

BladeCenter JS21 Type 8844

Installation and User's Guide

Welcome.

Thank you for buying an IBM blade server. This blade server takes advantage of IBM Power Architecture technologies and 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 from the IBM Support Web site.

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

Before installing the BladeCenter JS21 Type 8844, you should have completed the following procedures:

- Installed and configured the rack according to the documentation that came with the rack.
- Installed and configured the BladeCenter unit into the rack. See the documentation provided with the BladeCenter unit to install the unit into the rack.
- Supplied input power to the BladeCenter unit.

Install options in the blade server:

- Drives
 - Memory modules
 - I/O expansion card
- See Chapter 3 for more information.

Make sure that the BladeCenter management module and the Ethernet switch module firmware support the Serial Over LAN (SOL) feature. See the *Serial Over LAN Setup Guide* for more information.

Install the blade server in the BladeCenter unit. See Chapter 3 for more information.

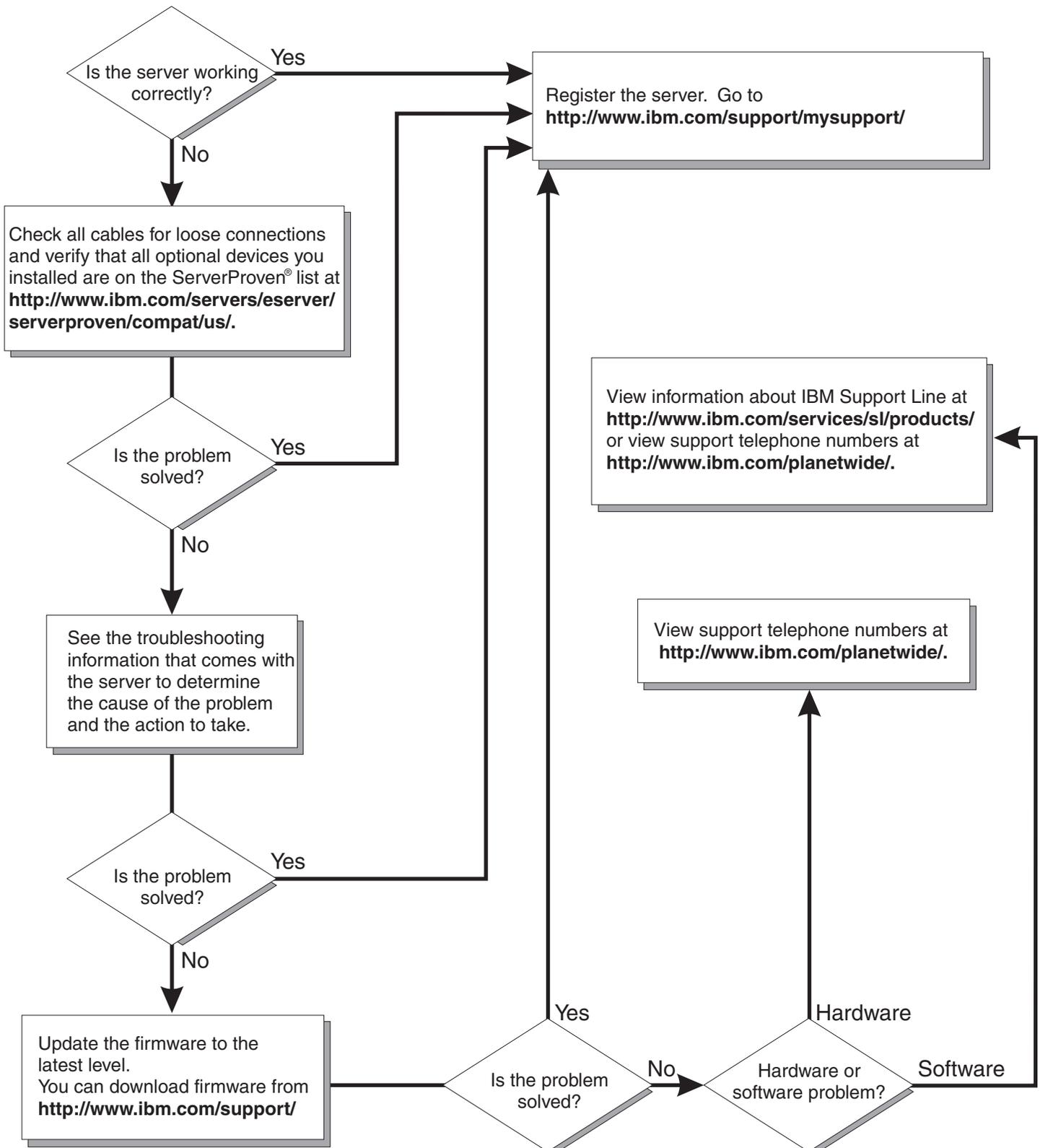
Establish an SOL session with the blade server. See the *Serial Over LAN Setup Guide* for more information.

