

IBM EXP400 Storage Expansion Unit



# Installation Guide



IBM EXP400 Storage Expansion Unit



# Installation Guide

**Note:** Before using this information and the product it supports, read the general information in Appendix B, "IBM Statement of Limited Warranty Z125-4753-07 11/2002", on page 35 and Appendix C, "Notices", on page 51.

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# Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الأمنية

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.

Pred 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 ασφαλείας (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 pečítajte 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.

**Important:**

All caution and danger statements in this documentation begin with a number. This number is used to cross reference an English caution or danger statement with translated versions of the caution or danger statement in the *IBM Safety Information* book.

For example, if a caution statement begins with a number 1, translations for that caution statement appear in the *IBM Safety Information* book under statement 1.

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

**Statement 1:**



**DANGER**

**Electrical current from power, telephone, and communication cables is hazardous.**

**To avoid a shock hazard:**

- **Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.**
- **Connect all power cords to a properly wired and grounded electrical outlet.**
- **Connect to properly wired outlets any equipment that will be attached to this product.**
- **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 table when installing, moving, or opening covers on this product or attached devices.**

**To Connect:**

1. Turn everything OFF.
2. First, attach all cables to devices.
3. Attach signal cables to connectors.
4. Attach power cords to outlet.
5. Turn device ON.

**To Disconnect:**

1. Turn everything OFF.
2. First, remove power cords from outlet.
3. Remove signal cables from connectors.
4. Remove all cables from devices.

**Statement 4:**



≥ 18 kg (39.7 lb)



≥ 32 kg (70.5 lb)



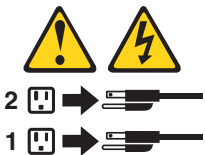
≥ 55 kg (121.2 lb)

**CAUTION:**  
Use safe practices when lifting.

**Statement 5:**



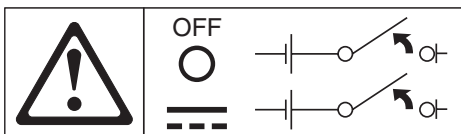
**CAUTION:**  
The power control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.



**Statement 19:**



**CAUTION:**  
The power-control button on the device does not turn off the electrical current supplied to the device. The device also might have more than one connection to dc power. To remove all electrical current from the device, ensure that all connections to dc power are disconnected at the dc power input terminals.





Statement 22:



**CAUTION:**

To reduce the risk of electric shock or energy hazards:

- This equipment must be installed by trained service personnel in a restricted-access location, as defined by the NEC and IEC 60950, Third Edition, The Standard for Safety of Information Technology Equipment.
- Connect the equipment to a reliably grounded safety extra low voltage (SELV) source. An SELV source is a secondary circuit that is designed so that normal and single fault conditions do not cause the voltages to exceed a safe level (60 V direct current).
- The branch circuit overcurrent protection must be rated at a minimum of 13 A to a maximum of 15 A.
- Use 16 American Wire Gauge (AWG) or 1.3 mm<sup>2</sup> copper conductor only, not exceeding 3 meters in length.
- Torque the wiring-terminal screws to 12 inch-pounds (1.4 newton-meters).
- Incorporate a readily available accessible and rated disconnect device in the field wiring.

**WARNING:** Handling the cord on this product or cords associated with accessories sold with this product, will expose you to lead, a chemical known to the State of California to cause cancer, and birth defects or other reproductive harm. ***Wash hands after handling.***

**ADVERTENCIA:** El contacto con el cable de este producto o con cables de accesorios que se venden junto con este producto, pueden exponerle al plomo, un elemento químico que en el estado de California de los Estados Unidos está considerado como un causante de cancer y de defectos congénitos, además de otros riesgos reproductivos. ***Lávese las manos después de usar el producto.***



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# Chapter 1. Introducing the IBM EXP400 Storage Expansion Unit

This *Installation Guide* contains instructions for setting up your IBM® EXP400 Storage Expansion Unit and basic instructions for installing options. More detailed instructions for replacing options and information about features are in the *User's Guide* on the IBM *Documentation CD*, which comes with your IBM EXP400 Storage Expansion Unit. The IBM EXP400 Storage Expansion Unit is referred to in this *Installation Guide* as expansion unit.

This publication contains information about:

- Setting up and cabling your expansion unit
- Starting and configuring your expansion unit
- Installing options
- Solving problems

The expansion unit provides high-capacity, small computer system interface (SCSI) disk storage. It supports up to 14 Ultra320 SCSI hard disk drives on a single or dual bus. It delivers fast, high-volume data transfer, retrieval, and storage functions across multiple drives, to multiple hosts. The expansion unit is designed for continuous, reliable service; the modular, redundant disk drives, power supply with fan units, and SCSI Bus Expander and Enclosure Services Module (referred to throughout this book as ESM) use hot-swap technology for easy replacement without turning off the expansion unit.

Expansion unit models 1RU and 1RX come with two 500-watt ac power supply with fan units, one ESM (the second ESM is optional), a filler panel to cover the empty ESM bay, and 14 drive filler panels. Expansion unit model 2RX comes with two -48 volt dc power supply with built-in fan units, two ESMs, and 14 drive filler panels. The drive filler panels are replaced with hard disk drive options.

Your expansion unit documentation might be updated occasionally to include information about new features, a translated version of the documentation might be available in your language, or technical updates might be available to provide additional information that is not included in your expansion unit documentation. These updates are available from the IBM Web site. Complete the following steps to check for updated documentation and technical updates:

1. Go to <http://www.ibm.com/pc/support/>.
2. In the **Learn** section, click **Online publications**.
3. On the "Online publications" page, in the **Brand** field, select **Servers**.
4. In the **Family** field, select **Rack/Storage Enclosures**.
5. Click **Display documents**.

Your expansion unit comes with a limited warranty. For more information about the terms of your warranty, see Appendix B, "IBM Statement of Limited Warranty Z125-4753-07 11/2002", on page 35.

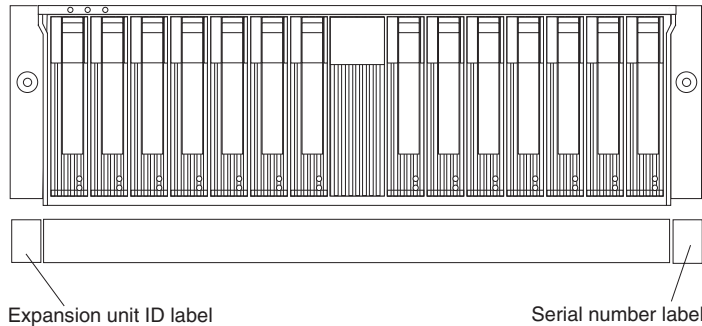
Record information about your expansion unit in Table 1 on page 2. You will need this information if you need to call for service.

Table 1. Product identification record

|                      |                                   |
|----------------------|-----------------------------------|
| <b>Product name</b>  | IBM EXP400 Storage Expansion Unit |
| <b>Machine type</b>  | 1733                              |
| <b>Model number</b>  | 1RU, 1RX, or 2RX                  |
| <b>Serial number</b> |                                   |
| <b>ID number</b>     |                                   |

The expansion unit ID and serial number are located on the front panel of the expansion unit, as shown in the following illustration.

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



Use Table 2 to keep a record of the options installed in or attached to your expansion unit. This information can be helpful when you install additional options or if you need to report a hardware problem. Make a copy of this table before recording information in it, in case you need extra space to write new values later, or when you update your expansion unit configuration.

Table 2. Drive location information record

| Drive location | Drive part and model number | Drive serial number | SCSI bus (1,2) | SCSI ID (0-6 or 8-14) |
|----------------|-----------------------------|---------------------|----------------|-----------------------|
| Bay 1          |                             |                     |                |                       |
| Bay 2          |                             |                     |                |                       |
| Bay 3          |                             |                     |                |                       |
| Bay 4          |                             |                     |                |                       |
| Bay 5          |                             |                     |                |                       |
| Bay 6          |                             |                     |                |                       |
| Bay 7          |                             |                     |                |                       |
| Bay 8          |                             |                     |                |                       |
| Bay 9          |                             |                     |                |                       |
| Bay 10         |                             |                     |                |                       |
| Bay 11         |                             |                     |                |                       |
| Bay 12         |                             |                     |                |                       |
| Bay 13         |                             |                     |                |                       |
| Bay 14         |                             |                     |                |                       |

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## The IBM Documentation CD

The IBM *Documentation* CD contains documentation for your expansion unit 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 NT® 4.0 (with Service Pack 3 or later), Windows® 98, or Windows 2000.
- 100 MHz Intel Pentium® microprocessor.
- 32 MB of RAM.
- Adobe Acrobat Reader 3.0 or later. Acrobat Reader software is included on the CD, and you can install it when you run the Documentation Browser.

### Using the Documentation Browser

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

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

- If Autostart is enabled, insert the CD into your CD-ROM drive. The Documentation Browser starts automatically.
- If Autostart is disabled, insert the CD into your CD-ROM drive and click **Start --> Run**. In the **Open** field, type

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

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

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

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

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

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

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## Notices and statements used in this publication

The caution and danger statements that appear in this publication are also in the multilingual *Safety Information* publication, which is on the IBM *Documentation* CD. Each statement is numbered for reference to the corresponding statement in the *Safety Information* publication.

The following types of notices and statements are used in this book:

- **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 possible damage to programs, devices, or data. An attention notice is placed just before the instruction or situation in which damage could 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 on page 5 contains a summary of the features and operating specifications for your expansion unit. Depending on your expansion unit model, some features might not be available, or some specifications might not apply.



Table 3. Features and operating specifications

|  |  |   |
|--|--|---|
| <p><b>General:</b></p> <ul style="list-style-type: none"> <li>• Modular components <ul style="list-style-type: none"> <li>– High-capacity disk drives</li> <li>– SCSI Bus Expander and Enclosure Services Module (ESM)</li> <li>– Power supplies with built-in fan units</li> </ul> </li> <li>• Technology <ul style="list-style-type: none"> <li>– Supports disk array technology</li> <li>– Supports clustering</li> <li>– SCSI (Ultra320) host interface, redundant data storage, power and cooling system, and ESMs</li> <li>– Hot-swap technology for hard disk drives, power supply with fan units, and ESMs</li> </ul> </li> <li>• User interface <ul style="list-style-type: none"> <li>– Built-in power, activity, and fault indicators, identification labeling on CRUs, rear indicator lights, switches, and connectors</li> <li>– Easy-to-replace drives, power supplies with built-in fan units, and ESMs</li> </ul> </li> </ul> <p><b>Hard disk drive storage:</b></p> <ul style="list-style-type: none"> <li>• Current capabilities: <ul style="list-style-type: none"> <li>– Maximum hard disk drives per expansion unit: 14</li> <li>– Hard disk drives per SCSI bus segment: 7</li> <li>– SCSI buses per unit: 2</li> <li>– SCSI buses can be configured as one continuous SCSI bus.</li> </ul> </li> </ul> <p><b>ESMs:</b></p> <ul style="list-style-type: none"> <li>• Technology and interfaces: <ul style="list-style-type: none"> <li>– SCSI: Ultra320</li> <li>– SCSI bus interface: Two 68-pin, Very High Density Connector Interface (VHDCI) connectors for SCSI bus cables</li> </ul> </li> </ul> | <p><b>Acoustical noise emissions:</b><br/>For open bay (no drives installed) and maximum system configurations (14 hard disk drives installed).</p> <ul style="list-style-type: none"> <li>• Sound power (idling): <ul style="list-style-type: none"> <li>– 5.5 bels (open bay)</li> <li>– 5.7 bels (typical)</li> </ul> </li> <li>• Sound power (operating): <ul style="list-style-type: none"> <li>– 6.0 bels (open bay)</li> <li>– 6.5 bels (typical)</li> </ul> </li> <li>• Sound pressure (idling): <ul style="list-style-type: none"> <li>– 44 dBA (open bay)</li> <li>– 47 dBA (typical)</li> </ul> </li> <li>• Sound pressure (operating): <ul style="list-style-type: none"> <li>– 44 dBA (open bay)</li> <li>– 54 dBA (typical)</li> </ul> </li> </ul> <p><b>AC power supply with built-in fan:</b></p> <ul style="list-style-type: none"> <li>• Expansion unit model 1RU or 1RX comes with two hot-swap 500 watt (115 - 230 V ac) power supply with fan units.</li> <li>• The two power supplies provide redundant power to the expansion unit.</li> </ul> <p><b>-48 volt dc power supply:</b></p> <p>At a nominal voltage of -48 volt dc, the expansion unit draws approximately 5 amperes.</p> <p><b>Size:</b></p> <ul style="list-style-type: none"> <li>• Height: 12.8 cm (5.0 in.)</li> <li>• Depth: 54.0 cm (21.8 in.)</li> <li>• Width: 44.7 cm (17.6 in.)</li> <li>• Weight: approximately 24.3 kg (53.6 lb) for a standard unit. When fully configured 37.3 kg (82 lb)</li> </ul> <p><b>Environment:</b></p> <ul style="list-style-type: none"> <li>• Air temperature: <ul style="list-style-type: none"> <li>– Expansion unit on: 10° to 40°C (50.0° to 104°F); altitude: 30.5 (100 ft) below to 3000 m (9840 ft) above sea level; temperature change: 10°C to (18°F) per hour</li> <li>– Expansion unit off: 10° to 50°C (14.0° to 120.0°F); maximum altitude: 3000 m (9840 ft); temperature change: 15°C (27.0°F) per hour</li> </ul> </li> </ul> | <p><b>Environment cont.</b></p> <ul style="list-style-type: none"> <li>• Humidity: <ul style="list-style-type: none"> <li>– Expansion unit on: 20% to 80%</li> <li>– Expansion unit off: 10% to 90%</li> <li>– Maximum dew point: 26°C (79°F)</li> <li>– Maximum humidity gradient: 10% per hour</li> </ul> </li> </ul> <p><b>Heat output:</b></p> <p>Approximate heat output in British thermal units (Btu) per hour:</p> <ul style="list-style-type: none"> <li>• Minimum configuration: 82.4 Btu (282 watts)</li> <li>• Maximum configuration: 91.0 Btu (311 watts)</li> </ul> <p><b>Electrical input:</b></p> <ul style="list-style-type: none"> <li>• Sine-wave input (50-60 Hz) required</li> <li>• Input voltage low range: <ul style="list-style-type: none"> <li>– Minimum: 90 V ac</li> <li>– Maximum: 136 V ac</li> </ul> </li> <li>• Input voltage high range: <ul style="list-style-type: none"> <li>– Minimum: 198 V ac</li> <li>– Maximum: 264 V ac</li> </ul> </li> <li>• Input kilovolt-amperes (kVA), approximately: <ul style="list-style-type: none"> <li>– Minimum: 0.06 kVA</li> <li>– Maximum: 0.45 kVA</li> </ul> </li> </ul> <p><b>Notes:</b></p> <ol style="list-style-type: none"> <li>1. Power consumption and heat output vary depending on the number and type of optional features installed and the power-management optional features in use.</li> <li>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 values stated 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.</li> </ol> |
|--|--|---|

