BladeCenter HS23 Blade Server Installation and User's Guide

Machine Types: 7875, 1929

Note

Before using this information and the product it supports, read the general information in Appendix B "Notices" on page 67, the *Warranty Information* document, and the *IBM Safety Information* and the *Environmental Notices and User Guide* documents on the IBM *Documentation* CD.

The most recent version of this document is available at http://www.ibm.com/supportportal/.

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.

ᠧᠢ ᠪᠦᠲᠦᠭᠡᠭ ᠢ ᠳᠡᠷᠡ ᠭᠡᠳᠡᠭ ᠢ

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་སྐྱོད་མ་བྱས་གོང་། སྐོར་གྱི་ཡིད་གཟབ་
བྱ་འདུ་མིན་ཡོད་པའི་འོད་སྟེར་བལྟ་དགོས།

Bu ürünü kurmadan önce güvenlik bilgilerini okuyun.

مەزكۇر 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 2

⚠

CAUTION:
When replacing the lithium battery, use only IBM Part Number 33F8354 or an equivalent type battery recommended by the manufacturer. If your system has a module containing a lithium battery, replace it only with the same module type made by the same manufacturer. The battery contains lithium and can explode if not properly used, handled, or disposed of.

Do not:

- **Throw or immerse into water**
- **Heat to more than 100°C (212°F)**
- **Repair or disassemble**

Dispose of the battery as required by local ordinances or regulations.

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

Statement 4
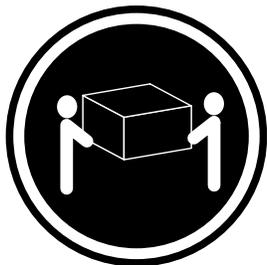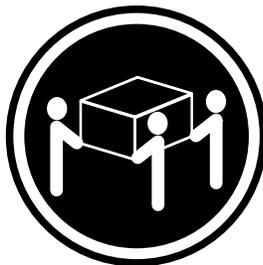
≥ 18 kg (39.7 lb)   ≥ 32 kg (70.5 lb)   ≥ 55 kg (121.2 lb)
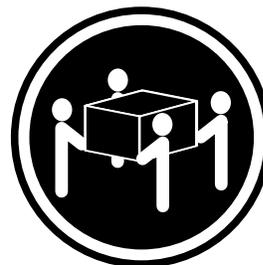
CAUTION:
Use safe practices when lifting.

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 12

CAUTION:
The following label indicates a hot surface nearby.

Statement 13

DANGER

> **Overloading a branch circuit is potentially a fire hazard and a shock hazard under certain conditions. To avoid these hazards, ensure that your system electrical requirements do not exceed branch circuit protection requirements. Refer to the information that is provided with your device for electrical specifications.**

Statement 21

CAUTION:
Hazardous energy is present when the blade is connected to the power source. Always replace the blade cover before installing the blade.

Statement 32

CAUTION:
To avoid personal injury, before lifting the unit, remove all the blades, power supplies, and removable modules to reduce the weight.
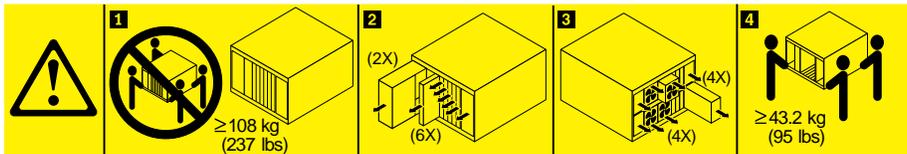
Statement 33

CAUTION:
This device does not provide a power control button. Removing power supply modules or turning off the server blades does not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.

Rack Safety Information, Statement 2

DANGER

- **Always lower the leveling pads on the rack cabinet.**
- **Always install stabilizer brackets on the rack cabinet.**
- **Always install servers and optional devices starting from the bottom of the rack cabinet.**
- **Always install the heaviest devices in the bottom of the rack cabinet.**

UL regulatory information

This device is for use only with supported blade chassis.

Chapter 1. Introduction

The IBM BladeCenter HS23 Types 7875 and 1929 blade server is compatible with IBMBladeCenter units. This high density, high performance, single-wide blade server is ideally suited for medium and large businesses. The IBM BladeCenter HS23 blade server supports up to two multi-core IntelXeon microprocessors and has sixteen memory-module slots, two hot-swappable storage-device bays, one Horizontal-compact-form-factor (CFFh) expansion card connector, one Vertical-combination-I/O (CIOv) connector, and one internal USB connector.

Note: Unless otherwise stated, references to the BladeCenter unit apply to all BladeCenter unit types.

This *Installation and User's Guide* provides information about:
• Setting up the blade server
• Starting and configuring the blade server
• Installing hardware options
• Installing the operating system
• Performing basic troubleshooting of the blade server

Packaged with this document are software CDs that help you to configure hardware, install device drivers, and install the operating system.

To download the latest device drivers, go to http://www.ibm.com/supportportal/.

The blade server comes with a limited warranty. For information about the terms of the warranty and getting service and assistance, see the *Warranty Information* document for your blade server. You can obtain up-to-date information about the blade server at http://www.ibm.com /systems/bladecenter/.

If firmware and documentation updates are available, you can download them from the IBM website. The blade server might have features that are not described in the documentation that comes with the blade server, 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 blade server documentation.

To check for updates, go to http://www.ibm.com/supportportal/.

You can subscribe to information updates specific to your blade server at http://www.ibm.com/support/mysupport/.

Note: The illustrations in this document might differ slightly from the hardware.

The following illustration shows an IBM BladeCenter HS23 blade server.

Release handle

Release buttons

Release handle
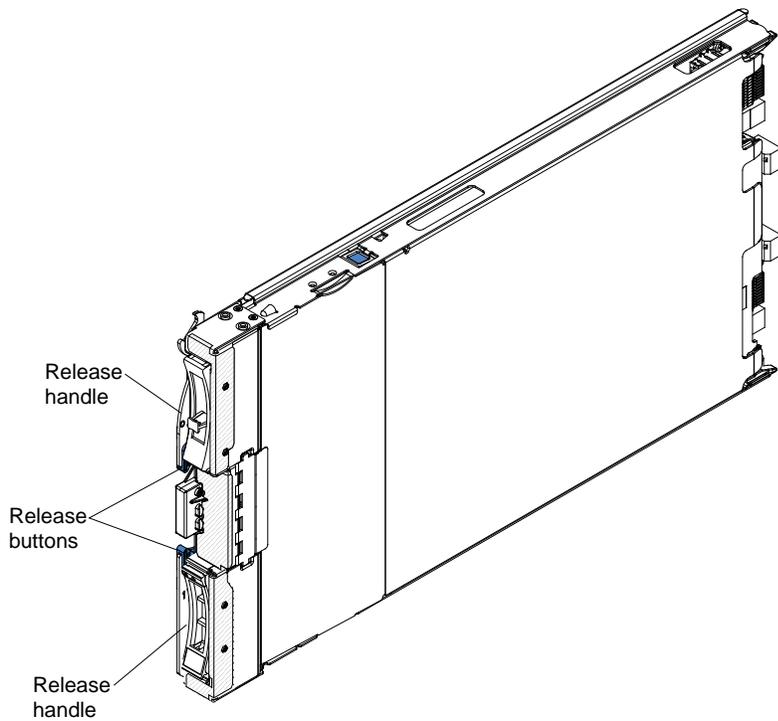
The model number and serial number are on the ID label on the side of the control panel on the front of the blade server, and on a label on the side of the blade server that is visible when the blade server is not in the BladeCenter unit.

Important: Do not place the label on the blade server itself or in any way block the ventilation holes on the blade server.

Serial number label
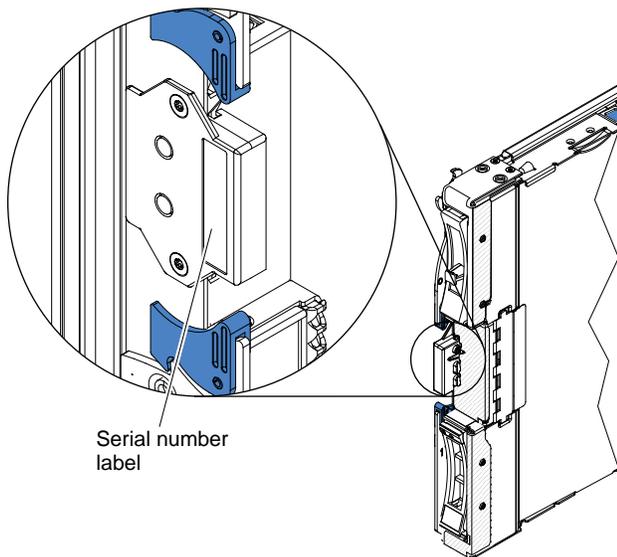
A set of blank labels for your blade server comes with the BladeCenter unit. When you install the blade server in the BladeCenter unit, write identifying information on a label and place the label on the BladeCenter unit bezel. See the documentation for your BladeCenter unit for recommended label placement.

Related documentation

Use this information to identify and locate related blade server documentation.

This *Installation and User's Guide* contains general information about the blade server, including how to install supported optional devices and how to configure the blade server. The following documentation is also available:

- *Safety Information*

  This document contains translated caution and danger statements. Each caution and danger statement that appears in the documentation has a number that you can use to locate the corresponding statement in your language in the *Safety Information* document.

- *Warranty Information*

  This document contains information about the terms of the warranty.

- *Environmental Notices and User Guide*

  This document contains translated environmental notices.

- *Integrated Management Module II User's Guide*

  This document explains how to use the functions of the IMM2 that is installed in an IBM server. The IMM2 works with IBM UEFI firmware to provide systems-management capability for System x® servers and blade servers.

- *Advanced Management Module Messages Guide*

  This document provides a complete list of all non-device specific events and recommended actions, sorted by event ID. Device specific event information is in the documentation for the device.

- *Advanced Management Module Command-Line Interface Reference Guide*

  This document explains how to use the advanced management module command-line interface (CLI) to directly access the BladeCenter management functions. The command-line interface also provides access to the text-console command prompt on each blade server through a Serial over LAN (SOL) connection.

- *Advanced Management Module Messages Guide*

  This document provides a complete list of all non-device-specific events and recommended actions, sorted by event ID. For event information that is specific to this blade server, see the *Problem Determination and Service Guide* for more information.

- *Safety Labels*

  This document is in PDF on the IBM *System x Documentation* CD. This document provides the Simplified Chinese, Mongolian, Tibetan, Uygur, and Zhuang translated versions of the product safety labels.

In addition to the documentation in this library, be sure to review the *Planning and Installation Guide* for your BladeCenter unit for information to help you prepare for system installation and configuration.

To check for updated documentation and technical updates, go to http://www.ibm.com/supportportal/.

The IBM Documentation CD

Use the IBM Documentation CD to access the blade server documentation in PDF format.

The IBM*Documentation* CD contains documentation for your blade server in Portable Document Format (PDF) and includes the IBM Documentation Browser to help you find information quickly.

You can run the IBM*Documentation* CD on any computer that meets the hardware and software requirements.

Hardware and software requirements

Use this information to determine the minimum hardware and software requirements for the blade server.

The IBM*Documentation* CD requires the following minimum hardware and software:
* MicrosoftWindows XP, Windows 2000, or Red Hat Enterprise Linux 5 Server
* 100 MHz microprocessor
* 32 MB of RAM
* Adobe Acrobat Reader 3.0 (or later) or xpdf, which comes with Linux operating systems

Using the Documentation Browser

Use these instructions to start the Documentation Browser.

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

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

* If Autostart is enabled, insert the CD into the CD drive. The Documentation Browser starts automatically.

* If Autostart is disabled or is not enabled for all users, use one of the following procedures:

    – If you are using a Windows operating system, insert the CD into the CD or DVD drive and click **Start → Run**. In the **Open** field, type
      `e:\win32.bat`
      where *e* is the drive letter of the CD or DVD drive, and click **OK**.

    – If you are using Red Hat Linux, insert the CD into the CD or DVD drive; then, run the following command from the `/mnt/cdrom` directory:
      `sh runlinux.sh`

Select your blade server from the **Product** menu. The **Available Topics** list displays all the documents for your blade server. Some documents might be in folders. A plus sign (+) indicates each folder or document that has additional documents under it. Click the plus sign to display the additional documents.

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

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

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

Notices and statements in this document

Use this information to understand the most common documentation notices and statements and how they are used.

The caution and danger statements in this document are also in the multilingual *Safety Information* document, which is on the IBM*Documentation* CD. Each statement is numbered for reference to the corresponding statement 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 possible 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

Use this table to view specific information about the blade server, such as blade server hardware features and the dimensions of the blade server.

Notes:

1. Power, cooling, removable-media drives, external ports, and advanced system management are provided by the BladeCenter unit.
2. The operating system in the blade server must provide USB support for the blade server to recognize and use USB media drives and devices. The BladeCenter unit uses USB for internal communications with these devices.

The following table is a summary of the features and specifications of the blade server.

Table 1. Features and specifications

Microprocessor: Supports up to two multi-core IntelXeon microprocessors. **Note:** Use the Setup utility to determine the type and speed of the microprocessors in the blade server. **Memory:** • 16 dual inline memory module (DIMM) connectors • Type: Very Low Profile (VLP) double-data rate (DDR3) DRAM. Supports 4 GB, 8 GB, and 16 GB DIMMs with up to 256 GB of total memory on the system board **Integrated functions:** • Horizontal-compact-form-factor (CFFh) expansion card interface • Vertical-combination-I/O (CIOv) expansion card interface • Local service processor: Integrated Management Module II (IMM2) with Intelligent Platform Management Interface (IPMI) firmware • Integrated Renesas SH7757 IMM2 video controller • SAS controller • Integrated keyboard/video/mouse (cKVM) controller through IMM2 • Light path diagnostics • RS-485 interface for communication with the management module • USB 2.0 for communication with cKVM and removable media drives (an external USB port is not supported) • Serial over LAN (SOL) • Wake on LAN (WOL) • Redundant buses for communication with keyboard, mouse, and removable media drives	**Predictive Failure Analysis (PFA) alerts:** • Microprocessors • Memory • Storage drives **Electrical input:** 12 V dc **Environment:** • Air temperature: – Blade server on: 10°C to 35°C (50°F to 95°F). Altitude: 0 m to 914.4 m (0 ft to 3000 ft) – Blade server on: 10°C to 32°C (50°F to 89.6°F). Altitude: 914.4 m to 2133.6 m (3000 ft to 7000 ft) – Blade server off: 10°C to 43°C (50°F to 109.4°F). Altitude: 914.4 m to 2133.6 m (3000 ft to 7000 ft) – Blade server shipping: -40°C to 60°C (-40°F to 140°F) • Humidity: – Blade server on: 8% to 80% – Blade server off: 8% to 80% – Blade server storage: 5% to 80% – Blade server shipment: 5% to 100% • E5-2697 V2 and E5-2690 V2 will reach their maximum operating temperature and throttle at ambient 31°C in Blade Center H chassis, when being fully exercised.	**Drives:** Supports up to two hot-swap, small form factor (SFF) Serial Attached SCSI (SAS) or Serial ATA (SATA) storage drives **Size:** • Height: 24.5 cm (9.7 inches) • Depth: 44.6 cm (17.6 inches) • Width: 2.9 cm (1.14 inches) • Maximum weight: 17.81 kg (39.25 lb) **NEBS Environment** • Air temperature: – Blade server on: 5°C to 40°C (41°F to 104°F). Altitude: -60 m to 1800 m (-197 ft to 6000 ft) – Blade server on: 5°C to 30°C (41°F to 86°F). Altitude: 1800 m to 4000 m (6000 ft to 13000 ft) – Blade server off: -5°C to 55°C (23°F to 131°F). Altitude: -60 m to 1800 m (-197 ft to 6000 ft) – Blade server off: -5°C to 45°C (23°F to 113°F). Altitude: 1800 m to 4000 m (6000 ft to 13000 ft) – Blade server storage: -40°C to 60°C (-40°F to 140°F) • Humidity: 8% to 85% • Particulate contamination: **Attention:** Airborne particulates and reactive gases acting alone or in combination with other environmental factors such as humidity or temperature might pose a risk to the server. For information about the limits for particulates and gases, see "Particulate contamination" on page 68.

What your blade server offers

Your blade server offers features, such as, the Integrated Management Module II (IMM2), storage disk drive support, IBM® Director, IBM Enterprise X-Architecture, microprocessor technology, integrated network support, I/O expansion, large system-memory capacity, light path diagnostics, PCI Express, and power throttling.

• **Integrated Management Module II (IMM2)**

  The integrated management module II (IMM2) combines service processor functions, video controller, the remote presence, and blue-screen capture features in a single chip. The IMM2 provides advanced

service-processor control, monitoring, and alerting function. If an environmental condition exceeds a threshold or if a system component fails, the IMM2 lights LEDs to help you diagnose the problem, records the error in the IMM2 system event log, and alerts you to the problem.

Optionally, the IMM2 also provides a virtual presence capability for remote systems management capabilities. The IMM2 provides remote systems management through industry-standard interfaces:

– Common Information Model (CIM)

– Intelligent Platform Management Interface (IPMI) version 2.0

– Simple Network Management Protocol (SNMP) version 3.0

– Web browser

- **Hard disk drive support**

  The blade server supports up to two 2.5-inch hot-swap SAS SFF hard disk drives. You can implement RAID 0 or RAID 1 for the drives.

- **IBM Systems Director**

  IBM Systems Director is a platform-management foundation that streamlines the way you manage physical and virtual systems in a heterogeneous environment.

  By using industry standards, IBM Systems Director supports multiple operating systems and virtualization technologies for IBM and non-IBM x86 platforms. For more information, see "IBM Systems Director" on page 9.

- **IBM *ServerGuide Setup and Installation* CD**

  The *ServerGuide Setup and Installation* CD provides programs to help you set up the blade server and install a Windows operating system. The ServerGuide program detects installed optional hardware devices and provides the correct configuration programs and device drivers. For more information about the *ServerGuide Setup and Installation* CD, see "Using the ServerGuide Setup and Installation CD" on page 49.

- **Microprocessor technology**

  The blade server supports up to two IntelXeon microprocessors. For more information about supported microprocessors and their part numbers, see the *Problem Determination and Service Guide*.

- **Integrated network support**

  The integrated Emulex BE3 dual-port Gigabit Ethernet controller supports connections to a 10 Mbps, 100 Mbps, or 1000 Mbps network through an Ethernet-compatible switch module in the chassis. The controller also supports Wake on LAN® technology.

  The blade server has connectors on the system board for optional expansion adapters for adding network communication capabilities to the blade server. Depending on the model, you can install up to two I/O expansion adapters for network support. This provides the flexibility to install expansion adapters that support a variety of network communication technologies.

