N2225 and N2226 SAS/SATA HBAs

User's Guide

Part Number: 00FH247

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Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الأمنية

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

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

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

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

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

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

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

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

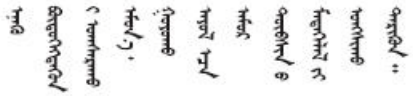
A termék telepítése előtt olvassa el a Biztonsági előírásokat!

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

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

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



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

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

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

Перед установкой продукта прочтите инструкции по
технике безопасности.

Pred inštaláciou tohto zariadenia si 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.

ཐོན་རྫས་འདི་བདེ་སྒྲུབ་མ་བྱས་གོང་། ་སྐོར་གྱི་ཡིད་གཟབ་
བྱ་འདྲ་མིན་ཡོད་པའི་འོད་སྟེར་བཤུད་གོས།

Bu ürünü kurmadan önce güvenlik bilgilerini okuyun.

ھەزكۇر مەھسۇلاتنى ئورنىتىشتىن بۇرۇن بىخەتەرلىك ئۇچۇرلىرىنى ئوقۇپ چىقىڭ.

Youq mwngz yungh canjbinj neix gaxgonq, itdingh aeu doeg aen
canjbinj soengq cungj vahgangj ancien siusik.

Safety statements

These statements provide the caution and danger information that is used in this documentation.

Important:

Each caution and danger statement in this documentation is labeled with a number. This number is used to cross reference an 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 documentation before you perform the procedures. Read any additional safety information that comes with your system 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.

Statement 8:

CAUTION:
Never remove the cover on a power supply or any part that has the following label attached.

Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

Statement 28:

CAUTION:
The battery is a lithium ion battery. To avoid possible explosion, do not burn the battery. Exchange it only with the approved part. Recycle or discard the battery as instructed by local regulations.

N2225 and N2226 SAS/SATA HBAs

1 Overview

The N2225 and N2226 SAS/SATA HBAs are Serial Attached SCSI (SAS) host bus adapters (HBAs) that provide high-performance external storage connectivity for servers and workstations. The N2225 HBA provides eight lanes of 12Gb/s SAS connectivity and is matched with eight lanes of PCI Express® (PCIe®) 3.0 8Gb/s performance. The N2226 HBA provides sixteen lanes of 12Gb/s SAS connectivity and is matched with eight lanes of PCIe 3.0 8Gb/s performance.

These HBAs are based on the Fusion-MPT™-architected LSI SAS 3008 controller that integrates the latest enhancements in PCIe 3.0 technology and 12Gb/s SAS technology. The HBAs have onboard Flash memory for the firmware.

2 HBA Features

The following sections list the features for these HBAs.

2.1 N2225 HBA Features

- Implements one LSI® SAS 3008 eight-port 12Gb/s SAS to PCIe 3.0 controller
- Supports eight-lane, full-duplex PCIe 3.0 performance
- Supports eight external 12Gb/s SATA+SAS ports
- Supports SATA link rates of 3Gb/s and 6Gb/s
- Supports SAS link rates of 3Gb/s, 6Gb/s, and 12Gb/s
- Provides two x4 external mini-SAS HD connectors (SFF-8644)
- Supports passive copper cables
- Supports up to 1024 SATA or SAS end devices
- Offered with a full-height bracket and a low-profile vented bracket
- Provides one heartbeat LED

2.2 N2226 HBA Features

- Implements two LSI SAS 3008 eight-port 12Gb/s SAS to PCIe 3.0 controllers
- Supports eight-lane, full-duplex PCIe 3.0 performance
- Supports sixteen external 12Gb/s SATA+SAS ports
- Supports SATA link rates of 3Gb/s and 6Gb/s
- Supports SAS link rates of 3Gb/s, 6Gb/s, and 12Gb/s
- Provides four x4 external mini-SAS HD connectors (SFF-8644)
- Supports passive copper cables
- Supports up to 1024 SATA or SAS end devices
- Offered with a full-height bracket
- Provides two heartbeat LEDs

3 Functional Descriptions

3.1 PCIe Interface

PCIe is a high-speed standard local bus for point-to-point interfacing of I/O components to the processor and the memory subsystems in high-end computers and servers. The N2225 HBA uses one LSI SAS 3008 controller chip and one PCIe switch to provide high-bandwidth interconnection ability. The N2226 HBA uses two LSI SAS 3008 controller chips and one PCIe switch to provide high-bandwidth interconnection ability.