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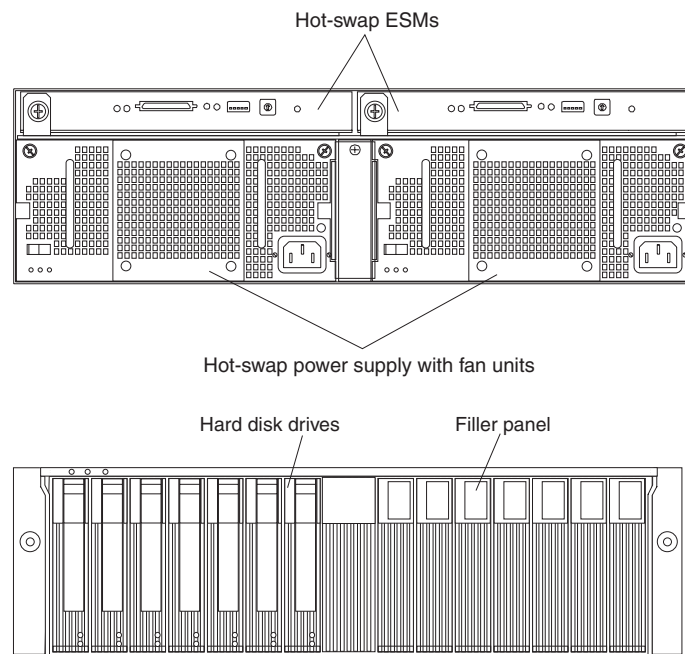
## Major components of the expansion unit

The orange color on components and labels in the expansion unit indicates hot-swap or hot-plug components. You can install or remove these components while the expansion unit is running. For information about installing hot-swap and hot-plug components, see Chapter 6, “Solving problems”, on page 31.

The blue color on components and labels indicates touch points, where a component can be gripped, a latch moved, and so on.

The following illustration shows the locations of major components in your expansion unit.

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



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## Rack or enclosure installation

You can install the expansion unit in the following types of enclosures:

- An Electronic Industries Association (EIA) 310 standard rack cabinet  
For complete rack installation instructions, see the *Rack Installation Instructions* publication.
- A tower enclosure unit  
For complete installation instructions, see the *Rack-to-Tower Conversion Kit Installation Instructions* that come with the rack-to-tower conversion kit.

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## Clustering support

Clustering is a feature of the expansion unit. Clustering is a way to share SCSI buses and hard disk drives among SCSI controllers to provide redundancy of SCSI controllers and servers. This redundancy is important if a hardware component fails. If a hardware component fails after clustering is set up, another server will take ownership of the hard disk drives or SCSI bus.

The expansion unit supports twin-tailed clustering. With twin-tailed clustering, you can connect two IBM ServeRAID™ controllers to one expansion unit. In the twin-tailed clustering environment, you can use dual-host controllers cabled separately to the expansion unit; however, only a single bus of 13 drives is supported. Each SCSI device on a SCSI bus must have a unique ID. To prevent conflicts in a twin-tailed configuration, do not install a hard disk drive in the bay that uses SCSI ID 6 because your secondary SCSI ServeRAID adapter is set to 6. If a hard disk drive is installed in the bay that uses SCSI ID 6, the hard disk drive is held in a Reset state if the following conditions are met:

- Switch position 4 on configuration switch SW4 is set to Off (default)
- Two ESMs are installed in the expansion unit
- Both ESMs are connected to servers with ServeRAID adapters installed
- Both ServeRAID adapters are powered on and are sending SCSI termination power to the SCSI cable.

**Note:** When each ESM is receiving termination power from the server, the green Termination-power LED on each ESM is lit.

**Service tip:** If you use ServeRAID adapters in a cluster configuration, the termination-power LED on the back of the expansion unit is useful. The ServeRAID controller provides the signal for termination power. If the termination-power LED is not lit, it indicates that a particular expansion unit is not attached to a controller that is turned on. Make a note of which expansion unit is attached to which server before the hardware is serviced. Clustering requires additional hardware and specialized software. For more information, go to <http://www.ibm.com/pc/ww/eserver/xseries/clustering/>.

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## Inventory checklist

After you fully unpack your expansion unit, verify that you have the following items:

- **Hardware:**
  - IBM EXP400 Storage Expansion Unit
  - Two or four power cords, depending on your country
  - One 2 m (6.56 ft) SCSI cable
  - One sheet of expansion unit ID (0-9) labels
  - One sheet of four SCSI ID labels
  - One rack installation hardware kit
    - Two rails (right and left assembly)
    - Two M5 screws
    - Ten M6 screws
    - Ten M6 cage nuts
    - Ten M6 clip nuts
- **Printed publications:**
  - *IBM EXP400 Storage Expansion Unit Installation Guide* (this book)
  - *Rack Installation Instructions*
  - Template for installing the expansion unit in a rack
- **Online publications:**
  - *IBM EXP400 Storage Expansion Unit User's Guide*
  - *IBM Safety Information*
  - *Hardware Maintenance Manual and Troubleshooting Guide*

All publications are available on the IBM *Documentation* CD or from the IBM Support Web site at <http://www.ibm.com/pc/support/>. For more information about related publications, see the *User's Guide*.

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## Chapter 2. Installing options

This chapter provides basic instructions for installing hardware options and cabling your expansion unit. These instructions are intended for users who are experienced with setting up IBM hardware.

---

### Installation guidelines

Before you begin installing your expansion unit, read the following information:

- Read the safety information beginning on page iii and the guidelines in “Handling static-sensitive devices”. This information will help you work safely with your expansion unit and options.
- Make sure that you have an adequate number of properly grounded electrical outlets for your expansion unit and other devices that you will connect to the expansion unit.
- Back up all important data before you make changes to disk drives.
- You do not need to turn off the expansion unit to install or replace hot-swap power supply with fan units, hot-swap hard disk drives, or ESMs.
- The orange color on components and labels identifies hot-swap or hot-plug components. You can install or remove hot-swap and hot-plug components while the expansion unit is running.
- The blue color on components and labels indicates touch points, where a component can be gripped, a latch moved, and so on.
- For a list of supported options for your expansion unit, go to <http://www.ibm.com/pc/compat/>.

### System reliability guidelines

To help ensure proper cooling and system reliability, make sure that:

- 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.
- There is adequate space around the expansion unit to allow the enclosure cooling system to work properly. Leave approximately 50 mm (2.0 in.) of open space around the front and rear of the expansion unit. Do not place objects in front of the power supply with fan units.
- You have replaced a failed power supply with fan unit 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 electronic devices and your expansion unit. 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 expansion unit 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 expansion unit 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 your expansion unit enclosure or on a metal surface.
- Take additional care when handling devices during cold weather. Heating reduces indoor humidity and increases static electricity.

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## Installing hot-swap hard disk drives

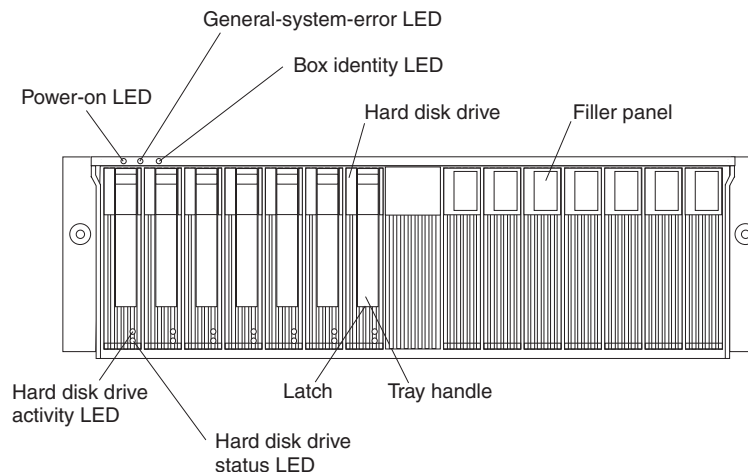
Your expansion unit supports up to 14 IBM Ultra320 SCSI hard disk drives. These IBM drives come preassembled in a drive tray, ready for installation. (Do not detach the drive from the tray.) Be sure to record the location information for each drive in Table 2 on page 2.

Expansion units come with filler panels in the drive bays. Before installing a new hard disk drive, remove the filler panel and save it for future use. Each of the 14 bays must contain either a filler panel or a hard disk drive.

Complete the following steps to install a hard disk drive in the expansion unit. You can install drives while the expansion unit is turned on.

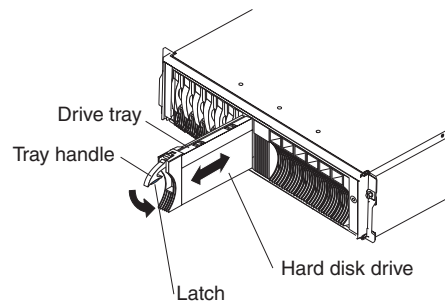
**Note:** If you are replacing a drive, see the *IBM EXP400 Storage Expansion Unit User's Guide* for more information.

1. Read the instructions that come with the hard disk drive.
2. Read the safety information beginning on page "Safety" on page iii and "Installation guidelines" on page 9.



3. Determine the bay into which you want to install the hard disk drive.
4. Remove the filler panel.
  - a. Insert a finger into the square hole at the top of the filler panel to grip and pull the filler panel out of the drive bay.
  - b. Save the filler panel for future use.
5. 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 bottom of the tray handle to release it.
  - b. Pull out the tray handle to the open position.
  - c. Gently slide the drive into the empty bay until the tray handle touches the expansion-unit bezel.
  - d. Push down the tray handle into the closed (latched) position.
6. Check the drive LEDs.
- a. When a drive is ready for use, the green activity LED and the amber status LED 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.

**ServeRAID information:** In some cases, the ServeRAID adapter will automatically reset the drive to the Hot Spare or Rebuild state. If the drive state change does not occur automatically (amber LED stays lit), refer to your ServeRAID 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 change.

7. Configure the hard disk drive using the appropriate software.

---

## Installing an additional ESM

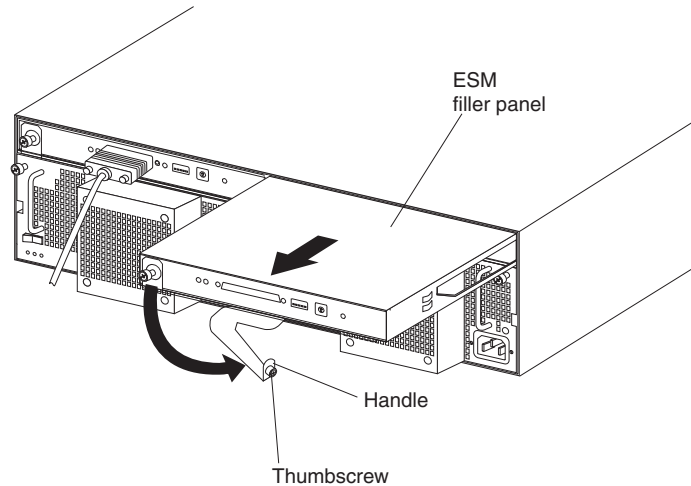
Expansion unit model 2RX comes with two ESMs. If your expansion unit model is 1RU or 1RX, you can add a second ESM for dual SCSI bus support. When two ESMs are installed, the ESM on the left becomes primary and will perform expansion unit services. The secondary ESM on the right will repeat the SCSI bus and monitor self-failure, but will not perform any other services.

**Note:** Before you install an ESM in the expansion unit, you must configure the internal switches. See Chapter 4, “Configuring the expansion unit”, on page 23 for more information.

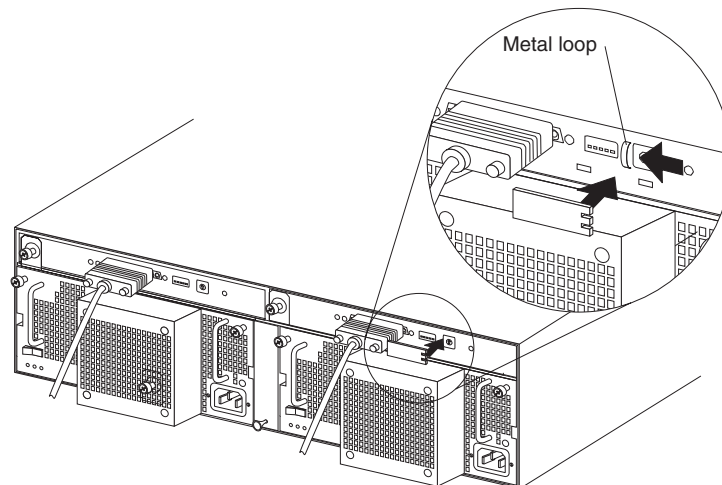
Complete the following steps to install an additional ESM:

1. Read the safety information beginning on page “Safety” on page iii and “Installation guidelines” on page 9.

2. Remove the ESM filler panel.



- a. Loosen the thumbscrew on the left side of the ESM filler panel.
  - b. Rotate the handle out and to the right.
  - c. Pull out the filler panel using the handle. Save the filler panel for future use.
3. Hold the ESM so the handle is attached to the bottom of the tray, and the handle is fully extended.
  4. Gently slide the ESM into the bay, and move the handle to the closed position (left) until it clicks.
  5. Tighten the thumbscrew.
  6. If the switch cover is not preinstalled on the right ESM, install it now:
    - a. Position the hook on the back of the switch cover to the right of the metal loop on the ESM.



- b. Slide the switch cover to the left until it snaps into place (the hook slides under the metal loop on the ESM).
7. Connect one end of the SCSI cable to the ESM; then, connect the other end of the SCSI cable to the SCSI adapter installed in the server. For more information, see “SCSI cabling information” on page 14.



## Completing the installation

After you install the hard disk drives and optional right ESM, follow the instructions in this section to complete the installation. Instructions for installing the identification labels and cabling the expansion unit are included.

### Installing identification labels

Your expansion unit comes with one sheet of 10 labels (0-9) and one sheet of 4 labels (SCSI ID labels).

