

Emulex 4 Gb Fibre Channel Host Bus Adapters  
for IBM System x



# Installation and User's Guide



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for IBM System x



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**Note:** Before using this information and the product it supports, read the warranty information in Appendix B, "IBM Statement of Limited Warranty Z125-4753-08 04/2004," on page 29 and the general information in Appendix C, "Notices," on page 47.

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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.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

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

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

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

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

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

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

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

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

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

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

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

Перед установкой продукта прочтите инструкции по технике безопасности.

Pred inštaláciou tohto zariadenia si 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:**

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

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

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



## **DANGER**

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

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

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

To disconnect:

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

To connect:

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

(D005a)



**CAUTION:**

This product might contain one or more of the following devices: CD-ROM drive, DVD-ROM drive, DVD-RAM drive, or laser module, which are Class 1 laser products. Note the following information:

- Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.
- Use of the controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.

(C026)



**CAUTION:**

Data processing environments can contain equipment transmitting on system links with laser modules that operate at greater than Class 1 power levels. For this reason, never look into the end of an optical fiber cable or open receptacle. (C027)



Class 1 Laser Product  
Laser Klasse 1  
Laser Klass 1  
Luokan 1 Laserlaite  
Appareil À Laser de Classe 1

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## Chapter 1. Introduction

This *Installation and User's Guide* contains instructions for installing the following host bus adapters in an IBM® System x™ server:

- Emulex 4 Gb FC Single-Port PCI-X HBA for IBM System x
- Emulex 4 Gb FC Dual-Port PCI-X HBA for IBM System x
- Emulex 4 Gb FC Single-Port PCIe HBA for IBM System x
- Emulex 4 Gb FC Dual-Port PCIe HBA for IBM System x

The Emulex 4 Gb FC Single-Port and Dual-Port PCI-X and PCIe host bus adapters for IBM System x are referred to throughout this document as *host bus adapter*.

This document contains information about:

- Installing and configuring the host bus adapter
- Updating the firmware and device drivers of the host bus adapter
- Performing custom configuration of the host bus adapter through the Emulex HBAnywhere utility
- Performing basic troubleshooting of the host bus adapter

Each host bus adapter is a 4 Gb Fibre Channel device that has either one or two configurable adapter ports. Communication signals are routed from the server through the Fibre Channel high-speed connector on the host bus adapter.

If firmware and documentation updates are available, you can download them from the IBM Web site. To check for updates, complete the following steps:

1. Go to <http://www.ibm.com/systems/x/>.
2. Under **Resources**, select **Drivers and downloads**.
3. In the **Brand** field, select **Options**.
4. In the **Family** field, select **Fibre**.
5. In the **Type** field, select **Host Bus Adapter**.
6. In the **Operating System** field, select the applicable operating system.
7. Click **Continue**.

You can select firmware updates, device drivers, and publications.

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

The host bus adapter comes with a one-year limited warranty. For information about your warranty, see Appendix B, "IBM Statement of Limited Warranty Z125-4753-08 04/2004," on page 29.

For service or assistance, see Appendix A, "Getting help and technical assistance," on page 27.

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## IBM Documentation and Support CD

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

## Hardware and software requirements

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

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

## Using the Documentation Browser

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

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

- If Autostart is enabled, insert the CD into the CD drive. The Documentation Browser starts automatically.
- If Autostart is disabled or is not enabled for all users, use one of the following procedures:
  - If you are using a Windows operating system, insert the CD into the CD drive and click **Start --> Run**. In the **Open** field, type  
`e:\win32.bat`  
  
where *e* is the drive letter of the CD drive, and click **OK**.
  - If you are using Red Hat Linux, insert the CD into the CD drive; then, run the following command from the `/mnt/cdrom` directory:  
`sh runlinux.sh`

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

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

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

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

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## Fibre Channel defined

Fibre Channel technology is outlined in the SCSI-3 Fibre Channel Protocol (SCSI-FCP) standard. Fibre Channel is a high-speed data transport technology that is used for mass storage and networking.

Using a Fibre Channel Arbitrated loop (FC-AL), 126 Fibre Channel devices can be supported, compared to 15 small computer system interface (SCSI) devices with Ultra SCSI.

The host bus adapter uses a multimode shortwave optical interface for distances up to 500 meters when it is operating at 1 Gbps, 300 meters when operating at 2 Gbps, and 150 meters when operating at 4 Gbps.

The host bus adapter is a 4 Gbps Fibre Channel device that supports data transfer rates up to 400 MB per second half-duplex and 800 MB per second full-duplex on optical interfaces.

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## Related documentation

This *Installation and User's Guide* contains setup, installation, configuration, and troubleshooting instructions for the host bus adapter. This document also provides general information about the host bus adapter, including warranty information, and how to get help.

In addition to this *Installation and User's Guide*, the following related documentation is provided with the host bus adapter:

- *IBM Systems Safety Notices*

This document is in Portable Document Format (PDF) on the *IBM Documentation and Support CD*. It contains translated versions of caution and danger statements. Each caution and danger statement in this document is labeled with a number. This number is used to cross reference the English language caution or danger statement with translated versions of the caution or danger statement in the *IBM Systems Safety Notices* document.

- Emulex device-driver user documents for the Microsoft Windows and Linux operating systems

These documents are in PDF on the *IBM Documentation and Support CD*, or you can download the PDF files from <http://www.ibm.com/systems/x/>. These documents describe how to install and use the HBAnyware utility and the device drivers for your operating system.

- *Emulex Firmware Update Manual*

This document is in PDF on the *IBM Documentation and Support CD*, or you can download the PDF file from <http://www.ibm.com/systems/x/>. It describes how to update firmware through the HBAnyware utility.

- *Emulex Boot Code User Manual*

This document is in PDF on the *IBM Documentation and Support CD*, or you can download the PDF file from <http://www.ibm.com/systems/x/>. It describes how to update boot code through the HBAnyware utility, how to configure a host bus adapter to boot from a SAN, and how to set up a Fibre Channel boot disk.