Both the HBAs supports eight-lane PCIe performance up to 64Gb/s single direction and up to 128Gb/s dual direction.

3.2 SAS Interface

The LSI SAS 3008 controller chip contains the SATA+SAS functionality for the HBAs. The following table shows the LSI SAS 12Gb/s SAS performance.

Half Duplex	Full Duplex
Narrow port (one lane), 1200 MB/s	Narrow port (one lane), 2400 MB/s
Wide port (four lanes), 4800 MB/s	Wide port (four lanes), 9600 MB/s

4 Operating System Support

To check for the latest list of supported operating systems and to download the device drivers for those operating systems, see http://www.ibm.com/systems/support/.

5 HBA Characteristics

5.1 Flash

The N2225 HBA provides one 4-M × 16-bit Flash ROMs to store the firmware and the BIOS.

The N2226 HBA provides two 4-M × 16-bit Flash ROMs to store the firmware and the BIOS.

5.2 LED

The N2225 HBA Heartbeat LED, CR1, blinks green to indicate the HBA is capable of general activity.

The N2226 HBA Heartbeat LEDs, CR3 and CR4, blink green to indicate the HBA is capable of general activity.

5.3 Connectors

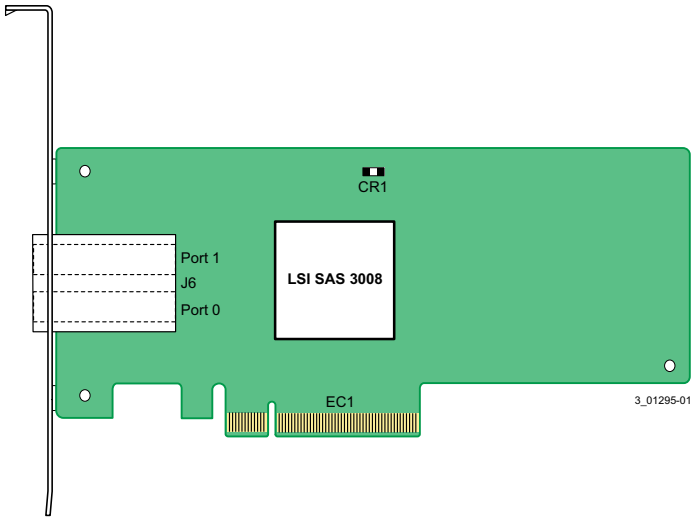
- **PCIe Connector (EC1).** The N2226 and N2225 HBAs support a x8 interface. The PCIe host interface connection is through the edge connector, EC1, which provides connections on both the top (EC1 B) and bottom (EC1 A) of the board. The signal definitions and pin numbers conform to the PCIe specification.
- **SATA+SAS Connectors**
  - **N2225 SATA+SAS (J6)**– The N2225 HBA supports SATA and SAS connectors through connectors that are SFF-8644 mini-SAS HD, external connectors. See Figure 1 for the connector locations.
  - **N2226 SATA+SAS (J6, J7)** – The N2226 HBA supports SATA and SAS connectors through connectors that are SFF-8644 mini-SAS HD, external connectors. See Figure 2 for the connector locations.
- **Auxiliary Power Connector (J5).** The N2226 HBA provides a 6-pin PCIe power connector.

5.4 Physical Characteristics

5.4.1 N2225 HBA Physical Characteristics

The N2225 SAS HBA is a 6.6-in. × 2.7-in., low-profile board. The component height on the top and bottom of the HBA is in accordance with the PCIe specification. The following figure shows the HBA board layout.

Figure 1 N2225 SAS/SATA HBA Board Layout

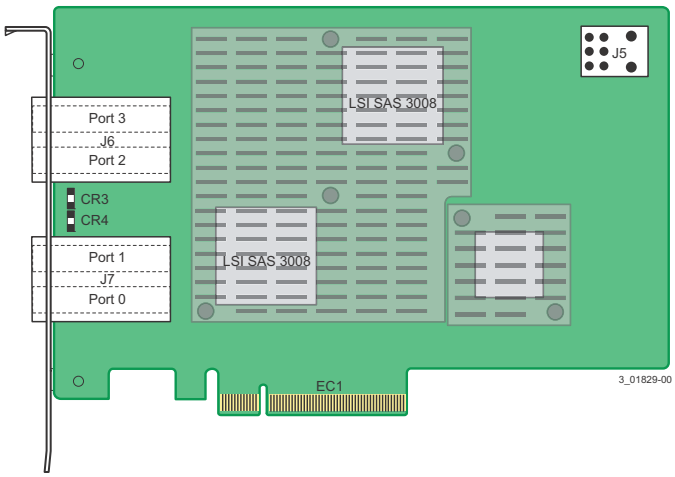


- **EC1** – PCIe x8 board edge connector
- **CR1** – Heartbeat LED
- **J6** – SFF-8644 mini-SAS HD, external, right-angle connectors