**Note:** If you are installing the expansion unit in a tower enclosure, see the information provided with the Rack-to-Tower Conversion kit to set the configuration switches and install the SCSI ID labels.

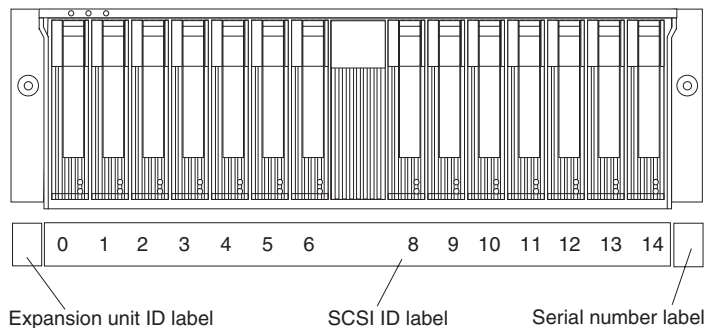
Complete the following steps to install the SCSI identification labels:

1. Locate the SCSI ID label for your configuration.

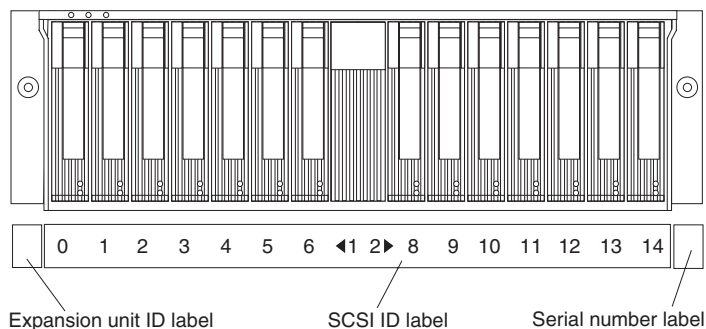
**Note:** For a dual-bus configuration, the SCSI ID label includes an arrow with numbers 1 and 2 pointing to each bus. Use the single-bus label if switch position 1 on configuration switch SW4 is set to Off. Use the dual-bus label if switch position 1 on configuration switch SW4 is set to On.

- a. Turn the label so that the printed numbers are legible from left-to-right.
- b. Peel the backing away from the adhesive side of the label.
- c. Carefully position the edge of the SCSI ID label against the edge of the serial number label so that the 14 printed ID numbers are located beneath each of the drive bays.
- d. Apply the label to the front of the expansion unit, as shown in the following illustrations.

#### Single-bus configuration



#### Dual-bus configuration



2. Apply the expansion unit ID label.

- a. Verify the setting of the expansion unit number switch (0-9).
- b. In the blank label area directly to the left of the SCSI ID label, apply the expansion unit ID label that matches the setting for the expansion unit ID switch.

## SCSI cabling information

A fully configured expansion unit has two ESMs and two 68-pin SCSI Very High Density Connector Interface (VHDCI) connectors. From left to right as seen from the back, these connectors are for SCSI bus 2 and SCSI bus 1. See “Rear view: ESMs” on page 19 for the location of these connectors. There are three ways to configure these buses.

**Attention:** A loss of data can occur if you change the position of configuration switch SW3 or configuration switch SW4 after storing data on the hard disk drives. Contact the IBM Integrated Technology Services for assistance if you want to change the configuration of your expansion unit from a rack enclosure to a tower enclosure or from a tower enclosure to a rack enclosure. For more information about the switches, see “Setting configuration switches and SCSI ID settings” on page 23. For IBM contact information, see Appendix A, “Getting help and technical assistance”, on page 33.

The following sections describe common expansion unit configurations and how to cable them.

### Cabling the expansion unit as a single 14-drive SCSI bus

This configuration includes the following hardware setup:

- The expansion unit is connected to one server that has one ServeRAID adapter installed.
- The expansion unit is configured for one SCSI bus.
- One ESM is required.

Complete the following steps to cable the expansion unit as a single 14-drive SCSI bus:

1. Verify that switch position 1 on configuration switch SW4 is set to Off. For more information, see “Setting configuration switches and SCSI ID settings” on page 23.
2. Connect one external SCSI cable to the ServeRAID adapter in the server and to the SCSI-bus connector on the expansion unit.

### Cabling the expansion unit SCSI buses independently

This configuration includes the following hardware setup:

- The expansion unit is connected to two servers that each have one ServeRAID adapter installed.
- The expansion unit is configured for two SCSI buses.
- Two ESMs are required.

Complete the following steps to cable the expansion unit SCSI buses independently:

1. Verify that switch position 1 on configuration switch SW4 is set to On. For more information, see “Setting configuration switches and SCSI ID settings” on page 23.
2. Connect one external SCSI cable to the ServeRAID adapter in the server and to the SCSI bus 1 connector on the expansion unit.

3. Connect a second external SCSI cable to the ServeRAID adapter in the server and to the SCSI bus 2 connector on the expansion unit.

### **Cabling the expansion unit as a redundant SCSI bus in an adapter failover configuration**

This configuration includes the following hardware setup:

- The expansion unit is connected to one server that has two ServeRAID adapters installed.
- The expansion unit is configured for one SCSI bus.
- Two ESMs are required.

Complete the following steps to cable the expansion unit as a redundant SCSI bus:

1. Verify that switch position 1 on configuration switch SW4 is set to Off. For more information, see “Setting configuration switches and SCSI ID settings” on page 23.
2. Connect one external SCSI cable to the ServeRAID adapter 1 in the server and to the SCSI bus 1 connector on the expansion unit.
3. Verify that the drive bay with SCSI ID 6 contains a filler panel.
4. Verify that one of the ServeRAID adapters is set to SCSI ID 6.
5. Connect a second external SCSI cable to the ServeRAID adapter 2 in the server and to the SCSI bus 2 connector on the expansion unit.

### **Cabling the expansion unit for clustering**

This configuration includes the following hardware setup:

- The expansion unit is connected to two servers that each have one ServeRAID adapter installed.
- The expansion unit is configured for one SCSI bus.
- Two ESMs are required.

**Note:** When clustering with ServeRAID adapters, you must configure all 13 hard disk drives on a single SCSI bus. The drive bay with SCSI ID 6 is automatically disabled to avoid an ID conflict with one of the ServeRAID adapters.

Complete the following steps to configure the expansion unit as a cluster of 13 hard disk drives on a single SCSI bus when using ServeRAID adapters:

1. Verify that switch position 1 on configuration switch SW4 is set to Off. For more information, see “Setting configuration switches and SCSI ID settings” on page 23.
2. Connect one external SCSI cable to the ServeRAID adapter in server 1 and to the SCSI bus 1 connector on the expansion unit.
3. Verify that the drive bay with SCSI ID 6 contains a filler panel.
4. Verify that one of the ServeRAID adapters is set to SCSI ID 6.
5. Connect a second external SCSI cable to the ServeRAID adapter in server 2 and to the SCSI bus 2 connector on the expansion unit.

For more information about clustering, see “Clustering support” on page 7.

## **Dedicated SCSI channel restriction**

The SCSI controller inside your server must have a dedicated SCSI channel for the expansion unit. If an external channel is used for the expansion unit, do not use its corresponding internal channel for other devices.

## Power cabling

Expansion unit models 1RU and 1RX comes with four power cords. You can connect the power cords to a primary power unit inside the rack, such as a properly grounded ac power-distribution unit or uninterruptible power supply, or to an external source, such as a properly grounded electrical outlet.

Expansion unit model 2RX uses dc power. For information about power cabling your expansion unit model 2RX, see Chapter 5, “Information for the -48 volt dc power model”, on page 27.

For information about the initial startup of the expansion unit, see “Expansion unit power features” on page 20.

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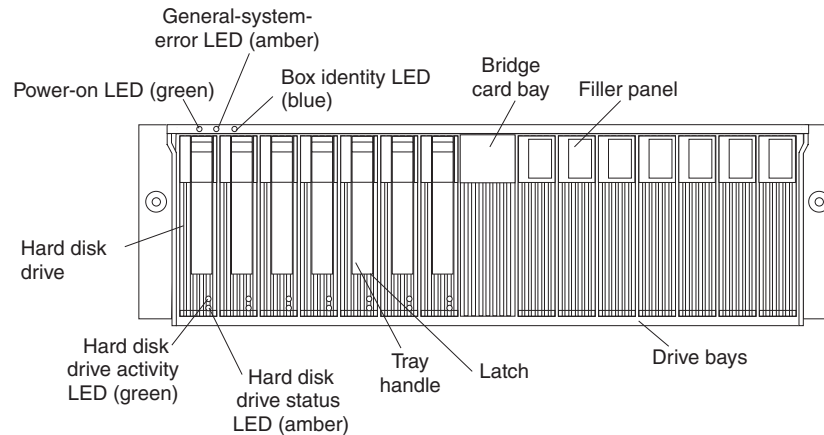
## Chapter 3. Expansion unit controls, LEDs, and power

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

---

### Front view

The primary controls on the front of the expansion unit are shown in the following illustration and are described in this section.



#### Power-on LED (green)

This green LED is lit when the power supply is turned on and is supplying both 5 volt and 12 volt dc power to the expansion unit.

#### General-system-error LED (amber)

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

#### Box identity (blue)

The box identity LED is used to identify the expansion unit. When this blue LED is lit, the system-management software on the server connected to the expansion unit has identified this expansion unit.

#### Bridge card bay

The bridge card is located in the center of the front panel between bay 7 and bay 8.

#### Filler panel

Your expansion unit comes with filler panels in the drive bays. Before installing a hard disk drive, remove the filler panel and save it for future use. Each of the 14 drive bays must contain either a filler panel or a hard disk drive.

#### Drive bays

There are 14 drive bays that contain either a hard disk drive or a filler panel.

**Latch** This multipurpose latch releases or locks the hard disk drive in place.

#### Tray handle

Use this multipurpose handle to insert or remove a hard disk drive.

#### Status LED (amber)

Each hard disk drive has a status LED. When lit continuously, this amber

LED indicates a drive failure. When flashing, this amber LED indicates that a drive Identify or Rebuild is in progress.

#### Activity LED (green)

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

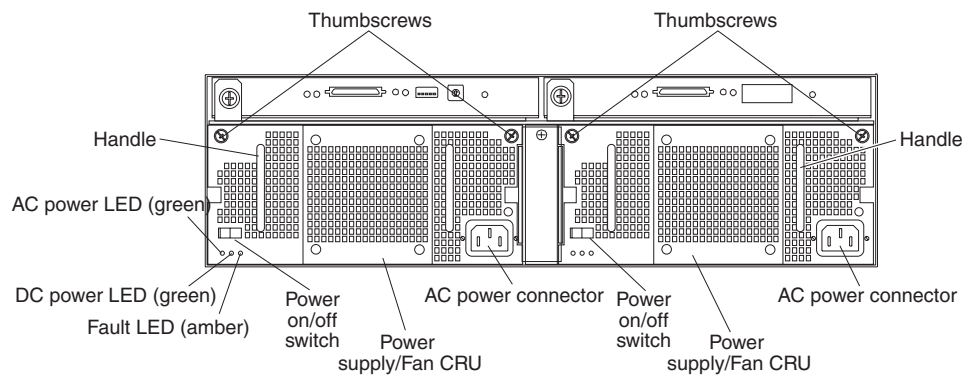
#### Hard disk drive

You can install up to 14 hot-swap Ultra320 hard disk drives in the expansion unit.

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## Rear view: power supply with fan unit

The expansion unit has two hot-swap power supply with fan units that are accessible from the back of the expansion unit. These components contain user controls, LEDs, and connectors and are shown in the following illustration.



#### Thumbscrews

Loosen the thumbscrews to remove or install a power supply with fan unit.

#### AC power connector

The power cord for the power supply with fan unit connects here.

#### Power-supply with fan unit

The two hot-swap power supply with fan units are located on the back of the expansion unit.

**Attention:** Your expansion unit comes with two power supply with fan units installed. When one power supply fails, the power-supply unit must be replaced to reestablish redundancy. When replacing the failed unit with the new power supply unit, ensure that this operation is performed in less than 10 minutes to prevent overheating.

The fan that is visible from the rear of the power supply is an auxiliary fan that is normally off. This fan turns on only when the main fan within the power supply fails.

#### Power on and off switch

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

#### Fault LED (amber)

When lit, this amber fault LED indicates a power supply failure or that a redundant power supply is not turned on. This LED also flashes when the built-in fan fails.

### DC power LED (green)

This green LED is lit when the expansion unit is turned on and is supplying both 5 volt and 12 volt dc power to the expansion unit.

### AC power LED (green)

This green LED is lit when the expansion unit is receiving ac power.

### Handles

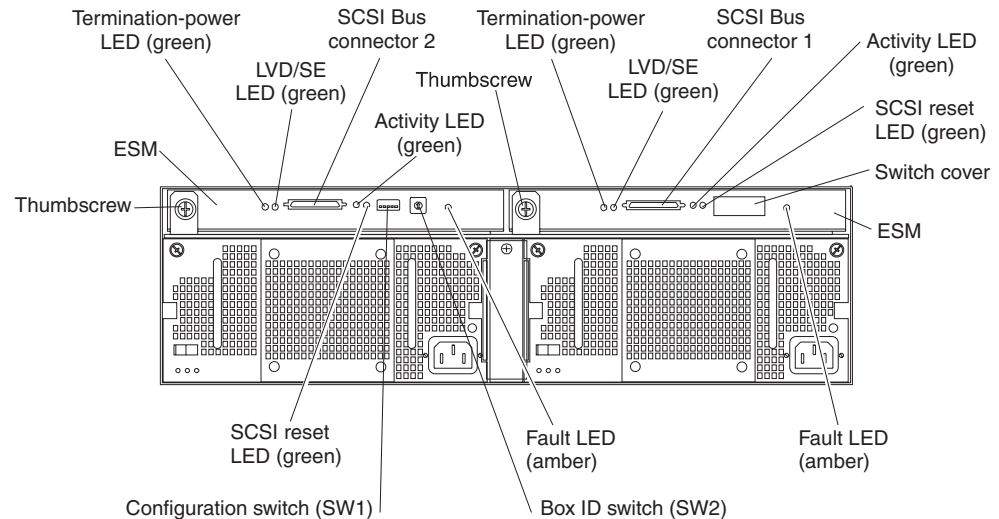
The two handles are used for installing and removing the power supply with fan unit.

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## Rear view: ESMs

The ESMs are accessible from the back of the expansion unit. These components contain user controls, LEDs, switches, and connectors as shown in the following illustration.