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

Install additional applications according to the instructions provided 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



BladeCenter JS21 Type 8844



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 41 and the *Warranty and Support Information* document for your blade server type on the *Documentation CD*.

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Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الأمنية

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

在安裝本產品之前，請仔細閱讀 **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 pečítajte 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 blade 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:

1. Turn everything OFF.
2. First, attach all cables to devices.
3. Attach signal cables to connectors.
4. Attach power cords to outlet.
5. Turn device ON.

To Disconnect:

1. Turn everything OFF.
2. First, remove power cords from outlet.
3. Remove signal cables from connectors.
4. Remove all cables from devices.

Statement 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.

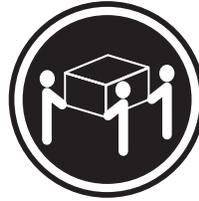
Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.

Class 1 Laser Product
Laser Klasse 1
Laser Klass 1
Luokan 1 Laserlaite
Appareil À Laser de Classe 1

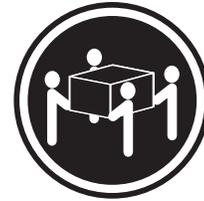
Statement 4:



≥ 18 kg (39.7 lb)



≥ 32 kg (70.5 lb)



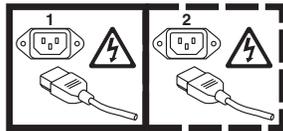
≥ 55 kg (121.2 lb)

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® JS21 Type 8844 blade server is based on the IBM Power Architecture™ technologies.

The BladeCenter JS21 Type 8844 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 and BladeCenter T units.

This *Installation and User's Guide* contains 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/support/>.

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 *BladeCenter JS21 Type 8844 Documentation* CD. You can obtain up-to-date information about the blade server at <http://www.ibm.com/support/>. For more information about locating online documentation, see "Related documentation" on page 2.

If firmware and documentation updates are available, you can download them from <http://www.ibm.com/support/>. 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/support/>. For firmware updates, click **Downloads and drivers**. For documentation updates, under **Search technical support**, type 8844 and click **Search**.

Notes:

- Changes are made periodically to the IBM Web site. Procedures for locating firmware and documentation might change from what is described in this document.
- Throughout this document, the blade server *basic input/output system (BIOS)* is also known as the blade server global firmware.

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

Product name	BladeCenter JS21
Machine type	8844
Model number	_____
Serial number	_____

The model number and serial number are 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 your hardware.

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 options and how to configure the blade server. The following documentation also comes with the blade server:

- *Warranty and Support Information*

This document is in Portable Document Format (PDF) on the *BladeCenter JS21 Type 8844 Documentation* CD. It contains information about the terms of the warranty and getting service and assistance.

- *Safety Information*

This document is in PDF on the *BladeCenter JS21 Type 8844 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.

- *Problem Determination and Service Guide*

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

- *BladeCenter Serial over LAN Setup Guide*

This document is in PDF on the *Documentation* CD. It explains how to update and configure BladeCenter components for Serial over LAN (SOL) operation. The SOL connection provides access to the text-console command prompt on each blade server and enables the blade servers to be managed from a remote location.

Additional documents might be included on the *BladeCenter JS21 Type 8844 Documentation* CD.

The most recent versions of this *Installation and User's Guide* and all other BladeCenter documentation are at <http://www.ibm.com/support/>.

In addition to the documentation in this library, be sure to review the *IBM BladeCenter Planning and Installation Guide* for your BladeCenter unit type for information to help you prepare for system installation and configuration. This document is available at <http://www.ibm.com/bladecenter/>.

The IBM Documentation CD

You can run the IBM *BladeCenter JS21 Type 8844 Documentation CD* on any personal computer that meets the hardware and software requirements.

The IBM *BladeCenter JS21 Type 8844 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 *BladeCenter JS21 Type 8844 Documentation CD* requires the following minimum hardware and software:

- Microsoft® Windows® NT 4.0 (with Service Pack 3 or later), or 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 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 Ctrl+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 *BladeCenter JS21 Type 8844 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 is a summary of the features and specifications of the JS21 Type 8844 blade server operating in a non-NEBS/ETSI (a non-Network Equipment Building System/European Telecommunications Standards Institute) environment.

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.