- **I/O expansion**

  The blade server has connectors on the system board for optional expansion cards for adding more network communication capabilities to the blade server.

- **Large system-memory capacity**

  The blade server system board supports up to 256 GB of system memory. The memory controller provides support for up to sixteen industry-standard registered ECC DDR3 on Very Low Profile (VLP) form factor DIMMs installed on the system board. For the most current list of supported DIMMs, see the ServerProven list at http://www.ibm.com /systems/info/x86servers/ serverproven/compat/us/.

- **Light path diagnostics**

  Light path diagnostics provides light-emitting diodes (LEDs) to help you diagnose problems. For more information, see the *Problem Determination and Service Guide*.

- **PCI Express**

  PCI Express is a serial interface that is used for chip-to-chip interconnect and expansion adapter interconnect. With the blade expansion connector you can add optional I/O and storage devices.

- **Power throttling**

  Each blade server is powered by two Enterprise Voltage Regulator-Down (EVRD) 12.0 voltage regulators. By enforcing a power policy known as power-domain oversubscription, the BladeCenter unit can share the power load between two power modules to ensure sufficient power for each device in the BladeCenter unit. This policy is enforced when the initial power is applied to the BladeCenter unit or when a blade server is inserted into the BladeCenter unit.

  The following settings for this policy are available:

  – Redundant without performance impact

  – Redundant with performance impact

  – Non-redundant

  You can configure and monitor the power environment by using the Advanced Management Module. For more information about configuring and using power throttling, see the Advanced-Management-Module documentation or http://www.ibm.com/supportportal/.

Reliability, availability, and serviceability features

Reliability, availability, and serviceability features help to ensure the integrity of the data that is stored in the blade server, the availability of the blade server when you need it, and the ease with which you can diagnose and correct problems.

Three of the most important features in server design are reliability, availability, and serviceability (RAS). These RAS features help to ensure the integrity of the data that is stored in the blade server, the availability of the blade server when you need it, and the ease with which you can diagnose and correct problems.

The blade server has the following RAS features:

- Advanced Configuration and Power Interface (ACPI)
- Built-in diagnostics using DSA Preboot, which is stored in integrated USB memory
- Built-in monitoring for temperature, voltage, and hard disk drives
- Customer support center 24 hours per day, 7 days a week[1]
- Customer upgrade of Flash ROM-resident code and diagnostics
- Customer-upgradeable Unified Extensible Firmware Interface (UEFI) code and diagnostics
- ECC protected DDR3 memory
- ECC protection on the L2 cache
- Error codes and messages
- Hot-swap SAS storage drives
- Integrated Management Module (IMM)
- Light path diagnostics
- Memory parity testing
- Microprocessor built-in self-test (BIST) during power-on self-test (POST)
- Microprocessor serial number access
- PCI PMI 2.2
- POST
- Power policy 24-hour support center
- Processor presence detect
- ROM resident diagnostics

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1. Service availability will vary by country. Response time will vary depending on the number and nature of incoming calls.

- Service processor that communicates with the Advanced Management Module to enable remote blade server management
- System error logging
- Vital product data (VPD) on memory
- Wake on LAN capability
- Wake on PCI (PME) capability
- Wake on USB 2.0 capability

IBM Systems Director

Use this information to understand how IBM Systems Director works with the blade server.

IBM Systems Director is a platform-management foundation that streamlines the way you manage physical and virtual systems in a heterogeneous environment.

By using industry standards, IBM Systems Director supports multiple operating systems and virtualization technologies in IBM and non-IBM x86 platforms.

Through a single user interface, IBM Systems Director provides consistent views for viewing managed systems, determining how these systems relate to one another, and identifying their statuses, helping to correlate technical resources with business needs. A set of common tasks that are included with IBM Systems Director provides many of the core capabilities that are required for basic management, which means instant out-of-the-box business value. These common tasks include discovery, inventory, configuration, system health, monitoring, updates, event notification, and automation for managed systems.

The IBM Systems Director web and command-line interfaces provide a consistent interface that is focused on driving these common tasks and capabilities:
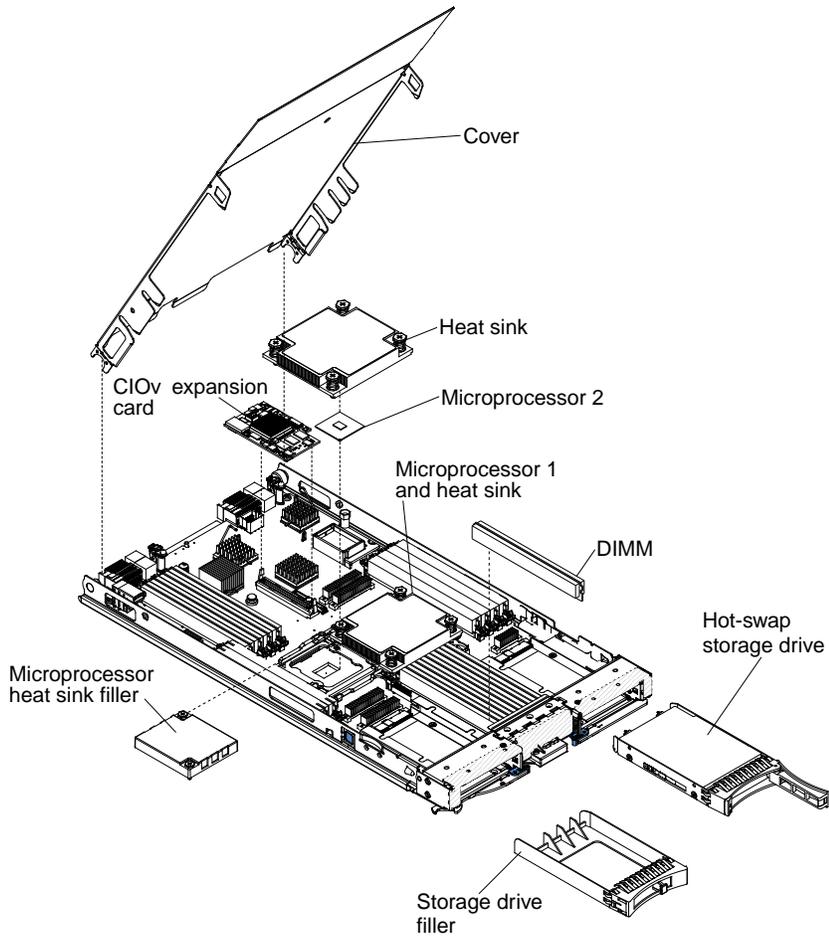
- Discovering, navigating, and visualizing systems on the network with the detailed inventory and relationships to the other network resources

- Notifying users of problems that occur on systems and the ability to isolate sources of the problems

- Notifying users when systems need updates and distributing and installing updates on a schedule

- Analyzing real-time data for systems and setting critical thresholds that notify the administrator of emerging problems

- Configuring settings of a single system and creating a configuration plan that can apply those settings to multiple systems

- Updating installed plug-ins to add new features and functions to the base capabilities

- Managing the life cycles of virtual resources

For more information about IBM Systems Director, see the documentation at http://publib.boulder.ibm.com/infocenter/eserver/v1r2/topic/diricinfo_all/diricinfoparent.html or http://www.ibm.com/systems/management/, which presents an overview of IBM Systems Management and IBM Systems Director.

Major components of the blade server

Use this information to locate the major components on the blade server.

The following illustration shows the major components of the blade server.

Cover

Heat sink

CIOv expansion card

Microprocessor 2

Microprocessor 1 and heat sink

DIMM

Hot-swap storage drive

Microprocessor heat sink filler

Storage drive filler

Chapter 2. Power, controls, and indicators

Use this information to view power features, turn on and turn off the blade server, and view the functions of the controls and indicators.

Blade server controls and LEDs

Use this information for details about the controls and LEDs on the blade server.

The following illustration identifies the buttons and information LEDs on the blade-server control panel.
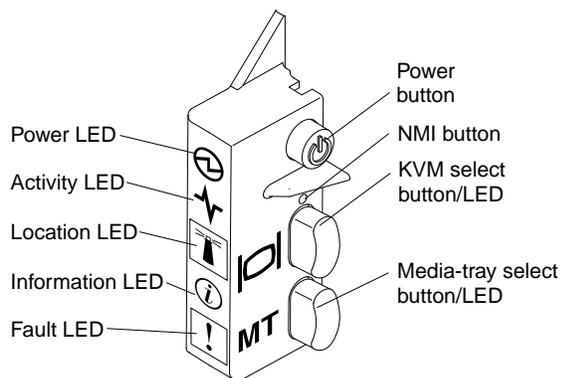
Power-on LED: This green LED indicates the power status of the blade server in the following manner:

- Flashing rapidly: While the service processor in the blade server is initializing and synchronizing with the management module, the power-on LED flashes rapidly, and the power-control button on the blade server does not respond. This process can take approximately two minutes after the blade server has been installed. If the LED continues to flash rapidly, the blade server might not have power permissions assigned to it through the Advanced Management Module (AMM), the BladeCenter unit does not have enough power to turn on the blade server, or the service processor (IMM2) on the blade server is not communicating with the AMM.

- Flashing slowly: The blade server has power supplied and is ready to be turned on.

- Lit continuously: The blade server has power and is turned on.

Activity LED: When this green LED is lit, it indicates that there is activity on the external storage device or network.

Location LED: The system administrator can remotely turn on this blue LED to aid in visually locating the blade server. When this LED is lit, the location LED on the BladeCenter unit is also lit. The location LED can be turned off through the Advanced-Management-Module Web interface or through IBM® Director Console. For more information about the Advanced-Management-Module web interface, see http://www.ibm.com/systems/management/. For more information about IBM® Director, see the documentation on the IBM® Director CD that comes with the server, or visit the IBM® Director Information Center at http://publib.boulder.ibm.com/infocenter/director/v6r1x/index.jsp.

Information LED: The Information LED is indicated by a lower case "i". When this yellow LED is lit, it indicates that information about a system event in the blade server has been placed in the Advanced-Management-Module event log. The information LED can be turned off through the Advanced-Management-Module CLI, SNMP, or web interface or through IBM® Director Console. For more information about the Advanced-Management-Module web interface, see http://www.ibm.com/systems/management/. For more

information about IBM® Director, see the documentation on the IBM® Director CD that comes with the server, or visit the IBM® Director Information Center at http://publib.boulder.ibm.com/infocenter/director/v6r1x/index.jsp.

Fault LED: The Fault LED is indicated by an exclamation mark. When this yellow LED is lit, it indicates that a system error has occurred in the blade server. The blade-error LED turns off only after the error is corrected.

Power-control button: Press this button to turn on or turn off the blade server. When the blade server is turned off, you can press and hold the power-control button to light the LEDs of failing components in the blade server.

Note: The power-control button has effect only if local power control is enabled for the blade server. Local power control is enabled and disabled through the Advanced-Management-Module web interface.

NMI button (recessed): The nonmaskable interrupt (NMI) dumps the partition. Use this recessed button only as directed by IBM Support.

Note: You can also send an NMI event to the selected blade server remotely using the AMM. For more information, see the *BladeCenter Advanced Management Module User's Guide*.

Keyboard/video/mouse (KVM) select button: Press this button to associate the shared BladeCenter unit keyboard port, video port, and mouse port with the blade server. The LED on this button flashes while the request is being processed and then is lit when the ownership of the keyboard, video, and mouse has been transferred to the blade server. It can take approximately 20 seconds to switch the keyboard, video, and mouse control to the blade server.

Using a keyboard that is directly attached to the AMM, you can press keyboard keys in the following sequence to switch KVM control between blade servers instead of using the KVM select button:

> NumLock NumLock *blade_server_number* Enter
>
> *blade_server_number* is the two-digit number of the blade-server bay in which the blade server is installed. A blade server that occupies more than one blade-server bay is identified by the lowest bay number that it occupies.

If there is no response when you press the KVM select button, you can use the Advanced-Management-Module web interface to determine whether local control has been disabled on the blade server. See http://www.ibm.com/systems/management/ for more information.

Notes:

1. The operating system in the blade server must provide USB support for the blade server to recognize and use the keyboard and mouse, even if the keyboard and mouse have PS/2-style connectors.
2. If you install a supported MicrosoftWindows operating system on the blade server while it is not the current owner of the keyboard, video, and mouse, a delay of up to 1 minute occurs the first time that you switch the keyboard, video, and mouse to the blade server. All subsequent switching takes place in the normal KVM switching time frame (up to 20 seconds).

Media-tray select button: Press this button to associate the shared BladeCenter unit media tray (removable-media drives) with the blade server. The LED on the button flashes while the request is being processed and then is lit when the ownership of the media tray has been transferred to the blade server. It can take approximately 20 seconds for the operating system in the blade server to recognize the media tray.

If there is no response when you press the media-tray select button, you can use the Advanced-Management-Module Web interface to determine whether local control has been disabled on the blade server.

Note: The operating system in the blade server must provide USB support for the blade server to recognize and use the removable-media drives.

The following illustration identifies the information LEDs on the SAS hot-swap hard disk drive.

Hard disk drive activity LED (green)

Hard disk drive status LED (amber)

Hot-swap storage drive
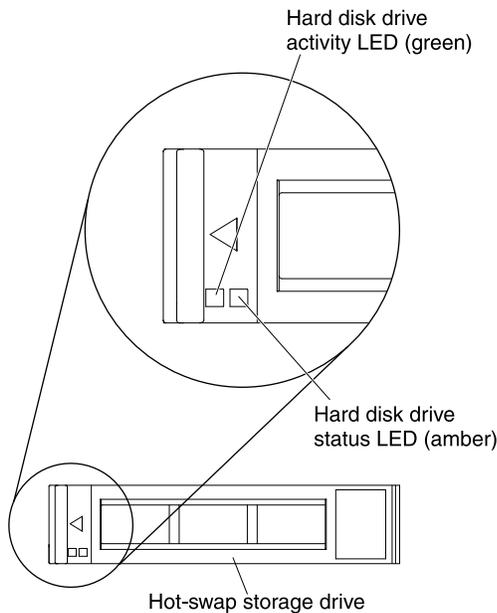
Hard disk drive activity LED (green): When this green LED is lit, it indicates that there is activity on the storage drive.

Hard disk drive status LED (yellow): When this yellow LED is lit, it indicates that an error has occurred with the storage drive. The LED turns off only after the error is corrected.

Turning on the blade server

Use this information to turn on the blade server.

After you connect the blade server to power through the BladeCenter unit, the blade server can start in any of the following ways:

- You can press the power-control button on the front of the blade server (see "Blade server controls and LEDs" on page 11) to start the blade server.

  Notes:

  1. Wait until the power-on LED on the blade server flashes slowly before you press the power-control button. While the service processor in the blade server is initializing and synchronizing with the management module, the power-on LED flashes rapidly, and the power-control button on the blade server does not respond. This process can take approximately two minutes after the blade server has been installed.

  2. While the blade server is starting, the power-on LED on the front of the blade server is lit and does not flash. See "Blade server controls and LEDs" on page 11 for the power-on LED states.

- If a power failure occurs, the BladeCenter unit and the blade server can be configured to start automatically when power is restored through the Advanced Management Module.

- You can turn on the blade server remotely by using the management module.

- If the blade server is connected to power (the power-on LED is flashing slowly), the blade server is communicating with the management module, the operating system supports the Wake on LAN feature,

and the Wake on LAN feature has not been disabled through the management module, the Wake on LAN feature can turn on the blade server.

Turning off the blade server

Use this information to turn off the blade server.

When you turn off the blade server, it is still connected to power through the BladeCenter unit. The blade server can respond to requests from the service processor, such as a remote request to turn on the blade server. To remove all power from the blade server, you must remove it from the BladeCenter unit. Shut down the operating system before you turn off the blade server. See the operating-system documentation for information about shutting down the operating system.

The blade server can be turned off in any of the following ways:

- You can press the power-control button on the blade server (see "Blade server controls and LEDs" on page 11). This starts an orderly shutdown of the operating system, if this feature is supported by the operating system.

- If the operating system stops functioning, you can press and hold the power-control button for more than 4 seconds to turn off the blade server.

- The management module can turn off the blade server through the Advanced-Management-Module web interface.

- The management module can turn off the blade server through the Advanced-Management-Module web interface. For additional information, see the *IBMBladeCenter Management Module User's Guide* or go to http://www.ibm.com /systems/management/ for more information.

Blade server connectors

Use this information to locate blade server system-board components and connectors for optional devices.

The following illustration shows the system-board components, including connectors for user-installable optional devices, in the blade server.
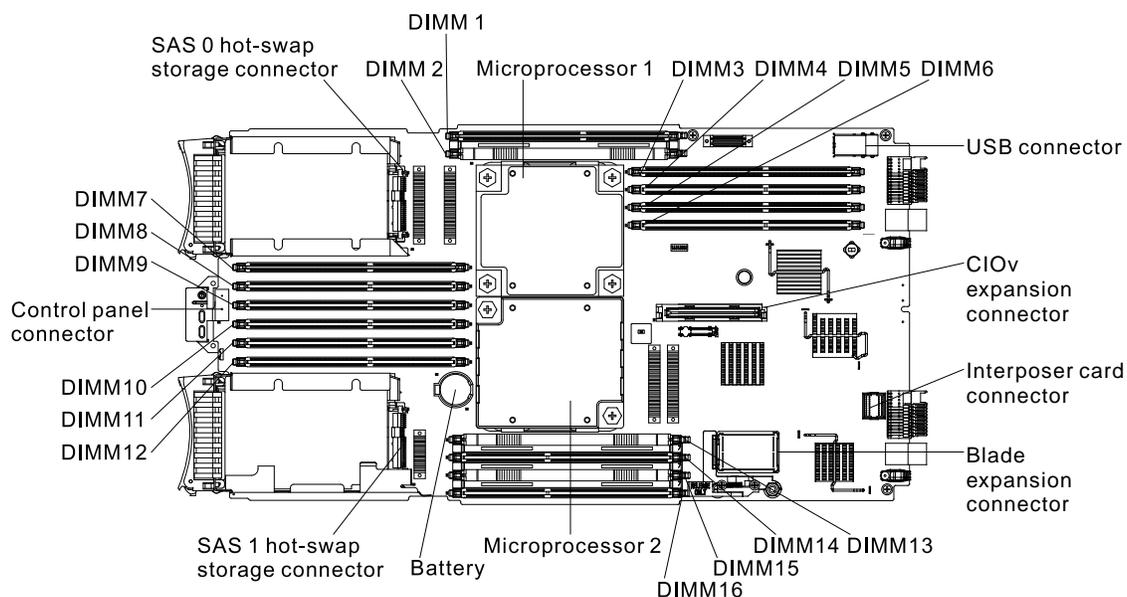
Chapter 3. Installing options

Use this information for instructions about installing optional hardware devices in the blade server. Some option-removal instructions are provided in case you have to remove one option to install another.