**Note:** The ESM on the right side is optional in expansion unit models 1RU and 1RX.



**ESM** Each ESM contains SCSI controls, LEDs, and connectors.

### Fault LED (amber)

When lit, this amber LED indicates an ESM failure.

### SCSI reset LED

When lit, this green LED indicates a SCSI bus reset.

### Thumbscrews

Each ESM has a thumbscrew on the left side of the module. Use the thumbscrew and lever to remove and insert the ESM.

### Termination-power LED (green)

When lit, this green LED indicates that termination power is present. When a termination-power LED is lit, it indicates that the other end of the SCSI bus connector is connected to a powered-on controller. Each external bus has a separate termination-power LED.

### LVD/SE LED (green)

When lit, this green LED indicates that the external host bus is in low voltage differential (LVD) mode. When this LED is off, it indicates that the

external host bus is in single-ended (SE) mode. Each external bus has a separate LVD/SE LED. Only LVD host bus controllers are supported.

#### **SCSI bus connectors**

The 68-pin Very High Density Connector Interface (VHDCI) connectors are for connecting SCSI cables to SCSI bus 1 and SCSI bus 2.

#### **Activity LED (green)**

When lit, this green LED indicates there is activity on the external SCSI bus. Both external buses have a separate activity LED.

#### **Configuration switch SW1**

Configuration switch SW1 is a 5-position switch that is mounted on the ESM and is accessible from the rear of the expansion unit.

#### **Box ID switch SW2**

Box ID switch SW2 is a 10-position rotary switch that sets the expansion unit ID using values 0 through 9. System-management software, such as IBM Director or ServeRAID Manager, uses this ID when it provides data and alerts for the expansion unit.

---

## **Expansion unit power features**

This section contains instructions for turning the expansion unit on and off under normal and emergency circumstances.

If you are turning on the expansion unit after an emergency shutdown or power outage, refer to “Turning on the expansion unit after an emergency” on page 22.

## **Turning on the expansion unit**

Complete the following steps to turn on the power for the initial startup of the expansion unit.

1. Verify that:
  - a. All cables are properly connected.
  - b. Both power cords are plugged into the back of the expansion unit and into properly grounded electrical outlets.
  - c. All hard disk drives are locked securely in place.
  - d. The configuration switches are set correctly. See “Setting configuration switches and SCSI ID settings” on page 23 for more information.
2. Check the system documentation for all the hardware devices you intend to turn on and determine the proper power-on sequence.

**Note:** Be sure to turn on the expansion unit before or at the same time as you turn on the server.

3. Turn on each device, based on the power-on sequence described in the documentation that comes with your devices.
4. Turn on both power supplies on the back of the unit.

The expansion unit might take a few seconds to turn on. During this time, you might see the fault (amber) and the power (green) LEDs on the expansion unit turn on and off intermittently. When the power-on sequence is complete, only the power (green) LEDs on the front and back should remain on. If one or more fault (amber) LEDs remain lit, see Chapter 6, “Solving problems”, on page 31.



## Turning off the expansion unit

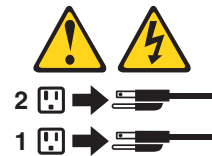
**Attention:** Except in an emergency situation, never turn off the power if any fault LEDs are lit on the expansion unit. Correct the fault before you attempt to turn off the power, using the proper troubleshooting or servicing procedure. This ensures that the expansion unit turns on correctly later. For more information, see Chapter 6, “Solving problems”, on page 31.

### Statement 5:



### CAUTION:

The power control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.



The expansion unit is designed to run continuously, 24 hours a day. Turn off the power only when at least one of the following is true:

- 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 expansion unit in an emergency”.

Complete the following steps to turn off the expansion unit:

1. On the server connected to the expansion unit, close all open operating system windows and programs; then, shut down the server.
2. Make sure that all amber status or fault LEDs are off. If any status or fault LEDs are lit (on hard disk drives, power supplies, or ESMs), identify or correct the problem before you turn off the power. For more information, see Chapter 6, “Solving problems”, on page 31.
3. Turn off both expansion unit power supplies.

## Turning off the expansion unit 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 expansion unit loses power unexpectedly, it might be due to a hardware failure in the power system or midplane, see Chapter 6, “Solving problems”, on page 31.

Complete the following steps to turn off the expansion unit during an emergency situation:

1. On the server connected to the expansion unit, close all open operating system windows and programs; then, shut down the server.
2. If you have time, stop all activity and check the LEDs (front and back). 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.
3. Turn off both expansion unit power supplies; then, unplug the power cables from the expansion unit.

## Turning on the expansion unit after an emergency

Complete the following steps to restart the expansion unit if you turned off the power supplies during an emergency shutdown, or if a power failure or a power outage occurred:

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

**Note:** Be sure to turn on the expansion unit before or at the same time you turn on the server.

4. Turn on each connected device, based on the power-on sequence described in the documentation that comes with the device.
5. Turn on both power supplies on the back of the expansion unit.
6. Only the power (green) LEDs on the front and back should be lit. If one or more of the fault (amber) LEDs are lit, see Chapter 6, “Solving problems”, on page 31 for instructions.
7. Use your installed software application as appropriate to check the status of the expansion unit.

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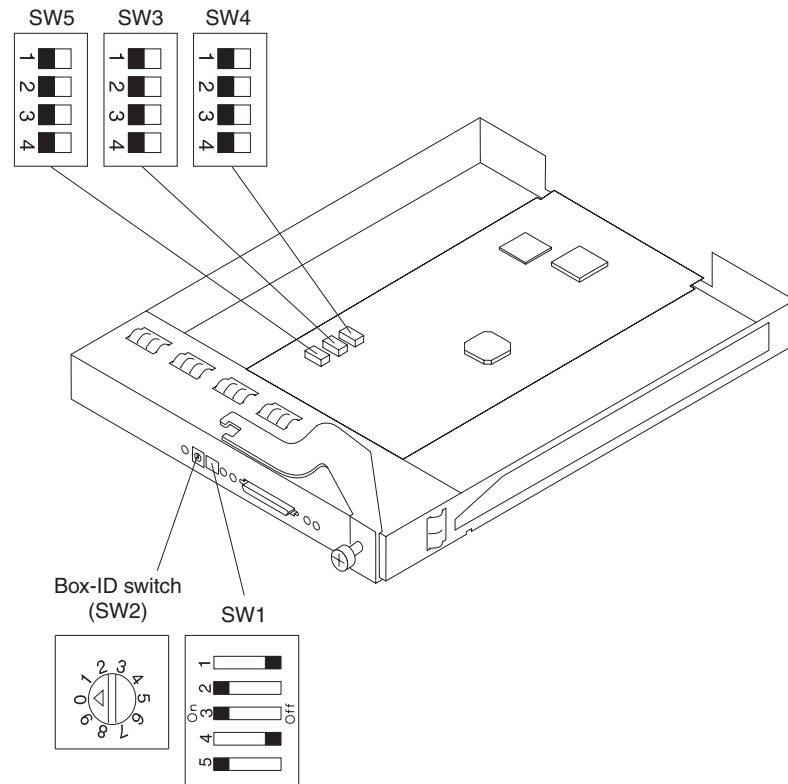
## Chapter 4. Configuring the expansion unit

This chapter provides information about configuring your expansion unit, including setting the configuration switches that support your SCSI bus configuration and the appropriate switch settings when you convert an expansion unit from a rack enclosure to a tower enclosure.

---

### Setting configuration switches and SCSI ID settings

An ESM contains five sets of switches, shown in the following illustration.



Configuration switches SW1, SW2, SW3, and SW4 are for user configuration. Configuration switch SW5 is not intended for user configuration and must be left at the factory default setting. The configuration switch SW1 and box ID switch SW2 are accessible from the rear panel of the expansion unit. Configuration switches SW3 and SW4 are accessible only when the ESM is removed from the ESM bay. It is easier to set switches SW3 and SW4 before you install the expansion unit in a rack or tower enclosure.

**Note:** If both ESMs are installed, the ESM on the left must have valid switch settings. The switch settings on the ESM that is installed in the right bay are ignored. If only one ESM is installed, it must be in the left bay.

Configuration switches are summarized in Table 4 on page 24 and described in this section.

Table 4. Factory default configuration switch settings

| Switch location          | Position | Description                  | Factory default switch setting |
|--------------------------|----------|------------------------------|--------------------------------|
| Configuration switch SW1 | 1        | Reserved                     | Off                            |
|                          | 2        | Reserved                     | On                             |
|                          | 3        | Reserved                     | On                             |
|                          | 4        | Reserved                     | Off                            |
|                          | 5        | Remote power control disable | On                             |
| Box ID switch SW2        | Rotary   | Expansion unit ID            | 0                              |
| Configuration switch SW3 | 1        | SCSI ID configuration 1      | Off                            |
|                          | 2        | SCSI ID configuration 2      | Off                            |
|                          | 3        | SCSI ID configuration 3      | Off                            |
|                          | 4        | Reserved                     | Off                            |
| Configuration switch SW4 | 1        | SCSI-bus split control       | Off                            |
|                          | 2        | Rack and tower LED           | Off                            |
|                          | 3        | Reserved                     | Off                            |
|                          | 4        | Reserved                     | Off                            |
| Configuration switch SW5 | 1        | Reserved                     | Off                            |
|                          | 2        | Reserved                     | Off                            |
|                          | 3        | Reserved                     | Off                            |
|                          | 4        | Reserved                     | Off                            |

#### Configuration switch SW1 settings

Configuration switch SW1 is a five-position switch that is mounted on the ESM and is accessible from the rear of the expansion unit. The five switch positions are set as follows:

- Switch positions 1 through 4 - Reserved
- Switch position 5 - Remote power control disable

When switch position 5 is set to Off, the ESM will enable the power supplies when the termination power (TERMPWR) is active in any external SCSI port. This means that the expansion unit will be powered on and off automatically when the host server is powered on and off or when TERMPWR is disabled. When switch position 5 is set to On (the default setting), power on and off is not controlled by the TERMPWR signal, but by the power on/off switches on the power supplies.

#### Box ID switch SW2

Box ID switch SW2 is a 10-position rotary switch that sets the expansion unit ID using values 0 through 9. System-management software, such as IBM Director or IBM ServeRAID Manager, uses this ID when it provides data and alerts for the expansion unit.

#### Configuration switch SW3 — SCSI ID configuration switch

Configuration switch SW3 defines the SCSI bus ID configurations. The user should prevent a SCSI ID conflict in a specific bus mode. SCSI bus mode is controlled by configuration switch SW4.

There are two SCSI buses (bus 1 and bus 2) in the expansion unit. Each bus uses seven SCSI ID numbers. Each hard disk drive within the expansion unit has a unique SCSI bus and ID assignment, based on its physical location in the expansion unit and the setting of configuration switch SW3. This prevents a SCSI ID conflict in a specific bus mode.

The switch positions configure the SCSI ID assignment. Switch positions 1, 2, and 3 are set to Off for rack enclosures. Rack enclosure SCSI IDs are identified from left to right. The SCSI addresses are 0, 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14.

Switch positions 1, 2, and 3 are set to On for a tower enclosures. The enclosure unit is rotated counter-clockwise 90 degrees to be converted to a tower unit. In this case, the SCSI addresses are reversed and they are 0, 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14 from top to bottom. All other switch settings are reserved. Numbered stickers for the front of the drives are provided so you can label the drives with the SCSI IDs.

- **Switch position 1 - SCSI ID configuration 1**  
This switch position (default is Off) is used to configure SCSI ID assignment with a combination of SCSI ID switch positions 2 and 3.
- **Switch position 2 - SCSI ID configuration 2**  
This switch position (default is Off) is used to configure SCSI ID assignment with a combination of SCSI ID switch positions 1 and 3.
- **Switch position 3 - SCSI ID configuration 3**  
This switch position (default is Off) is used to configure SCSI ID assignment with a combination of SCSI ID switch positions 1 and 2.
- **Switch position 4 - Reserved**  
This switch position is reserved and set to Off (the default).

Table 5. SCSI ID configuration matrix

| SW position |     |     | Bus Config | L-segment |        |        |        |        |        |        | R-segment |        |         |         |         |         |         |
|-------------|-----|-----|------------|-----------|--------|--------|--------|--------|--------|--------|-----------|--------|---------|---------|---------|---------|---------|
| 1           | 2   | 3   |            | Slot 1    | Slot 2 | Slot 3 | Slot 4 | Slot 5 | Slot 6 | Slot 7 | Slot 8    | Slot 9 | Slot 10 | Slot 11 | Slot 12 | Slot 13 | Slot 14 |
| Off         | Off | Off | Rack       | 0         | 1      | 2      | 3      | 4      | 5      | 6      | 8         | 9      | 10      | 11      | 12      | 13      | 14      |
| On          | On  | On  | Tower      | 14        | 13     | 12     | 11     | 10     | 9      | 8      | 6         | 5      | 4       | 3       | 2       | 1       | 0       |

#### Configuration switch SW4

Configuration switch SW4 controls the SCSI bus configuration. When switch position 1 is set to Off (default is Off), the expansion unit configuration is set as a single SCSI bus mode. When switch position 1 is set to On, the expansion unit configuration is set as a dual SCSI bus (split bus) mode.

- **Switch position 1 - SCSI-bus split control**  
This switch position controls the SCSI bus mode. When the switch position is set to Off (default is Off), the expansion unit is configured as a single SCSI bus. When this switch position is set to On, the expansion unit is configured as a dual or split SCSI bus.
- **Switch position 2 - Rack-to-tower LED mode**  
Set switch position 2 to Off (default is Off) for rack enclosures and to On for tower enclosures. These settings control the power and fault LEDs on the midplane, which are exchanged from one orientation to the other. In a tower enclosure, the top LED is green and in a rack enclosure, the left side LED is green.

**Note:** If you are installing the expansion unit in a tower enclosure, see the *Rack-to-Tower Conversion Kit Installation Instructions* for configuration switch settings and labeling information.

- **Switch position 3 - Reserved**

This switch position is reserved and set to Off (the default).

- **Switch position 4 - Reserved**

This switch position is reserved and set to Off (the default).

---

## Systems-management software support

The expansion unit provides software alert functions through the systems-management functions provided in the IBM Director and IBM ServeRAID software.

The following alerts are supported:

- Hard disk drive disabled
- Power-supply failure
- Fan failure
- Expansion unit exceeds normal operating temperature

You must use IBM ServeRAID version 6.10.25 or later for your ServeRAID controller to report status and alerts properly. To download the latest ServeRAID software, go to <http://www.ibm.com/pc/support/>.