<p>Microprocessor:</p> <p>Support for:</p> <ul style="list-style-type: none"> • Two single-core, 64-bit, IBM PowerPC® 970MP microprocessors (2.7 GHz in BladeCenter H unit, 2.6 GHz in other BladeCenter units) or • Two dual-core, 64-bit, IBM PowerPC 970MP microprocessors (2.5 GHz in BladeCenter H unit, 2.3 GHz in other BladeCenter units) <p>Memory:</p> <ul style="list-style-type: none"> • Dual-channel (DDR2) with 4 DIMM slots • Supports 512 MB, 1 GB, 2 GB, and 4 GB DIMMs, for a maximum of 16 GB (as of the date of this publication) • Supports 2-way interleaved, DDR2, PC2-3200 or PC2-4200, ECC SDRAM registered x4 (Chipkill™) DIMMs <p>Drives: Support for two internal small-form-factor Serial Attached SCSI (SAS) drives</p>	<p>Integrated functions:</p> <ul style="list-style-type: none"> • Two 1 Gigabit Ethernet controllers • Expansion card interface • Intelligent Platform Management Interface (IPMI) • Baseboard management controller (BMC) with IPMI firmware • ATI RN 50 video controller (future use) • SAS RAID controller • Light path diagnostics • Local service processor (BMC) • RS-485 interface for communication with the management module • Automatic server restart (ASR) • Serial over LAN (SOL) • Four Universal Serial Bus (USB) buses for communication with keyboard and mouse (future use), diskette drive, and CD drive <p>Predictive Failure Analysis® (PFA) alerts:</p> <ul style="list-style-type: none"> • Microprocessor • Memory 	<p>Electrical input: 12 V dc</p> <p>Environment:</p> <ul style="list-style-type: none"> • Air temperature: <ul style="list-style-type: none"> – Blade server on: 10° to 35°C (50° to 95°F). Altitude: 0 to 914 m (3000 ft) – Blade server on: 10° to 32°C (50° to 90°F). Altitude: 914 m to 2133 m (3000 ft to 7000 ft) – Blade server off: -40° to 60°C (-40° to 140°F) • Humidity: <ul style="list-style-type: none"> – Blade server on: 8% to 80% – Blade server off: 5% to 80% <p>Size:</p> <ul style="list-style-type: none"> • Height: 24.5 cm (9.7 inches) • Depth: 44.6 cm (17.6 inches) • Width: 2.9 cm (1.14 inches) • Maximum weight: 5.0 kg (11 lb)
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What your blade server offers

The design of the blade server takes advantage of advancements in memory management and data storage. 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, such as the following functions:

- Provides Alert Standard Format (ASF) and RS-485 interfaces to the management modules
- 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)

The BMC also provides the following features and functions:

- Continuous health monitoring and control
- Configurable notification and alerts
- Event logs that are time stamped and saved in nonvolatile memory and can be attached to e-mail alerts
- Point-to-point protocol (PPP) support
- Remote power control
- Remote firmware update and access to critical blade server settings
- Around-the-clock access to the blade server, even if the blade server is turned off

- **Disk drive support**

The blade server supports up to two 2.5 inch 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*.

- **Impressive performance using the latest microprocessor technology**

The blade server supports two PowerPC 970MP microprocessors. The blade server comes with two microprocessors installed.

- **Integrated network support**

The blade server has two integrated (onboard) Gigabit Ethernet controllers. Each Ethernet controller has an interface for connecting to 10/100/1000-Mbps networks through an Ethernet-compatible switch module in the BladeCenter unit. The blade server automatically selects between 10BASE-T and 100/1000BASE-TX environments. Each controller provides full-duplex (FDX) capability, which enables simultaneous transmission and reception of data on the Ethernet local area network (LAN). Only the integrated controllers support Wake on LAN[®] technology.

- **I/O expansion**

The blade server has connectors on the system board for an optional expansion card, such as the Fibre Channel expansion card, for adding more network communication capabilities to the blade server.

- **Large system memory capacity**

As of the date of this publication, the memory bus in the blade server supports up to 16 GB of system memory. 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. An LED on the blade server control panel is lit if an unusual condition or a problem occurs. If this happens, you can look at the LEDs on the system board to locate the source of the problem. For more information, see the *Problem Determination and Service Guide*.

- **Power throttling**

If your BladeCenter unit type supports power management, the power consumption of the blade server can be dynamically managed through the management module. For more information, see the management-module documentation or <http://www.ibm.com/support/>.

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:

