DAS 5300 Series

Rackmount Models
Installation and Service

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Rackmount Models
Installation and Service

Hardware

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Preface

This manual explains how to install the Intelligent Disk-Array Enclosure (iDAE), rackmount model, and how to replace and add customer-replaceable units (CRUs). The iDAE is also known as DAS 5300.

If you are a technical service person who will install and service the rackmount iDAE, you should read this manual. After reading it, you will be able to install a rackmount iDAE, replace any CRUs that may fail, and upgrade a rackmount iDAE by adding disk modules and redundant CRUs.

Organization of the manual

Chapter 1	Introduces the iDAE's components.
Chapter 2	Describes requirements and explains how to install the iDAE in a 19-inch cabinet.
Chapter 3	Describes how to replace CRUs, such as disk modules, and add disk modules and redundant CRUs.
Appendix A	Lists the iDAE's technical specifications.
Glossary	Defines terms used in the Fibre Channel environment.

Related manuals

Disk-Array Enclosure (DAE) Installation and Service for Rackmount Models (86 A145KX)

DC Standby Power Supply (SPS) Installation and Service (86 A1 20KX)

The *Installation Procedure for Drawers (86 A7 29PX)* describes how to install a DAS 5300 in an ESCALA EPC1200/A rack system.

The *ESCALA EPC400 Rack Service Guide (86 A1 20PX)* describes how to install a DAS 5300 in an ESCALA EPC400 Rack system.

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Chapter 2 – Installing an iDAE

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1 About the Intelligent Disk-Array Enclosure (iDAE)

This chapter introduces the Intelligent Disk-Array Enclosure (iDAE) storage system. Topics are

- iDAE components

- Enclosure

- Storage processors (SPs) (with memory for write caching if required)

- Disk modules

- Power supplies

- SPS (standby power supply)

- Drive fan pack

- Configurations

The iDAE is an intelligent, highly available, high performance, high capacity storage system that uses a Fibre Channel Arbitrated Loop (FC-AL) as its interconnect interface. Its modular, scalable design provides additional disk storage as your needs increase.
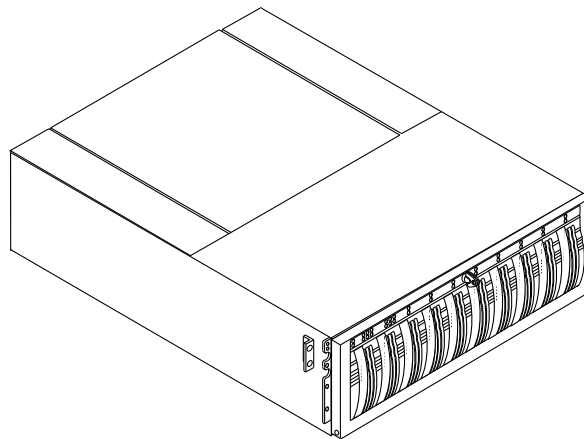
Using its FC-AL interface, with simple FC-AL serial cabling, an iDAE can support up to two disk-array enclosures (DAEs). A DAE is a basic enclosure without a storage processor (SP). The iDAE and two DAEs support up to 30 disk modules in a single disk-array storage system. You can place the DAEs in the same cabinet as the iDAE, in a separate cabinet, or in two separate cabinets.

An iDAE connects to a server using the server's Fibre Channel host-bus adapter (FC adapter) or an external hub. An external hub lets three or more servers connect to one or more iDAEs. High availability features are optional.

iDAE components

The iDAE components are

- A sheet-metal enclosure with a midplane and front door

- One or two SPs

- As many as ten disk modules

- One or two power supplies

- One drive fan pack

- One or two standby power supply(s) (optional, needed for write caching)

Any unoccupied slot (SP, disk module, or power supply) has a filler module to maintain air flow and compliance with electromagnetic interference (EMI) standards.

The SPs, disk modules, power supplies, fan packs, and filler modules are customer-replaceable units (CRUs), which you can add or replace without tools while the iDAE is powered up.

The optional high availability features for an iDAE are

- second SP

- second power supply

- second standby power supply

A second SP provides continued access to the iDAE and any connected DAEs if the first SP fails. The second SP can improve performance and connect easily to a second server.

The disk drives are FC-AL compliant and support dual-port FC-AL interconnects through the two SPs and their cabling.
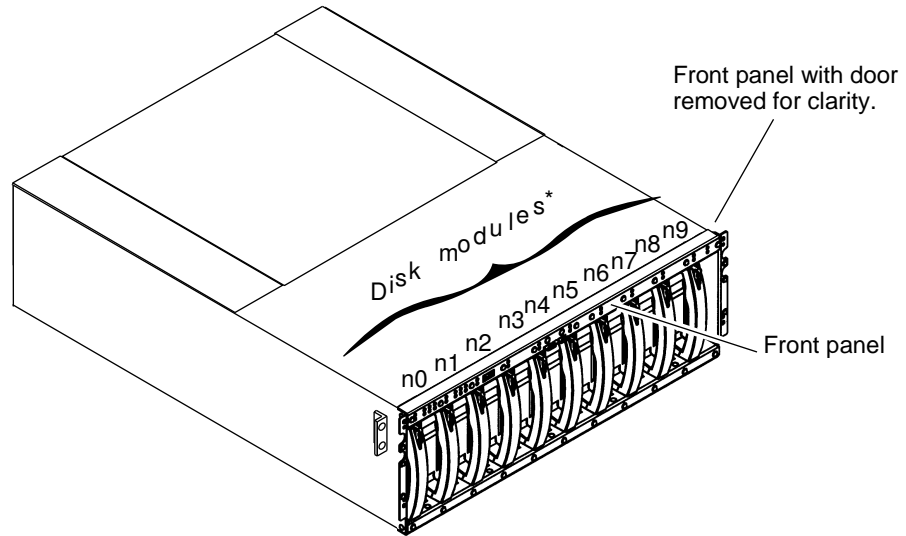
Enclosure

The enclosure is a sheet-metal housing with a front panel, a midplane, front door, and slots for the SPs, disk modules, power supplies, and the fan pack.

The following figures show the iDAE 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. If there is a second component, it is in slot B and is called *component-name* B, as follows.

Component	Name in slot A	Name in slot B
Storage Processor	SP A	SP B
Power supply	PS A	PS B

If you have one power supply, it can be in either slot A or slot B. If you have one SP, it can be in either slot A or B.

iDAE front view with door removed

* n is the enclosure address (EA) set on the front panel at installation. It must be set to 0 for an iDAE. All other EA values are invalid for an iDAE. The disk module ID is the enclosure address and the module ID (0-9) within the enclosure. In an iDAE, the ID for the right most disk module is 09.

iDAE back view
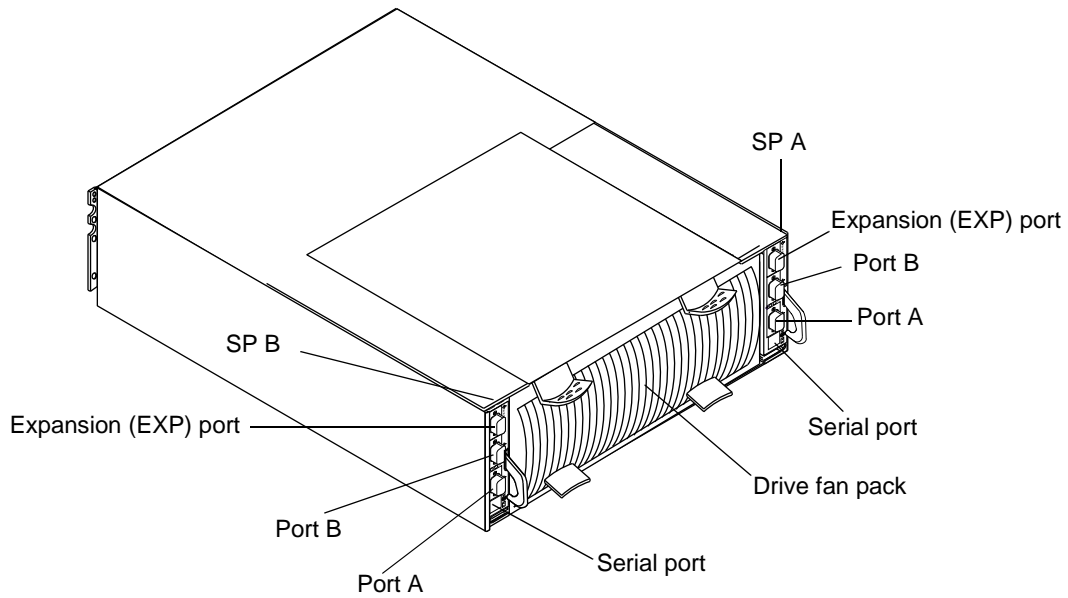
iDAE back view with drive fan pack removed

Power supply
in slot A

Power supply
in slot B

Power cord
connectors

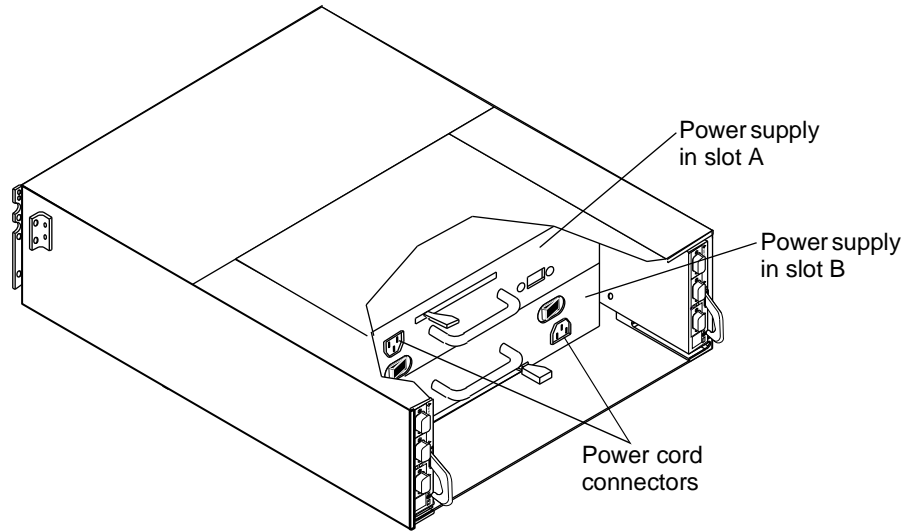**Front panel**

Enclosure
address switch
(not visible with
door closed)

Disk module status lights
(two per module)

iDAE status lights

Enclosure
address lights

Disk check

Disk Active

System Check

Power
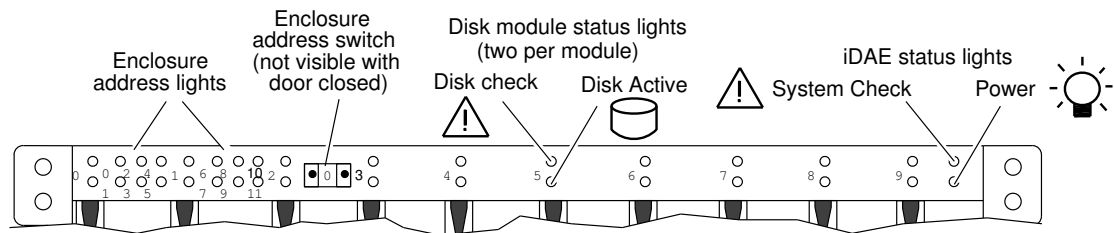
The front panel contains the enclosure address (EA) light, two status lights
for each disk module slot, and two iDAE status lights. All lights are visible
with the front door closed.

The enclosure address light displays the enclosure address setting for the
iDAE. The iDAE must have an EA of 0. You must set that EA using the
enclosure address switches, as explained in Chapter 2.

The iDAE status lights are described in the "Monitoring iDAE status"
section in Chapter 3.

Midplane
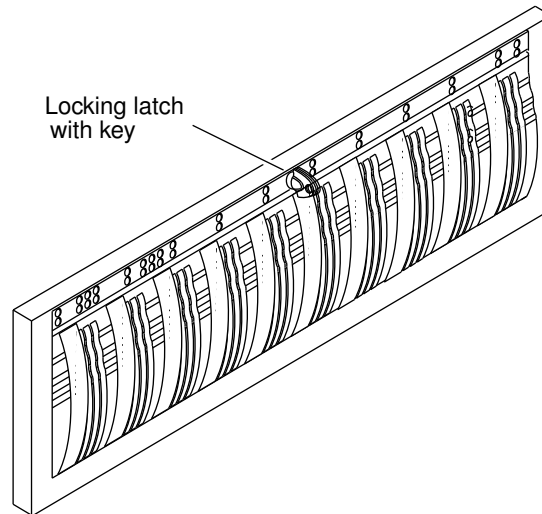
The midplane distributes power and signals to all the enclosure components. All CRUs except the fan packs plug directly into midplane connectors.

Front door

Locking latch
with key

The front door has a locking latch and an EMI shield. The latch is a push button with a removable locking key that you can use in any iDAE or DAE. When the door is open, you can remove or install disk modules.

IMPORTANT The front door must be closed for the iDAE to be EMI compliant. Opening the door to access the disk modules is a service procedure.

Storage processors (SPs)

The SP is the iDAE's intelligent component. It defines the iDAE and differentiates the iDAE from a DAE. An SP is a printed-circuit board with one dual in-line memory module (DIMM), a bezel with status lights, and securing latches.

expansion (**EXP**) port   port **B**   port **A**   serial connection
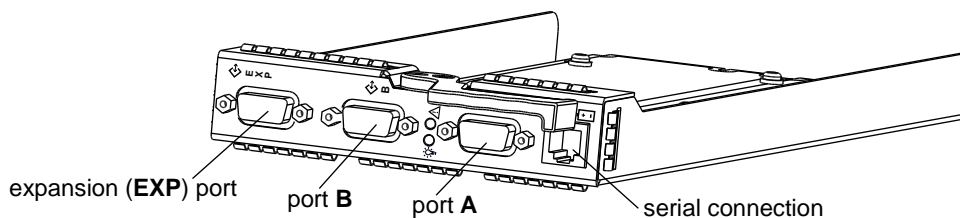
The SP has three Fibre Channel ports. Port A and Port B are for connecting to servers or hubs. The expansion connector (EXP) is for connecting to a DAE. The port interface is called the SP front end. It can connect to a server's Fibre Channel host-bus adapter (FC adapter) or external hub. You set an SP's FC-AL address ID using rotary switches.

The SP connects to disk modules in the same enclosure via an internal FC-AL. The expansion port extends the internal FC-AL to the corresponding link control card (LCC) in the DAE enclosure. This FC-AL is referred to as the SP back end.

An SP also has an RJ-type connector for serial communications with a standby power supply (SPS) and with a console.

Each SP has two status lights visible from the rear of the iDAE. For the meaning of these lights, see the "Monitoring iDAE status" section in Chapter 3.

Storage-system read caching requires one SP, and mirrored storage-system write caching requires two SPs and an SPS. If an iDAE has one SP, you can install a second one while the iDAE is running. When both SPs are installed, you can replace either SP while the iDAE is running. You should never attempt to replace any of the SP's components, except the memory modules.

Disk modules
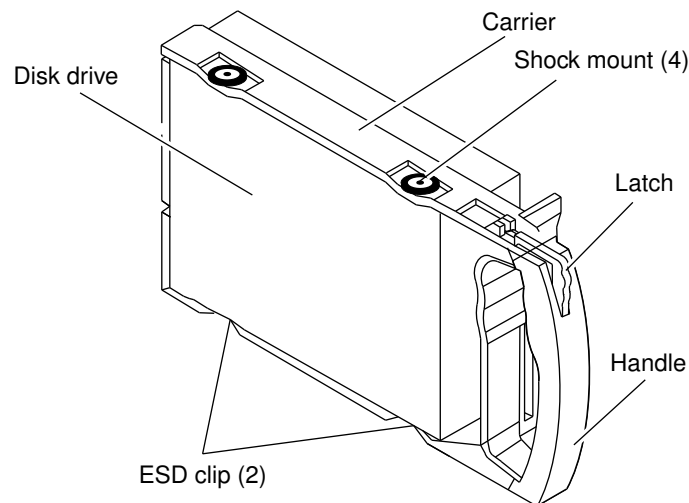
Each disk module consists of a Fibre Channel disk drive in a carrier assembly. You can add or remove a disk module while the iDAE is powered up.