Installation guidelines

Use these guidelines before you install the blade server or optional devices.

Before you install optional devices, read the following information:

- Before you begin, read "Safety" on page iii and "Handling static-sensitive devices" on page 16. This information will help you work safely.
- When you install your new blade server, 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 your blade server is ready to function at maximum levels of performance. To download firmware updates for your blade server, go to http://www.ibm.com/supportportal/.
- Observe good housekeeping in the area where you are working. Place removed covers and other parts in a safe place.
- Back up all important data before you make changes to disk drives.
- Before you remove a blade server from the BladeCenter unit, you must shut down the operating system and turn off the blade server. You do not have to shut down the BladeCenter unit itself.
- Blue on a component indicates touch points, where you can grip the component to remove it from or install it in the blade server, open or close a latch, and so on.
- Orange on a component or an orange label on or near a component indicates that the component can be hot-swapped, which means that if the server and operating system support hot-swap capability, you can remove or install the component while the server is running. (Orange can also indicate touch points on hot-swap components.) See the instructions for removing or installing a specific hot-swap component for any additional procedures that you might have to perform before you remove or install the component.
- For a list of supported optional devices for the blade server, see http://www.ibm.com /systems/info/ x86servers/ serverproven/compat/us/.

System reliability guidelines

Use this information to make sure that the blade server meets the proper cooling and reliability guidelines.

To help make sure that proper cooling and system reliability requirements are met, review the following guidelines:

- To ensure proper cooling, do not operate the BladeCenter unit without a blade server, expansion unit, or blade filler installed in each blade-server bay. See the documentation for your BladeCenter unit for additional information.
- Each microprocessor socket always contains either a microprocessor dust cover and heat sink filler or a microprocessor and heat sink. If the blade server has only one microprocessor, it must be installed in microprocessor socket 1.
- DIMMs or DIMM fillers must occupy DIMM connectors 1, 2, 13, 14, 15, and 16 for proper cooling.
- Each hot-swap SAS bay contains a SAS storage drive or filler.
- Make sure that the ventilation holes on the blade server are not blocked.

- The blade server battery must be operational. If the battery becomes defective, replace it immediately. For instructions, see the *Problem Determination and Service Guide*.

Handling static-sensitive devices

Use this information to observe the static-sensitive device requirements.

Attention: Static electricity can damage the blade 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:

- When you work on a BladeCenter unit that has an electrostatic discharge (ESD) connector, use a wrist strap, especially when you handle modules, optional devices, or blade servers. To work correctly, the wrist strap must have a good contact at both ends (touching your skin at one end and firmly connected to the ESD connector on the front or back of the BladeCenter unit).
- Limit your movement. Movement can cause static electricity to build up around you.
- 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 part of the BladeCenter unit or any *unpainted* metal surface on any other grounded rack component in the rack in which you are installing the device 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 blade 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 blade 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.

Instructions for IBM Business Partners

In addition to the instructions in this chapter for installing optional hardware devices, updating firmware and device drivers, and completing the installation, IBM Business Partners must also complete the following steps:

1. Before you configure a server for a customer, complete the Solution Assurance checklist at http://w3. ibm.com/support/assure/assur30i.nsf/webindex/sa294/.
2. After you have confirmed that the server starts correctly and recognizes the newly installed devices and that no error LEDs are lit, run the Dynamic System Analysis (DSA) stress test. For information about using DSA, see the *Problem Determination and Service Guide*.
3. Shut down and restart the server multiple times to ensure that the server is correctly configured and functions correctly with the newly installed devices.
4. Save the DSA log as a file and send it to IBM. For information about transferring data and logs, see http://publib.boulder.ibm.com/infocenter/toolsctr/v1r0/index.jsp?topic=/dsa/dsa_main.html.
5. To ship the server, repackage it in the original undamaged packing material and observe IBM procedures for shipping.

Support information for IBM Business Partners is available at http://www.ibm.com/partnerworld/pwhome. nsf/weblook/index_us.html.

How to send DSA data to IBM

Before you send diagnostic data to IBM, read the terms of use at http://www.ibm.com/de/support/ecurep/terms.html.

You can use any of the following methods to send diagnostic data to IBM:

- **Standard upload:** http://www.ibm.com/de/support/ecurep/send_http.html
- **Standard upload with the system serial number:**http://www.ecurep.ibm.com/app/upload_hw
- **Secure upload:**http://www.ibm.com/de/support/ecurep/send_http.html#secure
- **Secure upload with the system serial number:**https://www.ecurep.ibm.com/app/upload_hw

Removing the blade server from the BladeCenter unit

Use these instructions to remove the blade server from the BladeCenter unit.

The following illustration shows how to remove a single-width type of blade server or blade filler from a BladeCenter unit. The appearance of your BladeCenter unit might be different; see the documentation for your BladeCenter unit for additional information.
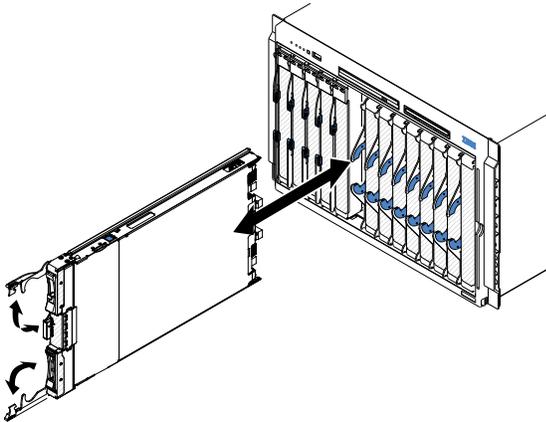
Attention:

- To maintain proper system cooling, do not operate the BladeCenter unit without a blade server, expansion unit, or filler module installed in each blade server bay.
- When you remove the blade server, note the blade-server bay number. Reinstalling a blade server into a different blade server bay from the one it was removed from can have unintended consequences. Some configuration information and update options are established according to blade-server bay number; if you reinstall the blade server into a different bay, you might have to reconfigure the blade server.

To remove the blade server, complete the following steps:

Step 1.   If the blade server is operating, shut down the operating system (see the documentation for your operating system for more information).

Step 2.   If the server is still on, press the power-control button for four seconds to turn off the blade server (see "Turning off the blade server" on page 14 for more information).

   Attention: Wait at least 30 seconds, until the storage devices stops spinning, before you proceed to the next step.

Step 3.   Open the two release handles as shown in the illustration. The blade server moves out of the blade server bay approximately 0.6 cm (0.25 inch).
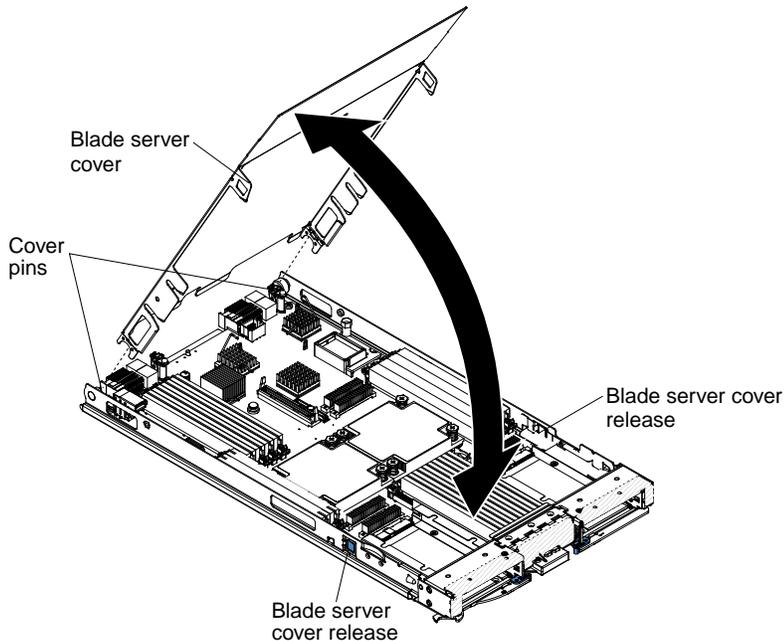
Step 4.   Pull the blade server out of the bay.

Step 5.   Place either a blade filler or another blade server in the blade server bay within 1 minute.

Removing the blade server cover

Use these instructions to open the blade server cover.

The following illustration shows how to open the cover on the blade server.

To open the blade server cover, complete the following steps:

Step 1.   Before you begin, read "Safety" on page iii and "Installation guidelines" on page 15.

Step 2.   If the blade server is installed in a BladeCenter unit, remove it (see "Removing the blade server from the BladeCenter unit" on page 17 for instructions).

Step 3.   Carefully lay the blade server on a flat, static-protective surface, with the cover side up.

Step 4.   Press the blade server cover release on each side of the blade server or expansion unit and lift the cover open, as shown in the illustration.

Step 5.   Lay the cover flat, or lift it from the blade server and store for future use.

Statement 21

CAUTION:
Hazardous energy is present when the blade server is connected to the power source. Always replace the blade cover before installing the blade server.

Installing an optional expansion unit

Use these instructions to install an optional expansion unit.

Attention: If a horizontal combination-form-factor (CFFh) expansion card is installed on the blade server system board, you cannot install an optional expansion unit.

Notes:

1. All devices should be installed in an expansion unit before attaching it to the blade server.
2. After you install one or more expansion units on your blade server, the combined blade server and expansion units together occupy adjacent blade bays in the BladeCenter unit. Enough power modules must be installed in the BladeCenter unit to power the blade bays in which you install the blade server and expansion units.
3. The following illustration shows an optional expansion unit in a blade server.
4. The illustrations in this document might differ slightly from your hardware.

To install an optional expansion unit, complete the following steps.

Expansion unit

Blade server
cover release

Blade server
cover release
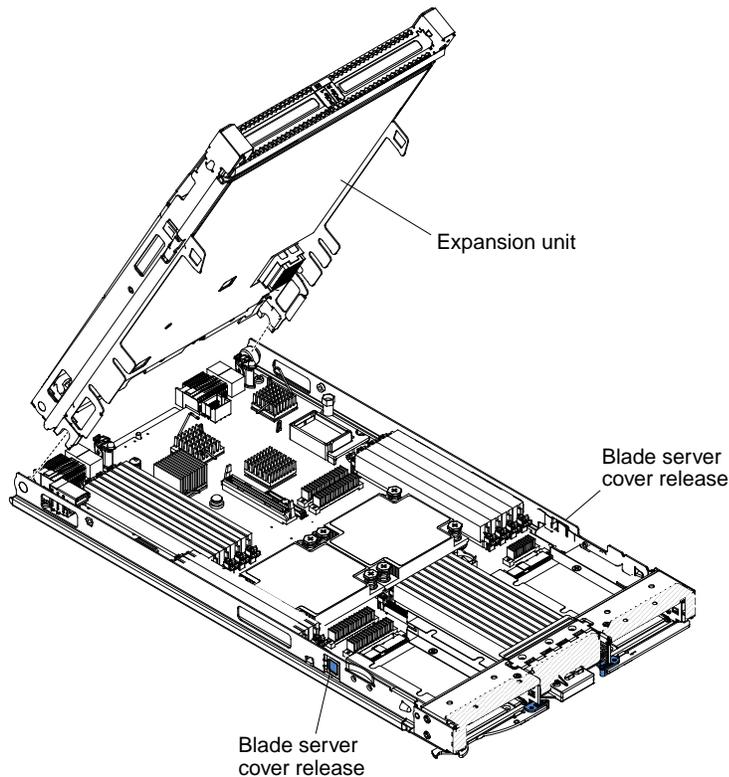
Step 1. Before you begin, read "Safety" on page iii and "Installation guidelines" on page 15. To determine the type and number of expansion units that can be installed on your blade server, see http://www. ibm.com /systems/info/x86servers/ serverproven/compat/us/.

Step 2. If the blade server is installed in a BladeCenter unit, remove it (see "Removing the blade server from the BladeCenter unit" on page 17 for instructions).

Step 3. Remove the cover from the blade server or the expansion unit (see "Removing the blade server cover" on page 18). Save the top cover for future use.

Step 4. Locate the blade expansion connector on the blade server system board or the expansion unit and remove the cover if one is installed (see "Blade server connectors" on page 14).

Step 5. Touch the static-protective package that contains the optional expansion unit to any *unpainted* metal surface on the BladeCenter unit or any *unpainted* metal surface on any other grounded rack component; then, remove the optional expansion unit from the package.

Step 6. Orient the optional expansion unit as shown in the illustration.

Step 7. Lower the expansion unit so that the slots at the rear slide down onto the cover pins at the rear of the blade server; then, pivot the expansion unit down onto the blade server.

Step 8. If the expansion unit has an extraction device (such as a thumbscrew or a lever), use it to fully engage the expansion unit on the blade server; otherwise, press the expansion unit firmly into the closed position until it clicks into place. To install an option into the expansion unit, refer to the documentation provided with the expansion unit.

Step 9. If additional expansion units are being installed, repeat steps 4 through 8 for each expansion blade; otherwise continue with step 11.

Step 10. Follow the instructions provided with the expansion unit to install an option in the expansion unit.

Step 11. If you have other devices to install or remove, do so now; otherwise, go to "Completing the installation" on page 39.

Removing an optional expansion unit

Use these instructions to remove the optional expansion unit from the blade server.

To remove an optional expansion unit, complete the following steps:
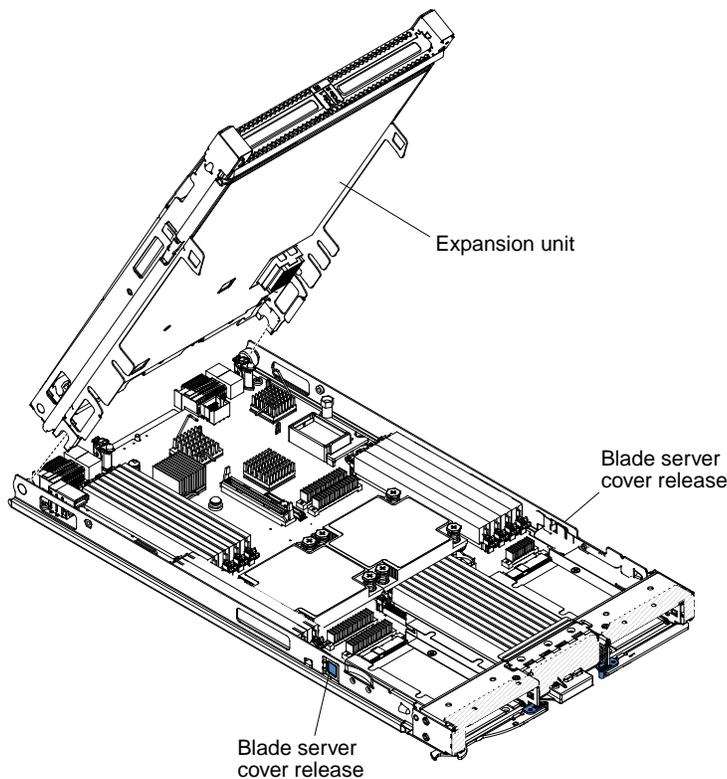
Expansion unit

Blade server cover release

Blade server cover release

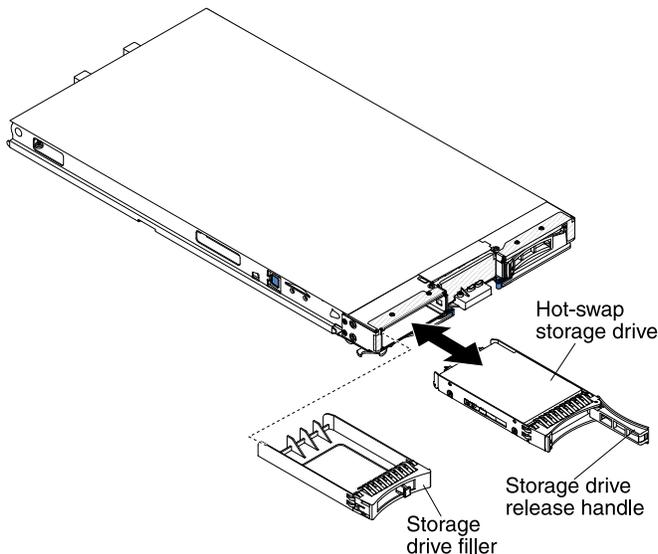Step 1. Before you begin, read "Safety" on page iii and "Installation guidelines" on page 15.

Step 2. If the blade server is installed in a BladeCenter unit, remove it (see "Removing the blade server from the BladeCenter unit" on page 17 for instructions).

Step 3. Carefully lay the blade server on a flat, static-protective surface, with the cover side up.

Step 4. Remove the blade server cover, if one is installed (see "Removing the blade server cover" on page 18 for instructions).

Step 5. Remove the expansion unit:

a. If the expansion unit has an extraction device, use the extraction device to disengage the expansion unit from the blade server. These extraction devices can be of several types, including thumbscrews or levers. See the instructions provided with the expansion unit for detailed instructions for removing the expansion unit.

b. If the expansion unit does not have an extraction device, press the blade server cover release on each side of the blade server and lift the expansion unit from the blade server.

c. Rotate the expansion unit open; then, lift the expansion unit from the blade server.

Step 6. If you are instructed to return the expansion unit, remove from it any options that you have installed; then, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing a hot-swap storage drive

Use these instructions to install a hot-swap storage drive into the blade server.

The blade server has two storage bays for installing hot-swap storage drives. One storage drive might already be installed in the blade server in storage bay 0. If the blade server is equipped with one storage drive, you can install an additional drive in storage bay 1. The blade server supports using RAID 0 or RAID 1 when two storage drives of the same interface type are installed. See "Configuring a RAID array" on page 53 for information about SAS RAID configuration.

To install a hot-swap storage drive or drive filler, complete the following steps.

Step 1. Before you begin, read "Safety" on page iii and "Installation guidelines" on page 15.

Step 2. Identify the storage bay (storage bay 0 or storage bay 1) in which the hot-swap storage drive will be installed (see "Blade server connectors" on page 14).

Step 3. If a storage-bay filler is installed, remove it from the blade server by pulling the release lever and sliding the filler away from the blade server (see "Removing a hot-swap storage drive" on page 22).

Step 4. Touch the static-protective package that contains the hot-swap storage drive to any *unpainted* metal surface on the BladeCenter unit or any *unpainted* metal surface on any other grounded rack component; then, remove the hard disk drive from the package.

