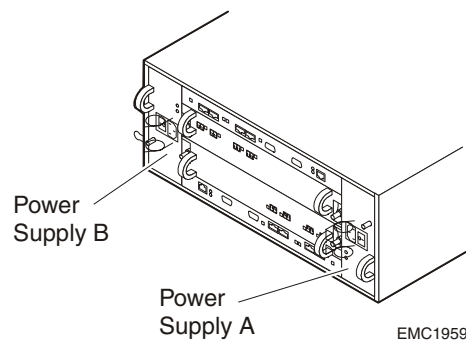


Figure 1-10 Location of the Power Supplies

Each power supply is an auto-ranging, power-factor-corrected, multi-output, off-line converter with its own line cord and power switch. Each supply supports a fully configured SPE and shares load currents with the other supply. A FRU with power-related faults will not adversely affect the operation of any other FRU. You can add or remove one power supply in a highly available configuration while the CX700 storage system is powered up.

Each power supply has status lights, that are described in Chapter 3.

A latch on the power supply locks it into place to ensure proper connection to the midplane.

Figure 1-11 shows the power supply status LEDs and the latch. (Note that Figure 1-11 shows an ac power supply; LEDs on -48 V dc systems are the same.)

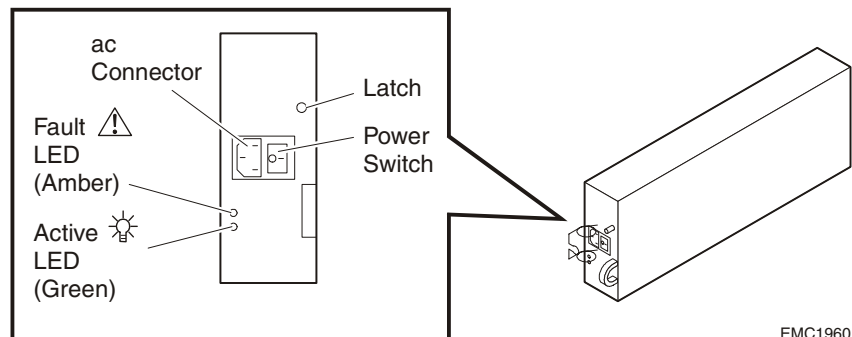


Figure 1-11 Power Supply

Fan Module

The CX700 fan modules (Figure 1-12) cool the two storage processors. Separate, integrated fans cool the power supplies. There are three fan modules, each containing two fans that draw ambient room air through the front bezel. Each fan module connects directly to the midplane and is powered by the power supplies. The fans operate at a lower voltage and speed during normal operation to minimize acoustic sound. If a fan fails, the voltage and speed of the remaining fans increase to compensate, resulting in higher acoustic sound.

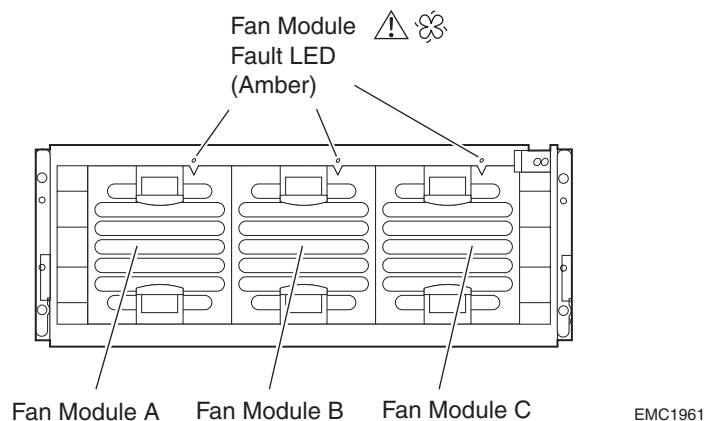


Figure 1-12 Fan Module (Front Bezel Removed)

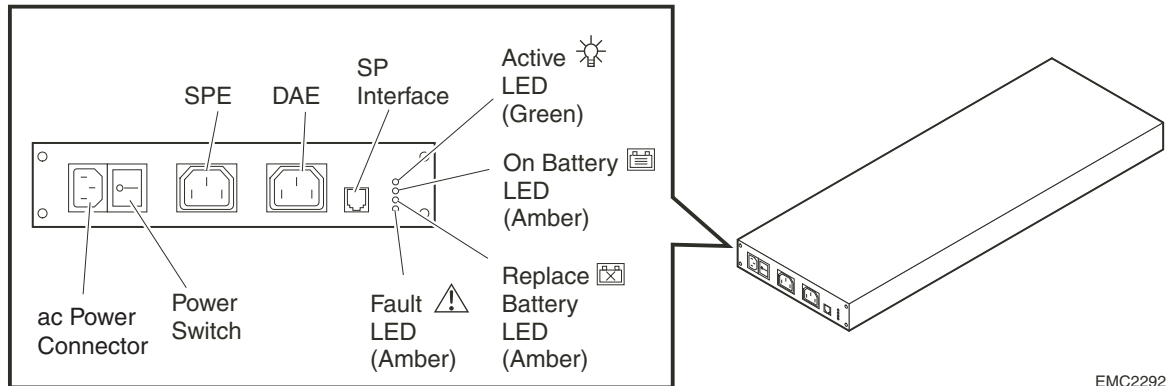
Each fan module has one status light associated with it on the fan module housing. The status light is described in Chapter 3.

Latches on the fan module hold the module in place.

You can remove the fan module while the SPE is powered up. While the module is removed, the amber LED associated with that module on the front panel is illuminated. If the fan module is removed for more than approximately two minutes, the SP is shut down until the fan module is re-inserted.

Standby Power Supply (SPS)

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 CX700 and DAEs. See Figure 1-13.



EMC2292

Figure 1-13 Standby Power Supply

See Chapter 4, *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.

Setting Up and Starting a CX700 System

This chapter describes CX700 installation requirements and procedures. Major topics include

- ◆ Requirements 2-2
- ◆ Cabling a CX700 2-7
- ◆ CX700 Powerup and Initialization 2-22
- ◆ CX700 Powerdown 2-23

Requirements

This section explains installation, site, cabling, disk, and addressing requirements.

Installing an SPE in a Cabinet

The CX700 mounts inside a cabinet on two L-shaped mounting rails connected to the cabinet's vertical channels.

- ◆ How to install the cabinet is explained in the cabinet installation manual that shipped with the cabinet.
- ◆ How to install the universal mounting rails in the cabinet, and the 4U 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 in which you will install the CX700 must have a full earth ground to provide reliable grounding. Also, the cabinet should have its own switchable power distribution. We suggest that you use a cabinet that has dual power distribution units, one on each side.



WARNING

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

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 CX700 or DAE in the upper half of the cabinet when the lower half is empty. Figure 2-1 shows a CX700 and four DAE enclosures installed in a cabinet.

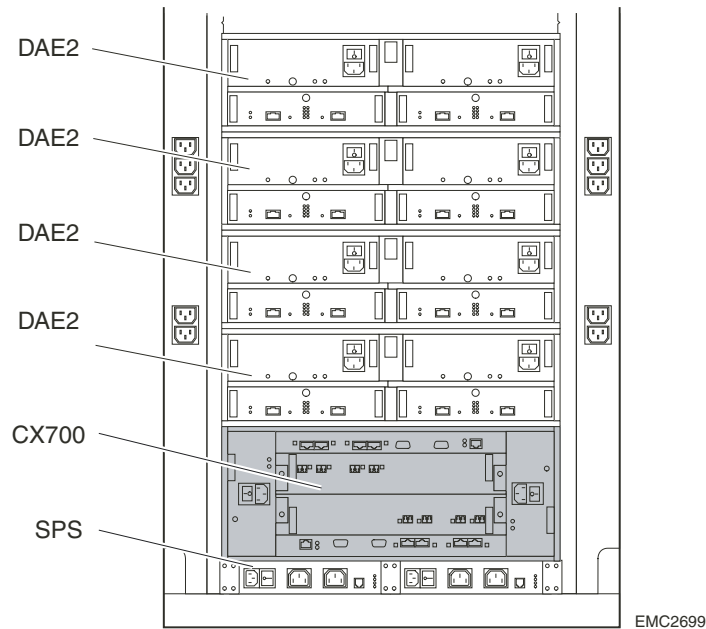


Figure 2-1 Sample CX700 Installation (Rear View with Four DAEs)

Site Requirements

For proper CX700 operation, the installation site must conform to certain environmental specifications, which are detailed in Appendix A.

Power To determine a CX700'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 for the CX700 are based on the maximum capability of the power supplies and cooling system to provide internally regulated power. Typical values will be less, depending on the number and manufacturer of disk drives, as well as other factors.

These values represent the sum of the values shared by the line cords of two power supplies in the same CX700 SPE. 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) and power distribution panels (PDPs). To support all of the CX700 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 CX700 SPE, a DAE, and any additional disk enclosures.

Cabling Requirements

Use SFF Fibre Channel optical cables for CX700 connections to the external Fibre Channel environment — either to a switch or host bus adapter (HBA) in a server.

Use HSSDC shielded Fibre Channel copper cables to connect a CX700 to a DAE2; DAE2P cables require at least one HSSDC2 connector. Any copper cables you use must meet the appropriate standards for 2-Gbit FC-AL. Such cables are fully shielded, twin-axial, full-duplex cables with high speed serial data connector (HSSDC/HSSDC2) connectors. Distances greater than 1 meter require equalized cables;

unequalized 1-meter cables are adequate. A DAE does not support cables shorter than 1 meter or longer than 10 meters.

DAE2P enclosures use cables with HSSDC2 connectors on at least one end.

CX700 and DAE interconnections should maintain LCC consistency; that is, one set of FC loops should connect the CX700's SP A and each DAE's LCC A, and the other FC loops should connect the CX700's SP B and each DAE's LCC B.

Do not leave an unused (that is, dangling) cable connected to any Fibre Channel port because it may cause excess noise and performance problems on the Fibre Channel.

Disk Requirements

CX700 storage systems require at least five Fibre Channel disk modules installed in slots 0, 1, 2, 3 and 4 (the leftmost slots) of the first DAE2/DAE2P. The first DAE is typically adjacent to and directly above the CX700.

The disk modules in slots 0-4 of the first DAE (enclosure 0, loop 0) provide recovery and mirrored boot capability and are preloaded according to their slot assignment before shipment. **Do not move a preloaded 0-4 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 DAE.

CX700 Address Requirements

The CX700 SPs process *front-end* I/O from servers (hosts), and *back-end* communication between disks and the DAEs 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).

- ◆ The CX700 back end (BE) addresses each DAE using the FC-AL address (loop) ID 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 correspond to the BE port numbers on the CX700 SP; you specify enclosure addresses with a switch on each DAE.

Setting the Enclosure Address (EA)

For details on DAE configuration, refer to the hardware reference for your DAE enclosure.

Each DAE on a back-end loop requires a unique enclosure address (EA) to identify the enclosure and determine disk ALPA addresses. The first DAE, connected to your CX700 on loop 0, includes the system vault disks and must be set to EA 0. Subsequent DAEs, the first on loop 1, 2, or 3, are also EA 0. Identifying DAEs consecutively, the second EA *on any loop* is 1, the third 2, and so on.

You set the EA with the enclosure address switch. 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

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 and the back end is not connected. Refer to your DAE2P setup guide or hardware reference for instructions on changing a DAE2P enclosure address.

Set the enclosure address for any DAE2 disk enclosures before connecting system power.

- ◆ The first DAE *on Loop 0* (BE 0), connected directly to the SPE, must be set to EA 0.
- ◆ The first DAE on subsequent loops should also be EA 0; set the EA for the second DAE on a given loop to 1, the third to 2, and so on.

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

See Figure 2-2 and Figures 2-9 through 2-12 as necessary.