Disk drives

The disk drives are 3.5-inch FC-AL drives that conform to the following standards:

- SFF-8045 and 8067

- SCSI Enclosure Services (SES) portion of the SCSI3 Standard

- Fibre Channel Arbitrated Loop (FC-AL)

- FC-AL Private Loop Direct Attach (PLDA) profile

The disk module slots in the enclosure accommodate drives with heights of either 1.0 inch (2.54 cm) or 1.6 inches (4.06 cm). You can combine drives of either height, and from different manufacturers, within the same iDAE, subject to the restrictions imposed by the Licensed Internal Code (LIC) running in the iDAE's SPs.

Drive carrier

The disk-drive carrier is a plastic assembly that slides into the enclosure slot guides and midplane connectors. It has a handle with a latch and electrostatic discharge (ESD) clips, which connect to the drive's head-disk assembly. The latch holds the disk module in place to ensure proper connection with the midplane.

Power supplies (PSs)

IMPORTANT The iDAE requires specific power supplies. Installing an older model power supply into an iDAE is not supported and will not work.
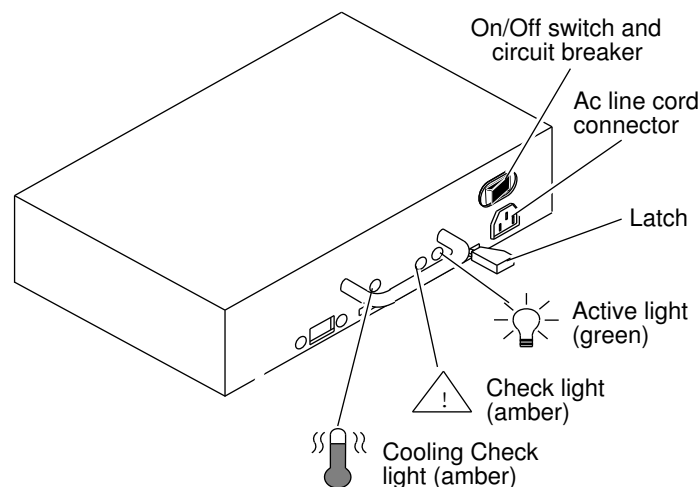
The power supplies are located behind the drive fan pack. With two power supplies, the top supply is installed inverted with respect to the bottom supply.

Each power supply is an auto-ranging, power-factor-corrected, multi-output, off-line converter with its own line cord and on/off switch. Each supply supports a fully configured iDAE and shares load currents with the other supply, if it is present. The drive voltage lines have individual soft-start switches that protect the disk drives if you install them while the iDAE is powered up. A disk with power-related faults will not adversely affect the operation of any other disk.

Each power supply has status lights. These status lights are partially visible through the drive fan pack, and fully visible with the drive fan pack removed. The status lights are described in the "Monitoring iDAE status" section of Chapter 3.

A latch on the power supply locks it into place to ensure proper connection to the midplane. You can add or remove one power supply in a highly available iDAE while the iDAE is powered up.

SPS (standby power supply)
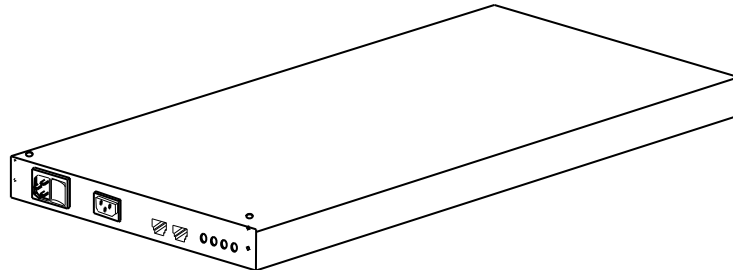
Disk configurations that use write caching, such as RAID-5, require an SPS (standby power supply) to prevent data loss during a power failure. One or two SPS units fit into a tray beneath an iDAE and maintain power to the iDAE power supplies in the event of a power outage. Installing an SPS and cabling it to the iDAE are explained in the manual *Standby Power Supply (SPS) Installation and Maintenance.*

Drive fan pack
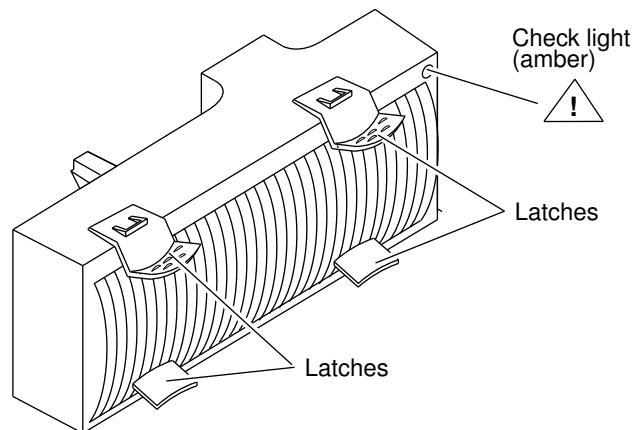
The drive fan pack cools the disk modules and SPs in the iDAE. The drive fan pack contains three fans that draw ambient room air through the front door, across the drive modules, and through the midplane and power supplies. The drive fan pack connects directly to both power supplies, and either supply can power it. The fans operate at a lower voltage and speed during normal operation to minimize acoustic noise. If a fan fails, the voltage and speed of the remaining fans increase to compensate, resulting in higher acoustic noise.

One status light on the drive fan pack indicates status. The status light is described in the "Monitoring iDAE status" section of Chapter 3.

Latches on the drive fan pack hold the pack in place.

> **IMPORTANT** You can remove the drive fan pack while the iDAE is powered up. While the pack is removed, the Cooling Check light on each power supply flashes. If the pack is removed for more than approximately two minutes, the disk modules power down and the SPs go into standby mode. When you re-install the drive fan pack, the disk modules power up and the SPs go into active mode.

Configurations

The iDAE minimum and maximum configurations are as follows.

Configuration	SPs	Power Supplies	Disk Modules	SPSs
minimum	1	1	3	0 (no write cache)
	2	2	5	1 (for write cache)
maximum	2	2	10	0 (no write cache)
	2	2	10	1 (for write cache)
	2	2	10	2 (for highest availability)

The maximum configuration provides the most redundancy, and therefore the highest degree of system availability. The fan pack provides redundant cooling for any configuration.

Database and Cache Vault Drives

In a rackmount iDAE the disk modules 0, 1 and 2 are the database drives for LIC, and the disk modules 3 and 4 are the cache vault drives.

> **IMPORTANT** A module designated as database or cache vault drive cannot be configured as a hot spare.

What next?

Continue to the next chapter, which tells how to install an iDAE.

☐ ☐ ☐

2 Installing an iDAE

This chapter describes the intelligent Disk Array Enclosure (iDAE) installation requirements and procedures. Major topics are

- Requirements

- Installing an iDAE in a cabinet

- iDAE powerup and initialization

- iDAE powerdown

- Binding disk modules into groups

Requirements

This section explains site, cabling, and addressing requirements.

Site requirements

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

Power

To determine an iDAE'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 iDAE 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 and activity level. These values represent either the values for the power cord of an iDAE with a single power supply, or the total values shared by the line cords of two power supplies in the same iDAE, with the division between the power cords and supplies at the current sharing ratio. If one of the two power supplies fails, the remaining supply and cord support the full load. You must use a rackmount cabinet with ac power distribution, and have main branch ac distribution that can handle these values for the number of iDAEs and DAEs that you will interconnect.

Cooling

The ambient temperature specification is measured at the front door inlet. The site must have air conditioning of the correct size and placement to maintain the specified ambient temperature range. The air conditioning must be able to handle the BTU requirements of the iDAEs and any connected DAEs.

Cabling requirements

You can use optical or copper cables for the FC-AL connections between the SPs and the server adapters or hubs. We recommend using optical cables where possible, because they provide ground isolation and reduced EMI noise. If you plan to use copper cabling, we recommend using a common ground distribution grid for all interconnected devices.

> **IMPORTANT** You must use a copper cable only (not an optical cable) to connect an iDAE to a DAE.

For optical cables, the SP has DB-9 cable connectors that support media interface adapters (MIAs). An MIA is approximately 1 inch by 2 inches. One end of the MIA attaches directly to the SP's DB-9 connector, and the other end attaches to an optical cable.

Any copper cables you use must meet the appropriate standards for 1-Gbaud FC-AL loops. Such cables are fully shielded, twin-axial, full-duplex cables with DB-9 connectors. Cables greater than 10 meters must be equalized; cables equal to or less than 10 meters do not need to be equalized.

iDAE and DAE interconnections should maintain LCC consistency. That is, one FC loop should connect the iDAE's SP A and each DAE's LCC A. The other FC loop should connect the iDAE's SP B and each DAE's LCC B.

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

Addressing requirements

There are two addresses for the iDAE: the Fibre Channel Arbitrated Loop address ID (FC-AL address ID) and the enclosure address.

FC-AL address ID

Each node (such as an SP) on the Fibre Channel front-end loop must have a unique FC-AL address ID. The FC-AL protocol translates the FC-AL address ID into an 8-bit arbitrated loop physical address (ALPA). You set the SP FC-AL address ID using switches, as explained later in this chapter.

Enclosure address (EA)

Each iDAE and DAE on a back-end loop needs a unique enclosure address (EA) that identifies the enclosure and determines disk module addresses. The iDAE must have an EA of 0. You must set that EA using the enclosure address switches, as explained later in this chapter. If you cable any DAEs to the iDAE, you might want to set the nearest DAE's EA to 1, and the next to 2. The enclosure address is displayed in lights visible behind the front door.

Installing an iDAE in a cabinet

The cabinet in which you will install the iDAE(s) must have a full earth ground to provide reliable grounding. Also, the cabinet should have its own switchable power distribution. If any iDAE you will install has two power supplies, we suggest that you use a cabinet that has dual power distribution units, one on each side.

> **IMPORTANT** If possible, set the cabinet main circuit breaker to the off position before installing the iDAE.

WARNING **The rackmount iDAE 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 iDAE into a rack without help from another person.**

WARNUNG **Das Rackmount-iDAE ist schwer und sollte nur von zwei Personen in einem Gehäuse installiert werden. Zur Vermeidung von körperlichen Verletzungen und/oder der Beschädigung des Gerätes, bitte die iDAE nicht ohne die Hilfe einer zweiten Person anheben und einbauen.**

We recommend that you use cabinet anti-tip devices, especially if you are installing or removing an iDAE in the upper half of the cabinet when the lower half is empty.

You install each iDAE on two L-shaped mounting rails connected to the cabinet's vertical channels.

- Installing the cabinet itself is explained in another manual - for some standard cabinets, in a cabinet installation manual shipped with the cabinet.

- Installing the mounting rails in the cabinet is explained in a rails installation manual shipped with the rails.

➤ **To install iDAEs on the mounting rails in the cabinet**

1. Attach the clip of the ESD wristband (strap) to bare metal on the cabinet, and put the wristband around your wrist with the metal button against your skin.

2. Lift the iDAE, and from the front of the cabinet, slide the iDAE onto the lowest rails. Brackets on the rear of the rails fit into cutouts on the iDAE.

3. Open the iDAE front door as shown below.

Opening the front door
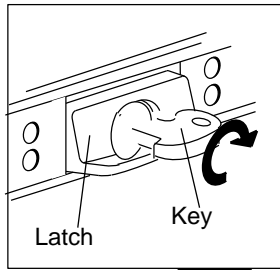
CAUTION Do not force the door open.
If the door snaps off the hinges, re-install it by
positioning it at a 45° angle to the enclosure and
snapping it into the hinge openings.

Latch

Key
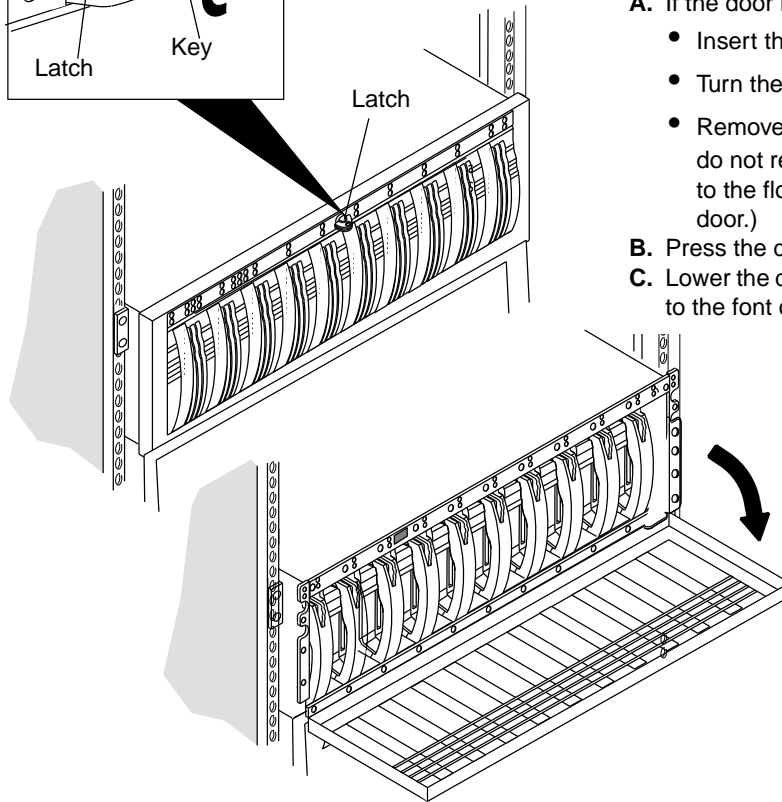
Latch

Latch

A. If the door is locked

  - Insert the key in the door's latch.

  - Turn the key 180° clockwise.

  - Remove the key, if desired. (If you do not remove the key, it may fall to the floor after you open the door.)

B. Press the door latch.
C. Lower the door until it is perpendicular to the font of the enclosure.

4. Secure the iDAE to the vertical channels of the cabinet as shown below.

Securing the iDAE to the cabinet front channel
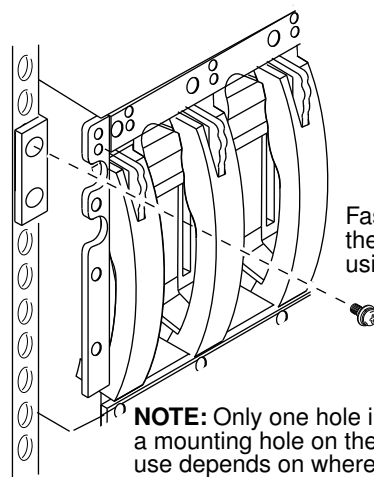
Fasten the front of the enclosure to
the front mounting holes in the cabinet
using two screws (one per side)

NOTE: Only one hole in the enclosure bracket aligns with
a mounting hole on the cabinet. The mounting hole you
use depends on where the rails are mounted in the cabinet.

2-4

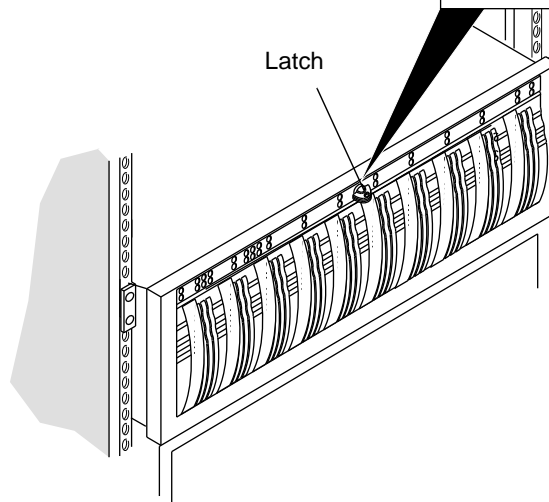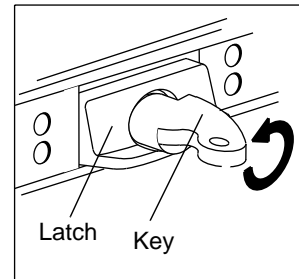5. Close the iDAE front door, as shown below.

