System Storage EXP3000

Installation, User's, and Maintenance Guide

System Storage EXP3000

Installation, User's, and Maintenance Guide

Note: Before using this information and the product it supports, read the general information in Appendix B, “Notices,” on page 41.

Third Edition (December 2007)

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Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الآمنية

Antes de instalar este produto, leia as Informações de Segurança.

在安装本产品之前，请仔细阅读 Safety Information (安全信息)。

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

Ennen kuin asennat tämän tuotteen, lue turvaohjeet kohdasta Safety Information.

Avant d'installer ce produit, lisez les consignes de sécurité.

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

Πριν εγκαταστήσετε το προϊόν αυτό, διαβάστε τις πληροφορίες ασφάλειας (safety information).

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

Prima di installare questo prodotto, leggere le Informazioni sulla Sicurezza.

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

Пред да се инсталира овој продукт, прочитајте информацијата за безбедност.

Les sikkerhetsinformasjonen (Safety Information) før du installerer dette produktet.

Przed zainstalowaniem tego produktu, należy zapoznać się z książką "Informacje dotyczące bezpieczeństwa" (Safety Information).

Antes de instalar este produto, leia as Informações sobre Segurança.

Перед установкой продукта прочтите инструкции по технике безопасности.

Pred inštaláciou tohto zariadenia si pečítaje Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

Antes de instalar este producto, lea la información de seguridad.

Läs säkerhetsinformationen innan du installerar den här produkten.

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Important:

Each caution and danger statement in this document is labeled with a number. This number is used to cross reference the English-language caution or danger statement with translated versions of the caution or danger statement in the *IBM Systems Safety Notices* document.

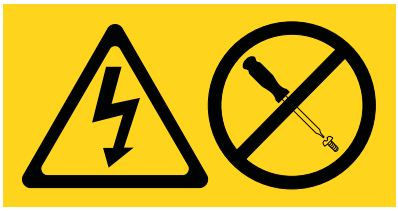
For example, if a caution statement is labeled “D005a,” translations for that caution statement are in the *IBM Systems Safety Notices* document under “D005a.”

Be sure to read all caution and danger statements in this document before you perform the procedures. Read any additional safety information that comes with the server or optional device before you install the device.

DANGER

Hazardous voltage, current, or energy levels are present inside any component that has this label attached. Do not open any cover or barrier that contains this label.

(L001)



DANGER

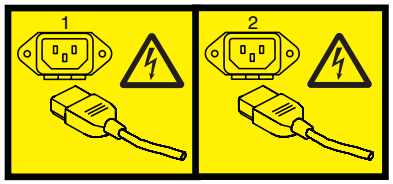
Rack-mounted devices are not to be used as shelves or work spaces.

(L002)

DANGER

Multiple power cords. The product might be equipped with multiple power cords. To remove all hazardous voltages, disconect all power cords.

(L003)



or

DANGER

When working on or around the system, observe the following precautions:

Electrical voltage and current from power, telephone, and communication cables are hazardous. To avoid a shock hazard:

- **Connect power to this unit only with the provided power cord. Do not use the provided power cord for any other product.**
- **Do not open or service any power supply assembly.**
- **Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.**
- **The product might be equipped with multiple power cords. To remove all hazardous voltages, disconnect all power cords.**
- **Connect all power cords to a properly wired and grounded electrical outlet. Ensure that the outlet supplies proper voltage and phase rotation according to the system rating plate.**
- **Connect any equipment that will be attached to this product to properly wired outlets.**
- **When possible, use one hand only to connect or disconnect signal cables.**
- **Never turn on any equipment when there is evidence of fire, water, or structural damage.**
- **Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.**
- **Connect and disconnect cables as described in the following procedures when installing, moving, or opening covers on this product or attached devices.**

  To disconnect:

  1. **Turn off everything (unless instructed otherwise).**
  2. **Remove the power cords from the outlets.**
  3. **Remove the signal cables from the connectors.**
  4. **Remove all cables from the devices.**

  To connect:

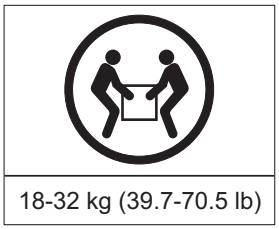
  1. **Turn off everything (unless instructed otherwise).**
  2. **Attach all cables to the devices.**
  3. **Attach the signal cables to the connectors.**
  4. **Attach the power cords to the outlets.**
  5. **Turn on the devices.**

  (D005a)

CAUTION:

or

or



The weight of this part or unit is between 18 and 32 kg (39.7 and 70.5 lb). It takes two persons to safely lift this part or unit. (C009)

Contents

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Chapter 1. Introduction

This *Installation, User's, and Maintenance Guide* contains instructions for setting up your IBM® System Storage™ EXP3000 and instructions for replacing components. The IBM System Storage EXP3000 is referred to in this document as the EXP3000.

This document contains information about:

- Setting up and cabling the EXP3000
- Starting and configuring the EXP3000
- Replacing components
- Solving problems

The EXP3000 provides high-capacity, Serial Attached SCSI (SAS) or Serial ATA (SATA) disk storage. It supports up to 12 SAS or SATA hard disk drives. It delivers fast, high-volume data transfer, retrieval, and storage functions among multiple drives. The EXP3000 is designed for continuous, reliable service; the modular, redundant hard disk drives and power supplies (with fans) use hot-swap technology for easy replacement without turning off the EXP3000.

See http://www.ibm.com/servers/storage/disk/exp3000/index.html for an interoperability matrix that lists supported hard disk drives for the RAID controller to which the EXP3000 is connected.

The EXP3000 comes with two 530-watt ac power supplies, one environmental services module (ESM), a filler panel to cover the empty ESM bay, and 12 drive filler panels. The drive filler panels can be replaced with optional hard disk drives.

If firmware and documentation updates are available, you can download them from the IBM support Web site. The EXP3000 might have features that are not described in the documentation that comes with the unit, and the documentation might be updated occasionally to include information about those features, or technical updates might be available to provide additional information that is not included in the EXP3000 documentation.

Note: Changes are made periodically to the IBM Web site. Procedures for locating firmware and documentation might vary slightly from what is described in this document.

If the EXP3000 is attached to a DS3000 storage subsystem:
To check for updates, complete the following steps:

1. Go to http://www.ibm.com/servers/storage/support/.
2. On the "Support for System Storage and TotalStorage® products" page, under **Select your product**, in the **Product family** field, select **Disk systems**.
3. In the **Product** field, select **EXP3000**.
4. Click **Go**.
5. Make the following selections:
   - For firmware updates, click the **Download** tab.

     Important: If you are using SATA disk drives with a DS3000 storage subsystem, the ESM firmware must be at version 1.86 or later. Check the RAID controller management software for the firmware version that is installed on the ESM.

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- For documentation updates, click the **Install and use** tab.

If the EXP3000 is directly attached to an IBM System x server or the EXP3000 is attached to an IBM System x server through an IBM ServeRAID HBA:
To check for updates, complete the following steps:

1. Go to http://www.ibm.com/servers/support/.
2. Select **System x**
3. On the "Support for IBM System x" page, in the **Product family** field, select **System Storage EXP3000**.
4. In the **Product** field, select **EXP3000**.
5. In the **Type** field, select **1727**.
6. Click **Go**.
7. Select **IBM HBA EXP3000 update program**.

The EXP3000 comes with a limited warranty. For more information about the terms of your warranty, see the *Warranty and Support Information* document on the IBM *Documentation* CD.

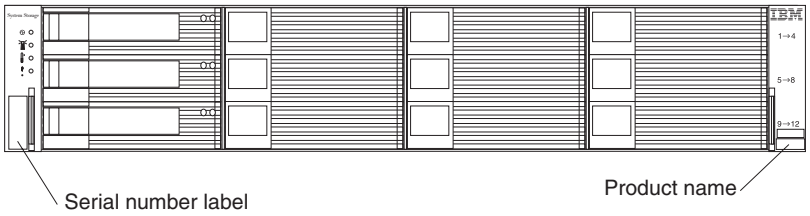
Record information about the EXP3000 in Table 1. You will need this information if you have to call for service.

Table 1. Product identification record

Product name	IBM System Storage EXP3000
Machine type	1727
Serial number	
EXP3000 ID number	

The serial number is on the label in the vertical recess on the left bezel. The serial number is also on the left chassis flange and on the rear of the chassis. A label that includes the machine type, model, and serial number is on the top front right chassis corner. The following illustration shows the product name and serial number label on the front of the EXP3000.

Note: The illustrations in this document might differ slightly from your hardware.



Use Table 2 on page 3 to keep a record of the hard disk drives that are installed in or attached to the EXP3000. This information can be helpful when you install additional hard disk drives or if you have to report a hardware problem. Make a copy of this table before you record information in it, in case you need extra space to write new values later, or when you update the EXP3000 configuration.

Table 2. Drive location information record

Drive location	Drive part and model number	Drive serial number
Bay 1		
Bay 2		
Bay 3		
Bay 4		
Bay 5		
Bay 6		
Bay 7		
Bay 8		
Bay 9		
Bay 10		
Bay 11		
Bay 12		

The IBM Documentation CD

The IBM *Documentation* CD contains documentation for the EXP3000 in Portable Document Format (PDF) and includes the IBM Documentation Browser to help you find information quickly.

Hardware and software requirements

The IBM *Documentation* CD requires the following minimum hardware and software:

- Microsoft® Windows® XP, Windows 2000, or Red Hat® Linux®
- 100 MHz microprocessor
- 32 MB of RAM
- Adobe Acrobat Reader 3.0 (or later) or xpdf, which comes with Linux operating systems

Using the Documentation Browser

Use the Documentation Browser to browse the contents of the CD, read brief descriptions of the documents, and view documents, using Adobe Acrobat Reader or xpdf. The Documentation Browser automatically detects the regional settings in use in your server and displays the documents in the language for that region (if available). If a document is not available in the language for that region, the English-language version is displayed.

Use one of the following procedures to start the Documentation Browser:

- If Autostart is enabled, insert the CD into the CD drive. The Documentation Browser starts automatically.
- If Autostart is disabled or is not enabled for all users, use one of the following procedures:
  - If you are using a Windows operating system, insert the CD into the CD drive and click **Start --> Run**. In the **Open** field, type

    ```
    e:\win32.bat
    ```

    where *e* is the drive letter of the CD drive, and click **OK**.

– If you are using Red Hat Linux, insert the CD into the CD drive; then, run the following command from the /mnt/cdrom directory:

```
sh runlinux.sh
```

Select the EXP3000 from the **Product** menu. The **Available Topics** list displays all the documents for the EXP3000. Some documents might be in folders. A plus sign (+) indicates each folder or document that has additional documents under it. Click the plus sign to display the additional documents.

When you select a document, a description of the document is displayed under **Topic Description**. To select more than one document, press and hold the Ctrl key while you select the documents. Click **View Book** to view the selected document or documents in Acrobat Reader or xpdf. If you selected more than one document, all the selected documents are opened in Acrobat Reader or xpdf.

