IBM

BladeCenter HS21
Type 8853

Installation and User's Guide

Welcome.

Thank you for buying an IBM blade server. Your blade server features superior performance, availability, and scalability.

This *Installation and User's Guide* contains information for setting up, configuring, and using your blade server.

Additionally, a service information label is attached to each BladeCenter unit and blade server. This label provides a graphical summary of many of the installation and service activities that are associated with each device.

For more information about your BladeCenter components and features, you can view the publications on the *Documentation* CD or download them from the IBM Support Web site.

Go to http://www.ibm.com/support/

Before installing the BladeCenter HS21 Type 8853 blade server in a BladeCenter unit, complete the following procedures:

- Install and configure the rack according to the documentation that came with the rack.
- Install the BladeCenter unit into the rack and configure it, according to the documentation that comes with the BladeCenter unit.
- Supply 200 - 240 V ac to the BladeCenter unit.
- Install the latest firmware in all BladeCenter components.

↓

Before you install the blade server into the BladeCenter unit, install devices such as drives, memory modules, and processor or expansion cards in the blade server, if applicable. Install the blade server in the BladeCenter unit. See Chapter 3 for more information.
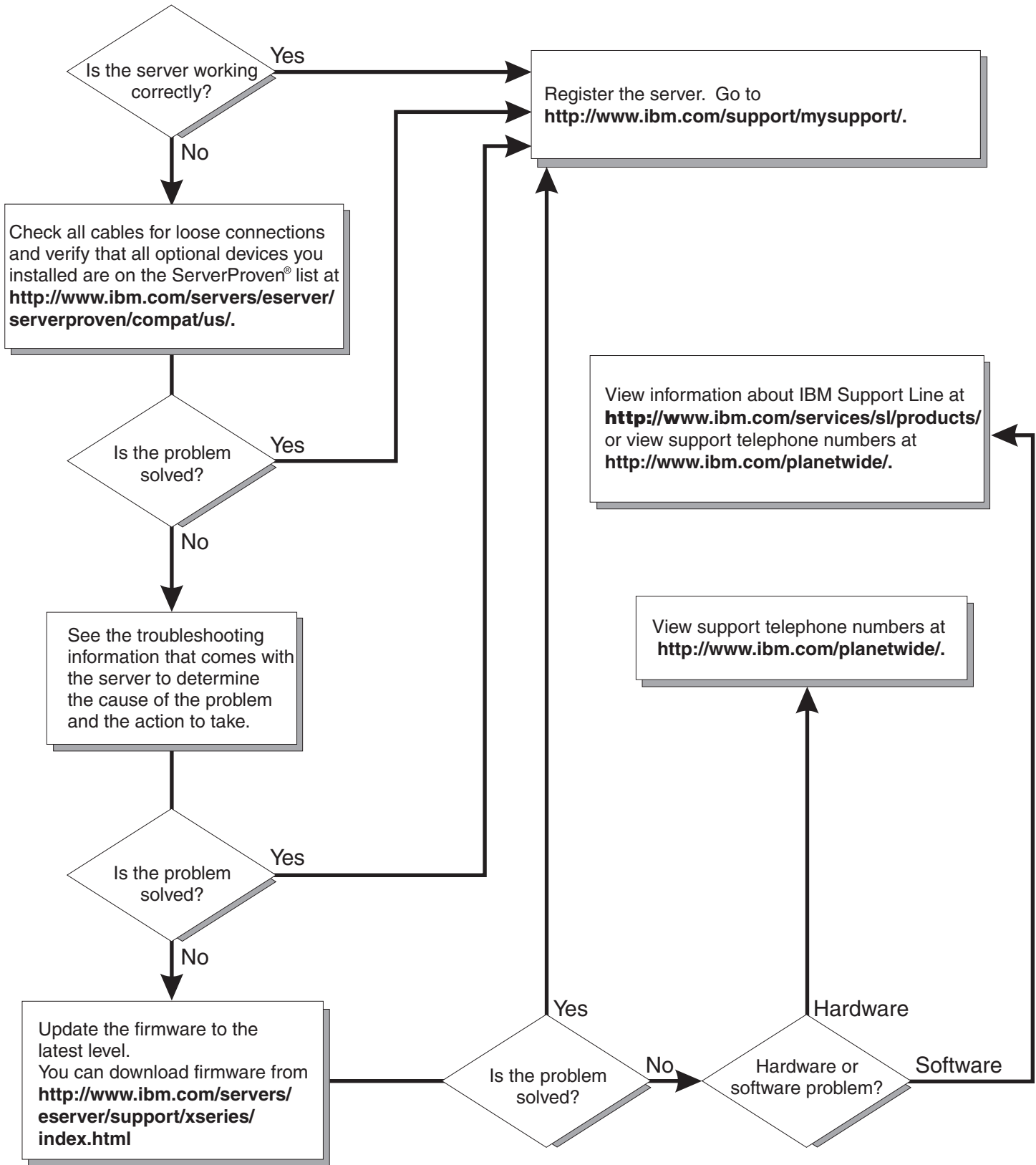
↓

Configure the blade server. See Chapter 4 for more information.

↓

Install the operating system. See Chapter 5 for more information.

↓

Install additional applications according to the instructions that comes with the applications.

↓

The blade server is now ready to use. Be sure to register and profile your blade server on the IBM Support Web site.

Server Support

Is the server working correctly?

Yes →

Register the server. Go to
http://www.ibm.com/support/mysupport/.

No ↓

Check all cables for loose connections and verify that all optional devices you installed are on the ServerProven® list at **http://www.ibm.com/servers/eserver/ serverproven/compat/us/.**

Is the problem solved?

Yes →

No ↓

See the troubleshooting information that comes with the server to determine the cause of the problem and the action to take.

Is the problem solved?

Yes →

No ↓

Update the firmware to the latest level.
You can download firmware from **http://www.ibm.com/servers/ eserver/support/xseries/ index.html**

→

Is the problem solved?

Yes ↑

No →

Hardware or software problem?

Hardware ↑

View support telephone numbers at **http://www.ibm.com/planetwide/.**

Software →

View information about IBM Support Line at **http://www.ibm.com/services/sl/products/** or view support telephone numbers at **http://www.ibm.com/planetwide/.**

BladeCenter HS21 Type 8853

IBM

Installation and User's Guide

Note: Before using this information and the product it supports, read the general information in Appendix B, "Notices," on page 55 and the *Warranty and Support Information* document for your blade server type on the *Documentation* CD.

Contents

Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الآمنية

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

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

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

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

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

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

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

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

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

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

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

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

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

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

Перед установкой продукта прочтите инструкции по
технике безопасности.

Pred inštaláciou tohto zariadenia si pečítaje Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

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

Läs säkerhetsinformationen innan du installerar den här produkten.

Important:

All caution and danger statements in this documentation begin with a number. This number is used to cross reference an English caution or danger statement with translated versions of the caution or danger statement in the *IBM Safety Information* book.

For example, if a caution statement begins with a number 1, translations for that caution statement appear in the *IBM Safety Information* book under statement 1.

Be sure to read all caution and danger statements in this documentation before performing the instructions. Read any additional safety information that comes with the server or optional device before you install the device.

Statement 1:

DANGER

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

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

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

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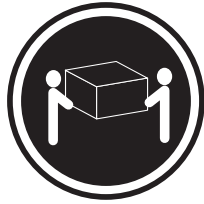
≥ 18 kg (39.7 lb)   ≥ 32 kg (70.5 lb)   ≥ 55 kg (121.2 lb)
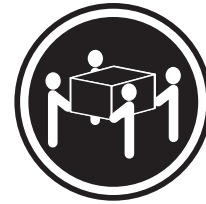
CAUTION:
Use safe practices when lifting.

Statement 5:

CAUTION:
The power control button on the device and the power switch on the power supply do 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.
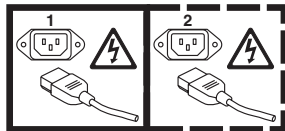
Statement 8:

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 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.

Chapter 1. Introduction

The IBM® BladeCenter® HS21 Type 8853 blade server is compatible with IBM BladeCenter units. This high-density, high-performance blade server is ideally suited for networking environments that require superior microprocessor performance, efficient memory management, flexibility, and reliable data storage.

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/bladecenter/.

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

If firmware and documentation updates are available, you can download them from http://www.ibm.com/bladecenter/. 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/bladecenter/ select **BladeCenter 8853** from the **Hardware** list, and click **Go**. For firmware updates, click the **Download** tab. For documentation updates, click the **Install and use** tab, and click **Product documentation**.

Note: Changes are made periodically to the IBM Web site. Procedures for locating firmware and documentation might change from what is described in this document.

Record information about the blade server in the following table. You will need these numbers when you register the blade server with IBM. You can register the blade server at http://www.ibm.com/support/mysupport/.

Product name	BladeCenter HS21
Machine type	8853
Model number	_____
Serial number	_____

The model number and serial number are located on the ID label that is behind the control panel door 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.

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

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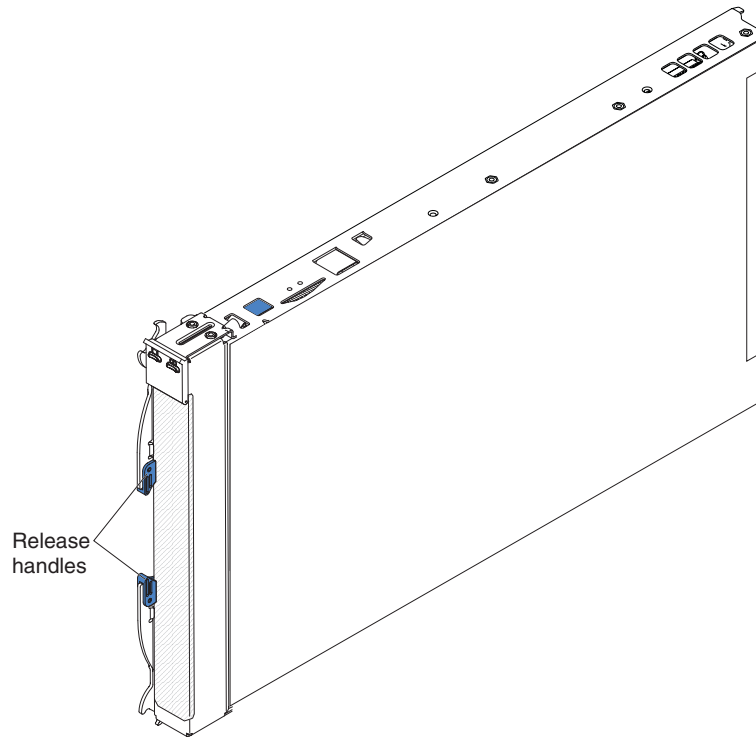
A set of blank labels comes with the blade server. When you install the blade server in the BladeCenter unit, write identifying information on a label and place the label on the BladeCenter unit bezel. See the documentation for your BladeCenter unit for recommended label placement.

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

Related 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 also comes with the blade server:

- *Problem Determination and Service Guide*

  This document is in Portable Document Format (PDF) on the IBM *Documentation* CD. It contains information to help you solve problems yourself, and it contains information for service technicians.

- *Safety Information*

  This document is in PDF on the IBM *Documentation* CD. It 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 and Support Information*

  This document is in PDF on the IBM *Documentation* CD. It contains information about the terms of the warranty and getting service and assistance.

Depending on your BladeCenter product, additional documents might be included on the IBM *Documentation* CD.

In addition to the documentation in this library, be sure to review the.*IBM BladeCenter 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, complete the following steps.

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

1. Go to http://www.ibm.com/bladecenter/.
2. From the **Hardware** list, select **BladeCenter 8853** and click **Go**.
3. Click the **Install and use** tab.
4. Click **Product documentation**.