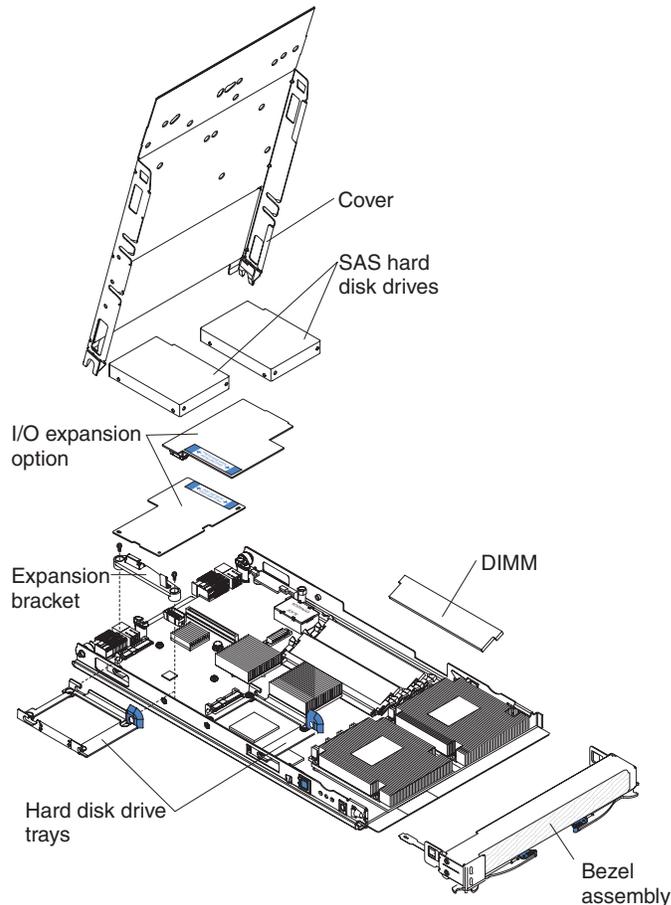
- Automatic error retry or recovery
- Automatic server restart (ASR)
- Built-in monitoring for temperature, voltage, hard disk drives, and flash drives
- Chipkill memory for dual inline memory modules (DIMMs)
- Customer-upgradeable basic input/output system (BIOS) code (firmware code)
- Customer support center 24 hours per day, 7 days a week¹
- Diagnostic support of Ethernet controllers
- DIMM failure isolation
 - DIMM pair identification through troubleshooting by the user
 - Single DIMM identification through troubleshooting by a service technician
- Error codes and messages
- ECC memory
- Failover Ethernet support
- Light path diagnostics
- Peripheral component interconnect (PCI) bus parity
- Power-on self-test (POST)
- Predictive Failure Analysis (PFA) alerts
- Service processor (BMC) that communicates with the management module to enable remote blade server management
- SDRAM with serial presence detect (SPD) and vital product data (VPD)
- System Management Services (SMS) menu support
- System error logging

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

- VPD on blade server and all major electronic components (includes information stored in nonvolatile memory for easier remote viewing)
- Wake on LAN capability

Major components of the blade server

You must remove the blade server from the BladeCenter unit and remove the cover to see the components. The following illustration shows the major components of the blade server.



Note: The microprocessors are soldered onto the system board and are not removable.

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 servers, desktop computers, workstations, and mobile 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 Server 2003, Windows 2000 Server, Windows XP Professional, Red Hat Linux, SUSE Linux, Novell NetWare, AIX®, and i5/OS™. 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?Indocid=MIGR-61788>. It is updated every 6 to 8 weeks.
- Support for IBM and non-IBM servers, desktop computers, workstations, and mobile 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 blade server, the IBM Director Information Center at http://publib.boulder.ibm.com/infocenter/eserver/v1r2/topic/dirinfo/fqm0_main.html, 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.

Chapter 2. Power, controls, indicators, and connectors

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 “The 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 pressing 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 “The 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. However, the blade server can only receive the Wake on LAN command through the Ethernet ports that are integrated on the system board, not through the Ethernet ports on an installed I/O expansion card.

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 “The control panel buttons and LEDs” on page 12). This also starts an orderly shutdown of the operating system, if this feature is supported by the operating system.

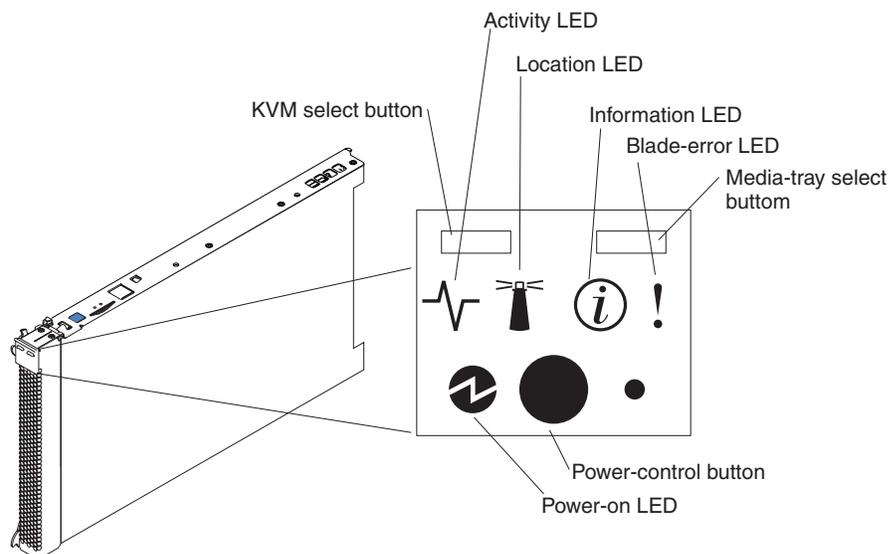
Note: After you turn off the blade server, wait at least 5 seconds before you press the power-control button to turn on the blade server again.