To search all the documents, type a word or word string in the **Search** field and click **Search**. The documents in which the word or word string appears are listed in order of the most occurrences. Click a document to view it, and press Crtl+F to use the Acrobat search function or Alt+F to use the xpdf search function within the document.

Click **Help** for detailed information about using the Documentation Browser.

Notices and statements in this document

The caution and danger statements in this document are also in the multilingual *IBM Systems Safety Notices* document, which is on the IBM *Documentation* CD. Each statement is followed by a reference number that you can use to locate the corresponding statement in your language in the *IBM Systems Safety Notices* document.

The following notices and statements are used in this document:

- **Note:** These notices provide important tips, guidance, or advice.
- **Important:** These notices provide information or advice that might help you avoid inconvenient or problem situations.
- **Attention:** These notices indicate potential damage to programs, devices, or data. An attention notice is placed just before the instruction or situation in which damage might occur.
- **Caution:** These statements indicate situations that can be potentially hazardous to you. A caution statement is placed just before the description of a potentially hazardous procedure step or situation.
- **Danger:** These statements indicate situations that can be potentially lethal or extremely hazardous to you. A danger statement is placed just before the description of a potentially lethal or extremely hazardous procedure step or situation.

Features and operating specifications

Table 3 contains a summary of the features and operating specifications of the EXP3000. Depending on your EXP3000 model, some features might not be available, or some specifications might not apply.

Table 3. Features and operating specifications

General:

- Modular components
  - High-capacity disk drives
  - Environmental services module (ESM)
  - Power supplies with built-in fan units
- Technology
  - Supports disk array technology
  - SAS host interface, redundant data storage, power and cooling system, and ESMs
  - Hot-swap technology for hard disk drives, power supplies, and ESMs
- User interface
  - Built-in power, activity, and fault LEDs, identification labeling on components, rear LEDs, and connectors
  - Easy-to-replace hard disk drives, power supplies with built-in fan units, and ESMs

Hard disk drive storage:
Maximum hard disk drives per EXP3000: 12
Drive type: SAS or SATA

ESMs:
Technology and interfaces:
SAS interface: Two 26-pin, mini-SAS connectors per ESM

Acoustical noise emissions:
For maximum system configurations (12 hard disk drives installed)

- Sound power (idling): 6.2 bels
- Sound power (operating): 6.2 bels
- Sound pressure (idling): 48 dBA
- Sound pressure (operating): 48 dBA

AC power supply with built-in fan:

- The EXP3000 comes with two hot-swap 530 watt (115 - 230 V ac) power supplies.
- The two power supplies provide redundant power to the EXP3000.

Size:

- Height: 8.7 cm (3.43 in.)
- Depth: 55.0 cm (21.6 in.)
- Width: 44.7 cm (17.6 in.)
- Weight: approximately 36.6 kg (16.6 lb) for a standard unit; when fully configured, 27.2 kg (60 lb)

Environment:

- Air temperature:
  - EXP3000 on: 10° to 35°C (50° to 95°F); altitude: 30.5 (100 ft) below to 3000 m (9840 ft) above sea level; temperature change: 10°C (18°F) per hour
  - EXP3000 off: 10° to 50°C (14° to 120°F); maximum altitude: 3000 m (9840 ft); temperature change: 15°C (27°F) per hour
- Humidity:
  - EXP3000 on: 20% to 80%
  - EXP3000 off: 10% to 90%
  - Maximum dew point: 26°C (79°F)
  - Maximum humidity gradient: 10% per hour

Heat output

Approximate heat output in British thermal units (Btu) per hour:

- Minimum configuration: 205 Btu (60 watts)
- Maximum configuration 1235 Btu (361 watts)

Electrical input:

- Sine-wave input (50-60 Hz) required
- Input voltage low range:
  - Minimum: 90 V ac
  - Maximum: 136 V ac
- Input voltage high range:
  - Minimum: 198 V ac
  - Maximum: 264 V ac
- Approximate input kilovolt-amperes (kVA):
  - Minimum: 0.06 kVA
  - Maximum: 0.38 kVA

Notes:

1. Power consumption and heat output vary depending on the number and type of optional features that are installed and the power-management optional features that are in use.
2. These levels were measured in controlled acoustical environments according to the procedures specified by the American National Standards Institute (ANSI) S12.10 and ISO 7779 and are reported in accordance with ISO 9296. Actual sound-pressure levels in a given location might exceed the average stated values because of room reflections and other nearby noise sources. The declared sound-power levels indicate an upper limit, below which a large number of computers will operate.

What the IBM System Storage EXP3000 offers

The EXP3000 provides several features for easy operation, including the following features:

- **Customer replaceable units (CRUs)**

The major CRUs in the EXP3000 are SAS or SATA hard disk drives, ESMs, and power supplies. See “Replaceable EXP3000 components” on page 25.

- **Fault indicators**

  All CRUs have fault or status light emitting diodes (LEDs) to indicate hardware failures.

- **Redundant cooling and power capabilities**

  The EXP3000 uses a dual ac input power system. This means that both power switches must be turned on for redundant operation. The redundant cooling of the fans enables continued operation if one fan fails. The EXP3000 comes with two 530-watt hot-swap power supplies, which provide redundant power for all EXP3000 configurations. If a problem occurs with one of the power supplies, the other power supply can meet the power requirements.

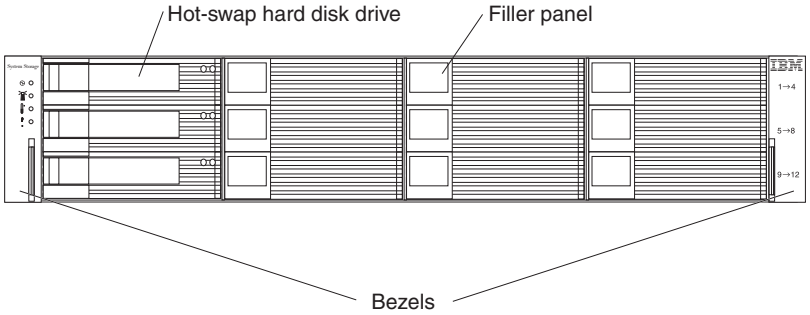
Major components of the EXP3000

Orange on a component or label indicates that the component can be hot-swapped. You can install or remove a hot-swap component while the EXP3000 is running. For information about installing hot-swap components, see Chapter 4, “Replacing components,” on page 25.

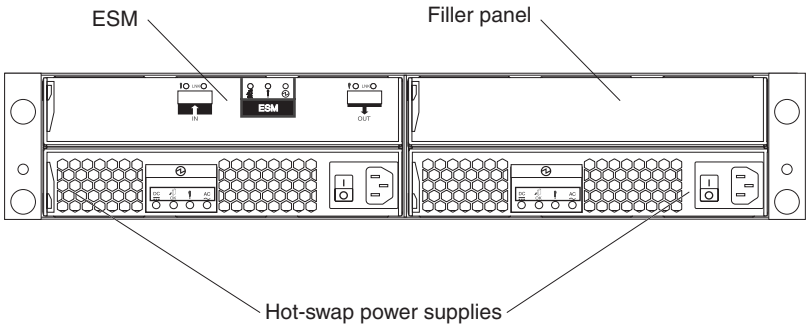
Blue on components and labels indicates touch points, where you can grip a component, move a latch, and so on.

The following illustrations show the major components of the EXP3000.

Front view



Rear view



Chapter 2. Installation

This chapter provides information about installing and cabling the EXP3000. The EXP3000 connects to a RAID controller in a server or in another supported device such as an IBM System Storage DS3200 or DS3400. See http://www.ibm.com/servers/storage/disk/exp3000/index.html for an interoperability matrix that lists supported RAID controllers to which the EXP3000 can connect.

Inventory checklist

After you unpack the EXP3000, make sure that you have the following items:

- **Hardware:**
  - IBM System Storage EXP3000
  - Two rack jumper power cords
  - One sheet of ID labels
  - Two front bezels (left and right)
  - One rack installation hardware kit:
    - Two rails (right and left assembly)
    - Eight M5 screws
    - Six M5 washers
    - Two M4 pan-head screws
    - Eight spacers
- **Printed documents:**
  - *IBM System Storage EXP3000 Quick Start Guide*
  - *Rack Installation Instructions*
- **Online documents:**
  - *IBM System Storage EXP3000 Installation and User's Guide*
  - *IBM Systems Safety Notices*

All documents are available on the IBM *Documentation* CD or from the IBM support Web site at http://www.ibm.com/servers/storage/support/.

Installing the EXP3000 in a rack

You can install the EXP3000 in an Electronic Industries Association (EIA) 310 standard rack cabinet. For complete rack installation instructions, see the *Rack Installation Instructions* document that comes with the EXP3000.

Installing hot-swap hard disk drives

The EXP3000 supports up to 12 IBM SAS or SATA hard disk drives. See http://www.ibm.com/servers/storage/disk/exp3000/index.html for an interoperability matrix that lists supported hard disk drives for the RAID controller to which the EXP3000 can connect.

Each drive comes preinstalled in a drive tray, ready for installation in the EXP3000. (Do not detach the drive from the tray.) Be sure to record the location information for each drive in Table 2 on page 3.

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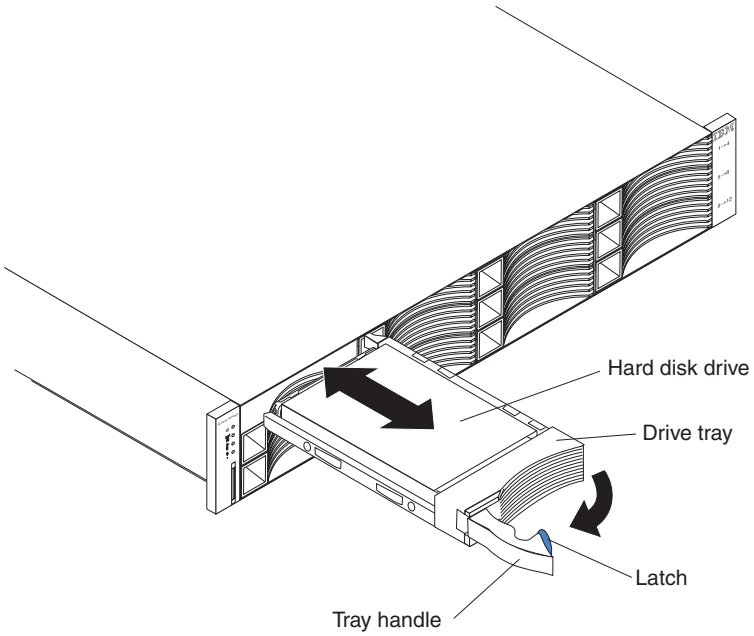
The EXP3000 comes with filler panels in the drive bays. Before you install a new hard disk drive, remove the filler panel and save it for future use. Each of the 12 bays must contain either a filler panel or a hard disk drive.

To install a hard disk drive in the EXP3000, complete the following steps. You can install drives while the EXP3000 is turned on.