---

## Features and specifications

The host bus adapter has the following features:

- Multifunction PCI-X or PCI Express (PCIe) device with up to two fully independent Fibre Channel ports
- Auto-negotiation between 1 Gb, 2 Gb, or 4 Gb link attachments
- Full support for all Fibre Channel topologies, including point-to-point, arbitrated loop, and fabric
- Full support for Fibre Channel services class 2 and 3
- End-to-end data path-parity and cyclical redundancy check (CRC) protection, including internal data path random-access memory (RAM)
- Internal high-speed static RAM (SRAM)
- Error correction code (ECC) protection of local memory, including single-bit correction and double-bit correction
- Up to two embedded short wave optical (LC) connections with link diagnostics capability
- Data buffers capable of supporting 16 buffer-to-buffer (BB) credits for short-wave applications
- Parts and construction that are compliant with the European Union Directive of Restriction of Hazardous Substances (RoHS)

PCI-X host bus adapters are native PCI-X 2.0 connections that are compliant with the Peripheral Component Interconnect (PCI) and PCI-X local bus specifications, specifically, PCI-X 2.0a and PCI 3.0 specifications for 3.3 V add-in cards.

PCIe host bus adapters are compliant with the PCIe Base Specification 1.0a and PCI Express CEM Specification 1.0a.

*Table 1. Host bus adapter specifications*

Type	Specification
Fibre Channel specification	<ul style="list-style-type: none"><li>• Support for 4/2/1 Gbps auto-negotiation (4.2480/2.1240/1.0625 Gbps) data rates</li><li>• Support for 100000 IOPS and higher</li><li>• Support for 400 MBps maximum at full-duplex, per port</li><li>• Support for point-to-point (N_Port), arbitrated loop (NL_Port), and switched fabric (N_Port)</li><li>• Support for F_Port and FL_Port login</li><li>• Up to 510 FC port logins and up to 1023 concurrent exchanges</li><li>• Support for Fibre Channel protocols FCP (SCSI-FCP), IP (FC-IP), FC-TAPE (FCP-2)</li><li>• Support for Fibre Channel service (classes 2 and 3)</li></ul>

Table 1. Host bus adapter specifications (continued)

Type	Specification
Processor	Single-chip design with support for up to two completely independent 4 Gb serial Fibre Channel ports. Each port provides: <ul style="list-style-type: none"> <li>• Reduced instruction set computer (RISC) processor</li> <li>• Integrated serializer/deserializer</li> <li>• Receive direct memory access (DMA) sequencer</li> <li>• Frame buffer</li> <li>• Processor operation at 100/133 MHz</li> </ul>
Application-specific integrated circuit (ASIC) internal random-access memory (SRAM)	<ul style="list-style-type: none"> <li>• Error-correcting code (ECC) protected</li> <li>• 1.5 MB internal high-speed SRAM</li> </ul>
Nonvolatile random-access memory (NVRAM)	NVRAM: 2 MB flash memory per port, field programmable
Integrated DMA	DMA controller for each port: transmit and receive
Frame buffer first in, first out (FIFO)	Integrated 63 KB transmit and 32 KB receive frame buffer for each data channel
Connectors (internal only)	PCI-X support for: <ul style="list-style-type: none"> <li>• PCI 32/64-bit data and 33/66 MHz clock frequency, 3.3 V signaling</li> <li>• PCI-X Mode 1 64-bit data and 66/100/133 MHz clock frequency</li> <li>• PCI-X Mode 2 64-bit data and 266 MHz (133 MHz clock frequency, double-data rate)</li> <li>• 3.3 V and 5 V PCI power required for operation</li> </ul> PCIe support for: <ul style="list-style-type: none"> <li>• x1 or x4 lane transfer link interface at 2.5 Gbps per lane</li> <li>• 3.3 v power required for operation</li> </ul>
Operating power	PCI/PCI-X, Mode 1, 66 MHz host: <ul style="list-style-type: none"> <li>• 1.5 watts (typical) at +3.3 V dc</li> <li>• 3.7 watts (typical) at +5.0 V dc</li> </ul> PCI-X, Mode 1, 100/133 MHz host: <ul style="list-style-type: none"> <li>• 1.5 watts (typical) at +3.3 V dc</li> <li>• 4.1 watts (typical) at +5.0 V dc</li> </ul> PCI-X, Mode 2, 266 MHz host: <ul style="list-style-type: none"> <li>• 1.5 watts (typical) at +3.3 V dc</li> <li>• 4.3 watts (typical) at +5.0 V dc</li> </ul> PCIe, x4 slot: 5.9 watts (typical) at +3.3 V dc

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## Inventory checklist

The host bus adapter option package includes the following items:

- One of the following host bus adapters:
  - Emulex 4 Gb FC Single-Port PCI-X HBA for IBM System x
  - Emulex 4 Gb FC Dual-Port PCI-X HBA for IBM System x
  - Emulex 4 Gb FC Single-Port PCIe HBA for IBM System x
  - Emulex 4 Gb FC Dual-Port PCIe HBA for IBM System x
- Low-profile expansion slot bracket
- *Emulex 4 Gb FC PCI-X and PCIe Host Bus Adapters for IBM System x Quick Installation Guide*
- *IBM Documentation and Support CD*

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## Notices and statements in this document