- 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 can 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*.

The 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 (normal) position in the following illustration. To access the power-control button, you must open the control panel door.



KVM select button: This function is not currently supported.

Activity LED: When this green LED is lit, it indicates that there is activity on the hard disk drive or network.

Location LED: When this blue LED is lit, it has been turned on by the system administrator to aid in visually locating the blade server. The location LED on the BladeCenter unit is lit also. 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 for 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.

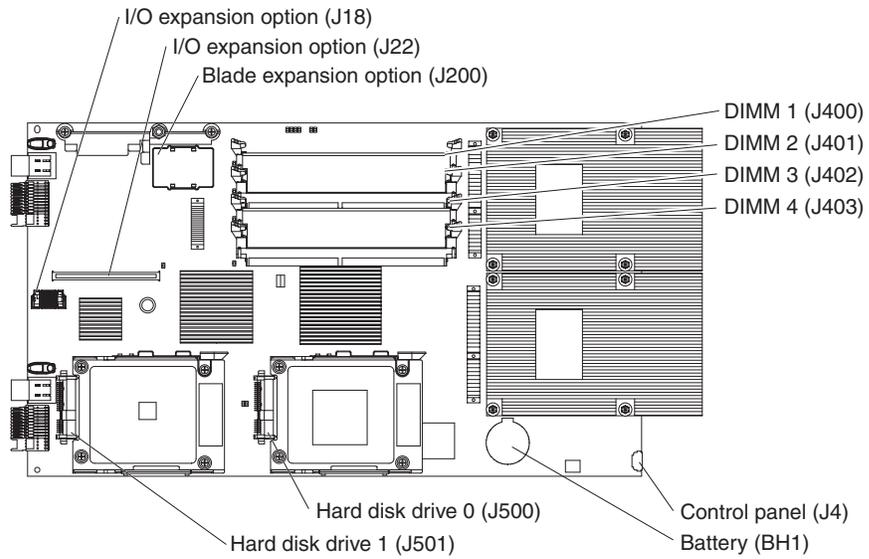
Note: The power-control button has effect only if local power control is enabled for the blade server. Local power control is enabled and disabled through the management-module Web interface.

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.

System-board connectors

The following illustration shows the connectors on the system board in the blade server.



Chapter 3. Installing and removing options

This chapter provides instructions for installing hardware options in the blade server. Some removal instructions are provided in case you need 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 server, go to <http://www.ibm.com/support/> and click **Downloads and drivers**.
- 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 hot-swap 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, see <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:

- The ventilation holes on the blade server are not blocked.
- You do not operate the BladeCenter unit without a blade server, expansion unit, or blade filler installed in each blade bay to ensure proper cooling. See the documentation for your BladeCenter unit type for additional information.
- The blade server battery is operational. If the battery becomes defective, replace it immediately. For instructions, see the *Problem Determination and Service Guide*.
- You have followed the reliability guidelines in the documentation that comes with the BladeCenter unit.

Handling static-sensitive devices

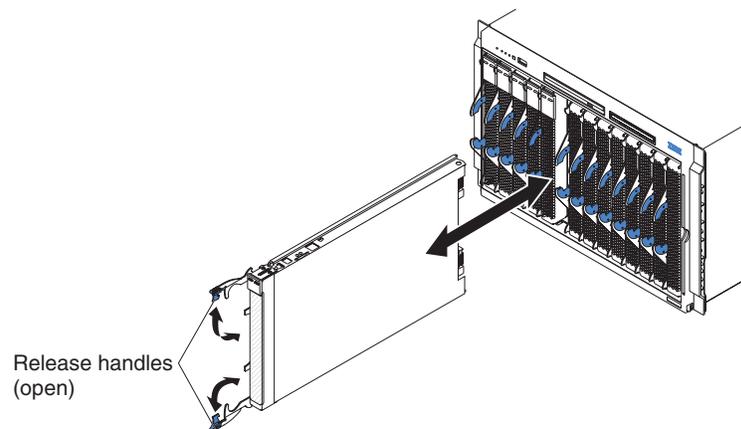
Attention: Static electricity can damage the blade server and other electronic devices. To avoid damage, keep static-sensitive devices in their static-protective packages until you are ready to install them.

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 the blade server from a typical BladeCenter unit.



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 numbers; if you reinstall the blade server into a different bay, you might have to reconfigure the blade server.