1. Read the instructions that come with the hard disk drive.
2. Read the safety information that begins on page iii and “Installation guidelines” on page 26.
3. Remove the filler panel from the bay into which you want to install the hard disk drive:
   a. Insert a finger into the square hole on the left side of the filler panel to grip and pull the filler panel out of the drive bay.
   b. Save the filler panel for future use.
4. Install the hard disk drive.

   Note: The hard disk drive comes with a tray already attached. Do not attempt to detach the drive from the tray.



   a. Press the latch on the right end of the tray handle to release it.
   b. Pull out the tray handle to the open position.
   c. Gently slide the drive all the way into the empty slot until the drive stops.
   d. Push the tray handle into the closed (latched) position.
5. Check the drive LEDs:
   a. When a drive is ready for use, the green activity LED and the amber status LED on the drive are off.
   b. If the amber status LED is lit and not flashing, remove the drive from the unit and wait 10 seconds; then, reinstall the drive. If the amber LED is flashing, the drive is rebuilding.

Controller management information: In some cases, the RAID controller automatically resets the drive to the Hot Spare or Rebuild state. If the drive state does not change automatically (the amber LED stays lit), see your RAID controller management documentation for information about manually changing the state of the drive from the current state to another state, such as Hot Spare or Ready. The amber LED should turn off within 10 seconds after the drive state changes.

6. Configure the hard disk drive, using the RAID controller management software.

Installing an additional ESM

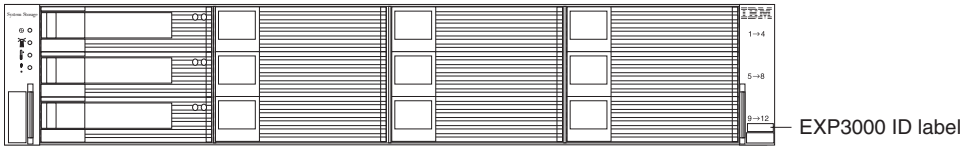
The EXP3000 comes with one environmental services module (ESM). If your RAID controller supports redundant drive paths (see the documentation that comes with the RAID controller or the device that contains the RAID controller), you can install a second ESM.

To install a second ESM, complete the following steps:

1. Read the safety information that begins on page iii and “Installation guidelines” on page 26.
2. Remove the ESM filler panel from the rightmost ESM bay of the EXP3000:
   a. On the left side of the ESM filler panel, press the orange release tab to the right just enough to release the handle (no more than 6 mm [0.25 in.]) as you rotate the handle upward.
   b. Using the handle, gently slide the ESM filler panel out of the EXP3000. Save the ESM filler panel for future use.
3. Hold the new ESM so that the handle is fully extended.
4. Gently slide the ESM into the bay until it stops. Rotate the handle downward into the closed position until it clicks.
5. Connect the SAS cable or cables to the ESM. See “Cabling the EXP3000” on page 12 for more information.

Installing identification labels

The EXP3000 comes with a sheet of numeric ID labels. Using your RAID controller management software, determine the ID number of the EXP3000, and affix the applicable label or labels directly above the product label on the right front bezel.



Cabling the EXP3000

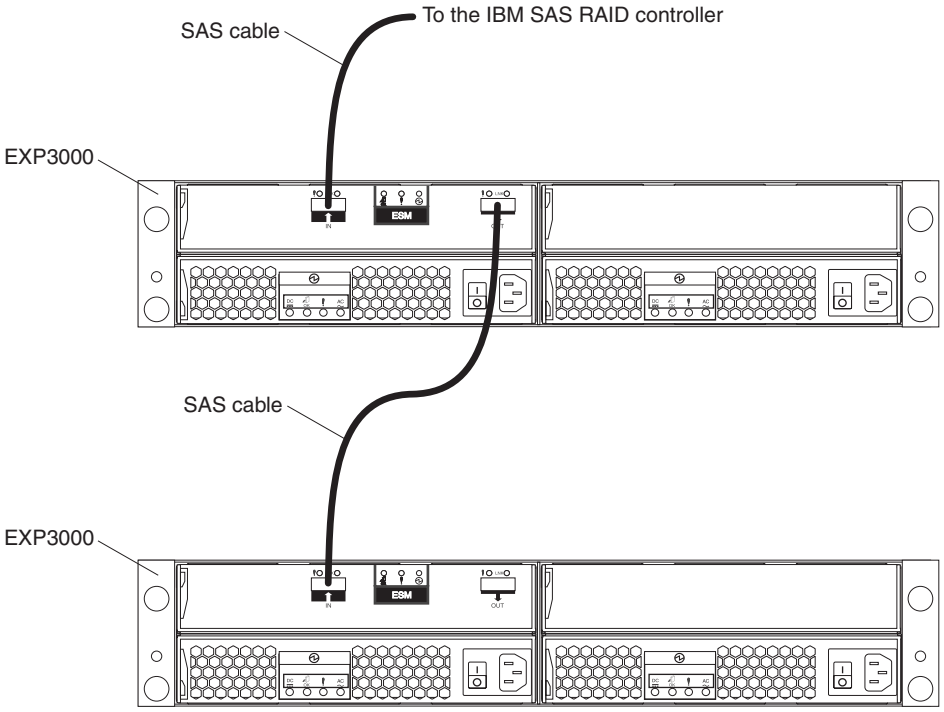
The EXP3000 comes with one ESM, which enables you to connect the EXP3000 to a RAID controller. Depending on the capabilities of the RAID controller, you can add a second ESM to the EXP3000 to provide a redundant drive path to the server, and you can create a chain of EXP3000s to the RAID controller. See the documentation that comes with the RAID controller or the device that contains the RAID controller for information about the capabilities of the RAID controller.

Single-ESM configuration

An ESM in the EXP3000 has two 26-pin mini-SAS connectors. The SAS connectors are labeled In (↑) and Out (↓). If your RAID controller supports more than one EXP3000 per physical port, you can connect two or more EXP3000s by chaining them together. See the documentation that comes with your RAID controller or the device that contains the RAID controller for more information.

To connect a RAID controller to one or more EXP3000s that have one ESM each, complete the following steps:

1. Connect one EXP3000 to the RAID controller:
   a. Connect one end of a SAS cable to the RAID controller.
   b. Connect the other end to the In (↑) SAS connector on the ESM in the EXP3000.

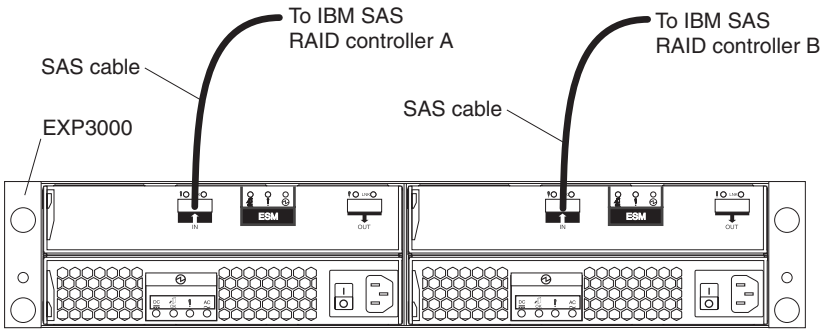


2. If your RAID controller supports connecting multiple EXP3000s, connect a second EXP3000 to the first EXP3000:
   a. Connect one end of a SAS cable to the Out (↓) SAS connector on the ESM of the EXP3000 that you just connected.
   b. Connect the other end of the SAS cable to the In (↑) SAS connector on the ESM on the next EXP3000.
   c. Repeat steps 2a and 2b for each EXP3000 that you add.

Dual-ESM configuration

The EXP3000 comes with one ESM. If your RAID controller supports redundant drive paths (see the documentation that comes with your RAID controller or the device that contains the RAID controller), you can install a second ESM. See “Installing an additional ESM” on page 11.

Dual-ESM configuration with a single EXP3000

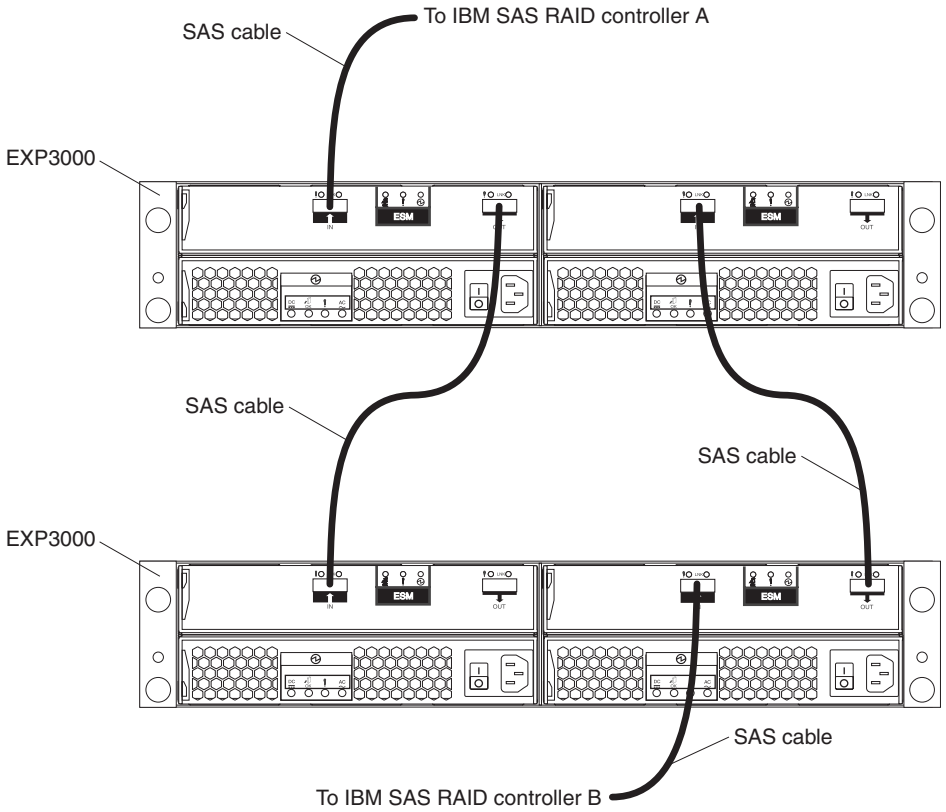


To connect RAID controllers A and B to one EXP3000 that has two ESMs, complete the following steps:

1. Connect the EXP3000 to RAID controller A:
   a. Connect one end of a SAS cable to RAID controller A.
   b. Connect the other end of the SAS cable to the In (↑) SAS connector on the left ESM in the EXP3000.
2. Connect the EXP3000 to RAID controller B:
   a. Connect one end of a SAS cable to RAID controller B.
   b. Connect the other end of the SAS cable to the In (↑) SAS connector on the right ESM in the EXP3000.

Dual-ESM configuration with two or more EXP3000s

An ESM in the EXP3000 has two 26-pin mini-SAS connectors. The SAS connectors are labeled In (↑) and Out (↓). If your RAID controller supports more than one EXP3000 per physical port, you can connect two or more EXP3000s by chaining them together. See the documentation that comes with your RAID controller or the device that contains the RAID controller for more information.