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

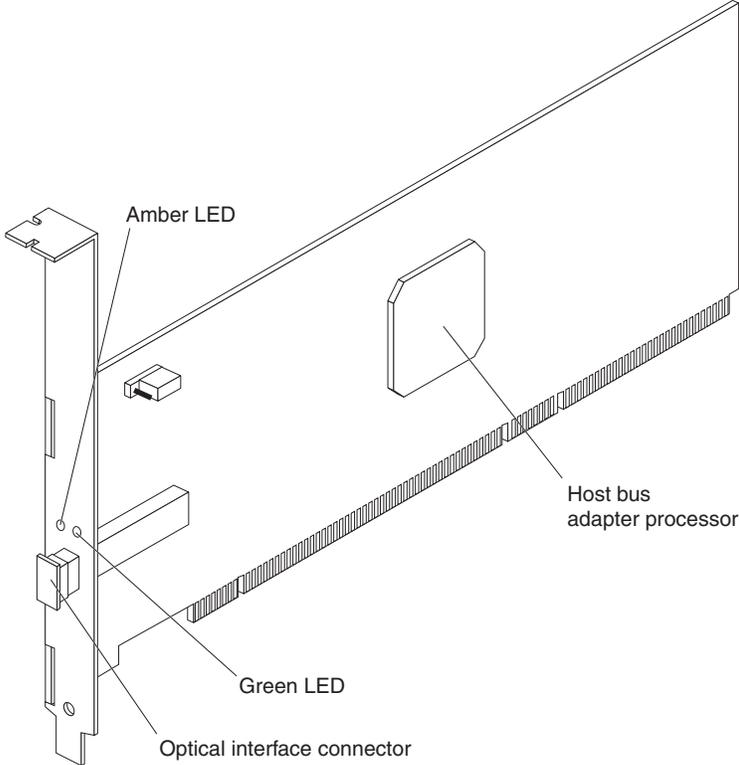
The following notices and statements are used in this document:

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

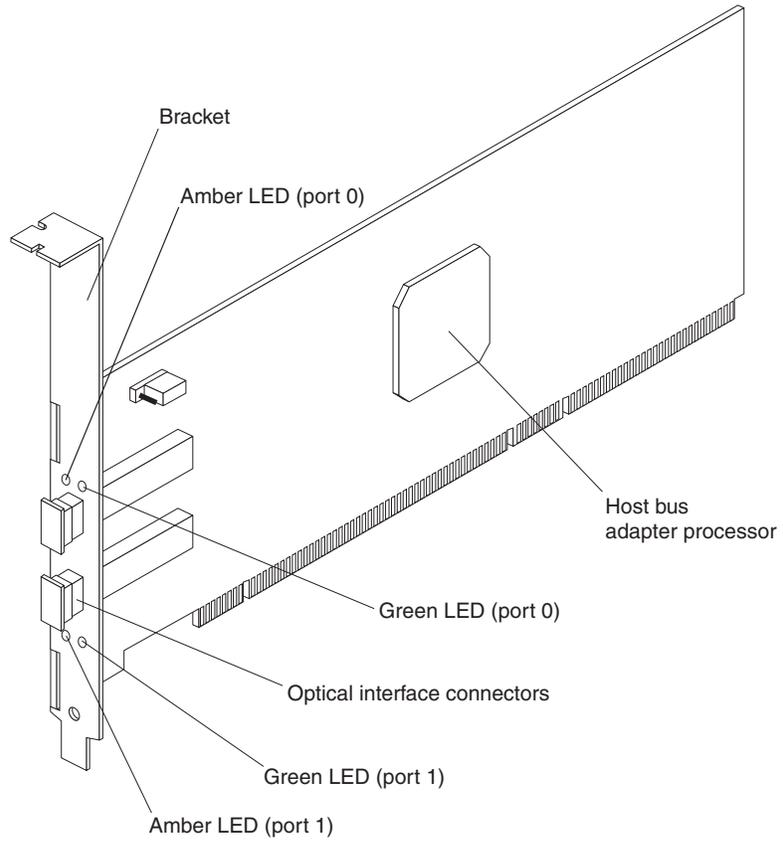
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# Host bus adapter components

The major components of the single-port host bus adapter (PCI-X and PCIe) are shown in the following illustration.



The major components of the dual-port host bus adapter (PCI-X or PCI Express) are shown in the following illustration.



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## Host bus adapter LEDs

Each Fibre Channel port has a set of amber and green light emitting diodes (LEDs). The amber LED indicates port activity, and the green LED indicates a firmware operation.

The following table describes the states of the amber and green LEDs and the host bus adapter activities that they indicate.

*Table 2. Host bus adapter activity*

<b>Amber LED</b>	<b>Green LED</b>	<b>Description</b>
Off	Off	Wake-up failure (failed system board)
On	Off	POST failure (failed system board)
Slow flash	Off	Wake-up failure monitor
Fast flash	Off	POST failure
Flashing	Off	POST processing in progress
Off	On	Failure while functioning
On	On	Failure while functioning
1 fast flash	On	1 Gb link rate - Normal, link-up
2 fast flashes	On	2 Gb link rate - Normal, link-up
3 fast flashes	On	4 Gb link rate - Normal, link-up
Off	Slow flash	Normal, link down or not started



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## Chapter 2. Installing the host bus adapter

This chapter provides information about installing the host bus adapter in a server.

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### Installation guidelines

Before you install the host bus adapter in the server, read the following information:

- Read the safety information that begins on page iii and the guidelines in “Handling static-sensitive devices.” This information will help you work safely.
- When you install the new host bus adapter, take the opportunity to download and apply the most recent firmware updates. This step will help to ensure that any known issues are addressed and that host bus adapter is ready to function at maximum levels of performance. Make sure that you are using the latest versions of device drivers, firmware code, and basic input/output system (BIOS) code for the server and the host bus adapter. To download the most recent device drivers and firmware updates, go to <http://www.ibm.com/systems/x/>. Follow the instructions that are included with the download procedure.
- Observe good housekeeping in the area where you are working. Place removed covers and other parts in a safe place.
- Do not attempt to lift an object that you think is too heavy for you. If you have to lift a heavy object, observe the following precautions:
  - Make sure that you can stand safely without slipping.
  - Distribute the weight of the object equally between your feet.
  - Use a slow lifting force. Never move suddenly or twist when you lift a heavy object.
  - To avoid straining the muscles in your back, lift by standing or by pushing up with your leg muscles.
- Have a small flat-blade screwdriver available.
- When you are finished working on the server, reinstall all safety shields, guards, labels, and ground wires.