To remove the blade server, complete the following steps:

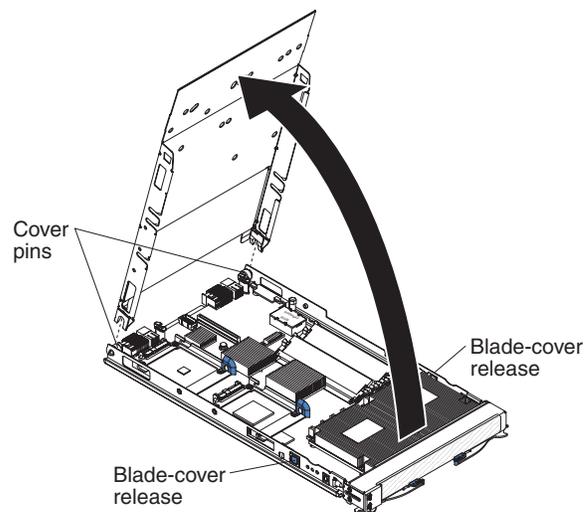
1. If the blade server is operating, shut down the operating system; then, press the power-control button (behind the control-panel door) to turn off the blade server (see “Turning off the blade server” on page 11 for more information).

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. Spring-loaded doors farther back in the bay move into place to cover the bay temporarily.
4. Place either a blade filler or another device in the bay within 1 minute. The recessed spring-loaded doors will move out of the way as you insert the blade server or blade filler.

Opening the blade server cover

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



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

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 16 for instructions).
3. Carefully lay the blade server down on a flat, static-protective surface, with the cover side up.

4. Press the blade-cover release on each side of the blade server and lift the cover open, as shown in the illustration.
5. Lay the cover flat, or lift it from the blade server and store it for future use.

Statement 21:



CAUTION:

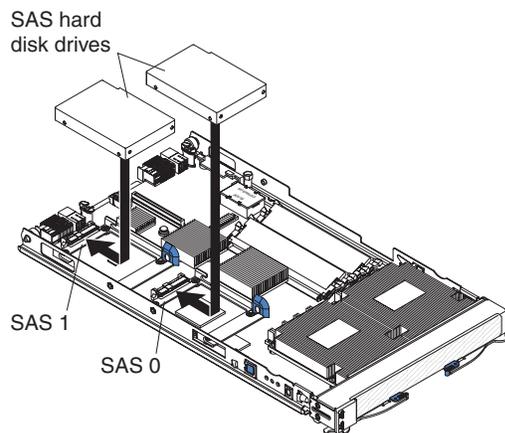
Hazardous energy is present when the blade server is connected to the power source. Always replace the blade cover before installing the blade server.

Installing a SAS hard disk drive

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

All SAS connectors are on the same bus. 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 SAS RAID array” on page 31 for information about SAS RAID configuration.

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



Note: Do not install a SAS hard disk drive in SAS connector 1 (J501) 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 16 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 17 for instructions).
5. Locate SAS connector 0 (J500) or SAS connector 1 (J501).
6. If a standard-form-factor expansion card is installed in the SAS connector 1 location, complete the following steps:
 - a. Remove the expansion card and its mounting bracket, and save the screws that secure the tray 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.

7. Put the drive into the tray and push it into the connector until the drive moves past the lever at the front of the tray.

If you have other options to install or remove, do so now; otherwise, go to “Completing the installation” on page 24.

Removing 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. 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 16 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 17 for instructions).
5. Locate SAS connector 0 (J500) or SAS connector 1 (J501).
6. While you pull the blue lever at the front of the hard disk drive tray, slide the drive out of the SAS connector and disengage it from the drive tray.

If you have other options to install or remove, do so now; otherwise, go to “Completing the installation” on page 24.

Installing memory modules

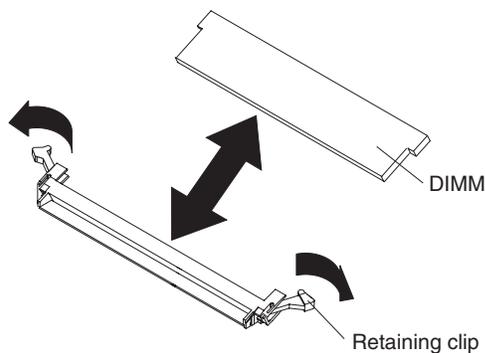
The following notes describe the types of dual inline memory modules (DIMMs) that the blade server supports and other information that you must consider when you install DIMMs:

- The system board contains four DIMM connectors and supports two-way memory interleaving.
- As of the date of this publication, 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 that is set in the blade server firmware code, the blade server supports a minimum of 1 GB and a maximum of 16 GB of system memory.

- When you install memory, you must install a pair of matched DIMMs. Install the DIMMs in the following order:

Pair	DIMM connectors
First	2 and 4 (J401 and J403)
Second	1 and 3 (J400 and J402)

- Both DIMMs in a pair must be the same size, speed, type, technology, and physical design. You can mix compatible DIMMs from different manufacturers.
- The second pair of DIMMs must have the same speed as the first pair. However, the second pair does not have to be DIMMs of the same size, type, technology, and physical design as the first pair.
- Install only DDR2, PC2-3200 or PC2-4200, 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 of the blade server. After you install or remove a DIMM, the blade server is automatically reconfigured, and the new configuration information is stored. When you restart the blade server, it displays a message indicating that the memory configuration has changed.