To connect RAID controllers A and B to two or more EXP3000s that have two ESMs each, complete the following steps:

1. Connect one EXP3000 to RAID controller A:
   a. Connect one end of a SAS cable to RAID controller A.
   b. Connect the other end of the SAS cable to the In (↑) SAS connector on the left ESM in the EXP3000.
2. Connect the left ESM of the EXP3000 to the next EXP3000 in the chain:
   a. Connect one end of a SAS cable to the Out (↓) SAS connector on the left ESM of the EXP3000 that you just connected.
   b. Connect the other end of the SAS cable to the In (↑) SAS connector on the left ESM in the next EXP3000 in the chain.
   c. Repeat steps 2a and 2b for each EXP3000 that you add.
3. Connect the last EXP3000 in the chain to RAID controller B:
   a. Connect one end of a SAS cable to RAID controller B.
   b. Connect the other end of the SAS cable to the In (↑) SAS connector on the right ESM in the last EXP3000 of the chain that you created.
4. In reverse order (last in chain to first in chain), connect the right ESMs in the EXP3000s in the chain:
   a. Connect one end of a SAS cable to the Out (↓) SAS connector on the right ESM of the EXP3000 that you just connected.
   b. Connect the other end of the SAS cable to the In (↑) SAS connector on the right ESM of the previous EXP3000 in the chain.
   c. Repeat steps 4a and 4b until you connect the right ESM of the first EXP3000 in step 2 to the right ESM of the EXP3000 in step 1.

Connecting the power cords

The EXP3000 comes with two power cords. You can connect the power cords to a primary power unit inside the rack cabinet, such as a properly grounded ac power distribution unit (PDU) or uninterruptible power supply.

Note: Power cords, specific to a country, can be purchased separately.

For information about the initial startup of the EXP3000, see “EXP3000 power features” on page 21.

Systems-management software support

The EXP3000 provides software alert functions through the systems-management functions that are provided by the management software that comes with your RAID controller.

The following alerts are supported:

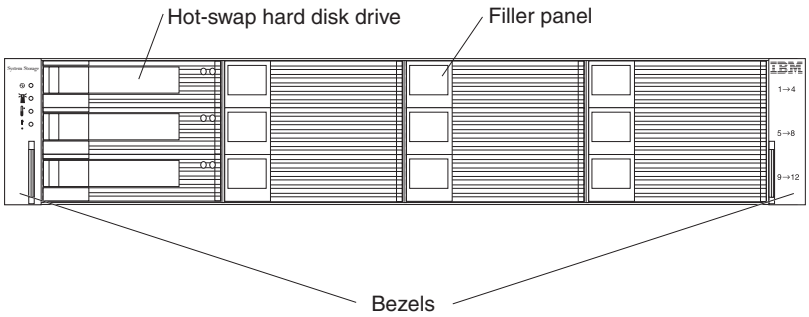
- Hard disk drive disabled
- Power-supply failure
- Fan failure
- Normal operating temperature exceeded

Chapter 3. EXP3000 controls, LEDs, and power

This section describes the controls and light-emitting diodes (LEDs) and how to turn the EXP3000 on and off.

Front view: components

The components on the front of the EXP3000 are shown in the following illustration.



Hot-swap hard disk drive

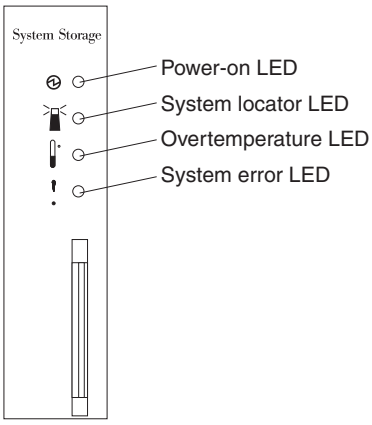
You can install up to 12 hot-swap SAS or SATA hard disk drives in the EXP3000.

Filler panel

The EXP3000 comes with filler panels in the drive bays. Before you install a hard disk drive, remove the filler panel and save it for future use. Each of the 12 drive bays must contain either a filler panel or a hard disk drive.

Bezel (left side)

The left bezel contains the EXP3000 LEDs, as shown in the following illustration. For a description of the LEDs, see “Front view: LEDs” on page 18.



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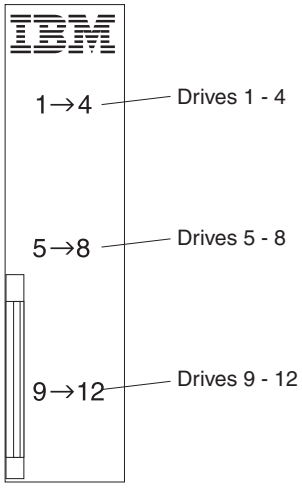
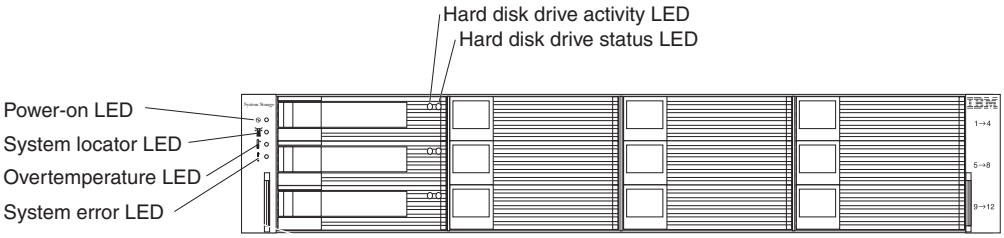
Bezel (right side)

The right bezel contains the hard disk drive identification information, as shown in the following illustration.



Front view: LEDs

The LEDs on the front of the EXP3000 are shown in the following illustration.



Power-on LED (green)

When this green LED is lit, it indicates that the power supply is turned on and is supplying both 5-volt and 12-volt dc power to the EXP3000.

System locator LED (blue)

This blue LED can be lit by the systems-management software on the RAID controller that is connected to the EXP3000, to aid in visually locating the EXP3000.

Overtemperature LED (amber)

When this amber LED is lit, it indicates that the EXP3000 is in an overtemperature condition.

System error LED (amber)

When this amber LED is lit, it indicates that the unit has a fault, such as in a power supply, ESM, or hard disk drive.

Hard disk drive activity LED (green)

Each hard disk drive has an activity LED. When this green LED is flashing, it indicates drive activity.

Hard disk drive status LED (amber)

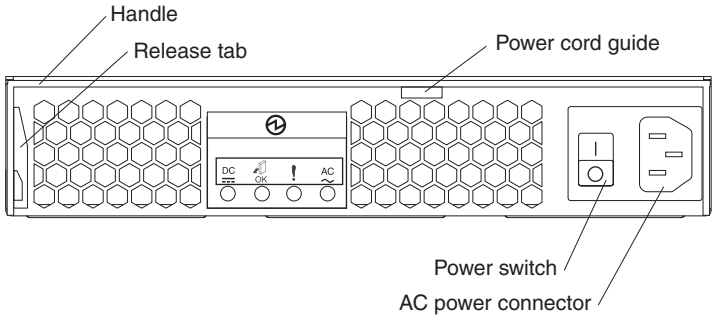
Each hard disk drive has a status LED. When this amber LED is lit continuously, it indicates a drive failure. When it is flashing, it indicates that a drive Identify or Rebuild is in progress.

Rear view: power supply

The two hot-swap power supplies are on the rear of the EXP3000.

Attention: The EXP3000 comes with two installed power supplies. When one power supply fails, the power-supply unit must be replaced to reestablish redundancy. When you replace a failed unit with a new power supply, make sure that you perform this operation in less than 10 minutes to prevent overheating.

The power-supply controls and connectors are shown in the following illustration.



Handle

Use the handle to install or remove the power supply.

Release tab

Press the release tab to the right and rotate the handle downward to remove the power supply.

Power cord guide

Use the power cord guide to prevent the power cord from disconnecting.

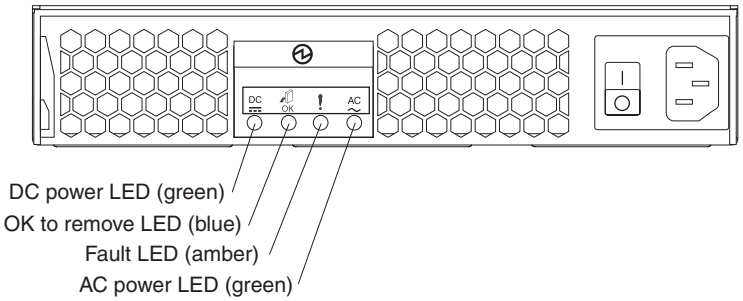
AC power connector

Connect the power cord for the power supply to this connector.

Power switch

Use this switch to turn the power supply on and off.

The LEDs on the power supply are shown in the following illustration.



DC power LED (green)

When this green LED is lit, it indicates that the EXP3000 is turned on and is supplying both 5-volt and 12-volt dc power to the EXP3000.

OK to remove LED (blue)

This LED is supported only when the EXP3000 is attached to a DS3000 controller. Do not remove the EXP3000 power supply unless this blue LED is lit.

Fault LED (amber)

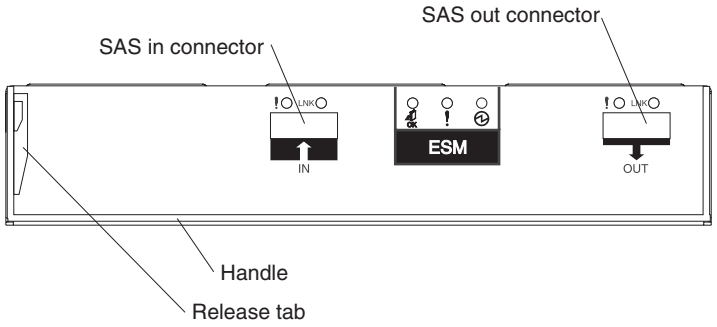
When this amber LED is lit, it indicates that a power supply or fan has failed or that a redundant power supply is not turned on.

AC power LED (green)

When this green LED is lit, it indicates that the EXP3000 is receiving ac power.

Rear view: ESMs

The connectors on the ESM are shown in the following illustration.



SAS In connector

Connect a SAS cable to this connector and to either an IBM SAS RAID controller or the SAS Out (↓) connector of another EXP3000.

SAS Out

Connect a SAS cable to this connector and to the SAS In (↑) connector of another EXP3000.

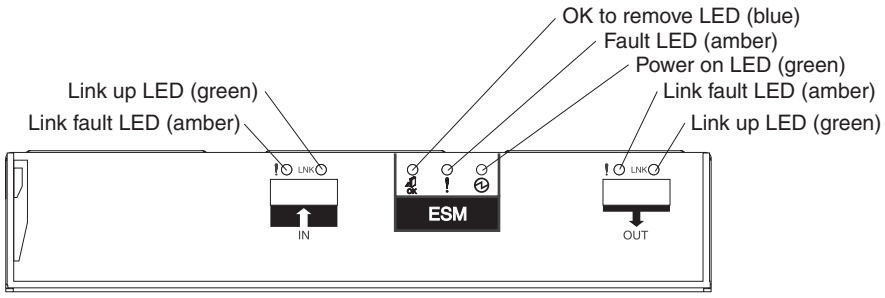
Handle

Use the handle to install or remove the ESM.