---

### Handling static-sensitive devices

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

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

- Limit your movement. Movement can cause static electricity to build up around you.
- The use of a grounding system is recommended. For example, wear an electrostatic-discharge wrist strap, if one is available. Always use an electrostatic-discharge wrist strap or other grounding system when you work inside the server with the power on.
- 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 surface on the outside of the server 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 server without setting down the device. If it is necessary to set down the device, put it back into its static-protective package. Do not place the device on the server cover or on a metal surface.
- Take additional care when you handle devices during cold weather. Heating reduces indoor humidity and increases static electricity.

---

## Handling fiber-optic cables

**Attention:** To avoid damage to a fiber-optic cable, follow these guidelines:

- Do not route the cable along a folding cable-management arm.
- When you attach the cable to a device on slide rails, leave enough slack in the cable so that it does not bend to a radius of less than 38 mm (1.5 in.) when the device is extended or become pinched when the device is retracted.
- Route the cable away from places where it can be snagged by other devices in the rack.
- Do not use plastic cable ties in place of the provided cable straps.
- Do not overtighten the cable straps or bend the cable to a radius of less than 38 mm (1.5 in.).
- Do not put excess weight on the cable at the connection point. Make sure that the cable is well supported.
- Use the following suggested maximum cable lengths:
  - 1 Gbps: 500 meters 50/125  $\mu\text{m}$  fiber, 300 meters 62.5/125  $\mu\text{m}$  fiber
  - 2 Gbps: 300 meters 50/125  $\mu\text{m}$  fiber, 150 meters 62.5/125  $\mu\text{m}$  fiber
  - 4 Gbps: 150 meters 50/125  $\mu\text{m}$  fiber, 70 meters 62.5/125  $\mu\text{m}$  fiber

---

## Installing the host bus adapter



**CAUTION:**

This product might contain one or more of the following devices: CD-ROM drive, DVD-ROM drive, DVD-RAM drive, or laser module, which are Class 1 laser products. Note the following information:

- Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.
- Use of the controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.

(C026)



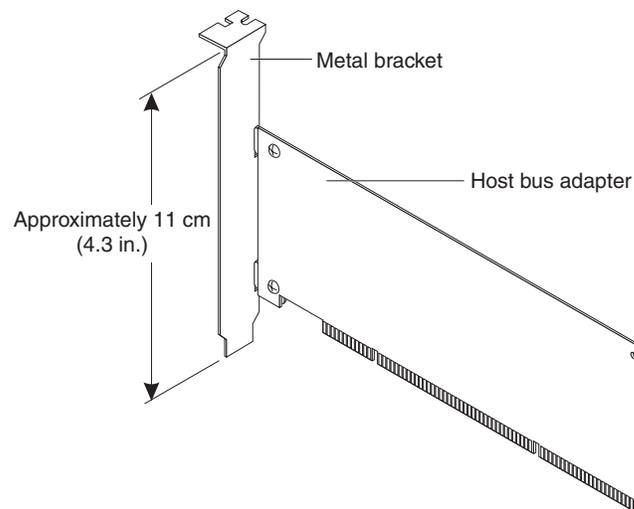
**CAUTION:**

Data processing environments can contain equipment transmitting on system links with laser modules that operate at greater than Class 1 power levels. For this reason, never look into the end of an optical fiber cable or open receptacle. (C027)

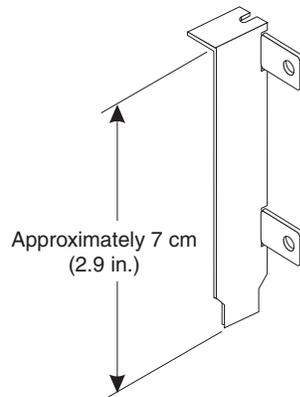
Before you install the host bus adapter, make sure that the preinstalled expansion slot bracket is the correct size for the server in which you are installing the host bus adapter.

**Note:** The expansion-slot opening is measured along the longest dimension and might be oriented horizontally in some servers.

The host bus adapter comes with a preinstalled expansion-slot bracket that is approximately 11 cm (4.3 in.) long. If the opening for the PCI-X or PCIe expansion slot is approximately 10 cm (4.0 in.) long, you will use the preinstalled bracket.



The option package also contains a low-profile expansion-slot bracket that is approximately 7 cm (2.9 in.) long. If the opening for the PCI-X or PCIe expansion slot is approximately 6 cm (2.3 in.) long, you must replace the preinstalled bracket with the low-profile bracket. You will do this in step 6 on page 15 in the following procedure.



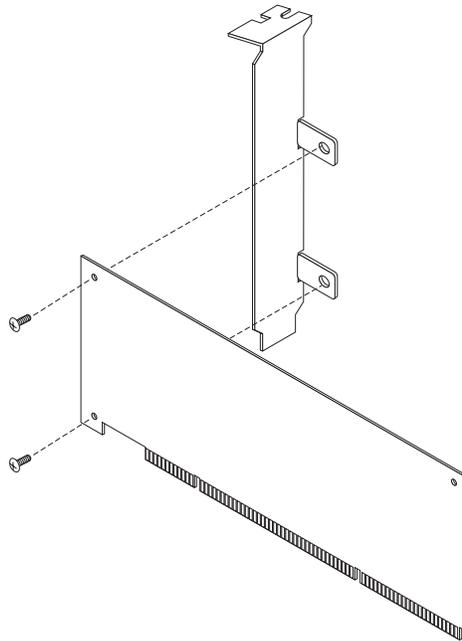
To install the host bus adapter in the server, complete the following steps:

1. Read the safety information that begins on page iii, and “Handling static-sensitive devices” on page 11.
2. Check the server system board and make any necessary configuration changes to accommodate the host bus adapter.

**Note:** The host bus adapter is self-configuring. If your server requires manual configuration to enable the host bus adapter, bus-master slot, and interrupt request (IRQ) level, use the Configuration/Setup Utility program that is part of the server basic input/output system (BIOS). For more information about the Configuration/Setup Utility program, see the *User's Guide* that comes with the server.