   IMPORTANT The door must be closed for EMI compliance. Open the door only to service the iDAE.

Closing and locking the front door
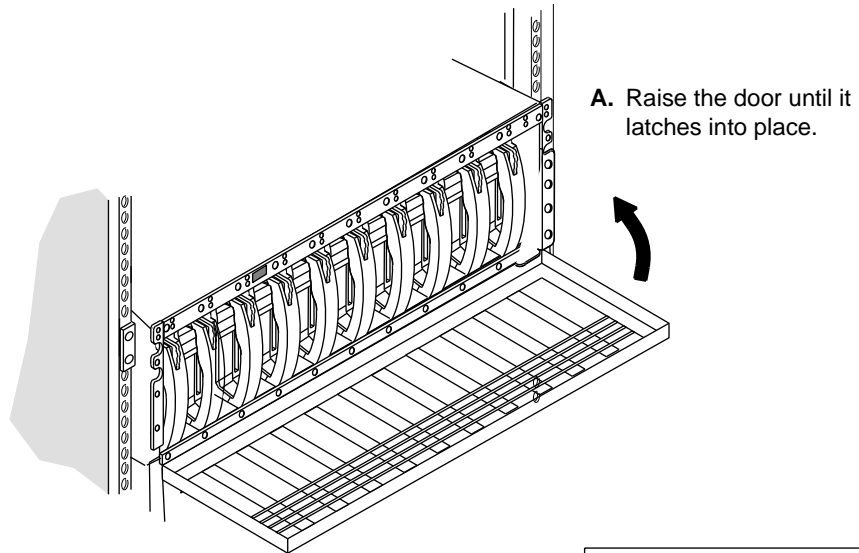
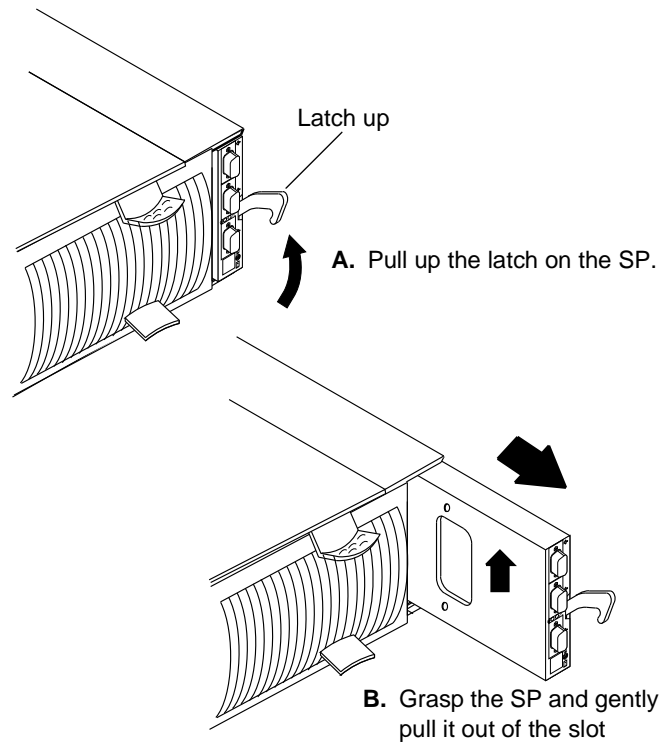**A.** Raise the door until it latches into place.

B. If desired, lock the door as follows:

- Insert the key into the door latch.
- Turn the key 180° counterclockwise.
- Remove the key, if desired.

Latch   Key

Latch

6. At the back of the iDAE enclosure, remove each SP from its slot as shown below.

Removing an SP

Latch up

A. Pull up the latch on the SP.
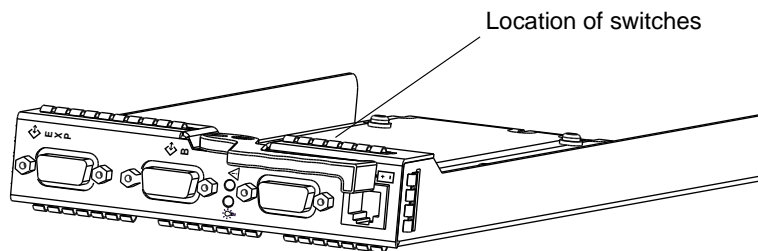
B. Grasp the SP and gently pull it out of the slot

7. For each SP, set the FC-AL address ID using the FC-AL ID switches on the SP printed circuit board.

Each node (such as an SP) on the Fibre Channel front-end loop must have a unique FC-AL address ID. The FC-AL protocol translates the FC-AL address ID into an 8-bit arbitrated loop physical address (ALPA).
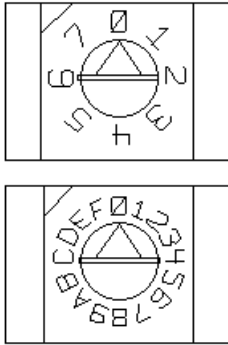
IMPORTANT Each SP's FC-AL ID must be unique from all other FC devices on that same FC-AL loop.

The valid FC-AL address ID range is a number 0 through 125 decimal, which is 0 through 7D hexadecimal. The following figures and table locate the switches and show how to select ID numbers using them.

**FC-AL address ID switch locations (on SP printed circuit board)**

Location of switches

SP FC-AL address ID switches

For address ID	Set top switch to	Set bottom switch to
0	0	0
1	0	1
.	.	.
.	.	.
.	.	.
15	0	F
16	1	0
.	.	.
.	.	.
.	.	.
29	1	D

8. Set the iDAE's enclosure address (EA) switch to 0 using the tip of a pen or a paper clip as shown in the illustration below.

    To access the EA switch, you must open the iDAE's front door. The enclosure address, referred to as the back-end address, identifies the iDAE and determines disk module addresses. The iDAE enclosure address must be set to 0.
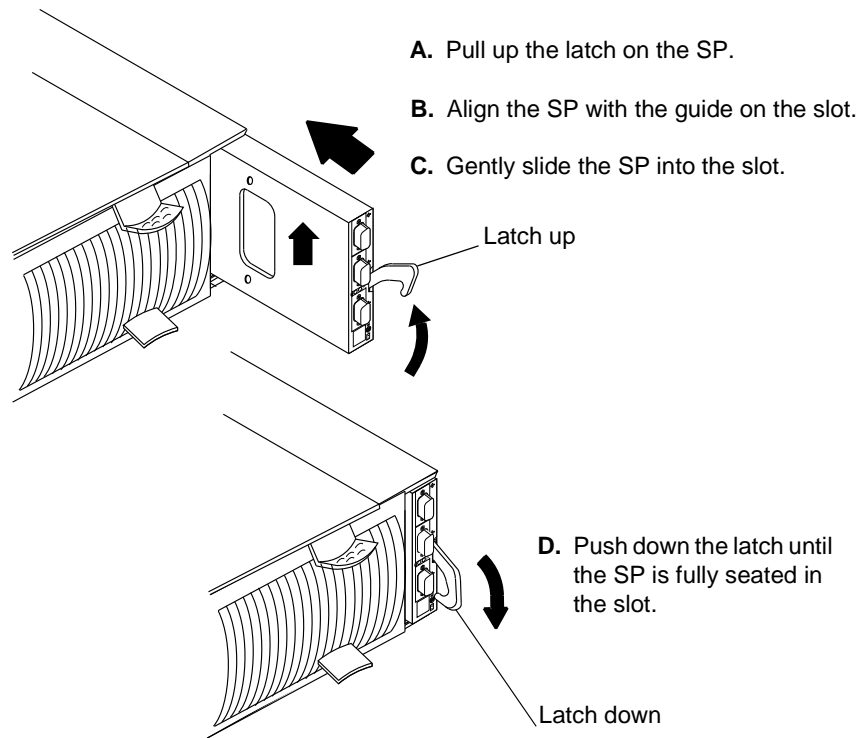
Setting the enclosure address (EA)

Increment button
Push to increase address.

Enclosure address lights
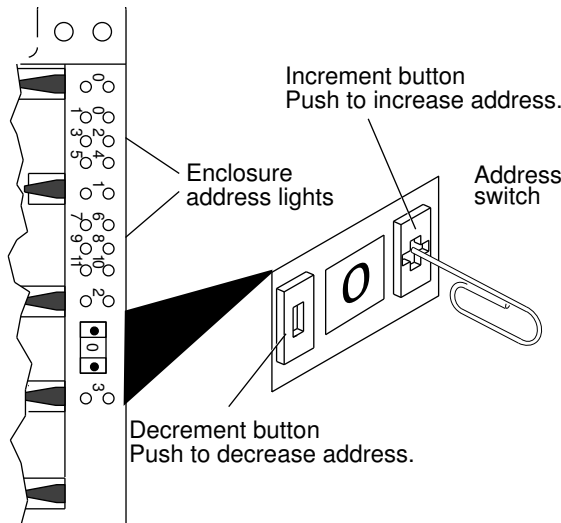
Address switch

NOTE: The address switch has 16 positions, 12 are marked 0 through 11 and the remaining 4 are marked with a dash (-). A dash position is equivalent to the 0 position.
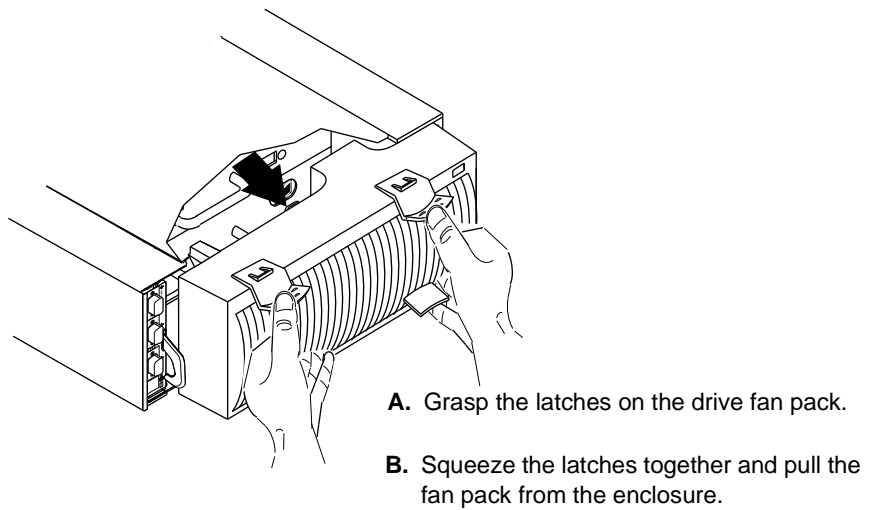
Decrement button
Push to decrease address.

9. Reinstall each SP in its slot as shown below.

Installing an SP

A. Pull up the latch on the SP.

B. Align the SP with the guide on the slot.

C. Gently slide the SP into the slot.

Latch up

D. Push down the latch until the SP is fully seated in the slot.

Latch down

10. Remove the drive fan pack as shown below.

Removing the drive fan pack

A. Grasp the latches on the drive fan pack.

B. Squeeze the latches together and pull the fan pack from the enclosure.

11. From the back of the cabinet, plug the ac line cord into each power supply and turn on the supply's power, as shown next.

Plugging the ac line cord into the power supply and turning on the power switch
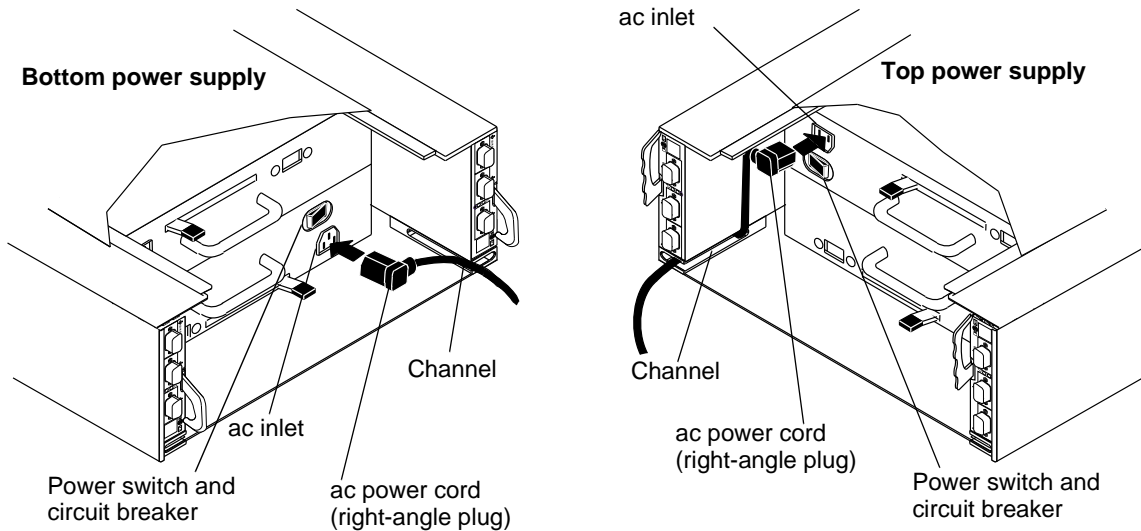
ac inlet

Bottom power supply

Top power supply

Channel

Channel

ac inlet

ac power cord
(right-angle plug)

Power switch and
circuit breaker

ac power cord
(right-angle plug)

Power switch and
circuit breaker

For each power supply:

A. Insert the right-angle plug on the ac line cord into the supply's ac inlet

B. Route the cord along the power supply to the side of the enclosure.

   IMPORTANT: The cord must not occupy the drive fan pack space.

C. Bend the cord into a U shape and slide the U into the channel so the end of the cable comes out of the channel at the back of the enclosure.

D. Plug the end of the cord into one of the cabinet's power outlets.

E. Set the supply's power switch to the on (1) position.

12. Re-install the drive fan pack in the back of the iDAE.

You can install the drive fan pack in either horizontal position. However, for a consistent image with DAEs, we recommend you install it with the status light in the upper right corner as shown below.

Installing the drive fan pack
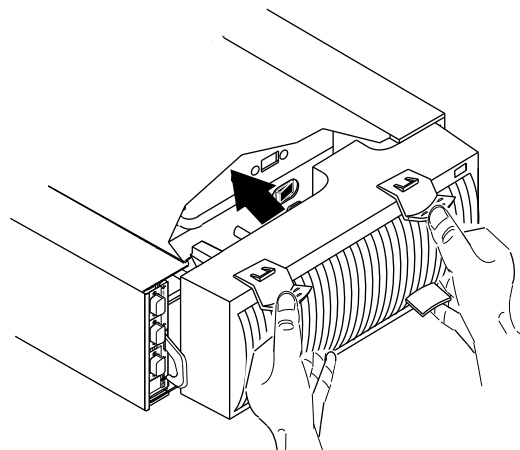
A. Grasp the latches on the drive fan pack.

B. Squeeze the latches together and gently push the fan pack into the enclosure until it clicks in place.

2-9

13. Attach the Fibre Channel cable from the server Fibre Channel adapter or the external hub to the SP's A and/or B port. Use either a copper cable, or an optical cable as shown in the illustrations that follow.

IMPORTANT Keep the covers on all optical cables 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 an unused (that is, dangling) cable, connected to an SP port because it may cause excess noise on the loop.

