

Emulex 8 Gb FC Single-Port and Dual-Port
HBAs for IBM System x



Installation and User's Guide

Emulex 8 Gb FC Single-Port and Dual-Port
HBAs for IBM System x



Installation and User's Guide

Note: Before using this information and the product it supports, read the warranty information in Appendix B, "IBM Statement of Limited Warranty Z125-4753-09 08/2006," on page 29 and the general information in Appendix C, "Notices," on page 47.

First Edition (July 2008)

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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.

在安裝本產品之前，請仔細閱讀 **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 ασφαλείας
(safety information).

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

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

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

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

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

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

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

Перед установкой продукта прочтите инструкции по
технике безопасности.

Pred inštaláciou tohto zariadenia si pečítajte Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

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

Läs säkerhetsinformationen innan du installerar den här produkten.

Important:

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 *Safety Information* document.

For example, if a caution statement is labeled “Statement 1,” translations for that caution statement are in the *Safety Information* document under “Statement 1.”

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.

Statement 1:



DANGER

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

To avoid a shock hazard:

- **Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.**
- **Connect all power cords to a properly wired and grounded electrical outlet.**
- **Connect to properly wired outlets any equipment that will be attached to this product.**
- **When possible, use one hand only to connect or disconnect signal cables.**
- **Never turn on any equipment when there is evidence of fire, water, or structural damage.**
- **Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.**
- **Connect and disconnect cables as described in the following table when installing, moving, or opening covers on this product or attached devices.**

To Connect:

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

To Disconnect:

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

Statement 3:



CAUTION:

When laser products (such as CD-ROMs, DVD drives, fiber optic devices, or transmitters) are installed, note the following:

- 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 controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.



DANGER

Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following.

Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.



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 8 Gb FC Single-Port HBA for IBM System x
- Emulex 8 Gb FC Dual-Port HBA for IBM System x

The Emulex 8 Gb FC Single-Port and Dual-Port 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 HBAnyware utility
- Performing basic troubleshooting of the host bus adapter

Each host bus adapter is an 8 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. The host bus adapter might have features that are not described in the documentation that comes with the host bus adapter, and the documentation might be updated occasionally to include information about those features, or technical updates might be available to provide additional information that is not included in the host bus adapter documentation. To check for updates, complete the following steps.

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.

1. Go to <http://www.ibm.com/systems/storage/>.
2. From the left navigation pane, click **Product A - Z**.
3. Scroll to **Fibre Channel Host Bus Adapter** and click the link.
4. Click **Product support** under the applicable host bus adapter.
5. Click the **Download** tab for firmware updates, or click the **Documentation** tab for documentation updates.

The host bus adapter comes with a one-year limited warranty. For information about your warranty, see Appendix B, "IBM Statement of Limited Warranty Z125-4753-09 08/2006," on page 29.

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

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 300 meters when operating at 2 Gbps, 150 meters when operating at 4 Gbps, and 50 meters when operating at 8 Gbps.

The host bus adapter is an 8 Gbps Fibre Channel device that supports data transfer rates up to 800 MB per second half-duplex and 1600 MB per second full-duplex on optical interfaces.

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:

- *Safety Information*

This document is in Portable Document Format (PDF) on the *Emulex 8 Gb FC Single-Port and Dual-Port HBAs 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 *Safety Information* document.

- *Emulex 8 Gb FC Single-Port and Dual-Port HBAs Quick Installation Guide*

This printed document contains basic instructions for installing the host bus adapter.

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

These documents are in PDF on the *Emulex 8 Gb FC Single-Port and Dual-Port HBAs for IBM System x Support* CD, or you can download the PDF files from <http://www.ibm.com/systems/storage/>. 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 *Emulex 8 Gb FC Single-Port and Dual-Port HBAs for IBM System x Support* CD, or you can download the PDF file from <http://www.ibm.com/systems/storage/>. It describes how to update firmware through the HBAnyware utility.

- *Emulex Boot Code User Manual*

This document is in PDF on the *Emulex 8 Gb FC Single-Port and Dual-Port HBAs for IBM System x Support* CD, or you can download the PDF file from <http://www.ibm.com/systems/storage/>. 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.

Notices and statements in this document

The caution and danger statements in this document are also in the multilingual *Safety Information* document, which is on the IBM *Emulex 8 Gb FC Single-Port and Dual-Port HBAs Support* CD that comes with the server. Each statement is numbered for reference to the corresponding statement in your language in the *Safety Information* document.