For up-to-date information about IBM Director software support available for your expansion unit, go to [http://www.ibm.com/pc/ww/eserver/xseries/systems\\_management/index.html](http://www.ibm.com/pc/ww/eserver/xseries/systems_management/index.html).

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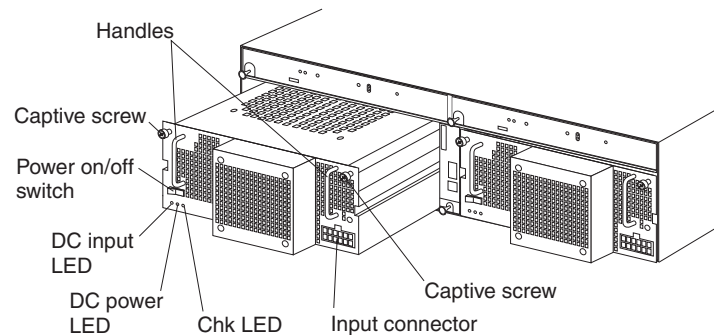
## Chapter 5. Information for the -48 volt dc power model

**Attention:** Only a trained service technician may connect or disconnect the -48 volt dc power supply from its power source, install or remove the power connection on the rear of the expansion unit, and remove or install the power supply in the expansion unit.

**Important:** To be compliant with EN55024:1998, the power cables for this -48 volt dc product must not exit the building in which the equipment is installed.

This chapter provides instructions for connecting the power supply to a power-distribution unit and for replacing the power supply in the expansion unit. Read this chapter completely before making the power connections.

The following illustration shows the major components of the -48 volt dc power supply.



**Handle:** Use the two handles for installing and removing the power supply.

**Captive screws:** Use these screws to secure the power supply to the expansion unit.

**Power on/off switch:** Press this switch to turn the power supply on and off.

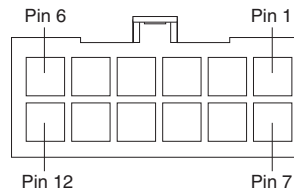
**DC input LED:** When this LED is lit, it indicates that the power supply is receiving dc power from the external power-distribution unit.

**DC power LED:** When this LED is lit, it indicates that the power supply is supplying power to the expansion unit.

**Chk LED:** When this LED is lit, it indicates that the power supply has failed or the power switch is turned off. When this LED is flashing, the fan has failed.

**Input connector:** Connect the dc cable to this connector.

The input connector is a 12-position connector at the lower-right side of the power supply. The following illustration shows the pin-number assignments as viewed from the wiring side.



The pin assignments are shown in the following table. For cable connection instructions, see “Connecting the power supply to a power-distribution unit”.

Table 6. Input connector pin assignments

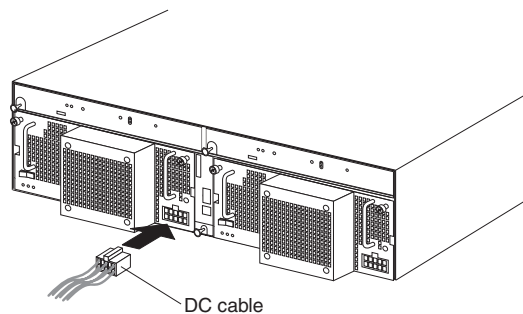
| Pin | Assignment         | Pin | Assignment         |
|-----|--------------------|-----|--------------------|
| 1   | Frame ground       | 7   | Frame ground       |
| 2   | Not used           | 8   | Not used           |
| 3   | -48 V return (0 V) | 9   | -48 V return (0 V) |
| 4   | -48 V return (0 V) | 10  | -48 V return (0 V) |
| 5   | -48 V in           | 11  | -48 V in           |
| 6   | -48 V in           | 12  | -48 V in           |

## Connecting the power supply to a power-distribution unit

The following instructions are an overview of the procedure for connecting the power supply to a power-distribution unit. For specific information about connecting the power cable to a power-distribution unit, see the installation instructions that come with the power-distribution unit.

Complete the following steps to connect the power supply to a power-distribution unit:

1. Review the safety information beginning on page iii.
2. Connect the dc cable to the input connector on the power supply. Make sure that the dc cable is fully seated in the connector and locks into place.



3. Open the terminal-block cover on the power-distribution unit.
4. Connect the wires on the dc cable to the power-distribution unit.



**Attention:** You must connect the wires in the order described to ensure proper operation of the power supply. The wires are color-coded.



- a. Connect the frame ground (green and yellow) to the main ground terminal (also known as earth ground) in the terminal block.
  - b. Connect the 0 V wire (blue) to the return terminal on the terminal block.
  - c. Connect the -48 V wire (brown) to the -48 V terminal on the terminal block.
5. Close the terminal-block cover.
  6. Turn on the power supply. Check the LEDs for proper operation of the power supply.

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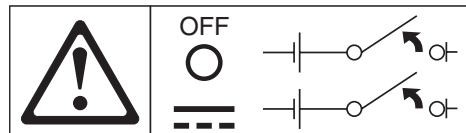
## Disconnecting and removing the dc power supply

**Statement 19:**



**CAUTION:**

The power-control button on the device does not turn off the electrical current supplied to the device. The device also might have more than one connection to dc power. To remove all electrical current from the device, ensure that all connections to dc power are disconnected at the dc power input terminals.



Complete the following steps to disconnect the dc power connection and remove the power supply from the expansion unit:

1. See the operating-system documentation and “Turning off the expansion unit” on page 21 for the proper procedure to shut down the system.
2. When the expansion unit is ready for shutdown, press the power on/off switch on the power supply.
3. Turn off the power from the power-distribution unit. See the documentation that comes with the power-distribution unit.

**Note:** If you need to disconnect the cables from the power-distribution unit, see the documentation that comes with the power-distribution unit.

4. Remove the dc cable from the input connector on the power supply.
5. Loosen the captive screws on the power supply and remove the power supply from the bay of the expansion unit.

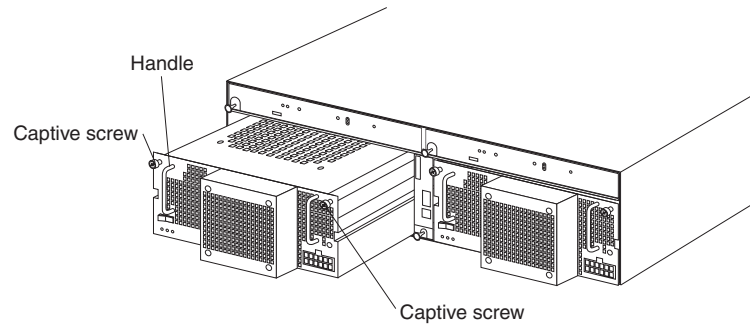
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## Installing the dc power supply

**Attention:** Do not use the power supply with an ac input power supply in the same expansion unit.

Complete the following steps to install the power supply:

1. Review the safety information beginning on page iii.
2. Make sure that the power supply is turned off.
3. Insert the power supply into the open bay until it is fully seated in the expansion unit.



4. Tighten the two captive screws by turning them clockwise.
5. For instructions about how to connect the power supply to a power-distribution unit, see “Connecting the power supply to a power-distribution unit” on page 28.

## Chapter 6. Solving problems

The following table contains troubleshooting information to help you solve some basic problems you might have with your expansion unit. It contains the problem symptoms and suggested actions to take to resolve the problem.

Table 7. Troubleshooting information

| Component        | Problem indicator                       | Possible cause  | Possible solutions   |
|------------------|---|---|--|
| Drive CRU        | Amber LED on                            | Drive failure   | Replace the failed hard disk drive. See “Replacing hot-swap drives” in the <i>IBM EXP400 Storage Expansion Unit User’s Guide</i> .   |
| ESM              |   | Board failure   | Replace the failed ESM. See “Replacing an ESM” in the <i>IBM EXP400 Storage Expansion Unit User’s Guide</i> .  |
| Front panel      |   | General machine fault   | Indicates that a status or fault LED somewhere on the expansion unit is turned on. Check for amber LEDs on CRUs. See Chapter 3, “Expansion unit controls, LEDs, and power”, on page 17.  |
| All CRUs         | All green LEDs off                      | The expansion unit is turned off  | Check that all expansion unit power cables are plugged in and the power is on. If applicable, check that the main circuit breakers for the rack are turned on.<br><br>If configuration switch SW1 is set to Off, the SCSI controller must be cabled to the expansion unit and turned on. |
|                  |   | ac or dc power failure  | Check the main circuit breaker and ac or dc outlet.  |
|                  |   | Power supply failed   | Replace the power supply CRU. See “Replacing a hot-swap power supply with fan unit” in the <i>IBM EXP400 Storage Expansion Unit User’s Guide</i> .   |
|                  |   | Midplane failure  | Have the expansion unit serviced.  |
| Drive CRUs       | Amber LED flashing                      | Drive rebuild or identity is in process                                 | No corrective action is needed.  |
| Power supply CRU |   | Fan failure   | Replace the power supply CRU.  |
| Power supply CRU | Amber LED on and green dc power LED off | Power supply failure or power supply is turned off.                     | If the power switch is on, replace the power supply CRU. See “Replacing a hot-swap power supply with fan unit” in the <i>IBM EXP400 Storage Expansion Unit User’s Guide</i> .  |
| Power supply CRU | Amber LED on and green ac power LED off | No ac power to power supply. Check the ac power cord (cable) or breaker | If ac power is good at the source, replace the power cord CRU. If the power supply has failed, replace the power supply CRU. See “Replacing a hot-swap power supply with fan unit” in the <i>IBM EXP400 Storage Expansion Unit User’s Guide</i> .  |
| Drive CRU ID=6   | Green LED on                            | Cluster configuration   | If not currently configured for clustering, power cycle the expansion unit to reenable ID=6.   |

Table 7. Troubleshooting information (continued)

| Component                          | Problem indicator   | Possible cause   | Possible solutions  |
|------------------------------------|---|--|---|
| One or more drive CRUs             | One or more green LEDs are off                            | No activity to the drives  | No action is required.  |
| All drive CRUs or those on one bus |   | No activity to the drives  | No action is required.  |
|                                    |   | Damaged or loose SCSI cables                                     | Check the SCSI-bus cables and connections.  |
|                                    |   | ESM failure  | Use the system-management software to check the SCSI-bus status. Replace the ESM. See "Replacing an ESM" in the <i>IBM EXP400 Storage Expansion Unit User's Guide</i> .   |
| Front panel                        |   | Midplane failure   | Have the expansion unit serviced.   |
| Some or all CRUs                   | Intermittent or sporadic power loss to the expansion unit | Power supply   | Make sure the cables are plugged in and power supplies are turned on.   |
|                                    |   | Hardware failure   | If any other LEDs are lit, have the expansion unit serviced.  |
|                                    |   | Defective ac or dc power source or partially plugged power cable | Check the ac or dc power source. Secure all installed power cables and power supplies. If applicable, check the power components (power supply units, uninterruptible power supply, and so on). Replace defective power cables.   |
| Drives and SCSI bus                | Unable to access drives on one or both SCSI buses         | Power supply failure   | Check for a fault LED on the power supply and replace the failed CRU. See "Replacing a hot-swap power supply with fan unit" in the <i>IBM EXP400 Storage Expansion Unit User's Guide</i> .  |
|                                    |   | Midplane failure   | Have the expansion unit serviced.   |
|                                    |   | Incorrect SCSI ID settings                                       | Make sure the SCSI cables are undamaged and properly connected. Check the drive SCSI ID settings. Be sure that configuration switches SW3 and SW4 (on the ESM) are set to the appropriate positions.<br><br><b>Attention:</b> Change configuration switch positions only when your host server and expansion unit are turned off. |
| Bridge card                        |   | ESM failure  | Have the expansion unit serviced.   |
|                                    |   | Bridge card failure  | All high address or all low address hard disk drives failed; check the bridge card CRU and replace if necessary. See "Replacing a bridge card" in the <i>IBM EXP400 Storage Expansion Unit User's Guide</i> .   |
| Subsystem                          | Random errors   | Midplane failure   | Have the expansion unit serviced.   |

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## 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 appendix contains information about where to go for additional information about IBM and IBM products, what to do if you experience a problem with your xSeries or IntelliStation® system, and whom to call for service, if it is necessary.

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### 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 is turned on.
- Use the troubleshooting information in your system documentation, and use the diagnostic tools that come with your system.
- Go to the IBM Support Web site at <http://www.ibm.com/pc/support/> to check for technical information, hints, tips, and new device drivers.
- Use an IBM discussion forum on the IBM Web site to ask questions.

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

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### Using the documentation

Information about your IBM xSeries or IntelliStation system and preinstalled software, if any, is available in the documentation that comes with your system. That documentation includes printed books, online books, 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/pc/support/> and follow the instructions. Also, you can order publications through the IBM Publications Ordering System at <http://www.elink.ibm.com/public/applications/publications/cgibin/pbi.cgi>.

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### 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 xSeries and IntelliStation products, services, and support. The address for IBM xSeries information is <http://www.ibm.com/eserver/xseries/>. The address for IBM IntelliStation information is <http://www.ibm.com/pc/intellistation/>.

You can find service information for your IBM products, including supported options, at <http://www.ibm.com/pc/support/>.

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## Software service and support

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

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

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## Hardware service and support

You can receive hardware service through IBM Integrated Technology Services or through your IBM reseller, if your reseller is authorized by IBM to provide warranty service. Go to <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.

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# Appendix B. IBM Statement of Limited Warranty Z125-4753-07 11/2002

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## Part 1 - General Terms

### Part 1 - General Terms

*This Statement of Limited Warranty includes Part 1 - General Terms, Part 2 - Country-unique Terms, and Part 3 - Warranty Information. The terms of Part 2 replace or modify those of Part 1. The warranties provided by IBM in this Statement of Limited Warranty apply only to Machines you purchase for your use, and not for resale. The term "Machine" means an IBM machine, its features, conversions, upgrades, elements, or accessories, or any combination of them. The term "Machine" does not include any software programs, whether pre-loaded with the Machine, installed subsequently or otherwise. **Nothing in this Statement of Limited Warranty affects any statutory rights of consumers that cannot be waived or limited by contract.***

### What this Warranty Covers

IBM warrants that each Machine 1) is free from defects in materials and workmanship and 2) conforms to IBM's Official Published Specifications ("Specifications") which are available on request. The warranty period for the Machine starts on the original Date of Installation and is specified in Part 3 - Warranty Information. The date on your invoice or sales receipt is the Date of Installation unless IBM or your reseller informs you otherwise. Many features, conversions, or upgrades involve the removal of parts and their return to IBM. A part that replaces a removed part will assume the warranty service status of the removed part. Unless IBM specifies otherwise, these warranties apply only in the country or region in which you purchased the Machine.