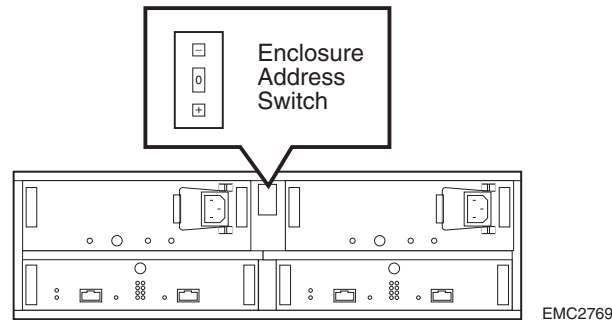


Figure 2-2 Enclosure Address (EA) Switch on a DAE2

Cabling a CX700

After a CX700 is installed in a rack or cabinet, you can connect all necessary cables. You will connect

- ◆ ac line cords between power supplies and SPS units
- ◆ Serial connections between storage processors and SPS units
- ◆ Serial connections between storage processors and dc power supplies
- ◆ Each SP to the front-end (FE) external environment (server or switch)
- ◆ Each SP's first back end (BE 0) to a DAE
- ◆ Each SP's BE 1 to a second DAE, if present
- ◆ Optional third and fourth back loops to additional DAEs
- ◆ Multiple DAEs together

For details on installing a CX700 and DAEs in a cabinet, see the *EMC Rails and Enclosures (CX-Series Storage Systems) Field Installation Guide*.

**CAUTION**

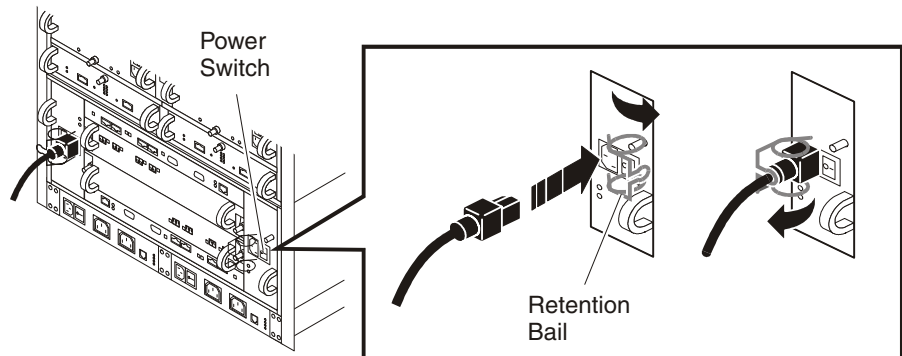
Be sure to maintain power and loop integrity when cabling your storage system. Always connect power supply A, SPS A, SP A, LCC A(s), and DAE power/cooling module A (on the first DAE) together in one power/loop configuration. Connect all the B components together in the same manner.

Making Power Connections - ac Power Source

Note that the CX700 uses retention bails to relieve strain on the ac power cords and to keep the cords seated in their connectors.

Refer to Figure 2-3 as you connect the ac line cord to the power supplies.

1. At the back of the cabinet, rotate the retention bail on each power supply out of the way of the ac connector.
2. Plug the ac line cord into each power supply.
3. Return the retention bail to its original position.
4. Push the cord into the bail loop to hold the cord in position.



EMC1966

Figure 2-3 Connecting the ac Line Cord to the Power Supply

Refer to Figure 2-4 as you connect the ac line cords to your SPS.

Be sure to maintain *all* A to A and B to B connections. Failure to do so will prevent write caching from working.

5. Plug the free end of power supply A's power cord into SPS A's power outlet.
6. Plug the free end of power supply B's power cord into SPS B's power outlet.
7. Repeat Step 1 through Step 6 on the power/cooling modules in the first DAE (EA 0). Refer to Figure 2-4 or Figure 2-5. *To support write-caching, EA 0 on loop 0 must receive power from the SPS.*
8. Connect each SPS ac inlet to the nearest ac outlet in the vertical power strip in the cabinet. As shown in Figure 2-4 and Figure 2-5, each SPS connects to a different power strip. For high availability, you must connect each power strip to a different circuit.

Figure 2-4 shows ac power cord connection for a CX700 that uses a DAE2 as the first (EA 0, loop 0) DAE in the storage system.

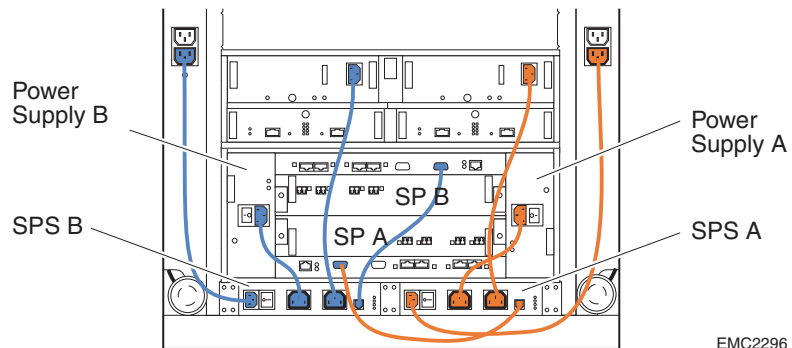


Figure 2-4 Connecting the Power Cords to the SPSs (DAE2 as EA 0, Loop 0)

Figure 2-5 shows a CX700 in a 40U-C cabinet with multiple DAE2Ps. Again, power modules in the first (EA 0, loop 0) DAE in the storage system are connected to the SPSs.

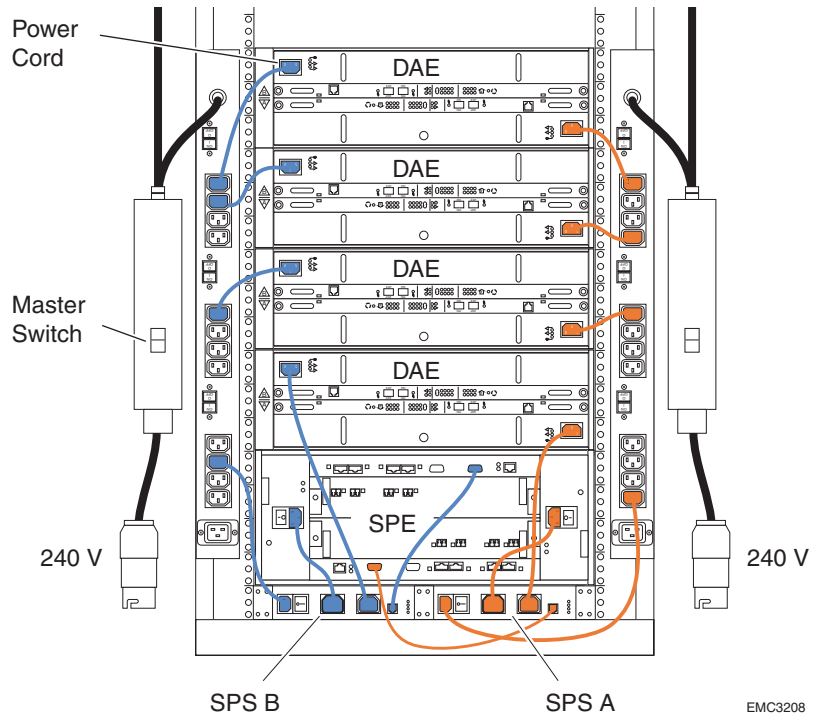


Figure 2-5 Connecting Power Cords to the SPSs (DAE2P as EA 0, Loop 0)

Connecting the Storage Processors to the Standby Power Supplies

Refer to Figure 2-6 as you connect the storage processors to the SPS.

1. Connect SPS A to the SPS port on SP A.
2. Connect SPS B to the SPS port on SP B.

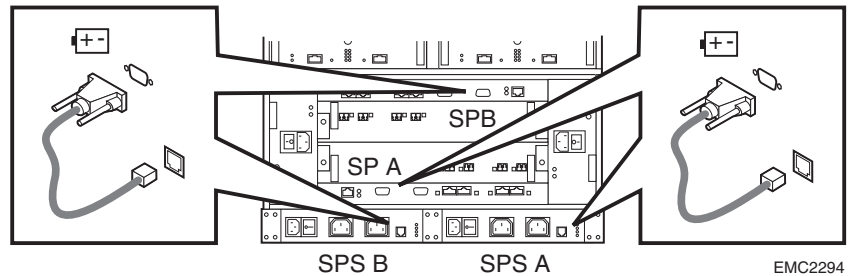


Figure 2-6 Connecting Storage Processors to the Standby Power Supplies

3. Connect additional 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).
4. 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.

Making Power Connections - dc Power Source

Follow these instructions to make power connections for CX700 systems with dc power supplies.

1. Connect Y-shaped sense cables (sometimes called SPS emulator cables) between each power supply, the SPS serial connector on its corresponding storage processor, and the first DAE2 as shown in Figure 2-7 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 supply A, and to power module A on the first DAE. Connect SP B to both PS B modules.

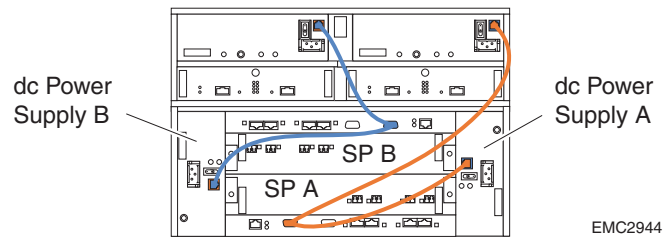


Figure 2-7 Connecting dc Power Supplies to the CX700 and DAE2 SPS Ports

2. Connect the dc power cables from power supply A (PS A) and PS B to independent sources of dc power.
3. Connect DAE2s 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 CX700 supports four redundant Fibre Channel back-end loops on each SP for a total of eight 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, BE 2, and BE 3 connectors are also paired and share disks in the same way. Together, loops A0/B0, A1/B1, A2/B2, and A3/B3 act as four redundant loops, also called *buses*.

Always optimize your system by using every available back-end loop, and spreading the number of DAEs as evenly as possible across the loops.

To achieve the maximum advantage of DAE2P point-to-point fault and data isolation, you should further optimize your system by configuring DAE2Ps on separate loops from DAE2s.

When cabling DAEs, you should always cable from the CX700 BE port to the primary port of the first DAE in the loop. When connecting multiple DAEs, cable from the expansion port to the primary port of the next DAE in that loop. Most often, this means that DAEs are cabled from the bottom up. However, as long as you connect an expansion port to the next primary port in a loop, you can also cable down.

Refer to Figures 2-8 through 2-12 as you connect the DAEs.

1. Connect the first DAE on back-end loop 0.

Cable SP A's BE 0 port to the PRI (primary) port on the first DAE's LCC A. Use a 1-m copper cable with HSSDC connectors to connect a DAE2; use a 2-m HSSDC2-HSSDC cable to connect a DAE2P.

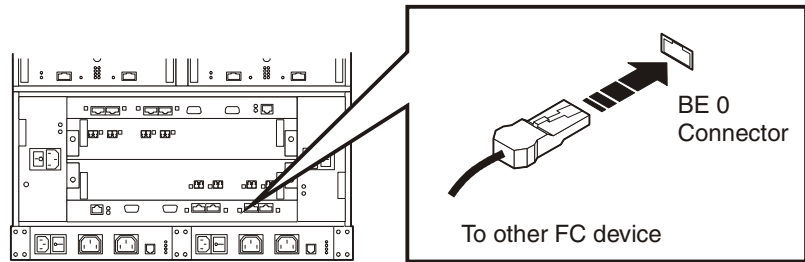
Connect the BE 0 port on SP B to the PRI port on LCC B in the first DAE.

2. Connect the second DAE on back-end loop 1.

Cable SP A's BE 1 port to the PRI (primary) port on the second DAE's LCC A. Use the copper cable appropriate for your DAE.

Connect the BE 1 port on SP B to the PRI port on LCC B in the second DAE.

3. If your system includes additional DAEs, connect the third and fourth DAEs to BE 2 and BE 3, respectively, on both SPs.



EMC2293

Figure 2-8 Connecting the Copper Cable to the BE 0 SP Port

4. To connect additional DAEs on each loop, cable the LCC EXP (expansion) port on each DAE to the PRI port on the next LCC *on that loop*. Be sure to maintain the division between A and B components; never connect an LCC A and an LCC B together.

Note that in a typical single-cabinet installation, loops skip over physically adjacent DAEs, as shown in Figure 2-9. Other configurations allow daisy-chaining between adjacent DAEs, as shown in Figure 2-11.

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

Figures 2-9 through 2-12 show sample SPE-to-DAE loops, enclosure addresses, and cabling in one- and two-cabinet configurations.