The following notices and statements are used in this document:

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

Features and specifications

The host bus adapter has the following features:

- Multifunction PCI Express (PCIe) device with up to two fully independent Fibre Channel ports (dual-port HBA model only)
- Auto-negotiation between 2 Gb, 4 Gb, or 8 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 40 buffer-to-buffer (BB) credits per port for short-wave applications
- Parts and construction that are compliant with the European Union Directive of Restriction of Hazardous Substances (RoHS)

PCIe host bus adapters are compliant with the PCIe Base Specification 2.0 and PCI Express CEM Specification 2.0.

Table 1. Host bus adapter specifications

Type	Specification
Fibre Channel specification	<ul style="list-style-type: none">• Support for 8/4/2 Gbps auto-negotiation (8.5/4.25/2.125 Gbps data rates)• Support for 400000 IOPS and higher• Support for 1600 MBps maximum at full-duplex, per port• Support for point-to-point (N_Port), arbitrated loop (NL_Port), and switched fabric (N_Port)• Support for F_Port and FL_Port login• Up to 4096 FC port logins and up to 4096 concurrent exchanges per FC port• Support for Fibre Channel protocols FCP (SCSI-FCP), IP (FC-IP), FC-TAPE (FCP-2)• Support for Fibre Channel service (classes 2 and 3)
Processor	<p>Single-chip design with support for up to two completely independent 8 Gb serial Fibre Channel ports. Each port provides:</p> <ul style="list-style-type: none">• Reduced instruction set computer (RISC) processor• Integrated serializer/deserializer• Receive direct memory access (DMA) sequencer• Frame buffer• Processor operation at 100/133 MHz

Table 1. Host bus adapter specifications (continued)

Type	Specification
Application-specific integrated circuit (ASIC) internal random-access memory (SRAM)	<ul style="list-style-type: none"> Error-correcting code (ECC) protected 1.5 MB internal high-speed SRAM
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)	PCIe support for: <ul style="list-style-type: none"> x8 lane transfer link interface at 5 Gbps per lane 3.3 v power required for operation
Operating power	PCIe, x8 slot: 5.9 watts (typical) at +3.3 V dc

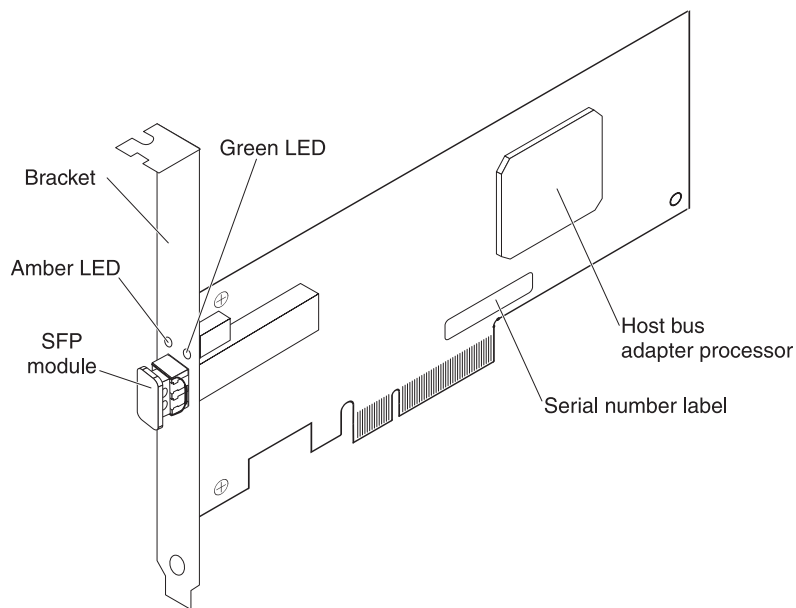
Inventory checklist

The host bus adapter option package includes the following items:

