



N2215 SAS/SATA HBA for IBM System x User's Guide

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Important:

Each caution and danger statement in this document 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 document before you perform the procedures. Read any additional safety information that comes with the server or optional device before you install the device.

This device is intended for use with UL Listed IBM devices.

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:



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

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.

N2215 SAS/SATA HBA for IBM System x User's Guide

1 Overview

The N2215 SAS/SATA HBA for IBM® System x® is a host bus adapter (HBA) that provides high-performance internal storage connectivity for servers and workstations. The HBA provides eight lanes of 12Gb/s SAS storage connectivity and is matched with eight lanes of PCIe 3.0 8Gb/s host connectivity. The low-profile design of the SAS HBA includes a full-height bracket and low-profile mounting bracket that creates a universal fit for any server. The HBA is 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 HBA has integrated Flash memory for the firmware and BIOS.

2 HBA Features

This section lists the HBA features.

- Implements one LSI SAS 3008 eight-port 12Gb/s to PCIe 3.0 controller
- Supports eight-lanes, full-duplex PCIe 3.0 performance
- Supports eight internal 12Gb/s SATA+SAS ports
- Supports SATA link rates of 3.0Gb/s, and 6.0Gb/s
- Supports SAS link rates of 3.0Gb/s, 6.0Gb/s, and 12.0Gb/s
- Provides two x4 internal mini-SAS HD connectors (SFF-8643)
- Supports passive copper cable
- Supports up to 1024 SATA or SAS end devices
- Offers with a full-height bracket and low-profile vented bracket
- Provides one heartbeat LED

3 Functional Descriptions

3.1 PCI Express Host 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 a server. The LSI SAS 3008 controller chip contains the PCIe functionality for the HBA. The LSI SAS 3008 controller chip connects directly to the PCIe bus and generates timing and protocol in compliance with the PCIe specifications.

The HBA supports eight-lane PCIe performance up to 64Gb/s single direction and 128Gb/s dual direction.

3.2 SAS-3 Interface

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

Table 1 12 Gb/s SAS Bandwidths

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

The HBA supports the following operating systems: Microsoft Windows, Red Hat Enterprise Linux Server, SUSE Linux Enterprise Server, and VMware.

Refer to: <http://www.ibm.com/systems/info/x86servers/serverproven/compat/us/xseries/controllers/matrix.html> for details on the software versions and device driver support.

5 HBA Characteristics

5.1 Memory

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

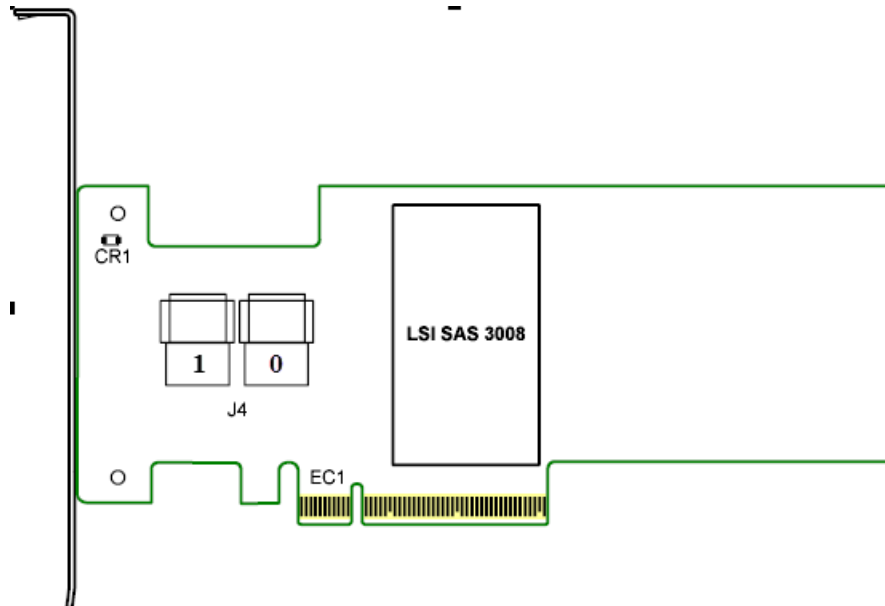
5.2 LED

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

5.3 Physical Characteristics

The HBA is a 167.65-mm x 68.58-mm (6.6-in. x 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 board layout.