Step 5. Open the release lever on the hot-swap storage drive and slide the drive into the storage bay until it is firmly seated in the connector.

Step 6. Lock the hot-swap storage drive into place by closing the release lever.

If you have other devices to install or remove, do so now; otherwise, go to "Completing the installation" on page 39.

Removing a hot-swap storage drive

Use this information to remove a hot-swap storage drive.

The blade server has two hot-swap storage bays for installing or removing hot-swap storage devices. To remove a hot-swap hard disk drive or drive filler, complete the following steps.
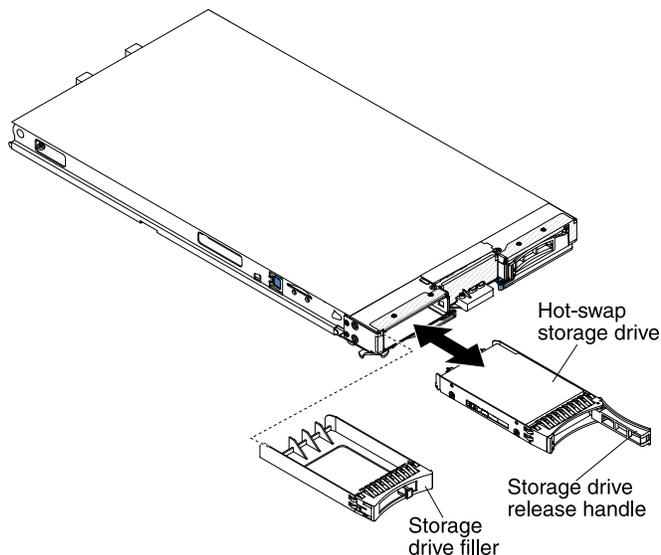
Step 1. Before you begin, read "Safety" on page iii and "Installation guidelines" on page 15.

Step 2. If possible, save the data on your drive, especially if it is part of a RAID array, before you remove it from the blade server.

Step 3. Press the release latch (orange) on the storage drive to release the drive handle.

Step 4. Pull the release handle to remove the drive from the storage bay.

Installing a memory module

Use these instructions to install memory modules in the blade server.

The blade server has a total of sixteen direct inline memory module (DIMM) slots. The blade server supports very low profile (VLP) DDR3 DIMMs with error code correction (ECC) in 4 GB, 8 GB, and 16 GB capacities. For a current list of supported DIMMs for the blade server, see http://www.ibm.com /systems/info/ x86servers/ serverproven/compat/us/.

After you install or remove a DIMM, you must change and save the new configuration information by using the Setup utility. When you turn on the blade server, a message indicates that the memory configuration has changed. Start the Setup utility and select **Save Settings** (see "Setup utility menu" on page 46 for more information) to save changes.

The memory is accessed internally through the system using four channels per microprocessor. Each channel contains two DIMM connectors. The following table lists each channel and which DIMM connectors belong to the channel.

Table 2. Memory channel configuration

Memory channel	DIMM connector (microprocessor 1)	DIMM connector (microprocessor 2)
Channel 0	7 and 8	15 and 16
Channel 1	1 and 2	13 and 14
Channel 2	3 and 4	9 and 10
Channel 3	5 and 6	11 and 12

Depending on the memory mode that is set in the Setup utility, the blade server can support a minimum of 4 GB and a maximum of 128 GB of system memory on the system board in a blade server with one microprocessor. If two microprocessors are installed, the blade server can support a minimum of 8 GB and a maximum of 256 GB of system memory. There are four different memory modes:

- **Independent channel mode:** Independent channel mode gives a maximum of 128 GB of usable memory with one microprocessor installed, and 256 GB of usable memory with two microprocessors installed (using 16 GB DIMMs). The DIMMs can be installed without matching sizes. See the table below for the memory installation order.

- **Rank sparing mode:** In rank sparing mode, one rank of a DIMM in each populated channel is reserved as spare memory. The spare rank is not available as active memory. When the active rank memory fails, its content is copied to the spare rank memory which becomes active. The memory set aside for spare is one rank per channel. The size of a rank varies depending on the DIMMs installed. The DIMM population ordering for rank sparing mode is the same as that for independent channel mode.

Table 3. DIMM population sequence for independent-channel mode and rank-sparing mode

One microprocessor installed	Two microprocessors installed
DIMM connectors 1, 7, 3, 5, 2, 8, 4, and 6	DIMM connectors 1, 16, 7, 14, 3, 9, 5, 11, 2, 15, 8, 13, 4, 10, 6, and 12

- **Mirrored channel mode:** In mirrored channel mode, the memory contents on channel 0 are duplicated in channel 2, and the memory contents of channel 1 are duplicated in channel 3. The effective memory available to the system is only half of that installed. The maximum available memory (with 16 GB DIMMs) is 64 GB for a single microprocessor system and 128 GB for a dual microprocessor system.

  Important: The memory configuration of channel 0 must match that of channel 2, and the memory configuration of channel 1 must match that of channel 3. For example, if a 4 GB Dual Rank DIMM is installed into the DIMM connector 3 (channel 0), then a 4 GB Dual Rank DIMM must also be installed into the DIMM connector 7 (channel 2). Table 2 "Memory channel configuration" on page 23 lists each channel and which DIMM connectors belong to the channel.

  The following table shows the order that memory DIMMs are installed to use a mirrored channel mode.

Table 4. DIMM population sequence for mirrored channel mode

DIMM pair	DIMM connectors	
	One microprocessor installed	**Two microprocessors installed**
First	1 and 7	1 and 7
Second	3 and 5	14 and 16
Third	2 and 8	3 and 5
Fourth	4 and 6	9 and 11
Fifth	None	2 and 8
Sixth	None	13 and 15
Seventh	None	4 and 6
Eighth	None	10 and 12
Note: The DIMM pairs must be identical in size, type, and rank count.		

Attention: DIMMs or DIMM fillers must occupy DIMM connectors 1, 2, 13, 14, 15, and 16 for proper cooling.

To install a DIMM, complete the following steps:

Step 1.   Before you begin, read "Safety" on page iii and "Installation guidelines" on page 15.

Step 2.   Read the documentation that comes with the DIMMs.

Step 3.   If the blade server is installed in a BladeCenter unit, remove it (see "Removing the blade server from the BladeCenter unit" on page 17 for instructions).

Step 4.   Carefully lay the blade server on a flat, static-protective surface.

Step 5.   Open the blade server cover (see "Removing the blade server cover" on page 18 for instructions).

Step 6.   If an expansion unit is installed and you are installing DIMMs on the system board, remove the expansion unit (see "Removing an optional expansion unit" on page 20).

Step 7.   Locate the DIMM connectors (see "Blade server connectors" on page 14). Determine which DIMM connector you will be installing memory into.

Step 8.   If a DIMM filler or another memory module is already installed in the DIMM connector, remove it (see "Removing a memory module" on page 25).

   Note: A DIMM or DIMM filler must occupy each DIMM socket before the blade server is turned on.

Step 9.   If you are installing a DIMM in DIMM connector seven through twelve, use your fingers to lift the DIMM access door.

DIMM access door
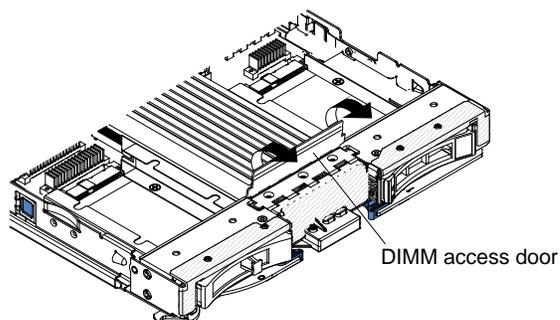
Step 10. Touch the static-protective package that contains the DIMM to any *unpainted* metal surface on the BladeCenter unit or any *unpainted* metal surface on any other grounded rack component in the

rack in which you are installing the DIMM for at least two seconds; then, remove the DIMM from its package.

Step 11. To install the DIMMs, repeat the following steps for each DIMM that you install:
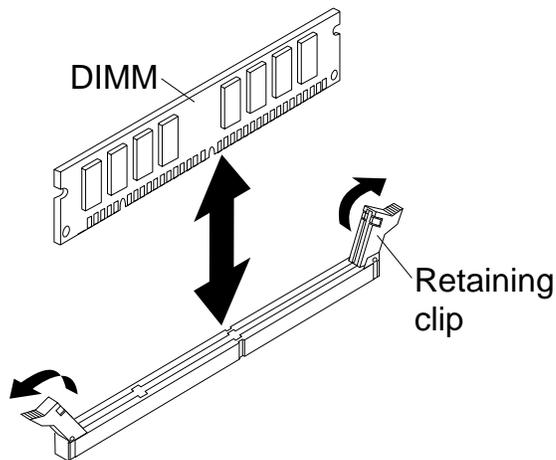
a. Make sure that the retaining clips are in the open position, away from the center of the DIMM connector.

b. Turn the DIMM so that the DIMM keys align correctly with the DIMM connector on the system board.

   Attention: To avoid breaking the retaining clips or damaging the DIMM connectors, handle the clips gently.

c. Press the DIMM into the DIMM connector. The retaining clips will lock the DIMM into the connector.

d. Make sure that the small tabs on the retaining clips are in the notches on the DIMM. If there is a gap between the DIMM and the retaining clips, the DIMM has not been correctly installed. Press the DIMM firmly into the connector, and then press the retaining clips toward the DIMM until the tabs are fully seated. When the DIMM is correctly installed, the retaining clips are parallel to the sides of the DIMM.

Step 12. If the DIMM access door is open, use your fingers to close it.

Step 13. If you have other devices to install or remove, do so now; otherwise, go to "Completing the installation" on page 39.

Removing a memory module

Use this information to remove a dual inline memory module (DIMM) from the blade server.

The following illustration shows how to remove a DIMM from the blade server. This information also applies to removing a DIMM filler.

After you install or remove a DIMM, you must change and save the new configuration information by using the Setup utility. When you turn on the blade server, a message indicates that the memory configuration has changed. Start the Setup utility and select **Save Settings** (see "Using the Setup utility" on page 45 for more information) to save changes.
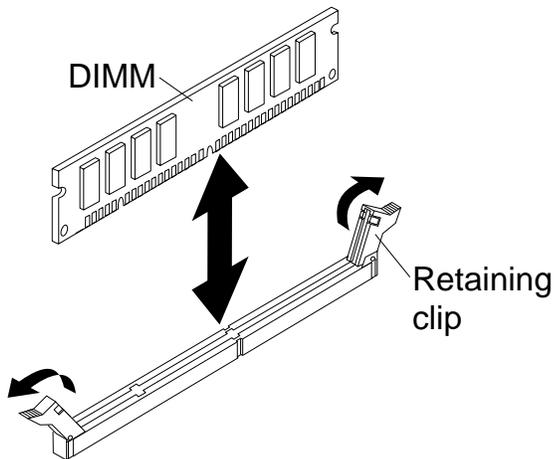
DIMM

Retaining clip

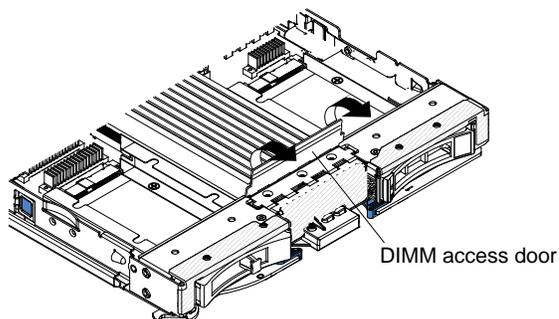**Note:** DIMMs or DIMM fillers must occupy DIMM connectors 1, 2, 13, 14, 15, and 16 for proper cooling.

To remove a DIMM, complete the following steps:

Step 1. Before you begin, read "Safety" on page iii and "Installation guidelines" on page 15.

Step 2. If the blade server is installed in a BladeCenter unit, remove it (see "Removing the blade server from the BladeCenter unit" on page 17).

Step 3. Remove the blade server cover (see "Removing the blade server cover" on page 18).

Step 4. If an optional expansion unit is installed, remove the expansion unit (see "Removing an optional expansion unit" on page 20).

Step 5. Locate the DIMM connectors (see "Blade server connectors" on page 14). Determine which DIMM you want to remove from the blade server.

   Attention: To avoid breaking the retaining clips or damaging the DIMM connectors, handle the clips gently.

Step 6. Move the retaining clips on the ends of the DIMM connector to the open position by pressing the retaining clips away from the center of the DIMM connector.

   Note: To access DIMM connectors seven through twelve, use your fingers to lift the DIMM access door.

DIMM access door

Step 7. Using your fingers, pull the DIMM out of the connector.

Step 8. Install a DIMM or DIMM filler in each empty DIMM connector (see "Installing a memory module" on page 22).

   Note: DIMMs or DIMM fillers must occupy DIMM connectors 1, 2, 13, 14, 15, and 16 for proper cooling.
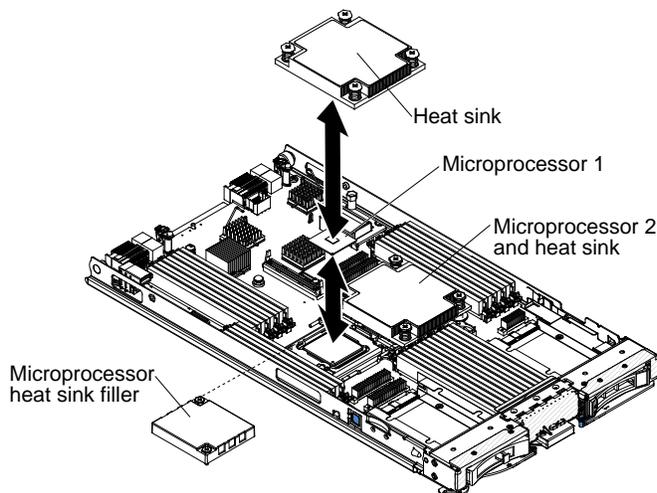
Installing a microprocessor and heat sink

Use this information to install a microprocessor and heat sink in the blade server.

The following notes describe the type of microprocessor that the server supports and other information that you must consider when you install a microprocessor:

- Each microprocessor socket must always contain either a socket cover and heat-sink filler or a microprocessor and heat sink. If the blade server has only one microprocessor, it must be installed in microprocessor socket 1.
- If you are installing a second microprocessor, make sure that the microprocessors are identical.
- Before you install a new microprocessor, download and install the most current level of UEFI code (see "Updating firmware and device drivers" on page 52).
- When you install a second microprocessor, you might have to install additional memory, or redistribute memory across the DIMM connectors (see "Installing a memory module" on page 22).
- The microprocessor installation tool might become worn after several uses. Make sure that the tool can hold the microprocessor securely if you are reusing an existing microprocessor installation tool. Do not return the tool with other parts that you are returning.

The following illustration shows how to install a microprocessor and heat sink in the blade server.

There are two types of microprocessor installation tools. The tools are similar in function and design, however Tool A has one setting for installing one size of microprocessor, and supports the following families of microprocessors: E5-26xx, E5-46xx. Installation Tool B has two settings for installing two different sizes of microprocessors. The settings that are marked on Tool B are "L" for smaller low core microprocessors, and "H" for larger high core microprocessors. Installation Tool B supports the following families of microprocessors: E5-26xx, E5-46xx, E5-26xx v2, E5-46xx v2.

Microprocessor Installation Tools A and B are shown in the following illustration.
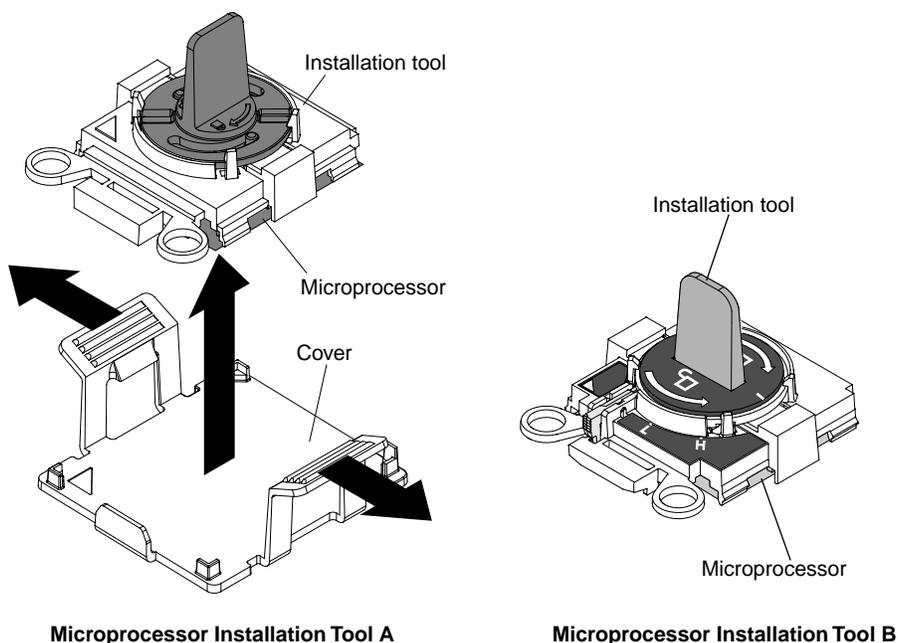
Microprocessor Installation Tool A   Microprocessor Installation Tool B

Figure 1. Microprocessor installation tools

Attention:

1. Do not use any tools or sharp objects to lift the release levers on the microprocessor socket. Doing so might result in permanent damage to the system board.
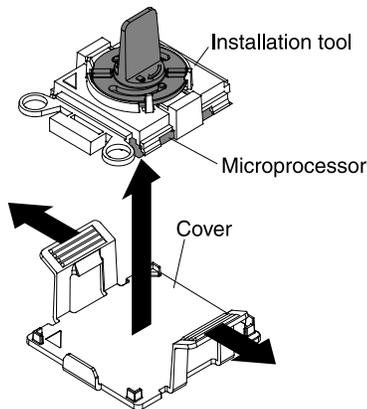
2. Do not touch the contacts in the microprocessor socket. Touching these contacts might result in permanent damage to the system board.

To install a microprocessor and heat sink, complete the following steps:

Step 1.   Before you begin, read "Safety" on page iii and "Installation guidelines" on page 15.

Step 2.   Shut down the operating system, turn off the blade server, and remove the blade server from the BladeCenter unit. See "Removing the blade server from the BladeCenter unit" on page 17 for instructions.

Step 3.   Carefully lay the blade server on a flat, static-protective surface.

Step 4.   Open the blade server cover (see "Removing the blade server cover" on page 18 for instructions).

Step 5.   If you are installing a microprocessor in the blade server and an expansion unit is attached to the blade server, remove the device (see "Removing an optional expansion unit" on page 20).