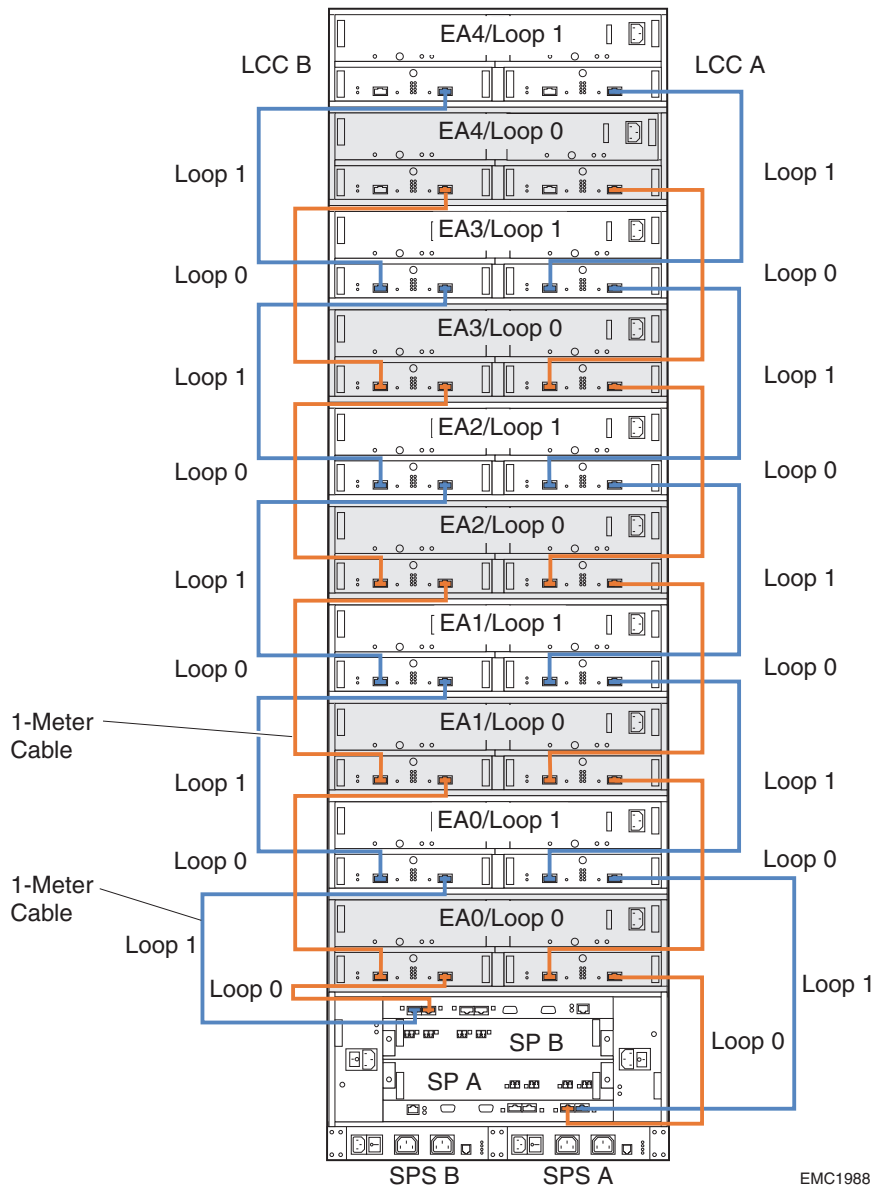


Figure 2-9 Sample CX700 and DAE Cabling — One Cabinet with Four Loops

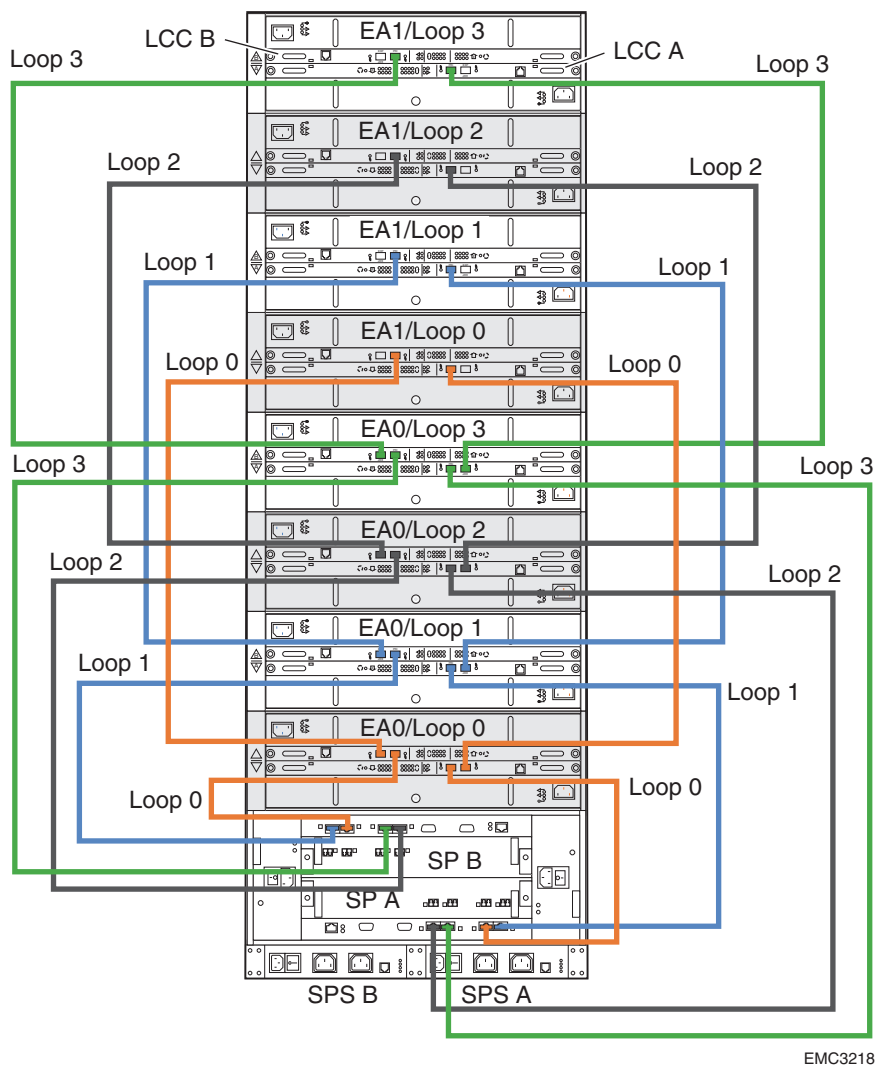
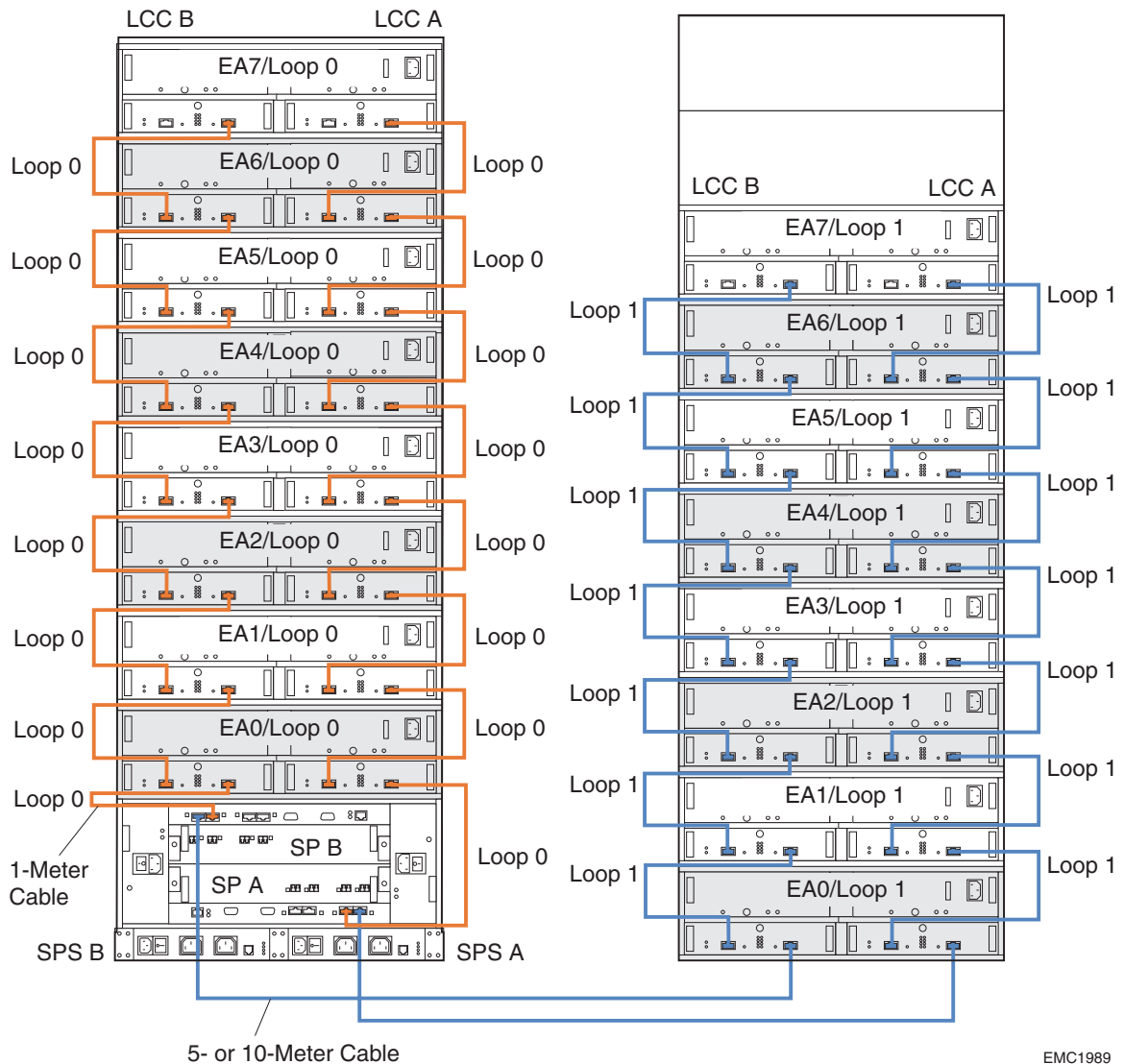


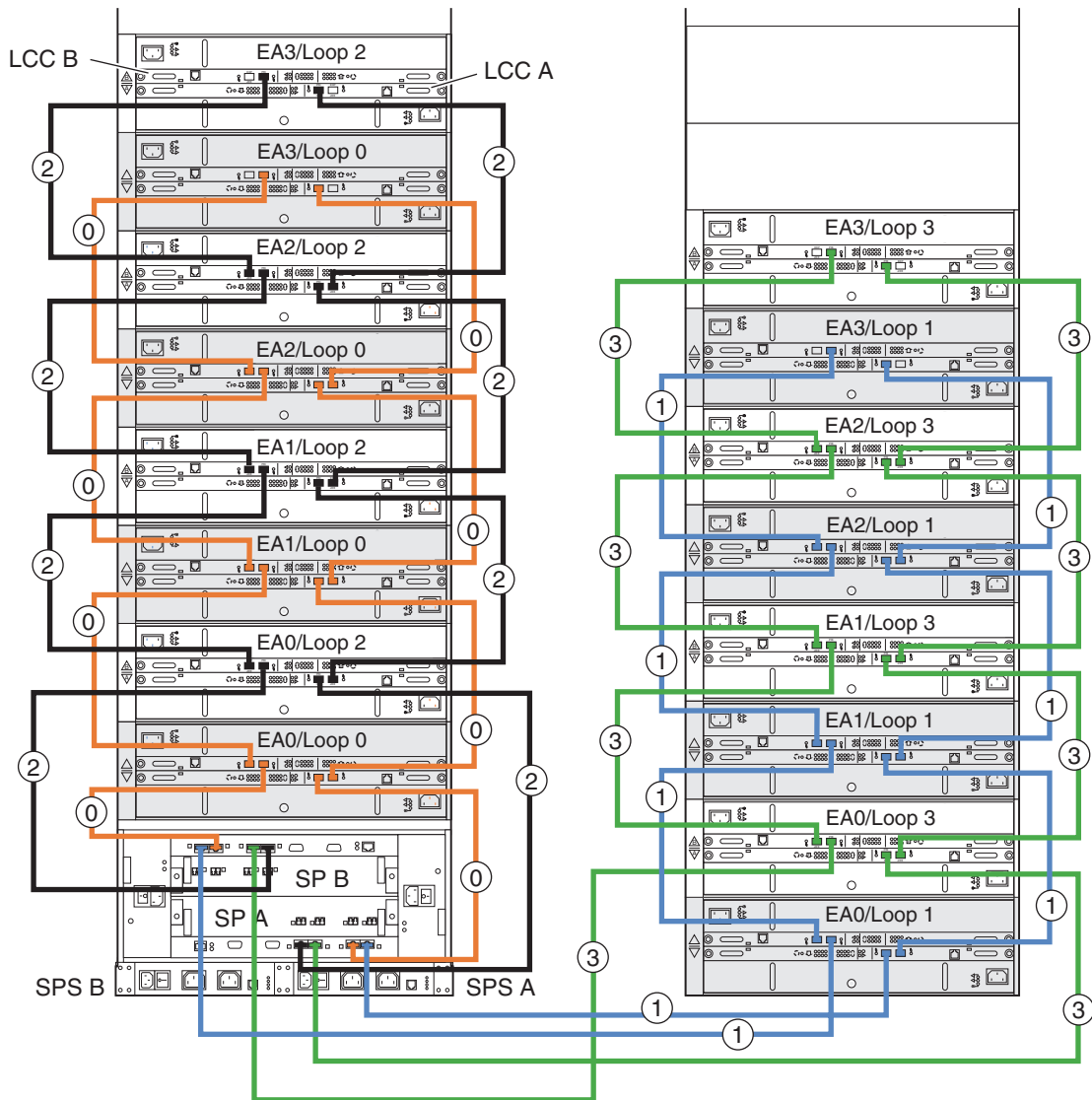
Figure 2-10 Sample CX700 and DAE Cabling — One Cabinet with Four Loops