Release tab

Press the release tab to the right and rotate the handle upward to remove the ESM.

The LEDs on the ESM are shown in the following illustration.



Link fault LED (amber)
When this amber LED is lit, it indicates that the link through the SAS cable is not successful.

Link up LED (green)
When this green LED is lit, it indicates that the link through the SAS cable is successful.

OK to remove LED (blue)
This LED is supported only when the EXP3000 is attached to a DS3000 controller. Do not remove the ESM unless this blue LED is lit.

Fault LED (amber)
When this amber LED is lit, it indicates that the ESM has failed.

Power-on LED (green)
When this green LED is lit, it indicates that the ESM is receiving power.

EXP3000 power features

This section contains instructions for turning the EXP3000 on and off in normal and emergency situations.

If you are turning on the EXP3000 after an emergency shutdown or power outage, see “Turning on the EXP3000 after an emergency” on page 23.

Turning on the EXP3000

To turn on the power for the initial startup of the EXP3000, complete the following steps:

1. Make sure that:
   a. All cables are correctly connected.
   b. Both power cords are connected into the rear of the EXP3000 and into properly grounded electrical outlets.
   c. All hard disk drives are locked securely in place.

      Important: You must install a minimum of four hard disk drives for both power supplies to operate in a redundant mode.
2. Check the system documentation for all the hardware devices that you want to turn on and to determine the correct power-on sequence.

   Note: Be sure to turn on the EXP3000 before or at the same time as you turn on the device that contains the RAID controller.

3. Turn on both power supplies on the rear of the unit.

   The EXP3000 might take a few seconds to turn on. During this time, you might see the EXP3000 amber fault LED, green power LED, power supply LEDs, and blue system locator LED turn on and off intermittently. When the power-on sequence is completed, only the green power LEDs on the front and rear should remain lit. If one or more amber fault LEDs remain lit, see Chapter 5, “Solving problems,” on page 37.

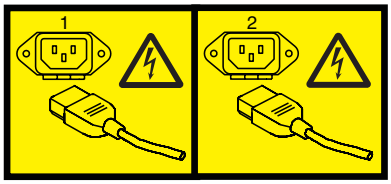
Turning off the EXP3000

Attention: Except in an emergency situation, never turn off the power if any fault LEDs are lit on the EXP3000. Correct the fault before you attempt to turn off the power, using the correct troubleshooting or servicing procedure. This ensures that the EXP3000 turns on correctly later. For more information, see Chapter 5, “Solving problems,” on page 37.

DANGER

Multiple power cords. The product might be equipped with multiple power cords. To remove all hazardous voltages, disconect all power cords.

(L003)



or

The EXP3000 is designed to run continuously, 24 hours a day. Turn off the power only under one or more of the following conditions:

- Instructions in a hardware or software procedure require you to turn off the power.
- A service technician tells you to turn off the power.

- A power outage or emergency situation occurs. See “Turning off the EXP3000 in an emergency.”

To turn off the EXP3000, complete the following steps:

1. Make sure that all amber status or fault LEDs on the EXP3000 are off. If any status or fault LEDs are lit (on hard disk drives, power supplies, or ESMs), identify or correct the problems before you turn off the power. For more information, see Chapter 5, “Solving problems,” on page 37.
2. On the server to which the EXP3000 is connected, either directly or through another supported device that contains a RAID controller to which the EXP3000 is connected, close all operating-system windows and programs; then, shut down the server.
3. Shut down any device that contains a RAID controller to which the EXP3000 is connected.
4. Turn off both EXP3000 power supplies.

Turning off the EXP3000 in an emergency

Attention: Emergency situations might include fire, flood, extreme weather conditions, or other hazardous circumstances. If a power outage or emergency situation occurs, always turn off all power switches on all computing equipment. This will help safeguard your equipment from potential damage due to electrical surges when power is restored. If the EXP3000 loses power unexpectedly, it might be due to a hardware failure in the power system or midplane. See Chapter 5, “Solving problems,” on page 37.

To turn off the EXP3000 during an emergency situation, complete the following steps:

1. If you have time, stop all activity and check the LEDs (front and rear). Make note of any status or fault LEDs that are lit so that you can correct the problem when you turn on the power again.

   Note: See the documentation that comes with your RAID controller for information about correcting the problem.
2. On the server to which the EXP3000 is connected, either directly or through another supported device that contains a RAID controller to which the EXP3000 is connected, close all operating-system windows and programs; then, shut down the server.
3. Shut down any device that contains a RAID controller to which the EXP3000 is connected.
4. Turn off both EXP3000 power supplies; then, disconnect the power cables from the EXP3000.

Turning on the EXP3000 after an emergency

To restart the EXP3000 if you turned off the power supplies during an emergency shutdown, or if a power failure or a power outage occurred, complete the following steps:

1. After the emergency situation is over or power is restored, check the EXP3000 for damage. If there is no visible damage, continue with step 2; otherwise, have your unit serviced.
2. Check the system documentation for the hardware devices that you intend to turn on, and determine the correct power-on sequence.

Note: Be sure to turn on the EXP3000 before or at the same time you turn on the device that contains the RAID controller to which the EXP3000 is connected.

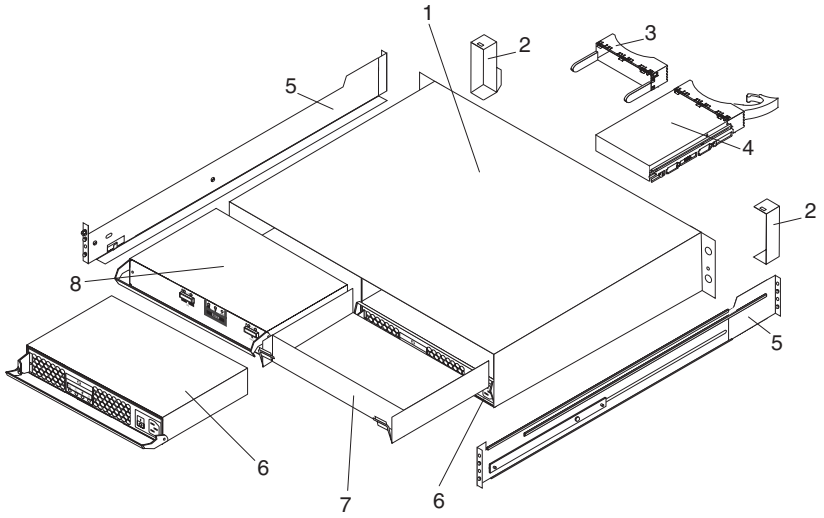
3. Turn on each connected device, according to the power-on sequence that is described in the documentation that comes with the device.
4. Connect the EXP3000 power cables and turn on both power switches on the rear of the EXP3000.
5. Make sure that only the power (green) LEDs on the front and rear are lit. If one or more of the fault (amber) LEDs are lit, see Chapter 5, “Solving problems,” on page 37 for instructions.
6. Use the RAID controller management software as applicable to check the status of the EXP3000.

Chapter 4. Replacing components

This chapter contains information about IBM customer replaceable units (CRUs) and field replaceable units (FRUs) for the EXP3000 and instructions for replacement parts that are not installed during a typical installation.

Replaceable EXP3000 components

The following replaceable components are available for the EXP3000. See Table 4 on page 26 for the identification and part number of each component.



Replaceable components are of three types:

- **Tier 1 customer replaceable unit (CRU):** Replacement of Tier 1 CRUs is your responsibility. If IBM installs a Tier 1 CRU at your request, you will be charged for the installation.
- **Tier 2 customer replaceable unit:** You may install a Tier 2 CRU yourself or request IBM to install it, at no additional charge, under the type of warranty service that is designated for your server.
- **Field replaceable unit (FRU):** FRUs must be installed only by trained service technicians.

For information about the terms of the warranty and getting service and assistance, see the *IBM Machine Type 1727 Warranty and Support Information* document on the *IBM Documentation* CD that comes with the EXP3000.

For an interoperability matrix that lists supported hard disk drives for the RAID controller to which the EXP3000 is connected, see http://www.ibm.com/servers/storage/disk/exp3000/index.html.

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Table 4. EXP3000 parts listing

Index	Description	CRU part number (Tier 1)	CRU part number (Tier 2)	FRU part number
1	Chassis and midplane assembly			39R6545
2	Bezel kit - chassis	39R6546		
3	Filler panel, hard disk drive	42R7992		
4	Hard disk drive	varies		
5	2 U rail kit	39R6550		
6	Power supply ac	42C2140		
7	Filler panel, ESM	39R6548		
8	ESM		39R6516	
	IBM 1-meter SAS cable	39R6530		
	IBM 3-meter SAS cable	39R6532		
	3-meter SAS cable for MegaRAID 8480	39R6472		
	Service cable			13N1932
	Power cord, rack jumper	39M5377		
	Miscellaneous hardware kit		39R6551	

Installation guidelines

Before you install the EXP3000, read the following information:

- Read the safety information that begins on page iii and the guidelines in “Handling static-sensitive devices” on page 27. This information will help you work safely.
- Make sure that you have an adequate number of properly grounded electrical outlets for the EXP3000 and other devices that you will connect to the EXP3000.
- Back up all important data before you make changes to disk drives.
- You do not have to turn off the EXP3000 to install or replace hot-swap power supplies or hot-swap hard disk drives.
- Orange on a component or label indicates that the component can be hot-swapped. You can install or remove a hot-swap component while the EXP3000 is running.
- Blue on components and labels indicates touch points, where you can grip a component, move a latch, and so on.

System reliability guidelines

To help ensure proper cooling and system reliability, make sure that the following requirements are met:

- Each of the drive bays has a drive or a filler panel and electromagnetic compatibility (EMC) shield installed in it.
- Each of the power-supply bays has a power supply installed in it.
- Each of the ESM bays has an ESM or a filler panel installed in it.
- There is adequate space around the EXP3000 to allow the cooling system to work correctly. Leave approximately 50 mm (2.0 in.) of open space around the front and rear of the EXP3000. Do not place objects behind the power supplies.
- You have replaced a failed power supply within 48 hours.

- You have replaced a hot-swap hard disk drive within 2 minutes of removal with a new drive or filler panel.

Handling static-sensitive devices

Attention: Static electricity can damage the EXP3000 and other electronic devices. To avoid damage, keep static-sensitive devices in their static-protective packages until you are ready to install them.