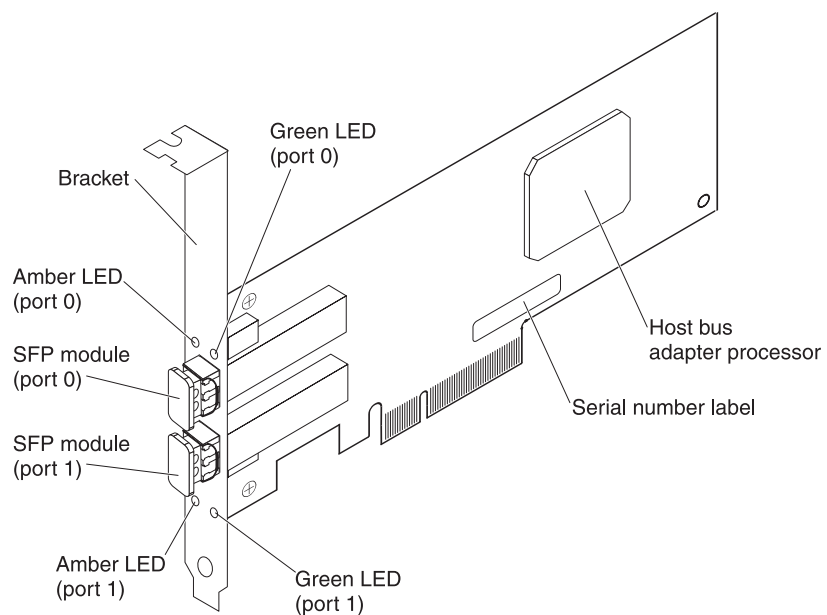
- One of the following host bus adapters:
 - Emulex 8 Gb FC Single-Port HBA for IBM System x
 - Emulex 8 Gb FC Dual-Port HBA for IBM System x
- Low-profile expansion slot bracket
- *Emulex 8 Gb FC Host Bus Adapters for IBM System x Quick Installation Guide*
- *Emulex 8 Gb FC Single-Port and Dual-Port HBAs Support CD*

Host bus adapter components

The major components of the single-port host bus adapter are shown in the following illustration.



The major components of the dual-port host bus adapter are shown in the following illustration.



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

Amber LED	Green LED	Description
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	2 Gb link rate - Normal, link-up
2 fast flashes	On	4 Gb link rate - Normal, link-up
3 fast flashes	On	8 Gb link rate - Normal, link-up
Off	Slow flash	Normal, link down or not started

Chapter 2. Installing the host bus adapter

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

Installation guidelines

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

- Read the safety information that begins on pageiii 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/storage/>. 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.

Working with SFP modules and fiber optic cables

A small-form-factor pluggable (SFP) module converts electrical signals to optical signals that are required for Fibre Channel transmission to and from RAID controllers. The 8 Gb FC single-port HBA comes with one SFP module and the dual-port 8 Gb FC HBA comes with two SFP modules. One end of a fiber optic cable is inserted into the SFP module and the other end of the fiber optic cable is connected to a Fibre Channel device. SFP modules are laser products.

Statement 3:



CAUTION:

When laser products (such as CD-ROMs, DVD drives, fiber optic devices, or transmitters) are installed, note the following:

- 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 controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.



DANGER

Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following.

Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.

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:
 - 2 Gbps: 300 meters 50/125 μ m fiber, 150 meters 62.5/125 μ m fiber
 - 4 Gbps: 150 meters 50/125 μ m fiber, 70 meters 62.5/125 μ m fiber
 - 8 Gbps: 50 meters 50/125 μ m fiber 21 meters 62.5/125 μ m fiber

Handling SFP modules

Before installing or removing SFP modules and fiber optic cables, read the following information:

- The SFP module housing has an integral guide key that is designed to prevent you from inserting the SFP module incorrectly.
- Use minimal pressure when inserting an SFP module into a Fibre Channel port. Forcing the SFP module into a port could cause damage to the SFP module or to the port.
- You can insert or remove the SFP module while the port is powered-on.
- You must insert the SFP module into a port before you connect the fiber optic cable.
- You must remove the fiber optic cable from the SFP module before you remove the SFP module from the port.

Installing the host bus adapter

Statement 1:



DANGER

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

To avoid a shock hazard:

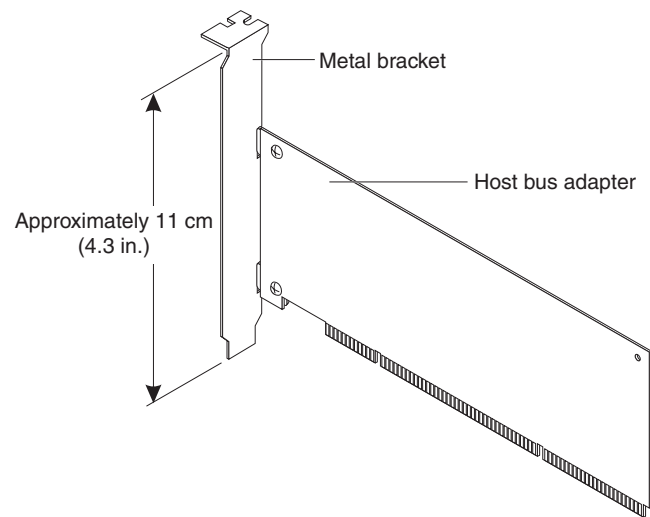
- Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.
- Connect all power cords to a properly wired and grounded electrical outlet.
- Connect to properly wired outlets any equipment that will be attached to this product.
- When possible, use one hand only to connect or disconnect signal cables.
- Never turn on any equipment when there is evidence of fire, water, or structural damage.
- Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.
- Connect and disconnect cables as described in the following table when installing, moving, or opening covers on this product or attached devices.

