Brocade 4 Gb / 8 Gb FC Single-Port and Dual-Port HBAs for IBM System x

Installation Guide

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Note: Before using this information and the product it supports, read the warranty information in the *IBM Important Notices and Warranty Information* document and the general information in Appendix B, “Notices,” on page 21.

Second Edition (October 2009)

Contents

Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الآمنية

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

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

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

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

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

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

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

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

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

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

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

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

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

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

Перед установкой продукта прочтите инструкции по
технике безопасности.

Pred inštaláciou tohto zariadenia si pečítaje Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

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

Läs säkerhetsinformationen innan du installerar den här produkten.

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:	**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.	

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

Chapter 1. Introduction

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

- Brocade 4 Gb FC Single-Port HBA for IBM System x
- Brocade 4 Gb FC Dual-Port HBA for IBM System x
- Brocade 8 Gb FC Single-Port HBA for IBM System x
- Brocade 8 Gb FC Dual-Port HBA for IBM System x

The Brocade 4 Gb / 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 the host bus adapter
- Performing basic troubleshooting of the host bus adapter

Depending on the model, the host bus adapter is a 4 Gbps or 8 Gbps high-performance Fibre Channel host adapter that is designed for high-end servers. It features 500 K IOPs per port, low power consumption, and advanced functionality such as Quality of Service (QoS) and Fabric Based LUN Discovery. The function and performance are derived from the Crossbow ASIC. The Brocade PCI Express interface supports PCI Express specifications Gen2 (PCI Base Specification 2.0) and Gen1 (PCI Base Specification 1.0, 1.1a, and 1.1). It operates as an x8 lane DMA bus master at 2.5 GHz, full duplex. Effective data rate on Gen2 systems is 32 Gbps and on Gen1 systems is 16 Gbps.

The host bus adapter can connect the following devices:

- Mainframe computers
- Super computers
- Workstations
- Storage devices
- Servers

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/servers/storage/support/disk/.
2. Under **System Storage**, click **Products A - Z**.
3. Scroll to **Fibre Channel Host Bus Adapters** and click the link.
4. Click **Product support** under the applicable host bus adapter.
5. Under **Support & downloads**, click **Download** for firmware updates, or click **Documentation** for documentation updates.

The host bus adapter comes with a one-year limited warranty. For information about your warranty, see the *Important Notices* document that comes with the host bus adapter.

For service or assistance, see Appendix A, “Getting help and technical assistance,” on page 19.

Related documentation

This *Installation Guide* contains setup and installation instructions for the host bus adapter. It also provides general information about the host bus adapter, including how to get help.

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

- *Important Notices and Warranty Information*

  This printed document provides information about the safety, warranty, environmental, and electronic emission notices for the host bus adapter.
- *IBM Safety Information*

  This document is in Portable Document Format (PDF) on the *Brocade 4 Gb / 8 Gb FC Single-Port and Dual-Port HBAs for IBM System x Documentation* CD. It contains translated versions of caution and danger statements. Each caution and danger statement in this document is labeled with a number. This number is used to cross reference the English-language caution or danger statement with translated versions of the caution or danger statement in the *IBM Safety Information* document.
- *Environmental Notices and User Guide*

  This document is in PDF on the IBM *Documentation* CD. It contains translated environmental notices.
- *IBM License Agreement for Machine Code*

  This document is in PDF on the IBM *Documentation* CD. It contains translated versions of the IBM License Agreement for Machine code for your device.

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 *Brocade 4 Gb / 8 Gb FC Single-Port and Dual-Port HBAs Documentation* 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:

- Compatible with PCI Express slot
- Conforms to *PCI Express Base Specification rev. 2.0*, *PCI Express Card Electromechanical Specification rev. 2.0*, and *PCI Bus Power Management Interface Specification revision 1.1*

The host bus adapter operating environment specifications are described in the following table.