**THESE WARRANTIES ARE YOUR EXCLUSIVE WARRANTIES AND REPLACE ALL OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. SOME STATES OR JURISDICTIONS DO NOT ALLOW THE EXCLUSION OF EXPRESS OR IMPLIED WARRANTIES, SO THE ABOVE EXCLUSION MAY NOT APPLY TO YOU. IN THAT EVENT, SUCH WARRANTIES ARE LIMITED IN DURATION TO THE WARRANTY PERIOD. NO WARRANTIES APPLY AFTER THAT PERIOD. SOME STATES OR JURISDICTIONS DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU.**

### What this Warranty Does not Cover

This warranty does not cover the following:

- any software programs, whether pre-loaded or shipped with the Machine, or installed subsequently;
- failure resulting from misuse (including but not limited to use of any Machine capacity or capability, other than that authorized by IBM in writing), accident, modification, unsuitable physical or operating environment, or improper maintenance by you;
- failure caused by a product for which IBM is not responsible; and
- any non-IBM products, including those that IBM may procure and provide with or integrate into an IBM Machine at your request.

The warranty is voided by removal or alteration of identification labels on the Machine or its parts.

IBM does not warrant uninterrupted or error-free operation of a Machine.

Any technical or other support provided for a Machine under warranty, such as assistance via telephone with “how-to” questions and those regarding Machine set-up and installation, is provided **WITHOUT WARRANTIES OF ANY KIND**.

### **How to Obtain Warranty Service**

If the Machine does not function as warranted during the warranty period, contact IBM or your reseller to obtain warranty service. If you do not register the Machine with IBM, you may be required to present proof of purchase as evidence of your entitlement to warranty service.

### **What IBM Will Do to Correct Problems**

When you call for service, you must follow the problem determination and resolution procedures that IBM specifies. A technician will attempt to make an initial diagnosis of your problem and help you resolve it over the telephone.

The type of warranty service applicable to your Machine is specified in Part 3 - Warranty Information.

You are responsible for downloading and installing designated Machine Code (microcode, basic input/output system code (called “BIOS”), utility programs, device drivers, and diagnostics delivered with an IBM Machine) and other software updates from an IBM Internet Web site or from other electronic media, and following the instructions that IBM provides.

If your problem can be resolved with a Customer Replaceable Unit (“CRU”) (e.g., keyboard, mouse, speaker, memory, hard disk drive and other easily replaceable parts), IBM will ship these parts to you for replacement by you.

If the Machine does not function as warranted during the warranty period and your problem cannot be resolved over the telephone, through your application of Machine Code or software updates, or with a CRU, IBM or your reseller, if approved by IBM to provide warranty service, will either, at its discretion, 1) repair it to make it function as warranted, or 2) replace it with one that is at least functionally equivalent. If IBM is unable to do either, you may return the Machine to your place of purchase and your money will be refunded.

IBM or your reseller will also manage and install selected engineering changes that apply to the Machine.

### **Exchange of a Machine or Part**

When the warranty service involves the exchange of a Machine or part, the item IBM or your reseller replaces becomes its property and the replacement becomes yours. You represent that all removed items are genuine and unaltered. The replacement may not be new, but will be in good working order and at least functionally equivalent to the item replaced. The replacement assumes the warranty service status of the replaced item.

### **Your Additional Responsibilities**



Before IBM or your reseller exchanges a Machine or part, you agree to remove all features, parts, options, alterations, and attachments not under warranty service.

You also agree to:

1. ensure that the Machine is free of any legal obligations or restrictions that prevent its exchange;
2. obtain authorization from the owner to have IBM or your reseller service a Machine that you do not own; and
3. where applicable, before service is provided:
  - a. follow the service request procedures that IBM or your reseller provides;
  - b. backup or secure all programs, data, and funds contained in the Machine;
  - c. provide IBM or your reseller with sufficient, free, and safe access to your facilities to permit IBM to fulfill its obligations; and
  - d. inform IBM or your reseller of changes in the Machine's location.
4. (a) ensure all information about identified or identifiable individuals (Personal Data) is deleted from the Machine (to the extent technically possible), (b) allow IBM, your reseller or an IBM supplier to process on your behalf any remaining Personal Data as IBM or your reseller considers necessary to fulfill its obligations under this Statement of Limited Warranty (which may include shipping the Machine for such processing to other IBM service locations around the world), and (c) ensure that such processing complies with any laws applicable to such Personal Data.

#### **Limitation of Liability**

IBM is responsible for loss of, or damage to, your Machine only while it is 1) in IBM's possession or 2) in transit in those cases where IBM is responsible for the transportation charges.

Neither IBM nor your reseller are responsible for any of your confidential, proprietary or personal information contained in a Machine which you return to IBM for any reason. You should remove all such information from the Machine prior to its return.

Circumstances may arise where, because of a default on IBM's part or other liability, you are entitled to recover damages from IBM. In each such instance, regardless of the basis on which you are entitled to claim damages from IBM (including fundamental breach, negligence, misrepresentation, or other contract or tort claim), except for any liability that cannot be waived or limited by applicable laws, IBM is liable for no more than

1. damages for bodily injury (including death) and damage to real property and tangible personal property; and
2. the amount of any other actual direct damages, up to the charges (if recurring, 12 months' charges apply) for the Machine that is subject of the claim. For purposes of this item, the term "Machine" includes Machine Code and Licensed Internal Code ("LIC").

This limit also applies to IBM's suppliers and your reseller. It is the maximum for which IBM, its suppliers, and your reseller are collectively responsible.

**UNDER NO CIRCUMSTANCES IS IBM, ITS SUPPLIERS OR RESELLERS LIABLE FOR ANY OF THE FOLLOWING EVEN IF INFORMED OF THEIR POSSIBILITY: 1) THIRD PARTY CLAIMS AGAINST YOU FOR DAMAGES (OTHER THAN THOSE UNDER THE FIRST ITEM LISTED ABOVE); 2) LOSS OF, OR DAMAGE TO, DATA; 3) SPECIAL, INCIDENTAL, OR INDIRECT DAMAGES OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES; OR 4) LOST**

**PROFITS, BUSINESS REVENUE, GOODWILL OR ANTICIPATED SAVINGS. SOME STATES OR JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU. SOME STATES OR JURISDICTIONS DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU.**

### **Governing Law**

Both you and IBM consent to the application of the laws of the country in which you acquired the Machine to govern, interpret, and enforce all of your and IBM's rights, duties, and obligations arising from, or relating in any manner to, the subject matter of this Statement of Limited Warranty, without regard to conflict of law principles.

**THESE WARRANTIES GIVE YOU SPECIFIC LEGAL RIGHTS AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE OR JURISDICTION TO JURISDICTION.**

### **Jurisdiction**

All of our rights, duties, and obligations are subject to the courts of the country in which you acquired the Machine.

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## **Part 2 - Country-unique Terms**

### **AMERICAS**

#### **ARGENTINA**

**Governing Law:** *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the Ordinary Commercial Court of the city of Buenos Aires.

#### **BRAZIL**

**Governing Law:** *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the court of Rio de Janeiro, RJ.

#### **PERU**

**Limitation of Liability:** *The following is added at the end of this section:*

In accordance with Article 1328 of the Peruvian Civil Code the limitations and exclusions specified in this section will not apply to damages caused by IBM's willful misconduct ("dolo") or gross negligence ("culpa inexcusable").

### **NORTH AMERICA**

**How to Obtain Warranty Service:** *The following is added to this Section:*

To obtain warranty service from IBM in Canada or the United States, call 1-800-IBM-SERV (426-7378).

#### **CANADA**

**Limitation of Liability:** *The following replaces item 1 of this section:*

1. damages for bodily injury (including death) or physical harm to real property and tangible personal property caused by IBM's negligence; and

**Governing Law:** *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:*

laws in the Province of Ontario.

## **UNITED STATES**

**Governing Law:** *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:*

laws of the State of New York.

## **ASIA PACIFIC**

### **AUSTRALIA**

**What this Warranty Covers:** *The following paragraph is added to this section:*

The warranties specified in this Section are in addition to any rights you may have under the Trade Practices Act 1974 or other similar legislation and are only limited to the extent permitted by the applicable legislation.

**Limitation of Liability:** *The following is added to this section:*

Where IBM is in breach of a condition or warranty implied by the Trade Practices Act 1974 or other similar legislation, IBM's liability is limited to the repair or replacement of the goods or the supply of equivalent goods. Where that condition or warranty relates to right to sell, quiet possession or clear title, or the goods are of a kind ordinarily acquired for personal, domestic or household use or consumption, then none of the limitations in this paragraph apply.

**Governing Law:** *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:*

laws of the State or Territory.

### **CAMBODIA, LAOS, AND VIETNAM**

**Governing Law:** *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:*

laws of the State of New York, United States of America.

### **CAMBODIA, INDONESIA, LAOS, AND VIETNAM**

**Arbitration:** *The following is added under this heading:*

Disputes arising out of or in connection with this Statement of Limited Warranty shall be finally settled by arbitration which shall be held in Singapore in accordance with the Arbitration Rules of Singapore International Arbitration Center ("SIAC Rules") then in effect. The arbitration award shall be final and binding for the parties without appeal and shall be in writing and set forth the findings of fact and the conclusions of law.

The number of arbitrators shall be three, with each side to the dispute being entitled to appoint one arbitrator. The two arbitrators appointed by the parties shall appoint a third arbitrator who shall act as chairman of the proceedings. Vacancies in the post of chairman shall be filled by the president of the SIAC. Other vacancies shall

be filled by the respective nominating party. Proceedings shall continue from the stage they were at when the vacancy occurred.

If one of the parties refuses or otherwise fails to appoint an arbitrator within 30 days of the date the other party appoints its, the first appointed arbitrator shall be the sole arbitrator, provided that the arbitrator was validly and properly appointed.

All proceedings shall be conducted, including all documents presented in such proceedings, in the English language. The English language version of this Statement of Limited Warranty prevails over any other language version.

## **HONG KONG S.A.R. OF CHINA AND MACAU S.A.R. OF CHINA**

**Governing Law:** *The following replaces “laws of the country in which you acquired the Machine” in the first sentence:*

laws of Hong Kong Special Administrative Region of China.

## **INDIA**

**Limitation of Liability:** *The following replaces items 1 and 2 of this section:*

1. liability for bodily injury (including death) or damage to real property and tangible personal property will be limited to that caused by IBM's negligence; and
2. as to any other actual damage arising in any situation involving nonperformance by IBM pursuant to, or in any way related to the subject of this Statement of Limited Warranty, the charge paid by you for the individual Machine that is the subject of the claim. For purposes of this item, the term “Machine” includes Machine Code and Licensed Internal Code (“LIC”).

**Arbitration:** *The following is added under this heading:*

Disputes arising out of or in connection with this Statement of Limited Warranty shall be finally settled by arbitration which shall be held in Bangalore, India in accordance with the laws of India then in effect. The arbitration award shall be final and binding for the parties without appeal and shall be in writing and set forth the findings of fact and the conclusions of law.

The number of arbitrators shall be three, with each side to the dispute being entitled to appoint one arbitrator. The two arbitrators appointed by the parties shall appoint a third arbitrator who shall act as chairman of the proceedings. Vacancies in the post of chairman shall be filled by the president of the Bar Council of India. Other vacancies shall be filled by the respective nominating party. Proceedings shall continue from the stage they were at when the vacancy occurred.

If one of the parties refuses or otherwise fails to appoint an arbitrator within 30 days of the date the other party appoints its, the first appointed arbitrator shall be the sole arbitrator, provided that the arbitrator was validly and properly appointed.

All proceedings shall be conducted, including all documents presented in such proceedings, in the English language. The English language version of this Statement of Limited Warranty prevails over any other language version.

## **JAPAN**

**Governing Law:** *The following sentence is added to this section:*

Any doubts concerning this Statement of Limited Warranty will be initially resolved between us in good faith and in accordance with the principle of mutual trust.

## **MALAYSIA**

**Limitation of Liability:** *The word “SPECIAL” in item 3 of the fifth paragraph is deleted.*

## **NEW ZEALAND**

**What this Warranty Covers:** *The following paragraph is added to this section:*

The warranties specified in this section are in addition to any rights you may have under the Consumer Guarantees Act 1993 or other legislation which cannot be excluded or limited. The Consumer Guarantees Act 1993 will not apply in respect of any goods which IBM provides, if you require the goods for the purposes of a business as defined in that Act.

**Limitation of Liability:** *The following is added to this section:*

Where Machines are not acquired for the purposes of a business as defined in the Consumer Guarantees Act 1993, the limitations in this section are subject to the limitations in that Act.

## **PEOPLE’S REPUBLIC OF CHINA (PRC)**

**Governing Law:** *The following replaces “laws of the country in which you acquired the Machine” in the first sentence:*

laws of the State of New York, United States of America (except when local law requires otherwise).

## **PHILIPPINES**

**Limitation of Liability:** *Item 3 in the fifth paragraph is replaced by the following:*

**SPECIAL (INCLUDING NOMINAL AND EXEMPLARY DAMAGES), MORAL, INCIDENTAL, OR INDIRECT DAMAGES FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES; OR**

**Arbitration:** *The following is added under this heading:*

Disputes arising out of or in connection with this Statement of Limited Warranty shall be finally settled by arbitration which shall be held in Metro Manila, Philippines in accordance with the laws of the Philippines then in effect. The arbitration award shall be final and binding for the parties without appeal and shall be in writing and set forth the findings of fact and the conclusions of law.

The number of arbitrators shall be three, with each side to the dispute being entitled to appoint one arbitrator. The two arbitrators appointed by the parties shall appoint a third arbitrator who shall act as chairman of the proceedings. Vacancies in the post of chairman shall be filled by the president of the Philippine Dispute Resolution Center, Inc. Other vacancies shall be filled by the respective nominating party. Proceedings shall continue from the stage they were at when the vacancy occurred.

If one of the parties refuses or otherwise fails to appoint an arbitrator within 30 days of the date the other party appoints its, the first appointed arbitrator shall be the sole arbitrator, provided that the arbitrator was validly and properly appointed.

All proceedings shall be conducted, including all documents presented in such proceedings, in the English language. The English language version of this Statement of Limited Warranty prevails over any other language version.