EMC1989

Figure 2-11 Sample CX700 and DAE Cabling — Two Cabinets with Two Loops

Note that for increased clarity and ease of maintenance, the configuration in Figure 2-11 segregates the loops into the separate cabinets.



Note: Numbers In circles are loop numbers

EMC3222

Figure 2-12 Sample CX700 and DAE Cabling — Two Cabinets with Four Loops

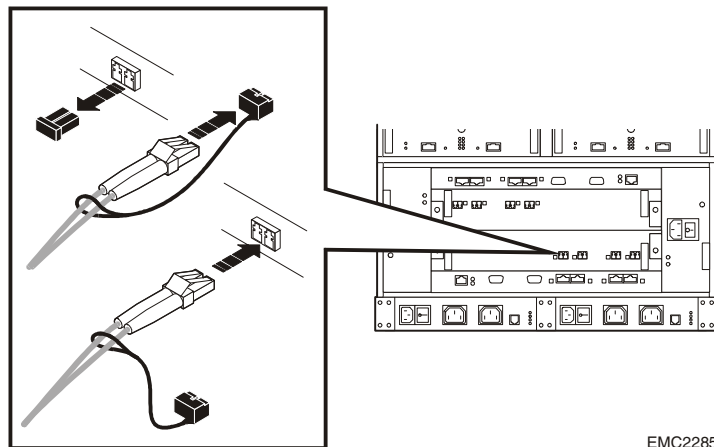
Connecting Storage Processors to the External Environment

When working with optical cables, observe the following precautions:

- ◆ Keep the covers on all optical cables and optical connectors until you are ready to insert the cables. The covers protect the cables and connectors and prevent foreign particles, such as dust, from entering and affecting the connection.
- ◆ Do not leave any unused (dangling) cables connected to an SP port.
- ◆ Avoid tight bends. If you need to make a 90° bend, do it over 6 to 12 inches.
- ◆ Do not use optical cables to support weight. That includes long cable runs without support.
- ◆ Do not pull long runs of cable. 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.

Refer to Figure 2-13 as you cable the SPs and connect them to the external environment.

1. Remove the protective covers from each optical connector and each optical cable.
2. Plug the cable into a host port on the SP.



EMC2285

Figure 2-13 Attaching Optical Cables to the SP

3. To connect to a 2-Gbit switch or host bus adapter (HBA) port, refer to Figure 2-14; for a 1-Gbit switch or HBA port, refer to Figure 2-15.
 - a. Connect the external end of the Port 0-2 cables as follows:
 - For a *direct attach* configuration— to the host server’s host bus adapter (HBA).

If the HBA is not yet installed in the host server, refer to the *Installation Roadmap for CX-Series, AX-Series, and FC-Series Storage Systems* for instructions on configuring hosts, then connect the SP.

- For a *storage area network (SAN)* configuration — to a Fibre Channel switch port.
- b. Connect the external end of the Port 3 (outside) cable as follows:
 - In a system *without MirrorView™ software* — to an HBA port (direct-attach configurations) or switch port (SAN configurations).
 - In a system *with MirrorView* — to a corresponding storage processor (SP) host port on the remote storage system.

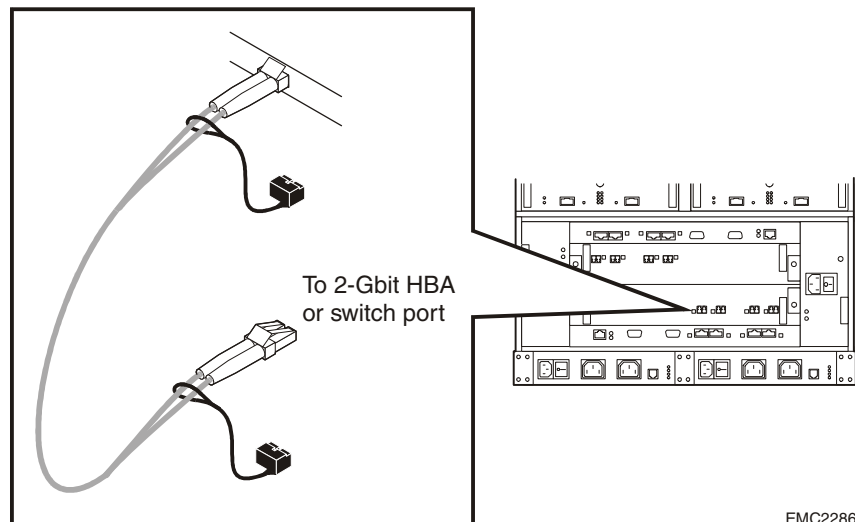
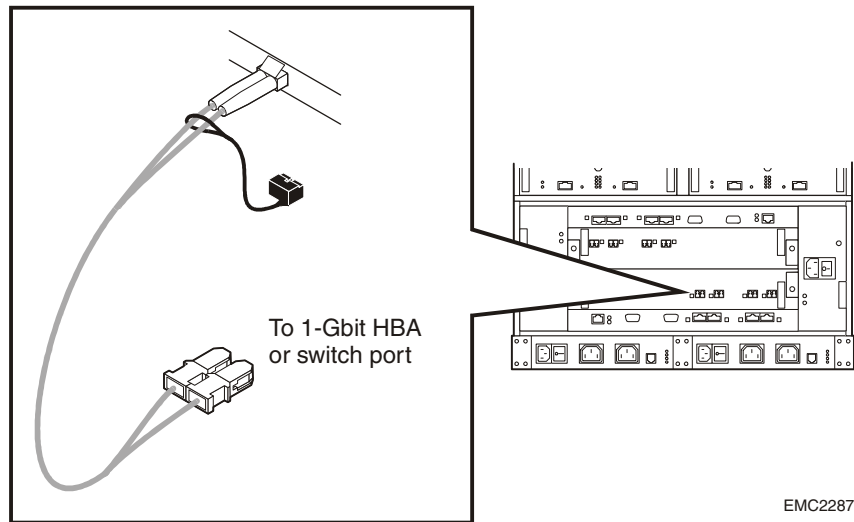


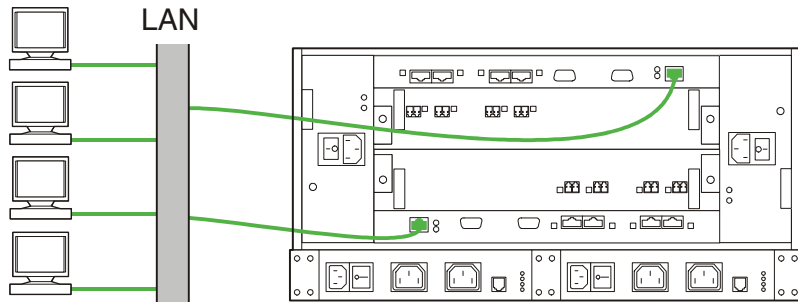
Figure 2-14 Connecting to a 2-Gbit Switch or HBA



EMC2287

Figure 2-15 Connecting to a 1-Gbit Switch Port or HBA

4. Connect each SP to the external LAN from which you will manage the storage system. See Figure 2-16.



EMC2309

Figure 2-16 Connecting CX700 SPs to an External (Management) LAN

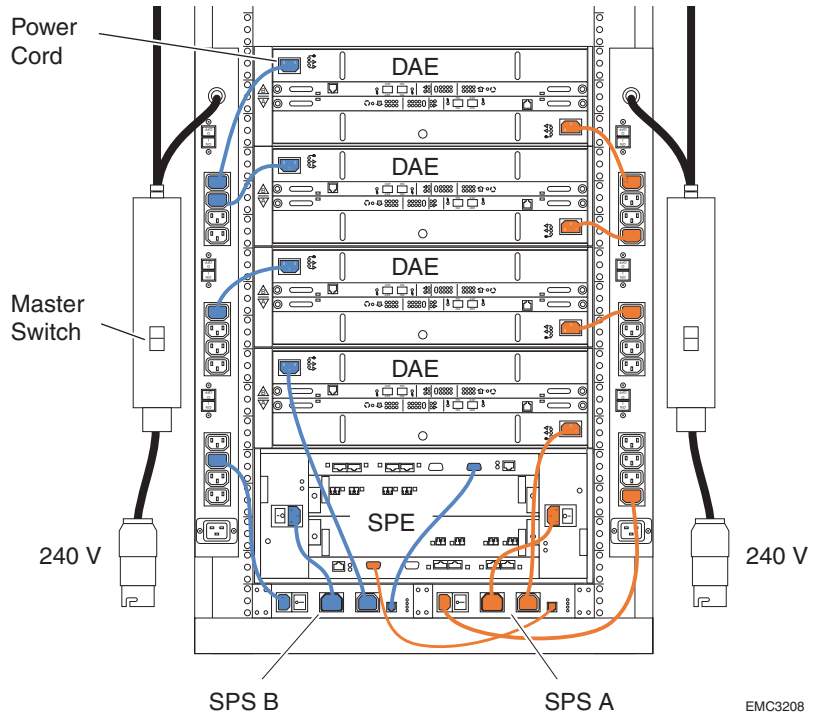
CX700 Powerup and Initialization

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

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

Follow the steps below to power up the CX700:

1. Connect power to all DAEs connected to the CX700. If any of the DAEs have power switches, turn them to the on position.



EMC3208

Figure 2-17 Power Connections (ac System Shown)

2. If present, turn the CX700's power supply switches to the on (I) position.
3. In systems with ac source power, 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 CX700 and any DAEs in the cabinet will power up.

Once the CX700 is powered up, it boots and begins the initialization process. For instructions on how to initialize your system after its first powerup, refer to the *CX700 2-Gigabit Fibre Channel Storage Processor Enclosure (SPE) Setup Guide* and the *EMC Installation Roadmap for CX-Series, AX-Series, and FC-Series Storage Systems*.

CX700 Powerdown

If a CX700 with ac power powers down abnormally (for example, at a brownout or ac failure), the SPS ensures that any data in the storage-system cache is saved to the storage-system vault disks. However, when the CX700 is powered back up, it may take longer to come on line.

Turning Off the Power - ac Systems

Follow these instructions to power down CX700 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 CX700 SPE.

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 the 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 CX700 is running the UNIX® operating system, unmount file systems.
3. Use the power switch on each SPS to turn off power. See Figure 2-18. This turns off power to the CX700 and the first DAE.

You do not need to turn off power to the other connected DAEs.