Table 1. Host bus adapter operating environment specifications

Environment	Minimum	Maximum
Operating temperature	0°C (32°F)	55°C (131°F)
Storage temperature	-43°C (-40°F)	73°C (163°F)
Relative humidity (noncondensing)	5%	93%
Storage humidity (noncondensing)	5%	95%

The host bus adapter specifications are described in the following table.

Table 2. Host bus adapter specifications

Type	Specification
Host bus	• Conforms to *PCI Express Base Specification rev. 2.0*, *PCI Express Card Electromechanical Specification rev. 2.0*, and *PCI Bus Power Management Interface Specification revision 1.1* • Bus interface: PCI Express x8 • Memory: 4 MB SRAM (on chip memory) and 4 MB flash (SPI) • Compliance: PCI Express Base Specification rev. 1.0, 1.1a, and 1.1 and PCI Express Card Electromechanical Specification rev. 1.0 and 1.1
PCI Express signaling environment	Support for 3.3 V
PCI Express transfer rate	PCI Express x8 bus at 5 GHz

Table 2. Host bus adapter specifications (continued)

Type	Specification
Fibre Channel specifications	• Data rate: – For 4 Gb host bus adapters: 4/2/1 Gbps auto-negotiation – For 8 Gb host bus adapters: 8/4/2/1 Gbps auto-negotiation • Performance: 500,000 IOPS • Topology: Point-to-point (N_Port) and switched fabric (N_Port)Logins Support for F_Port • 2,048 concurrent logins and 2,048 active exchanges • Class of service: Class 3 • Protocols FCP (SCSI-FCP), IP (FC-IP), FC-TAPE (FCP-2) • Compliance: SCSI-3 Fibre Channel Protocol (SCSI-FCP), Fibre Channel Physical and Signaling Interface (FC-PH), Fibre Channel 2nd Generation (FC-PH-2), Third Generation Fibre Channel Physical and Signaling Interface (FC-PH-3), Fibre Channel-Arbitrated Loop (FC-AL-2), Fibre Channel Fabric Loop Attachment Technical Report (FC-FLA), Fibre Channel-Private Loop Direct Attach Technical Report (FC-PLDA), Fibre Channel Tape (FC-TAPE) profile, SCSI Fibre Channel Protocol-2 (FCP-2), Second Generation FC Generic Services (FC-GS-3), Third Generation FC Generic Services (FC-GS-3), Fibre Channel Framing and Signaling (FC-FS)
Processor	Single-chip design that includes a RISC processor, Fibre Channel protocol manager, PCI DMA controller, and integrated serializer/deserializer (SERDES) and electrical transceivers that can auto-negotiate a data rate of 8 GB per second
Host data transfer	64-bit, bus-master DMA data transfers to 2000 MB per second
RAM	1 M of SRAM supporting parity protection
BIOS ROM	2 MB of flash ROM, field programmable
NVRAM	2 KB, field programmable
Connectors (external)	Brocade-branded small-form-factor pluggable plus (SFP+) multimode optic For cable distance information, see “Fiber optic cable specifications” on page 5.
Form factor	Low-profile PCI Express adapter: 68.9 mm x 167.7 mm (2.71 in. x 6.60 in.)
Power dissipation	6.3 watts (maximum)

Fiber optic cable specifications

Table 10 summarizes the maximum distances supported for different fiber optic cable types. This table assumes a 1.5 dB connection loss and an 850 nm laser source.

Table 3. Fiber optic cable specifications

Port speed	**OM1 (M6) Standard 62.5/125 micron**	**OM2 (M5) Standard 50/125 micron**	**OM3 (M5E) Laser-optimized 50/125 micron -300**
2 Gbps	150 m	300 m	500 m
4 Gbps	70 m	150 m	380 m
8 Gbps[1]	Not recommended	50 m	150 m
[1] The 8 Gbps port speed is supported on the 8 Gb host bus adapters only.			