3. Turn off the server and peripheral devices and disconnect the power cords.
4. Remove the server cover. For more information, see the *Installation Guide* that comes with the server.
5. Touch the static-protective package that contains the host bus adapter to any unpainted surface on the outside of the server; then, grasp the host bus adapter by the top edge or upper corners and remove it from the package and inspect it for damage. Contact your IBM marketing representative or authorized reseller if the host bus adapter appears to be damaged.

6. If you have to remove the preinstalled expansion-slot bracket and replace it with the low-profile bracket, complete the following steps; otherwise, go to step 7.
  - a. Orient the host bus adapter as shown in the following illustration.



- b. Remove the two screws that hold the bracket onto the host bus adapter.
    - c. Lift the bracket from the host bus adapter and store the bracket in a safe place for possible reuse.
    - d. Align the low-profile bracket so that the tabs are on the back side of the host bus adapter and the holes on the tabs align with the holes on the host bus adapter.
    - e. From the front side of the host bus adapter, attach the bracket to the host bus adapter using the two screws that you removed in step 6b.
7. Determine which PCI-X or PCIe slot you will use. Depending on the server model, you might have to remove the expansion-slot cover or release the bracket lever for the selected PCI-X or PCIe slot. To remove the expansion-slot cover, you might have to remove the expansion-slot screw. Place the removed parts in a safe place. For detailed instructions for installing the host bus adapter in your server, see the *User's Guide* that comes with the server.
8. Position the host bus adapter by aligning the PCI-X or PCIe connector with the PCI-X or PCIe slot on the system board. Insert the host bus adapter firmly into the connector.

**Note:** Depending on the server model, you might have to install the host bus adapter in a riser card and then install the riser card with the host bus adapter in the PCI-X or PCIe slot on the system board.
9. Secure the host bus adapter to the server chassis. Replace the expansion-slot screw if you removed it in step 7, or return the bracket lever to the closed position.
10. Remove the protective caps from the ends of an LC-LC fiber-optic cable and from the optical interface connector on the host bus adapter (see “Handling fiber-optic cables” on page 12).

11. Connect one end of the LC-LC fiber-optic cable to the optical interface connector on the host bus adapter. Connect the other end to a Fibre Channel device.
12. Replace the server cover.
13. Reconnect the power cords.
14. Turn on all external Fibre Channel devices; then, turn on the server. To be sure that the host bus adapter is functioning correctly, check the amber and green LEDs on the front bracket of the host bus adapter. For more information, see “Host bus adapter LEDs” on page 9.

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## Chapter 3. Updating the boot code and firmware and installing device drivers

After you install the host bus adapter, make sure that the latest boot code and firmware are installed; then, install the device drivers.

The device drivers, utilities, documentation, and installation instructions for the following supported operating systems are on the *IBM Documentation and Support* CD. You can obtain the latest information from <http://www.ibm.com/systems/x/>.

- Microsoft Windows Server 2003, Advanced Server, or Enterprise Edition
- Novell Netware version 6.5
- Red Hat Enterprise Linux Advanced Server or Enterprise Server version 4
- SUSE Linux Enterprise Server version 8 or version 9
- VMware ESX Server 2.5 or 3.0

After you install the device drivers, you can customize the configuration of the host bus adapter by using the Emulex HBAnyware utility in one of the following ways:

- Use the Emulex HBAnyware utility to manage either the local Fibre Channel host bus adapter or any remote Emulex Fibre Channel host bus adapter on the storage area network (SAN) that is discovered by the Emulex HBAnyware utility. For more information about using the Emulex HBAnyware utility to update firmware and boot code and to perform other configuration functions, see Chapter 5, “Using the Emulex HBAnyware utility,” on page 23.
- You can also use the Emulex HBAnyware utility through a network connection to a workstation or by starting the Emulex HBAnyware utility for IBM Director. For more information, see Chapter 5, “Using the Emulex HBAnyware utility,” on page 23.



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## Chapter 4. Configuring BootBIOS

This chapter provides information about the Emulex BIOS utility and the BootBIOS function that you can use to configure the host bus adapter.

**Important:** If the configuration settings are incorrect, the host bus adapter might not function correctly.

Before you customize the configuration of the host bus adapter, consider the following guidelines:

- Make sure that the host bus adapter is installed in the server correctly.
- Make sure that the server and all other server components are configured correctly.
- Make sure that the SAN components that support Fibre Channel operation are configured correctly.

**Note:** For more detailed information about the Emulex BIOS utility and the BootBIOS feature, see the *Emulex Boot Code User Manual* on the *IBM Documentation and Support CD*, or you can download the PDF file from <http://www.ibm.com/systems/x/>.

---

### Using the BIOS utility

You can use the BIOS utility to change host bus adapter parameters (for example, topology, PLOGI retry timer, and auto-scan setting) and configure startup (boot) devices.

The following requirements apply when you are using the BIOS utility:

- The host bus adapter settings and default values will vary, according to the version of BIOS code that is installed for the host bus adapter.
- Default settings are acceptable for most installations.
- In the BIOS utility:
  - Press d to reset the selected host bus adapter to its default values.
  - Press Esc to return to the previous menu.
  - Press X to exit from the menu.
- The default topology is auto topology with loop first. For a Fibre Channel arbitrated loop (FC-AL), each host bus adapter has a default arbitrated loop physical address (AL\_PA) of 01 (hexadecimal). If necessary, change this topology setting before you configure boot devices.
- All host bus adapters or boot drives can be configured to other AL\_PAs instead of their default values.
- If the server has more than one host bus adapter with the same PCI bus number and each has a boot drive attached, the first PCI-scanned host bus adapter is the boot host bus adapter. The first host bus adapter is usually in the lowest-numbered PCI slot in the server. You can view this information through the server Configuration/Setup Utility.

---

## Starting the BIOS utility

Before you can run the BIOS utility, BootBIOS must be installed and the boot up message must be enabled on at least one installed host bus adapter in the server.

To start the BIOS utility to configure your host bus adapters, complete the following steps:

1. Turn on the server.
2. Press Alt+E immediately (within 5 seconds) when the BootBIOS prompt is displayed for starting the BIOS utility. The BIOS utility menu is displayed. This menu contains a list of host bus adapters.
3. Select the number of the host bus adapter that you want. The main configuration menu is displayed.
4. Press 2 to configure the host bus adapter. The adapter configuration menu is displayed.
5. Select 1 to configure boot devices for remote boot functions or select 2 to configure the host bus adapter parameters.