Step 6.   Locate microprocessor socket 2 (see "Blade server connectors" on page 14).

Step 7.   Remove the heat-sink filler, if one is present.

Step 8.   If you are not installing a new microprocessor and a new heat sink, remove the thermal grease from the heat sink and microprocessor; then, apply new thermal grease before installation (see "Thermal grease" on page 32).

Attention: Do not use any tools or sharp objects to lift the release levers on the microprocessor socket. Doing so might result in permanent damage to the system board.

Step 9.   Open the microprocessor socket release levers and retainer:

Microprocessor
retainer

❸

❷

❶

Release lever
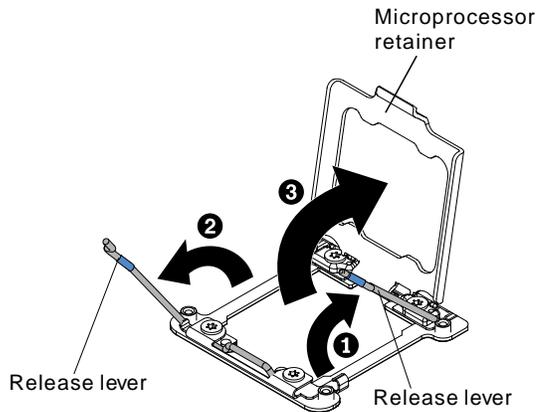
Release lever

a. Note which release lever is labeled as the first release lever to open and open it.

b. Open the second release lever on the microprocessor socket.

c. Open the microprocessor retainer.

Step 10. Install the microprocessor in the microprocessor socket:

a. If a dust cover is installed over the microprocessor socket, lift the dust cover from the socket. Store the dust cover in a safe place.

b. Touch the static-protective bag that contains the new microprocessor to any *unpainted* surface on the BladeCenter chassis or any *unpainted* metal surface on any other grounded rack component; then, carefully remove the microprocessor and the installation tool from the package.

c. Release the sides of the cover and remove the cover from the installation tool. The microprocessor is preinstalled on the installation tool.

Installation tool

Microprocessor

Cover

Note: Do not touch the microprocessor contacts. Contaminants on the microprocessor contacts, such as oil from your skin, can cause connection failures between the contacts and the socket.

d. Align the installation tool with the microprocessor socket. The installation tool rests flush on the socket only if properly aligned.
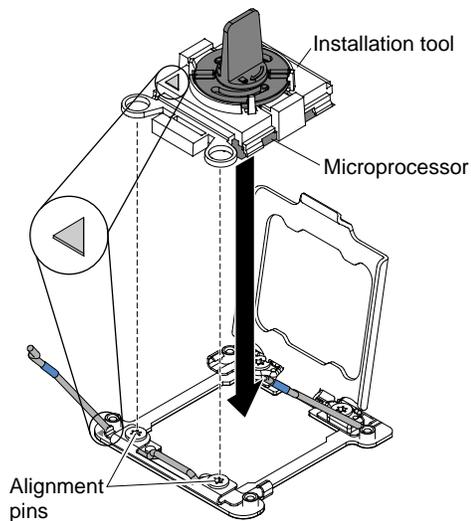
e. Install the microprocessor using the following instructions for your installation tool.

- If using Installation Tool A, twist the handle on the microprocessor tool assembly counterclockwise to the open position to insert the microprocessor into the socket, and lift the installation tool out of the socket.

- If using Installation Tool B, twist the handle of the installation tool assembly counterclockwise until the microprocessor is inserted into the socket, and lift the installation tool out of the socket. The following illustration shows the tool handle in the open position.
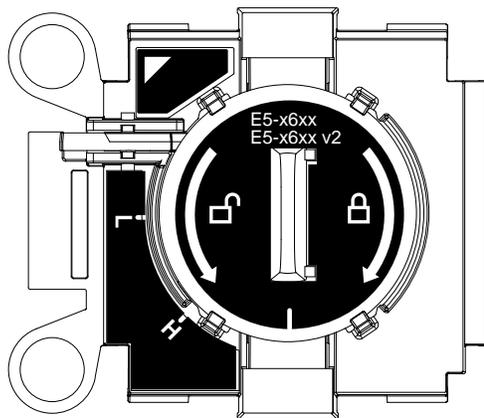
Figure 2. Installation Tool B
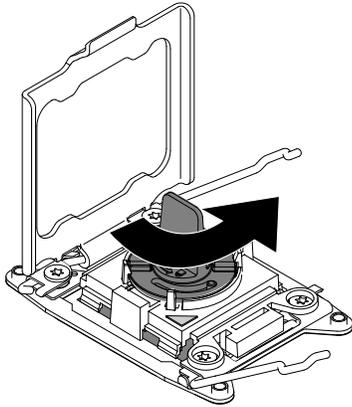
Figure 3. Installation tool handle adjustment

Attention:

- Do not press the microprocessor into the socket.
- Do not touch exposed pins of the microprocessor socket.
- Make sure that the microprocessor is oriented and aligned correctly in the socket before you try to close the microprocessor retainer.
- Do not touch the thermal material on the bottom of the heat sink or on top of the microprocessor. Touching the thermal material will contaminate it.

Step 11. Close the microprocessor socket release levers and retainer:
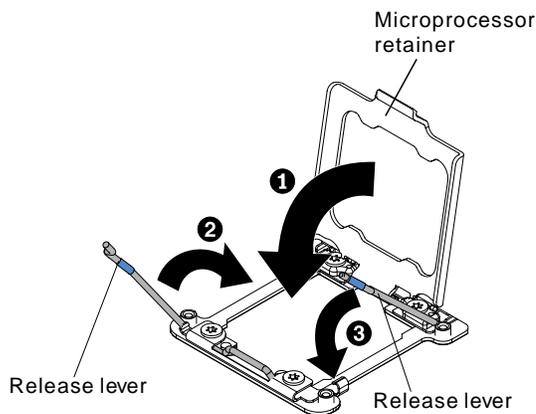
a. Close the microprocessor retainer on the microprocessor socket.

b. Identify which release lever is labeled as the first release lever to close and close it.

c. Close the second release lever on the microprocessor socket.

d. If a socket cover is installed over the microprocessor retainer, it is released as you close the retainer. Remove the socket cover from the blade server and store it in a safe place.

Step 12. If you are reinstalling a heat sink that was removed from the blade server, complete the following steps.

Attention: Do not touch the thermal material on the bottom of the heat sink. Touching the thermal material will contaminate it. If the thermal material on the microprocessor or heat sink becomes contaminated, wipe off the contaminated thermal material on the microprocessor or heat sink with the alcohol wipes and reapply clean thermal grease to the heat sink.

a. Make sure that the thermal material is still on the bottom of the heat sink and on the top of the microprocessor.

   b. Position the heat sink over the microprocessor. The heat sink is keyed to assist with proper alignment.

   c. Align and place the heat sink on top of the microprocessor in the retention bracket, thermal material side down. Press firmly on the heat sink.

   d. Align the screws on the heat sink with the holes on the heat-sink retention module.

   e. Press firmly on the captive screws and tighten them with a screwdriver, alternating among the screws until they are tight. If possible, each screw should be rotated two full rotations at a time. Repeat until the screws are tight. Do not overtighten the screws by using excessive force. If you are using a torque wrench, tighten the screws to 8.5 Newton-meters (Nm) to 13 Nm (6.3 foot-pounds to 9.6 foot-pounds).

Step 13. If you are installing a new heat sink, complete the following steps.

Attention:

- Do not set down the heat sink after you remove the plastic cover.
- Do not touch the thermal material on the bottom of the heat sink. Touching the thermal material will contaminate it. If the thermal material on the microprocessor or heat sink becomes contaminated, contact your service technician.

   a. Remove the plastic protective cover from the bottom of the heat sink.

   b. Position the heat sink over the microprocessor. The heat sink is keyed to assist with proper alignment.

   c. Align and place the heat sink on top of the microprocessor in the retention bracket, thermal material side down.

   d. Press firmly on the heat sink.

   e. Align the screws on the heat sink with the holes on the heat-sink retention module.

   f. Press firmly on the captive screws and tighten them with a screwdriver, alternating among the screws until they are tight. If possible, each screw should be rotated two full rotations at a time. Repeat until the screws are tight. Do not overtighten the screws by using excessive force. If you are using a torque wrench, tighten the screws to 8.5 Newton-meters (Nm) to 13 Nm (6.3 foot-pounds to 9.6 foot-pounds).

Step 14. Install the optional expansion unit, if you removed one from the blade server to replace the battery (see "Installing an optional expansion unit" on page 19 for instructions).

Thermal grease

Use this information to determine the guidelines for using thermal grease on a heat sink and processor.

The thermal grease must be replaced whenever the heat sink has been removed from the top of the microprocessor and is going to be reused or when debris is found in the grease.

To replace damaged or contaminated thermal grease on the microprocessor and heat sink, complete the following steps:

Step 1. Place the heat-sink assembly on a clean work surface.

Step 2. Remove the cleaning pad from its package and unfold it completely.

Step 3. Use the cleaning pad to wipe the thermal grease from the bottom of the heat sink.

   Note: Make sure that all of the thermal grease is removed.

Step 4. Use a clean area of the cleaning pad to wipe the thermal grease from the microprocessor; then, dispose of the cleaning pad after all of the thermal grease is removed.

0.02 mL of thermal grease
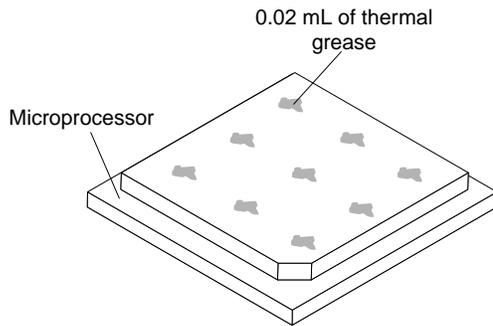
Microprocessor

Step 5. Use the thermal-grease syringe to place nine uniformly spaced dots of 0.02 mL each on the top of the microprocessor.
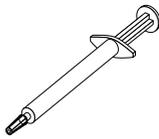
Note: 0.01mL is one tick mark on the syringe. If the grease is properly applied, approximately half (0.22 mL) of the grease will remain in the syringe.

Step 6. Continue with step Step 9 "Open the microprocessor socket" on page 28.

Installing a USB Flash key

Use these instructions to install a USB Flash key in the blade server.

The following illustration shows the installation of the USB Flash key.
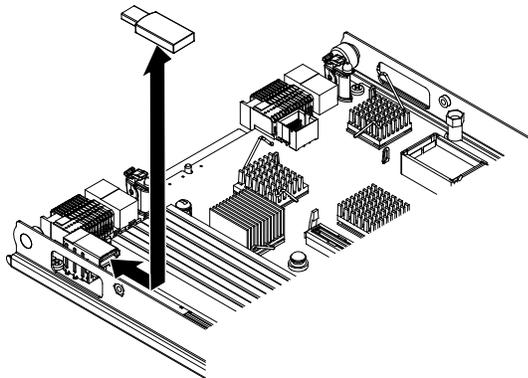
To install a USB module, complete the following steps:

Step 1. Before you begin, read "Safety" on page iii and "Installation guidelines" on page 15.

Step 2. Read the documentation that comes with the USB Flash key.

Step 3. If the blade server is installed in a BladeCenter unit, remove it (see "Removing the blade server from the BladeCenter unit" on page 17 for instructions).

Step 4. Carefully lay the blade server on a flat, static-protective surface.

Step 5. Open the blade server cover (see "Removing the blade server cover" on page 18 for instructions).

Step 6.   If an expansion unit is installed, remove the expansion unit (see "Removing an optional expansion unit" on page 20).

Step 7.   Locate the USB connector on the blade server (see "Blade server connectors" on page 14).

Step 8.   Touch the static-protective package that contains the USB Flash key to any *unpainted* metal surface on the BladeCenter unit or any *unpainted* metal surface on any other grounded rack component in the rack in which you are installing the USB module for at least two seconds; then, remove the USB module from its package.

Step 9.   Orient the connector on the USB Flash key with the USB connector on the blade server.

Step 10. Use your fingers to push the USB Flash key into the USB connector on the blade server.

Step 11. If you have other devices to install or remove, do so now; otherwise, go to "Completing the installation" on page 39.

I/O expansion cards

Use this information to install an I/O expansion card in the blade server.

The blade server has two I/O expansion connectors on the system board. One connector supports horizontal combination-form-factor (CFFh) expansion cards and the other connector supports vertical-combination-I/O (CIOv) expansion cards. See http://www.ibm.com /systems/info/x86servers/ serverproven/compat/us/ for a list of available I/O expansion cards for your blade server.
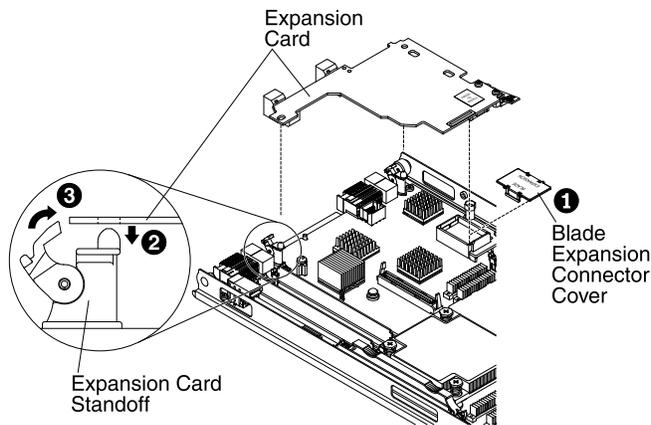
Make sure that the BladeCenter unit and the I/O modules to which the I/O expansion card is mapped support the network-interface type of the I/O expansion card. For example, if you add an Ethernet expansion card to a blade server, the I/O modules in I/O-module bays 3 and 4 on the BladeCenter unit must both be compatible with the expansion card. All other expansion cards that are installed in other blade servers in the BladeCenter unit must also be compatible with these I/O modules. In this example, you can then install two Ethernet switch modules, two pass-thru modules, or one Ethernet switch module and one pass-thru module in the BladeCenter unit. Because pass-thru modules are compatible with a variety of I/O expansion cards, installing two pass-thru modules enables the use of several types of compatible I/O expansion cards in blade servers within the same BladeCenter unit.

Installing a horizontal-compact-form-factor expansion card

Use these instructions to install a compact-form-factor expansion card in the blade server.

The blade server supports a horizontal-combination-form-factor (CFFh) expansion card. The following illustration shows how to install a CFFh expansion card.

Attention: If the expansion card is not running at the speed supported by the card, you can change the maximum speed of the PCIe bus in the Setup Utility by selecting **System Settings** and **Devices and I/O Ports**.

Expansion
Card

Blade
Expansion
Connector
Cover

Expansion Card
Standoff

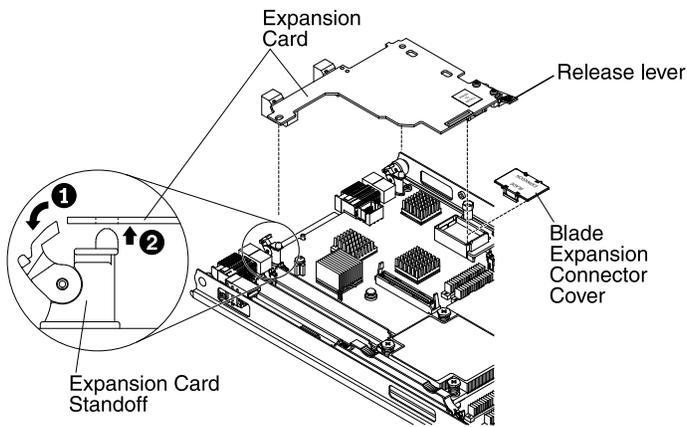To install a CFFh expansion card, complete the following steps:

Step 1. Before you begin, read "Safety" on page iii and "Installation guidelines" on page 15.

Step 2. If the blade server is installed in a BladeCenter unit, remove it (see "Removing the blade server from the BladeCenter unit" on page 17 for instructions).

Step 3. Carefully lay the blade server on a flat, static-protective surface.

Step 4. Open the blade server cover (see "Removing the blade server cover" on page 18 for instructions).

Step 5. Locate the blade server expansion connector (see "Blade server connectors" on page 14).

Step 6. If a cover is installed on the expansion connector, remove it by using your fingers to lift the cover from the expansion connector.

Step 7. If a 10Gb interposer card is installed on the expansion connector, remove it (see "Removing a 10Gb interposer card" on page 39).

Step 8. Touch the static-protective package that contains the expansion card to any *unpainted* metal surface on the BladeCenter unit or any *unpainted* metal surface on any other grounded rack component; then, remove the expansion card from the package.

Step 9. Rotate the expansion-card standoffs to the open position.

Step 10. Orient the connector on the expansion card and expansion connector on the system board; then, press the expansion card into the expansion connector.

Step 11. Firmly press on the indicated locations to seat the expansion card.

Note: For device-driver and configuration information to complete the installation of the expansion card, see the documentation that comes with the expansion card.

Step 12. Rotate the expansion-card standoffs to the closed position to secure the expansion card in place.

Step 13. If you have other devices to install or remove, do so now; otherwise, go to "Completing the installation" on page 39.

Removing a horizontal-compact-form-factor expansion card

Use these instructions to remove a compact-form-factor expansion card from the blade server.

The following illustration shows how to remove a horizontal-compact-form-factor (CFFh) expansion card.

Expansion
Card

Release lever

Blade
Expansion
Connector
Cover

Expansion Card
Standoff

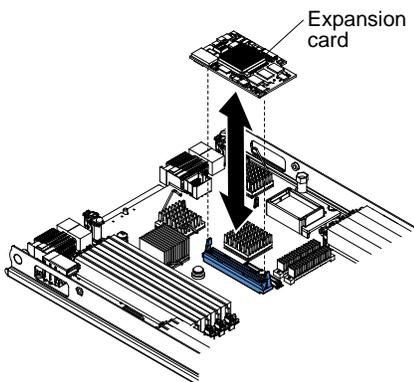To remove a CFFh expansion card, complete the following steps:

Step 1.   Before you begin, read "Safety" on page iii and "Installation guidelines" on page 15.

Step 2.   If the blade server is installed in a BladeCenter unit, remove it (see "Removing the blade server from the BladeCenter unit" on page 17 for instructions).

Step 3.   Carefully lay the blade server on a flat, static-protective surface.

Step 4.   Open the blade server cover (see "Removing the blade server cover" on page 18 for instructions).

Step 5.   Locate the CFFh expansion card. The CFFh expansion card is installed into the blade expansion connector (see "Blade server connectors" on page 14).