To Connect:	To Disconnect:
1. Turn everything OFF.	1. Turn everything OFF.
2. First, attach all cables to devices.	2. First, remove power cords from outlet.
3. Attach signal cables to connectors.	3. Remove signal cables from connectors.
4. Attach power cords to outlet.	4. Remove all cables from devices.
5. Turn device ON.	

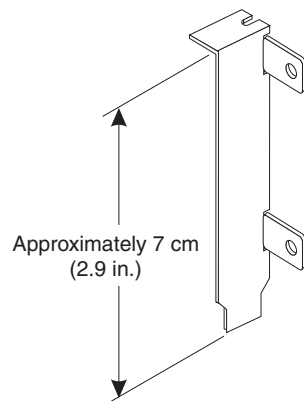
Before you install the host bus adapter, make sure that the preinstalled expansion slot bracket is the correct size for the server in which you are installing the host bus adapter.

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 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 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 14 in the following procedure.



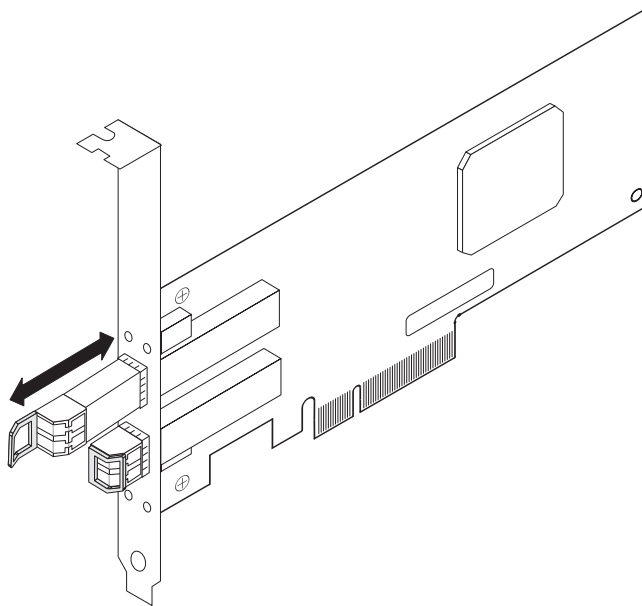
To install the host bus adapter in the server, complete the following steps:

1. Read the safety information that begins on page iii, and “Handling static-sensitive devices” on page 9.
2. Check the server system board and make any necessary configuration changes to accommodate the host bus adapter.

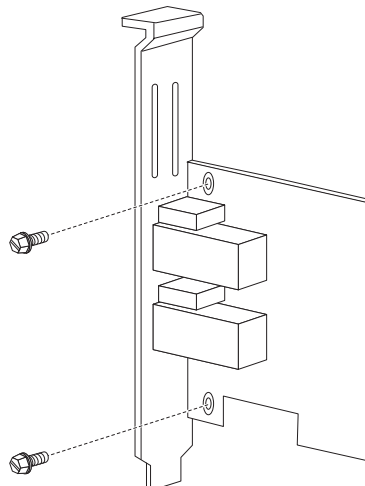
Note: The host bus adapter is self-configuring. If your server requires manual configuration to enable the host bus adapter, bus-master slot, and interrupt request (IRQ) level, use the Configuration/Setup Utility program that is part of the server basic input/output system (BIOS). For more information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