The IBM Documentation CD

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

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.

Hardware and software requirements

The IBM *Documentation* CD requires the following minimum hardware and software:
- Microsoft® Windows NT® 4.0 (with Service Pack 3 or later), Windows® 2000, or Red Hat Linux®.
- 100 MHz microprocessor.
- 32 MB of RAM.
- Adobe Acrobat Reader 3.0 (or later) or xpdf, which comes with Linux operating systems. Acrobat Reader software is included on the CD, and you can install it when you run the Documentation Browser.

Using 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 drive and click **Start → Run**. In the **Open** field, type:

      ```
      e:\win32.bat
      ```

      where *e* is the drive letter of the CD-ROM drive, and click **OK**.
    - If you are using Red Hat Linux, insert the CD into the CD 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 appears 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 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

The caution and danger statements that appear 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 could occur.
- **Caution:** These statements indicate situations that can be potentially hazardous to you. A caution statement is placed just before the description of a potentially hazardous procedure step or situation.
- **Danger:** These statements indicate situations that can be potentially lethal or extremely hazardous to you. A danger statement is placed just before the description of a potentially lethal or extremely hazardous procedure step or situation.

Features and specifications

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

Notes:

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

Microprocessor: Supports up to two dual-core Intel® Xeon microprocessors.
Note: Use the Configuration/Setup Utility program to determine the type and speed of the microprocessors in your blade server.

Memory:
- Dual-channel DIMMs: 4 DIMM slots
- Type: fully-buffered double-data rate (FB-DDR2), PC2-5300, ECC SDRAM registered x4 (Chipkill) DIMMs
- Supports 512 MB, 1 GB, 2 GB, and 4 GB DIMMs (as of the date of this publication) with up to 16 GB of total memory in the system board
- Additional memory support when an optional IBM BladeCenter Memory and I/O Expansion Blade is installed

Drives: Support for up to two internal small-form-factor Serial Attached SCSI (SAS) drives

Predictive Failure Analysis® (PFA) alerts:
- Microprocessor
- Memory
- Hard disk drives

Electrical input: 12 V dc

Integrated functions:
- Dual Gigabit Ethernet controllers
- Expansion card interface
- Local service processor: Baseboard management controller (BMC) with Intelligent Platform Management Interface (IPMI) firmware
- ATI RN-50 video controller
- LSI 1064E Serial Attached SCSI (SAS) controller
- Light path diagnostics
- RS-485 interface for communication with the management module
- Automatic server restart (ASR)
- Serial over LAN (SOL)
- Redundant buses for communication with keyboard, mouse, and removable media drives
- Concurrent keyboard/video/mouse (cKVM) support when optional cKVM feature card is installed

Environment (non-NEBS):
- Air temperature:
  – Blade server on: 10° to 35° C (50° to 95° F). Altitude: 0 to 914 m (0 to 3000 ft)
  – Blade server on: 10° to 32° C (50° to 90° F). Altitude: 914 to 2134 m (3000 to 7000 ft)
  – Blade server off: -40° to 60° C (-40° to 140° F)
- Humidity:
  – Blade server on: 8% to 80%
  – Blade server off: 5% to 80%

Environment (NEBS):
- Air temperature:
  – Blade server on: 5° to 40°C (41° to 104°F). Altitude: -60 to 1800 m (-197 to 5905 ft)
  – Blade server on (short term): -5° to 55°C (23° to 131°F). Altitude: -60 to 1800 m (-197 to 5905 ft)
  – Blade server on: 5° to 30°C (41° to 86°F). Altitude: 1800 to 4000 m (5905 to 13 123 ft)
  – Blade server on (short term): -5° to 45°C (23° to 113°F). Altitude: 1800 to 4000 m (5905 to 13 123 ft)
  – Blade server off: -40° to 60°C (-40° to 140°F)
- Humidity:
  – Blade server on: 8% to 85%
  – Blade server on (short term): 5% to 90% but not to exceed 0.024 kg water/kg of dry air
  – Blade server off: uncontrolled

Note: "Short term" refers to a period of not more than 96 consecutive hours and a total of not more than 15 days in 1 year. (This refers to a total of 360 hours in any year, but no more than 15 occurrences during that 1-year period.)

Size:
- Height: 24.5 cm (9.7 inches)
- Depth: 44.6 cm (17.6 inches)
- Width: 2.9 cm (1.14 inches)
- Maximum weight: 5.4 kg (12 lb)

What your blade server offers

The blade server uses the following features and technologies:

- **Baseboard management controller (BMC)**

  The baseboard management controller (BMC) is on the system board of the blade server. The BMC operates as the service processor for the blade server and performs several tasks, including the following:

  – Provides RS-485 interfaces to the management module

  – Provides support for:

    - Intelligent Platform Management Interface (IPMI)
    - The operating system
    - Power control and advanced power management
    - Reliability, availability, and serviceability (RAS) features
    - Serial over LAN (SOL)

- **Disk drive support**

  The blade server supports up to two 2.5-inch small-form-factor (SFF) Serial Attached SCSI (SAS) hard disk drives.

- **IBM Director**

  IBM Director is a workgroup-hardware-management tool that you can use to centrally manage servers. For more information, see the IBM Director documentation on the *IBM Director* CD.

- **IBM Enterprise X-Architecture™**

  IBM Enterprise X-Architecture technology combines proven, innovative IBM designs to make your x86-processor-based blade server powerful, scalable, and reliable. For more information, see http://www.ibm.com/servers/eserver/xseries/ xarchitecture/enterprise/index.html.

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

  The *ServerGuide Setup and Installation* CD that comes with the blade server 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 43.

- **Microprocessor technology**

  The blade server supports up to two dual-core Intel Xeon™ microprocessors. Depending on the model, the blade server comes with either one or two microprocessors installed. In models that come with one factory-installed microprocessor, an optional second microprocessor can be added.

- **Integrated network support**

  The blade server comes with two integrated Broadcom BCM5708S Gigabit Ethernet controllers, which support connection to a 10 Mbps, 100 Mbps, or 1000 Mbps network through an Ethernet-compatible switch module in the BladeCenter unit. The controller supports Wake on LAN® technology.

- **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**

  The blade server system board supports up to 16 GB of system memory. The memory controller provides support for up to four industry-standard fully-buffered double-data rate (FB-DDR2), PC2-5300, ECC SDRAM registered x4 (Chipkill™) DIMMs installed on the system board. The controller is able to support additional memory DIMMs that are installed in an optional expansion unit. For the most current list of supported DIMMs, see the ServerProven® list at http://www.ibm.com/servers/eserver/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 BladeCenter redundant power-supply modules. 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. You can configure and monitor the power environment by using the management module. For more information about configuring and using power throttling, see the management-module documentation or http://www.ibm.com/bladecenter/.

Reliability, availability, and serviceability features

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)
- Automatic error retry or recovery
- Automatic server restart
- Built-in monitoring for temperature, voltage, hard disk drives.
- Chipkill memory
- Customer support center 24 hours per day, 7 days a week[1]
- Customer-upgradeable basic input/output system (BIOS) code and diagnostics
- Diagnostic support of Ethernet controllers
- ECC memory
- ECC protection on the L2 cache
- Error codes and messages
- Failover Ethernet support
- Hot-spare memory

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

- Hot-swap drives on optional Serial Attached SCSI (SAS) storage expansion unit
- Light path diagnostics feature
- Memory parity testing
- Microprocessor built-in self-test (BIST) during power-on self-test (POST)
- Microprocessor presence detection
- Microprocessor serial number access
- Power policy support
- Power-on self-test (POST)
- Predictive Failure Analysis (PFA) alerts
- ROM resident diagnostics
- FB-DDR2 SDRAM with serial presence detect (SPD) and vital product data (VPD)
- Memory mirroring with an optional Memory and I/O Expansion Blade
- Service processor that communicates with the management module to enable remote blade server management
- System error logging
- Wake on LAN capability

IBM Director

With IBM Director, a network administrator can perform the following tasks:
- View the hardware configuration of remote systems, in detail
- Monitor the usage and performance of critical components, such as microprocessors, disks, and memory
- Centrally manage individual or large groups of IBM and non-IBM x86 processor-based servers, desktop computers, workstations, and notebook computers on a variety of platforms

IBM Director provides a comprehensive entry-level workgroup hardware manager. It includes the following key features:
- Advanced self-management capabilities for maximum system availability.
- Multiple operating-system platform support, including Microsoft Windows 2000 Server, Windows Server 2003, Windows XP Professional, AIX®, i5/OS®, Red Hat Linux, SUSE Linux, VMware, and Novell NetWare. For a complete list of operating systems that support IBM Director, see the IBM Director Compatibility Document. This document is in Portable Document Format (PDF) at http://www.ibm.com/pc/support/site.wss/document.do?lndocid=MIGR-61788. It is updated every 6 to 8 weeks.
- Support for IBM and non-IBM servers, desktop computers, workstations, and notebook computers.
- Support for systems-management industry standards.
- Integration into leading workgroup and enterprise systems-management environments.
- Ease of use, training, and setup.

IBM Director also provides an extensible platform that supports advanced server tools that are designed to reduce the total cost of managing and supporting networked systems. By deploying IBM Director, you can achieve reductions in ownership costs through the following benefits:

- Reduced downtime
- Increased productivity of IT personnel and users
- Reduced service and support costs

For more information about IBM Director, see the documentation on the *IBM Director* CD that comes with the server, the IBM Director Information Center at http://publib.boulder.ibm.com/infocenter/eserver/v1r2/topic/diricinfo/fgm0_main.htm and the IBM xSeries® Systems Management Web page at http://www.ibm.com/servers/eserver/xseries/systems_management/, which presents an overview of IBM Systems Management and IBM Director.

Major components of the blade server

You must remove the blade server from the BladeCenter unit and remove the cover to access the components.

The following illustration shows the major components of the blade server.
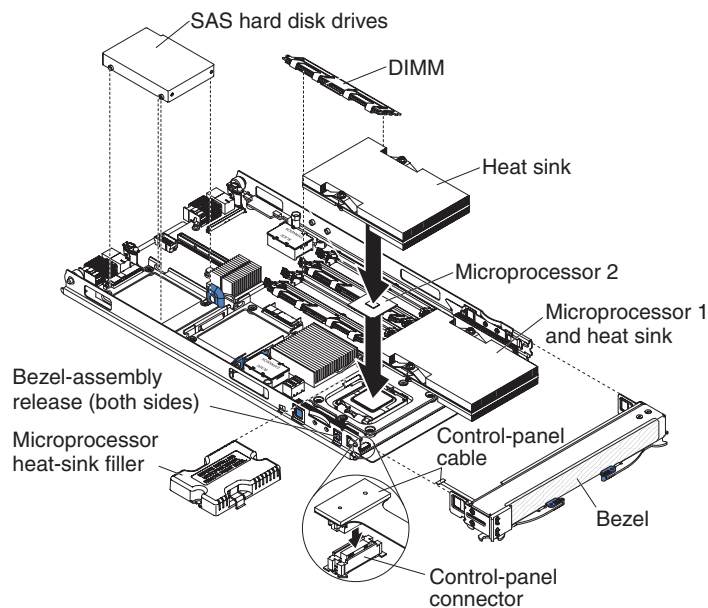
Chapter 2. Power, controls, and indicators

This chapter describes the power features, how to turn on and turn off the blade server, and what the controls and indicators mean. This chapter also identifies the system-board connectors.

Turning 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 (behind the control panel door, see "Control panel buttons and LEDs" on page 12) 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 management module is initializing, the power-on LED does not flash, and the power-control button on the blade server does not respond.
  2. While the blade server is starting, the power-on LED on the front of the blade server is lit. See "Control panel buttons and LEDs" on page 12 for the power-on LED states.