If you select to configure the host bus adapter parameters, the adapter configuration menu is displayed. After you change the settings, the BIOS utility restarts the server to enable the new parameters.

**Important:** If the BootBIOS prompt is not displayed, you must enable this prompt. For more information, see the x86 BootBIOS installation section of the *Emulex Boot Code User Manual* on the *IBM Documentation and Support CD* or download the PDF file from <http://www.ibm.com/systems/x/>.

---

## Enabling BootBIOS on the host bus adapter through the BIOS utility

Before you can use the BootBIOS features, BootBIOS must be enabled on at least one installed host bus adapter in the server.

To enable BootBIOS on an installed host bus adapter, complete the following steps:

1. Turn on the server.
2. Press Alt+E immediately (within 5 seconds) when the BootBIOS prompt is displayed for starting the BIOS utility. The BIOS utility menu is displayed. This menu contains a list of host bus adapters.
3. Select the applicable host bus adapter by entering the corresponding number. The main configuration menu is displayed.
4. Press **2** to configure the host bus adapter. The adapter configuration menu is displayed.
5. Press **1** to enable or disable BootBIOS. If BootBIOS is not already enabled, you must enable it so that you can use the BootBIOS features.

**Important:** If the BootBIOS prompt is not displayed, you must enable this prompt. For additional information, see the x86 BootBIOS installation section of the *Emulex Boot Code User Manual* on the *IBM Documentation and Support CD* or you can download the PDF file from <http://www.ibm.com/systems/x/>.

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## The adapter configuration menu choices

This section describes the choices on the adapter configuration menu. You can use this menu to view the parameters for the host bus adapter. You can change a modifiable value if the server supports the corresponding feature.

- **Enable or Disable BIOS:** Enable or disable BootBIOS on the selected host bus adapter. Before you can use the BootBIOS features, BootBIOS must be enabled on at least one installed host bus adapter in the server. For additional information, see “Enabling BootBIOS on the host bus adapter through the BIOS utility” on page 20.
- **Change default ALPA of this adapter:** This choice applies only to a Fibre Channel arbitrated loop (FC-AL). The factory default value for each host bus adapter is an arbitrated loop physical address (AL\_PA) of **01** (hexadecimal).
- **Change PLOGI Retry Timer (+Advanced Option+):** Sets the interval for the port login (PLOGI) retry timer. The factory default value is **NoPLOGI Retry: 0 msec**.
- **Topology Selection (+Advanced Option+):** If it is necessary to change the topology, do so before you configure the boot devices.
- **Enable or Disable Spinup Delay (+Advanced Option+):** Enable or disable the spin-up delay. The factory default value is **Disabled**.
- **Auto Scan Setting (+Advanced Option+):** Enable the first device in the boot entry list to issue a Name Server Inquiry. The factory default value is **Disabled**.
- **Enable, Disable EDD 3.0 (+Advanced Option+):** Enable or disables the Enhanced Disk Drive (EDD) option that is available on Intel® Itanium® (IA-64) servers only. Enabling EDD 3.0 displays the path to the boot device. The factory default value is **Disabled**.
- **Enable or Disable Start Unit Command (+Advanced Option+):** Use this command to issue the small computer system interface (SCSI) start unit command for various devices, such as tape backup units that are attached to the SAN. You must know the specific LUN of the applicable device to issue the SCSI start unit command. The factory default value is **Disabled**.
- **Enable or Disable Environment Variable (+Advanced Option+):** Enable or disable the ability to set the boot controller order, if the server supports the environment variable. The factory default value is **Disabled**.
- **Auto Boot Sector:** This option automatically defines the boot sector (32-sector or 63-sector) of the target disk. The factory default value is **Enabled**.
- **Link Speed Selection:** Define the link speed of the port as Auto, 1 Gb, 2 Gb, or 4 Gb. The factory default value is **Auto**.

To reset a host bus adapter parameter to its default value, complete the following steps:

1. Select the applicable host bus adapter.
2. Select the applicable option on the configuration menu.
3. Press d.

For more detailed information about the Emulex BIOS utility and the BootBIOS, see the *Emulex Boot Code User Manual* on the *IBM Documentation and Support* CD or download the PDF file from <http://www.ibm.com/systems/x/>.



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## Chapter 5. Using the Emulex HBAnyware utility

This chapter provides an overview of the Emulex HBAnyware utility for advanced users who want to customize the configuration of a Fibre Channel host bus adapter that is installed in a server. For more detailed information, see the HBAnyware utility online help or the documentation that comes with the HBAnyware utility.

---

### Installation and system requirements

Make sure that you are using the latest version of the HBAnyware utility for the host bus adapter. See <http://www.ibm.com/systems/x/> for the latest information about the HBAnyware utility. The latest instructions and system requirements are in the documentation that comes with the HBAnyware utility.

---

### Features

You can use the HBAnyware utility to perform the following tasks:

- Depending on the device driver, set the HBAnyware utility options
- Connect to hosts
- Discover and manage host bus adapters on the SAN through Fibre Channel and IP discovery
- Use diagnostics features:
  - PCI, internal, and external loopback tests
  - User-initiated POST (adapter health check)
  - End-to-end tests (based on the Echo command)
  - Ping and trace route
  - Beaconsing support
  - Firmware or device-driver dump
- Use host-to-host SAN configuration policies:
  - Configuration profiles (device-driver parameters saved into and reloaded from a file)
  - Auto persistent binding (Microsoft Windows operating system only)
  - Host bus adapter/port alias symbolic name
  - Emulex vital product data (eVPD)
  - Firmware update
  - Boot code update
  - Loading of expansion ROM boot code for support of the remote boot function
- Configure port devices
- Use logical unit number (LUN) level configuration and target binding
- Review host bus adapter information, including:
  - General information
  - Statistics
  - Information about attached devices
  - Link status for attached device
- Perform host bus adapter functions, including:
  - Configuring the adapter device-driver parameters
  - Running Fibre Channel diagnostics (read/write buffer loopback tests)

- Performing flash updates on a host bus adapter
- Manage configurations: Configuring single or multiple host bus adapters
- Confirm security

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## Using the Emulex HBAnyware utility

The Emulex HBAnyware utility, which comes with the device drivers for the Microsoft Windows or Linux operating system, is used to configure a storage area network (SAN) environment that consists of Fibre Channel host bus adapters. It is a network-capable application that can connect to and configure remote systems, enabling centralized management and configuration of host bus adapter components.