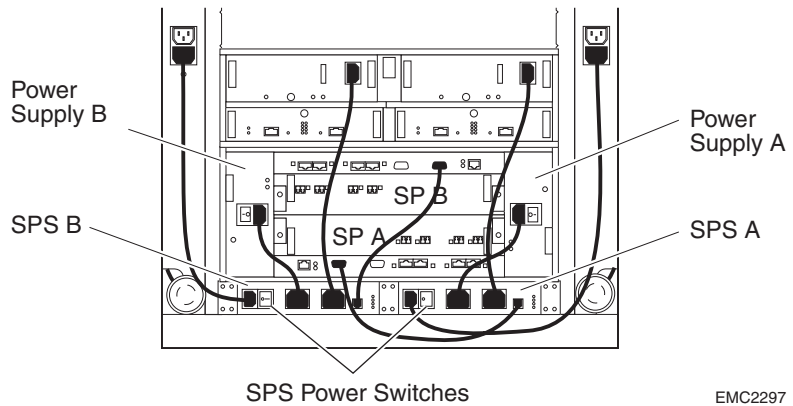


CAUTION

Never shut off the power supplies to shut down a CX700. 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 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.



EMC2297

Figure 2-18 Power Down Each SPS (ac Power)

Turning Off the Power - dc Systems

Follow these instructions to power down CX700 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 CX700.

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 CX700 is running the UNIX® operating system, unmount file systems.
3. On the SPE, 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.

Servicing a CX700 SPE

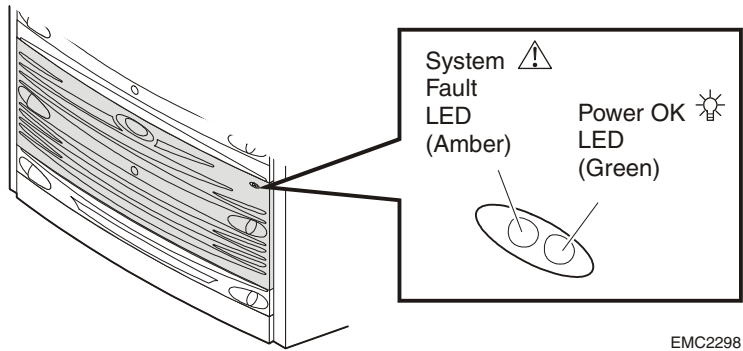
This chapter describes how to monitor CX700 system status, handle FRUs (field-replaceable units), and replace or add a FRU. Topics include

- ◆ Monitoring CX700 Status3-2
- ◆ Handling FRUs3-7
- ◆ Replacing a Fan Module 3-11
- ◆ Replacing a Power Supply3-13
- ◆ Replacing a Storage Processor (SP)3-15

Monitoring CX700 Status

Status lights made up of light emitting diodes (LEDs) on the storage system and its FRUs indicate the current status of the CX700 and its individual components.

Figures 3-1 through 3-4 and Tables 3-1 through 3-3 explain the lights.



EMC2298

Figure 3-1 Status Lights Visible from the Front of the CX700 SPE

Table 3-1 Status Lights Visible from the Front of CX700 SPE

LED	Quantity	Color	Meaning
CX700 Power OK	1	Green	On when the SPE is powered up.
CX700 System Fault	1	Amber	On when any fault condition exists; if the fault is not obvious from another fault light on the front, look at the back of the CX700 system.

If the System Fault light is on, you should look at the other status lights to identify the faulty FRU(s). If the status light for a FRU remains on, replace the FRU as soon as possible.

If a FRU fails in a CX700 SPE, the write cache function is disabled and high availability is compromised until you replace the faulty FRU.

Each fan module includes one amber cooling check (fan fault) LED that indicates a faulty module. These lights, visible with the front bezel removed, are shown in Figure 3-2.

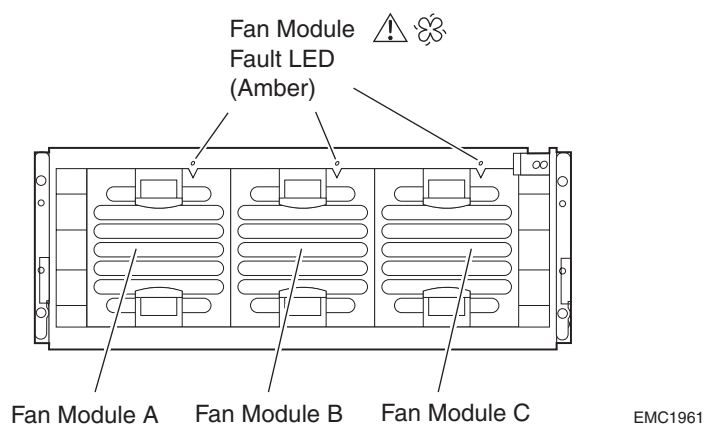


Figure 3-2 Status LEDs, Front Bezel Removed

Figures 3-3 and 3-4 and Tables 3-2 and 3-3 show and explain the fault lights visible from the rear of the CX700 SPE.

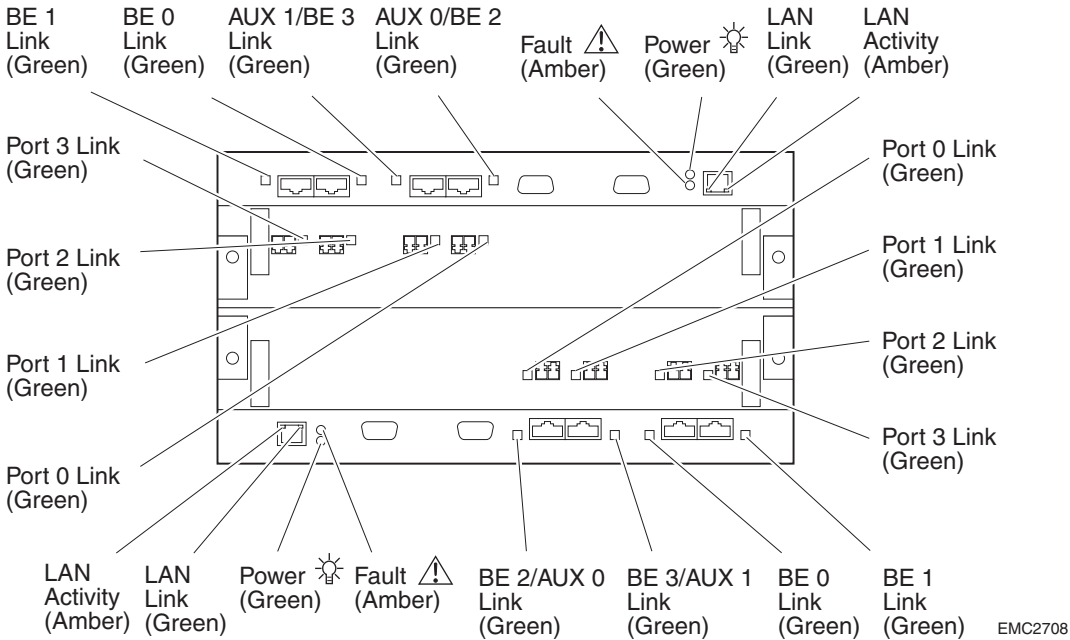
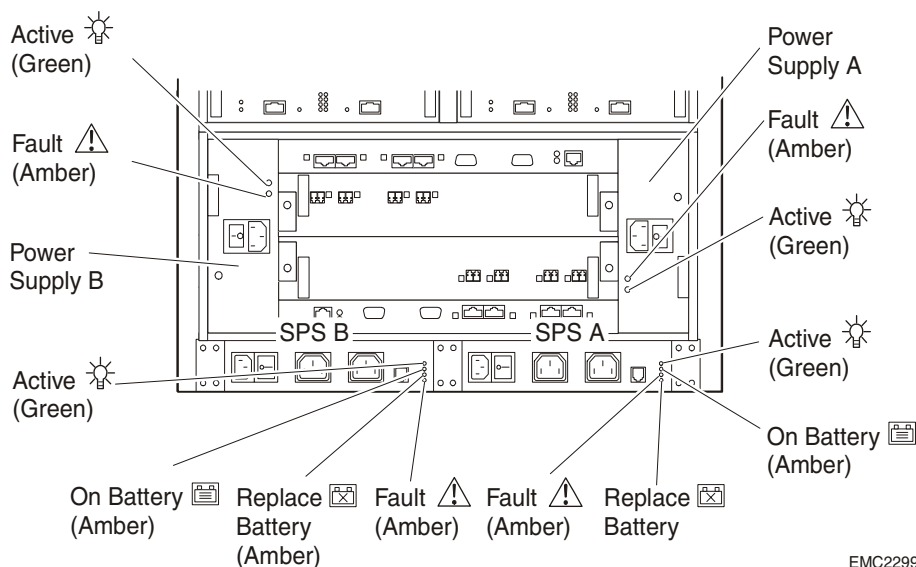


Figure 3-3 SP A and SP B Status LEDs

Table 3-2 Meaning of SP A and SP B Status LEDs

LED	Quantity	Color	Meaning
BE 0—BE 3 (AUX 0, AUX 1) Link LEDs	1 per port	Green	On to indicate auxiliary or back-end activity.
LAN Link LED	1 per LAN port	Green	On when there is a valid Ethernet connection.
LAN Activity LED	1 per LAN port	Amber	Flashes to indicate LAN activity.
Power LED	1 per SP	Green	On to indicate +12 Volt power.
Fault LED	1 per SP	Amber	Flashing indications: 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
Link LEDs (Ports 0, 1, 2, 3)	1 per port	Green	On to indicate I/O with server.



EMC2299

Figure 3-4 Power Supply and SPS Status LEDs

Table 3-3 Meaning of the Power Supply and SPS Status LEDs

LED	Quantity	Color	Meaning
Power Supply Active LED	1 per supply	Green	On when the power supply is operating.
Power Supply Fault LED	1 per supply	Amber	On when the power supply is faulty or if one of the two is not receiving ac line voltage. Flashes when system has been shut down due to a multiple fan fault or ambient over-temperature.
SPS Active LED	1 per SPS	Green	On when the SPS is ready and operating normally. Flashes when SPS is re-charging.
SPS On Battery LEDs	1 per SPS	Amber	On to indicate the ac power line is no longer available and the SPS is supplying dc output power from its battery.
SPS Replace Battery	1 per SPS	Amber	On to indicate the SPS battery pack can no longer support loads. Replace the SPS as soon as possible.
SPS Fault	1 per SPS	Amber	On to indicate the SPS has an internal fault. Replace the SPS as soon as possible.

Handling FRUs

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

Power Issues and FRUs

The CX700 is designed to be powered up at all times and to be repaired while powered up. To ensure EMI compliance and proper air flow, each of the system's compartments should contain a FRU and its front bezel must be in place. While it is powered up, you can service or replace any FRU. Do not remove a faulty FRU until you have a replacement available.

You can remove any of the three fan modules while the CX700 is powered up. However, if a module is removed for more than two minutes, the SPS power down.



CAUTION

If you need to power down a CX700 SPE, use the power switch on each SPS to shut off CX700 power.

Never shut off the power supplies to shut down a CX700. 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 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 simply by 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 a CX700 SPE. 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 CX700 SPE. To use it, attach the clip of the ESD wristband (strap) to any bare (unpainted) metal on the CX700 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 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.
 1. Attach the clip of the ESD wristband to the ESD bracket or bare metal on the CX700 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.
- ◆ 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.

Precautions When Handling Optical Cables

When working with optical cables, observe the following precautions:

- ◆ Keep the covers on all optical cables and optical GBICs 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.
- ◆ Avoid tight bends. If you need to make a 90° bend, do it over 6 to 12 inches.
- ◆ Do not use optical cables to support weight. That includes 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.

Replacing a Fan Module

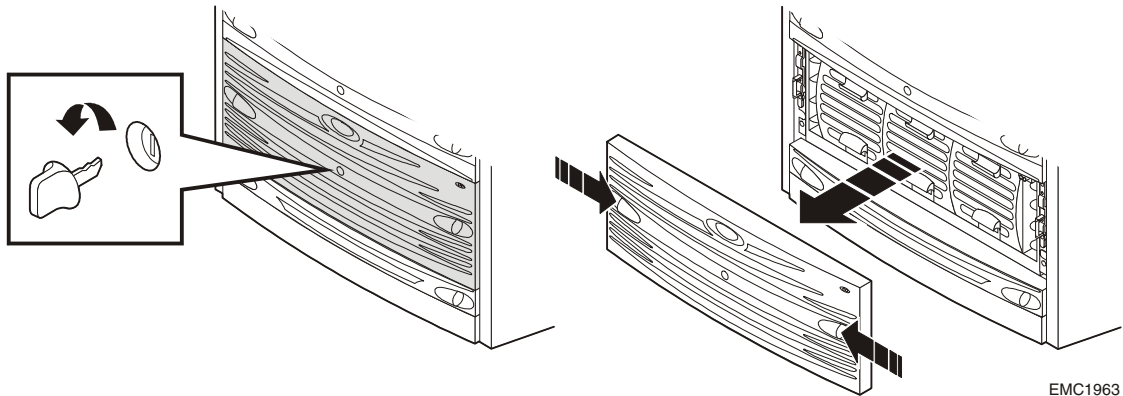


CAUTION

Handle a fan module gently and use an ESD wristband. Do not remove a faulty fan module until you have a replacement available. You can remove the fan module while the CX700 is powered up. If the module is removed for more than about two minutes, the SPs power down.