Step 6.   Rotate the expansion-card standoffs to the open position.

Step 7.   Lift the release lever to disengage the CFFh expansion card from the expansion connector on the system board.

Step 8.   Use your fingers to hold the edge of the CFFh expansion card where it connects to the blade expansion connector; then, lift the card vertically out of the expansion connector.

Installing a CIOv-form-factor expansion card

Use these instructions to install a CIOv-form-factor expansion card in the blade server.

The blade server supports a vertical-combination-I/O (CIOv) expansion card and a horizontal-combination-form-factor (CFFh) expansion card. The following illustration shows the location and installation of a CIOv expansion card.

Attention: If the expansion card is not running at the speed supported by the card, you can change the maximum speed of the PCIe bus in the Setup Utility by selecting **System Settings** and **Devices and I/O Ports**.

Expansion
card

To install a CIOv expansion card, complete the following steps:

Step 1.   Before you begin, read "Safety" on page iii and "Installation guidelines" on page 15.

Step 2.   If the blade server is installed in a BladeCenter unit, remove it (see "Removing the blade server from the BladeCenter unit" on page 17 for instructions).

Step 3.   Carefully lay the blade server on a flat, static-protective surface.

Step 4.   Open the blade server cover (see "Removing the blade server cover" on page 18 for instructions).

Step 5.   Touch the static-protective package that contains the expansion card to any *unpainted* metal surface on the BladeCenter unit or any *unpainted* metal surface on any other grounded rack component; then, remove the expansion card from the package.

Step 6.   Locate the CIOv expansion connector (see "Blade server connectors" on page 14).

Step 7.   Orient the connector on the expansion card with the CIOv expansion connector on the system board; then, press the card into the CIOv expansion connector.

Step 8.   Firmly press on the indicated locations to seat the expansion card.

   Note: For device-driver and configuration information to complete the installation of the expansion card, see the documentation that comes with the expansion card.

Step 9.   If you have other devices to install or remove, do so now; otherwise, go to "Completing the installation" on page 39.

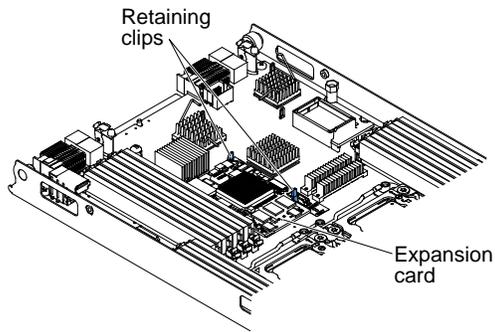## Removing a CIOv-form-factor expansion card

Use these instructions to remove a CIOv-form-factor expansion card in the blade server.

The following illustration shows how to remove a vertical-combination-I/O (CIOv) expansion card.
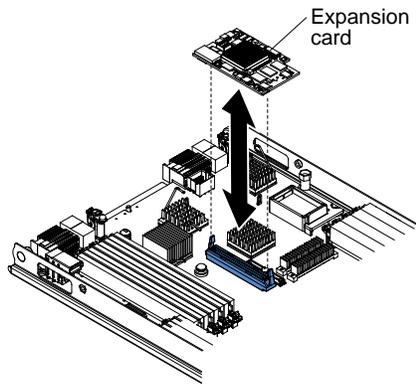
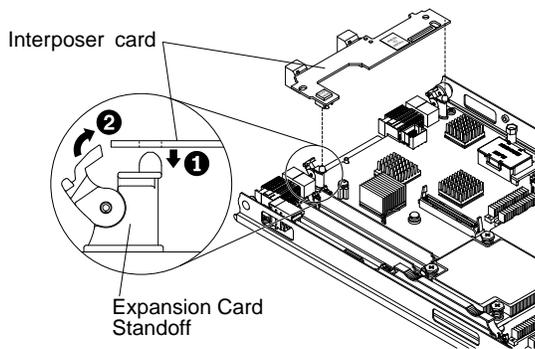To remove a CIOv expansion card, complete the following steps:

Step 1.   Before you begin, read "Safety" on page iii and "Installation guidelines" on page 15.

Step 2.   If the blade server is installed in a BladeCenter unit, remove it (see "Removing the blade server from the BladeCenter unit" on page 17 for instructions).

Step 3.   Carefully lay the blade server on a flat, static-protective surface.

Step 4.   Open the blade server cover (see "Removing the blade server cover" on page 18 for instructions).

Step 5.   Touch the static-protective package that contains the expansion card to any *unpainted* metal surface on the BladeCenter unit or any *unpainted* metal surface on any other grounded rack component; then, remove the expansion card from the package.

Step 6.   Locate the CIOv expansion connector (see "Blade server connectors" on page 14).

Retaining clips

Expansion card

Step 7. Using your fingers, move the retaining clips away from the CIOv card; then, lift the card vertically out of the connector.

Installing a 10Gb interposer card

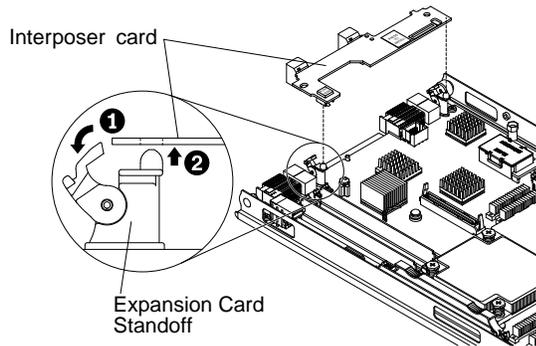Use these instructions to install a 10Gb interposer card in the blade server.

Interposer card

Expansion Card Standoff

To install a 10Gb interposer card, complete the following steps:

Step 1. Before you begin, read "Safety" on page iii and "Installation guidelines" on page 15.

Step 2. If the blade server is installed in a BladeCenter unit, remove it (see "Removing the blade server from the BladeCenter unit" on page 17 for instructions).

Step 3. Carefully lay the blade server on a flat, static-protective surface.

Step 4. Open the blade server cover (see "Removing the blade server cover" on page 18 for instructions).

Step 5. Locate the blade server interposer card connector (see "Blade server connectors" on page 14).

Step 6. If a horizontal-combination-form-factor (CFFh) expansion card is installed on the expansion connector, remove it (see "Removing a horizontal-compact-form-factor expansion card" on page 35).

Step 7. Touch the static-protective package that contains the interposer card to any *unpainted* metal surface on the BladeCenter unit or any *unpainted* metal surface on any other grounded rack component; then, remove the interposer card from the package.

Step 8. Rotate the expansion-card standoffs to the open position.

Step 9. Align the connector on the interposer card with the connector on the system board; then, press the interposer card into the connector.

Step 10. Firmly press on the indicated locations to seat the interposer card.

Step 11. Rotate the expansion-card standoffs to the closed position to secure the interposer card in place.

Step 12. If you have other devices to install or remove, do so now; otherwise, go to "Completing the installation" on page 39.

Removing a 10Gb interposer card

Use these instructions to remove a 10Gb interposer card from the blade server.

Interposer card

Expansion Card Standoff

To remove a 10Gb interposer card, complete the following steps:

Step 1.   Before you begin, read "Safety" on page iii and "Installation guidelines" on page 15.

Step 2.   If the blade server is installed in a BladeCenter unit, remove it (see "Removing the blade server from the BladeCenter unit" on page 17 for instructions).

Step 3.   Carefully lay the blade server on a flat, static-protective surface.

Step 4.   Open the blade server cover (see "Removing the blade server cover" on page 18 for instructions).

Step 5.   Locate the 10Gb interposer card.

Step 6.   Rotate the expansion-card standoffs to the open position.

Step 7.   Use your fingers to hold the edge of the interposer card where it connects to the connector on the system board; then, lift the card vertically up.

Completing the installation

To complete the installation, complete the following tasks.

Step 1.   Reinstall the optional expansion unit, if you removed one to install other devices (see "Installing an optional expansion unit" on page 19 for information on installing the expansion unit).

Step 2.   Close the blade server cover, unless you installed an optional expansion unit that has its own cover (see "Installing the blade server cover" on page 40).

Statement 21

CAUTION:
Hazardous energy is present when the blade server is connected to the power source. Always replace the blade server cover before installing the blade server.

Step 3.   Reinstall the blade server into the BladeCenter unit (see "Installing the blade server in a BladeCenter unit" on page 41).

Step 4.   Turn on the blade server (see "Turning on the blade server" on page 13).If you have just connected the power cords of the BladeCenter unit to electrical outlets, you must wait until the power-on LED on the blade server flashes slowly before you press the power-control button.

Step 5.   For certain optional devices, you might have to run the blade server Setup utility to configure the blade server (see Chapter 4 "Configuring the blade server" on page 45). See the documentation that comes with your optional device for additional information.
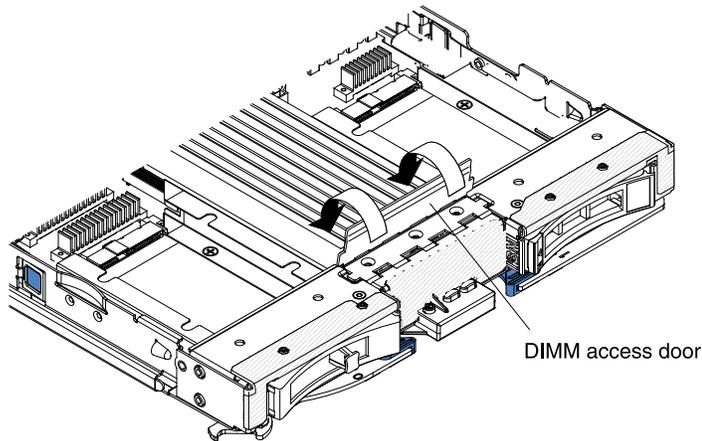
Installing the blade server cover

Use these instructions for information about how to close the blade server cover.

Attention: You cannot insert the blade server into the BladeCenter unit until the cover is installed and closed or an expansion unit is installed. Do not attempt to override this protection.

To install the blade server cover, complete the following steps:

Step 1.   Read the safety information that begins on page "Safety" on page iii and "Installation guidelines" on page 15.
Step 2.   Close the DIMM access door by rotating the door towards the DIMM connectors.

DIMM access door

Step 3.   If you removed an expansion unit from the blade server, install it now (see "Installing an optional expansion unit" on page 19).
Step 4.   Lower the cover so that the slots at the rear slide down onto the pins at the rear of the blade server, as shown in the illustration. Before you close the cover, make sure that all components are installed and seated correctly and that you have not left loose tools or parts inside the blade server.
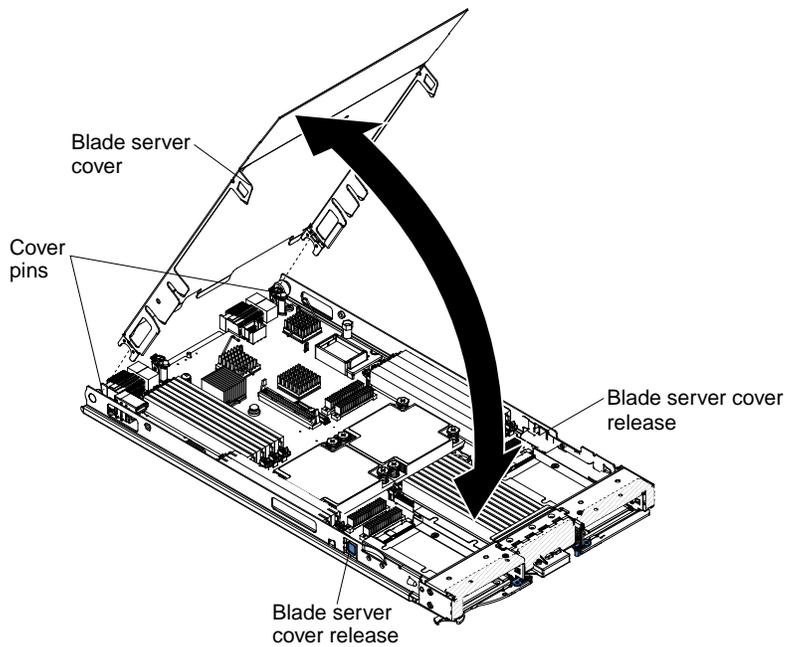
Step 5. Pivot the cover to the closed position until it clicks into place.

Installing the blade server in a BladeCenter unit

Use these instructions to install the blade server in a BladeCenter unit.

The following illustration shows how to install a blade server into a BladeCenter unit. The appearance of your BladeCenter unit might be different; see the documentation for your BladeCenter unit for additional information. To install a blade server in a BladeCenter unit, complete the following steps.
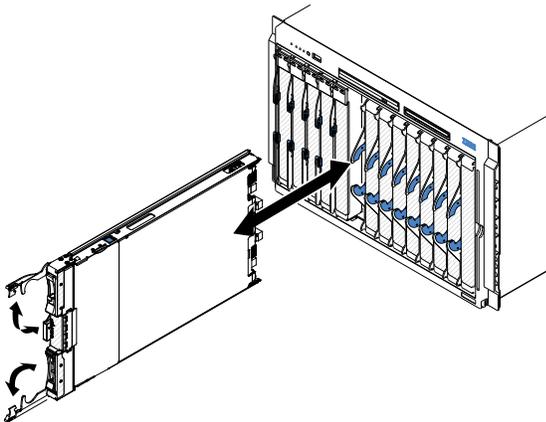
Statement 21

CAUTION:
Hazardous energy is present when the blade server is connected to the power source. Always replace the blade cover before installing the blade server.

Step 1.   Before you begin, read "Safety" on page iii and "Installation guidelines" on page 15.

Step 2.   Select the blade bay for the blade server; at least one blade bay is required.

> **Notes:**
>
> 1. When any blade server or device is in blade bay 7 through 14, power modules must be installed in all four power-module bays. For additional information, see the *Installation and User's Guide* that comes with the BladeCenter unit.
>
> 2. If you are reinstalling a blade server that you removed, you must install it in the same blade bay from which you removed it. Some blade server configuration information and update options are established according to blade server bay number. Reinstalling a blade server into a different blade server bay number from the one which it was removed can have unintended consequences, and you might have to reconfigure the blade server.
>
> 3. To help ensure proper cooling, performance, and system reliability, make sure that each blade bay on the front of the BladeCenter unit contains a blade server, expansion unit, or blade filler. Do not operate a BladeCenter unit for more than 1 minute without a blade server, expansion unit, or blade filler in each blade bay.

Step 3.   Make sure that the release handles on the blade server are in the open position (perpendicular to the blade server).

Step 4.   Slide the blade server into the blade bay until it stops.

Step 5.   Push the release handles on the front of the blade server to the closed position.

> **Note:** After the blade server is installed, the IMM2 in the blade server initializes and synchronizes with the management module. This process takes approximately two minutes to complete. The power-on LED flashes rapidly, and the power-control button on the blade server does not respond until this process is complete.

Step 6.   Turn on the blade server (see "Turning on the blade server" on page 13 for instructions).

Step 7.   Make sure that the power-on LED on the blade server control panel is lit continuously, indicating that the blade server is receiving power and is turned on.

Step 8.   If you have other blade servers to install, do so now.

Step 9.   Write identifying information on one of the labels that come with the blade servers and place the label on the BladeCenter unit bezel. See the documentation for your BladeCenter unit for information about the label placement.

> **Important:** Do not place the label on the blade server or in any way block the ventilation holes on the blade server.

If this is the initial installation of the blade server in the BladeCenter unit, you must configure the blade server through the Setup utility and install the blade server operating system. See "Updating the blade server configuration" on page 42 and Chapter 5 "Installing the operating system" on page 59 for details.

If you have changed the configuration of the blade server or if you are installing a different blade server from the one that you removed, you must configure the blade server through the Setup utility, and you might have to install the blade server operating system. For more information, see "Using the Setup utility" on page 45.

Updating the blade server configuration

Use this information to update the blade server configuration.

When the blade server starts for the first time after you add or remove an internal device, you might receive a message that the configuration has changed. The Setup utility automatically starts so that you can save the new configuration settings. See "Using the Setup utility" on page 45 for more information about the Setup utility.

Some options have device drivers that you must install. See the documentation that comes with each device for information about installing device drivers.

The blade server operates as a symmetric multiprocessing (SMP) server, regardless of how many microprocessors are installed. For optimum performance, you must upgrade the operating system to support SMP. See Chapter 5 "Installing the operating system" on page 59 and your operating-system documentation for additional information.

Input/output connectors and devices

Use this information to locate the input/output connectors and devices.

The input/output connectors that are available to the blade server are supplied by the BladeCenter unit. See the documentation that comes with the BladeCenter unit for information about the input/output connectors.

The blade server has two selection buttons on the control panel: the media tray select button and the keyboard/video/mouse select button. See "Blade server controls and LEDs" on page 11 for information about these buttons and their functions.

The Ethernet controllers on the blade server communicate with the network through the Ethernet-compatible I/O modules in the BladeCenter unit. Network signals to and from the blade server or any expansion cards are automatically routed to a same-network-interface I/O module through circuitry in the BladeCenter unit.

Chapter 4. Configuring the blade server

Use this information for details about the configuration requirements of the blade server.

This chapter describes the configuration requirements of the blade server. Before you continue, make sure that the blade server has the latest version of firmware code. For additional information, see "Updating firmware and device drivers" on page 52.

The following configuration programs come with the blade server:

- **Setup utility**

  The Setup utility is used to change system settings, such as interrupt requests (IRQ), date and time, and password. See "Using the Setup utility" on page 45 for more information.

- **IBM FastSetup**

  IBM FastSetup is a no-cost software tool that helps simplify the maintenance and deployment of selected IBM BladeCenter chassis, servers, and components. The intuitive graphical interface initializes all phases of server setup, including discovery, update, and configuration. Features include templates that enable replication of settings to many servers and automation that reduces hands-on time and user errors. Wizards and other default settings enable customization capabilities. The low-touch, set-once and walk-away feature reduces the hands-on server setup time from days to minutes, particularly for larger deployments. For information about this tool, see http://www-947.ibm.com/ support/entry/portal/ docdisplay?lndocid=TOOL-FASTSET.

- **IBM *ServerGuide Setup and Installation* CD**

  The ServerGuide program provides software-setup tools and installation tools that are designed for the blade server. Use this CD during the installation of the blade server to configure basic hardware features and to simplify the installation of the operating system. For information about obtaining and using this CD, see "Using the ServerGuide Setup and Installation CD" on page 49.

- **Preboot Execution Environment (PXE) boot agent utility program**

  The PXE boot agent utility program is part of the blade server firmware. Use it to select the boot protocol and other boot options and to select a power-management option. For information about using this utility program, see "Setting the PXE boot protocol using the Setup utility" on page 51.