You can use the HBAnyware utility to manage and control one or more host bus adapters that are installed on local or remote servers. Use the HBAnyware utility, along with problem determination procedures (PDPs), on new or existing installations to help diagnose Fibre Channel subsystem problems in adapters, controllers, and devices that are attached to the Fibre Channel fabric or loop.

You can also perform the following operations using the HBAnyware utility to configure devices in the server.

*Table 3. HBAnyware utility operations for configuring devices*

Operation	Description
Discover local and remote hosts	When a device is set as unconfigured, it is not recognized by the host bus adapter and is not accessible to the host bus adapter in that server.
Set the host bus adapter device-driver parameters to a single or multiple host bus adapters	You can set the device-driver parameters to optimize device-driver performance for a particular operating system or application. You can set parameters on a single or multiple host bus adapters simultaneously through batch mode.
Update the firmware on single or multiple host bus adapters	You can update the host bus adapter firmware and boot code on single or multiple host bus adapters simultaneously through batch mode.
Run diagnostics including loopback and echo tests	You can run diagnostics on a host bus adapter. Options include the following tests: <ul style="list-style-type: none"> <li>• A quick test</li> <li>• A full power-on self-test (POST)</li> <li>• More advanced diagnostics: <ul style="list-style-type: none"> <li>– A peripheral component interconnect (PCI) loopback (testing the PCI bus)</li> <li>– An internal loopback (on the host bus adapter)</li> <li>– An external loopback (requires an external plug)</li> </ul> </li> </ul>

To reset a parameter for the host bus adapter to its default value, complete the following steps:

1. Select the applicable host bus adapter.
2. Select the **Driver Parameters** tab in the Adapter Properties window.
3. Click **Default**.

---

## Chapter 6. Troubleshooting

If you are having a problem, use the following information to help you determine the cause of the problem and the action to take. Additional troubleshooting and debugging procedures are available in the *Problem Determination and Service Guide* or in the *Hardware Maintenance Manual and Troubleshooting Guide* that comes with the server.

Make sure that you are using the latest versions of device drivers, firmware code, and BIOS code for the server. To download the most recent device drivers and firmware and BIOS boot code updates, go to <http://www.ibm.com/systems/x/> and click **Support**. Follow the instructions that are included with the download procedure.

To determine whether the problem is caused by the hardware, perform the following tasks:

- Make sure that the host bus adapter is installed correctly in the server.
- Make sure that the server is configured correctly.
- Make sure that the HBAnyware utility device-driver parameters are correct.
- Make sure that all peripheral devices are:
  - Connected to the Fibre Channel host bus adapters correctly
  - Turned on
  - Operating correctly

For more information, see the documentation that comes with the peripheral devices.

To determine whether the problem is caused by the software, perform the following tasks:

- Make sure that the correct device driver is installed. To download or get information about the latest supported device drivers, utilities, and documentation, go to <http://www.ibm.com/systems/x/> and click **Support**. Follow the instructions that are included with the download procedure. For more information, see the *Installation Guide* and *User's Guide* for the server.
- Make sure that the BIOS functional firmware and boot code in the host bus adapter are at the latest level.
- Make sure that the host bus adapter NVRAM settings are correct for your SAN and operating system.

To determine whether the problem is caused by the system configuration:

- Make sure that the host bus adapter is configured correctly.
- Make sure that the server is configured correctly.
- Make sure that all other SAN components are configured correctly.

To determine whether the problem is caused by an attached Fibre Channel device, perform the following tasks:

- Make sure that the server is turned on.
- Make sure that the host bus adapter settings are correct.
- See the troubleshooting section in the documentation that comes with the applicable Emulex device driver.
- If you determine that the server is configured correctly, see the diagnostics section of the applicable device-driver *Installation Guide* or *User's Guide*.

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## Customer replaceable unit parts

Replaceable components are of three types:

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

For information about the terms of the warranty and getting service and assistance, see Appendix B, "IBM Statement of Limited Warranty Z125-4753-08 04/2004," on page 29.

*Table 4. Host bus adapter CRU listing*

Description	CRU part number (Tier 1)
4 Gb PCI-E single port	42C2070
4 Gb PCI-E dual port	42C2072
4 Gb PCI-X single port	42D0406
4 Gb PCI-X dual port	42D0408

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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 system or optional device, 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 and any optional devices are turned on.
- Use the troubleshooting information in your system documentation, and use the diagnostic tools that come with your system. Information about diagnostic tools is in the *Hardware Maintenance Manual and Troubleshooting Guide* or *Problem Determination and Service Guide* on the IBM Documentation CD that comes with your system.

**Note:** For some IntelliStation models, the *Hardware Maintenance Manual and Troubleshooting Guide* is available only from the IBM support Web site.

- Go to the IBM support Web site at <http://www.ibm.com/servers/eserver/support/xseries/index.html> to check for technical information, hints, tips, and new device drivers or to submit a request for information.

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

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### Using the documentation

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

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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 systems, optional devices, services, and support. The address for IBM System x and xSeries information is <http://www.ibm.com/systems/x/>. The address for IBM IntelliStation information is <http://www.ibm.com/intellistation/>.

You can find service information for IBM systems and optional devices at <http://www.ibm.com/servers/eserver/support/xseries/index.html>.

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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 System x and xSeries servers, BladeCenter products, IntelliStation workstations, and appliances. For information about which products are supported by Support Line in your country or region, see <http://www.ibm.com/services/sl/products/>.