## **SINGAPORE**

**Limitation of Liability:** *The words “SPECIAL” and “ECONOMIC” in item 3 in the fifth paragraph are deleted.*

## **EUROPE, MIDDLE EAST, AFRICA (EMEA)**

### ***THE FOLLOWING TERMS APPLY TO ALL EMEA COUNTRIES:***

The terms of this Statement of Limited Warranty apply to Machines purchased from IBM or an IBM reseller.

**Hot to Obtain Warranty Service:** If you purchase a Machine in Austria, Belgium, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Monaco, Netherlands, Norway, Portugal, Spain, San Marino, Sweden, Switzerland, United Kingdom or Vatican State, you may obtain warranty service for that Machine in any of those countries from either (1) an IBM reseller approved to perform warranty service or (2) from IBM, provided the Machine has been announced and made available by IBM in the country in which you wish to obtain service. If you purchased a Personal Computer Machine in Albania, Armenia, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Georgia, Hungary, Kazakhstan, Kyrgyzstan, Federal Republic of Yugoslavia, Former Yugoslav Republic of Macedonia (FYROM), Moldova, Poland, Romania, Russia, Slovak Republic, Slovenia, or Ukraine, you may obtain warranty service for that Machine in any of those countries from either (1) an IBM reseller approved to perform warranty service or (2) from IBM.

If you purchase a Machine in a Middle Eastern or African country, you may obtain warranty service for that Machine from the IBM entity within the country of purchase, if that IBM entity provides warranty service in that country, or from an IBM reseller, approved by IBM to perform warranty service on that Machine in that country. Warranty service in Africa is available within 50 kilometers of an IBM approved service provider. You are responsible for transportation costs for Machines located outside 50 kilometers of an IBM approved service provider.

*Add the following paragraph in **Western Europe** (Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Liechtenstein, Luxembourg, Monaco, Netherlands, Norway, Portugal, Spain, San Marino, Sweden, Switzerland, United Kingdom, Vatican State):*

The warranty for Machines acquired in Western Europe shall be valid and applicable in all Western Europe countries provided the Machines have been announced and made available in such countries.

### **Governing Law:**

*The phrase “the laws of the country in which you acquired the Machine” is replaced by:*

1) “the laws of Austria” in **Albania, Armenia, Azerbaijan, Belarus, Bosnia-Herzegovina, Bulgaria, Croatia, Georgia, Hungary, Kazakhstan, Kyrgyzstan, FYR Macedonia, Moldova, Poland, Romania, Russia, Slovakia, Slovenia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan, and FR Yugoslavia;** 2)



“the laws of France” in **Algeria, Benin, Burkina Faso, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo Republic, Djibouti, Democratic Republic of Congo, Equatorial Guinea, French Guiana, French Polynesia, Gabon, Gambia, Guinea, Guinea-Bissau, Ivory Coast, Lebanon, Madagascar, Mali, Mauritania, Mauritius, Mayotte, Morocco, New Caledonia, Niger, Reunion, Senegal, Seychelles, Togo, Tunisia, Vanuatu, and Wallis & Futuna**; 3) “the laws of Finland” in **Estonia, Latvia, and Lithuania**; 4) “the laws of England” in **Angola, Bahrain, Botswana, Burundi, Egypt, Eritrea, Ethiopia, Ghana, Jordan, Kenya, Kuwait, Liberia, Malawi, Malta, Mozambique, Nigeria, Oman, Pakistan, Qatar, Rwanda, Sao Tome, Saudi Arabia, Sierra Leone, Somalia, Tanzania, Uganda, United Arab Emirates, the United Kingdom, West Bank/Gaza, Yemen, Zambia, and Zimbabwe**; and 5) “the laws of South Africa” in **South Africa, Namibia, Lesotho and Swaziland**.

**Jurisdiction:** *The following exceptions are added to this section:*

1) **In Austria** the choice of jurisdiction for all disputes arising out of this Statement of Limited Warranty and relating thereto, including its existence, will be the competent court of law in Vienna, Austria (Inner-City); 2) **in Angola, Bahrain, Botswana, Burundi, Egypt, Eritrea, Ethiopia, Ghana, Jordan, Kenya, Kuwait, Liberia, Malawi, Malta, Mozambique, Nigeria, Oman, Pakistan, Qatar, Rwanda, Sao Tome, Saudi Arabia, Sierra Leone, Somalia, Tanzania, Uganda, United Arab Emirates, West Bank/Gaza, Yemen, Zambia, and Zimbabwe** all disputes arising out of this Statement of Limited Warranty or related to its execution, including summary proceedings, will be submitted to the exclusive jurisdiction of the English courts; 3) in **Belgium and Luxembourg**, all disputes arising out of this Statement of Limited Warranty or related to its interpretation or its execution, the law, and the courts of the capital city, of the country of your registered office and/or commercial site location only are competent; 4) **in France, Algeria, Benin, Burkina Faso, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo Republic, Djibouti, Democratic Republic of Congo, Equatorial Guinea, French Guiana, French Polynesia, Gabon, Gambia, Guinea, Guinea-Bissau, Ivory Coast, Lebanon, Madagascar, Mali, Mauritania, Mauritius, Mayotte, Morocco, New Caledonia, Niger, Reunion, Senegal, Seychelles, Togo, Tunisia, Vanuatu, and Wallis & Futuna** all disputes arising out of this Statement of Limited Warranty or related to its violation or execution, including summary proceedings, will be settled exclusively by the Commercial Court of Paris; 5) **in Russia**, all disputes arising out of or in relation to the interpretation, the violation, the termination, the nullity of the execution of this Statement of Limited Warranty shall be settled by Arbitration Court of Moscow; 6) **in South Africa, Namibia, Lesotho and Swaziland**, both of us agree to submit all disputes relating to this Statement of Limited Warranty to the jurisdiction of the High Court in Johannesburg; 7) **in Turkey** all disputes arising out of or in connection with this Statement of Limited Warranty shall be resolved by the Istanbul Central (Sultanahmet) Courts and Execution Directorates of Istanbul, the Republic of Turkey; 8) in each of the following specified countries, any legal claim arising out of this Statement of Limited Warranty will be brought before, and settled exclusively by, the competent court of a) Athens for **Greece**, b) Tel Aviv-Jaffa for **Israel**, c) Milan for **Italy**, d) Lisbon for **Portugal**, and e) Madrid for **Spain**; and 9) **in the United Kingdom**, both of us agree to submit all disputes relating to this Statement of Limited Warranty to the jurisdiction of the English courts.

**Arbitration:** *The following is added under this heading:*

**In Albania, Armenia, Azerbaijan, Belarus, Bosnia-Herzegovina, Bulgaria, Croatia, Georgia, Hungary, Kazakhstan, Kyrgyzstan, FYR Macedonia, Moldova,**

**Poland, Romania, Russia, Slovakia, Slovenia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan, and FR Yugoslavia** all disputes arising out of this Statement of Limited Warranty or related to its violation, termination or nullity will be finally settled under the Rules of Arbitration and Conciliation of the International Arbitral Center of the Federal Economic Chamber in Vienna (Vienna Rules) by three arbitrators appointed in accordance with these rules. The arbitration will be held in Vienna, Austria, and the official language of the proceedings will be English. The decision of the arbitrators will be final and binding upon both parties. Therefore, pursuant to paragraph 598 (2) of the Austrian Code of Civil Procedure, the parties expressly waive the application of paragraph 595 (1) figure 7 of the Code. IBM may, however, institute proceedings in a competent court in the country of installation.

**In Estonia, Latvia and Lithuania** all disputes arising in connection with this Statement of Limited Warranty will be finally settled in arbitration that will be held in Helsinki, Finland in accordance with the arbitration laws of Finland then in effect. Each party will appoint one arbitrator. The arbitrators will then jointly appoint the chairman. If arbitrators cannot agree on the chairman, then the Central Chamber of Commerce in Helsinki will appoint the chairman.

## **EUROPEAN UNION (EU)**

### ***THE FOLLOWING TERMS APPLY TO ALL EU COUNTRIES:***

Consumers have legal rights under applicable national legislation governing the sale of consumer goods. Such rights are not affected by the warranties provided in this Statement of Limited Warranty.

**How to Obtain Warranty Service:** *The following is added to this section:*

To obtain warranty service from IBM in EU countries, see the telephone listing in Part 3 - Warranty Information.

You may contact IBM at the following address:

IBM Warranty & Service Quality Dept.  
PO Box 30  
Spango Valley  
Greenock  
Scotland PA16 0AH

## **AUSTRIA, DENMARK, FINLAND, GREECE, ITALY, NETHERLANDS, PORTUGAL, SPAIN, SWEDEN AND SWITZERLAND**

**Limitation of Liability:** *The following replaces the terms of this section in its entirety:*

Except as otherwise provided by mandatory law:

1. IBM's liability for any damages and losses that may arise as a consequence of the fulfillment of its obligations under or in connection with this Statement of Limited Warranty or due to any other cause related to this Statement of Limited Warranty is limited to the compensation of only those damages and losses proved and actually arising as an immediate and direct consequence of the non-fulfillment of such obligations (if IBM is at fault) or of such cause, for a maximum amount equal to the charges you paid for the Machine. For purposes of this item, the term "Machine" includes Machine Code and Licensed Internal Code ("LIC").



The above limitation shall not apply to damages for bodily injuries (including death) and damages to real property and tangible personal property for which IBM is legally liable.

2. **UNDER NO CIRCUMSTANCES IS IBM, ITS SUPPLIERS OR RESELLERS LIABLE FOR ANY OF THE FOLLOWING, EVEN IF INFORMED OF THEIR POSSIBILITY: 1) LOSS OF, OR DAMAGE TO, DATA; 2) INCIDENTAL OR INDIRECT DAMAGES, OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES; 3) LOST PROFITS, EVEN IF THEY ARISE AS AN IMMEDIATE CONSEQUENCE OF THE EVENT THAT GENERATED THE DAMAGES; OR 4) LOSS OF BUSINESS, REVENUE, GOODWILL, OR ANTICIPATED SAVINGS.**

## **FRANCE AND BELGIUM**

**Limitation of Liability:** *The following replaces the terms of this section in its entirety:*

Except as otherwise provided by mandatory law:

1. IBM's liability for any damages and losses that may arise as a consequence of the fulfillment of its obligations under or in connection with this Statement of Limited Warranty is limited to the compensation of only those damages and losses proved and actually arising as an immediate and direct consequence of the non-fulfillment of such obligations (if IBM is at fault), for a maximum amount equal to the charges you paid for the Machine that has caused the damages. For purposes of this item, the term "Machine" includes Machine Code and Licensed Internal Code ("LIC").

The above limitation shall not apply to damages for bodily injuries (including death) and damages to real property and tangible personal property for which IBM is legally liable.

2. **UNDER NO CIRCUMSTANCES IS IBM, ITS SUPPLIERS OR RESELLERS LIABLE FOR ANY OF THE FOLLOWING, EVEN IF INFORMED OF THEIR POSSIBILITY: 1) LOSS OF, OR DAMAGE TO, DATA; 2) INCIDENTAL OR INDIRECT DAMAGES, OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES; 3) LOST PROFITS, EVEN IF THEY ARISE AS AN IMMEDIATE CONSEQUENCE OF THE EVENT THAT GENERATED THE DAMAGES; OR 4) LOSS OF BUSINESS, REVENUE, GOODWILL, OR ANTICIPATED SAVINGS.**

## **THE FOLLOWING TERMS APPLY TO THE COUNTRY SPECIFIED:**

### **AUSTRIA**

**What this Warranty Covers:** *The following replaces the first sentence of the first paragraph of this section:*

The warranty for an IBM Machine covers the functionality of the Machine for its normal use and the Machine's conformity to its Specifications.

*The following paragraphs are added to this section:*

The warranty period for Machines is 12 months from the date of delivery. The limitation period for consumers in action for breach of warranty is the statutory period as a minimum. In case IBM or your reseller is unable to repair an IBM Machine, you can alternatively ask for a partial refund as far as justified by the reduced value of the unrepaired Machine or ask for a cancellation of the respective agreement for such Machine and get your money refunded.

*The second paragraph does not apply.*

**What IBM Will Do to Correct Problems:** *The following is added to this section:*

During the warranty period, transportation for delivery of the failing Machine to IBM will be at IBM's expense.

**Limitation of Liability:** *The following paragraph is added to this section:*

The limitations and exclusions specified in the Statement of Limited Warranty will not apply to damages caused by IBM with fraud or gross negligence and for express warranty.

*The following sentence is added to the end of item 2:*

IBM's liability under this item is limited to the violation of essential contractual terms in cases of ordinary negligence.

## **EGYPT**

**Limitation of Liability:** *The following replaces item 2 in this section:*

as to any other actual direct damages, IBM's liability will be limited to the total amount you paid for the Machine that is the subject of the claim. For purposes of this item, the term "Machine" includes Machine Code and Licensed Internal Code ("LIC").

*Applicability of suppliers and resellers (unchanged).*

## **FRANCE**

**Limitation of Liability:** *The following replaces the second sentence of the first paragraph of this section:*

In such instances, regardless of the basis on which you are entitled to claim damages from IBM, IBM is liable for no more than: (items 1 and 2 unchanged).

## **GERMANY**

**What this Warranty Covers:** *The following replaces the first sentence of the first paragraph of this section:*

The warranty for an IBM Machine covers the functionality of the Machine for its normal use and the Machine's conformity to its Specifications.

*The following paragraphs are added to this section:*

The minimum warranty period for Machines is twelve months. In case IBM or your reseller is unable to repair an IBM Machine, you can alternatively ask for a partial refund as far as justified by the reduced value of the unrepaired Machine or ask for a cancellation of the respective agreement for such Machine and get your money refunded.

*The second paragraph does not apply.*

**What IBM Will Do to Correct Problems:** *The following is added to this section:*

During the warranty period, transportation for delivery of the failing Machine to IBM will be at IBM's expense.

**Limitation of Liability:** *The following paragraph is added to this section:*

The limitations and exclusions specified in the Statement of Limited Warranty will not apply to damages caused by IBM with fraud or gross negligence and for express warranty.

*The following sentence is added to the end of item 2:*

IBM's liability under this item is limited to the violation of essential contractual terms in cases of ordinary negligence.

## **HUNGARY**

**Limitation of Liability:** *The following is added at the end of this section:*

The limitation and exclusion specified herein shall not apply to liability for a breach of contract damaging life, physical well-being, or health that has been caused intentionally, by gross negligence, or by a criminal act.