- If a power failure occurs, the BladeCenter unit and then the blade server can start automatically when power is restored, if the blade server is configured through the management module to do so.

- 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 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

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 (behind the control panel door, see "Control panel buttons and LEDs" on page 12). 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:
  - If the system is not operating correctly, the management module will automatically turn off the blade server.
  - Through the management-module Web interface, you can also configure the management module to turn off the blade server. For additional information, see the *IBM BladeCenter Management Module User's Guide*.

Control panel buttons and LEDs

This section describes the controls and LEDs on the blade server.

Note: The control panel door is shown in the closed position in the following illustration. To access the power-control button, you must open the control panel door.
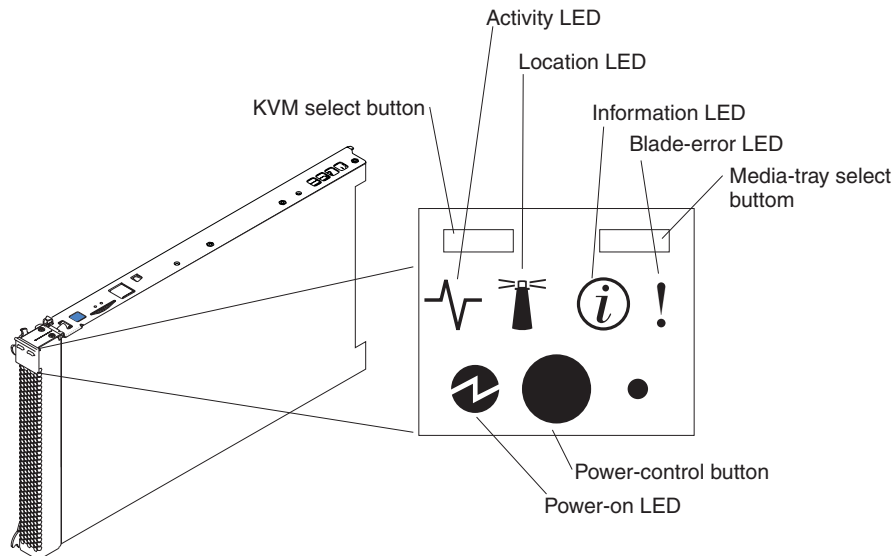
Keyboard/video/mouse (KVM) select button: Press this button to associate the shared BladeCenter unit keyboard port, video port, and mouse port with the blade server. The LED on this button flashes while the request is being processed and then is lit when the ownership of the keyboard, video, and mouse 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.

Instead of using the KVM select button use a keyboard that is directly attached to the management-module, you can press keyboard keys in the following sequence to switch KVM control between blade servers:

NumLock NumLock *blade_server_number* Press enter

blade_server_number is the two-digit number of the blade bay in which the blade server is installed. A blade server that occupies more than one blade 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 management-module Web interface to determine whether local control has been disabled on the blade server.

Note:

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 Microsoft Windows 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).

Activity LED: When this green LED is lit, it indicates that there is activity on the hard disk drive 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 turned on, the location LED on the BladeCenter unit is also lit. The location LED can be turned off through the management-module Web interface or through IBM Director Console.

Information LED: When this amber LED is lit, it indicates that information about a system error in the blade server has been placed in the management-module event log. The information LED can be turned off through the management-module Web interface or through IBM Director Console.

Blade-error LED: When this amber 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.

Media-tray select button: Press this button to associate the shared BladeCenter unit media tray (removable-media drives and front-panel USB ports) 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 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 and front-panel USB ports.

Power-control button: This button is behind the control panel door. Press this button to turn on or turn off 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 management-module Web interface.

Power-on LED: This green LED indicates the power status of the blade server in the following manner:

- Flashing rapidly: The service processor (BMC) on the blade server is communicating with the management module.
- Flashing slowly: The blade server has power but is not turned on.
- Lit continuously: The blade server has power and is turned on.

Blade server connectors

The following illustration shows the system-board components, including connectors for user-installable optional devices, for the blade server.
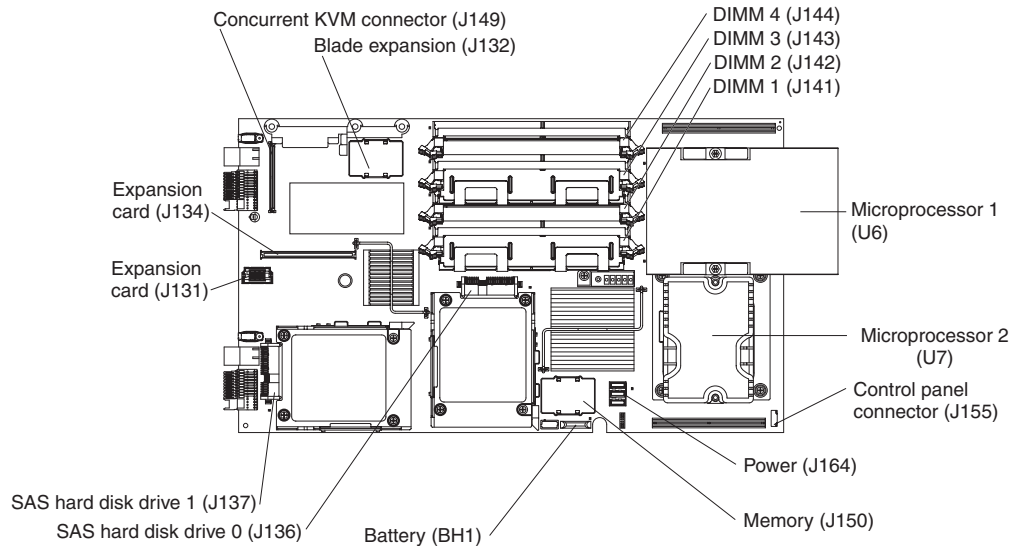
The following illustration shows components on the optional IBM BladeCenter Memory and I/O Expansion Blade.
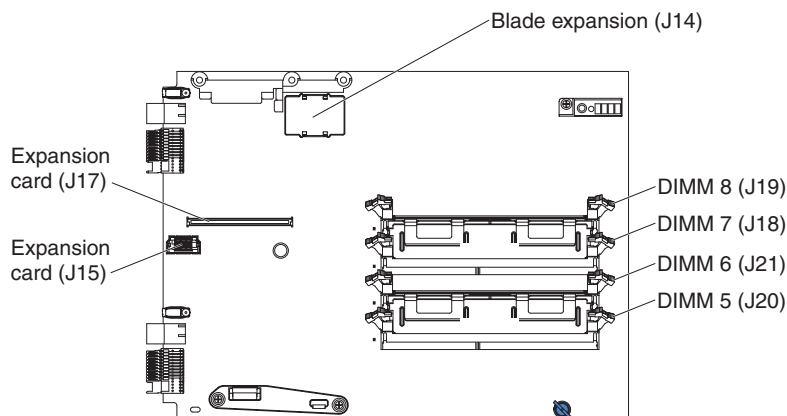
Chapter 3. Installing options

This chapter provides instructions for 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

Before you install options, read the following information:

- Read the safety information that begins on page v and the guidelines in "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/bladecenter/, select **BladeCenter 8853** from the **Hardware** list, click **Go**, and then click the **Download** tab.
- 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, or open or close a latch.
- Orange on a component or an orange label on or near a component indicates that the component can be hot-swapped, which means that you can remove or install the component while the BladeCenter unit 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.
- When you are finished working on the blade server, reinstall all safety shields, guards, labels, and ground wires.
- For a list of supported options for the blade server, go to http://www.ibm.com/servers/eserver/serverproven/compat/us/.

System reliability guidelines

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

- Each microprocessor socket always contains either a microprocessor 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.
- You do not operate the BladeCenter unit without a blade server, expansion unit, or filler blade installed in each blade bay to ensure proper cooling. See the documentation for your BladeCenter unit type for additional information.
- 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

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 T unit, use an electrostatic discharge (ESD) 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 T 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 it down. 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.

Removing the blade server from the BladeCenter unit

The following illustration shows how to remove a blade server from a BladeCenter unit. The appearance of your BladeCenter unit might be different, see the documentation for your BladeCenter unit for additional information.

Release handles
(open)
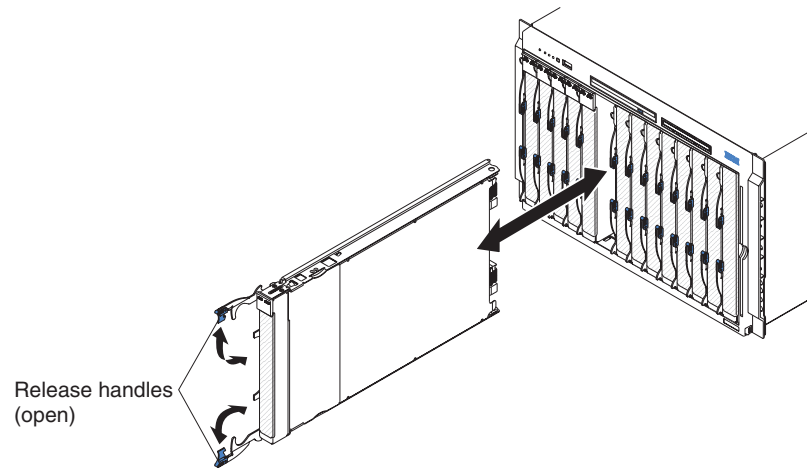
Attention:

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

To remove the blade server, complete the following steps:

1. If the blade server is operating, shut down the operating system; then, press the power-control button (behind the blade server control panel door) to turn off the blade server (see "Turning off the blade server" on page 11 for more information).

   Attention: Wait at least 30 seconds, until the hard disk drives stop spinning, before you proceed to the next step.

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

3. Pull the blade server out of the bay.

4. Place either a blade filler or another blade in the bay within 1 minute.

Opening the blade server cover

Note: If the blade server has an expansion unit installed in place of the cover, remove it (see "Removing an expansion unit" on page 19).

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

Blade-cover release

Blade-cover release
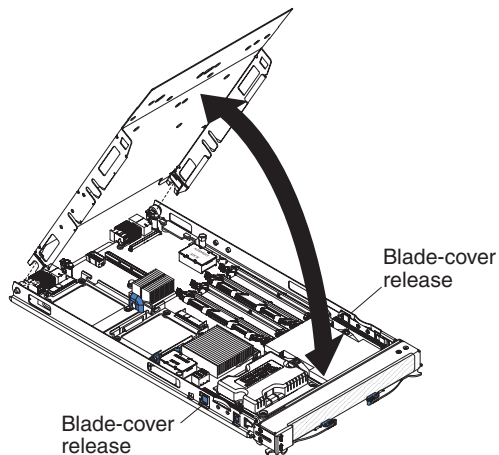
To open the blade server cover, complete the following steps:

1. Read the safety information that begins on page v and "Installation guidelines" on page 15.
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).
3. Carefully lay the blade server on a flat, static-protective surface, with the cover side up.
4. Press the blade-cover release on each side of the blade server or expansion unit and lift the cover open, as shown in the illustration.
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.

Removing an expansion unit

The following illustration shows how to remove an expansion unit from a blade server.