5.4.2 N2226 HBA Physical Characteristics

The N2226 SAS HBA is a 6.6-in. × 4.4-in board. The component height on the top and bottom of the HBA is in accordance with the PCIe specification. The following figure shows the HBA board layout.

Figure 2 N2226 SAS/SATA HBA Board Layout



- **EC1** – PCIe x8 board edge connector
- **CR3, CR4** – Heartbeat LEDs
- **J5** – Auxiliary power connector
- **J6, J7** – SFF-8644 mini-SAS HD, external, right-angle connectors

5.5 Electrical Characteristics

5.5.1 N2225 HBA Electrical Characteristics

The power requirements for the N2225 HBA under normal operation are as follows:

- PCIe 12.0 V = 1.07 A
- Power values:
  - Nominal = 14.5 W
  - Worst case = 22.5 W

5.5.2 N2226 HBA Electrical Characteristics

The power requirements for the N2226 HBA under normal operation are as follows:

- PCIe 12.0 V = 2.35 A
- PCIe 3.3 V = 0.13 A
- Power values:
  - Nominal = 28.6 W
  - Worst case = 35.4 W

5.6 Thermal and Atmospheric Limits

The atmospheric limits for the HBAs are as follows:

- Temperature range: 0 °C to 55 °C (32 °F to 131 °F) (dry bulb)

- Relative humidity range: 5% to 90% noncondensing
- Maximum dew point temperature: 32 °C (89.6 °F)
- Minimum airflow
  - **N2225 HBA**:
    - 200 linear feet per minute
  - **N2226 HBA**:
    - 220 LFPM at 35 °C inlet temperature
    - 270 LFPM at 45 °C inlet temperature
    - 350 LFPM at 55 °C inlet temperature

The following limits define the storage and transit environment for the HBAs:

- Temperature range: –45 °C to +105 °C (–49 °F to +221 °F) (dry bulb)
- Relative humidity range: 5% to 90% noncondensing

6 HBAs Certifications and Safety Characteristics

The HBAs meet or exceed the requirements of UL flammability rating 94V-0. Each bare board is marked with the supplier's name or trademark, type, and UL flammability rating. Because these boards are installed in a PCIe bus slot, all voltages are less than the SELV 42.4-V limit.

The design and implementation of the HBAs minimize electromagnetic emissions, susceptibility to radio frequency energy, and the effects of electrostatic discharge.

The HBAs meet the following integrated electromagnetic interference (EMI) compliance labels:

- CE mark
- CISPR Class B
- C-Tick mark
- Canadian Compliance Statement
- FCC Class B, marked with the FCC Self-Certification logo
- Japan VCCI
- Korean KCC
- Taiwan BSMI

The HBAs meet the following environmental directives:

- RoHS
- WEEE

7 Hardware Installation Instructions

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.	

To install the HBAs, follow these steps:

1. **Unpack the HBA and inspect if for damage**. If it appears damaged, or if any of the following items are missing, contact your place of purchase. The HBA is shipped with the following items:
   - A CD containing an electronic version of this User's Guide and other related documentation.
   - Warranty information

ATTENTION Make a backup of your data before changing your system configuration to avoid the risk of data loss.

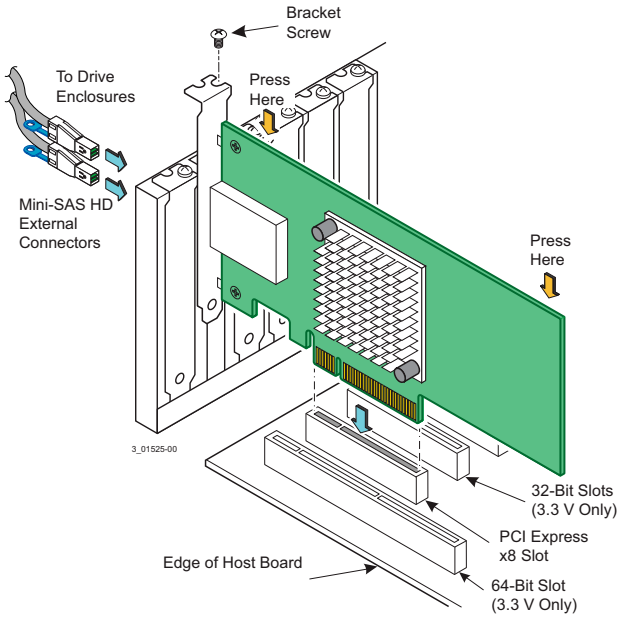
2. **Prepare the computer.** Turn off the computer, and disconnect the power cord from the rear of the power supply.