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. 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 16 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 17 for instructions).
6. Locate the DIMM connectors on the system board (see the illustration in “System-board connectors” on page 14). Determine the connectors into which you will install the DIMMs.
7. 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.

8. Complete 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. Insert the DIMM by pressing the DIMM along the guides into the connector. Make sure that the retaining clips snap into the closed position.

Important: If there is a gap between the DIMM and the retaining clips, the DIMM has not been correctly installed. 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 24.

Installing an I/O expansion card

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 one I/O expansion card of either the small-form-factor or standard-form-factor design. 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 cards. The blade server supports various types of I/O expansion cards, including Gigabit Ethernet, Fibre Channel, and Myrinet 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.

You can install one expansion card in a BladeCenter JS21 Type 8844 blade server. If two hard disk drives are installed in the blade server, you must use a small-form-factor expansion card. If only one drive is installed in the blade server, you can install either a small-form-factor or a standard-form-factor expansion card. Make sure that the I/O modules to which the I/O expansion card is mapped support the network-interface type of the I/O expansion card.

Important: For the BladeCenter JS21 Type 8844 blade server, if you plan to install an Ethernet expansion card (standard or small form-factor), first install the operating system to allow the onboard ports to be recognized and configured before the ports on the expansion card. If you install the Ethernet expansion card *before* you install the operating system, the expansion card ports will be assigned before the onboard ports. To see the MAC address information for the Ethernet ports on each blade server, refer to the management-module management and configuration program. (This statement does *not* apply to the BladeCenter JS20 Type 8842 blade server.)

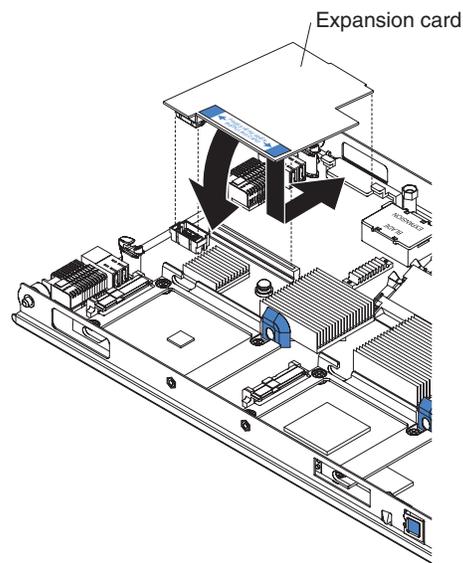
Note: For additional information about installing the operating system, see Chapter 5, “Installing the operating system,” on page 33.

The following sections describe how to install an I/O expansion card in the blade server.

Installing a small-form-factor expansion card

To install a small-form-factor expansion card near SAS connector 1 (J501), 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 16 for instructions.
3. Carefully lay the blade server on a flat, static-protective surface.
4. Open the cover (see “Opening the blade server cover” on page 17 for instructions).
5. Install the small-form-factor expansion card, as shown in the following illustration.



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

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 24.

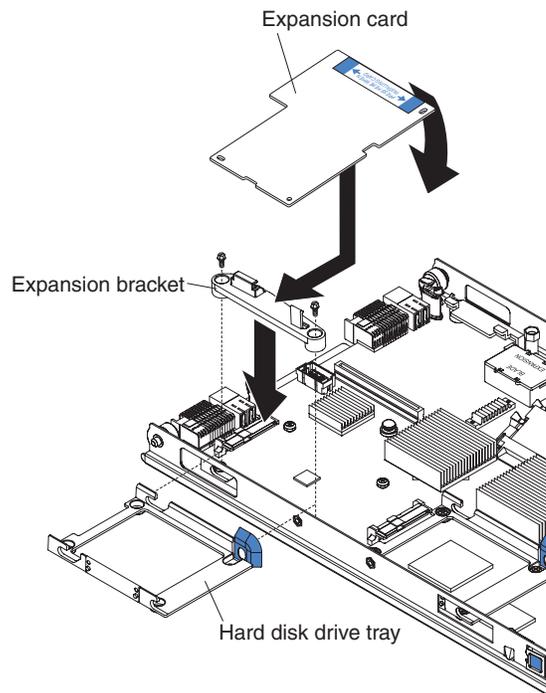
Installing a standard-form-factor expansion card

If a SAS drive is connected to SAS connector 1 (J501), you cannot install a standard-form-factor expansion card. You must remove the drive before you can install a standard-form-factor expansion card (see “Removing a SAS hard disk drive” on page 19). Before you remove the drive, back up the data from the drive to another storage device.

If the SAS hard disk drive that is connected to SAS connector 1 is part of a RAID array, delete the array before you remove the drive. When you delete the array, the array configuration information is removed, but no data is deleted (see “Configuring a SAS RAID array” on page 31 for more information).