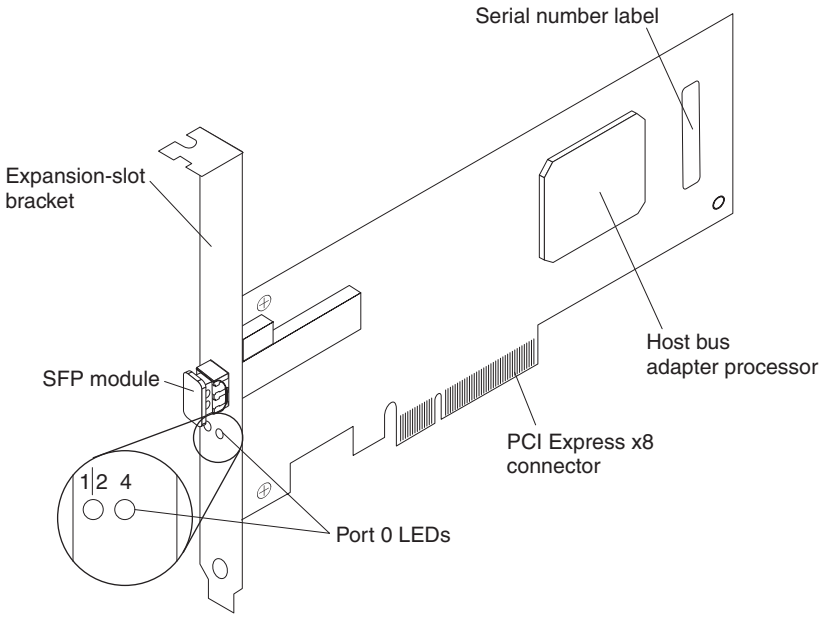
Inventory checklist

The host bus adapter option package contains the following items:

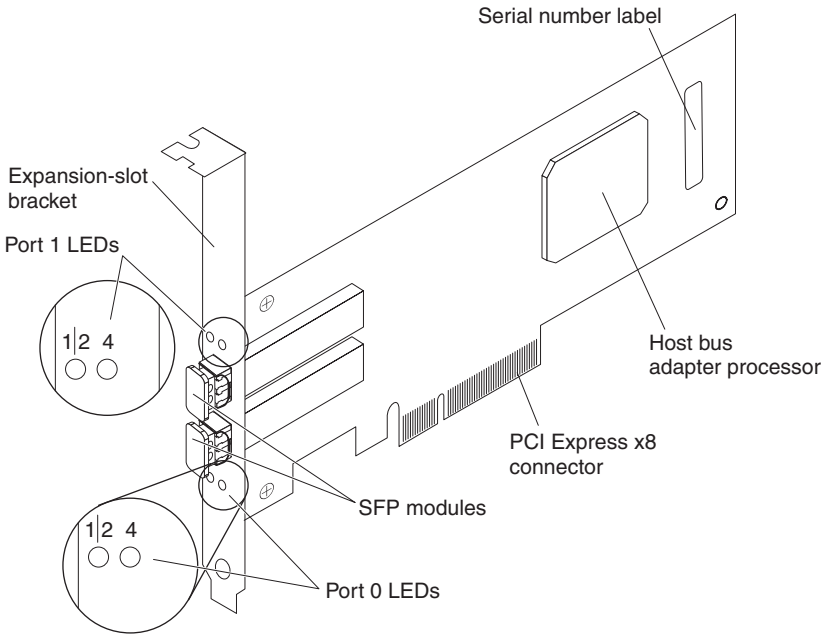
- One of the following host bus adapters:
  - Brocade 4 Gb FC Single-Port HBA for IBM System x
  - Brocade 4 Gb FC Dual-Port HBA for IBM System x
  - Brocade 8 Gb FC Single-Port HBA for IBM System x
  - Brocade 8 Gb FC Dual-Port HBA for IBM System x
- Low-profile expansion slot bracket
- *Important Notices with Warranty Information* document
- *Brocade 4 Gb / 8 Gb FC Single-Port and Dual-Port HBAs for IBM System x Documentation* CD (includes the *Installation Guide* and the *Safety Information* documents)