Removing a Fan Module

1. To unlock the front bezel, turn the key at the front of the CX700 counterclockwise. See Figure 3-5.
2. Press the buttons on the front of the bezel, and pull it straight towards you.



EMC1963

Figure 3-5 Removing the CX700 Front Bezel

3. Squeeze the latches together and gently pull the fan module out. Refer to Figure 3-6.

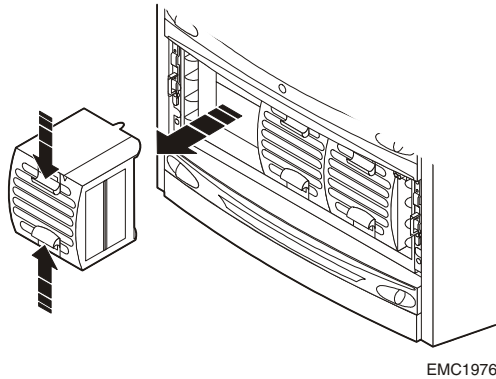


Figure 3-6 Removing a Fan Module

Installing a Replacement Fan Module

1. At the front of the CX700 SPE, insert the replacement fan module into the enclosure, and push gently until you hear a loud click and you cannot push the module in any further.
2. At the front of the CX700 SPE, hold the front bezel by its sides and push the bezel onto the latch brackets until it snaps into place.
3. To lock the panel, turn the key clockwise.

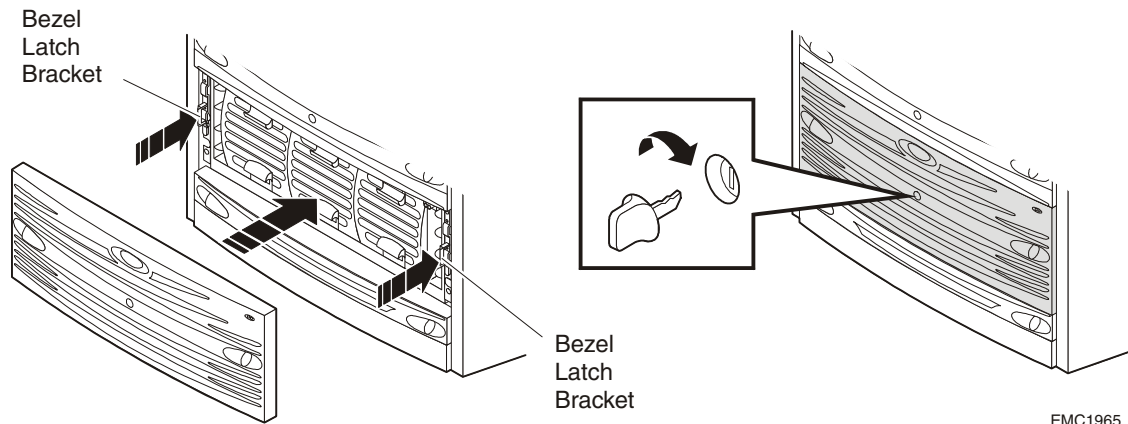


Figure 3-7 Installing the Front bezel

Replacing a Power Supply



CAUTION

Make sure the write cache has been written to disk *before* shutting any power down. Turn power off at the SPS or dc power supply, and wait for the cache dump to finish (typically less than one minute).

If the supply includes an on/off switch, turn off the power supply before unplugging the line cord from the supply or removing the supply from the enclosure.

Once you have replaced a power supply and powered on the new one, make sure to wait five seconds after the green LED lights on the first supply before turning off the second supply.

To Remove a Power-Supply Module

1. If present, set the module's power switch to the off position.
2. Move any retention bail aside by disengaging the cord from the loop, and unplug the ac/dc line cord. Figure 3-8 shows how to remove ac power cords, Figure 3-9 shows how to disconnect dc power cords.

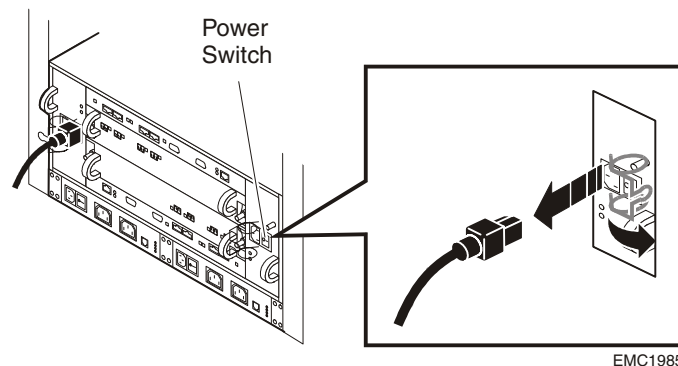


Figure 3-8 Removing the Power Supply ac Line Cord

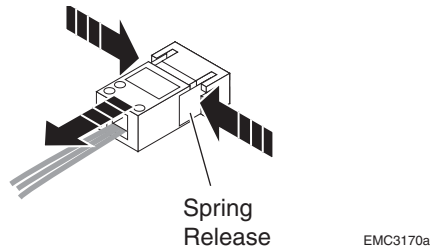


Figure 3-9 Disconnecting dc Power Cords

3. Turn the latch counter-clockwise to release the power supply as shown in Figure 3-10.
4. Grasp the handle with one hand and gently pull the power supply from the enclosure while supporting it with your other hand. See Figure 3-10.

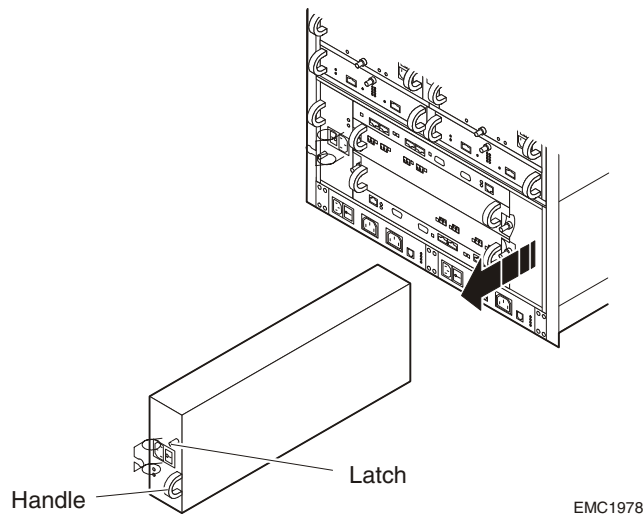


Figure 3-10 Removing the Power Supply

Installing the Replacement Power Supply

1. Make sure the latch is turned fully counter-clockwise before installing the power supply.

2. Align the power supply with the enclosure slot and gently push it all the way into the slot. Ensure that the power supply handle is aligned with the outer wall of the chassis.
3. Turn the latch clockwise to secure the supply into the chassis.

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

Attaching the Line Cord and Powering On

1. Plug the ac/dc line cord into the new power supply.
2. Return any retention bail to its original position, and push the cord into the loop to hold it in place.
3. Verify that the ac line cord is plugged into the appropriate (A or B) SPS, and that SPS power is on.
4. If present, set the power supply's switch to the on (I) position.

Replacing a Storage Processor (SP)



CAUTION

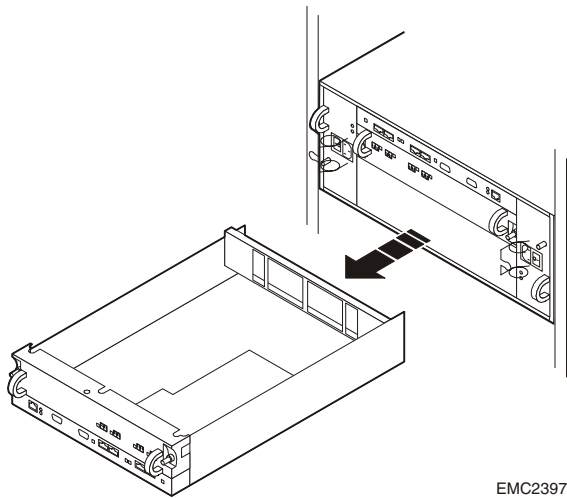
Handle a storage processor gently and use an ESD wristband. Do not remove a faulty storage processor until you have a replacement available. You can remove a storage processor while the CX700 is powered up.

Removing a Storage Processor

1. Disconnect all Fibre Channel, SPS, and Ethernet cables from the storage processor. Take care to *gently* press the connector latches to release them before you remove the cables.

Mark or label each cable to ensure that you correctly connect the replacement storage processor.

2. Release the latches on either side of the storage processor module *as indicated by the icons on the SP panel*. Note that
 - SP A and SP B are reversed, so the latches will turn in opposite directions to release.
 - Unlike captive screws (which they resemble), the latches need only 1/4 turn to release or secure.
3. Use the handles to pull the storage processor module from its slot. See Figure 3-11.



EMC2397

Figure 3-11 Removing a Storage Processor

4. Place the storage processor on a static-free surface.

Installing a Replacement Storage Processor

1. Remove the new SP from its static-free packaging.
2. Be sure the latches on either side of the SP module are in the open position.
3. Align the storage processor module with the guides on the side of the enclosure. Gently slide the SP into the enclosure, as shown in Figure 3-12. Be sure the module is completely seated in the CX700 midplane.

The SP Power light will turn on.

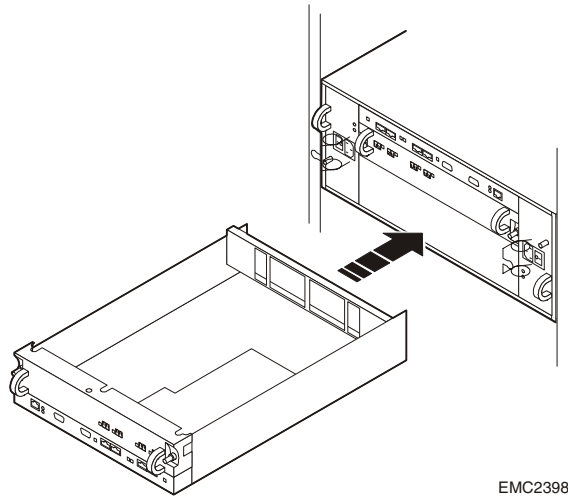


Figure 3-12 Installing a Storage Processor



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.

4. Turn the latches on either side of the SP module to the secure position.

The storage processor latches hold the module in an established position. They do not pull or otherwise help to seat the SP.

5. Reconnect all cables to the new storage processor.
6. Remove and store the ESD wristband.

Standby Power Supply (SPS)

The standby power supply (SPS) provides ac backup power required to protect the integrity of the CX700 storage processor write cache. This chapter describes the CX700 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.

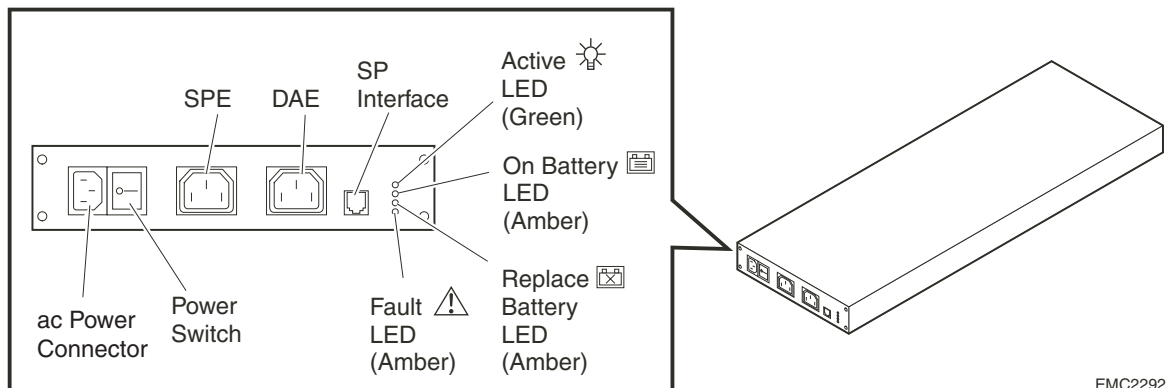
About the SPS

Two 1000-watt dc SPSs provide backup power for one CX700 SPE and the first (enclosure 0, loop 0) DAE2 or DAE2P adjacent to it. 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, ac outlets for the CX700 SPE and the DAE respectively, one phone-jack type connector, and status lights (LEDs).