Cabling an iDAE to a server, hub, or other FC device with a copper cable
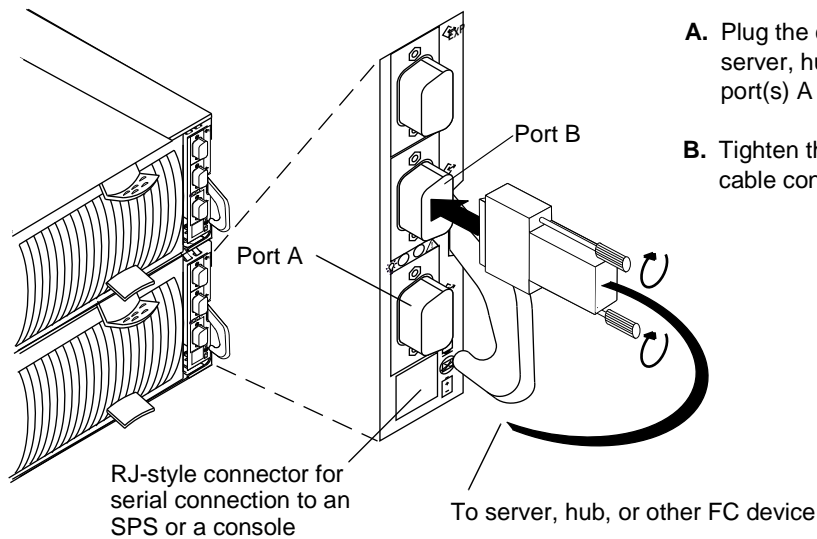
A. Plug the copper cable(s) from the server, hub, or other FC device into port(s) A and/or B on the SP.

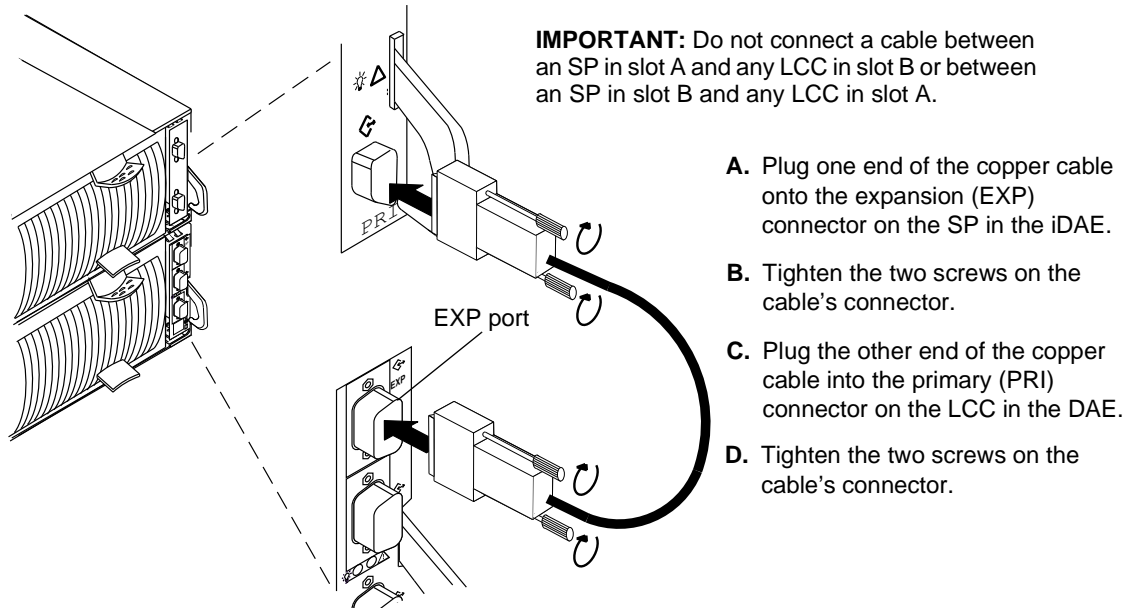**B.** Tighten the two screws on each cable connector.

Port B

Port A

RJ-style connector for serial connection to an SPS or a console

To server, hub, or other FC device

Cabling an iDAE to a server, hub, or other FC device with an optical cable
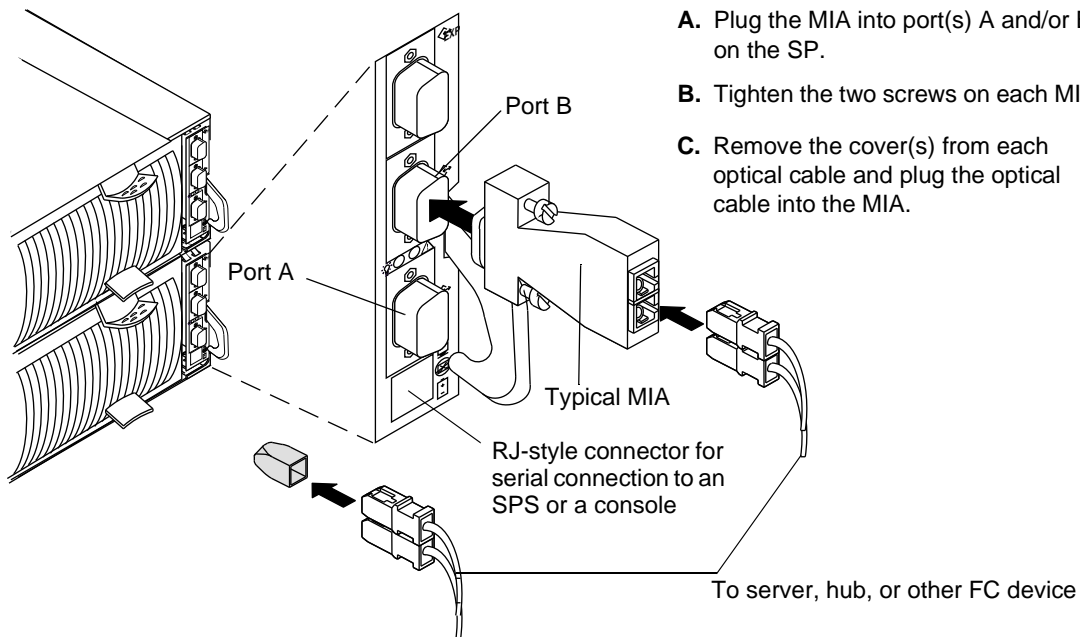
A. Plug the MIA into port(s) A and/or B on the SP.

B. Tighten the two screws on each MIA.

C. Remove the cover(s) from each optical cable and plug the optical cable into the MIA.

Port B

Port A

Typical MIA

RJ-style connector for serial connection to an SPS or a console

To server, hub, or other FC device

14. To expand this iDAE, cable its EXP connector to the corresponding DAEs PRI (primary) connector as shown below.

Cabling an iDAE to a DAE with a copper cable

IMPORTANT: Do not connect a cable between an SP in slot A and any LCC in slot B or between an SP in slot B and any LCC in slot A.

A. Plug one end of the copper cable onto the expansion (EXP) connector on the SP in the iDAE.

B. Tighten the two screws on the cable's connector.

C. Plug the other end of the copper cable into the primary (PRI) connector on the LCC in the DAE.

D. Tighten the two screws on the cable's connector.

15. If the iDAE has another SP and DAEs, connect the iDAE's other SP and the DAE's other LCCs as above.

16. To connect additional DAEs, attach a copper cable between the DAE's LCC EXP connector and the next DAE's PRI (primary) connector (detailed in the DAE installation manual). If this DAE and the next DAE have a second LCC, repeat this step for the second LCC.

17. Make sure all the slots in the iDAE and each DAE contain either CRUs or filler modules. At least three disk modules (in slots 0, 1and 2) are required in the iDAE.

18. In the cabinet, ensure that the main circuit breaker switches are set to the on position. When they are, the iDAE and any DAEs in the cabinet power up.

iDAE powerup and initialization

The only power switches on an iDAE are those on the power supply, which are normally covered by the drive fan pack. As a result, an iDAE is always active.

When ac power is initially applied to an iDAE, the disk drives power up according to their specifications, and spin up in a specified sequence. The slot spin-up delays are multiples of 12 seconds. The maximum delay is 84 seconds. The same delays are used when you insert a drive while an iDAE is powered up.

iDAE powerdown

If an iDAE (with an SPS option) is powered down abnormally (for example, a plug kick or a brown out), data is saved to the storage system vault disks, not lost. However, when the iDAE is powered up again, it will take longer to come online because it first must write the vault disk data to the correct LUNs.

➤ **To turn off power correctly**

1. Stop any I/O activity to the iDAE.

2. If the server connected to the iDAE is running the UNIX® operating system, unmount the file systems.

3. If the iDAE does not have SPS protection, shut off power to the ac distribution strips that supply the iDAE.

   The power in the distribution strips may be controlled by a circuit breaker located inside the cabinet (if the cabinet has such breakers) or may be controlled by a circuit breaker located externally to the cabinet.

SPS circuit breaker
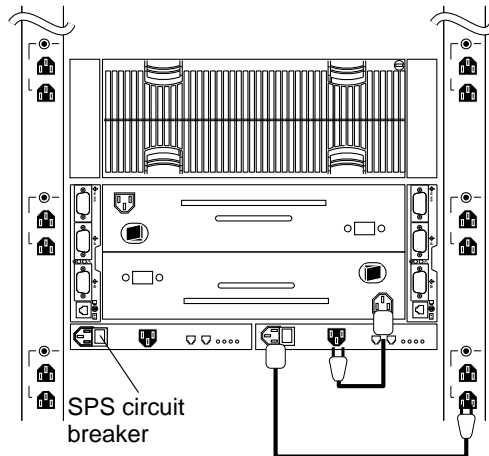
4. If the iDAE has SPS protection, use the circuit breaker on each SPS to turn off power.

   When you turn off power to a storage system with an SPS, the On Battery light may come on for a maximum of 90 seconds during which time the iDAE will continue to run. This is a normal condition. Wait for the light to go off and the fans to stop before proceeding with further service to the storage system.

   IMPORTANT Never remove the fan pack and then shut off the power supply to shut down an iDAE. Doing that effectively cuts out the SPS and write cache data cannot be saved to the vault drives, resulting in a cache dirty condition (data loss). When that happens, LUNs become inaccessible and the unsolicited event log displays a message similar to: "`Enclosure 0 Disk 5 0x90a (Can't Assign – Cache Dirty) 0 0xafb40 0x14362c.`" Navisphere will show that the inaccessible LUNs are unowned. Contact the storage-system manufacturer or distributor if this situation occurs. The LUNs may need to be unbound and rebound.

➤ **To turn on power**
Reverse the steps to powerup the iDAE.

Binding disk modules into groups

After cabling an iDAE and any DAEs, you can bind disk modules into LUNs and set up storage-system caching using Navisphere Manager, Navisphere Supervisor, or Navisphere CLI (command line interface).

□ □ □

3   Servicing and upgrading an iDAE

This chapter describes how to monitor iDAE status, handle CRUs, and replace or add a CRU. Topics are

- Hot swapping components

- Monitoring iDAE status

- Handling CRUs

- Replacing or adding a disk module

- Removing an SP or an SP filler module

- Installing or removing the SP memory module

- Installing an SP or SP filler module

- Replacing the drive fan pack

- Replacing or adding a power supply

  IMPORTANT   The iDAE requires specific power supplies. Installing an older model power supply into an iDAE is not supported and will not work.

  You can upgrade individual DAE or JBOD (Just-a-Bunch-Of-Disks) storage systems to an iDAE storage system. For more information, contact your service provider.

Hot swapping components

The iDAE is designed for continuous operation, and it should always be powered up. You should replace any disk module, redundant SP, redundant power supply, or fan pack while the iDAE is running.

During normal iDAE operation, all compartments should contain either a module or filler, and the front door should be closed. This ensures EMI compliance and proper air flow (cooling) within the unit.

Monitoring iDAE status

Status lights on the iDAE and its CRUs indicate error conditions. These lights are visible outside the iDAE. Some lights are visible from the front, and others from the back. The following figure and table describes the status lights.

IMPORTANT The iDAE enclosure address must be set to 0 (zero).

Status lights visible from the front of the iDAE

Light	Quantity	Color	Meaning
iDAE Power	1	Green	On when the iDAE is powered up.
iDAE System Check	1	Amber	On when any fault condition exists.
Disk Active	1 per disk module slot	Green	Off when the disk module slot is empty or contains a filler module.
			Flashing *(mostly off)* when the drive is powered up but not spinning; this is a normal part of the spin-up sequence, occurring during the spin-up delay of a slot.
			Flashing *(at a constant rate)* when the disk drive is spinning up or spinning down normally.
			On when the drive is spinning but not handling any I/O activity (the ready state).
			Flashing *(mostly on)* when the disk drive is spinning and handling I/O activity.
Disk Check	1 per disk module slot	Amber	On when the disk module is faulty, or as an indication to remove the drive.
Enclosure Address	12	Green	The enclosure address for the iDAE must be set to 0 (zero), the only enclosure address that is valid for the iDAE.

Status lights visible at the back of the iDAE

Light	Quantity	Color	Meaning
Active	1 per SP	Green	On when the SP is powered up.
SP Check	1 per SP	Amber	On when either the SP or a Fibre Channel connection is faulty.
Power Supply Active	1 per supply	Green	On when the power supply is operating.
Power Supply Check	1 per supply	Amber	On when the power supply is faulty or is not receiving proper ac line voltage.
Cooling Check	1 per supply	Amber	Flashing when either multiple fans in the drive fan pack are faulty or the drive fan pack is removed. The SP powers down the disk drives and goes into standby mode when the fault persists for more than about two minutes.
Drive Fan Pack Check	1 on drive fan pack	Yellow	On when a fan in the drive fan pack is faulty.

If the SP Check light is on, you should look at the other Check lights to determine which CRU is faulty. If a check light on a CRU remains on, you should replace that CRU as soon as possible.

If a nonredundant CRU fails in an iDAE, the system may be inoperable while you replace the CRU. If a redundant CRU fails, high availability will be compromised until you replace the faulty CRU.

Handling CRUs

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

Power issues and CRUs

The iDAE is designed for continuous operation and to be hot repairable. It should always be powered up. You can replace any disk module, redundant SP, redundant power supply, or the fan pack while the iDAE is running.

Its front door should be closed and each of its compartments should contain a CRU or filler panel to ensure EMI compliance and proper air flow over the CRUs.

While the iDAE is powered up, you can service or replace any CRU. You should not remove a faulty CRU until you have a replacement available.

IMPORTANT You can remove the drive fan pack while the iDAE is powered up. While the pack is removed, the Cooling check light on the power supply flashes. If the pack is removed for more than 2 minutes, the disk modules power down and the each SP goes into standby mode. When you reinstall the drive fan pack, The disk modules power up and each SP goes into active mode.

Since you can replace or add any CRU without sliding the iDAE out of the cabinet, you do *not* have to use cabinet anti-tip devices when you upgrade or service an iDAE.

If you need to power down an iDAE, refer to the power down procedure on page 3-12.

Avoiding electrostatic discharge (ESD) damage

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

> **IMPORTANT** Read and understand the following instructions.

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

- Do not remove replacement or upgrade CRUs from their antistatic packaging until you are ready to install them.

- Gather together the ESD kit and all other materials you will need before you service an iDAE. 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 CRU. 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 iDAE. To use it, attach the clip of the ESD wristband (strap) to any bare (unpainted) metal on the iDAE 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.

> **IMPORTANT** 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 CRU, touch a bare (unpainted) metal surface of the cabinet or enclosure.

- Before removing any CRU from its antistatic bag, place one hand firmly on a bare metal surface of the enclosure, and at the same time, pick up the CRU 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 CRU.

- When you remove a CRU 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 CRU, first place the CRU back in the antistatic bag. When you are ready again to install the CRU, repeat these procedures.

Precautions when removing, installing, or storing CRUs

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

- Do not remove a faulty CRU until you have a replacement available.

- Handle a CRU only when using an ESD wristband as follows: attach the clip of the ESD wristband to the ESD bracket or bare metal on the iDAE enclosure, and put the wristband around your wrist with the metal button against your skin.

- Handle CRUs gently. A sudden jar, drop, or vibration can permanently damage a CRU.

- Never use excessive force to remove or install a CRU.

- Store a CRU in the anti-static bag and specially designed shipping container in which you received it. Use that container if you need to return the CRU for repair.

- Maintain the location where you store CRUs within the limits specified in Appendix A.

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 a length of 6 to 12 inches.

- Do not use optical cables to support weight (including long cables 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 cable so that is not stepped on or rolled over by anything.

Replacing or adding a disk module

IMPORTANT If you have any *previously used* disk modules that you want to use as spares, contact your service provider for assistance.