Storage and I/O
expansion blade

Blade-cover
release

Blade-cover
release
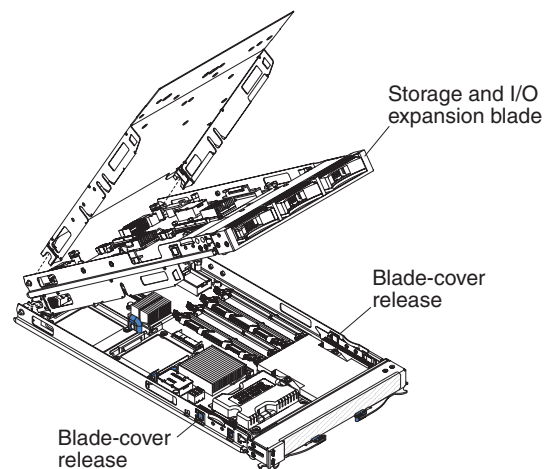
To remove the expansion unit, complete the following steps:

1. Read the safety information that begins on page v and "Installation guidelines" on page 15.

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).

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

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

5. Press the blade-cover release on each side of the blade server.

6. Use the extraction device on the expansion unit, if one is present, to disengage the expansion unit from the system board. These extraction devices can be of several types, including thumbscrews or levers.

7. Rotate the expansion unit open, as shown in the illustration; then, lift the expansion unit from the blade server.

Removing the blade server bezel assembly

To install certain options, you must first remove the blade server bezel assembly. The following illustration shows how to remove the bezel assembly.

Bezel-assembly release (both sides)

Control-panel cable

Bezel

Control-panel connector

To remove the blade server bezel assembly, complete the following steps:

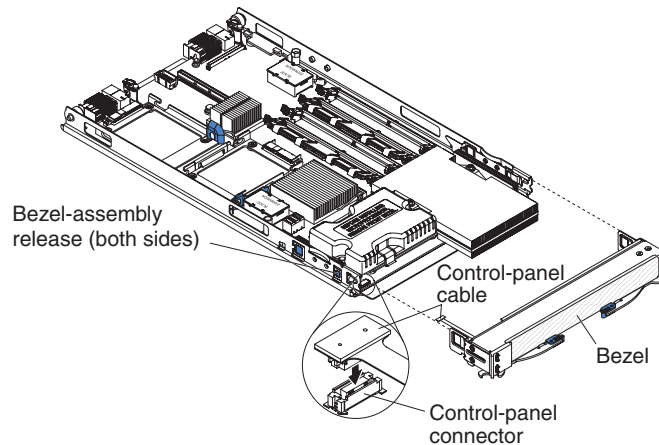1. Read the safety information that begins on page v and "Installation guidelines" on page 15.
2. If the blade server is installed in a BladeCenter unit, remove it (see "Removing the blade server from the BladeCenter unit" on page 17 for instructions).
3. Open the blade server cover (see "Opening the blade server cover" on page 18 for instructions).
4. If a Memory and I/O Expansion Blade is installed, remove it (see "Removing an expansion unit" on page 19).
5. Press the bezel-assembly release and pull the bezel assembly away from the blade server approximately 1.2 cm (0.5 inch).
6. Disconnect the control-panel cable from the control-panel connector.
7. Pull the bezel assembly away from the blade server.
8. Store the bezel assembly in a safe place.

Installing a SAS hard disk drive

The blade server has two connectors on the system board for installing optional SFF SAS hard disk drives.

Depending on the blade server model, at least one SAS hard disk drive might already be installed. If the blade server is equipped with one SAS hard disk drive, you can install an additional SAS hard disk drive. These two SAS hard disk drives can be used to implement and manage a redundant array of independent disks (RAID) level-1 array. See "Configuring a RAID array" on page 47 for information about SAS RAID configuration.

The following illustration shows how to install a SAS hard disk drive.

SAS ID 1

Hard disk drive
release lever   SAS ID 0

Hard disk
drive release
lever
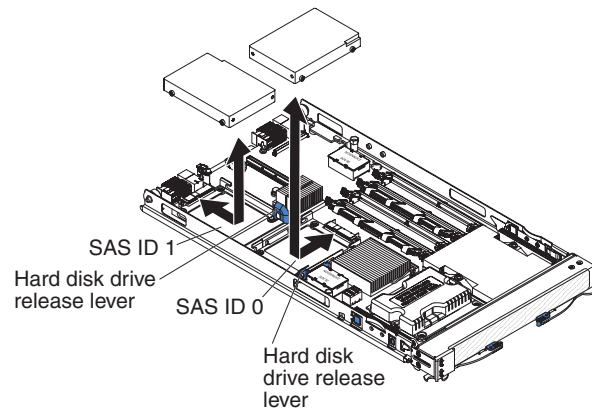
Note: Do not install a SAS hard disk drive in SAS connector 1 (SAS ID 1) if you
intend to also install an optional standard-form-factor expansion card. The
standard-form-factor expansion card occupies the same area as the second
hard disk drive.

To install a SAS hard disk drive, complete the following steps:

1. Read the safety information that begins on page v and "Installation guidelines"
   on page 15.
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).
3. Carefully lay the blade server on a flat, static-protective surface.
4. Open the blade server cover (see "Opening the blade server cover" on page 18
   for instructions).
5. If a Memory and I/O Expansion Blade is installed, remove it (see "Removing an
   expansion unit" on page 19).
6. Locate SAS connector 0 (J136) or SAS connector 1 (J137).
7. If a standard-form-factor expansion card is installed in the SAS connector 1
   location, complete the following steps:
   a. Remove the expansion card (see the illustration in "Installing a
      standard-form-factor expansion card" on page 31) and its mounting bracket,
      and save the screws that secure the mounting bracket to the system board.
      Store the screws in a safe place.
   b. Install the SAS connector 1 drive tray. Secure the drive tray to the system
      board with the screws from the option kit.

   Attention: Do not press on the top of the drive. Pressing on the top might
   damage the drive.
8. Put the drive into the tray and push it, from the rear edge of the drive, into the
   connector until the drive moves past the lever at the back of the tray.
9. If you have other options to install or remove, do so now; otherwise, go to
   "Completing the installation" on page 34.

Removing a SAS hard disk drive

The following illustration shows how to remove a SAS hard disk drive.
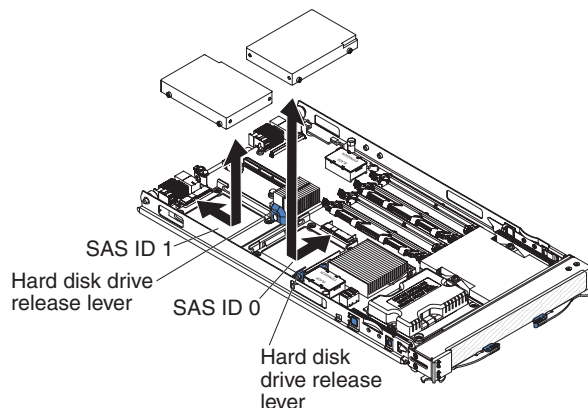
To remove a SAS hard disk drive, complete the following steps:

1. Read the safety information that begins on page v and "Installation guidelines" on page 15.
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).
3. Carefully lay the blade server on a flat, static-protective surface.
4. Open the blade server cover (see "Opening the blade server cover" on page 18 for instructions).
5. If a Memory and I/O Expansion Blade is installed, remove it (see "Removing an expansion unit" on page 19).
6. Locate SAS connector 0 (J136) or SAS connector 1 (J137). Slowly pull the blue lever at the back of the hard disk drive tray away from the hard disk drive to disengage the drive from its tray.
7. From the rear edge of the drive, slide the drive out of the SAS connector.

Installing memory modules

The following notes describe the types of dual inline memory modules (DIMMs) that the blade server supports and other information that you must consider when you install DIMMs:

*   The system board contains four DIMM connectors. If an optional IBM BladeCenter Memory and I/O Expansion Blade is installed on your blade server, it provides four additional DIMM connectors. The server supports two-way memory interleaving.
*   The DIMM options that are available for the blade server are 512 MB, 1 GB, 2 GB and 4 GB. Depending on the memory configuration set in the Configuration/Setup Utility program, the blade server supports a minimum of 1 GB and that is a maximum of 16 GB of system memory in the system board and a maximum of 32 GB of system memory when an optional IBM BladeCenter Memory and I/O Expansion Blade is installed.

- If the blade server does not have a Memory and I/O Expansion Blade, when you install memory, you must install a pair of matched DIMMs. Install the DIMMs in the following order:

Pair	DIMM connectors
First	1 (J141) and 3 (J143)
Second	2 (J142) and 4 (J144)

- To set up a non-mirrored memory configuration in a blade server with a Memory and I/O Expansion Blade, when you install memory, you must install a pair of matched DIMMs. Install the DIMMs in the following order:

 | Pair | DIMM connectors |
  | --- | --- |
  | First | 1 (system board J141) and 3 (system board J143) |
  | Second | 5 (Memory and I/O Expansion Blade J18) and 7 (Memory and I/O Expansion Blade J20) |
  | Third | 2 (system board J142) and 4 (system board J144) |
  | Fourth | 6 (Memory and I/O Expansion Blade J19) and 8 (Memory and I/O Expansion Blade J21) |

- To set up a mirrored memory configuration in a blade server with a Memory and I/O Expansion Blade, when you install memory, you must install matched DIMMs in groups of four. Install the DIMMs in the following order:

Group	DIMM connectors
First	1 (system board J141) and 3 (system board J143) 5 (Memory and I/O Expansion Blade J18) and 7 (Memory and I/O Expansion Blade (J20)
Second	2 (system board J142) and 4 (system board J144) 6 (Memory and I/O Expansion Blade J19) and 8 (Memory and I/O Expansion Blade J21)

- All DIMMs in a pair or group must be the same size, speed, type, technology, and physical design. You can mix compatible DIMMs from different manufacturers.
- All DIMMs must have the same speed. However, different pairs or groups of DIMMs do not have to be of the same size, type, technology, and physical design.
- If you want to take advantage of Chipkill memory, each DIMM in the blade server must support the Chipkill technology.
- Install only fully buffered double-data-rate dual-channel (FB-DDR2), PC2-5300, registered SDRAM with ECC DIMMs. For a current list of supported DIMMs for the blade server, see http://www.ibm.com/servers/eserver/serverproven/compat/us/.
- Installing or removing DIMMs changes the configuration information of the blade server. After instal or remove a DIMM, you must change and save the new configuration information by using the Configuration/Setup Utility program. When you restart the blade server, a message indicates that the memory configuration has changed. Start the Configuration/Setup Utility program and select **Save Settings** (see "Configuration/Setup Utility menu choices" on page 40 for more information) to save changes.

DIMM

Retaining clip
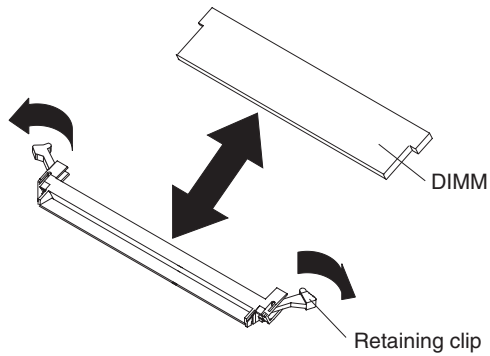
To install a DIMM, complete the following steps:

1. Read the safety information that begins on page v and "Installation guidelines" on page 15.
2. Read the documentation that comes with the DIMMs.
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).
4. Carefully lay the blade server on a flat, static-protective surface.
5. Open the blade server cover (see "Opening the blade server cover" on page 18 for instructions).
6. If a Memory and I/O Expansion Blade is installed and you are installing DIMMs on the system board, remove the expansion blade (see "Removing an expansion unit" on page 19).
7. Locate the DIMM connectors (see the illustrations in "Blade server connectors" on page 14). Determine the connectors into which you will install the DIMMs.
8. 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 2 seconds; then, remove the DIMM from its package.
9. To install the DIMMs, repeat the following steps for each DIMM that you install:

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

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

   b. 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.