Host bus adapter components

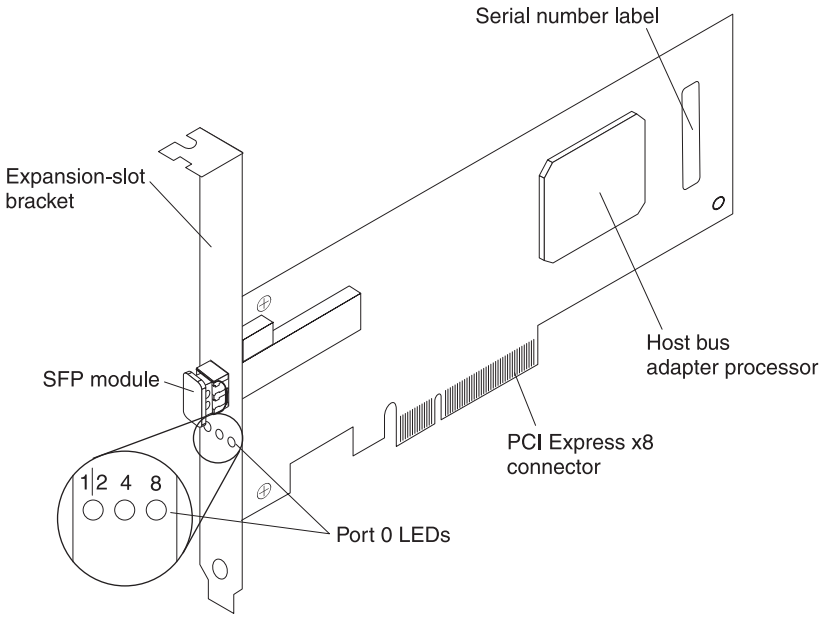
The major components of the 4 Gb single-port host bus adapter are shown in the following illustration.



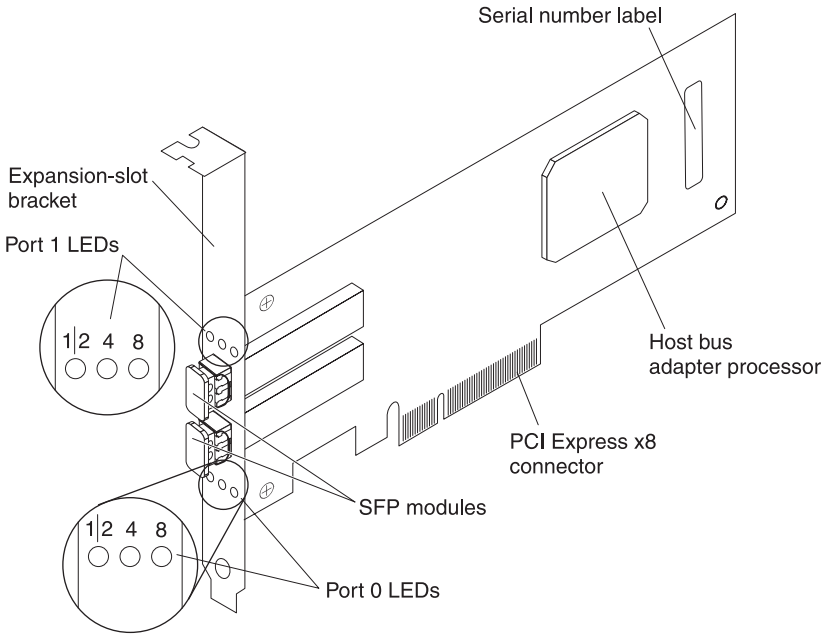
The major components of the 4 Gb dual-port host bus adapter are shown in the following illustration.