Figure 1 HBA Board Layout



- EC1: PCIe x8-lane board edge connector
- CR1: Heartbeat LED
- J4: SFF-8643, mini-SAS HD, internal, right-angle, connectors

5.4 Connectors

This section describes the different connectors on the HBA.

PCIe Connector (EC1). The HBA supports a x8 interface. The PCIe connection is through the edge connector (EC1), which provides connections on both the top (EC1B) and bottom (EC1A) of the board. The signal definitions and pin numbers conform to the PCIe specification.

SATA+SAS Connectors (J4). The HBA supports SATA and SAS that are SFF-8643 mini-SAS HD, internal connectors.

5.5 Power Requirements

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

- PCIe 12.0 V = 1.59 A
- Power
 - Nominal = 15 W
 - Worst Case = 19.04 W

5.6 Thermal and Atmospheric Limits

The atmospheric limits for the HBA operation 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: 200 linear feet per minute

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

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

6 Hardware Installation

The installation instructions for the HBA follow.

Statement 1:



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- Connect to properly wired outlets any equipment that will be attached to this product.
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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.

1. **Unpack the HBA, and inspect it for damage.** Unpack the HBA in a static-free environment. Touch the static-protective package that contains the HBA to any unpainted surface on the outside of the server; then, grasp the HBA by the top edge or upper corners, remove it from the package, and inspect it for damage. Contact your IBM sales representative or IBM reseller if the HBA appears to be damaged.



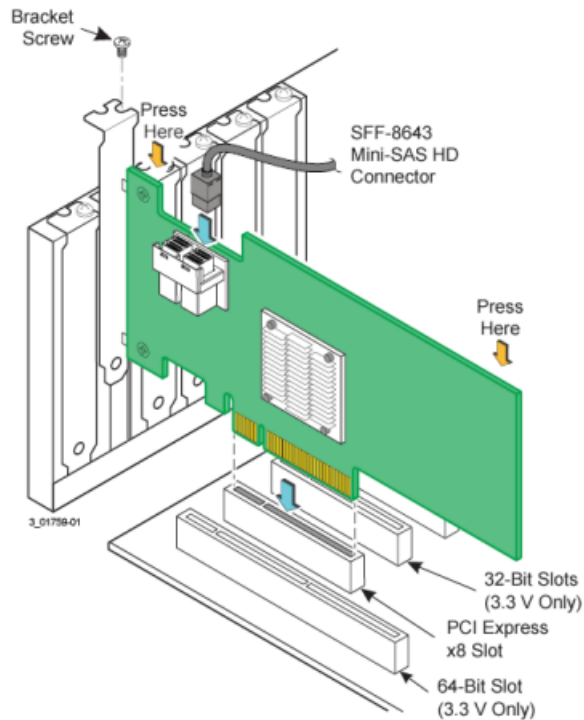
ATTENTION Make a backup of your data before changing your system configuration to avoid the risk of data loss.

2. **Prepare the server.** Turn off the server, and disconnect the power cord from the rear of the power supply.
3. **Remove the cover from the chassis.**

4. **Replace the mounting bracket (system dependent).** If required for your system, replace the full-height mounting bracket that ships on the HBA with the low-profile bracket supplied. Save and reuse the two screws that attach the long bracket to attach the short bracket.
5. **Insert the HBA in an available PCIe slot.** Locate an empty x8 PCIe slot. Remove the expansion-slot cover for the selected PCIe slot. Save the bracket screw, if applicable.

Align the HBA with a PCIe slot. Press down gently, but firmly, to correctly seat the HBA in the slot. The following figure shows how to insert the HBA in a PCIe slot.

Figure 2 Installing the HBA in a PCI Express Slot



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

6. **Secure the HBA bracket to the system chassis.** Install the bracket screw, if applicable, or engage the system retention mechanism to secure the HBA to the system chassis.
7. **Connect SAS cables between the HBA and the SAS backplane or any other SATA or SAS devices.** Connect serial cables between the HBA and the SAS backplane or any other SATA or SAS devices. The preceding figure shows the locations of the two internal x4 mini-SAS (SFF-8643) connectors on the HBA.
8. **Replace the cover and any power cords, and power on the system.** Replace the chassis cover, reconnect any power cords, and reconnect any network cables. Turn on the power.