The parties accept the limitations of liability as valid provisions and state that the Section 314.(2) of the Hungarian Civil Code applies as the acquisition price as well as other advantages arising out of the present Statement of Limited Warranty balance this limitation of liability.

## **IRELAND**

**What this Warranty Covers:** *The following is added to this section:*

Except as expressly provided in these terms and conditions, all statutory conditions, including all warranties implied, but without prejudice to the generality of the foregoing all warranties implied by the Sale of Goods Act 1893 or the Sale of Goods and Supply of Services Act 1980 are hereby excluded.

**Limitation of Liability:** *The following replaces the terms of this section in its entirety:*

For the purposes of this section, a "Default" means any act, statement, omission, or negligence on the part of IBM in connection with, or in relation to, the subject matter of this Statement of Limited Warranty in respect of which IBM is legally liable to you, whether in contract or tort. A number of Defaults which together result in, or contribute to, substantially the same loss or damage will be treated as one Default occurring on the date of occurrence of the last such Default.

Circumstances may arise where, because of a Default, you are entitled to recover damages from IBM.

This section sets out the extent of IBM's liability and your sole remedy.

1. IBM will accept unlimited liability for death or personal injury caused by the negligence of IBM.
2. Subject always to the **Items for Which IBM is Not Liable** below, IBM will accept unlimited liability for physical damage to your tangible property resulting from the negligence of IBM.

3. Except as provided in items 1 and 2 above, IBM's entire liability for actual damages for any one Default will not in any event exceed the greater of 1) EUR 125,000, or 2) 125% of the amount you paid for the Machine directly relating to the Default.

#### **Items for Which IBM is Not Liable**

Save with respect to any liability referred to in item 1 above, under no circumstances is IBM, its suppliers or resellers liable for any of the following, even if IBM or they were informed of the possibility of such losses:

1. loss of, or damage to, data;
2. special, indirect, or consequential loss; or
3. loss of profits, business, revenue, goodwill, or anticipated savings.

#### **SLOVAKIA**

**Limitation of Liability:** *The following is added to the end of the last paragraph:*

The limitations apply to the extent they are not prohibited under §§ 373-386 of the Slovak Commercial Code.

#### **SOUTH AFRICA, NAMIBIA, BOTSWANA, LESOTHO AND SWAZILAND**

**Limitation of Liability:** *The following is added to this section:*

IBM's entire liability to you for actual damages arising in all situations involving nonperformance by IBM in respect of the subject matter of this Statement of Warranty will be limited to the charge paid by you for the individual Machine that is the subject of your claim from IBM.

#### **UNITED KINGDOM**

**Limitation of Liability:** *The following replaces the terms of this section in its entirety:*

For the purposes of this section, a "Default" means any act, statement, omission, or negligence on the part of IBM in connection with, or in relation to, the subject matter of this Statement of Limited Warranty in respect of which IBM is legally liable to you, whether in contract or tort. A number of Defaults which together result in, or contribute to, substantially the same loss or damage will be treated as one Default.

Circumstances may arise where, because of a Default, you are entitled to recover damages from IBM.

This section sets out the extent of IBM's liability and your sole remedy.

1. IBM will accept unlimited liability for:
  - a. death or personal injury caused by the negligence of IBM; and
  - b. any breach of its obligations implied by Section 12 of the Sale of Goods Act 1979 or Section 2 of the Supply of Goods and Services Act 1982, or any statutory modification or re-enactment of either such Section.
2. IBM will accept unlimited liability, subject always to the **Items for Which IBM is Not Liable** below, for physical damage to your tangible property resulting from the negligence of IBM.
3. IBM's entire liability for actual damages for any one Default will not in any event, except as provided in items 1 and 2 above, exceed the greater of 1) Pounds

Sterling 75,000, or 2) 125% of the total purchase price payable or the charges for the Machine directly relating to the Default.

These limits also apply to IBM's suppliers and resellers. They state the maximum for which IBM and such suppliers and resellers are collectively responsible.

### Items for Which IBM is Not Liable

Save with respect to any liability referred to in item 1 above, under no circumstances is IBM or any of its suppliers or resellers liable for any of the following, even if IBM or they were informed of the possibility of such losses:

1. loss of, or damage to, data;
2. special, indirect, or consequential loss; or
3. loss of profits, business, revenue, goodwill, or anticipated savings.

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## Part 3 - Warranty Information

This Part 3 provides information regarding the warranty applicable to your Machine, including the warranty period and type of warranty service IBM provides.

### Warranty Period

The warranty period may vary by country or region and is specified in the table below.

**Note:** "Region" means either Hong Kong or Macau Special Administrative Region of China.

### Machine - IBM EXP400 Storage Expansion Unit

| Country or Region of Purchase   | Warranty Period                  | Type of Warranty Service* |
|---|----------------------------------|---------------------------|
| Worldwide   | Parts - 3 years, labor - 3 years | 2                         |
| * See " <u>Types of Warranty Service</u> " for the legend and explanations of warranty-service types. |                                  |                           |

A warranty period of 3 years on parts and 1 year on labor means that IBM provides warranty service without charge for:

1. parts and labor during the first year of the warranty period; and
2. parts only, on an exchange basis, in the second and third years of the warranty period. IBM will charge you for any labor provided in performance of the repair or replacement(s) in the second and third year of the warranty period.

### Types of Warranty Service

If required, IBM provides repair or exchange service depending on the type of warranty service specified for your Machine in the above table and as described below. Warranty service may be provided by your reseller if approved by IBM to perform warranty service. Scheduling of service will depend upon the time of your call and is subject to parts availability. Service levels are response time objectives and are not guaranteed. The specified level of warranty service may not be available in all worldwide locations, additional charges may apply outside IBM's normal service area, contact your local IBM representative or your reseller for country and location specific information.

1. **Customer Replaceable Unit ("CRU") Service**

IBM will ship CRU parts to you for your replacement. If IBM instructs you to return the replaced CRU, you are responsible for returning it to IBM in accordance with IBM's instructions. If you do not return the defective CRU, if IBM so instructs, within 30 days of your receipt of the replacement CRU, IBM may charge you for the replacement.

**2. On-site Service**

IBM or your reseller will either repair or exchange the failing Machine at your location and verify its operation. You must provide suitable working area to allow disassembly and reassembly of the IBM Machine. The area must be clean, well lit and suitable for the purpose. **For some Machines, certain repairs may require sending the Machine to an IBM service center.**

**3. Courier or Depot Service\***

You will disconnect the failing Machine for collection arranged by IBM. IBM will provide you with a shipping container for you to return your Machine to a designated service center. A courier will pick up your Machine and deliver it to the designated service center. Following its repair or exchange, IBM will arrange the return delivery of the Machine to your location. You are responsible for its installation and verification.

**4. Customer Carry-In or Mail-In Service**

You will deliver or mail as IBM specifies (prepaid unless IBM specifies otherwise) the failing Machine suitably packaged to a location IBM designates. After IBM has repaired or exchanged the Machine, IBM will make it available for your collection or, for Mail-in Service, IBM will return it to you at IBM's expense, unless IBM specifies otherwise. You are responsible for the subsequent installation and verification of the Machine.

\* This type of service is called ThinkPad® EasyServ or EasyServ in some countries.

The IBM Machine Warranty World Wide Web site at [http://www.ibm.com/servers/support/machine\\_warranties/](http://www.ibm.com/servers/support/machine_warranties/) provides a worldwide overview of IBM Limited Warranty for Machines, a Glossary of IBM definitions, Frequently Asked Questions (FAQs) and Support by Product (Machine) with links to Product Support pages. **The IBM Statement of Limited Warranty is also available on this site in 29 languages.**

To obtain warranty service contact IBM or your IBM reseller. In Canada or the United States, call 1-800-IBM-SERV (426-7378). In the EU countries, see the telephone numbers below.

**EU Country Telephone List**

Phone numbers are subject to change without notice.

|                            |                                 |
|----------------------------|---------------------------------|
| Austria -- 43-1-24592-5901 | Italy -- 39-02-482-9202         |
| Belgium -- 02-718-4339     | Luxembourg -- 352-360385-1      |
| Denmark -- 4520-8200       | Netherlands -- 020-514-5770     |
| Finland -- 358-9-4591      | Portugal -- 351-21-7915-147     |
| France -- 0238-557-450     | Spain -- 34-91-662-4916         |
| Germany -- 07032-15-4920   | Sweden -- 46-8-477-4420         |
| Greece -- 30-210-688-1220  | United Kingdom -- 01475-555-055 |
| Ireland -- 353-1-815-4000  |                                 |

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## Appendix C. Notices

This information was developed for products and services offered in the U.S.A.

IBM may not offer the products, services, or features discussed in this document in other countries. Consult your local IBM representative for information on the products and services currently available in your area. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service.

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## Important notes

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

CD-ROM drive speeds list the variable read rate. Actual speeds vary and are often less than the maximum possible.

When referring to processor storage, real and virtual storage, or channel volume, KB stands for approximately 1000 bytes, MB stands for approximately 1 000 000 bytes, and GB stands for approximately 1 000 000 000 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 may 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 available from IBM.

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

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## Product recycling and disposal

This unit contains materials such as circuit boards, cables, electromagnetic compatibility gaskets, and connectors which may contain lead and copper/beryllium alloys that require special handling and disposal at end of life. Before this unit is disposed of, these materials must be removed and recycled or discarded according to applicable regulations. IBM offers product-return programs in several countries. For country-specific instructions, refer to the following Web site:  
<http://www.ibm.com/ibm/environment/products/prp.shtml>.

**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, contact your local waste disposal facility.**

In the United States, IBM has established a collection 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.

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## 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 89/336/EEC 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.

## 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

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### Power cords

For your safety, IBM provides a power cord with a grounded attachment plug to use with this IBM product. To avoid electrical shock, always use the power cord and plug with a properly grounded outlet.

IBM power cords used in the United States and Canada are listed by Underwriter's Laboratories (UL) and certified by the Canadian Standards Association (CSA).

For units intended to be operated at 115 volts: Use a UL-listed and CSA-certified cord set consisting of a minimum 18 AWG, Type SVT or SJT, three-conductor cord, a maximum of 15 feet in length and a parallel blade, grounding-type attachment plug rated 15 amperes, 125 volts.

For units intended to be operated at 230 volts (U.S. use): Use a UL-listed and CSA-certified cord set consisting of a minimum 18 AWG, Type SVT or SJT, three-conductor cord, a maximum of 15 feet in length and a tandem blade, grounding-type attachment plug rated 15 amperes, 250 volts.

For units intended to be operated at 230 volts (outside the U.S.): Use a cord set with a grounding-type attachment plug. The cord set should have the appropriate safety approvals for the country in which the equipment will be installed.

IBM power cords for a specific country or region are usually available only in that country or region.

| IBM power cord part number | Used in these countries and regions                             |
|----------------------------|---|
| 02K0546                    | China   |
| 13F9940                    | Australia, Fiji, Kiribati, Nauru, New Zealand, Papua New Guinea |

| IBM power cord part number | Used in these countries and regions   |
|----------------------------|---|
| 13F9979                    | Afghanistan, Albania, Algeria, Andorra, Angola, Armenia, Austria, Azerbaijan, Belarus, Belgium, Benin, Bosnia and Herzegovina, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo (Democratic Republic of), Congo (Republic of), Cote D'Ivoire (Ivory Coast), Croatia (Republic of), Czech Republic, Dahomey, Djibouti, Egypt, Equatorial Guinea, Eritrea, Estonia, Ethiopia, Finland, France, French Guyana, French Polynesia, Germany, Greece, Guadeloupe, Guinea, Guinea Bissau, Hungary, Iceland, Indonesia, Iran, Kazakhstan, Kyrgyzstan, Laos (People's Democratic Republic of), Latvia, Lebanon, Lithuania, Luxembourg, Macedonia (former Yugoslav Republic of), Madagascar, Mali, Martinique, Mauritania, Mauritius, Mayotte, Moldova (Republic of), Monaco, Mongolia, Morocco, Mozambique, Netherlands, New Caledonia, Niger, Norway, Poland, Portugal, Reunion, Romania, Russian Federation, Rwanda, Sao Tome and Principe, Saudi Arabia, Senegal, Serbia, Slovakia, Slovenia (Republic of), Somalia, Spain, Suriname, Sweden, Syrian Arab Republic, Tajikistan, Tahiti, Togo, Tunisia, Turkey, Turkmenistan, Ukraine, Upper Volta, Uzbekistan, Vanuatu, Vietnam, Wallis and Futuna, Yugoslavia (Federal Republic of), Zaire |
| 13F9997                    | Denmark   |
| 14F0015                    | Bangladesh, Lesotho, Maceo, Maldives, Namibia, Nepal, Pakistan, Samoa, South Africa, Sri Lanka, Swaziland, Uganda   |
| 14F0033                    | Abu Dhabi, Bahrain, Botswana, Brunei Darussalam, Channel Islands, China (Hong Kong S.A.R.), Cyprus, Dominica, Gambia, Ghana, Grenada, Iraq, Ireland, Jordan, Kenya, Kuwait, Liberia, Malawi, Malaysia, Malta, Myanmar (Burma), Nigeria, Oman, Polynesia, Qatar, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Seychelles, Sierra Leone, Singapore, Sudan, Tanzania (United Republic of), Trinidad and Tobago, United Arab Emirates (Dubai), United Kingdom, Yemen, Zambia, Zimbabwe   |
| 14F0051                    | Liechtenstein, Switzerland  |
| 14F0069                    | Chile, Italy, Libyan Arab Jamahiriya  |
| 14F0087                    | Israel  |
| 1838574                    | Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Brazil, Caicos Islands, Canada, Cayman Islands, Costa Rica, Colombia, Cuba, Dominican Republic, Ecuador, El Salvador, Guam, Guatemala, Haiti, Honduras, Jamaica, Japan, Mexico, Micronesia (Federal States of), Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Taiwan, United States of America, Venezuela  |
| 24P6858                    | Korea (Democratic People's Republic of), Korea (Republic of)  |
| 34G0232                    | Japan   |
| 36L8880                    | Argentina, Paraguay, Uruguay  |
| 49P2078                    | India   |
| 49P2110                    | Brazil  |

| <b>IBM power cord part number</b> | <b>Used in these countries and regions</b>  |
|-----------------------------------|---|
| 6952300                           | Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Caicos Islands, Canada, Cayman Islands, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guam, Guatemala, Haiti, Honduras, Jamaica, Mexico, Micronesia (Federal States of), Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Saudi Arabia, Thailand, Taiwan, United States of America, Venezuela |



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