CAUTION Disconnect the computer from the power supply and from any networks to which you will install the HBA, or you risk damaging the system or experiencing electrical shock.

3. **Remove the cover from the chassis.**
4. **Check the mounting bracket on the HBA (system-dependent).** If required for your system, replace the full-height mounting bracket that ships on the HBA with the low-profile bracket supplied.
5. **Insert the HBA into an available PCIe slot.**
   a. **For N2225 ONLY.** Locate an empty x8 PCIe slot. Remove the blank bracket panel on the rear of the computer that aligns with the empty PCIe slot. Save this bracket screw, if applicable. Align the HBA to a PCIe slot. Press down gently, but firmly, to seat the HBA correctly in the slot. The following figures show how to insert the HBA into a PCIe slot.

NOTE The shape, size, and locations of the components on your HBAs and its bracket might vary from this illustration. The HBAs require a x8 PCIe slot.

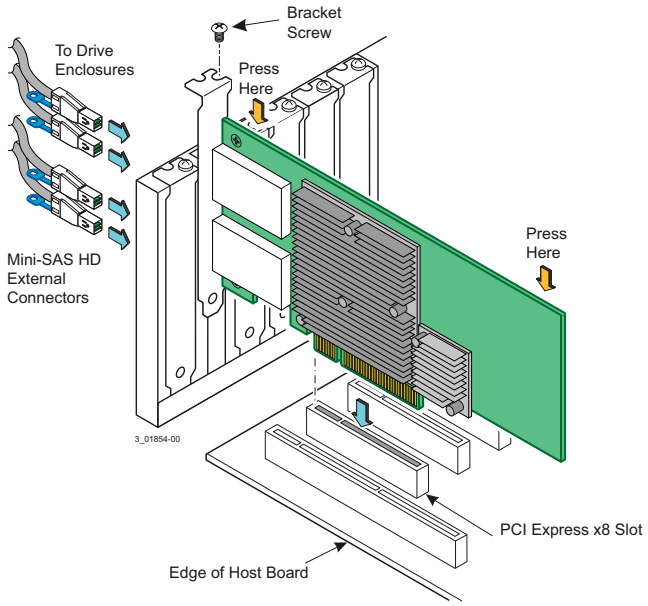
Figure 3 Install an N2225 HBA in a PCIe Slot



   a. **For N2226 ONLY.** Locate an empty x8 PCIe slot. The N2226 is a high power HBA and must be installed in a 75W slot, or an external power connector cable must be installed from the N2226 to the server. Remove the blank bracket panel on the rear of the computer that aligns with the empty PCIe slot. Save this bracket screw, if applicable. Align the HBA to a PCIe slot. Press down gently, but firmly, to seat the HBA correctly in the slot. The following figures show how to insert the HBA into a PCIe slot.

NOTE The shape, size, and locations of the components on your HBAs and its bracket might vary from this illustration. The HBAs require a x8 PCIe slot.

Figure 4 Install an N2226 HBA in a PCIe Slot



6. **Secure the HBA bracket to the system's chassis.** Install the bracket screw, if applicable, or engage the system retention mechanism to secure the HBA to the system's chassis.
7. **Replace the cover of the chassis.**
8. **Connect SAS cables between the HBA and the SAS enclosure that contains SATA or SAS devices.** The N2225 HBA has two, SFF-8644, external x4 mini-SAS HD connectors. The N2226 HBA has four SFF-8644, external x4 mini-SAS HD connectors. Use a cable with an external mini-SAS HD connector (SFF-8644) on one end (to connect to the HBA) and the appropriate connector to attach to the enclosure that contains SAS or SATA devices on the other end.
9. **Replace the cover and any power cords, and power up the system.** Replace the chassis's cover, reconnect any power cords, and reconnect any network cables. Turn on the power.

The hardware installation of your SAS HBAs is complete.