The major components of the 8 Gb single-port host bus adapter are shown in the following illustration.



The major components of the 8 Gb dual-port host bus adapter are shown in the following illustration.



Host bus adapter LEDs

The host bus adapter green light emitting diodes (LEDs) are described in the following table.

Each port on the 4 Gb host bus adapter operates at speeds up to 4 Gbps and each port has a 1-2 and 4 Gbps LED.

Each port on the 8 Gb host bus adapter operates at speeds up to 8 Gbps and each port has a 1-2, 4, and 8 Gbps LED.

The following table provides the descriptions for LED operation on a specific port.

Table 4. LED descriptions

LED operation	Description
LED is steady green	Depending on the LED that is lit, the link is active at the following rates: • For 4 Gb host bus adapters: 1-2 or 4 Gbps • For 8 Gb host bus adapter: 1-2, 4, or 8 Gbps The port is online (connected to an external device) but has no traffic. Note that only one of these LEDs at a time is steady green to indicate speed.
LED is flickering green	Activity, such as data transfers, is occurring on the active link.
All LEDs are flashing green	Beaconing is enabled on the port.
All LEDs are flashing amber	An unsupported SFP module is installed. An applicable Brocade-branded SFP module must be installed.

Chapter 2. Installing the host bus adapter

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

Handling static-sensitive devices

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

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

- Limit your movement. Movement can cause static electricity to build up around you.
- The use of a grounding system is recommended. For example, wear an electrostatic-discharge wrist strap, if one is available. Always use an electrostatic-discharge wrist strap or other grounding system when you work inside the server with the power on.
- Handle the device carefully, holding it by its edges or its frame.
- Do not touch solder joints, pins, or exposed circuitry.
- Do not leave the device where others can handle and damage it.

- While the device is still in its static-protective package, touch it to an unpainted metal surface on the outside of the server for at least 2 seconds. This drains static electricity from the package and from your body.
- Remove the device from its package and install it directly into the server without setting down the device. If it is necessary to set down the device, put it back into its static-protective package. Do not place the device on the server cover or on a metal surface.
- Take additional care when you handle devices during cold weather. Heating reduces indoor humidity and increases static electricity.

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 suggested maximum cable lengths in the table in “Fiber optic cable specifications” on page 5.

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.

What you need for the installation

To install the host bus adapter in the server, you will need a small Phillips screwdriver. Depending on the configuration, you might need the following two items:

- An LC-LC fiber optic cable (used to connect Fibre Channel nodes to a loop)
- LC-SC fiber optic cable (used to connect an LC-LC fiber optic cable to a device that requires an SC connector)

Note: The LC-LC and LC-SC fiber optic cables do not come with the host bus adapter and must be purchased separately.

Installing the host bus adapter

Statement 1:

DANGER

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

To avoid a shock hazard:

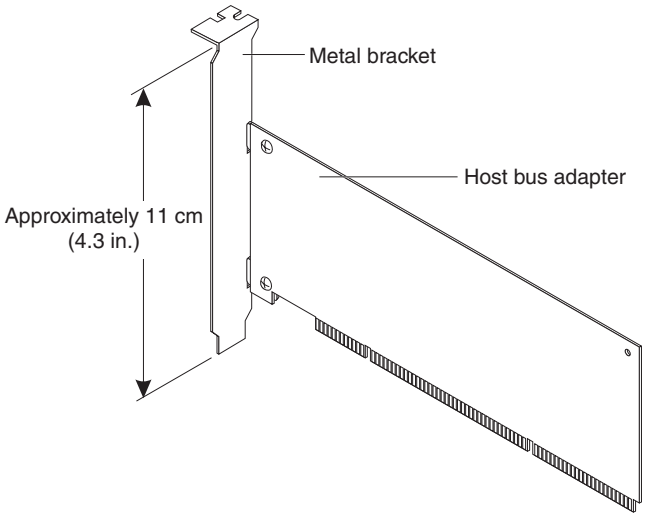
- **Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.**
- **Connect all power cords to a properly wired and grounded electrical outlet.**
- **Connect to properly wired outlets any equipment that will be attached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