CAUTION   *When replacing or adding a disk module, observe the following:*

- *Remove or install disk modules while the storage system is powered up.*

- *Do not move a disk module, that is part of an existing LUN, to another slot in the storage system. If you do, you risk destroying the storage system beyond recovery, or data loss at the very least. Each disk module has LUN identification information assigned to it when it is bound. Moving it to another slot can make the information stored on the disk module from the original LUN inaccessible. If you must move a disk module to another slot, unbind the LUN first; unbinding destroys all data on the LUN.*

- *A disk module must be inserted all the way or removed entirely. Do not leave a disk module partially removed except for periods when you are allowing it to spin down. A disk module being inserted or removed may be damaged by a partially removed adjacent module.*

- *Handle a disk module gently and use an ESD wristband. Do not remove a faulty disk module until you have a replacement module (with the same part number) or a filler module available. The part number (PN005xxxxxx) appears on the top or bottom of the module. A replacement or add-on disk module should have the same format (520- or 512-byte sectors) and the same capacity (size & speed) as the other modules in the enclosure.*

- *When removing or installing multiple disk modules, after removing or installing one, wait for the activity lights on the other disk modules to resume a steady flicker before removing or installing the next module. The activity lights show that the LIC (licensed internal code) has rediscovered the FC loop.*

IMPORTANT You must open the iDAE's front door to access the disk modules. The door must be closed for EMI compliance when the iDAE is powered up. Open it only to replace or add a disk module.

➤ **To unlock and open the front door**
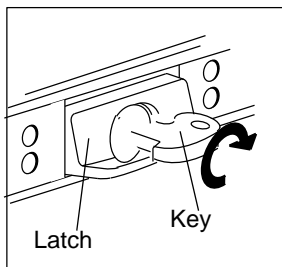
CAUTION Do not force the door open.
If the door snaps off the hinges, re-install it by
positioning it at a 45° angle to the enclosure and
snapping it into the hinge openings.

Latch

Key

Latch

Latch

A. If the door is locked
- Insert the key in the door's latch.
- Turn the key 180° clockwise.
- Remove the key, if desired. (If you do not remove the key, it may fall to the floor after you open the door.)

B. Press the door latch.

C. Lower the door until it is perpendicular to the font of the enclosure.
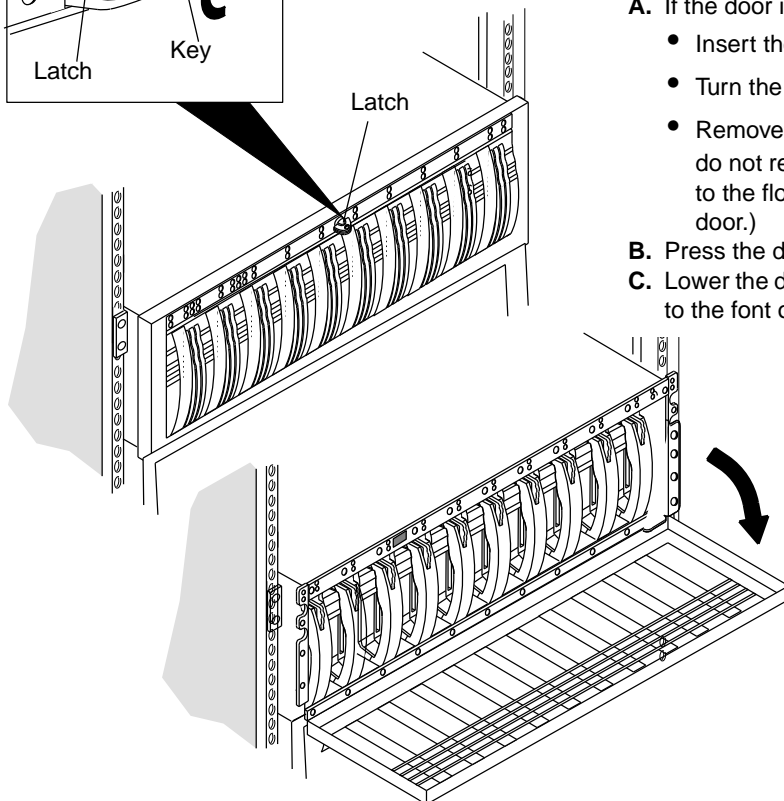
If you are adding a new disk module, continue to the disk filler module removal procedure that follows. If you are replacing a faulty disk module, proceed to the disk module removal procedure.

➤ **To remove a disk filler module**

Locate the slot where you want to install the disk module, and remove the filler module, as shown next.

Removing a disk filler module

Latch

A. Grasp the disk filler module's handle so that your thumb is on the latch.

B. Push the latch, and pull the disk filler module from the enclosure.
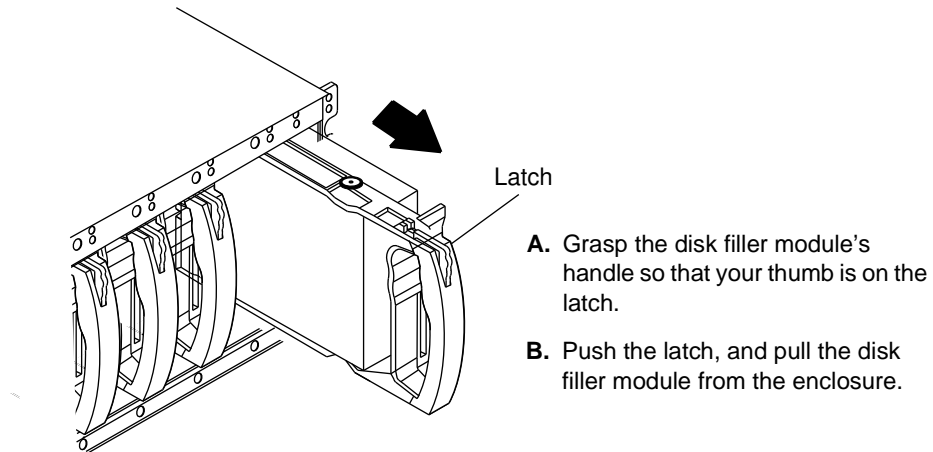
Skip to the disk installation procedure (page 3-9) to install the add-on disk module in the slot you just emptied.

➤ **To remove a disk module**

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

Generally, you should not remove a disk module unless its amber check light is on. Remove the disk module from the slot, as shown next.

Removing a disk module

Latch

A. Grasp the disk module's handle so that your thumb is on the latch.

B. If the active light is on steadily, push the latch, and slowly pull the module about 1 inch (3 cm) from its slot. Wait 30 seconds for the disk to stop spinning. Then remove the module.

If the active light is off or mostly off you do not need to wait for the disk to stop spinning. Push the latch and slowly pull the module from its slot.
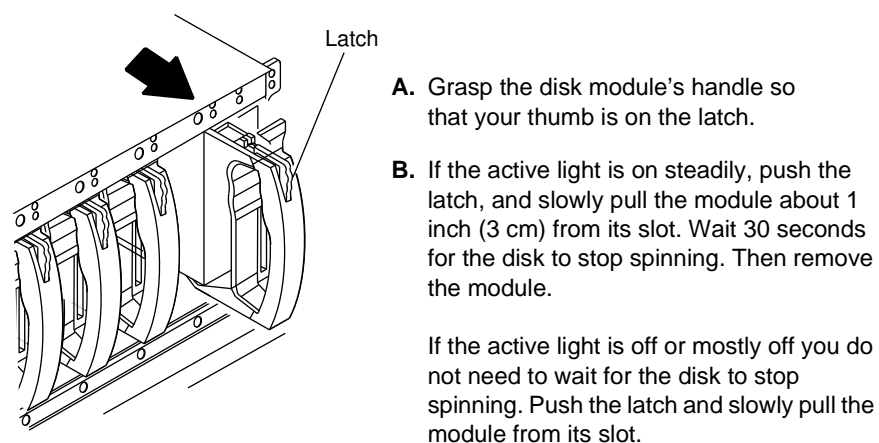
Continue to the next section to install the replacement disk module.

➤ **To install a disk or filler module**

1. *Gently* insert the disk module as follows:

   Installing a disk or filler module
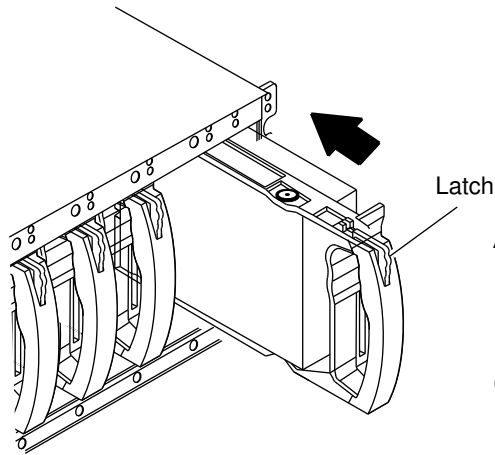
   Latch

   A. Grasp the disk or filler module's handle.

   B. Align the module with the guides in the slot.

   C. Gently push the module into the slot until the latch engages.

   The disk module's Active light flashes to reflect the disk's spin-up sequence. (No lights flash with a filler module.)

2. Remove and store the ESD wristband and continue to the next section to close the front door.

➤ **To close and lock the front door**
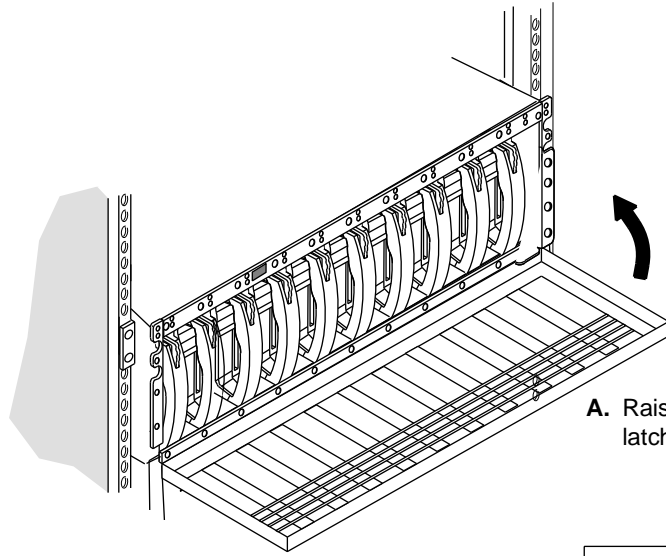
A. Raise the door until it latches into place.

B. If desired, lock the door as follows:

- Insert the key into the door latch.
- Turn the key 180° counterclockwise.
- Remove the key, if desired.

Latch   Key

Latch
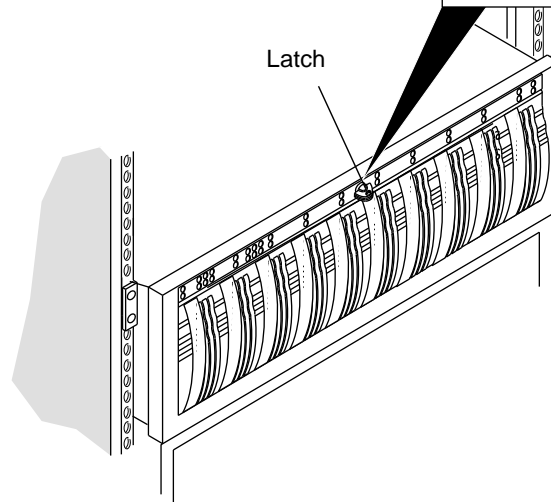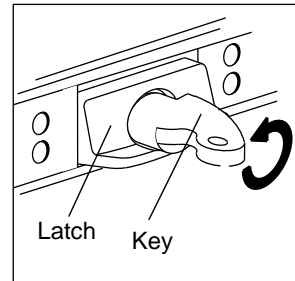
Removing an SP or an SP filler module

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

IMPORTANT An iDAE must have at least one SP installed while it is powered up. Do not remove both SPs while the iDAE is powered up.

Before removing an SP from a storage system that has caching enabled, you should disable the storage-system cache using a utility described in the server setup manual.

➤   **To remove an SP or an SP filler module**

1. If you are removing an SP filler module, ignore this step and proceed to step 2 on the next page; otherwise, remove the copper or optical cables connected to the SP, as shown below. (Also, if connected, remove the serial line with the RJ-style connector.)

    IMPORTANT Note where the cable(s) connect to the SP.

    Removing a copper cable(s) from an SP
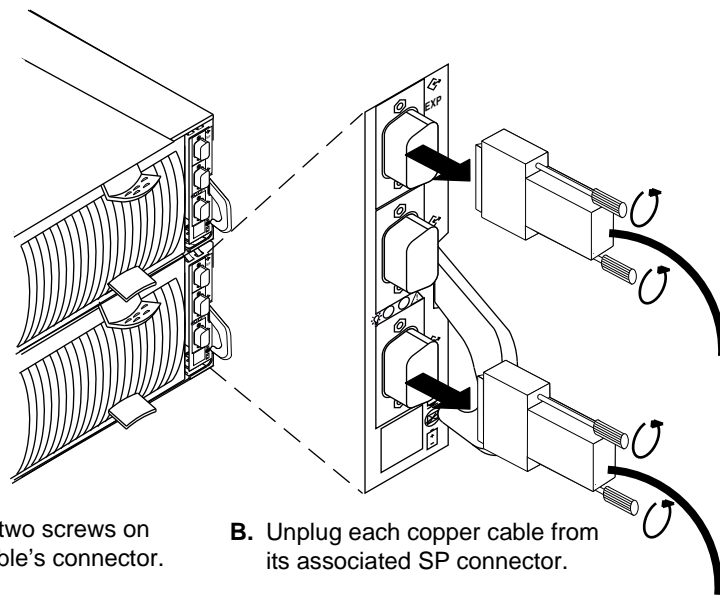
A. Loosen two screws on each cable's connector.

B. Unplug each copper cable from its associated SP connector.

Removing an optical cable(s) and MIA(s) from an SP

A. Unplug each optical cable from it's associated MIA and put the cover(s) on the optical connector.

B. Loosen two captive screws on each MIA.

C. Unplug each MIA from its associated SP connector.
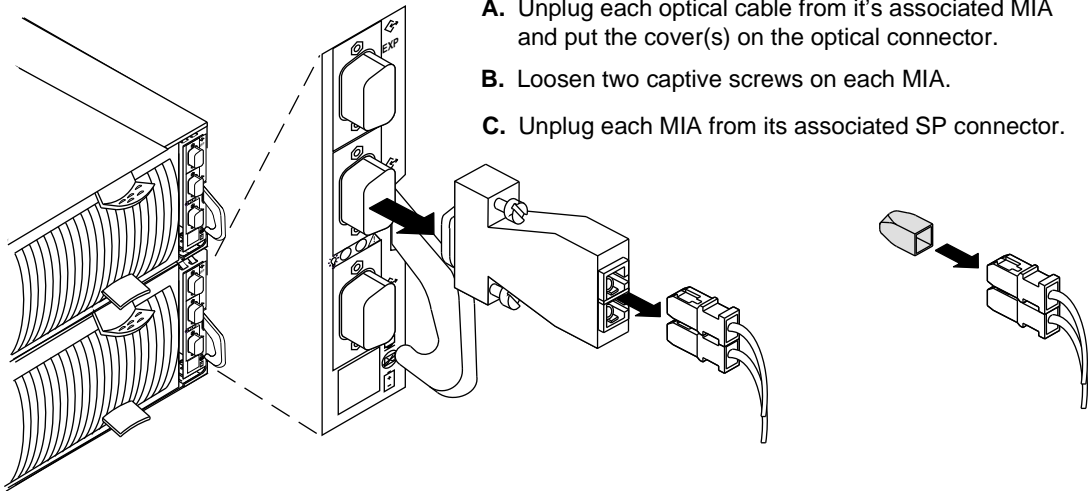
2. Remove the SP or SP filler module from its slot as shown below.