8 Replaceable HBA Components

The field replaceable unit (FRU) part number for the N2225 HBA is 00AE914.

The field replaceable unit (FRU) part number for the N2226 HBA is 00AE918.

Appendix A: Getting Help and Technical Assistance

If you need help, service, or technical assistance or just want more information about Lenovo products, you will find a wide variety of sources available from Lenovo to assist you.

Use this information to obtain additional information about Lenovo and Lenovo products, and determine what to do if you experience a problem with your Lenovo system or optional device.

Note: This section includes references to IBM web sites and information about obtaining service. IBM is Lenovo's preferred service provider for the BladeCenter, System x, Flex System, and NeXtScale System products.

A.1 Before You Call

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

If you believe that you require warranty service for your Lenovo product, the service technicians will be able to assist you more efficiently if you prepare before you call.

- 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.
- Check for updated software, firmware, and operating-system device drivers for your Lenovo product. The Lenovo Warranty terms and conditions state that you, the owner of the Lenovo product, are responsible for maintaining and updating all software and firmware for the product (unless it is covered by an additional maintenance contract). Your service technician will request that you upgrade your software and firmware if the problem has a documented solution within a software upgrade.
- If you have installed new hardware or software in your environment, check http://www.ibm.com/systems/info/x86servers/serverproven/compat/us to make sure that the hardware and software is supported by your product.
- Go to http://www.ibm.com/supportportal to check for information to help you solve the problem.
- Gather the following information to provide to the service technician. This data will help the service technician quickly provide a solution to your problem and ensure that you receive the level of service for which you might have contracted.
  - Hardware and Software Maintenance agreement contract numbers, if applicable
  - Machine type number (Lenovo 4-digit machine identifier)
  - Model number
  - Serial number
  - Current system UEFI and firmware levels
  - Other pertinent information such as error messages and logs
- Go to http://www.ibm.com/support/entry/portal/Open_service_request to submit an Electronic Service Request. Submitting an Electronic Service Request

will start the process of determining a solution to your problem by making the pertinent information available to the service technicians. The IBM service technicians can start working on your solution as soon as you have completed and submitted an Electronic Service Request.

You can solve many problems without outside assistance by following the troubleshooting procedures that Lenovo provides in the online help or in the Lenovo product documentation. The Lenovo product documentation also describes the diagnostic tests that you can perform. The documentation for most systems, operating systems, and programs 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.

A.2 Using the Documentation

Information about your Lenovo system and preinstalled software, if any, or optional device is available in the product documentation. 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. Lenovo 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/supportportal.

A.3 Getting Help and Information from the World Wide Web

Up-to-date information about Lenovo products and support is available on the World Wide Web.

On the World Wide Web, up-to-date information about Lenovo systems, optional devices, services, and support is available at http://www.ibm.com/supportportal. The most current version of the Flex System product documentation is available at http://pic.dhe.ibm.com/infocenter/flexsys/information/index.jsp.

A.4 Software service and support

Through IBM Support Line, you can get telephone assistance, for a fee, with usage, configuration, and software problems with your Lenovo 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).

A.5 Hardware service and support

IBM is Lenovo's preferred service provider for the BladeCenter, System x, Flex System and NeXtScale System products.

You can receive hardware service through your Lenovo reseller or from IBM. To locate a reseller authorized by Lenovo to provide warranty service, go to http://www.ibm.com/partnerworld and click **Business Partner Locator**. 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.

A.6 Taiwan product service

IBM is Lenovo's preferred service provider for the BladeCenter, System x, Flex System and NeXtScale System products. Use this information to contact 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

Lenovo may not offer the products, services, or features discussed in this document in all countries. Consult your local Lenovo representative for information on the products and services currently available in your area.

Any reference to a Lenovo product, program, or service is not intended to state or imply that only that Lenovo product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any Lenovo intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any other product, program, or service.

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Morrisville, NC 27560
U.S.A.
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B.2 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 1 024 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 Lenovo.

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

Each solid-state memory cell has an intrinsic, finite number of write cycles that the cell can incur. Therefore, a solid-state device has a maximum number of write cycles that it can be subjected to, expressed as `total bytes written` (TBW). A device that has exceeded this limit might fail to respond to system-generated commands or might be incapable of being written to. Lenovo is not responsible for replacement of a device that has exceeded its maximum guaranteed number of program/erase cycles, as documented in the Official Published Specifications for the device.