The hardware installation of your HBA is complete.

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.

A.1 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.
- Go to the IBM support website at <http://www.ibm.com/supportportal/> 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.

A.2 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/supportportal/> and follow the instructions.

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

On the World Wide Web, the IBM website has up-to-date information about IBM systems, optional devices, services, and support. You can find service information for IBM systems and optional devices at <http://www.ibm.com/supportportal/>.

A.4 Software Service and Support

Through IBM Support Line, you can get telephone assistance, for a fee, with usage, configuration, and software problems. For information about which products are supported by Support Line in your country or region, see <http://www.ibm.com/services/supline/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

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 Business Partners** 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.

A.6 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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Linux is a registered trademark of Linus Torvalds in the United States, other countries, or both.

Microsoft, Windows, and Windows NT are trademarks of Microsoft Corporation in the United States, other countries, or both.

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

B.2 Important Notes

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.

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IBM makes no representations or warranties with respect to non-IBM products. Support (if any) for the non-IBM products is provided by the third party, not IBM.

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

This product is not intended to be connected directly or indirectly by any means whatsoever to interfaces of public telecommunications networks, nor is it intended to be used in a public services network.

B.3 Documentation Format

The publications for this product are in Adobe Portable Document Format (PDF) and should be compliant with accessibility standards. If you experience difficulties when you use the PDF files and want to request a web-based format or accessible PDF document for a publication, direct your mail to the following address:

*Information Development
IBM Corporation
205/A015
3039 E. Cornwallis Road
P.O. Box 12195
Research Triangle Park, North Carolina 27709-2195
U.S.A.*

In the request, be sure to include the publication part number and title.

When you send information to IBM, you grant IBM a nonexclusive right to use or distribute the information in any way it believes appropriate without incurring any obligation to you.

B.4 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.

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.

Attention: This is an EN 55022 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.

Responsible manufacturer:

International Business Machines Corp.
New Orchard Road
Armonk, New York 10504
914-499-1900

European Community contact:

IBM Deutschland GmbH
IBM Technical Regulations, Department M372
IBM-Allee 1, 71139 Ehningen, Germany
Telephone: +49 7032 15 2941
Email: lugi@de.ibm.com

Germany Class A statement

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 zur Angleichung der Rechtsvorschriften über die elektromagnetische Verträglichkeit in den EU-Mitgliedsstaaten und hält die Grenzwerte der EN 55022 Klasse A ein.

Um dieses sicherzustellen, sind die Geräte wie in den Handbüchern beschrieben zu installieren und zu betreiben. Des Weiteren dürfen auch nur von der IBM empfohlene Kabel angeschlossen werden. IBM übernimmt keine Verantwortung für die Einhaltung der Schutzanforderungen, wenn das Produkt ohne Zustimmung der IBM verändert bzw. wenn Erweiterungskomponenten von Fremdherstellern ohne Empfehlung der IBM gesteckt/eingebaut werden.

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Deutschland: Einhaltung des Gesetzes über die elektromagnetische Verträglichkeit von Geräten

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 Einhaltung der EMV Vorschriften ist der Hersteller:

International Business Machines Corp.
New Orchard Road
Armonk, New York 10504
914-499-1900

Der verantwortliche Ansprechpartner des Herstellers in der EU ist:

IBM Deutschland GmbH
Technical Regulations, Abteilung M372
IBM-Allee 1, 71139 Ehningen, Germany
Telephone: +49 7032 15-2941
E-mail: lugi@de.ibm.com

Generelle Informationen:

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

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.

Korea Communications Commission (KCC) statement

이 기기는 업무용(A급)으로 전자파적합기기로
서 판매자 또는 사용자는 이 점을 주의하시기
바라며, 가정외의 지역에서 사용하는 것을 목
적으로 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.

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

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。

Taiwan Class A compliance statement

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這是甲類的資訊產品，在
居住的環境中使用時，可
能會造成射頻干擾，在這
種情況下，使用者會被要
求採取某些適當的對策。