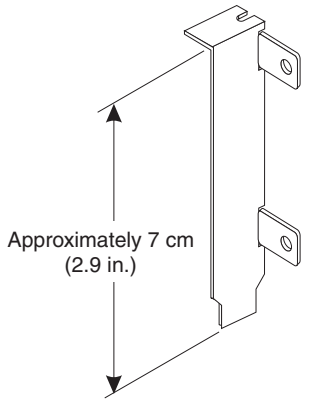
Before you install the host bus adapter, make sure that the preinstalled expansion slot bracket is the correct size for the server in which you are installing the host bus adapter.

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 PCI Express expansion-slot is approximately 10 cm (4.0 in.) long, you will use the preinstalled bracket.



The option package also contains a low-profile expansion-slot bracket that is approximately 7 cm (2.9 in.) long. If the opening for the PCI Express 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 7 on page 14 in the following procedure.



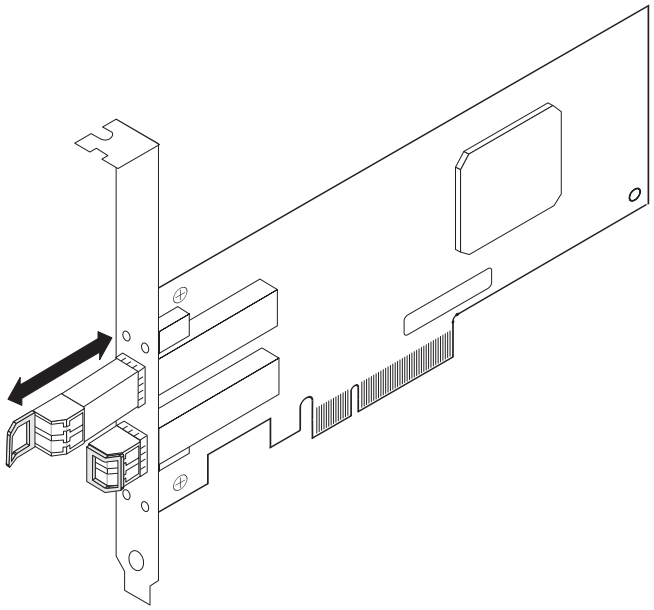
Note: Installing the host bus adapter in a server with an Intel® 64-bit processor (IA-64) is not supported.

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

1. Read the safety information that begins on page v and “Handling static-sensitive devices” on page 9.
2. Write down the serial number of the host bus adapter. Each adapter has a unique serial number. See the illustrations in “Host bus adapter components” on page 6 for the serial number location.
3. Check the server system board and make any necessary configuration changes to accommodate the host bus adapter.

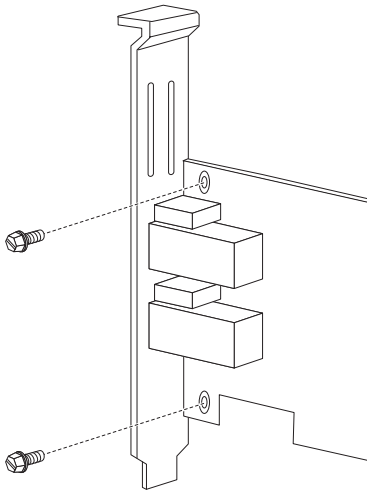
Note: The host bus adapter is self-configuring. If your server requires manual configuration to enable the host bus adapter, bus-master slot, and interrupt request (IRQ) level, use the Configuration/Setup Utility program, which is part of the server basic input/output system (BIOS). For more information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

4. Turn off the server and peripheral devices and disconnect the power cords.
5. Remove the server cover. For more information, see the *Installation Guide* that comes with the server.
6. 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.
7. 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 8 on page 16.
   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.