Removing an SP or an SP filler module

Latch up

A. Pull up the latch on the SP.

B. Grasp the SP and gently pull it out of the slot
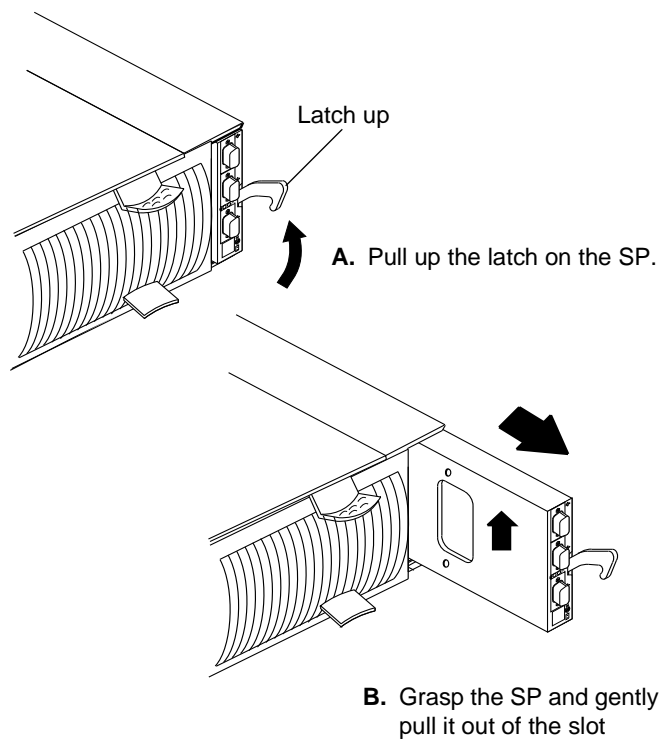
Continue to the next section to install the memory on the SP.

Installing or removing the SP memory module

When you order an SP, the DIMM memory you order ships with the SP. If the memory is not installed on the SP, you must install it before installing the SP.

To ship an SP or upgrade its memory module, you must remove the memory modules from the SP board.

➤ **To install or remove an SP memory module**

1. Read the "Avoiding electrostatic discharge (ESD) damage" section (page 3-4).

2. Attach the clip of the ESD wristband to any bare (unpainted) metal on the iDAE enclosure; then put the wristband around your wrist with the metal button against your skin.

3. Remove the memory module (or the new SP board and memory module) from its packaging, and place it on a static-free work surface.

4. If you are upgrading an SP, remove the SP from the enclosure (page 3-11), and place it on a static-free work surface.

5. On the SP, remove and/or install the DIMM in the appropriate connector as shown next.

   IMPORTANT A memory module has a notch on its edge near pin 1 so that you can insert it only one way.

Removing the memory module from the SP

A. Use your thumbs to push out on the locking tabs, and use your fingers to push the DIMM forward until it releases from the tabs.

B. Lift the module out of the connector, and place it in its own antistatic packaging.

Locking tab

Locking tab

Alignment notch
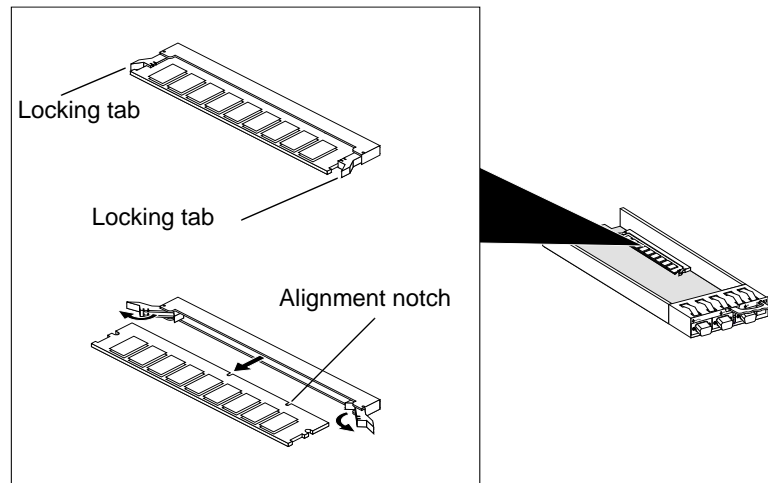
IMPORTANT Depending on the memory size (in megabytes), the iDAE SP memory module can contain chips on only one side or on both sides.

Installing the memory module on the SP

A. Lift the module out of its antistatic packaging and place the module into the connector.

B. Ensure that the alignment notch is correctly oriented.

C. Use your fingers to push out on the locking tabs, and use your thumbs to push the module in until seated. Then engage the tabs.

Locking tab

Alignment notch

Locking tab
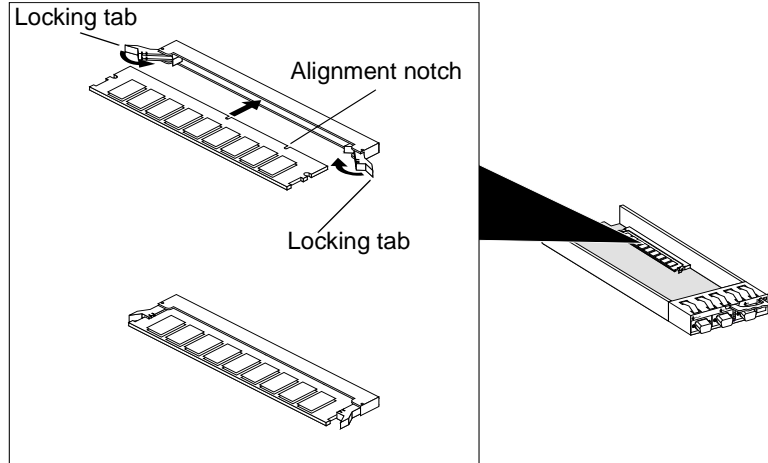
6. If you want to install the SP, continue to the next section.

If you want to ship the SP, store it in its antistatic bag and special shipping package. Then remove and store the ESD wristband.

Installing an SP or an SP filler module

IMPORTANT If you are installing a new/add-on/replacement SP, ensure that the SP memory has been installed before proceeding to install the SP.

Each SP requires a unique FC-AL address ID on the loop to communicate with a server/host. If you are installing a replacement SP, set its address to be the same as that of the SP you removed. If you are installing an add-on SP, set the address to a different setting than the address of any other SP on the loop. The FC-AL protocol translates the FC-AL address ID into an 8-bit arbitrated loop physical address (ALPA).

IMPORTANT Each SP's FC-AL ID must be unique on the FC-AL loop. If you have two FC-AL loops, we suggest a unique FC-AL address ID for each SP on both loops.

The valid FC-AL address ID range is a number 0 through 125 decimal, which is 0 through 7D hexadecimal. The following figures and table locate the switches and show how to select ID numbers using them.

IMPORTANT You must set the FC-AL address ID on the SP before you install it. If you are installing an SP filler module, ignore step 1 and proceed to step 2 on the next page.

1. Using the SP FC-AL ID switches, set the FC-AL address ID as shown below.

FC-AL address ID switch locations (on SP printed circuit board)

Location of switches

SP FC-AL address ID switches
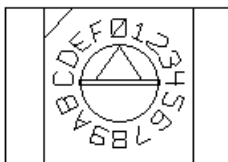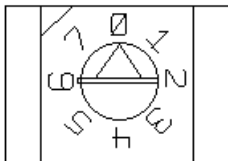
For address ID	Set top switch to	Set bottom switch to
0	0	0
1	0	1
.	.	.
.	.	.
.	.	.
15	0	F
16	1	0
.	.	.
.	.	.
.	.	.
29	1	D

2. *Gently* insert the SP or SP filler module as shown below.

Installing an SP or an SP filler module

Latch up

A. Pull up the latch on the SP.

B. Align the SP with the guide on the slot.

C. Gently slide the SP into the slot.

D. Push down the latch until the
SP is fully seated in the slot.

Latch down
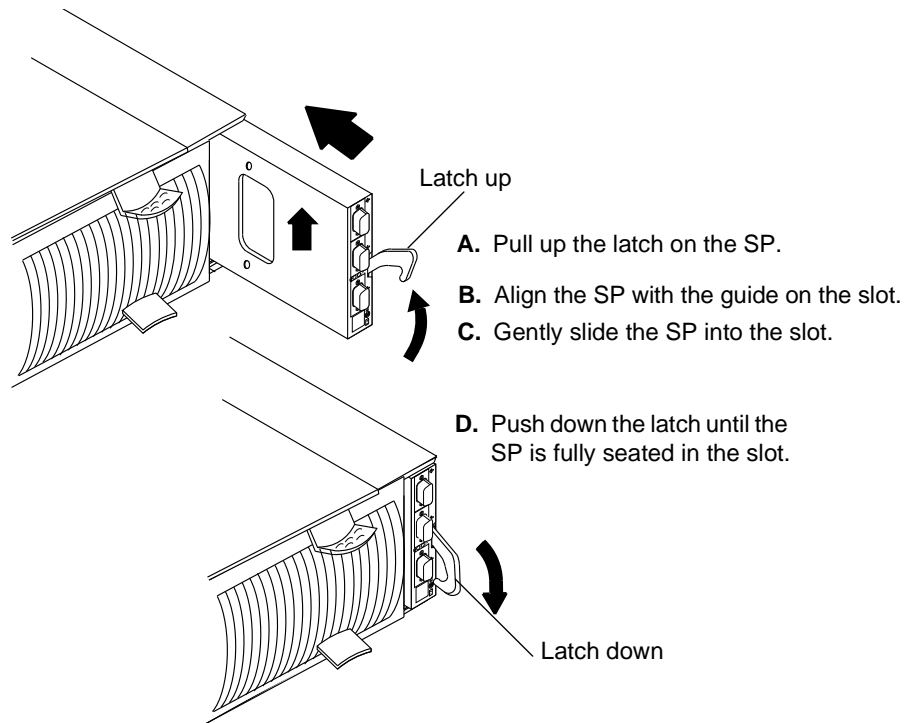
If you just installed an SP filler module, you are done. Remove and store
the ESD wristband.

If you just installed a replacement or add-on SP, the SP Active light
turns on. Continue to step 3 on the next page.

3. Install the copper or optical cables connected to the SP (and if required,
the serial line with the RJ-style connector):

Installing a copper cable on an SP

Port B

Port A

A. Plug the copper cable(s) from the
server, hub, or other FC device into
port(s) A and/or B on the SP.

B. Tighten the two screws on each
cable connector.

RJ-style connector for
serial connection to an
SPS or a console

To server, hub, or other FC device
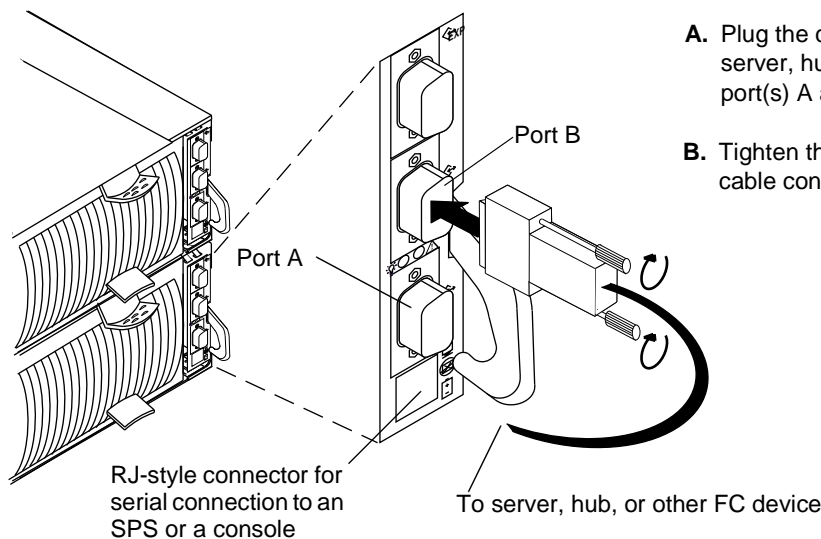
Installing an optical cable and MIA to an SP

> **IMPORTANT** You can use optical and copper cable connections for the SP-to-host connection (Ports **A** and **B** on the SP). You can use only copper cable for the SP-to-DAE connection on the expansionport (**EXP**). The figure below depicts an optical SP-to-host connection on port **A**.

An improper MIA-to-optical cable connection can result in loop connection problems. When connecting the optical cables to the MIA, push the cable in as far as it will go to ensure that it is properly seated. When you do, you should hear one or more clicks, which indicates a positive connection.

Port B

Port A

Typical MIA

RJ-style connector for serial connection to an SPS or a console

To server, hub, or other FC device

A. Plug the MIA into port(s) A and/or B on the SP.

B. Tighten the two screws on each MIA.

C. Remove the cover(s) from each optical cable and plug the optical cable into the MIA.
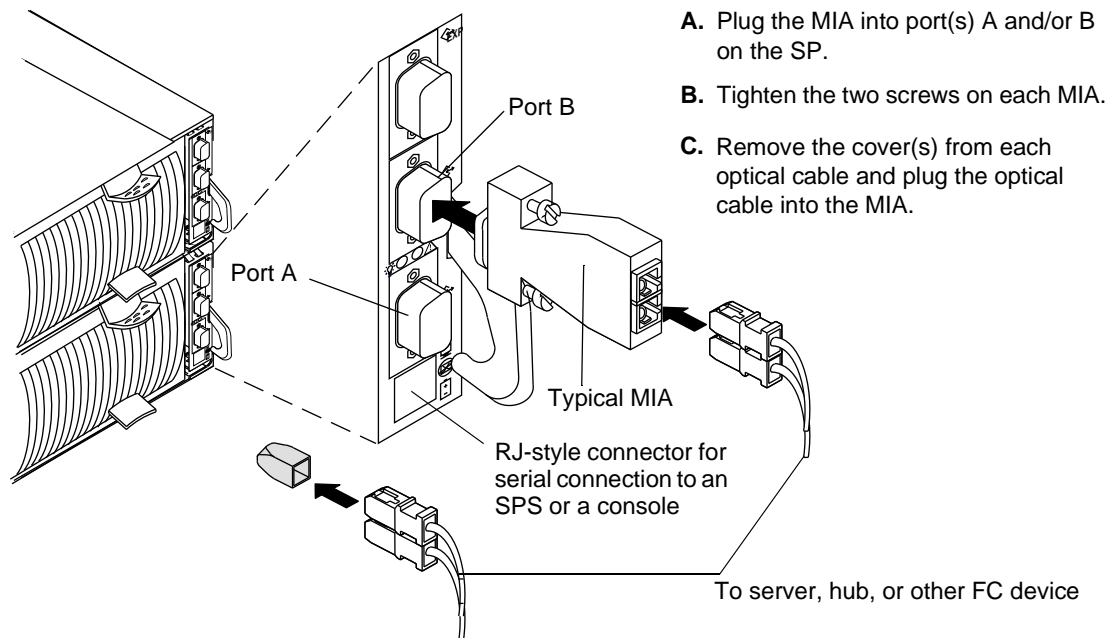
4. Remove and store the ESD wristband.

Replacing the drive fan pack

CAUTION   *Handle a drive fan pack gently and use an ESD wristband. Do not remove a faulty drive fan pack until you have a replacement unit available. You can remove the drive fan pack while the iDAE is powered up. While the pack is removed, the Cooling Check light on the power supply flashes. If the pack is removed for more than two minutes, the disk modules power down and the SP(s) go into standby mode. The disk modules power up when you reinstall the drive fan pack.*

➤   **To remove the drive fan pack**

> **IMPORTANT** The iDAE requires specific power supplies. Installing an older model power supply into an iDAE is not supported and will not work.

Removing the drive fan pack
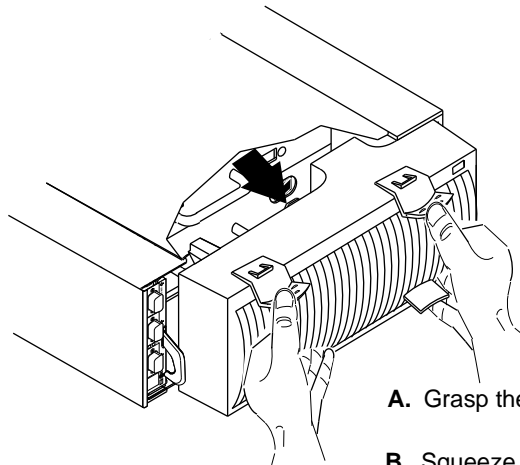
A. Grasp the latches on the drive fan pack.