To reduce the possibility of damage from electrostatic discharge, observe the following precautions:

- Limit your movement. Movement can cause static electricity to build up around you.
- Handle the device carefully, holding it by its edges or its frame.
- Do not touch solder joints, pins, or exposed circuitry.
- Do not leave the device where others can handle and damage it.
- While the device is still in its static-protective package, touch it to an unpainted metal part of the EXP3000 for at least 2 seconds. This drains static electricity from the package and from your body.
- Remove the device from its package and install it directly into the EXP3000 without setting down the device. If it is necessary to set down the device, put it back into its static-protective package. Do not place the device on the EXP3000 or on a metal surface.
- Take additional care when you handle devices during cold weather. Heating reduces indoor humidity and increases static electricity.

Working with hot-swap hard disk drives

Before you remove a hard disk drive, review the following information:

Hot-swap hardware

You can replace a failed hard disk drive without turning off the EXP3000. Therefore, you can continue to operate the EXP3000 while a hard disk drive is removed or installed. These drives are known as *hot-swap* drives.

Hard disk drives

The EXP3000 supports IBM SAS or SATA hard disk drives. Each drive comes preinstalled in a drive tray, ready for installation in the EXP3000. (Do not detach the drive from the tray.) You can install the drives directly into the 12 drive bays on the front of the EXP3000. Before you remove any drives, record the location information for each drive in Table 2 on page 3.

Attention: If you remove a drive, you must reinstall it in the same bay. If you reinstall a hard disk drive in the wrong bay, you might lose data.

Hard disk drive LEDs

Each hard disk drive has two LEDs that indicate the status of the drive. The drive LED states and descriptions are shown in the following table.

LED	LED state	Description
Activity (green)	Flashing	Flashes during read/write or inquiry operations to the hard disk drive

LED	LED state	Description
Status (amber)	Flashing	Flashes to indicate that the hard disk drive is being rebuilt or that the hard disk drive has been identified by the RAID controller management software
Status (amber)	Lit	Is lit continuously to indicate a drive failure

Replacing a hot-swap hard disk drive

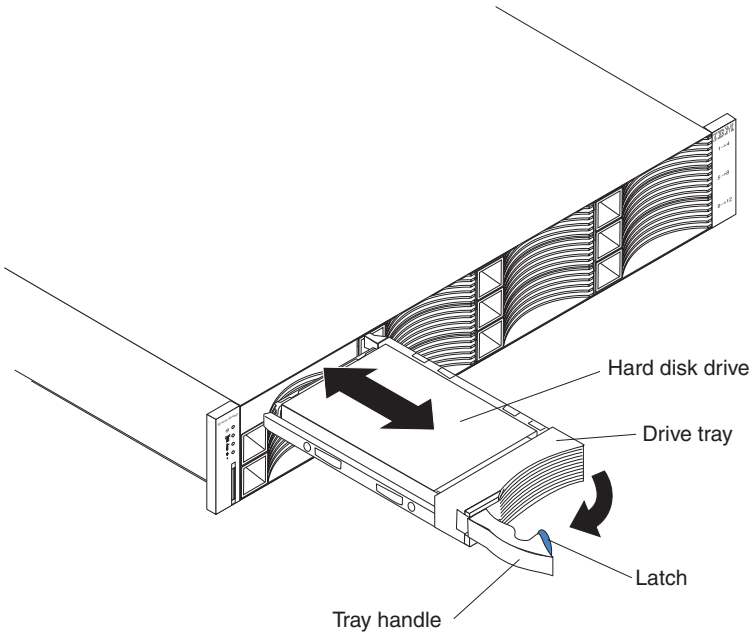
Hard disk drive problems include any malfunctions that delay, interrupt, or prevent successful I/O activity between the hosts and the hard disk drives in the EXP3000. This includes transmission problems between the host controllers, the ESMs, and the drives. This section explains how to replace a failed drive.

Check the hardware and software documentation that comes with your server to determine whether there are restrictions regarding hard disk drive configurations. Some system configurations might not allow mixing different hard disk drive capacities or types within an array.

To replace a hot-swap hard disk drive, complete the following steps:

1. Read the instructions that come with the hard disk drive.
2. Read the safety information that begins on page iii and “Installation guidelines” on page 26.
3. Locate the hard disk drive that you want to remove.

   Attention: Never hot-swap a hard disk drive when its green activity LED is flashing. Hot-swap a drive only when its amber status LED is lit (not flashing) or when the drive is inactive (activity LED is off).
4. Remove the hard disk drive.



   a. Press the latch on the right end of the tray handle to release it.

b. Pull out the tray handle to the open position.
c. Slide the drive partially out of the bay and wait at least 20 seconds before you remove the drive from the EXP3000. This enables the drive to spin down and avoids possible damage to the drive.
d. Make sure that there is proper identification (such as a label) on the hard disk drive; then, gently slide it completely out of the EXP3000. If the drive has failed, indicate that on the label.

5. Install the new hard disk drive:
   a. Gently push the drive into the empty bay until the drive stops.
   b. Push the tray handle to the right into the closed (latched) position.
6. Check the hard disk drive LEDs:
   - When the drive is ready for use, the green activity LED and the amber status LED are off.
   - If the amber status LED is lit and not flashing, remove the drive from the unit and wait 10 seconds; then, reinstall the drive. If the status LED is flashing, the drive is rebuilding.

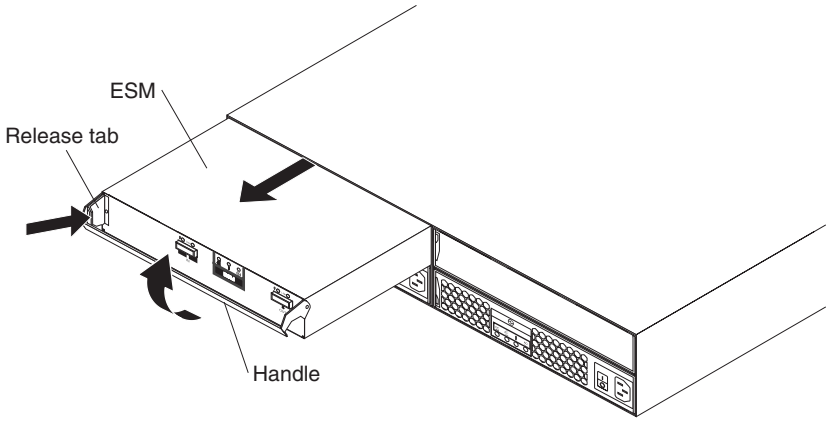
Controller management information: In some cases, the RAID controller automatically resets the drive to the Hot Spare or Rebuild state. If the drive state does not change automatically (the amber LED stays lit), see your RAID controller management documentation for information about manually changing the state of the drive from the current state to another state, such as Hot Spare or Ready. The amber LED should turn off within 10 seconds after the drive state changes.

Replacing an ESM

If you are replacing the only ESM in the EXP3000, you must turn off power to the EXP3000 before you replace the ESM. Refer to the documentation that comes with your RAID controller for additional information and instructions.

To replace an ESM, complete the following steps:

1. Read the safety information that begins on page iii and “Installation guidelines” on page 26.
2. If the EXP3000 contains only one ESM, turn off the power to the EXP3000. For more information, see “Turning off the EXP3000” on page 22.
3. Disconnect the SAS cable from the ESM.
4. On the left side of the ESM, press the orange release tab to the right just enough to release the handle (no more than 6 mm [0.25 in.]) as you rotate the handle upward.



5. Using the handle, gently slide the ESM out of the EXP3000.
6. Hold the new ESM so that the handle is fully extended.
7. Gently slide the ESM into the bay until it stops. Rotate the handle downward into the closed position until it clicks.
8. Connect the SAS cable to the ESM.
9. Turn on the power to the EXP3000. For more information, see “Turning on the EXP3000” on page 21.
10. Go to http://www.ibm.com/servers/storage/support/ to check for ESM code updates. For more information, see the download instructions on page 1.

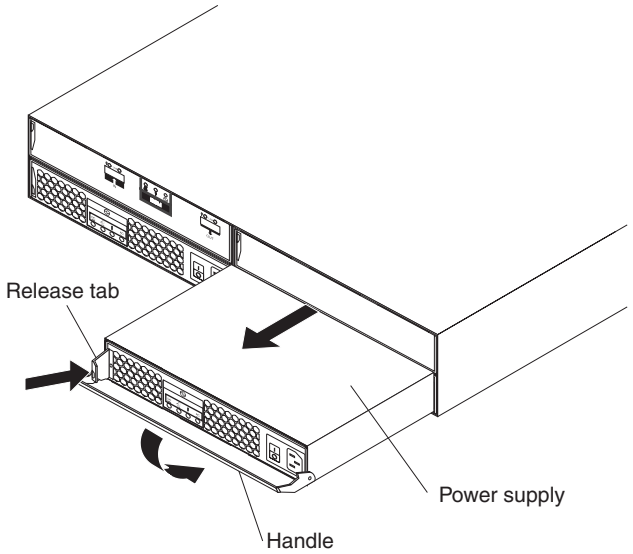
Replacing a hot-swap power supply

Before you replace a power supply, read the following important information:

- The power supply does not require preventive maintenance.
- Both power supplies must be installed to maintain cooling.
- Use only power supplies that the EXP3000 supports.

To replace a hot-swap power supply, complete the following steps:

1. Read the safety information that begins on page iii and “Installation guidelines” on page 26.
2. Turn off the power supply.
3. Disconnect the power cord from the electrical outlet.
4. Disconnect the power cord from the power supply.
5. On the left side of the power supply, press the orange release tab to the right just enough to release the handle (no more than 6 mm [0.25 in.]) as you rotate the handle downward.



6. Using the handle, gently slide the power supply out of the EXP3000.
7. Make sure that the new power supply that you are installing is turned off.
8. Hold the new power supply so that the handle is fully extended.
9. Gently slide the power supply into the EXP3000 until it stops. Rotate the handle upward into the closed position until it clicks.
10. Connect the power cord to the power supply.
11. Connect the other end of the power cord to a properly grounded electrical outlet.

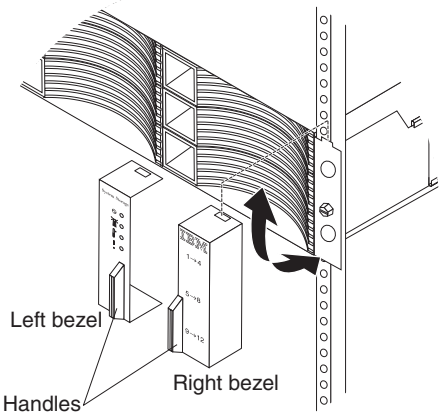
    Note: The fault (amber) LED is lit on the new power supply because its power switch is turned off.
12. Turn on the power supply.

    After you turn on the power, the fault (amber) LED is off, and the ac and dc power (green) LEDs are lit.

Replacing the bezels

The left bezel contains the LEDs; the right bezel shows the hard disk drive IDs. See the illustrations in “Front view: components” on page 17

Removing the bezels



To remove either the left or right bezel, complete the following steps:

1. If the EXP3000 is on a table or other flat surface, elevate the EXP3000 front slightly or extend the front over the table edge.
2. Grasp the handle on the front of the bezel and pull until the bezel is clear of the bottom tab on the chassis flange.
3. Lift the bezel off the chassis flange.