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

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## Hardware service and support

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

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

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## IBM Taiwan product service

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

IBM Taiwan product service contact information:

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

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# Appendix B. IBM Statement of Limited Warranty Z125-4753-08 04/2004

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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 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 contact IBM for service, you must follow the problem determination and resolution procedures that IBM specifies. An initial diagnosis of your problem can be made either by a technician over the telephone or electronically by access to an IBM website.

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), IBM will ship the CRU to you for you to install.

If the Machine does not function as warranted during the warranty period and your problem cannot be resolved over the telephone or electronically, 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**

**Jurisdiction:** *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.

#### **BOLIVIA**

**Jurisdiction:** *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the courts of the city of La Paz.

#### **BRAZIL**

**Jurisdiction:** *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.

#### **CHILE**

**Jurisdiction:** *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the Civil Courts of Justice of Santiago.

## **COLOMBIA**

**Jurisdiction:** *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the Judges of the Republic of Colombia.

## **EQUADOR**

**Jurisdiction:** *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the Judges of Quito.

## **MEXICO**

**Jurisdiction:** *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the Federal Courts of Mexico City, Federal District.

## **PARAGUAY**

**Jurisdiction:** *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the courts of the city of Asuncion.

## **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").

## **URUGUAY**

**Jurisdiction:** *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the City of Montevideo Court's Jurisdiction.

## **VENEZUELA**

**Jurisdiction:** *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the Courts of the Metropolitan Area Of the City of Caracas.

## **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 AND LAOS

**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, AND LAOS

**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.

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

*Add the following paragraph in **Western Europe** (Andorra, Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Monaco, Netherlands, Norway, Poland, Portugal, San Marino, Slovakia, Slovenia, Spain, Sweden, Switzerland, United Kingdom, Vatican State, and any country subsequently added to the European Union, as from the date of accession):*

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.

If you purchase a Machine in one of the Western European countries, as defined above, 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.

### **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:***

The warranty for Machines acquired in EU countries is valid and applicable in all EU countries provided the Machines have been announced and made available in such countries.

**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

## **CONSUMERS**

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.

**AUSTRIA, DENMARK, FINLAND, GREECE, ITALY, NETHERLANDS, NORWAY, 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**

**The provisions of this Statement of Limited Warranty replace any applicable statutory warranties.**

**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 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, IBM will reimburse you for the transportation charges for the delivery of the failing Machine to IBM.

**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.

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.

**Emulex 4 Gb FC Single-Port PCI-X HBA for IBM System x**  
**Emulex 4 Gb FC Dual-Port PCI-X HBA for IBM System x**  
**Emulex 4 Gb FC Single-Port PCIe HBA for IBM System x**  
**Emulex 4 Gb FC Dual-Port PCIe HBA for IBM System x**

Country or Region of Purchase	Warranty Period	Type of Warranty Service*
Worldwide	1 year	1
* See “Types of Warranty Service” for the legend and explanations of warranty-service types.		

**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 provides replacement CRUs to you for you to install. CRU information and replacement instructions are shipped with your Machine and are available from IBM at any time on your request. Installation of Tier 1 CRUs is your responsibility. If IBM installs a Tier 1 CRU at your request, you will be charged for the installation. You may install a Tier 2 CRU yourself or request IBM to install it, at no additional charge, under the type of warranty service designated for your Machine. IBM specifies in the materials shipped with a replacement CRU whether a defective CRU must be returned to IBM. When return is required, 1) return instructions and a container are shipped with the replacement CRU, and 2) you may be charged for the replacement CRU if IBM does not receive the defective CRU within 30 days of your receipt of 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.

**5. CRU and On-site Service**

This type of Warranty Service is a combination of Type 1 and Type 2 (see above).

**6. CRU and Courier or Depot Service**

This type of Warranty Service is a combination of Type 1 and Type 3 (see above).

**7. CRU and Customer Carry-In or Mail-In Service**

This type of Warranty Service is a combination of Type 1 and Type 4 (see above).

**When a 5, 6 or 7 type of warranty service is listed, IBM will determine which type of warranty service is appropriate for the repair.**

\* 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’s 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. For the warranty service contact telephone number in a country subsequently added to the EU and not yet reflected in the list below, contact IBM in that country or visit the website above for a current telephone listing.

Austria -- +43-1-24592-5901	Latvia -- +386-61-1796-699
Belgium -- +32-70-23-3392	Lithuania -- +386-61-1796-699
Cyprus -- +357-22-841100	Luxembourg -- +352-298-977-5063
Czech Republic -- +420-2-7213-1316	Malta -- +356-23-4175
Denmark -- +45-4520-8200	Netherlands -- +31-20-514-5770
Estonia -- +386-61-1796-699	Poland -- +48-22-878-6999
Finland -- +358-8001-4260	Portugal -- +351-21-892-7147
France -- +33-238-557-450	Slovakia -- +421-2-4954-1217
Germany -- +49-1805-253553	Slovenia -- +386-1-4796-699
Greece -- +30-210-680-1700	Spain -- +34-91-714-7983
Hungary -- +36-1-382-5720	Sweden -- +46-8-477-4420
Ireland -- +353-1-815-4000	United Kingdom -- +44-0870-550-0900
Italy -- +39-800-820-094	

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## Appendix C. Notices

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i5/OS		

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## Important notes

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

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

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## Product recycling and disposal

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

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

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

注意: このマークは EU 諸国およびノルウェーにおいてのみ適用されます。

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

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

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

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

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## Battery return program

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

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

**For Taiwan:** Please recycle batteries.



**For the European Union:**



**For California:** Perchlorate material – special handling may apply. See <http://www.dtsc.ca.gov/hazardouswaste/perchlorate/>.

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

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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

聲 明  
此為 A 級產品。在生活環境中，該產品可能會造成無線電干擾。在這種情況下，可能需要用戶對其干擾採取切實可行的措施。

## Japanese Voluntary Control Council for Interference (VCCI) statement

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