B. Squeeze the latches together and pull the fan pack from the enclosure.

As soon as the pack is disconnected from each power supply, the drive fan pack Check light turns off, if it was not already off; the iDAE Check light on the front panel turns on, if it was not already on; and the Cooling Check light on each power supply flashes.

➤ **To install the drive fan pack**

You can install the drive fan pack in either horizontal orientation. However, we recommend that you install it with the status light in the upper right corner.

Installing the drive fan pack
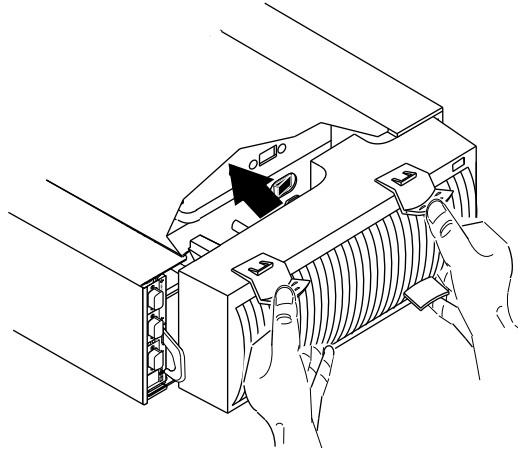
A. Grasp the latches on the drive fan pack.

B. Squeeze the latches together and gently push the fan pack into the enclosure until it clicks in place.

As soon as the pack is in place, the fans start spinning; the iDAE Check light turns off if no other CRUs are faulty, and the Cooling Check light on each power supply turns off.

Replacing or adding a power supply module

CAUTION   *To access the power supplies, you must remove the drive fan pack. If the drive fan pack is removed for more than approximately two minutes, the disk modules power down and the SP(s) go into standby mode. The disk modules power up when you reinstall the drive fan pack.*

Handle a power supply gently and use an ESD wristband. Do not remove a power supply until you have a replacement supply or filler module available.

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

If you are adding a new power supply, continue to the procedure that follows. If you are replacing a faulty power supply, proceed to the power-supply removal procedure as shown on page 3-21.

IMPORTANT The iDAE requires specific power supplies. Installing an older model power supply into an iDAE is not supported and will not work.

➤ **To remove a power-supply filler module**

1. Remove the drive fan pack as shown on page 3-18.

2. Remove the power-supply filler module as shown below.

Removing the bottom power-supply filler module
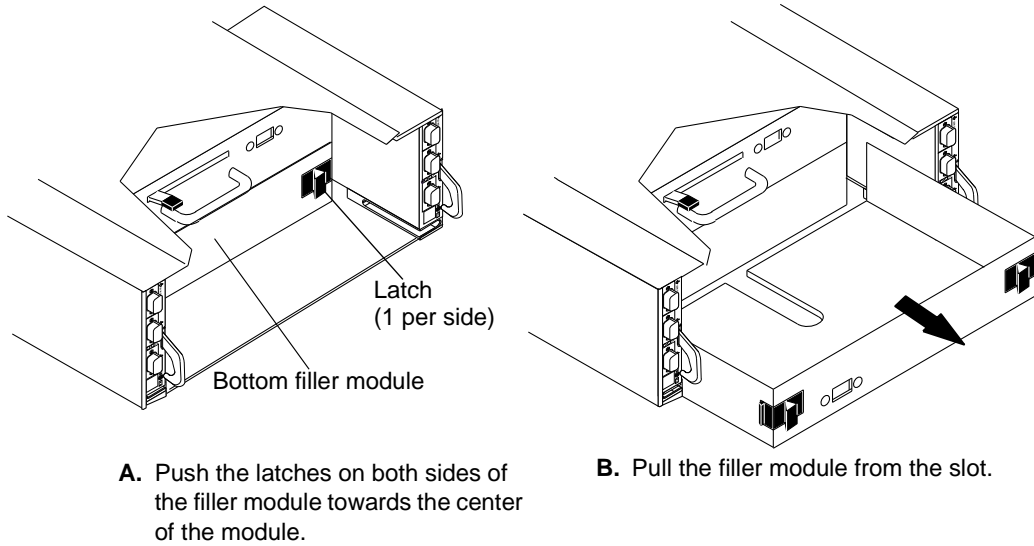
A. Push the latches on both sides of the filler module towards the center of the module.

B. Pull the filler module from the slot.

Removing the top power-supply filler module

A. Push the latches on both sides of the filler module towards the center of the module.

B. Pull the filler module from the slot.
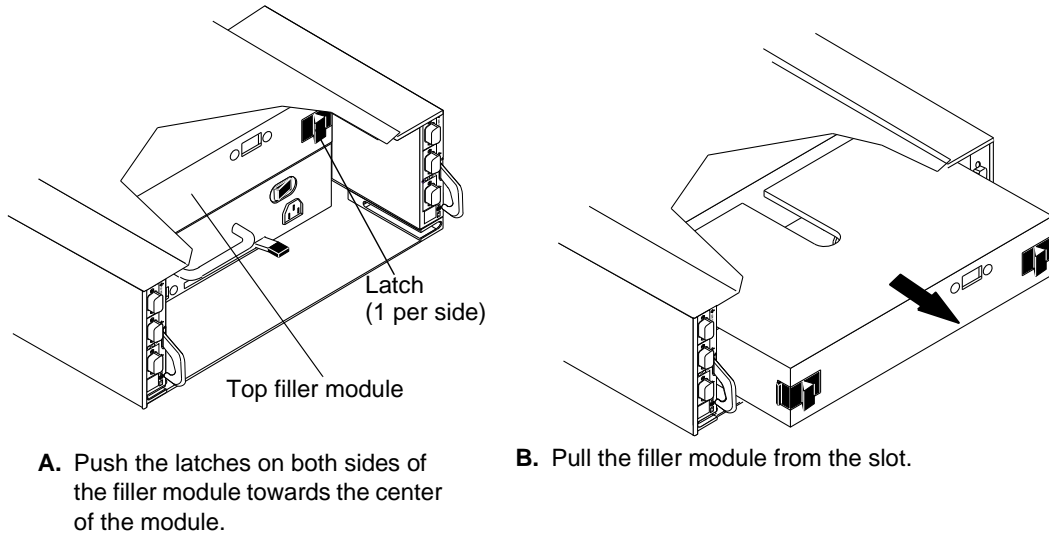
Continue to the power-supply installation procedure (page 3-24) to install the add-on power supply in the slot from which you removed the filler module.

➤ **To remove a power supply**

CAUTION   *Turn off the power supply before unplugging the power cord from the supply or removing the supply from the enclosure.*

1. Remove the drive fan pack as shown on page 3-18.

2. Turn off the power supply and unplug its ac line cord as shown below.

Turning off a supply's power and unplugging its ac power cord

Bottom power supply   **Top power supply**

Channel

Channel

ac receptacle   Power switch

Power switch   ac power cord
(right-angle plug)
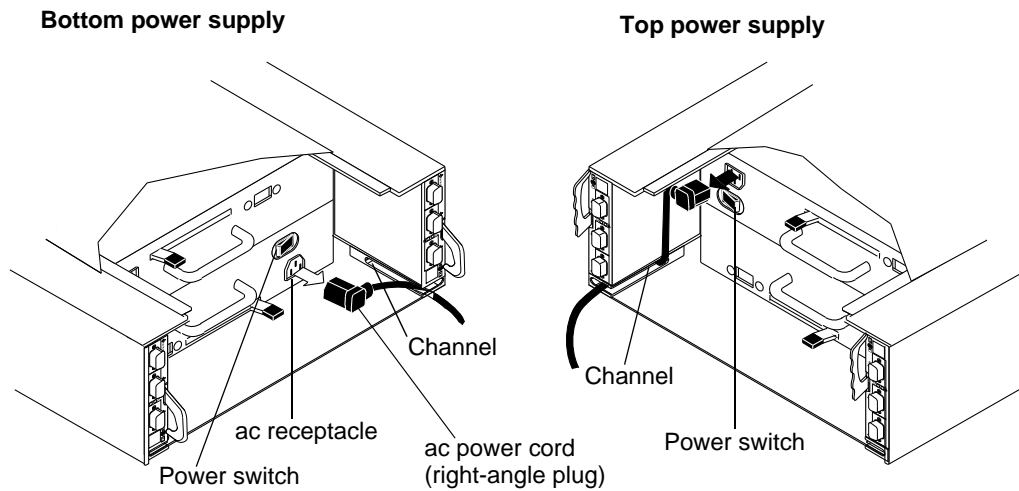
For the power supply to be removed:

A. Set the supply's power switch to the off (0) position.

B. Unplug the ac power cord from the supply's receptacle.

C. Remove the cord from the enclosure.

3. Remove the power supply as shown below.

Removing the top power supply
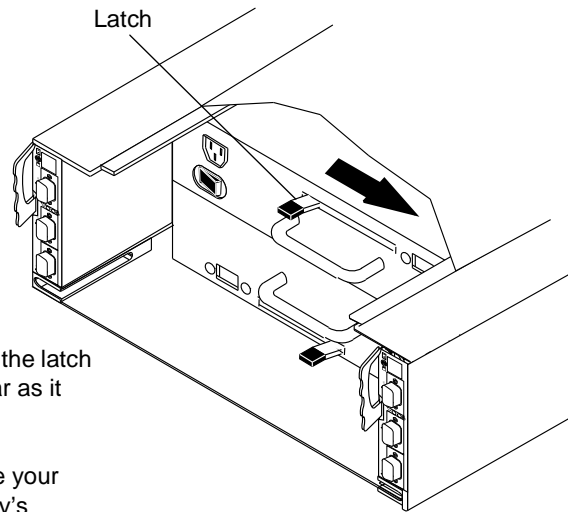
Latch

A. With your thumb, push the latch up, and then right as far as it goes.

You may need to brace your hand against the supply's handle.
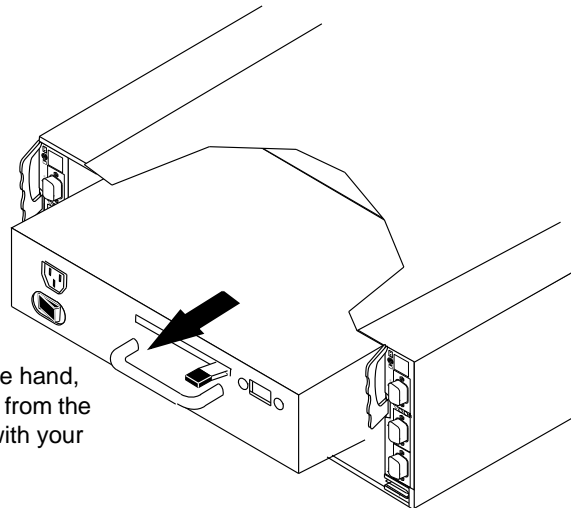
B. Grasp the handle with one hand, and gently pull the supply from the enclosure, supporting it with your other hand.

Removing the bottom power supply

A. With your thumb, push the latch down, and then left as far as it goes.

You may need to brace your hand against the supply's handle.

Latch

B. Grasp the handle with one hand, and gently pull the supply from the enclosure, supporting it with your other hand.
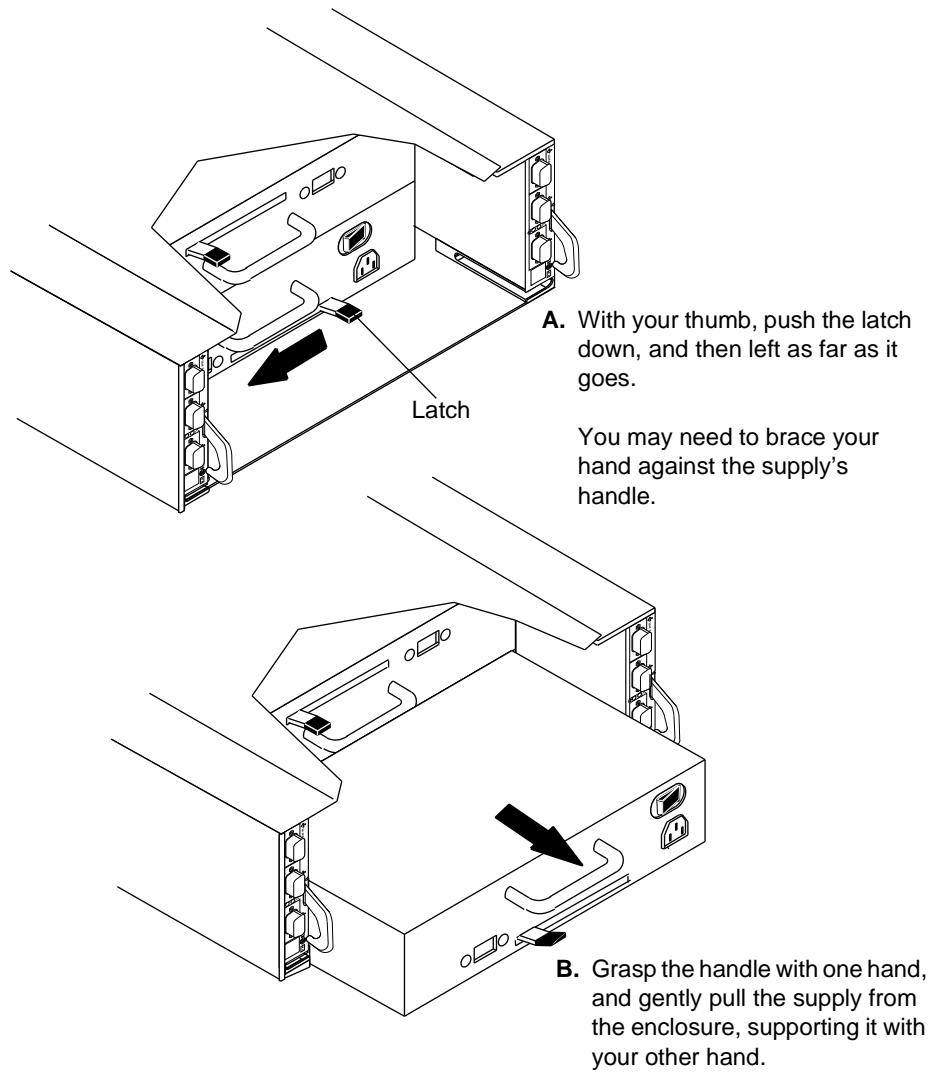
Continue to the power-supply installation procedure that follows to install the replacement supply.

➤ **To install a power supply**

> **IMPORTANT** The iDAE requires specific power supplies. Installing an older model power supply into an iDAE is not supported and will not work.

1. *Gently* insert the new power supply into the enclosure, as shown below.

> **IMPORTANT** The power supply in the top slot is inverted with respect to the power supply in the bottom slot.