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

B.3 Recycling information

Lenovo encourages owners of information technology (IT) equipment to responsibly recycle their equipment when it is no longer needed. Lenovo offers a variety of programs and services to assist equipment owners in recycling their IT products. For information on recycling Lenovo products, go to:
http://www.lenovo.com/recycling.

B.4 Telecommunication regulatory statement

This product may not be certified in your country for connection by any means whatsoever to interfaces of public telecommunications networks. Further certification may be required by law prior to making any such connection. Contact a Lenovo representative or reseller for any questions.

B.5 Electronic emission notices

When you attach a monitor to the equipment, you must use the designated monitor cable and any interference suppression devices that are supplied with the monitor.

B.5.1 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. Lenovo 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 might cause undesired operation.

B.5.2 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.

B.5.3 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.

B.5.4 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. Lenovo cannot accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the installation of option cards from other manufacturers.

This product has been tested and found to comply with the limits for Class A Information Technology Equipment according to 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.

Lenovo, Einsteinova 21, 851 01 Bratislava, Slovakia

B.5.5 Germany Class A statement

Deutschsprachiger EU Hinweis: Hinweis für Geräte der Klasse A EU-Richtlinie zur Elektromagnetischen Verträglichkeit

Deutschsprachiger EU Hinweis: Hinweis für Geräte der Klasse A EU-Richtlinie zur Elektromagnetischen Verträglichkeit Dieses Produkt entspricht den Schutzanforderungen der EU-Richtlinie 2004/108/EG (früher 89/336/EWG) 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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Deutschland:

Einhaltung des Gesetzes über die elektromagnetische Verträglichkeit von Betriebsmittein Dieses Produkt entspricht dem „Gesetz über die elektromagnetische Verträglichkeit von Betriebsmitteln" EMVG (früher „Gesetz über die elektromagnetische Verträglichkeit von Geräten"). Dies ist die Umsetzung der EU-Richtlinie 2004/108/EG (früher 89/336/EWG) in der Bundesrepublik Deutschland.

Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Betriebsmitteln, EMVG vom 20. Juli 2007 (früher Gesetz über die elektromagnetische Verträglichkeit von Geräten), bzw. der EMV EG Richtlinie 2004/108/EC (früher 89/336/EWG), 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 nach Paragraf 5 des EMVG ist die Lenovo (Deutschland) GmbH, Gropiusplatz 10, D-70563 Stuttgart.

Informationen in Hinsicht EMVG Paragraf 4 Abs. (1) 4: **Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55022 Klasse A.**

Nach der EN 55022: „Dies ist eine Einrichtung der Klasse A. Diese Einrichtung kann im Wohnbereich Funkstörungen verursachen; in diesem Fall kann vom Betreiber verlangt werden, angemessene Maßnahmen durchzuführen und dafür aufzukommen."

Nach dem EMVG: „Geräte dürfen an Orten, für die sie nicht ausreichend entstört sind, nur mit besonderer Genehmigung des Bundesministers für Post und Telekommunikation oder des Bundesamtes für Post und Telekommunikation betrieben werden. Die Genehmigung wird erteilt, wenn keine elektromagnetischen Störungen zu erwarten sind." (Auszug aus dem EMVG, Paragraph 3, Abs. 4). Dieses Genehmigungsverfahren ist nach Paragraph 9 EMVG in Verbindung mit der entsprechenden Kostenverordnung (Amtsblatt 14/93) kostenpflichtig.

Anmerkung: Um die Einhaltung des EMVG sicherzustellen sind die Geräte, wie in den Handbüchern angegeben, zu installieren und zu betreiben.

B.5.6 Japan VCCI Class A statement

この装置は、クラス A 情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。 VCCI-A

This is a Class A product based on the standard of the Voluntary Control Council for Interference (VCCI). If this equipment is used in a domestic environment, radio interference may occur, in which case the user may be required to take corrective actions.

B.5.7 Korea Communications Commission (KCC) statement

이 기기는 업무용(A급)으로 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

This is electromagnetic wave compatibility equipment for business (Type A). Sellers and users need to pay attention to it. This is for any areas other than home.

B.5.8 Russia Electromagnetic Interference (EMI) Class A statement

ВНИМАНИЕ! Настоящее изделие относится к классу А.
В жилых помещениях оно может создавать радиопомехи, для снижения которых необходимы дополнительные меры

B.5.9 People's Republic of China Class A electronic emission statement

中华人民共和国“A类”警告声明

声 明

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

B.5.10 Taiwan Class A compliance statement

警告使用者:
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