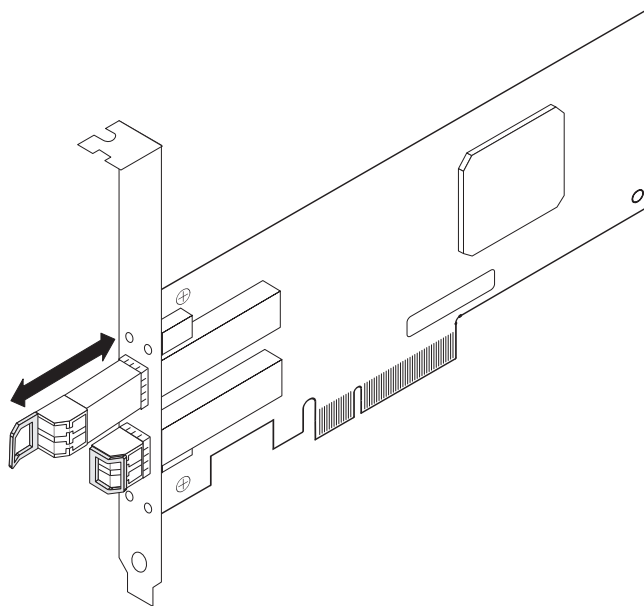
4. Remove the server cover. For more information, see the *Installation Guide* that comes with the server.
5. Touch the static-protective package that contains the host bus adapter to any unpainted surface on the outside of the server; then, grasp the host bus adapter by the top edge or upper corners 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 on page 15.
 - a. Remove each SFP module. A dual-port HBA has two SFP modules.
 - 1) Unlock the SFP module latch by pulling the wire tab outward 90°.
 - 2) With the SFP module wire tab in the unlocked position, grasp the wire tab and pull the SFP module out of the port.



- 3) Replace the protective cap on the SFP module.
- 4) Place the SFP module in a static-protective package.
- b. Orient the host bus adapter as shown in the following illustration.



- c. Remove the two screws that hold the bracket onto the host bus adapter.
- d. Lift the bracket from the host bus adapter and store the bracket in a safe place for possible reuse.
- e. 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. Make sure that you do not slide the bracket past the ends of the grounding “finger” tabs on the SFP module cage.
- f. 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 6c.
- g. Reinstall each SFP module:
 - 1) Remove the SFP module from its static-protective package.
 - 2) Remove the protective cap from the SFP module.
 - 3) Open the wire tab and insert the SFP module into the HBA port until it clicks into place.



- 4) Replace the protective cap on the SFP module.
7. Determine which 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 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 PCIe connector with the 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 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.

Statement 3:



CAUTION:

When laser products (such as CD-ROMs, DVD drives, fiber optic devices, or transmitters) are installed, note the following:

- 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 controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.



DANGER

Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following.

Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.

10. Remove the protective caps from the ends of an LC-LC fiber optic cable and from each SFP module on the host bus adapter (see “Handling fiber optic cables” on page 11).
11. Connect one end of the LC-LC fiber optic cable to the SFP module 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 7.

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 *Emulex 8 Gb FC Single-Port and Dual-Port HBAs Support* CD. You can obtain the latest information from <http://www.ibm.com/systems/storage/>.

- Microsoft Windows Server 2003, Advanced Server, or Enterprise Edition or Microsoft Windows Server 2008
- Red Hat Enterprise Linux Advanced Server version 4, or Red Hat Enterprise Linux Enterprise Server version 4
- Red Hat Enterprise Linux Advanced Server version 5, or Red Hat Enterprise Linux Enterprise Server version 5
- SUSE Linux Enterprise Server version 9 or SUSE Linux Enterprise Server version 10

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.

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 *Emulex 8 Gb FC Single-Port and Dual-Port HBAs Support CD*, or you can download the PDF file from <http://www.ibm.com/systems/storage/>.

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 *Emulex 8 Gb FC Single-Port and Dual-Port HBAs Support CD* or download the PDF file from <http://www.ibm.com/systems/storage/>.

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 *Emulex 8 Gb FC Single-Port and Dual-Port HBAs Support CD* or you can download the PDF file from <http://www.ibm.com/systems/storage/>.

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 8 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 *Emulex 8 Gb FC Single-Port and Dual-Port HBAs Support* CD or download the PDF file from <http://www.ibm.com/systems/storage/>.

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/storage/> 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

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"> • A quick test • A full power-on self-test (POST) • More advanced diagnostics: <ul style="list-style-type: none"> – A peripheral component interconnect (PCI) loopback (testing the PCI bus) – An internal loopback (on the host bus adapter) – An external loopback (requires an external plug)

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/storage/>. 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/storage/>. 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*.

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 “Part 3 - Warranty Information” on page 43.

Table 4. Host bus adapter CRU listing

Description	CRU part number (Tier 1)
Emulex 8 Gb FC Single-Port HBA	42D0491
Emulex 8 Gb FC Dual-Port HBA	42D0500
8 Gbps SFP module	42D0492

Appendix A. Getting help and technical assistance

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

Before you call

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

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

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

Using the documentation

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

Getting help and information from the World Wide Web

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

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

Software service and support

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

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

Hardware service and support

You can receive hardware service through your IBM reseller or IBM Services. To locate a reseller authorized by IBM to provide warranty service, go to <http://www.ibm.com/partnerworld/> and click **Find a Business Partner** on the right side of the page. For IBM support telephone numbers, see <http://www.ibm.com/planetwide/>. In the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

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

IBM Taiwan product service

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

IBM Taiwan product service contact information:

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

Appendix B. IBM Statement of Limited Warranty Z125-4753-09 08/2006

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.**

This Statement of Limited Warranty is available, in multiple languages, at the following IBM Internet website: http://www.ibm.com/servers/support/machine_warranties/.