The IBM Remote Deployment Manager (RDM) Version 4.4 program is available for purchase. You can use RDM to install a UEFI code update onto a blade server. For the latest information about RDM, including which operating systems that RDM supports and how to purchase the software, see http://www.ibm.com /systems/management/.

Using the Setup utility

Use these instructions to start the Setup utility.

To start the Setup utility, complete the following steps:

Step 1. Turn on the blade server (see "Turning on the blade server" on page 13).

Step 2. Immediately give the blade server control of the BladeCenter unit shared keyboard, video, and mouse ports.

- If you are managing the blade server by using the BladeCenter system console, press the KVM select button on the blade server (see "Blade server controls and LEDs" on page 11 for information).

- If you are managing the blade server from a remote location, see the *IBMBladeCenter Management Module User's Guide*, *IBMBladeCenter Management Module Command-Line Interface Reference Guide*, or *IBMBladeCenter Serial over LAN Setup Guide* for information and instructions.

Step 3. When the prompt `<F1> Setup` is displayed, press F1. If you have set an administrator password, you must type the administrator password to access the full Setup-utility menu. If you do not type the administrator password, a limited Setup-utility menu is available.

Step 4. Follow the instructions on the screen.

Setup utility menu

Use the Setup utility main menu to view and configure blade server configuration data and settings.

The following menu items are on the Setup utility main menu. Depending on the version of the Unified Extensible Firmware Interface (UEFI), some menu items might differ slightly from these descriptions.

- **System Information**

  Select this choice to view information about the server. When you make changes through other choices in the Setup utility, some of those changes are reflected in the system information; you cannot change settings directly in the system information. This choice is on the full Setup utility menu only.

  – **System Summary**

    Select this choice to view configuration information, including the ID, speed, and cache size of the microprocessors, machine type and model of the server, the serial number, the system UUID, and the amount of installed memory. When you make configuration changes through other options in the Setup utility, the changes are reflected in the system summary; you cannot change settings directly in the system summary.

  – **Product Data**

    Select this choice to view the revision level or issue date of the firmware, the integrated management module and diagnostics code, and the version and date.

- **System Settings**

  Select this choice to view or change the server component settings.

  – **Adapters and UEFI Drivers**

    Select this choice to view information about the adapters and UEFI drivers installed in the blade server.

    Note: Before you configure a UEFI-compatible device, you should update the firmware for your blade server. See "Updating firmware and device drivers" on page 52 for information about how to update the firmware for your blade server.

    To configure a UEFI-compatible expansion adapter, complete the following steps:

    1. Select **Please refresh this page first** and press Enter.
    2. Select the device driver that you want to configure and press Enter.
    3. When you have finished changing settings, press Esc to exit from the program; select **Save** to save the settings that you have changed.

  – **Processors**

    Select this choice to view or change the processor settings.

  – **Memory**

    Select this choice to view or change the memory settings. To configure memory mirroring, select **System Settings → Memory**, and then select **Memory Mode → Mirroring**

  – **Devices and I/O Ports**

Select this choice to view or change assignments for devices and input/output (I/O) ports. You can configure the remote console redirection, and enable or disable integrated Ethernet controllers and PCI slots. If you disable a device, it cannot be configured, and the operating system cannot detect it (disabling a device is equivalent to disconnecting the device).

You can also choose to enable or disable adapter option ROM support. Disabling support can potentially improve the time it takes the blade server to start.

– **Power**

Select this choice to view or change Active Energy Manager (AEM) power capping to control power consumption and processor performance states.

– **Operating Modes**

Select this choice to determine operational settings, such as operating mode (acoustic, efficiency, or performance) and memory speed.

– **Legacy Support**

Select this choice to view or set legacy support.

– **Force Legacy Video on Boot**

Select this choice to enable or disable force INT video support if the operating system does not support UEFI video output standards. The default is **Enable**.

– **Rehook INT 19h**

Select this choice to enable or disable devices from taking control of the boot process. The default is **Disable**.

– **Legacy Thunk Support**

Select this choice to enable or disable UEFI to interact with PCI mass storage devices that are non-UEFI compliant. The default is **Enable**.

– **Infinite Boot Retry**

Select this choice to enable or disable UEFI to infinitely retry the legacy boot order.

– **Non-planar PXE**

Select this choice to enable or disable non-planar PXE for legacy mode.

– **System Security**

Select this choice to view or change the security options for Trusted Platform Module (TPM).

– **Integrated Management Module**

Select this choice to view or change the settings for the integrated management module II (IMM2).

– **Commands on USB Interface**

Select this choice to specify whether the Ethernet over USB interface is enabled or disabled.

Notes: This option is primarily for older operating systems that have problems with USB communications device class (CDC) Ethernet interfaces. Disabling this option will cause the following issues:

• Online update packages will not work.

• Updates that use Bootable Media Creator (BoMC) will not work because BoMC uses the LAN over USB interface.

• You must install the IPMI device driver to use ASU to change the IMM2 or UEFI configuration.

• You cannot set the IMM2 OS Loader watchdog.

– **Network Configuration**

Select this choice to view the system management network interface port, the IMM2 MAC address, the current IMM2 IP address, and host name; define the static IMM2 IP address, subnet mask, and gateway address; specify whether to use the static IP address or have DHCP assign the IMM2 IP address; save the network changes.

– **Restore IMM to Defaults**

Select this choice to restore the IMM2 to the default settings. The IMM2 controller restarts after you restore the settings.

– **Reset IMM**

Select this choice to restart the IMM2 controller.

– **Recovery**

Select this choice to view or change recovery settings.

– **Storage**

Select this choice to view or change the storage device settings.

– **Network**

Select this choice to view or change the network device options, such as iSCSI.

– **Driver Health**

Select this choice to view the status of the controllers installed in the blade server.

- **Date and Time**

  Select this choice to set the date and time in the server, in 24-hour format *(hour:minute:second)*.

  This choice is on the full UEFI Setup Utility menu only.

- **Start Options**

  Select this choice to view or change the start options, including the startup sequence, keyboard NumLock state, PXE boot option, and PCI device boot priority. Changes in the startup options take effect when you start the server.

  The startup sequence specifies the order in which the server checks devices to find a boot record. The server starts from the first boot record that it finds. If the server has Wake on LAN hardware and software and the operating system supports Wake on LAN functions, you can specify a startup sequence for the Wake on LAN functions. For example, you can define a startup sequence that checks for a disc in the CD-RW/DVD drive, then checks the hard disk drive, and then checks a network adapter.

  This choice is on the full UEFI Setup Utility menu only.

- **Boot Manager**

  Select this choice to view, add, delete, or change the device boot priority, boot from a file, select a one-time boot, or reset the boot order to the default setting.

- **System Event Logs**

  Select this choice to access the System Event Manager, where you can view the POST event log and the system-event log.

  The POST event log contains the three most recent error codes and messages that were generated during POST.

  The system-event log contains POST and system management interrupt (SMI) events and all events that are generated by the baseboard management controller that is embedded in the integrated management module.

  Important: If the system-error LED on the front of the blade server is lit but there are no other error indications, clear the system-event log. Also, after you complete a repair or correct an error, clear the system-event log to turn off the system-error LED on the front of the blade server.

  – **POST Event Viewer**

Select this choice to enter the POST event viewer to view the UEFI diagnostic codes.

– **System Event Log**

Select this choice to view the system-event log.

– **Clear System Event Log**

Select this choice to clear the system-event log.

- **User Security**

  Select this choice to set, change, or clear passwords. See "Using passwords" on page 49 for more information.

- **Save Settings**

  Select this choice to save the changes that you have made in the settings.

- **Restore Settings**

  Select this choice to cancel the changes that you have made in the settings and restore the previous settings.

- **Load Default Settings**

  Select this choice to cancel the changes that you have made in the settings and restore the factory settings.

- **Exit Setup**

  Select this choice to exit from the Setup utility. If you have not saved the changes that you have made in the settings, you are asked whether you want to save the changes or exit without saving them.

Using passwords

Use this information to set, change, or delete a power-on password.

You can set, change, and delete a power-on password and an administrator password in the Setup utility by selecting **System Settings** then **System Security**.

If you set a power-on password, you must type the power-on password to complete the system startup and to have access to the Setup Utility menu.

The password must be from 6 to 20 characters. You can use any combination of ASCII printable characters for the password. Keep a record of your password in a secure place.

If you forget the power-on password, you can regain access to the blade server either by removing the blade server battery and then reinstalling it or by using the power-on password override switch (see the *Problem Determination and Service Guide* on the *Documentation* CD for instructions).

An administrator password is intended to be used by a system administrator; it limits access to the full Setup utility menu.

Attention: If you set an administrator password and then forget it, there is no way to change, override, or remove it. You must replace the system board.

Using the ServerGuide Setup and Installation CD

Use this information as an overview for using the ServerGuide Setup and Installation CD.

The *ServerGuide Setup and Installation* CD contains a setup and installation program that is designed for your blade server. The ServerGuide program detects the blade server model and optional hardware devices that are installed and uses that information during setup to configure the hardware. The ServerGuide

program simplifies operating-system installations by providing updated device drivers and, in some cases, installing them automatically.

You can download a free image of the *ServerGuide Setup and Installation* CD or purchase the CD from the ServerGuide fulfillment website at http://www.ibm.com /systems/management/serverguide/sub.html. To download the free image, click **IBM Service and Support Site**.

Note: Changes are made periodically to the IBM website. The actual procedure might vary slightly from what is in this document.

The ServerGuide program performs the following tasks:

- An easy-to-use interface
- Diskette-free setup and configuration programs that are based on detected hardware
- Device drivers that are provided for the blade server model and detected hardware
- Operating-system partition size and file-system type that are selectable during setup

ServerGuide features

Use this information to determine the ServerGuide features.

Features and functions can vary slightly with different versions of the ServerGuide program. To learn more about the version that you have, start the *ServerGuide Setup and Installation* CD and view the online overview. Not all features are supported on all blade server models.

The ServerGuide program requires a supported IBM blade server that is associated with an enabled startable (bootable) CD drive. In addition to the *ServerGuide Setup and Installation* CD, you must have the operating-system CD to install the operating system.

The ServerGuide program has the following features:

- Sets system date and time
- Detects installed optional hardware devices and provides updated device drivers for most adapters and devices
- Provides diskette-free installation for supported Windows operating systems
- Includes an online readme file with links to tips for the hardware and operating-system installation

Setup and configuration overview

Use this information to setup and configure the blade server.

When you use the *ServerGuide Setup and Installation* CD, you do not need setup diskettes. You can use the CD to configure any supported IBM blade server model. The setup program provides a list of tasks that are required to set up the blade server.

Note: Features and functions can vary slightly with different versions of the ServerGuide program.

When you start the *ServerGuide Setup and Installation* CD, the program prompts you to complete the following tasks:

- Select your language.
- Select your keyboard layout and country.
- View the overview to learn about ServerGuide features.

- View the readme file to review installation tips for your operating system and adapter.

- Start the operating-system installation. You will need your operating-system CD.

Typical operating-system installation

Use this information for a typical ServerGuide operating-system installation.

The ServerGuide program can reduce the time it takes to install an operating system. It provides the device drivers that are required for the hardware and for the operating system that you are installing. This section describes a typical ServerGuide operating-system installation.

Note: Features and functions can vary slightly with different versions of the ServerGuide program.

1. After you have completed the setup process, the operating-system installation program starts. (You will need your operating-system CD to complete the installation.)

2. The ServerGuide program stores information about the blade server model, service processor, hard disk drive controllers, and network adapters. Then, the program checks the CD for newer device drivers. This information is stored and then passed to the operating-system installation program.

3. The ServerGuide program presents operating-system partition options that are based on your operating-system selection and the installed hard disk drives.

4. The ServerGuide program prompts you to insert your operating-system CD and restart the blade server. At this point, the installation program for the operating system takes control to complete the installation. The BladeCenter CD drive must be associated with the blade server when this step is performed.

Installing the operating system without using ServerGuide

Use these instructions to install the operating system on the blade server without using a ServerGuide.

If you have already configured the blade server hardware and you are not using the ServerGuide program to install the operating system, download the latest operating-system installation instructions from the IBM website at http://www.ibm.com/supportportal/.

Setting the PXE boot protocol using the Setup utility

Use the Setup utility to set the PXE boot protocol.

To use the Setup utility to configure the boot protocol to boot from a non-UEFI legacy network device for all PXE boot attempts, complete the following steps:

1. Turn on the server (see "Turning on the blade server" on page 13).

2. When the prompt `Press <F1> Setup` is displayed, press F1. If you have set an administrator password, you must type the administrator password to access the full Setup utility menu. If you do not type the administrator password, a limited Setup utility menu is available.

3. From the Setup utility main menu, select **Boot Manager**.

4. Select **Boot Modes**; then select **Legacy Only**.

5. Press Esc twice to return to the Setup utility main menu.

6. Select **Save Settings** and then select **Exit Setup**.

To use the Setup utility to configure the boot protocol to boot from a non-UEFI legacy network device for the next boot only, complete the following steps:

1. Turn on the server (see "Turning on the blade server" on page 13).

2. When the prompt `Press <F1> Setup` is displayed, press F1. If you have set an administrator password, you must type the administrator password to access the full Setup utility menu. If you do not type the administrator password, a limited Setup utility menu is available.

3. From the Setup utility main menu, select **Boot Manager**.

4. Select **Add Boot Option**; then select **Generic Boot Option**.

5. Select **Legacy Only**.

6. Press Esc three times to return to the Setup utility main menu.

7. Select **Save Settings** and then select **Exit Setup**.

Note: Press Ctrl+P when prompted during POST to access the PXE boot agent utility program.

Updating firmware and device drivers

IBM periodically makes UEFI code, service processor (IMM2) firmware, diagnostic firmware updates, and device driver updates available for the blade server. Provisioning is the set of actions you take to update the firmware and device drivers, and install the operating system. Several tools are available to help update the firmware and device drivers in the provisioning process. Use the instructions that are included with the downloaded files.

Important: Installing the wrong firmware or device-driver update might cause the blade server to malfunction. Before you install a firmware or device-driver update, read any readme and change history files that are provided with the downloaded update. These files contain important information about the update and the procedure for installing the update, including any special procedure for updating from an early firmware or device-driver version to the latest version.

- **UpdateXpress System Packs**

  UpdateXpress System Packs (UXSP) contain an integration-tested bundle of online, updateable firmware and device drivers for your blade server. The IBM ToolsCenter Bootable Media Creator uses UpdateXpress System Packs to update the firmware and device drivers.

  Typically, use UpdateXpress System Packs to update firmware and devices drivers for a blade server that has previously been provisioned. For more information about UpdateXpress System Packs, see http://www.ibm.com/ support/entry/portal/docdisplay? brand=5000008&lndocid=SERV-XPRESS.

- **IBM ToolsCenter Bootable Media Creator**

  You can use IBM ToolsCenter Bootable Media Creator to create bootable media that is suitable for applying firmware updates, and running preboot diagnostics. Using IBM ToolsCenter Bootable Media Creator, you can create a single bootable image on supported media (such as CD, DVD, ISO image, USB flash drive, or set of PXE files) that bundles multiple IBM BladeCenter system tools and updates from UpdateXpress System Packs, which contain Windows and Linux® firmware updates.

  Typically, use IBM ToolsCenter Bootable Media Creator for the initial set up of a blade server. For more information about the IBM Bootable Media Creator, see http://www.ibm.com/ support/entry/portal/docdisplay? brand=5000008&lndocid=TOOL-BOMC.

Important: To avoid problems and to maintain system performance, always make sure that the UEFI code, service processor (IMM2) firmware, and diagnostic firmware levels are consistent for all blade servers within the BladeCenter unit.

Configuring UEFI compatible devices

Use this information to configure UEFI compatible devices.

Your IBM BladeCenter H23 Type 7875 or 1929 blade server is UEFI compatible. UEFI compatible expansion cards can be configured through the Setup utility. To configure a UEFI compatible expansion card, complete the following steps:

Note: Before configuring a UEFI compatible device, it is recommended to update the firmware for your blade server. See "Updating firmware and device drivers" on page 52 for information on how to update the firmware for your blade server.

1. Run the Setup utility (see "Using the Setup utility" on page 45).
2. Select **System Settings** → **Network** or **Storage** depending on the type of your adapters.

   Note: Select **System Settings** → **Adapters and UEFI drivers** for UEFI 2.0 (and prior) compliant adapters and drivers installed in the server.
3. Select **Please refresh this page first** and press Enter.
4. Select the device driver that you want to configure and press Enter.
5. When you have finished changing settings, press Esc to exit from the program; select **Save** to save the settings that you have changed.

Configuring the Gigabit Ethernet controller

Use this information to locate the device drivers for the Gigabit Ethernet controller.

One four-port Ethernet controller is integrated on the blade server system board. The controller provides a 1000 Mbps full-duplex interface for connecting to one of the Ethernet-compatible I/O modules in I/O-module bays 1 and 2, which enables simultaneous transmission and reception of data on the Ethernet local area network (LAN). The Ethernet controller on the system board is routed to I/O-module bay 1 or bay 2. The logical link of each Ethernet port to an I/O-module bay is assigned by the operating system. The controller provides a dual-port 10Gb interface that connects to switch bays 7 and 9 in a BladeCenter H chassis.

You do not have to set any jumpers or configure the controller for the blade server operating system. However, you must install a device driver to enable the blade server operating system to address the Ethernet controller. For device drivers and information about configuring the Ethernet controller, go to http://www.ibm.com/supportportal/.

Configuring a RAID array

Use this information to configure a RAID array.

Configuring a RAID array applies only to a blade server in which two or more storage drives are installed.

Note: When configuring a RAID array, the storage drives must use the same type of interface. For example, a RAID array can be configured with two SAS storage drives, two SATA storage drives, or two SSD storage drives.

You can use two storage drives in the blade server to implement and manage RAID level-0 (striping) or RAID level-1 (mirror) arrays in operating systems that are listed on the ServerProven list at http://www.ibm.com /systems/info/x86servers/ serverproven/compat/us/.

Refer to the *Human Interface Infrastructure Configuration Application User Guide* in http://www-01.ibm.com/ support/docview.wss?uid=psg2MIGR-5088601 for more information on the storage drives and SAS controller configuration.

If an optional RAID expansion card is installed, you can use it to control all of the storage drives that are installed in the blade server. See the documentation that comes with the expansion card for information on how to configure the RAID array.

Important: You must create the RAID array *before* you install the operating system on the blade server.

Using the LSI Logic Configuration Utility program

Use these instructions to start the LSI Logic Configuration Utility program.