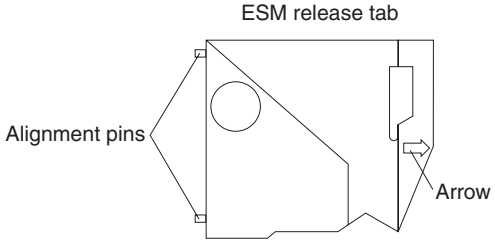
Installing the bezels

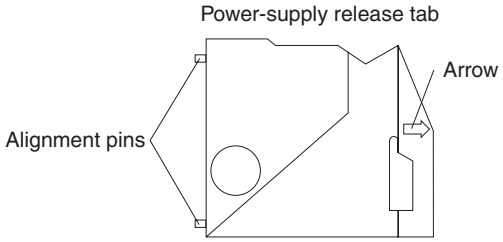
To install either the left or right bezel, complete the following steps:

1. Fit the cutout that is on the top of the bezel over the tab on the chassis flange.
2. Rotate the bezel down until it snaps into place. Make sure that the inside surface of the bezel is flush with the chassis.

Replacing the release tab on an ESM or power supply

The miscellaneous hardware kit contains two replacement release tabs: one for a power supply and one for an ESM or ESM filler panel. Obtain a miscellaneous hardware kit if you have to replace a release tab (see Table 4 on page 26).





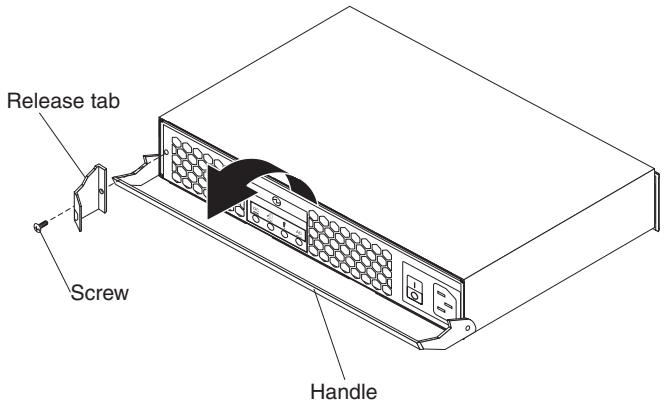
Before you replace a release tab, read the following important information:

- In this procedure, the term *ESM* refers to an ESM or ESM filler panel.
- Make sure that you have a size #1 or #0 Phillips screwdriver.

To replace a release tab, complete the following steps:

1. Read the safety information that begins on page iii and “Installation guidelines” on page 26.
2. Make sure that it is safe to proceed:
   - If you are replacing the release tab on the only ESM in the EXP3000, make sure that the EXP3000 is shut down for maintenance.
   - If you are replacing a power-supply release tab, make sure that the power supplies are providing redundant power (on both power supplies, the ac power LED and dc power LEDs are lit, and the fault LED is off). If the power supplies are not providing redundant power, resolve the redundancy problem first, or wait until the EXP3000 is shut down for maintenance, before you replace the release tab.
3. Remove the ESM or power supply from the EXP3000 chassis. See “Replacing an ESM” on page 29 or “Replacing a hot-swap power supply” on page 30.
4. Close the handle to move it out of the way.

   The following illustration shows how to remove the release tab on a power supply.



5. Use a #1 or #0 Phillips screwdriver to remove the screw that secures the release tab to the ESM or power supply; then, remove the release tab. Save the screw to install the new release tab.
6. Insert the alignment pins on the release tab into the holes in the left front of the ESM or power supply and hold it in place.

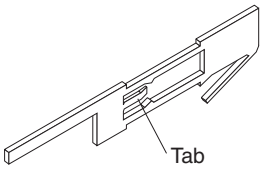
   Note: The arrow on the outside of the release tab points to the right.
7. Use a #1 or #0 Phillips screwdriver to install the screw that you removed in step 5.
8. Press the release tab gently to the right and open the handle on the ESM or power supply.
9. Reinstall the ESM or power supply. See “Replacing an ESM” on page 29 or “Replacing a hot-swap power supply” on page 30.

Replacing a drive compatibility key

Each hard disk drive bay contains a drive compatibility key, which helps to ensure that you install only a supported drive in the bay.

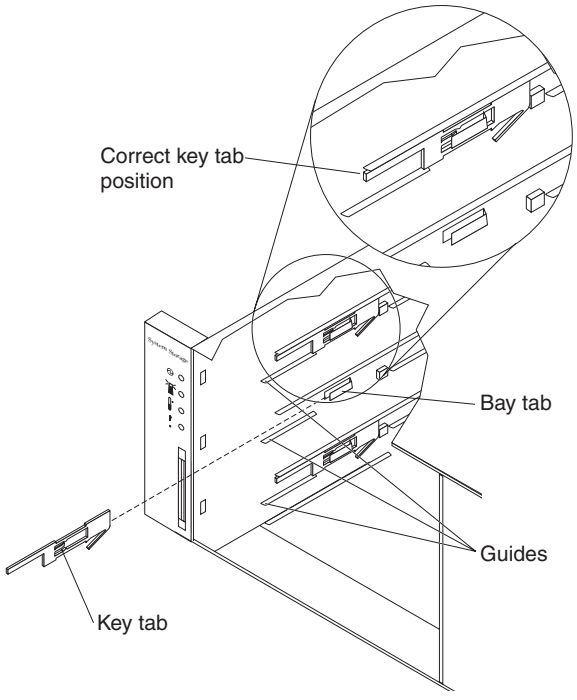
Important: Do not attempt to install any hard disk drive other than a supported drive in any hard disk drive bay. See http://www.ibm.com/servers/storage/disk/exp3000/index.html for information about the EXP3000 and an interoperability matrix that lists supported hard disk drives.

If a drive compatibility key breaks, you must replace it. The miscellaneous hardware kit contains several replacement drive compatibility keys; obtain a kit if you have to replace a drive compatibility key (see Table 4 on page 26). The following illustration shows a drive compatibility key.



To replace a drive compatibility key, complete the following steps:

1. Read the safety information that begins on page iii and “Installation guidelines” on page 26.
2. Turn off the EXP3000, or wait until the EXP3000 is shut down for maintenance.
3. Remove the three hard disk drives that are in the column of bays that contain the broken drive compatibility key. See “Replacing a hot-swap hard disk drive” on page 28.
4. Remove the broken drive compatibility key:
   a. Flex the rear of the key slightly toward the middle of the bay to release it from the tab that holds it.
   b. Slide the key toward the front of the bay until it is released from the chassis.



5. Install the replacement drive compatibility key:
   a. Orient the key as shown in the illustration.
   b. Place the key between the drive guides in the left wall of the bay, flush with the wall.

c. Slide the key tab under the metal tab that is on the left wall of the bay; then, slide the key toward the rear of the chassis until the key stops (the key is flush with the side wall, the tab is covered, and the front of the key extends approximately 1 mm [0.04 in.] in front of the short metal upper guide).

6. Reinstall the hard disk drives in the bays from which they were removed. See “Replacing a hot-swap hard disk drive” on page 28.
7. If you turned off the EXP3000 in step 2 on page 34, turn it on.

Chapter 5. Solving problems

The following table contains troubleshooting information to help you solve some basic problems that you might have with the EXP3000.

Table 5. Troubleshooting information

Component	Problem indicator	Possible cause	Possible solutions
Hard disk drive	Amber fault LED lit	Drive failure	Replace the failed hard disk drive. See “Replacing a hot-swap hard disk drive” on page 28.
ESM		Board failure	Replace the failed ESM. See “Replacing an ESM” on page 29.
Front panel		General machine fault	A status or fault LED somewhere on the EXP3000 is lit. Check for amber LEDs on components. See Chapter 3, “EXP3000 controls, LEDs, and power,” on page 17.
All components	All green LEDs off	The EXP3000 is turned off	Make sure that all EXP3000 power cables are connected and that the power is on. If applicable, make sure that the main circuit breakers for the rack are turned on.
		ac or dc power failure	Check the main circuit breaker and ac or dc outlet.
		Power-supply failure	Replace the power supply. See “Replacing a hot-swap power supply” on page 30.
		Midplane failure	Have the EXP3000 serviced.
Hard disk drives	Amber fault LED flashing	Drive rebuild or identity in process	No action is required.
Power supply	Amber fault LED lit; green dc power LED off	Power supply failure; power supply turned off; minimum hard disk drives not installed	1. Install four or more hard disk drives, turn off the power, and turn it on again. 2. If the power-supply switch is on, turn off the power supply and then turn it on again. If the condition remains, replace the power supply. See “Replacing a hot-swap power supply” on page 30.
Power supply	Amber fault LED lit; green ac power LED off	No ac power to power supply	Check the ac power cord or breaker. • If ac power is good at the source, replace the power cord. • If the power supply has failed, replace the power supply. See “Replacing a hot-swap power supply” on page 30.
ESM	Link fault amber LED lit	SAS communication failure	1. Reconnect the SAS cable. 2. Replace the SAS cable. 3. If the LED is still lit, replace either the ESM or the controller or device into which the other end of the SAS cable is connected.

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Table 5. Troubleshooting information (continued)

Component	Problem indicator	Possible cause	Possible solutions
One or more hard disk drives	One or more green LEDs off	No activity to the drives	No action is required.
All hard disk drives		No activity to the drives	No action is required.
		Damaged or loose SAS cables	Check the SAS cables and connections.
		ESM failure	Use the RAID controller management software to check the drive status. Replace the ESM. See “Replacing an ESM” on page 29.
		Midplane failure	Have the EXP3000 serviced.
Front panel		Power supply	Make sure that the cables are connected and the power supplies are turned on.
		Hardware failure	If any other LEDs are lit, have the EXP3000 serviced.
Some or all components	Intermittent or sporadic power loss to the EXP3000	Defective ac or dc power source or partially connected power cord	1. Check the ac or dc power source. 2. Secure all installed power cables and power supplies. 3. If applicable, check the power components (power supplies, uninterruptible power supply, and so on). 4. Replace defective power cables.
		Power-supply failure	Check for a fault LED on the power supply and replace the failed power supply. See “Replacing a hot-swap power supply” on page 30.
		Midplane failure	Have the EXP3000 serviced.
Drives	Unable to access any drives	SAS cable	1. Make sure that the SAS cables are undamaged and correctly connected. 2. Replace the cables.
		ESM failure	Have the EXP3000 serviced.
Subsystem	Random errors	Midplane failure	Have the EXP3000 serviced.

Appendix A. Getting help and technical assistance

If you need help, service, or technical assistance or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you. This section contains information about where to go for additional information about IBM and IBM products, what to do if you experience a problem with your system, and whom to call for service, if it is necessary.

Before you call

Before you call, make sure that you have taken these steps to try to solve the problem yourself:

- Check all cables to make sure that they are connected.
- Check the power switches to make sure that the system and any optional devices are turned on.
- Use the troubleshooting information in your system documentation, and use the diagnostic tools that come with your system. Information about diagnostic tools is in the *Problem Determination and Service Guide* on the IBM *Documentation* CD that comes with your system.
- Go to the IBM support Web site at http://www.ibm.com/systems/support/ to check for technical information, hints, tips, and new device drivers or to submit a request for information.