What this Warranty Covers

IBM warrants that each Machine is free from defects in materials and workmanship and conforms to its Specifications. "Specifications" is information specific to a Machine in a document entitled "Official Published Specifications" which is available upon request.

During the warranty period, IBM provides repair and exchange service for the Machine under the type of warranty service IBM designates for the Machine. The warranty period for the Machine is a fixed period starting on its original Date of Installation. The date on your purchase invoice or sales receipt is the Date of Installation unless IBM or your reseller informs you otherwise. The warranty period, type of warranty, and service level that apply to your Machine are designated in Part 3.

Many features, conversions, or upgrades involve the removal of parts and their return to IBM. An IBM part that replaces a removed part will assume the warranty service status of the removed part. An IBM part that is added to a Machine without replacing a previously-installed part is subject to warranty effective on its Date of Installation. Unless IBM specifies otherwise, the warranty period, type of warranty, and service level of such part is the same as the Machine on which it is installed.

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:

1. failure or damage 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;
2. failure caused by a product for which IBM is not responsible;
3. any non-IBM Products, including those provided with, or installed on, an IBM Machine at your request;
4. accessories, supply items and consumables (e.g. batteries and printer cartridges), and structural parts (e.g. frames and covers);
5. service of Machine alterations; and
6. service of a Machine on which you are using capacity or capability, other than that authorized by IBM in writing.

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. Contact information for IBM is provided in Part 3. 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

IBM will attempt to diagnose and resolve your problem over the telephone or electronically by access to an IBM Internet website. Certain Machines contain remote support capabilities for direct problem reporting, remote problem determination and resolution with IBM. When you contact IBM for service, you must follow the problem determination and resolution procedures that IBM specifies. Following problem determination, if IBM determines on-site service is required, a service technician will be scheduled for service at your location.

You are responsible for downloading or obtaining from IBM, 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 in a timely manner from an IBM Internet website or from other electronic media, and following the instructions that IBM provides. You may request IBM to install Machine Code changes, however, you may be charged for that service.

Some parts of IBM Machines are designated as Customer Replaceable Units ("CRUs"). If your problem can be resolved with a CRU (e.g., keyboard, 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 its subcontractor or a reseller that has been 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 or its subcontractor or the reseller is unable to do either, you may return the Machine to your place of purchase and your money will be refunded.

IBM or its subcontractor or the 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 its subcontractor or the reseller replaces becomes IBM's 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

You agree:

1. before IBM or its subcontractor or the reseller exchanges a Machine or part, to remove all features, parts, options, alterations, and attachments not under warranty service and ensure that the Machine is free of any legal obligations or restrictions that prevent its exchange;
2. to obtain authorization from the owner to have IBM or its subcontractor or the reseller service a Machine that you do not own;
3. where applicable, before service is provided:
 - a. follow the service request procedures that IBM or its subcontractor or its reseller provides;
 - b. backup and secure all programs, data, and funds contained in the Machine; and
 - c. inform IBM or its subcontractor or the reseller of changes in the Machine's location;
4. to provide IBM or its subcontractor or the reseller with sufficient and safe access to your facilities to permit IBM to fulfill its obligations;
5. to allow IBM or its subcontractor or the reseller to install mandatory engineering changes, such as those required for safety;
6. when the type of warranty service requires that you deliver a failing Machine to IBM, you agree to ship it suitably packaged, as IBM specifies, to a location IBM designates. After the Machine has been repaired or exchanged, IBM will return the repaired Machine or provide a replacement Machine to you at its expense, unless IBM specifies otherwise. 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; and
7. to securely erase from any Machine you return to IBM for any reason all programs not provided by IBM with the Machine, and data, including without limitation the following: 1) information about identified or identifiable individuals or legal entities ("Personal Data") and 2) your confidential or proprietary

information and other data. If removing or deleting Personal Data is not possible, you agree to transform such information (e.g., by making it anonymous or encrypting it) so that it no longer qualifies as Personal Data under applicable law. You also agree to remove all funds from Machines returned to IBM. IBM is not responsible for any funds, programs not provided by IBM with the Machine, or data contained in a Machine that you return to IBM. You acknowledge that, to perform its responsibilities under this Statement of Limited Warranty, IBM may ship all or part of the Machine or its software to other IBM or third party locations around the world, and you authorize IBM to do so.