      Important: If there is a gap between the DIMM and the retaining clips, the DIMM has not been correctly installed. In this case, open the retaining clips and remove the DIMM; then, reinsert the DIMM.

If you have other options to install or remove, do so now; otherwise, go to "Completing the installation" on page 34.

If memory is installed in the Memory and I/O Expansion Blade, you can configure it to provide memory mirroring by using the Configuration/Setup Utility program. See **Advanced Setup → Memory Settings** under "Configuration/Setup Utility menu choices" on page 40 for more information.

Installing an additional microprocessor

The blade server comes with at least one microprocessor. If the blade server comes with one microprocessor, you can install a second microprocessor. The blade server operate as a symmetric multiprocessing (SMP) server. With SMP, certain operating systems and application programs can distribute the processing load between the microprocessors.

Notes:

1. You cannot remove the single microprocessor and replace it with a different type of microprocessor of greater or lesser speed.
2. If you install a second microprocessor, you must install the same microprocessor type and speed as the first microprocessor.

To use SMP, obtain an SMP-capable operating system. For a list of supported operating systems and other options, see http://www.ibm.com/servers/eserver/serverproven/compat/us/.

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

- Always install microprocessors that have the same cache size and type, the same clock speed, and identical internal and external clock frequencies (including system bus speed).
- Make sure that the microprocessor with the lowest feature set is the startup (bootstrap) microprocessor, which is installed in the microprocessor 1 socket (U6).
- For a list of microprocessors that the blade server supports, seehttp://www.ibm.com/servers/eserver/serverproven/compat/us/.
- Before installing a new microprocessor, download and install the most current level of BIOS code from http://www.ibm.com/bladecenter/.
- The microprocessors terminate themselves; therefore, no terminator card is required if microprocessor socket 2 (U7) is empty. However, for proper airflow, this socket must contain a microprocessor heat-sink filler, sometimes called a microprocessor baffle.
- The microprocessor speeds are automatically set for this server; therefore, you do not have to set any microprocessor frequency-selection jumpers or switches.

The following illustration shows how to install the second microprocessor on the system board.

Heat sink

Microprocessor 2

Microprocessor 1 and heat sink

Microprocessor heat sink filler
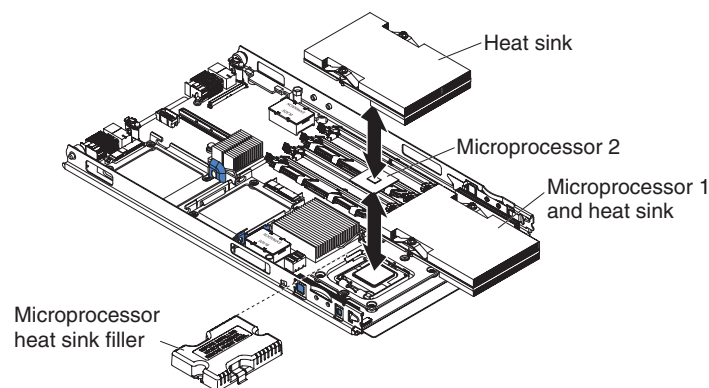
To install an additional microprocessor, complete the following steps:

1. Read the safety information that begins on page v and "Installation guidelines" on page 15.

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).

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

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

5. If a Memory and I/O Expansion Blade is installed, remove it (see "Removing an expansion unit" on page 19).

6. Remove the bezel assembly (see "Removing the blade server bezel assembly" on page 20 for instructions).

7. Locate the microprocessor socket on the system board.

8. Remove the heat-sink filler from the microprocessor socket.

   Attention: Do not touch the pins in the microprocessor socket. Touching these pins might result in permanent damage to the system board.
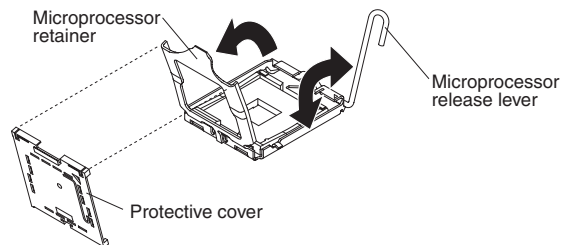
9. Remove the protective cover from the microprocessor retainer, if one is present.

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

10. Rotate the locking lever on the microprocessor socket from its closed and locked position until it stops in the fully open position (approximately a 135° angle), as shown.

11. Rotate the microprocessor retainer on the microprocessor socket from its closed position until it stops in the fully open position (approximately a 135° angle), as shown.

12. Touch the static-protective package that contains the new microprocessor to any *unpainted* metal surface on the blade server or any *unpainted* metal surface on any other grounded rack component in the rack you are installing the microprocessor in for at least 2 seconds; then, remove the microprocessor from the package.

13. Remove the cover from the bottom of the microprocessor.
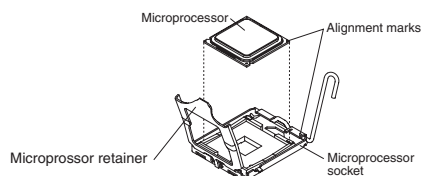
   **Attention:** Do not press the microprocessor into the socket.

14. Center the microprocessor over the microprocessor socket. Align the triangle on the corner of the microprocessor with the triangle on the corner of the socket and carefully place the microprocessor into the socket.

Attention: Make sure that the microprocessor is oriented and aligned correctly in the socket before you try to close the microprocessor retainer.

15. Carefully close the microprocessor retainer.

16. Rotate the locking lever on the microprocessor socket to the closed and locked position. Make sure that the lever is secured in the locked position by the tab on the microprocessor socket.

    Attention:

    • Do not set down the heat sink after you remove the plastic cover.

    • Do not touch the thermal grease on the bottom of the heat sink. Touching the thermal grease will contaminate it. If the thermal grease on the microprocessor or heat sink becomes contaminated, contact your service technician.

Heat sink   Thermal material
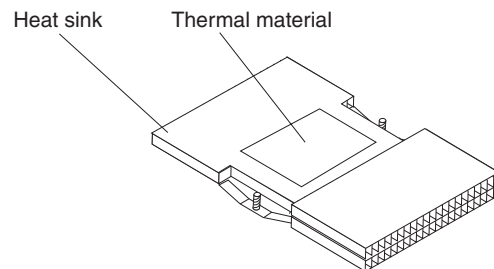
17. Remove the plastic protective cover from the bottom of the heat sink.

18. Make sure that the thermal material is still on the bottom of the heat sink; then, 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.

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

20. Press firmly on the captive screws and tighten them with a screwdriver, alternating between screws until they are tight. If possible, rotate each 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 to 13 Newton-meters (Nm) (6.3 to 9.6 inch-pounds).

If you have other options to install or remove, do so now; otherwise, go to "Completing the installation" on page 34.

Installing a Concurrent KVM Feature Card

If the BladeCenter unit and management module support the concurrent-KVM function, you can add a Concurrent KVM Feature Card to the blade server system board.

The following illustration shows how to install a Concurrent KVM Feature Card.
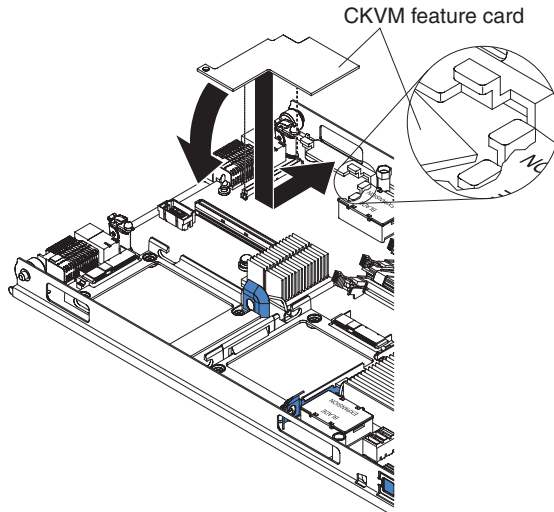
CKVM feature card

To install a Concurrent KVM Feature Card, complete the following steps:

1. Read the safety information that begins on page v and "Installation guidelines" on page 15.
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).
3. Carefully lay the blade server on a flat, static-protective surface.
4. Open the blade server cover (see "Opening the blade server cover" on page 18 for instructions).
5. If a Memory and I/O Expansion Blade is installed, remove it (see "Removing an expansion unit" on page 19).
6. If a small-form-factor expansion card or a high-speed expansion card is installed, remove it.
7. Touch the static-protective package that contains the Concurrent KVM Feature Card to any *unpainted* metal surface on the BladeCenter unit or any *unpainted* metal surface on any other grounded rack component; then, remove the card from the package.
8. Locate the concurrent KVM connector and orient the Concurrent KVM Feature Card.
9. Slide the right side of the card (the side of the card that is away from the concurrent KVM connector) between the two tabs at the right side of the expansion card bracket; then, gently pivot the card into the connector.

   Note: For device-driver and configuration information needed to complete the installation of the Concurrent KVM Feature Card, see the documentation that comes with the card.

10. If you removed a small-form-factor expansion card or a high-speed expansion card in step 6, reinstall it (see "Installing an I/O-expansion card" on page 29).

If you have other options to install or remove, do so now; otherwise, go to "Completing the installation" on page 34.

Installing an I/O-expansion card

The following sections describe how to install an I/O expansion card in the blade server. The illustrations show installation of the I/O expansion cards in the system board: installing the cards in an expansion unit is similar.

If the BladeCenter unit supports I/O expansion, you can add an I/O expansion card to the blade server. An I/O expansion card provides additional connections for communicating on a network.

The blade server supports various types of I/O expansion cards. See http://www.ibm.com/servers/eserver/serverproven/compat/us/ for a list of available I/O expansion cards and their form-factor types. The following notes describe information that you must consider when installing I/O-expansion modules:

* Some expansion cards are available as both small-form-factor cards and standard-form-factor cards. Other expansion cards are available only as standard-form-factor or high-speed cards.
* The system board supports one I/O expansion card. The supported cards are the small-form-factor card, the standard-form-factor card, or the high-speed card.
* If two hard disk drives are installed in the blade server, you can install only a small-form-factor expansion card or a high-speed expansion card. If only one drive is installed in the blade server, you can install any type of expansion card.
* If an expansion unit is installed, you cannot install a high-speed expansion card in the blade server; however, some expansion units do support installation of additional I/O expansion cards. See the documentation for your expansion unit for information.
* Small-Form-Factor and Standard-Form-Factor expansion cards are not supported in the Blade Storage Expansion Unit 3, when a Memory and I/O Expansion Blade is installed.

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 in a Type 8677 BladeCenter unit, 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. Because pass-thru modules are compatible with a variety of I/O expansion cards, installing two pass-thru modules would enable the use of several different types of compatible I/O expansion cards in blade servers within the same BladeCenter unit.

Installing a small-form-factor expansion card

The following sections describe how to install an I/O expansion card in the blade server. The illustrations show installation of the I/O expansion cards in the system board: installing the cards in an expansion unit is similar.

The following illustration shows how to install a small-form-factor expansion card.
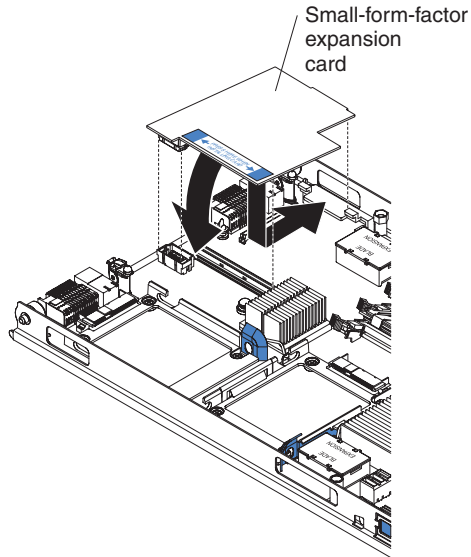
Small-form-factor
expansion
card

To install a small-form-factor expansion card, complete the following steps:

1. Read the safety information that begins on page v and "Installation guidelines" on page 15.

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).