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

Figure 4-1 shows a 1000-watt SPS unit.



EMC2292

Figure 4-1 1000-Watt SPS Rear Panel

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

Table 4-1 **SPS Status LEDs**

Light	Meaning When Lit
Active - Green	When this LED is steady, the SPS is ready and operating normally. When this LED flashes, the batteries are being re-charged. In either case, the output from the SPS is supplied by ac line input.
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 SPE, the file server writes all cached data to disk, and the event log records the event.
Replace battery - Amber	The SPS battery is not fully charged and may not be able to serve its cache flushing function. With the battery in this state, and no other online SPS connected to the SPE, the storage system disables write caching, writing any modified pages to disk first. Replace the SPS as soon as possible.
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.

Two SPS units fit in a tray beneath the CX700 to which they connect. Figure 4-2 shows the SPS in a cabinet with a CX700 and DAE2.

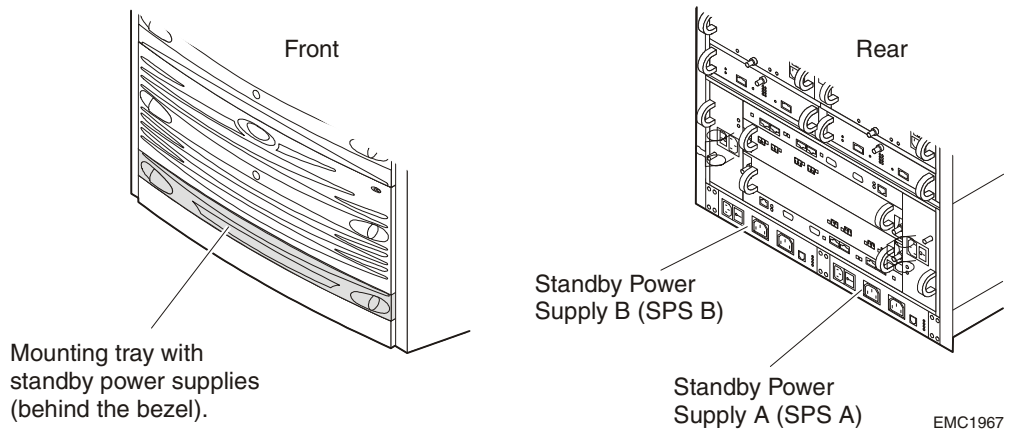


Figure 4-2 SPS Installation, Front and Rear Views

If ac power fails, an SPS provides backup power until the storage processor has flushed its write cache data to the DAE disks. The SP then shuts off SPS power. 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 recharge times are explained in Appendix A. 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.

Technical Specifications and Operating Limits

This appendix describes the CX700 technical specifications, operating limits, and shipping and storage requirements. Major sections are

- ◆ SPE Technical Specifications.....A-2
- ◆ SPE Standards Certification and Compliance.....A-6
- ◆ SPE Operating LimitsA-9
- ◆ SPS Technical SpecificationsA-13

SPE Technical Specifications

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

Power Requirements

The input current, power (VA), and dissipation per CX700 SPE are based on the system requirements for the power supplies and cooling system to provide internal regulated power. These values represent either

- ◆ the values for a single power supply line cord, or
- ◆ the sum of 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 CX700 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 CX700 and DAE2/DAE2P in the cabinet.

CX700 ac Ratings

Requirement	Description
ac line voltage	100 to 240 V ac $\pm 10\%$, single phase
Frequency	47-63 Hz, full auto-ranging
ac line current	5.2 A max at 100 V, 2.6 A max at 200 V (fully configured)
Power consumption	520 VA (510 W) max (fully configured)
Startup surge current	15 Apk (10.6 Arms) max for 100 ms, at any line voltage
Power factor	.98 min at full load, 100 V ac
Heat dissipation	1840 KJ/hr (1740 BTU/hr) max estimate
In-rush current	25 A peak estimate for 1/2 line cycle, per power supply @ 240 V ac 15 A peak estimate for 1/2 line cycle, per power supply @ 120 V ac
ac protection	10 A on each power supply, both phases
ac inlet type	IEC320-C14 appliance coupler per power supply
Ride-through time	30 ms min
Current sharing	60% max, 40% min between power supplies

CX700 dc Ratings

Requirement	Description
dc line voltage	-36 V to -72 V dc (Nominal -48V or -60V power systems)
dc line current	14.2 A max at -36 V dc, 10.6 A typical at -48 V dc
Power consumption	510 W max
Heat dissipation	1.84 x 10 ⁶ J/hr, (1,740 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

Sizes and Weights

Measurement	CX700 SPE	SPS
Height	17.78 cm (7.00 in), 4 NEMA units (U), including mounting rails	4.02 cm (1.58 in), 1 U, including mounting rails
Width	44.45 cm (17.5 in); mounting bars fit standard 19-inch NEMA cabinets	20.96 cm (8.25 in)
Depth	Front door to rear: 70.02 cm (27.57 in) Chassis to rear: 67.1 cm (26.42 in) Rail front-to-back: 64.12 cm (25.24)	60.33 cm (23.75 in)
Weight	32.9 kg (72.6 lbs) with rails	10.7 kg (23.65 lbs) each 4.5 kg (9.85 lbs) tray 25.9 kg (57.15 lbs) total

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;

SP Optical Cabling to Switch or Server

Optical cables connect the SFF LC transceivers on the storage processors 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, CX500i, 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.

SP to DAE2/DAE2P Copper Cabling

Connector - shielded HSSDC (High Speed Serial Data Connector) or HSSDC2.

The expansion port interface to the SPE is copper cable.

Type ^a :	Shielded, 150Ω differential, shield bonded to HSSDC plug connector shell (360°) FC-PI Standard, Revision 13 or higher (HSSDC) Shielded, 150 Ω differential, shield bonded to plug connector shell (360°) FC-PI-2 Standard, Revision 7 or higher HSSDC2 -HSSDC2 for DAE2P-DAE2P connection; HSSDC -HSSDC2 for DAE2P connection to DPE, SPE, or DAE2
Length:	DAE2:1 meter (3.3 feet) unequalized; 5 meters (16.5 feet) and 10 meters (33 feet) equalized DAE2P: 2 meter (6.6 feet);5meter (16.5 feet) and 8 meter 26.4 feet)

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

SP to SPS Interface Cabling

The storage processor to SPS interface meets the following specifications:

- ◆ 9600 baud, 8 bit, no parity
- ◆ serial RS-232 interface
- ◆ shielded DB-9 to RJ-45 connection

SPE Standards Certification and Compliance

A stand-alone CX700 has been tested and certified for compliance with the international environmental and safety specifications listed below. Each CX700 is marked to indicate such compliance and certification as required.

CX700 - 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

CX700 - dc Power

Stand-alone CX700 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

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-PH, 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 SPE/DAE use functions from later revisions of specifications.

SPE 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 CX700 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 CX700 is mounted. Mounting equipment in a cabinet directly above or below a CX700 does *not* restrict air flow to the SPE; air flows through the CX700 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

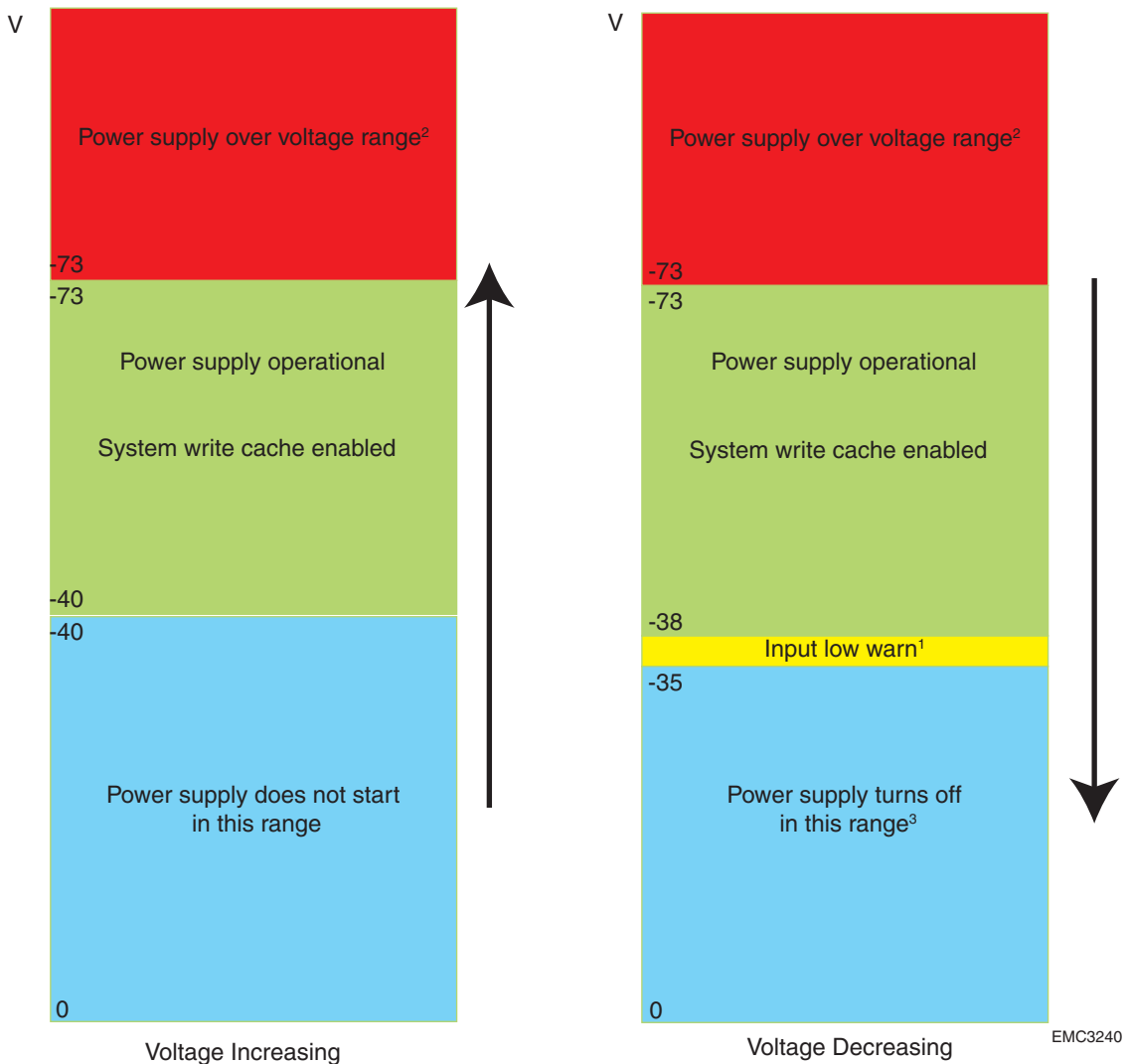
If the system exceeds maximum ambient temperature by approximately 10°C/18°F, the storage processors will begin an orderly shutdown that saves cached data and shuts off the SPs. LCCs in each DAE will power down their disks but remain powered on. If the system detects that the temperature has dropped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

SPE Shipping and Storage Requirements

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

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 (CX700 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 buss*

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

SPS 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
ac inlet type	IEC 320-C14 appliance coupler with switch
ac outlet type	EC 320-C13 appliance coupler (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)

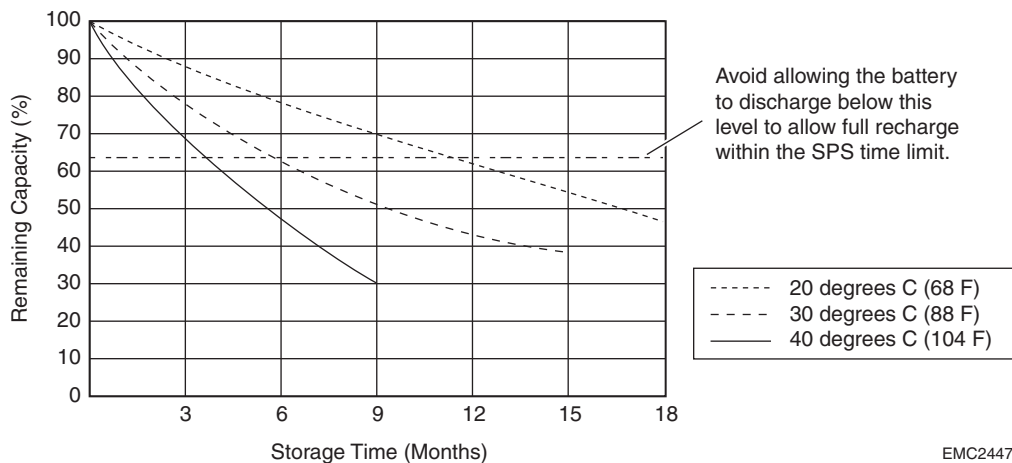
Rear 81.3 cm (32.0 in)

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 array. If an actual power failure occurs during the test, the test is terminated and the unit goes into On-Battery mode.
Full	At each storage system startup, the system software initiates a full power test. During the test, the system disables write cache and allows the SPS to stay on for its entire 90-second period. The system initiates a full test when the SPS is On-Line and fully charged. If the batteries are charging at test time, the system defers the test until the next programmed time.