Limitation of Liability

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, subcontractors, and resellers. It is the maximum for which IBM and its suppliers, subcontractors and resellers are collectively responsible.

UNDER NO CIRCUMSTANCES IS IBM OR ITS SUPPLIERS, SUBCONTRACTORS, 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.

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.

Part 2 - Country-unique Terms

AMERICAS

Jurisdiction: *The following sentence is added to this section as it applies to countries in bold print below:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by 1) in **Argentina**; the Ordinary Commercial Court of the city of Buenos Aires; 2) in **Bolivia**; the courts of the city of La Paz; 3) in **Brazil**; court of Rio de Janeiro, RJ; 4) in **Chile**; the Civil Courts of Justice of Santiago; 5) in **Colombia**; the Judges of the Republic of Colombia; 6) in **Ecuador**; the civil judges of Quito for executory or summary proceedings (as applicable); 7) in **Mexico**; the courts located in Mexico City, Federal District; 8) in **Paraguay**; the courts of the city of Asuncion; 9) in **Peru**; the judges and tribunals of the judicial district of Lima, Cercado; 10) in **Uruguay**; the courts of the city of Montevideo; 11) in **Venezuela**; the courts of the metropolitan area of the city of Caracas.

BRAZIL

Exchange of a Machine or Part: *Delete the last sentence:*

The replacement assumes the warranty service status of the replaced item.

CANADA

What this Warranty Covers: *The following replaces the 2nd paragraph to this section:*

During the warranty period, IBM provides repair and exchange service for the Machine under the type of warranty service IBM designates for the Machine. The warranty period for the Machine is a fixed period starting on its original Date of Installation. The date on your purchase invoice or sales receipt is the Date of Installation unless IBM informs you otherwise. The warranty period, type of warranty, and service level that apply to your Machine are designated in Part 3.

Limitation of Liability: *The following replaces item 1 and item 2 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
2. the amount of any other actual direct damages, up to the greater of \$100,000.00 or 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").

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.

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").

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.

As applies to transactions initiated and performed in Hong Kong S.A.R., phrases throughout this Agreement containing the word “country” (for example, “country of purchase” and “country of Installation”) are replaced with “Hong Kong S.A.R.”

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.

MACAU S.A.R.

As applies to transactions initiated and performed in Macau S.A.R., phrases throughout this Agreement containing the word “country” (for example, “country of purchase” and “country of Installation”) are replaced with “Macau S.A.R.”

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 purchase a Machine in a Middle East 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, Montenegro, Poland, Romania, Russia, Serbia, Slovakia, Slovenia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan**; 2) “the laws of France” in **Algeria, Benin, Burkina Faso, Cameroon, 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, Libya, 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, United Kingdom, 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, 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, Libya, 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 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; 6) **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; 7) 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 8) **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, Libya, FYR Macedonia, Moldova, Montenegro, Poland, Romania, Russia, Serbia, Slovakia, Slovenia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan 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.

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, OR ITS SUPPLIERS, SUBCONTRACTORS, 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, OR ITS SUPPLIERS, SUBCONTRACTORS, 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 AND 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 price reduction 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.

IRELAND

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

Except as expressly provided in these terms and conditions or Section 12 of the Sale of Goods Act 1893 as amended by the Sale of Goods and Supply of Services Act, 1980 ("the 1980 Act"), all conditions or warranties (express or implied, statutory or otherwise) are hereby excluded including, without limitation, any warranties implied by the Sale of Goods Act 1893 as amended by the 1980 Act (including, for the avoidance of doubt, section 39 of the 1980 Act).

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.

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.

SWITZERLAND

Your Additional Responsibilities: *The following sentence is added to this section:*

Personal Data also includes information about you as a legal entity.

TURKEY

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

The minimum warranty period for Machines is 2 years.

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;
3. loss of profits, business, revenue, goodwill, or anticipated savings; or

4. third party claims against you for damages.

Part 3 - Warranty Information

Emulex 8 Gb FC Single-Port HBA for IBM System x Emulex 8 Gb FC Dual-Port HBA for IBM System x

Country or Region of Purchase	Warranty Period	Type of Warranty Service*	Service Level*
Worldwide	1 year	1	Not applicable
* See “Types of Warranty Service” and “Service Levels” for explanations of warranty-service types and service levels.			