You can solve many problems without outside assistance by following the troubleshooting procedures that IBM provides in the online help or in the documentation that is provided with your IBM product. The documentation that comes with IBM systems also describes the diagnostic tests that you can perform. Most systems, operating systems, and programs come with documentation that contains troubleshooting procedures and explanations of error messages and error codes. If you suspect a software problem, see the documentation for the operating system or program.

Using the documentation

Information about your IBM system and preinstalled software, if any, or optional device is available in the documentation that comes with the product. That documentation can include printed documents, online documents, readme files, and help files. See the troubleshooting information in your system documentation for instructions for using the diagnostic programs. The troubleshooting information or the diagnostic programs might tell you that you need additional or updated device drivers or other software. IBM maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates. To access these pages, go to http://www.ibm.com/systems/support/ and follow the instructions. Also, some documents are available through the IBM Publications Center at http://www.ibm.com/shop/publications/order/.

Getting help and information from the World Wide Web

On the World Wide Web, the IBM Web site has up-to-date information about IBM systems, optional devices, services, and support. The address for IBM System x™ and xSeries® information is http://www.ibm.com/systems/x/. The address for IBM BladeCenter® information is http://www.ibm.com/systems/bladecenter/. The address for IBM IntelliStation® information is http://www.ibm.com/intellistation/.

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You can find service information for IBM systems and optional devices at http://www.ibm.com/systems/support/.

Software service and support

Through IBM Support Line, you can get telephone assistance, for a fee, with usage, configuration, and software problems with System x and xSeries servers, BladeCenter products, IntelliStation workstations, and appliances. For information about which products are supported by Support Line in your country or region, see http://www.ibm.com/services/sl/products/.

For more information about Support Line and other IBM services, see http://www.ibm.com/services/, or see http://www.ibm.com/planetwide/ for support telephone numbers. In the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

Hardware service and support

You can receive hardware service through IBM Services or through your IBM reseller, if your reseller is authorized by IBM to provide warranty service. See http://www.ibm.com/planetwide/ for support telephone numbers, or in the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

In the U.S. and Canada, hardware service and support is available 24 hours a day, 7 days a week. In the U.K., these services are available Monday through Friday, from 9 a.m. to 6 p.m.

IBM Taiwan product service

台灣 IBM 產品服務聯絡方式：
台灣國際商業機器股份有限公司
台北市松仁路 7 號 3 樓
電話：0800-016-888

IBM Taiwan product service contact information:
IBM Taiwan Corporation
3F, No 7, Song Ren Rd.
Taipei, Taiwan
Telephone: 0800-016-888

Appendix B. Notices

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Active Memory	IntelliStation	Tivoli Enterprise
Active PCI	NetBAY	Update Connector
Active PCI-X	Netfinity	Wake on LAN

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AIX	PowerExecutive	XA-32
Alert on LAN	Predictive Failure Analysis	XA-64
BladeCenter	ServeRAID	X-Architecture
Chipkill	ServerGuide	XpandOnDemand
e-business logo	ServerProven	xSeries
@server	System x	

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Important notes

Processor speed indicates the internal clock speed of the microprocessor; other factors also affect application performance.

CD or DVD drive speed is the variable read rate. Actual speeds vary and are often less than the possible maximum.

When referring to processor storage, real and virtual storage, or channel volume, KB stands for 1024 bytes, MB stands for 1 048 576 bytes, and GB stands for 1 073 741 824 bytes.

When referring to hard disk drive capacity or communications volume, MB stands for 1 000 000 bytes, and GB stands for 1 000 000 000 bytes. Total user-accessible capacity can vary depending on operating environments.

Maximum internal hard disk drive capacities assume the replacement of any standard hard disk drives and population of all hard disk drive bays with the largest currently supported drives that are available from IBM.

Maximum memory might require replacement of the standard memory with an optional memory module.

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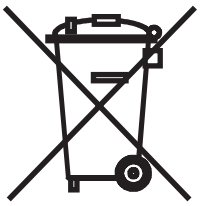
Some software might differ from its retail version (if available) and might not include user manuals or all program functionality.

Product recycling and disposal

This unit must be recycled or discarded according to applicable local and national regulations. IBM encourages owners of information technology (IT) equipment to responsibly recycle their equipment when it is no longer needed. IBM offers a variety of product return programs and services in several countries to assist equipment owners in recycling their IT products. Information on IBM product recycling offerings can be found on IBM's Internet site at http://www.ibm.com/ibm/environment/products/index.shtml.

Esta unidad debe reciclarse o desecharse de acuerdo con lo establecido en la normativa nacional o local aplicable. IBM recomienda a los propietarios de equipos de tecnología de la información (TI) que reciclen responsablemente sus equipos cuando éstos ya no les sean útiles. IBM dispone de una serie de programas y servicios de devolución de productos en varios países, a fin de ayudar a los propietarios de equipos a reciclar sus productos de TI. Se puede encontrar información sobre las ofertas de reciclado de productos de IBM en el sitio web de IBM http://www.ibm.com/ibm/environment/products/index.shtml.



Notice: This mark applies only to countries within the European Union (EU) and Norway.

This appliance is labeled in accordance with European Directive 2002/96/EC concerning waste electrical and electronic equipment (WEEE). The Directive determines the framework for the return and recycling of used appliances as applicable throughout the European Union. This label is applied to various products to indicate that the product is not to be thrown away, but rather reclaimed upon end of life per this Directive.

注意: このマークは EU 諸国およびノルウェーにおいてのみ適用されます。

この機器には、EU 諸国に対する廃電気電子機器指令 2002/96/EC(WEEE) のラベルが貼られています。この指令は、EU 諸国に適用する使用済み機器の回収とリサイクルの骨子を定めています。このラベルは、使用済みになった時に指令に従って適正な処理をする必要があることを知らせるために種々の製品に貼られています。

Remarque : Cette marque s'applique uniquement aux pays de l'Union Européenne et à la Norvège.

L'etiquette du système respecte la Directive européenne 2002/96/EC en matière de Déchets des Equipements Electriques et Electroniques (DEEE), qui détermine les dispositions de retour et de recyclage applicables aux systèmes utilisés à travers l'Union européenne. Conformément à la directive, ladite étiquette précise que le produit sur lequel elle est apposée ne doit pas être jeté mais être récupéré en fin de vie.

In accordance with the European WEEE Directive, electrical and electronic equipment (EEE) is to be collected separately and to be reused, recycled, or recovered at end of life. Users of EEE with the WEEE marking per Annex IV of the WEEE Directive, as shown above, must not dispose of end of life EEE as unsorted municipal waste, but use the collection framework available to customers for the return, recycling, and recovery of WEEE. Customer participation is important to minimize any potential effects of EEE on the environment and human health due to the potential presence of hazardous substances in EEE. For proper collection and treatment, contact your local IBM representative.

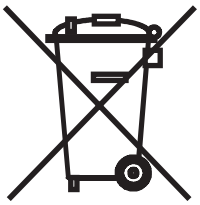
Battery return program

This product may contain a sealed lead acid, nickel cadmium, nickel metal hydride, lithium, or lithium ion battery. Consult your user manual or service manual for specific battery information. The battery must be recycled or disposed of properly. Recycling facilities may not be available in your area. For information on disposal of batteries outside the United States, go to http://www.ibm.com/ibm/environment/products/index.shtml or contact your local waste disposal facility.

In the United States, IBM has established a return process for reuse, recycling, or proper disposal of used IBM sealed lead acid, nickel cadmium, nickel metal hydride, and battery packs from IBM equipment. For information on proper disposal of these batteries, contact IBM at 1-800-426-4333. Have the IBM part number listed on the battery available prior to your call.

For Taiwan: Please recycle batteries.

For the European Union:



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Batteries or packaging for batteries are labeled in accordance with European Directive 2006/66/EC concerning batteries and accumulators and waste batteries and accumulators. The Directive determines the framework for the return and recycling of used batteries and accumulators as applicable throughout the European Union. This label is applied to various batteries to indicate that the battery is not to be thrown away, but rather reclaimed upon end of life per this Directive.

Les batteries ou emballages pour batteries sont étiquetés conformément aux directives européennes 2006/66/EC, norme relative aux batteries et accumulateurs en usage et aux batteries et accumulateurs usés. Les directives déterminent la marche à suivre en vigueur dans l'Union Européenne pour le retour et le recyclage des batteries et accumulateurs usés. Cette étiquette est appliquée sur diverses batteries pour indiquer que la batterie ne doit pas être mise au rebut mais plutôt récupérée en fin de cycle de vie selon cette norme.

バッテリーあるいはバッテリー用のパッケージには、EU 諸国に対する廃電気電子機器指令 2006/66/EC のラベルが貼られています。この指令は、バッテリーと蓄電池、および廃棄バッテリーと蓄電池に関するものです。この指令は、使用済みバッテリーと蓄電池の回収とリサイクルの骨子を定めているもので、EU 諸国にわたって適用されます。このラベルは、使用済みになったときに指令に従って適正な処理をする必要があることを知らせるために種々のバッテリーに貼られています。

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For California:

Perchlorate material – special handling may apply. See http://www.dtsc.ca.gov/hazardouswaste/perchlorate/.

The foregoing notice is provided in accordance with California Code of Regulations Title 22, Division 4.5 Chapter 33. Best Management Practices for Perchlorate Materials. This product/part may include a lithium manganese dioxide battery which contains a perchlorate substance.

Electronic emission notices

Federal Communications Commission (FCC) statement

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

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. IBM is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

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.

Industry Canada Class A emission compliance statement

This Class A digital apparatus complies with Canadian ICES-003.

Avis de conformité à la réglementation d'Industrie Canada

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

Australia and New Zealand Class A statement

Attention: 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.

United Kingdom telecommunications safety requirement

Notice to Customers

This apparatus is approved under approval number NS/G/1234/J/100003 for indirect connection to public telecommunication systems in the United Kingdom.

European Union EMC Directive conformance statement

This product is in conformity with the protection requirements of EU Council Directive 2004/108/EC on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a nonrecommended modification of the product, including the fitting of non-IBM option cards.

This product has been tested and found to comply with the limits for Class A Information Technology Equipment according to CISPR 22/European Standard EN

55022. The limits for Class A equipment were derived for commercial and industrial environments to provide reasonable protection against interference with licensed communication equipment.

Attention: 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.

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Fax: 0049 (0)711 785 1283
E-mail: tjahn@de.ibm.com

Taiwanese Class A warning statement

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。

Chinese Class A warning statement

声　　明
此为 A 级产品。在生活环境中，
该产品可能会造成无线电干扰。
在这种情况下，可能需要用户对其
干扰采取切实可行的措施。

Japanese Voluntary Control Council for Interference (VCCI) statement

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。

Korean Class A warning statement

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Index

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P

R

S

T

U

W

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