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

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

5. If a Memory and I/O Expansion Blade is installed, remove it (see "Removing an expansion unit" on page 19).

6. 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.

7. Locate the expansion-card connectors and orient the expansion card.

8. Slide the notch in the narrow end of the card into the raised hook on the expansion-card bracket; then, gently pivot the card into the expansion-card connectors.

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

If you have other options to install or remove, do so now; otherwise, go to "Completing the installation" on page 34.
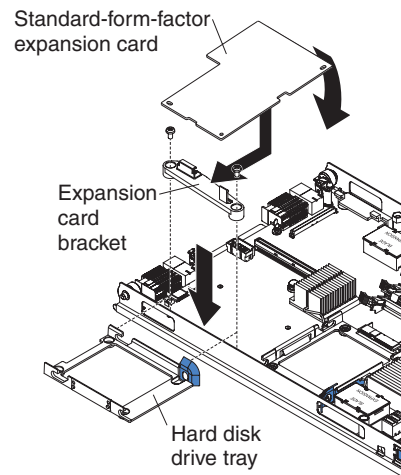
Installing a standard-form-factor expansion card

The following sections describe how to install an I/O expansion card in the blade server. The illustrations show installation of the I/O expansion cards in the system board: installing the cards in an expansion unit is similar.

If a SAS drive is connected to SAS connector 1 (J137), you must remove it and the SAS drive tray before you can install a standard-form-factor expansion card and expansion card bracket on the system board (see "Removing a SAS hard disk drive" on page 22). Before you remove the drive, back up the data from the drive another storage device.

If the drive that is connected to the SAS hard disk drive connector 1 is part of a RAID array, delete the SAS RAID array before you remove the drive. When you delete the array, the array configuration information is removed, but no data is deleted.

The following illustration shows how to install a standard-form-factor expansion card.

To install a standard-form-factor expansion card, Complete the following steps:

1. Read the safety information that begins on page v and "Installation guidelines" on page 15.
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).
3. Carefully lay the blade server on a flat, static-protective surface.
4. Open the blade server cover (see "Opening the blade server cover" on page 18 for instructions).
5. If a Memory and I/O Expansion Blade is installed, remove it (see "Removing an expansion unit" on page 19).
6. If you are installing the expansion card in the system board and a drive is connected to SAS hard disk drive connector 1, remove the drive and tray (see "Removing a SAS hard disk drive" on page 22 for instructions), and save the screws that secure the tray to the system board. Store the screws in a safe place.
7. 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.

8. Install the expansion-card bracket, if it is not already installed. Secure the bracket to the system board with the screws from the option kit or from the removed drive tray.

9. Locate the expansion-card connectors and orient the expansion card.

10. Slide the notch in the narrow end of the card into the raised hook on the expansion-card bracket; then, gently pivot the wide end of the card into the expansion-card connectors.

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

If you have other options to install or remove, do so now; otherwise, go to "Completing the installation" on page 34.

Installing a high-speed expansion card

The following sections describe how to install an I/O expansion card in the blade server. The illustrations show installation of the I/O expansion cards in the system board: installing the cards in an expansion unit is similar.

Note: High-speed expansion cards are *not* supported by all BladeCenter unit types. If an expansion unit is installed on the blade server, you cannot install a high-speed expansion card on the blade server, it must be installed on the expansion unit.

The following illustration shows how to install a high-speed.
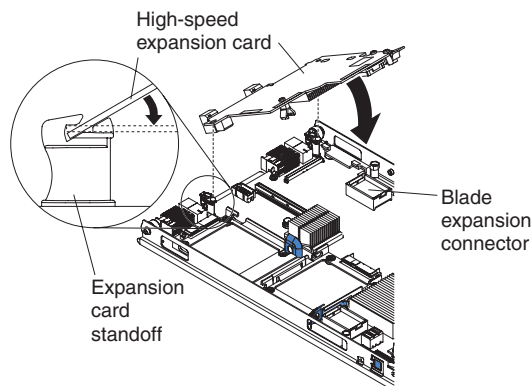
To install a high-speed expansion card, complete the following steps:

1. Read the safety information that begins on page v and "Installation guidelines" on page 15.

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).

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

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

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.

6. Locate the blade-expansion connector and remove the cover, if one is installed.

7. Orient the expansion-card and slide the slots at the back end of the card onto the pins on the expansion card standoff; then, gently pivot the card into the blade-expansion connector.

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.

9. If you have other options to install or remove, do so now; otherwise, go to "Completing the installation" on page 34.

Installing an expansion unit

Note: If a high-speed expansion card is installed on the blade server system board, you cannot install an expansion unit. If a BladeCenter Storage Expansion Unit 3 and a Memory and I/O Expansion Blade are installed on the blade server, you cannot install standard-form-factor or small-form-factor expansion cards in the BladeCenter Storage Expansion Unit 3.

The following illustration shows how to install an expansion unit on a blade server.
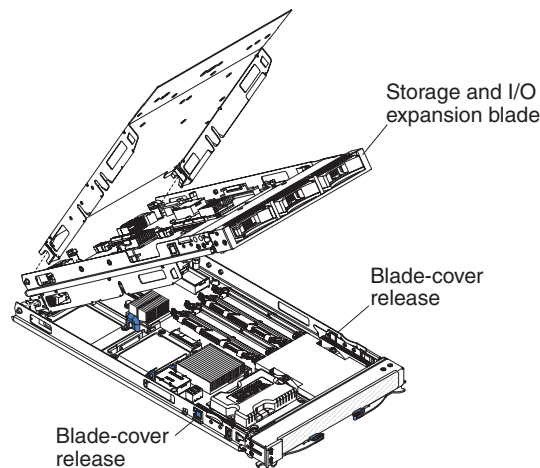
To install an expansion unit, complete the following steps:

1. Read the safety information that begins on page v and "Installation guidelines" on page 15.

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).

3. If you removed the blade bezel assembly, replace it now (see "Installing the blade server bezel assembly" on page 35 for instructions).

4. Remove the protective covers from the blade expansion connectors, if they are present.

5. If you are installing a Memory and I/O Expansion Blade on the blade server, remove the power jumper from power connector J164. Store the power jumper in a safe place.

6. Touch the static-protective package that contains the 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 expansion unit from the package.

7. Orient the expansion unit as shown in the illustration.

8. Lower the expansion unit so that the slots at the rear slide down onto the cover pins at the rear of the blade server.

9. Close the expansion unit (see the documentation for the expansion unit for information and instructions):

   a. If the expansion unit has an extraction device, pivot the expansion unit closed; then, use the extraction device to fully seat the expansion unit on the system board. These extraction devices can be of several types, including thumbscrews or levers.

   b. If the expansion unit has no extraction device, pivot the expansion unit closed; then, press the expansion unit firmly into place until the blade-cover releases click.

   The connectors on the expansion unit automatically align with and connect to the connectors on the system board.

If you have other expansion units to install, do so now; otherwise, go to "Completing the installation."

Completing the installation

To complete the installation, complete the following tasks. Instructions for each task are in the following sections.

1. Reinstall the blade server bezel assembly, if you removed it (see "Installing the blade server bezel assembly" on page 35 for information on installing the bezel assembly).

2. Reinstall the Memory and I/O Expansion Blade, if you removed it to install other options (see "Installing an expansion unit" on page 33 for information on installing the Memory and I/O Expansion Blade).

3. Close the blade server cover, unless you installed an optional expansion unit that has its own cover (see "Closing the blade server cover" on page 35).

   **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.

4. Reinstall the blade server into the BladeCenter unit (see "Installing the blade server in a BladeCenter unit" on page 36).

5. Turn on the blade server (see "Turning on the blade server" on page 11).

6. For certain options, run the blade server Configuration/Setup Utility program (see Chapter 4, "Configuring the blade server," on page 39).

   Note: 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.

Installing the blade server bezel assembly

The following illustration shows how to install the bezel assembly.
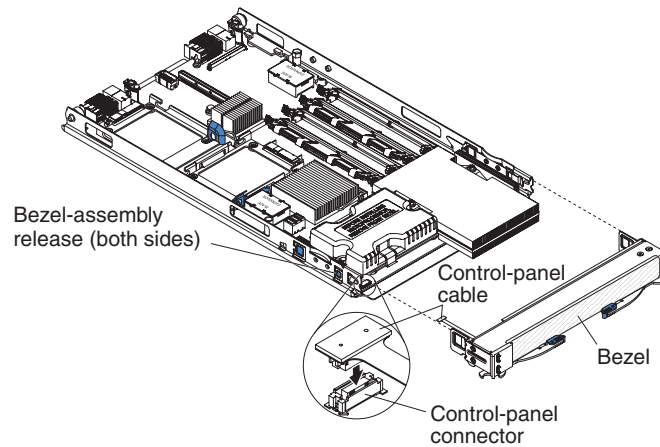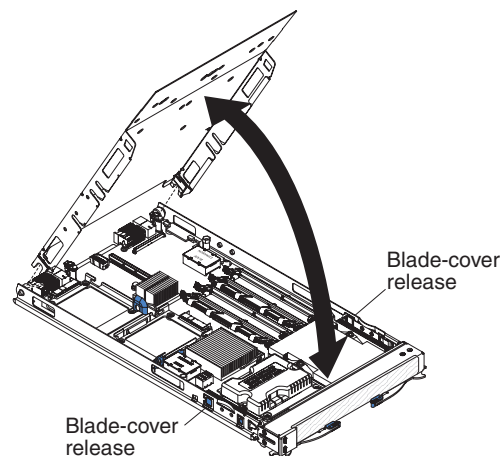

To install the blade server bezel assembly, complete the following steps:

1. Read the safety information that begins on page v and "Installation guidelines" on page 15.
2. Connect the control-panel cable to the control-panel connector on the system board.
3. Carefully slide the bezel assembly onto the blade server until it clicks into place.

Closing 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.

The following illustration shows how to close the blade server cover.

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

1. Read the safety information that begins on page v and "Installation guidelines" on page 15.
2. If you removed the blade bezel assembly, replace it now (see "Installing the blade server bezel assembly" for instructions).
3. If a Memory and I/O Expansion Blade is *not* installed on the blade server, make sure that the power jumper is installed in power connector J164.

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.

5. Pivot the cover to the closed position, as shown in the illustration, until it clicks into place.

Installing the blade server in a BladeCenter unit

The following illustration shows how to install a blade server into a Type 8677 BladeCenter unit. The appearance of your BladeCenter unit might be different, see the documentation for your BladeCenter unit for additional information.

Release handles
(open)
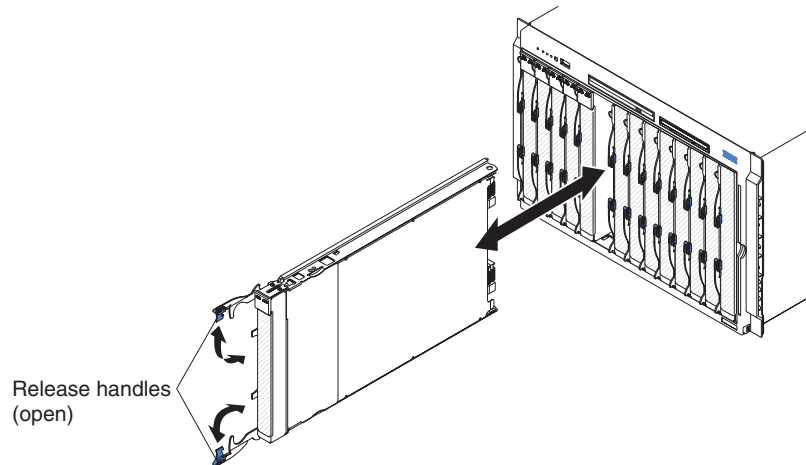
To install a blade server in a BladeCenter unit, complete the following steps.