Scheduling of a warranty service will depend upon the following: 1) the time your request for service is received, 2) Machine technology, and 3) availability of parts. Contact your local IBM representative or the subcontractor or reseller performing services on behalf of IBM for country and location specific information.

Types of Warranty Service

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. CRUs are designated as being either Tier 1 or a Tier 2 CRU. 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 15 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 of the Machine and verification of its operation.

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).

8. **Machine Exchange Service**

IBM will initiate shipment of a replacement Machine to your location. You are responsible for its installation and verification of its operation. You must pack the failing Machine into the shipping container that contained the replacement Machine and return the failing Machine to IBM. Transportation charges, both ways, are paid by IBM. You may be charged for the replacement Machine if IBM does not receive the failing Machine within 15 days of your receipt of the replacement Machine.

(*) 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.

Service Levels

Service levels specified below are response-time objectives only and are not guarantees. The specified service level may not be available in all worldwide locations. Charges may apply outside IBM's normal service area. Certain Machines with a Same Day On-site response-time objective may require the installation and use of remote connectivity tools and equipment for direct problem reporting, remote problem determination and resolution.

1. **Next Business Day (NBD), 9X5**

After we receive your call, following problem determination, if IBM determines on-site service is required, a service technician will be scheduled to arrive at your location on the next business day. Service will be provided from 8:00 a.m. to 5:00 p.m. in your local time zone, Monday through Friday, excluding holidays.

2. **Same Business Day (SBD), 9X5**

After we receive your call, following problem determination, if IBM determines on-site service is required, a service technician will be scheduled to arrive at your location within four hours. Service will be provided from 8:00 a.m. to 5:00 p.m. in your local time zone, Monday through Friday, excluding local IBM holidays. If after 1:00 p.m. it is determined that on-site service is required, a service technician will be scheduled to arrive the morning of the following business day.

3. **Same Day (SD), 24X7**

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IBM Contact Information

For IBM in Canada or the United States, call 1-800-IBM-SERV (or 1-800-426-7378). For IBM in the European Union (EU), Asia Pacific, and Latin America countries,

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Important notes

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

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

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

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

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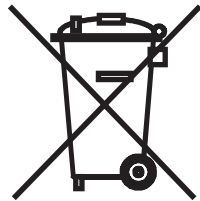
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This unit must be recycled or discarded according to applicable local and national regulations. IBM encourages owners of information technology (IT) equipment to responsibly recycle their equipment when it is no longer needed. IBM offers a variety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

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



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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。

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Battery return program

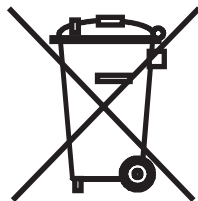
This product may contain a sealed lead acid, nickel cadmium, nickel metal hydride, lithium, or lithium ion battery. Consult your user manual or service manual for specific battery information. The battery must be recycled or disposed of properly. Recycling facilities may not be available in your area.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

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

For Taiwan: Please recycle batteries.



For the European Union:



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

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In accordance with the European Directive 2006/66/EC, batteries and accumulators are labeled to indicate that they are to be collected separately and recycled at end of life. The label on the battery may also include a chemical symbol for the metal concerned in the battery (Pb for lead, Hg for mercury, and Cd for cadmium). Users of batteries and accumulators must not dispose of batteries and accumulators as unsorted municipal waste, but use the collection framework available to customers for the return, recycling, and treatment of batteries and accumulators. Customer participation is important to minimize any potential effects of batteries and accumulators on the environment and human health due to the potential presence of hazardous substances. For proper collection and treatment, contact your local IBM representative.

This notice is provided in accordance with Royal Decree 106/2008 of Spain: The retail price of batteries, accumulators, and power cells includes the cost of the environmental management of their waste.

For California:

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

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

Electronic emission notices

Federal Communications Commission (FCC) statement

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

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

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Industry Canada Class A emission compliance statement

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

Avis de conformité à la réglementation d'Industrie Canada

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

Australia and New Zealand Class A statement

Attention: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

United Kingdom telecommunications safety requirement

Notice to Customers

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

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European Community contact:

IBM Technical Regulations
Pascalstr. 100, Stuttgart, Germany 70569
Telephone: 0049 (0)711 785 1176
Fax: 0049 (0)711 785 1283
E-mail: tjahn@de.ibm.com

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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。

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聲 明
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干擾採取切实可行的措施。

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바라며, 만약 잘못 구입하셨을 때에는 구입한 곳에
서 비업무용으로 교환하시기 바랍니다.

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