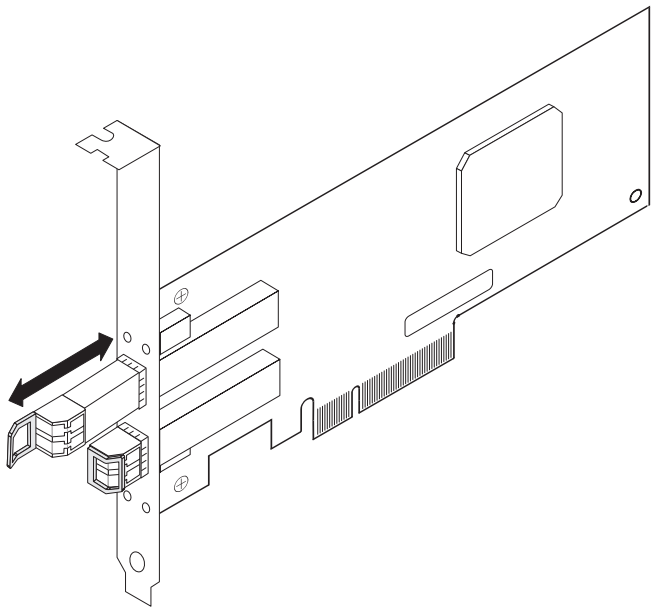


      3) Replace the protective cap on the SFP module.
      4) Place the SFP module in a static-protective package.

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 7c.
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.

8. Determine which x8 PCI Express slot you will use. Depending on the server model, you might have to remove the expansion-slot cover or release the bracket lever for the selected PCI Express 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.
9. Position the host bus adapter by aligning the PCI Express connector with the PCI Express slot on the system board. Insert the host bus adapter firmly into the connector.

   Note: Depending on the server model, you might have to install the host bus adapter in a riser card and then install the riser card with the host bus adapter in the PCI Express slot on the system board.
10. Secure the host bus adapter to the server chassis. Replace the expansion-slot screw if you removed it in step 8, 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.

11. Remove the protective caps from the ends of an LC-LC fiber optic cable and from the optical interface connector on the host bus adapter (see "Handling fiber optic cables" on page 11).
12. Connect one end of the LC-LC fiber optic cable to the optical interface connector on the host bus adapter. Connect the other end to a Fibre Channel device.
13. Replace the server cover.
14. Reconnect the power cords.

15. Turn on all external Fibre Channel devices; then, turn on the server. To make sure that the host bus adapter is functioning correctly, check the LEDs on the front bracket of the host bus adapter. For more information about the host bus adapter LEDs, see “Host bus adapter LEDs” on page 8.

    The following information is displayed.

    For a single-port or dual-port host bus adapter:

    ```
    "
    Brocade Copyright 2007 All Rights Reserved!
    Press <CTL-B> or <ALT-B> to enter Brocade's HBA boot config menu
    "
    ```

16. Go to http://www.brocade.com for instructions for installing the applicable device driver and updating the host bus adapter BIOS code.

Replaceable host bus adapter components

Each replaceable component on the host bus adapter is a 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.

For information about the terms of the warranty and getting service and assistance, see the *Important Notices and Warranty Information* document.

Table 5. Host bus adapter CRU part numbers

Description	CRU part number (Tier 1)
Brocade 4 Gb FC Single-Port HBA for IBM System x	59Y1992
Brocade 4 Gb FC Dual-Port HBA for IBM System x	59Y1998
Brocade 8 Gb FC Single-Port HBA for IBM System x	46M6061
Brocade 8 Gb FC Dual-Port HBA for IBM System x	46M6062
Brocade 4 Gb SFP+ SW Optical Transceiver	59Y2019
Brocade 8 Gb SFP+ SW Optical Transceiver	44X1974

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. Notices

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UNIX is a registered trademark of The Open Group in the United States and other countries.