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.

1. Read the safety information that begins on page v and "Installation guidelines" on page 15 through "Handling static-sensitive devices" on page 16.

2. If you have not done so already, install any options that you want, such as SAS drives or memory, in the blade server.

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

   Notes:

   - When any blade server or option is in blade bays 7 through 14 (in a BladeCenter unit) or in blade bays 5 through 8 (in a BladeCenter T unit), power modules must be present in all four power-module bays. For additional information, see the *Installation and User's Guide* that comes with the BladeCenter or BladeCenter T unit.

   - 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 or a BladeCenter T unit for more than 20 minutes without a blade server, expansion unit, or blade filler in each blade bay.

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

5. Slide the blade server into the blade bay until it stops.

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

7. Turn on the blade server (see "Turning on the blade server" on page 11 for instructions).

8. 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.

9. (Optional) Write identifying information on one of the labels that come with the blade servers and place the label on a 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.

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

11. (BladeCenter T unit only) Reinstall the bezel assembly on the BladeCenter T unit. For detailed instructions for reinstalling the bezel assembly, see the *Installation and User's Guide* that comes with the BladeCenter T unit.

If you reinstall 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 bay number. Reinstalling a blade server into a different blade bay from the one from which it was removed can have unintended consequences, and you might have to reconfigure the blade server.

If this is the initial installation for the blade server in the BladeCenter unit, you must configure the blade server through the Configuration/Setup Utility program and install the blade server operating system. See "Updating the blade server configuration" on page 38 and Chapter 5, "Installing the operating system," on page 49 for details.

Updating the blade server configuration

When the blade server starts for the first time after you add or remove an internal option, you might receive a message that the configuration has changed. The Configuration/Setup Utility program automatically starts so that you can save the new configuration settings. See "Using the Configuration/Setup Utility program" on page 39 for more information about the Configuration/Setup Utility program.

Some options have device drivers that you must install. See the documentation that comes with each option 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, Chapter 5, "Installing the operating system," on page 49 on page 49 and your operating-system documentation for additional information.

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 "Control panel buttons and LEDs" on page 12 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 on 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

This chapter describes the configuration requirements for the blade server. Before you continue, make sure that the blade server has the latest version of firmware code. For additional information, see "Firmware updates" on page 45.

The following configuration programs come with the blade server:

- **Configuration/Setup Utility program**

  The Configuration/Setup Utility program is part of the basic input/output system (BIOS). Use it to change system settings, such as interrupt requests (IRQ), date and time, and password. See "Using the Configuration/Setup Utility program" for more information.

- **LSI Logic Configuration Utility program**

  The LSI Logic Configuration Utility program is part of the BIOS. Use it to set the device scan order and to set the SAS controller IDs. See "Using the LSI Logic Configuration Utility program" on page 47 for more information.

- **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 using this CD, see "Using the ServerGuide Setup and Installation CD" on page 43.

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

  The PXE boot agent utility program is part of the BIOS. 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 "Using the PXE boot agent utility program" on page 45.

The IBM Remote Deployment Manager (RDM) Version 4.20 program is available for purchase. You can use IBM RDM Version 4.20 (or later) to install a BIOS code update onto a blade server by following the instructions in the documentation that comes with the RDM program. To determine whether an operating system supports the RDM program or for updated information about RDM and information about purchasing the software, go to http://www.ibm.com/servers/eserver/xseries/systems_management/.

Using the Configuration/Setup Utility program

To start the Configuration/Setup Utility program, complete the following steps:

1. Turn on the blade server (see "Turning on the blade server" on page 11).
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 "Control panel buttons and LEDs" on page 12 for information).
   - If you are managing the blade server from a remote location, see the *IBM BladeCenter Management Module User's Guide*, *IBM BladeCenter Management Module Command-Line Interface Reference Guide*, or *IBM BladeCenter Serial over LAN Setup Guide* for information and instructions.
3. When the Configuration/Setup utility message appears, press F1.
4. Follow the instructions on the screen.

Configuration/Setup Utility menu choices

The following choices are on the Configuration/Setup Utility main menu. Depending on the version of the BIOS, some menu choices might differ slightly from these descriptions.

- **System Summary**

  Select this choice to display configuration information, including the type, speed, and cache sizes of the microprocessors and the amount of installed memory. When you make configuration changes through other choices in the Configuration/Setup Utility program, the changes are reflected in the system summary; you cannot change settings directly in the system summary.

  - **Processor Summary**

    Select this choice to view information about the microprocessors installed in the blade server.

  - **USB Device Summary**

    Select this choice to view information about the USB devices installed in the blade server.

- **System Information**

  Select this choice to display information about the blade server. When you make configuration changes through other options in the Configuration/Setup Utility program, some of those changes are reflected in the system information; you cannot change settings directly in the system information.

  - **Product Data**

    Select this choice to view the machine type and model of the blade server, the serial number, and the revision level or issue date of the BIOS and diagnostics code that are stored in electrically erasable programmable ROM (EEPROM).

- **Devices and I/O Ports**

  Select this choice to view or change assignments for devices and input/output (I/O) ports.

  You can also enable or disable the integrated SAS and Ethernet controllers, all standard ports (such as serial), and the I/O-expansion card. **Enable** is the default setting for all controllers. If you disable a device, it cannot be configured, and the operating system will not be able to detect it (this is equivalent to disconnecting the device). If you disable the Ethernet controller, the blade server will have no Ethernet capability.

  With an optional BladeCenter Storage Expansion Unit 3, you can control all of the SAS hard disk drives in the host blade server. Set **BSE3 Controls All Blade SAS HDD** to **Enable** to control all of the hard disk drives in the host blade server.

  - **Remote Console Redirection**

    Select this choice to enable Serial over LAN (SOL) and to set remote console communication parameters.

  - **Video**

    Select this choice to view information about the integrated video controller.

  - **System MAC Addresses**

    Select this choice to set and view the MAC addresses for the Ethernet controllers on the blade server.

    Note: MAC addresses are displayed only for those devices with PXE enabled

- **Date and Time**

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

- **System Security**

  Select this choice to set a power-on password. See "Using passwords" on page 42 for more information about passwords.

- **Start Options**

  Select this choice to view or change the start options. Changes in the start options take effect when you start the blade server.

  - **Startup Sequence Options**

    Select this choice to view the startup device sequence that is set for the blade server.

    Note: To set the startup sequence, which is the order in which the blade server checks devices to find a boot record, you must use the management-module Web interface.

  You can set keyboard operating characteristics, such as whether the blade server starts with the keyboard number lock on or off. You can enable the blade server to run without a diskette drive or keyboard.

  You can enable or disable the PXE option for all of the Ethernet controllers in the blade server. The default settings enable the PXE option for the two Ethernet controllers on the system board.

  If you enable the boot fail count, the BIOS default settings will be restored after three consecutive failures to find a boot record.

  You can enable a virus-detection test that checks for changes in the boot record when the blade server starts.

- **Advanced Setup**

  Select this choice to change settings for advanced hardware features.

  Important: The blade server might malfunction if these settings are incorrectly configured. Follow the instructions on the screen carefully.

  - **Memory Settings**

    Select this choice to manually enable a pair of memory connectors.

    If a memory error is detected during POST or memory configuration, the blade server automatically disables the failing memory pair of memory connectors and continues operating with reduced memory. After the problem is corrected, you must enable the memory connectors. Use the arrow keys to highlight the pair of memory connectors that you want to enable, and use the arrow keys to select **Enable**.

    To maintain optimum system operation in the event of a memory failure, you can set memory configuration to mirroring or sparing. Memory mirroring stores duplicate data on two DIMMs to prevent data loss if a DIMM fails. Memory sparing removes the failed memory from the system configuration and activates a hot spare memory pair of DIMMs to replace the failed memory pair of DIMMs. Before you can enable the memory mirroring or sparing, at least two pairs of DIMMs must be installed in the blade server that adhere to the special requirements that are described in "Installing memory modules" on page 22. Set **Memory Configuration** to **Flat** to disable memory mirroring and sparing.

    Note: Memory mirroring is available only when an optional IBM BladeCenter Memory and I/O Expansion Blade is installed on the blade server.

– **CPU Options**

Select this choice to disable the microprocessor cache or to set the microprocessor cache to use the write-back or write-through method. Write-back caching generally provides better system performance.

You can also select this choice to enable or disable hyper-threading and adjust microprocessor performance settings. If hyper-threading is enabled, active only if it is supported by your operating system.

– **PCI Bus Control**

Select this choice to view and set interrupts for PCI devices and to configure the master-latency-timer value for the blade server.

– **Baseboard Management Controller (BMC) Settings**

Select this choice to enable or disable the **Reboot on System NMI** option. If you enable this option, the blade server will automatically restart 60 seconds after the service processor issues a nonmaskable interrupt (NMI) to the blade server. You can also select this choice to enable or disable and set the timeouts for the POST and OS loader watchdog timers and view BMC version information.

- **BMC Network Configuration**

Select this choice to set the network addresses of the BMC.

- **BMC System Event Log**

Select this choice to view and clear BMC event log entries.

- **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 Configuration/Setup Utility program. 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

From the **System Security** choice, you can set, change, and delete a power-on password.

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 Configuration/Setup Utility menu.

You can use any combination of up to seven characters (A–Z, a–z, and 0–9) 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 in 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).

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.

If a later version of the ServerGuide program is available, you can download a free image of the *ServerGuide Setup and Installation* CD, or you can purchase the CD. To download the image, go to the IBM ServerGuide Web page at http://www.ibm.com/pc/qtechinfo/MIGR-4ZKPPT.html. To purchase the latest *ServerGuide Setup and Installation* CD, go to the ServerGuide fulfillment Web site at http://www.ibm.com/servers/eserver/xseries/systems_management/serverguide/sub.html.

The ServerGuide program has the following features to make setup easier:
- 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

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

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

The ServerGuide program to 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 the 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 the operating-system selection and the installed hard disk drives.
4. The ServerGuide program prompts you to insert the operating-system CD and restart the 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 before you perform this step.

Installing the operating system without ServerGuide

If you have already configured the blade server hardware and you are not using the ServerGuide program to install the operating system, complete the following steps to download the latest operating-system installation instructions from the IBM Support Web page.

1. Go to http://www.ibm.com/bladecenter/.
2. From the **Hardware** list, select **BladeCenter8853** and click **Go**.
3. Click **Install and use** tab.
4. Click **Product documentation**.
5. Select the installation instructions for your operating system.

Using the PXE boot agent utility program

Use the Preboot Execution Environment (PXE) boot agent utility program to select the boot protocol and other boot options and to select a power-management option.

Notes:

1. The blade server does not support Remote Program Load (RPL) selection for the boot protocol option.

2. Enabling PXE might reduce the number of optional expansion modules that your blade server can manage.

To start the PXE boot agent utility program, complete the following steps:

1. Turn on the server.

2. When the `Broadcom NetXtreme Boot Agent vX.X.X` prompt is displayed, press Ctrl+S. You have 2 seconds (by default) to press Ctrl+S after the prompt is displayed.

   If the PXE setup prompt is not displayed, use the Configuration/Setup Utility program to set the **Enable Ethernet PXE/DHCP** option.