Installing the bottom power supply
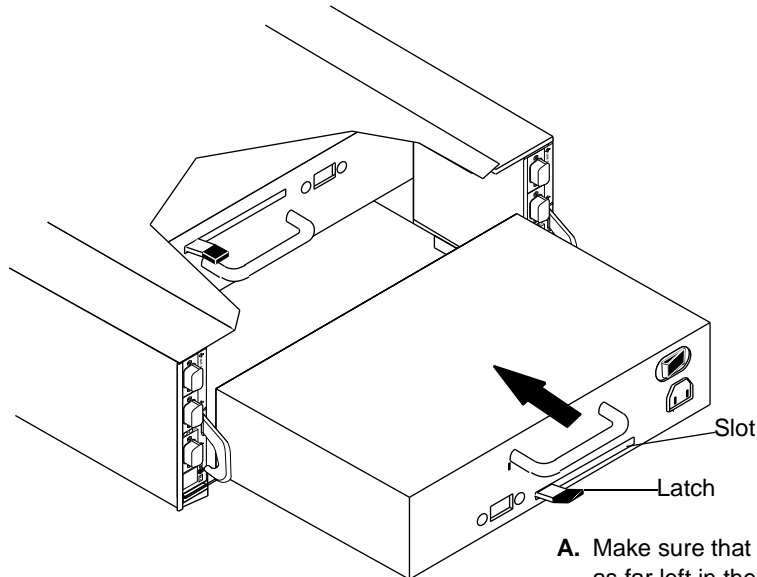
Slot

Latch

A. Make sure that the supply's latch is as far left in the slot as possible.

B. Align the supply with the enclosure slot and gently push into the slot until the latch moves to the middle of the slot.
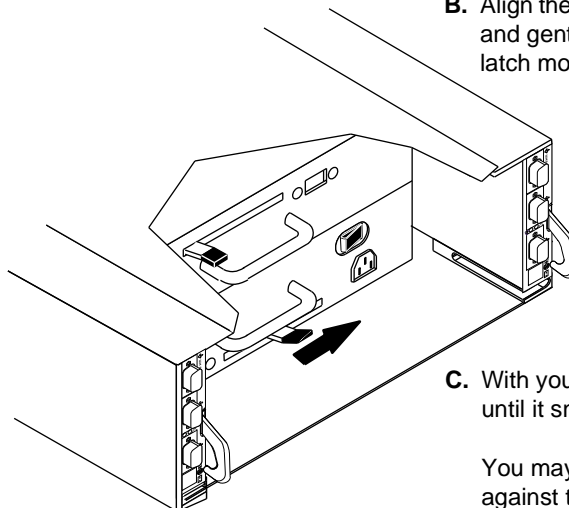
C. With your thumb, push the latch right until it snaps up.

You may need to brace your hand against the supply's handle.

Installing the top power supply
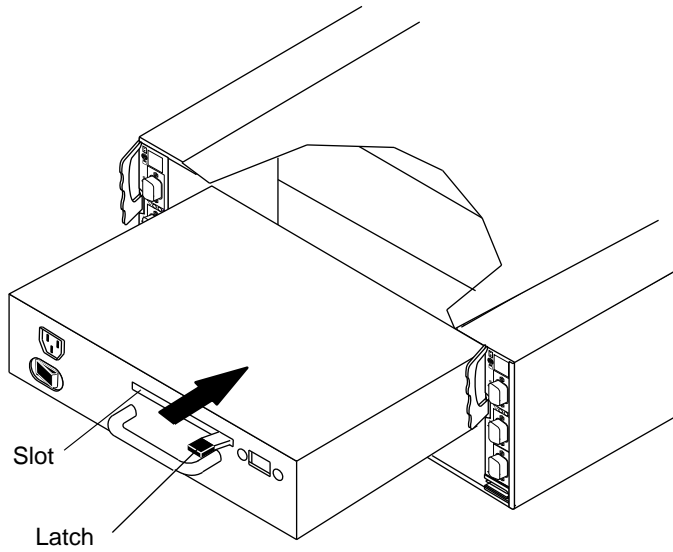
Slot

Latch

A. Make sure that the supply's latch is as far right in the slot as possible.

B. Align the supply with the enclosure slot and gently push into the slot until the latch moves to the middle of the slot.
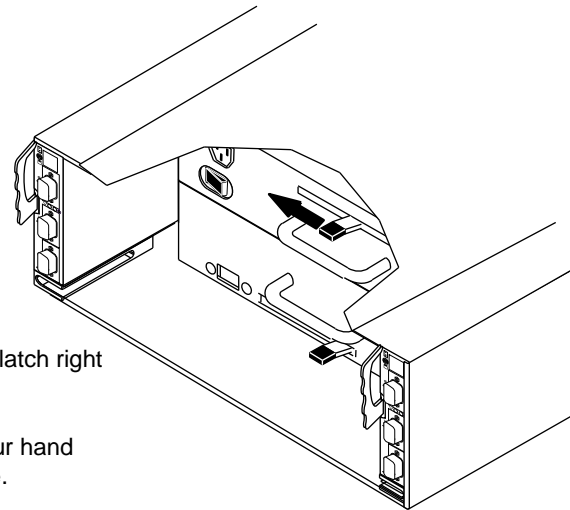
C. With your thumb, push the latch right until it snaps down.

You may need to brace your hand against the supply's handle.

2. Plug the ac power cord into the new supply, and turn on the power supply as shown below.

Plugging the ac power cord into the supply and turning power on
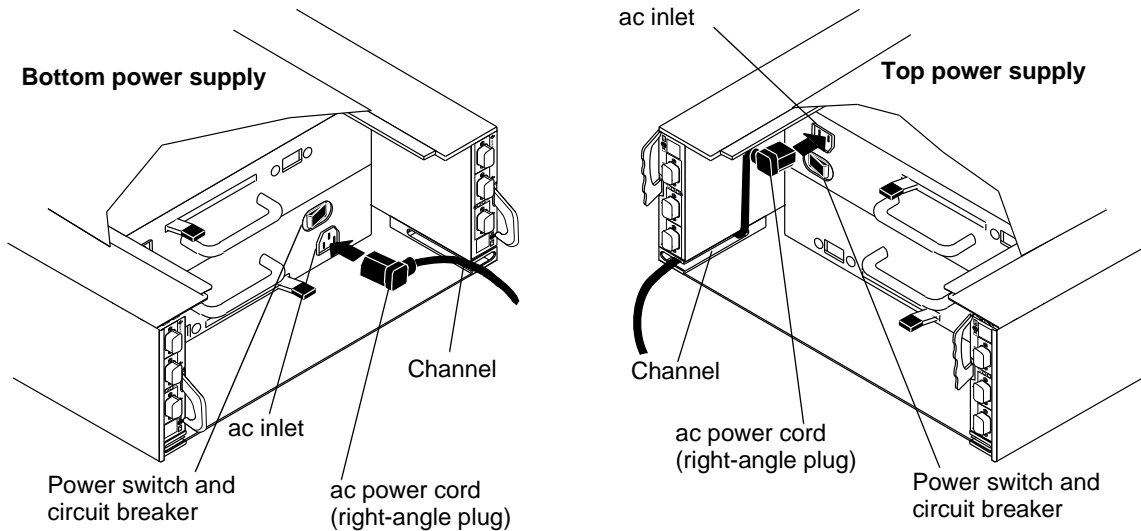
For each power supply:

A. Insert the right-angle plug on the ac line cord into the supply's ac inlet

B. Route the cord along the power supply to the side of the enclosure.

   IMPORTANT: The cord must not occupy the drive fan pack space.

C. Bend the cord into a U shape and slide the U into the channel so the end of the cable comes out of the channel at the back of the enclosure.

D. Plug the end of the cord into one of the cabinet's power outlets.

E. Set the supply's power switch to the on (1) position.

3. Reinstall the drive fan pack as shown on page 3-18.

☐ ☐ ☐

A Technical specifications and operating limits

This appendix describes the iDAE technical specifications, operating limits, and shipping and storage requirements.

Technical specifications

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

ac power requirements

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

- the values for the line cord of an iDAE with a single power supply, or

- the total values shared by the line cords of two power supplies in the same iDAE, with the division between the line cords and supplies at the current sharing ratio.

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

Requirement	Description
ac line voltage	100 to 240 Vac $\pm$10%, single phase, 47 to 63 Hz
ac line current	4.0 A max estimate at 100 V (fully configured)
Power consumption	400 VA max estimate (fully configured)
Power dissipation	392 W max estimate (fully configured)
Power factor	0.98 min at full load, low voltage
Heat dissipation	1411×10^3 J/hr (1340 BTU/hr) max estimate
In-rush current	25 A max estimate for 1/2 line cycle, per power supply
ac protection	8 A thermal circuit breaker on each power supply
ac inlet type	IEC320-C14 appliance coupler
Hold-up time	10 ms min at 50 Hz
Current sharing	60% max, 40% min

Size and weight

Item	Measurement
Height	5.41 cm (6.07 in) 3.5 NEMA units including mounting hardware
Width	44.5 cm (17.5 in)
Depth	63.27 cm (24 .91 in) front door to back of drive fan pack 60.43 cm (23.79 in) chassis front to back of drive fan pack 57.25 cm (22.54 in) rail front to back od drive fan pack
Weight	36.0 kg (80.0 lbs) highly available max 1.05 kg (2.3 lbs) disk module 0.68 kg (1.5 lbs) storage processor 3.8 kg (8.5 lbs) power supply 1.8 kg (4.0 lbs) drive fan pack

Drive type

3.5-inch drives, Fibre Channel interface, 1.0-inches (2.54 cm) or 1.6-inches (4.06 cm) tall.

Disk module address
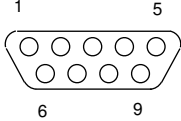
Each disk module on a Fibre Channel loop has a unique physical address. This address is derived from the enclosure address (EA, which must be set to 0 for an iDAE) as follows:

Fibre Channel loop physical address = (10 multiplied by EA) + (slot address)

where the slot address is number of the slot (0-9) containing the disk module (numbered from left to right, as viewed from the front of the enclosure).

A-3

SP FC-AL interface

Connector - shielded DB-9 receptacle with pinouts as follows.

Connector diagram	Pin	Signal	Defined by
	1	+fc_out	FC standard
	2	5V	MIA consortium
	3	n_mia_fault(active LO)	MIA consortium
	4	key	MIA consortium
	5	+fc_in	FC standard
	6	-fc_out	FC standard
	7	mia_output_disable	MIA consortium
	8	gnd	MIA consortium
	9	-fc_in	FC standard

Copper cabling

Type: Shielded, 75Ω twin-axial, shield bonded to DB-9 plug connector shell (360°)
FC-AL Standard, Revision 4.4 or higher

Length: 0.3 m (1 foot) min., 10 m (33 feet) max. iDAE to DAE, 30 m (99 feet) max iDAE to host;
$\leq$ 10 m (33 feet) unequalized; > 10 m (33 feet) equalized

Optical cabling

Type: 50 μm or 62.5 μm multi-mode, dual SC
Requires MIA on SPDB9 connector

Length: 50 μm: 500 m (1,650 feet) max, 2m (6.5 feet) min
62.5 μm: 300 m (984 feet) max, 2m (6.5 feet) min

Bend radius 3 cm (1.2 in) minimum

Standards certification and compliance

A stand-alone iDAE complies with the international environmental and safety specifications listed below. Each iDAE will be marked to indicate such compliance and certification as required.

Safety standards

Standard	Description
CSA 22.2 No. 950	Safety of Information Technology Equipment including Electrical Business Equipment.
UL 1950	Safety of Information Technology Equipment including Electrical Business Equipment.
CE Mark	European EMC Directive & Low Voltage Directive Requirements. Including: EN 60950 - Safety of Information Technology Equipment including Electrical Business Equipment, TUV-GS, and CB REPORT.

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. Including: CISPR22 - Class A, Limits & Methods of Measurement of Radio Interference Characteristics of ITE and EN55022-Class A.
VCCI	Class A, Voluntary Control Council for Interference
AS/NZS 3548	Class A, Electromagnetic Interference - Limits & Methods of Measurement of ITE
CNS13438	BSMI EMC Requirements

Fibre Channel related standards

Standard	Description
Fibre Channel	Physical and signaling interface, FC-PH, Revision 4.4
Fibre Channel	Arbitrated Loop (FC-AL), Revision 4.5
Fibre Channel	Private Loop Direct Attach (PLDA), Revision 1.10
SCSI III	SCSI Enclosure Services (SES), Revision 8a

Operating limits

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

Requirement	Description
Ambient temperature	10°C to 40°C (50°F to 104°F)
Temperature gradient	10°C/hr (50°F/hr)
Relative humidity	20% to 80% noncondensing
Elevation	2438 m (8,000 ft) at 40°C, 3077 m (10,000 ft) at 37°C
Drive module power	25 W drive slot maximum (seeking)

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

Shipping and storage requirements

Requirement	Description
Ambient temperature	-40°C to 65°C (-40°F to 149°F)
Temperature gradient	25°C/hr (77°F/hr)
Relative humidity	10% to 90% noncondensing
Elevation	7625 m (25,000 ft.)

❑ ❑ ❑

Glossary

The terms and definitions listed below are related to the storage system described in this manual. Understanding them will aid your understanding of the storage system.

ALPA (arbitrated loop physical address) — An 8-bit address that uniquely identifies a device on an FC 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.

BTU (British Thermal Unit) — A standard measure of a device's heat output.

cache — *See* storage-system caching.

CRU (customer-replaceable unit) — A hardware component, like a disk module, that anyone can install or replace.

disk-drive module — Another name for disk module.

disk unit — A short name for physical disk unit.

disk module — A self-contained disk drive that slides into one of the slots in the front of the storage system. It consists of the carrier assembly, which holds the disk drive and the regulator board. Also called disk-drive module.

DAE (disk array enclosure) — A storage device that includes an enclosure, up to 10 disk modules, one or two Fibre Channel LCCs, and one or two power supplies.

DIMM (dual on-line memory module) — A type of memory module used in SP memory for write caching or RAID 3 memory.

EA (enclosure address) — A number, selectable on an iDAE/DAE front panel, set to 0 on an iDAE, that helps establish a unique address for each disk module on an FC-AL loop. You must set the EA on each DAE. Since the iDAE EA is 0, you might set the first DAE EA to 1 and the second to 2.

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 explained after the Notice page near the beginning of the 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 chapter 3.

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

FC-AL address ID — A number that identifies a device as a node on a fibre channel loop. You select the FC-AL address ID for an SP using switches on the SP. The default FC-AL address ID for SP A is 0; the default FC-AL address ID for SP B is 1.

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 thence the disk drives within a DAE.

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

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

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

host — *See* server.

hot repair — *See* replace under power.

hub — An FC_AL switching device that allows multiple servers and targets such as storage systems to connect at a central point. A single hub configuration appears as a single loop.

iDAE (intelligent disk array enclosure) — A storage system that includes an enclosure, up to 10 disk modules, one or two SPs, and one or two power supplies. An iDAE can support up to 2 DAEs (each with up to 10 disk modules) in addition to its own 10 disk modules, for a total of 30 disk modules. You can attach a iDAE to one or more servers or external hubs in any of many different configurations.

JBOD (Just-a-Bunch-Of-Disks) — A storage system consisting of one or more DAEs (Disk Array Enclosures).

LCC (link control card) — A CRU in an enclosure that connects Fibre Channel signalling to the disk modules. The LCC receives and electrically terminates the incoming FC-AL signal. Then it passes the input signal to the disk drives in the DAE, and drives the output signal via cables to the next device (if any) in the loop.

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.

media interface adapter — *See* MIA (media interface adapter).

memory module — *See* SP memory module.

MIA (media interface adapter) — A device for connecting an optical cable to a DB9 copper connector.

node — Any device with a Fibre Channel interface (such as an HBA in a server or a disk drive) that connects to a Fibre Channel loop.

power supply — An essential element of the storage-system power supply. A storage system can have two power supplies, PS A and PS B. With two, it can survive failure of one supply. You can replace a power supply under power, without interrupting applications.

PLDA (private loop direct attach) profile — A standard for FC-AL disk drives.

replace under power — The storage system provides replace under power capability, allowing you to replace, for example, a disk module or a fan module without powering down the storage system. Applications continue while you replace the failed module.

SCSI (small computer system interface) — A well-known protocol and standard for connecting computers and peripheral devices.

SES (SCSI enclosure services) — A functional subset of SCSI III commands that allow a server to communicate with storage enclosures using their disk modules.

SFF — Small Form Factor Committee

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 memory modules and control logic that manages the storage-system I/O between the server FC adapter and the disk modules. The SP in a DPE storage system sends the multiplexed fibre channel loop traffic through a link control card (LCC) to the disk units. For higher availability and greater flexibility, a DPE can use a second SP.

SP memory module — A memory module (DIMM or SIMM) that provides the local storage for an SP.

SPS (standby power supply) — A unit that provides backup power in case of a power outage. An SPS is required for storage-system write caching. If power fails, the SPS allows the SP to write the data from its cache to disk. You can replace an SPS under power, without interrupting applications.

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

storage-system caching — The procedure of storing disk-based data in RAM memory (in this case, DIMM memory on an SP) temporarily to save time if the data needs to be accessed or changed again soon.

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Index

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Bull

Utiliser les marques de découpe pour obtenir les étiquettes.
Use the cut marks to get the labels.

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86 A1 24KX 01

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