Other company, product, or service names may be trademarks or service marks of others.

Important notes

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

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

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

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

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

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

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

Particulate contamination

Attention: Airborne particulates (including metal flakes or particles) and reactive gases acting alone or in combination with other environmental factors such as humidity or temperature might pose a risk to the device that is described in this document. Risks that are posed by the presence of excessive particulate levels or concentrations of harmful gases include damage that might cause the device to malfunction or cease functioning altogether. This specification sets forth limits for particulates and gases that are intended to avoid such damage. The limits must not be viewed or used as definitive limits, because numerous other factors, such as temperature or moisture content of the air, can influence the impact of particulates or environmental corrosives and gaseous contaminant transfer. In the absence of specific limits that are set forth in this document, you must implement practices that maintain particulate and gas levels that are consistent with the protection of human health and safety. If IBM determines that the levels of particulates or gases in your environment have caused damage to the device, IBM may condition provision of repair or replacement of devices or parts on implementation of appropriate remedial measures to mitigate such environmental contamination. Implementation of such remedial measures is a customer responsibility.

Table 6. Limits for particulates and gases

Contaminant	Limits
Particulate	• The room air must be continuously filtered with 40% atmospheric dust spot efficiency (MERV 9) according to ASHRAE Standard 52.2[1]. • Air that enters a data center must be filtered to 99.97% efficiency or greater, using high-efficiency particulate air (HEPA) filters that meet MIL-STD-282. • The deliquescent relative humidity of the particulate contamination must be more than 60%[2]. • The room must be free of conductive contamination such as zinc whiskers.
Gaseous	• Copper: Class G1 as per ANSI/ISA 71.04-1985[3] • Silver: Corrosion rate of less than 300 Å in 30 days

[1] ASHRAE 52.2-2008 - *Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size*. Atlanta: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

[2] The deliquescent relative humidity of particulate contamination is the relative humidity at which the dust absorbs enough water to become wet and promote ionic conduction.

[3] ANSI/ISA-71.04-1985. *Environmental conditions for process measurement and control systems: Airborne contaminants*. Instrument Society of America, Research Triangle Park, North Carolina, U.S.A.

Electronic emission notices

Federal Communications Commission (FCC) statement

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in

accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

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

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

Industry Canada Class A emission compliance statement

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

Avis de conformité à la réglementation d'Industrie Canada

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

Australia and New Zealand Class A statement

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

United Kingdom telecommunications safety requirement

Notice to Customers

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

European Union EMC Directive conformance statement

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

This product has been tested and found to comply with the limits for Class A Information Technology Equipment according to CISPR 22/European Standard EN 55022. The limits for Class A equipment were derived for commercial and industrial environments to provide reasonable protection against interference with licensed communication equipment.

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

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

Taiwanese Class A warning statement

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居住的環境中使用時，可
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求採取某些適當的對策。

Germany Electromagnetic Compatibility Directive

Deutschsprachiger EU Hinweis:

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Dieses Produkt entspricht den Schutzanforderungen der EU-Richtlinie 2004/108/EG zur Angleichung der Rechtsvorschriften über die elektromagnetische Verträglichkeit in den EU-Mitgliedsstaaten und hält die Grenzwerte der EN 55022 Klasse A ein.

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Dieses Produkt entspricht dem “Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG)”. Dies ist die Umsetzung der EU-Richtlinie 2004/108/EG in der Bundesrepublik Deutschland.

Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG) (bzw. der EMC EG Richtlinie 2004/108/EG) für Geräte der Klasse A

Dieses Gerät ist berechtigt, in Übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen. Verantwortlich für die Konformitätserklärung des EMVG ist die IBM Deutschland GmbH, 70548 Stuttgart.

Generelle Informationen:

Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55022 Klasse A.

People's Republic of China Class A warning statement

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