3. Use the arrow keys or press Enter to select a choice from the menu.

4. Follow the instructions on the screen to change the settings of the selected items; then, press Enter.

Firmware updates

IBM periodically makes BIOS code, service processor (BMC) firmware, and diagnostic firmware updates available for the blade server. Before you install the blade server in a BladeCenter unit, go to http://www.ibm.com/bladecenter/ to download the latest firmware for the blade server. Install the updates, using the instructions that are included with the downloaded files.

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

Configuring the Gigabit Ethernet controllers

Two Ethernet controllers are integrated on the blade server system board. Each 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). Each Ethernet controller on the system board is routed to a different I/O module in I/O module bay 1 or bay 2. The routing from an Ethernet controller to an I/O-module bay varies according to the blade server type and the operating system that is installed. See "Blade server Ethernet controller enumeration" on page 46 for information about how to determine the routing from an Ethernet controller to an I/O module bay for the blade server.

Note: Other types of blade servers, such as the BladeCenter HS20 Type 8678 blade server, that are installed in the same BladeCenter unit as the BladeCenter HS21 Type 8853 blade server might have different Ethernet controller routing. See the documentation that comes with the other blade servers for information.

You do not have to set any jumpers or configure the controllers for the blade server operating system. However, you must install a device driver to enable the blade server operating system to address the Ethernet controllers. For device drivers and information about configuring the Ethernet controllers, see the *Broadcom NetXtreme Gigabit Ethernet Software* CD that comes with the blade server. For updated information about configuring the controllers, see http://www.ibm.com/bladecenter/.

The Ethernet controllers in your blade server support failover, which provides automatic redundancy for the Ethernet controllers. Without failover, you can have only one Ethernet controller from each server attached to each virtual LAN or subnet. With failover, you can configure more than one Ethernet controller from each server to attach to the same virtual LAN or subnet. Either one of the integrated Ethernet controllers can be configured as the primary Ethernet controller. If you have configured the controllers for failover and the primary link fails, the secondary controller takes over. When the primary link is restored, the Ethernet traffic switches back to the primary Ethernet controller. See the operating-system device-driver documentation for information about configuring for failover.

Important: To support failover on the blade server Ethernet controllers, the Ethernet switch modules in the BladeCenter unit must have identical configurations.

Blade server Ethernet controller enumeration

The enumeration of the Ethernet controllers in a blade server is operating-system dependent. You can verify the Ethernet controller designations that a blade server uses through the operating-system settings.

The routing of an Ethernet controller to a particular I/O-module bay depends on the type of blade server. You can verify which Ethernet controller is routed to which I/O-module bay by using the following test:

1. Install only one Ethernet switch module or pass-thru module in I/O-module bay 1.
2. Make sure that the ports on the switch module or pass-thru module are enabled (click **I/O-module Tasks → Management → Advanced Management** in the management-module Web-based user interface).
3. Enable only one of the Ethernet controllers on the blade server. Note the designation that the blade server operating system has for the controller.
4. Ping an external computer on the network connected to the switch module or pass-thru module. If you can ping the external computer, the Ethernet controller that you enabled is associated with the switch module or pass-thru module in I/O-module bay 1. The other Ethernet controller in the blade server is associated with the switch module or pass-thru module in I/O-module bay 2.

If you have installed an I/O-expansion card in the blade server, communication from the expansion card is routed to I/O-module bays 3 and 4, if these bays are supported by your BladeCenter unit. You can verify which controller on the card is routed to which I/O-module bay by performing the same test and using a controller on the expansion card and a compatible switch module or pass-thru module in I/O-module bay 3 or 4.

Configuring a RAID array

Configuring a SAS RAID array applies to a blade server in which two SAS hard disk drives are installed.

Two SAS hard disk drives in the blade server can be used 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/servers/eserver/serverproven/compat/us/. For the blade server, you must configure the SAS RAID using the LSI Configuration Utility program.

If an optional BladeCenter Storage Expansion Unit 3 is installed, you can use it to control all of the SAS hard disk drives that are installed in the blade server. Enable this feature by using the Device and I/O Ports choice in Configuration/Setup Utility program (see Configuration/Setup Utility menu choices on page 40 for information and instructions).

Using the LSI Logic Configuration Utility program

You can use the LSI Logic Configuration Utility program to:
- 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:
1. Turn on the blade server, and make sure that the blade server is the owner of the keyboard, video, and mouse.
2. When the `<<<Press Ctrl-C to start LSI Logic Configuration Utility>>>` prompt is displayed, press Ctrl-C.
3. Use the arrow keys to select the controller from the list of adapters; then, press Enter.
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.

Chapter 5. Installing the operating system

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 Microsoft Windows operating system.
- Use Remote Deployment Manager (RDM) Version 4.20 (or later) to install a supported Microsoft Windows operating system or Red Hat Advanced Server 2.1. To determine whether an operating system supports RDM, see http://www.ibm.com/servers/eserver/xseries/systems_management/.
- Download the latest operating-system installation instructions and install the operating system. Local deployment for Microsoft Windows 2000 requires an integrated CD that contains Windows 2000 with Service Pack 3 applied. Instructions for creating a Windows 2000 integrated CD are in the latest operating-system installation instructions for Windows 2000 at http://www.ibm.com/bladecenter/.

Important:

1. 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.
2. Some operating systems, such as Red Hat Linux 7.3, enable you to select the type of mouse that is being used. If you are offered this choice, select USB instead of PS/2. Although the mouse might be a PS/2-style device, communication with the mouse is through an internal USB bus in the BladeCenter unit; therefore, the operating system in the blade server must recognize the mouse as a USB device.

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

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

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.
2. Insert the CD, and restart the blade server. If the CD does not start, see "ServerGuide problems" on page 52.
3. Follow the instructions on the screen to:
   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 Version 4.20 or later to install the operating system

You can use RDM version 4.20 (or later) to install a supported Microsoft Windows operating system or Red Hat Linux Advanced Server 2.1 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 operating system supports RDM, see http://www.ibm.com/servers/eserver/xseries/systems_management/.

Downloading installation instructions

To download operating-system installation instructions, complete the following steps:

1. Go to http://www.ibm.com/bladecenter/.
2. From the **Hardware** list, select **BladeCenter 8853**, and click **Go**.
3. Click the **Install and use** tab.
4. Click **Product documentation**.
5. Select the installation instructions for your operating system.

Chapter 6. Solving problems

This chapter provides basic information about the diagnostic tools that are available to help you solve some common problems that might occur while you are setting up 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 36).
- If the power-on LED is flashing slowly, turn on the blade server (see "Turning on the blade server" on page 11).
- 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

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

- **POST beep codes**

  The power-on self-test beep codes can indicate the detection of a problem.
  - One beep indicates successful completion of POST
  - Repeating long beeps indicate a memory error. Make sure that all DIMMs are correctly installed.
  - Additional beep codes are listed in "Diagnostics" in the *Problem Determination and Service Guide* for your blade server.

- **POST error codes**

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

- **ServerGuide problems**

  The table in "ServerGuide problems" on page 52 lists problem symptoms and steps to correct the problems.

- **Troubleshooting tables**

  Use the troubleshooting tables to find solutions to problems that have identifiable symptoms. These tables are in the *Problem Determination and Service Guide* for your blade server.

- **Diagnostic programs and error messages**

  Real Time Diagnostics 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. Real Time Diagnostics can be plugged into an existing IBM Director environment or installed without IBM Director present. For documentation and download information for Real Time Diagnostics, see http://www.ibm.com/servers/eserver/xseries/ systems_management/. See the *Problem Determination and Service Guide* for more information.

  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.

- **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.

ServerGuide problems

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 IRQ assignments. • Make sure that the hard disk drive is connected correctly.
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 there is no logical drive 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. This appendix contains information about where to go for additional information about IBM and IBM products, what to do if you experience a problem with your BladeCenter product or optional device, and whom to call for service, if it is necessary.

Before you call

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

- Check all cables to make sure that they are connected.
- Check the power switches to make sure that the system and any optional devices are turned on.
- Use the troubleshooting information in your system documentation, and use the diagnostic tools that come with your system. Information about diagnostic tools is in the *Hardware Maintenance Manual and Troubleshooting Guide* or *Problem Determination and Service Guide* on the IBM *Documentation* CD that comes with your system.
- Go to http://www.ibm.com/bladecenter/ and click **Support** to check for information to help you solve the problem.

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 BladeCenter systems also describes the diagnostic tests that you can perform. Most BladeCenter 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 software.

Using the documentation

Information about your IBM BladeCenter 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/bladecenter/, click **Support**, and follow the instructions. Also, some documents are available through the IBM Publications Center at http://www.ibm.com/shop/publications/order/.

Getting help and information from the World Wide Web

On the World Wide Web, the IBM Web site has up-to-date information about IBM BladeCenter systems, optional devices, services, and support at http://www.ibm.com/bladecenter/. For service information, click **Support**.

Software service and support

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

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

Hardware service and support

You can receive hardware service through IBM Services or through your IBM reseller, if your reseller is authorized by IBM to provide warranty service. See http://www.ibm.com/planetwide/ for support telephone numbers, or 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.

Appendix B. Notices

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Important notes

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

CD drive speeds list the variable read rate. Actual speeds vary and are often less than the maximum possible.

When referring to processor storage, real and virtual storage, or channel volume, KB stands for approximately 1000 bytes, MB stands for approximately 1 000 000 bytes, and GB stands for approximately 1 000 000 000 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 may 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 available from IBM.

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

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

Product recycling and disposal

This unit must be recycled or discarded according to applicable local and national regulations. IBM encourages owners of information technology (IT) equipment to responsibly recycle their equipment when it is no longer needed. IBM offers a variety of product return programs and services in several countries to assist equipment owners in recycling their IT products. Information on IBM product recycling offerings can be found on IBM's Internet site at http://www.ibm.com/ibm/environment/products/prp.shtml.
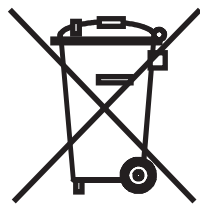
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Remarque : Cette marque s'applique uniquement aux pays de l'Union Européenne et à la Norvège.

L'etiquette du système respecte la Directive européenne 2002/96/EC en matière de Déchets des Equipements Electriques et Electroniques (DEEE), qui détermine les dispositions de retour et de recyclage applicables aux systèmes utilisés à travers l'Union européenne. Conformément à la directive, ladite étiquette précise que le produit sur lequel elle est apposée ne doit pas être jeté mais être récupéré en fin de vie.

In accordance with the European WEEE Directive, electrical and electronic equipment (EEE) is to be collected separately and to be reused, recycled, or recovered at end of life. Users of EEE with the WEEE marking per Annex IV of the WEEE Directive, as shown above, must not dispose of end of life EEE as unsorted municipal waste, but use the collection framework available to customers for the return, recycling, and recovery of WEEE. Customer participation is important to minimize any potential effects of EEE on the environment and human health due to the potential presence of hazardous substances in EEE. For proper collection and treatment, contact your local IBM representative.

Battery return program

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

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

In the Netherlands, the following applies.

For Taiwan: Please recycle batteries.

廢電池請回收

Electronic emission notices

Federal Communications Commission (FCC) statement

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

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

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

Industry Canada Class A emission compliance statement

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

Avis de conformité à la réglementation d'Industrie Canada

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

Australia and New Zealand Class A statement

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

United Kingdom telecommunications safety requirement

Notice to Customers

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

European Union EMC Directive conformance statement

This product is in conformity with the protection requirements of EU Council Directive 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a nonrecommended modification of the product, including the fitting of non-IBM option cards.

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

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

Taiwanese Class A warning statement

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

Chinese Class A warning statement

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

Japanese Voluntary Control Council for Interference (VCCI) statement

この装置は、情報処理装置等電波障害自主規制協議会(VCCI)の基準に
基づくクラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を
引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求
されることがあります。

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