You can use the LSI Logic Configuration Utility program to perform the following tasks:

- Set the SAS device scan order
- Set the SAS ID for the controller
- Manage the SAS RAID configuration

To start the LSI Logic Configuration Utility program, complete the following steps:

Note: The LSI controller on your blade server is a UEFI compatible device and can also be configured through the Setup utility for your blade server (see "Configuring UEFI compatible devices" on page 52).

Step 1.   Turn on the blade server, and make sure that the blade server is the owner of the keyboard, video, and mouse.

Step 2.   When the `<<<Press Ctrl-C to start LSI Logic Configuration Utility>>>` prompt is displayed, press Ctrl+C.

Step 3.   Use the arrow keys to select the controller from the list of adapters; then, press Enter.

Step 4.   Follow the instructions on the screen to change the settings of the selected items; then, press Enter. If you select **SAS Topology** or **Advanced Adapter Properties**, additional screens are displayed.

Using LAN over USB to interface the IMM2

The IMM2 does not require IPMI device drivers or USB daemons for in-band IMM2 communication. Instead, a LAN over USB interface enables in-band communications to the IMM2; the IMM2 hardware on the system board presents an internal Ethernet NIC from the IMM2 to the operating system. LAN over USB is also called the "USB in-band interface" in the IMM2 web interface.

Typically, the IMM2 IP address for the LAN over USB interface is set to a static address of 169.254.95.118 with a subnet mask of 255.255.0.0. In the event of an IP address collision on the network, the IMM2 might obtain a different IP address in the 169.254.*xxx.xxx* range.

Because the IMM2 might obtain a random IP address for the LAN over USB interface, the IBM Advanced Settings Utility (ASU) and firmware flash utilities, DSA, and the IBM Director Agent use the Service Location Protocol (SLP) to discover the IMM2 IP address. These tools perform an SLP multicast discovery on the LAN over USB interface. When they receive a response from the IMM2, they obtain the attributes that contain the IP address the IMM2 is using for the LAN over USB interface.

Potential conflicts with the LAN over USB interface

In some situations, the IMM2 LAN over USB interface can conflict with certain network configurations, applications, or both.

For example, Open MPI attempts to use all of the available network interfaces on a server. Open MPI detects the IMM2 LAN over USB interface and attempts to use it to communicate with other systems in a clustered

environment. The LAN over USB interface is an internal interface, so this interface does not work for external communications with other systems in the cluster.

Resolving conflicts with the IMM2 LAN over USB interface

Use this information to resolve LAN over USB conflicts with network configurations and applications.

There are several actions that resolve LAN over USB conflicts with network configurations and applications:

1. For conflicts with Open MPI, configure the application so it does not attempt to use this interface.
2. Take the interface down (run `ifdown` under Linux).
3. Remove the driver (run `rmmod[modulename]` under Linux).
4. Disable the USB in-band interface on the IMM2 through either the IMM2 web interface or the AMM web interface.

   Important: If you disable the USB in-band interface, you cannot perform an in-band update of the IMM2 firmware using the Linux or Windows flash utilities. If the USB in-band interface is disabled, use the Firmware Update option on the IMM2 web interface to update the firmware. If you disable the USB in-band interface, also disable the watchdog timeouts to prevent the server from restarting unexpectedly.

   - Use the following steps to disable the LAN over USB interface from the IMM2 web interface.
     a. Log in to the IMM2 on which you want to disable the USB device driver interface.
     b. In the navigation pane, click **System Settings** and scroll down to the **Miscellaneous** area.
     c. Select the **Do not allow commands on USB interface** check box to disable the USB in-band interface. Selecting this option does not affect the USB remote presence functions (for example, keyboard, mouse, and mass storage). When you disable the USB in-band interface, the in-band systems-management applications such as the Advanced Settings Utility (ASU) and firmware update package utilities might not work.

        Note: The ASU works with a disabled USB in-band interface if an IPMI device driver is installed.

        If you try to use systems-management applications while the in-band interface is disabled, they might not work.
     d. Click **Save**.
   - Use the following steps to disable the LAN over USB interface from the AMM web interface:
     a. Log in to the AMM web interface.
     b. In the navigation pane, click **Blade Configuration** under the **Blade Tasks** heading.
     c. Scroll down to the Service Processor LAN over USB interface are on the Blade Configuration web page. The section lists all blades in the chassis which are capable of enabling and disabling the LAN over USB interface.
     d. Select the check boxes next to the blade or blades that you want to enable or disable.
     e. Click the **Disable** button to disable the LAN over USB interface on the selected blades.

Configuring the LAN over USB interface manually

The IMM2 using the LAN over USB interface requires operating-system drivers and other configuration. The firmware update package or Advanced Settings Utility attempt to perform the setup automatically, if needed. If the automatic setup fails or if you prefer to set up the LAN over USB manually, use one of the following processes.

For more information about LAN over USB configuration on different operating systems, see http://www-947.ibm.com/ support/entry/portal/docdisplay? brand=5000008&lndocid=MIGR-5083207.

For more information about LAN over USB configuration on different operating systems, see http://www-947.ibm.com/ support/entry/portal/docdisplay? brand=5000008&lndocid=MIGR-5083207.

LAN over USB Windows Driver Installation

Use this information to install the LAN over USB driver for Windows.

When you install Windows, there will be an unknown RNDIS device in the device manager. IBM provides a Windows INF file that identifies this device. The signed version of the INF is included in all of the Windows versions of the IMM2, UEFI, and DSA update packages. Perform the following steps to install `ibm_rndis_server_os.inf`.

Note: These steps only need to be performed if the server is running a Windows operating system and the `ibm_rndis_server_os.inf` file has not been previously installed. The file needs to be installed only once. It is required by Windows operating systems to detect and use the LAN over USB functionality.

1. Obtain a Windows version of the IMM2, server firmware, and DSA update package (see "Updating firmware and device drivers" on page 52 for more information).

2. Extract the `ibm_rndis_server_os`.inf and `device.cat` files from the firmware update package and copy them to the `\WINDOWS\inf` subdirectory.

3. Go to **Computer Management**, then **Device Manager** and find the RNDIS Device. Select **Properties > Driver > Reinstall driver**. Point the server to the `\Windows\inf` directory where it can find the `ibm_rndis_server_os`.inf file and install the device.

4. Go to **Computer Management** then **Device Manager** and right-click on **Network adapters** and select **Scan for hardware changes**. A small pop-up confirms that the Ethernet device is found and installed. The New Hardware Wizard starts automatically.

5. When you are prompted with the question, "Can Windows connect to Windows Update to search for software?", select **No, not this time**. Click **Next** to continue.

6. When you are prompted with the question, "What do you want the wizard to do?", select **Install from a list or specific location (Advanced)**. Click **Next** to continue.

7. When you are prompted with the statement, "Please choose your search and installation options", select **Don't search. I will choose the driver to install**. Click **Next** to continue.

8. When you are prompted with the statement, "Select a hardware type, and then click Next", select **Network adapters**. Click **Next** to continue.

9. You are prompted with the statement, "Completing the Found New Hardware Wizard". Click **Finish**.

   Note: A new local area connection appears and might state, "This connection has limited or no connectivity". Ignore this message.

10. Go back to the Device Manager. **IBM USB Remote NDIS Network Device** appears under **Network Adapters**.

11. Open a command prompt, type `ipconfig`, and press Enter. The local area connection for the IBM USB RNDIS appears with an IP address in the range of 169.254.*xxx.xxx* with a subnet mask set to 255.255.0.0.

LAN over USB Linux Driver Installation

Use this information to install the LAN over USB driver for Linux.

Current versions of Linux, such as RHEL5 Update 2 and SLES10 Service Pack 2, support the LAN over USB interface by default. This interface is detected and displayed during the installation of these operating systems. When you configure the device, use a static IP address of 169.254.95.130 with a subnet mask of 255.255.0.0.

Note: Older Linux distributions might not detect the LAN over USB interface, and might require manual configuration. For information about configuring LAN over USB on specific Linux distributions, see http://www-947.ibm.com/ support/entry/portal/docdisplay? brand=5000008&Indocid=MIGR-5083207.

The IMM2 LAN over USB interface requires that the `usbnet` and `cdc_ether` drivers be loaded. If the drivers have not been installed, use `modprobe` to install them. When these drivers are loaded, the IMM2 USB network interface shows up as a network device in the operating system. To discover the name that the operating system has assigned to the IMM2 USB network interface, type: This interface is configured to come up with an IP address in the 169.254.*xxx.xxx* range each time that the operating system is booted.

```
dmesg | grep -i cdc ether
```

The interface is configured with `ifconfig` to have an IP address in the range 169.254.*xxx.xxx*. For example:

```
ifconfig IMM_device_name 169.254.1.102 netmask 255.255.0.0
```

Chapter 5.   Installing the operating system

Use these instructions to install the operating system on the blade server.

To install the operating system on a blade server, you can use any of the following methods:

- Use the *ServerGuide Setup and Installation* CD to install a supported MicrosoftWindows operating system.
- Use Remote Deployment Manager (RDM) Version 4.20 (or later) to install a supported operating system. To determine whether RDM supports an operating system, seehttp://www.ibm.com /systems/ management/.
- Download the latest operating-system installation instructions and install the operating system.

Important: The operating system in the blade server must provide USB support for the blade server to recognize and use the keyboard, mouse, and removable-media drives. The BladeCenter unit uses USB for internal communication with these devices.

Using the ServerGuide Setup and Installation CD to install the operating system

Use these instructions for using the ServerGuide Setup and Installation CD to install the blade server operating system.

To use the *ServerGuide Setup and Installation* CD, complete the following steps:

Step 1.   While the blade server is on, press the KVM select button on the front of the blade server to associate the BladeCenter unit CD drive with the blade server.

Step 2.   Insert the CD, and restart the blade server. If the CD does not start, see "ServerGuide problems" on page 62.

Step 3.   Follow the instructions on the screen to complete the following tasks:

     a.   Select your language.

     b.   Select your keyboard layout and country.

     c.   View the overview to learn about ServerGuide features.

     d.   View the readme file to review installation tips about your operating system and adapter.

     e.   Start the setup and hardware configuration programs.

     f.   Start the operating-system installation. You will need your operating-system CD.

Using RDM to install the operating system

Use this information if you are using RDM to install the blade server operating system.

You can use RDM to install a supported operating system on a blade server.

Follow the instructions in the documentation that comes with RDM to install a supported operating system.

Note: To determine whether an RDM supports an operating system, see http://www.ibm.com /systems/ management/.

Downloading installation instructions

Use these instructions to download the operating-system installation instructions.

To download operating-system installation instructions, go to http://www.ibm.com/supportportal/.

Chapter 6. Solving problems

Use these instructions to resolve any problems you may encounter while installing the blade server.

If you install the blade server in the BladeCenter unit and the blade server does not start, perform the following actions:

- Make sure that the BladeCenter unit is correctly connected to a power source.
- Reseat the blade server in the BladeCenter unit (see "Installing the blade server in a BladeCenter unit" on page 41).
- If the power-on LED is flashing slowly, turn on the blade server (see "Turning on the blade server" on page 13).
- If you have just added a new optional device or component, make sure that it is correctly installed and compatible with the blade server and its components. If the device or component is not compatible, remove it from the blade server, reinstall the blade server in the BladeCenter unit, and then restart the blade server.

If the blade server does not start after you have performed the preceding actions, see the *Problem Determination and Service Guide* for your blade server on the IBM *Documentation* CD.

Diagnostic tools overview

Use this overview to locate specific diagnostic tools to diagnose and solve hardware-related problems.

The following tools are available to help you diagnose and solve hardware-related problems:

- **POST codes, error messages, and error logs**

  The POST error codes indicate the detection of a problem. See the *Problem Determination and Service Guide* for more information.

- **Troubleshooting tables**

  These tables list problem symptoms and actions to correct the problems. See the *Problem Determination and Service Guide* for your blade server.

- **Light path diagnostics**

  Use light path diagnostics LEDs on the system board to diagnose system errors. If the system-error LED on the system LED panel on the front or rear of the BladeCenter unit is lit, one or more error LEDs on the BladeCenter unit components also might be lit. These LEDs help identify the cause of the problem. Blade server error LEDs are described in the *Problem Determination and Service Guide* for your blade server.

- **Dynamic System Analysis (DSA) Portable Edition diagnostic program**

  DSA tests the major components of the BladeCenter unit, including the management modules, I/O modules, removable-media drives, and the blade servers, while the operating system is running. DSA can be plugged into an existing IBM Director environment or installed without IBM Director present. For documentation and download information for DSA, see http://www.ibm.com /systems/management/. For more information about diagnostic programs and error messages, see the *Problem Determination and Service Guide* for your blade server.

  Note: If you are unable to find the system-error logs in the blade server firmware code, view the system-event log in the BladeCenter management module.

- **Dynamic System Analysis (DSA) Preboot diagnostic program**

The DSA Preboot diagnostic programs are stored in read-only memory and collect and analyze system information to aid in diagnosing server problems. The diagnostic programs collect the following information about the server:

– Drive health information

– Event logs for ServeRAID controllers and service processors

– Hardware inventory, including PCI and USB information

– Light path diagnostics status

– RAID and controller configuration

– Network interfaces and settings

– ServeRAID configuration

– Service processor status and configuration

– System configuration

– Vital product data, firmware, and Unified Extensible Firmware Interface (UEFI) configuration

The diagnostic programs create a merged log that includes events from all collected logs. The information is collected into a file that you can send to IBM service and support. Additionally, you can view the information locally through a generated text report file. You can also copy the log to removable media and view the log from a web browser.

ServerGuide problems

Use this information to locate ServerGuide problems and suggested actions.

The following table lists problem symptoms and suggested solutions.

Symptom	Suggested action
The*ServerGuide Setup and Installation* CD will not start.	• Make sure that the CD drive is associated with the blade server that you are configuring. • Make sure that the blade server supports the ServerGuide program and has a bootable CD (or DVD) drive. • If the startup (boot) sequence settings have been changed, make sure that the CD drive is first in the startup sequence.
The RAID configuration program cannot view all installed drives, or the operating system cannot be installed.	• Make sure that there are no duplicate SCSI/SAS IDs or interrupt request (IRQ) assignments. See "Configuring a RAID array" on page 53. • Make sure that the storage drive is connected correctly. See "Blade server connectors" on page 14 to locate the storage drive connector.
The operating-system installation program continuously loops.	Make more space available on the hard disk.
The ServerGuide program will not start the operating-system CD.	Make sure that the operating-system CD is supported by the ServerGuide program. See the*ServerGuide Setup and Installation* CD label for a list of supported operating-system versions.
The operating system cannot be installed; the option is not available.	Make sure that the operating system is supported on the blade server. If the operating system is supported, either no logical drive is defined (SCSI/SAS RAID systems) or the ServerGuide System Partition is not present. Run the ServerGuide program and make sure that setup 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.

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

If you believe that you require IBM to perform warranty service on your IBM product, the IBM 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 IBM product. The IBM Warranty terms and conditions state that you, the owner of the IBM product, are responsible for maintaining and updating all software and firmware for the product (unless it is covered by an additional maintenance contract). Your IBM 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 IBM 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 IBM Support. This data will help IBM Support 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 (IBM 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 IBM Support quickly and efficiently. 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 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/supportportal.

Getting help and information from the World Wide Web

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

On the World Wide Web, up-to-date information about IBM systems, optional devices, services, and support is available at http://www.ibm.com/supportportal. IBM System x information is at http://www.ibm.com/systems/x. IBM BladeCenter information is at http://www.ibm.com/systems/bladecenter. IBM IntelliStation information is at http://www.ibm.com/systems/intellistation.

How to send DSA data to IBM

Use the IBM Enhanced Customer Data Repository to send diagnostic data to IBM.

Before you send diagnostic data to IBM, read the terms of use at http://www.ibm.com/de/support/ecurep/terms.html.

You can use any of the following methods to send diagnostic data to IBM:

- **Standard upload:** http://www.ibm.com/de/support/ecurep/send_http.html
- **Standard upload with the system serial number:** http://www.ecurep.ibm.com/app/upload_hw
- **Secure upload:** http://www.ibm.com/de/support/ecurep/send_http.html#secure
- **Secure upload with the system serial number:** https://www.ecurep.ibm.com/app/upload_hw

Creating a personalized support web page

You can create a personalized support web page by identifying IBM products that are of interest to you.

To create a personalized support web page, go to http://www.ibm.com/support/mynotifications. From this personalized page, you can subscribe to weekly email notifications about new technical documents, search for information and downloads, and access various administrative services.

Software service and support

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

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).

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 **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.

Taiwan import and export contact information

Contacts are available for Taiwan import and export information.

委製商/進口商名稱: 台灣聯想環球科技股份有限公司
進口商地址: 台北市南港區三重路 66 號 8 樓
進口商電話: 0800-000-702

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.

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.

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. IBM 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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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.

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 5. 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.	

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:

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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.

Taiwan BSMI RoHS declaration

單元 Unit	限用物質及其化學符號 Restricted substances and its chemical symbols					
	鉛Lead (Pb)	汞Mercury (Hg)	鎘Cadmium (Cd)	六價鉻 Hexavalent chromium (Cr^{+6})	多溴聯苯 Polybrominated biphenyls (PBB)	多溴二苯醚 Polybrominated diphenyl ethers (PBDE)
機架	○	○	○	○	○	○
外部蓋板	○	○	○	○	○	○
機械組合件	−	○	○	○	○	○
空氣傳動設備	−	○	○	○	○	○
冷卻組合件	−	○	○	○	○	○
內存模塊	−	○	○	○	○	○
處理器模塊	−	○	○	○	○	○
鍵盤	−	○	○	○	○	○
調製解調器	−	○	○	○	○	○
監視器	−	○	○	○	○	○
滑鼠	−	○	○	○	○	○
電纜組合件	−	○	○	○	○	○
電源	−	○	○	○	○	○
儲備設備	−	○	○	○	○	○
電池匣組合件	−	○	○	○	○	○
有mech的電路卡	−	○	○	○	○	○
無mech的電路卡	−	○	○	○	○	○
雷射器	−	○	○	○	○	○

備考1.〝超出0.1 wt％〞及〝超出0.01 wt％〞係指限用物質之百分比含量超出百分比含量基準值。

Note1 : "exceeding 0.1wt%" and "exceeding 0.01 wt%" indicate that the percentage content
　　　　of the restricted substance exceeds the reference percentage value of presence condition.

備考2.〝○〞係指該項限用物質之百分比含量未超出百分比含量基準值。

Note2 : "○"indicates that the percentage content of the restricted substance does not exceed the
　　　　percentage of reference value of presence.

備考3.〝−〞係指該項限用物質為排除項目。

Note3 : The "-" indicates that the restricted substance corresponds to the exemption.

Index

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