Battery Self-Discharge Times

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



EMC2447

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

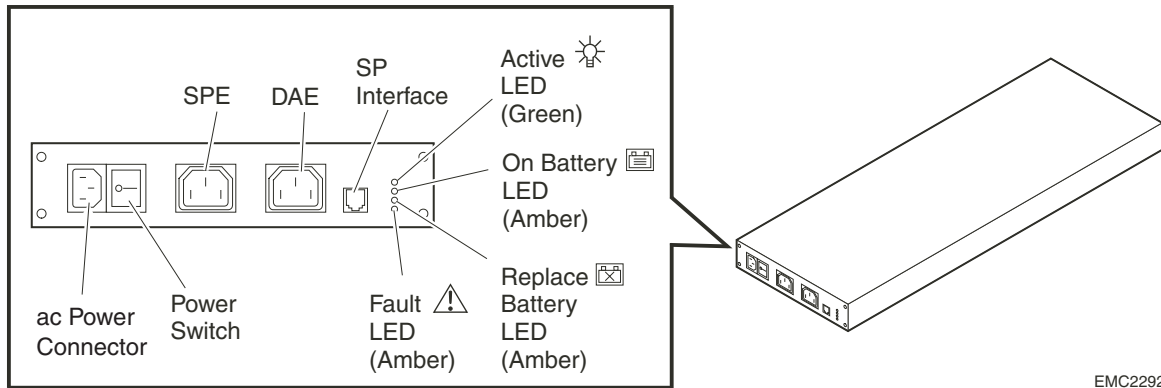
Standard	Description
EN 60950	Safety of Information Technology Equipment including Electrical Business Equipment.
UL 1950	
CSA 22.2 No. 950	
CE Mark	European EMC Directive & Low Voltage Directive Requirements

EMI Standards

Standard	Description
FCC Part 15	Class B, Radio Frequency Device Requirements
ICES-003	Class B, Interference-Causing Equipments Standard - Digital Apparatus
CE Mark	European EMC Directive & Low Voltage Directive Requirements
VCCI	Class B, Voluntary Control Council for Interference
AS/NZS CISPR22	Class B, Electromagnetic Interference - Limits & Methods of Measurement of ITE
CNS13438	BSMI EMC Requirements

Cable Pinout Information

Figure A-2 shows the storage processor (SP) interface to the SPS.



EMC2292

Figure A-2 1000-Watt dc SPS

The interface 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

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 B-2
- ◆ Troubleshooting the Problem B-3
- ◆ Before Calling the Customer Support Center B-4
- ◆ Documenting the Problem..... B-5
- ◆ Reporting a New Problem B-6
- ◆ Sending Problem Documentation..... B-7

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).

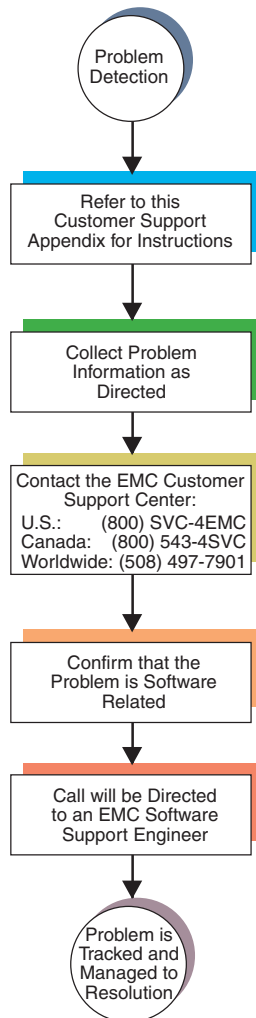


Figure B-1 Problem Detection and Resolution Process

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:

<http://powerlink.EMC.com>

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.

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 hardware-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*.

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 CX700 systems can hold 0-15 disks.

**direct attach storage
(DAS)**

A direct attach storage system consists of disk-array storage systems that connect directly (not via a switch) to host servers.

**DPE (disk processor
enclosure)**

A type of storage device that includes SPs, power supplies, cooling modules, and disks in a single enclosure. In most cases, a DPE can support its own integrated disks and one or more DAEs. Each DAE is

designed to work with a DPE. A DPE differs from an SPE like the CX700, which holds no disks but connects to 15-disk DAE2s.

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 a DAE enclosure. The carrier assembly holds the disk drive.

disk unit

A short name for physical disk unit.

E

EA (enclosure address)

A number, selectable on a DAE rear panel, that helps establish a unique address for each disk module on an FC-AL loop. You must set the EA on each DAE.

EMI (electromagnetic interference)

Electronic radiation emitted by an electrical device. The levels of EMI are strictly controlled for data processing equipment. The EMI standards 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 and you should take steps to prevent this, as explained in the appropriate sections 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).

field-replaceable unit

See *FRU (field-replaceable unit)*.

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.

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 Gigabyte Interface Card. A device for converting Fibre channel signals from copper 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*.

L

LCC (link control card) A FRU in a DAE enclosure that connects Fibre Channel signalling to the disk modules. An LCC provides Fibre Channel connectivity between the storage processor, disks, and other enclosures on a loop. 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*.

MIA Media Interface Adapter

N

NAS (network-attached storage) A self-contained, intelligent, multi-disk RAID system that attaches directly to an existing LAN. A NAS device is typically a dedicated, high-performance, high-speed communicating, single-purpose machine or component. NAS devices are optimized to stand alone and serve specific storage needs with their own operating systems

and integrated hardware and software. A file system is located and managed on the NAS device and data is transferred to clients over industry-standard network protocols (TCP/IP or IPX), using industry-standard file-sharing protocols.

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 mains power to low voltage dc power for the system components. A CX700 has 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

SAN (storage area network) A high-speed special-purpose network (or subnetwork) that interconnects different kinds of data storage devices with associated data servers on behalf of a larger network of users.

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 (DIMM) that provides the local storage for an SP.

SPE (storage processor enclosure)	A storage device that includes an enclosure, SPs with host I/O ports, back-end disk ports, and power supplies.
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 <i>SP (storage processor)</i> .
storage-system caching	The procedure of temporarily storing disk-based data in SP memory to save time if the data is needed again soon.

A

- ac line cord 2-8
 - removing from power supply 3-13
- ALPA (Arbitrated Loop Physical Address)
 - defined g-1

B

- binding disk modules, defined g-1

C

- cabinet, installing SPE in 2-2
- cables
 - copper
 - DAE LCC A-4
 - length restrictions A-4
 - SPE to DAE 2-13
 - specifications for SP A-4
 - optical 2-19
 - connecting 2-20
 - handling 3-10
 - specifications A-4
- cabling specifications A-4
- components 1-3
- cooling requirements 2-4
- copper cables
 - DAE LCC A-4
 - length restrictions A-4
- Customer support B-3
- Customer Support Center B-7

D

- DAE (disk-array enclosure)
 - cable specifications A-4
 - connecting 2-12
 - defined g-1
- discharge times, SPS A-15
- disk module, defined g-2

E

- EA (enclosure address), defined g-2
- electromagnetic interference (EMI)
 - standards certification/compliance A-6
- electromagnetic interference (EMI), *see* EMI
- electrostatic discharge, *see* ESD
- EMI (electromagnetic interference)
 - defined g-2
- enclosure
 - connecting to SPS 2-10
 - fan module, description 1-10
 - high-availability features 1-3
 - midplane description 1-6
 - power supply, description 1-9
- environmental recovery A-9
- ESD (electrostatic discharge)
 - avoiding damage by 3-8
 - defined g-2

F

- fan module
 - description 1-11
 - status lights 1-11
- fan pack, *see* fan module

FC-AL (Fibre Channel Arbitrated Loop)
 cabling, SPE to DAE 2-13
 connector A-4
 defined g-2
 Fibre Channel adapter (FC adapter), defined g-2
 front panel
 status lights 3-2
 FRUs (field-replaceable units)
 defined g-3
 handling 3-7
 power issues 3-7
 power supply, defined g-4
 SPS 4-2
 defined g-5

G

grounding xv

H

HBA (host bus adapter), defined g-3
 high-availability features 1-3

I

installing SPE in cabinet 2-2
 interface specifications, SPS A-13

L

LAN port, SP 1-7
 LCC (link control card), FC-AL connector A-4
 LEDs, *see* status lights
 length restrictions, cabling A-4
 lights, *see* status lights
 LUN (logical disk unit), defined g-3

M

memory modules, defined g-4
 memory, SP 1-7

O

optical cables
 handling 3-10
 precautions when using 2-19
 technical specifications A-4

overtemp recovery A-9

P

PDU (power distribution unit, defined g-4
 port, serial, SP 1-7
 power
 consumption, SPS A-13
 cord, connecting 2-8
 issues and FRUs 3-7
 requirements 2-4
 power supply
 connecting ac line cord 2-8
 defined g-4
 description 1-9
 removing ac line cord 3-13
 status lights 1-10, 3-6
 turning off 3-7

R

recovery, environmental A-9
 replace under power, defined g-4

S

SCSI, defined g-4
 serial ports, SP 1-7
 server, defined g-4
 shield, EMI 1-6
 site requirements
 cooling 2-4
 power 2-4
 SP (storage processor)
 cabling specifications A-4
 components 1-7
 connecting to SPS 2-10
 defined g-4
 description 1-7
 memory modules, defined g-4
 optical cabling specifications A-4
 status lights 3-4
 SPE (storage processor enclosure)
 connecting to SPS 2-10
 defined g-5
 fan module, description 1-10
 front bezel 1-6
 high-availability features 1-3

- midplane description 1-6
- power supply 1-9
- specifications A-2
- status lights 3-2
- specifications
 - SPE A-2
 - SPS A-13
- SPS (standby power supply)
 - back panel 4-2
 - battery lifetime 4-4
 - battery specifications A-14
 - cable pinout information A-17
 - charge times A-13
 - connecting to SPs 2-10
 - defined g-5
 - description 4-2
 - dimensions A-14
 - EMI standards A-16
 - interface to SP A-13
 - operating limits A-14
 - power specifications A-13
 - self-discharge times A-15
 - service clearance A-14
 - shipping requirements A-14

- standards certification/compliance A-16
- status lights 3-6, 4-3
- storage requirements A-14
- technical specifications A-13
- tests A-15
- transfer times A-13
- weight A-14
- status lights
 - fan module 1-11
 - power supply 1-10, 3-6
 - SP 1-7, 3-4
 - SPS 3-6, 4-3
- status, monitoring SPE 3-2
- storage processor enclosure, defined g-5
- storage processor, *see* SP (storage processor)
- storage time, effect on SPS A-15

T

- technical specifications
 - SPE A-2
 - SPS A-13
- Technical support B-3
- tests, SPS A-15