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. 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 16 for instructions.
3. Carefully lay the blade server on a flat, static-protective surface.
4. Open the cover (see “Opening the blade server cover” on page 17 for instructions).
5. If a drive is connected to SAS connector 1, remove the drive and tray (see “Removing a SAS hard disk drive” on page 19 for instructions), and save the screws that secure the tray to the system board. Store the screws in a safe place.
6. Install the expansion card, as shown in the following illustration.



- a. Install the expansion bracket. Secure the bracket to the system board with the screws from the option kit or from the removed drive tray.
- b. Orient the expansion card and slide the notch in the narrow end of the card into the raised hook on the bracket; then, gently pivot the wide end of the card into the expansion-card connectors.

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 24.

Completing the installation

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

1. Close the blade server cover (see “Closing the blade server cover”).

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.

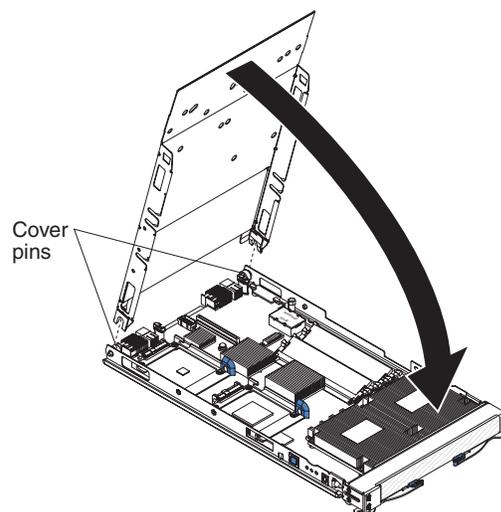
2. Reinstall the blade server into the BladeCenter unit (see “Installing the blade server in a BladeCenter unit” on page 25).
3. Turn on the blade server (see “Turning on the blade server” on page 11).
4. For certain optional devices, run the blade server SMS Utility program.

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.

Closing the blade server cover

Attention: You cannot insert the blade server into the BladeCenter unit until the cover is installed and closed. 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. 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,

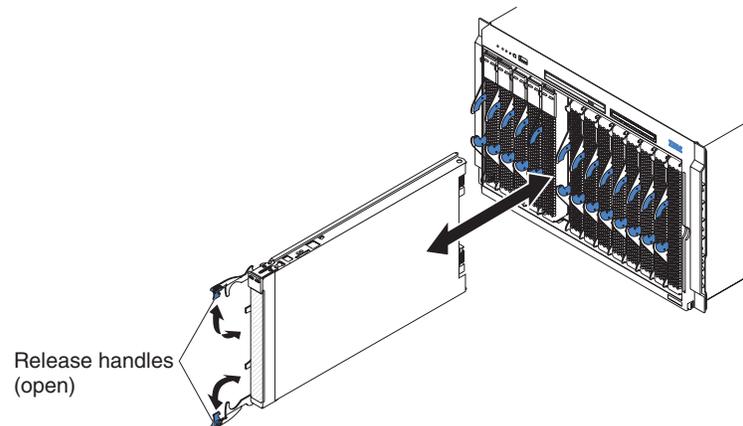
make sure that all components are installed and seated correctly and that you have not left loose tools or parts inside the blade server.

3. 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

Before you install the blade server in a BladeCenter unit, go to <http://www.ibm.com/support/> to download the latest firmware for the blade server.

The following illustration shows how to install the blade server into a typical BladeCenter unit.



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 optional devices that you want, such as SAS drives or memory, in the blade server.
3. Select the bay for the blade server.

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.

- If you reinstall a blade server that you have 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 numbers. Reinstalling a blade server into a different blade bay from the one from which it was removed could have unintended consequences, and you might have to reconfigure the blade server.
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. The spring-loaded doors, farther back in the bay, that cover the bay opening move out of the way as you insert the blade server.
 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 server and place the label on a BladeCenter unit bezel. See the documentation for your BladeCenter unit for recommended 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, repeat step 2 on page 25 through step 9 for each blade server.
 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 this is the initial installation for the blade server in the BladeCenter unit, you must configure the blade server through the SMS Utility program and install the blade server operating system. See Chapter 4, “Configuring the blade server,” on page 27 and Chapter 5, “Installing the operating system,” on page 33 for details.

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 a media-tray select button on the control panel. See “The control panel buttons and LEDs” on page 12 for information about this button and its function.

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.

After you install the blade server in the BladeCenter unit, the blade server is automatically configured. The Ethernet controller device driver is installed after you install the operating system. The blade server is automatically reconfigured after you install software or hardware. IBM will periodically make firmware updates available for the blade server. Before you continue, you should make sure that the blade server has the latest version of firmware code. For additional information, see “Firmware updates” on page 29.

Although the blade server is automatically configured, you must first establish a connection to the blade server through one of the following methods to install your operating system, so that you can use the blade server and run programs on the blade server:

- A Serial over LAN (SOL) connection
- An unattended network-installation method

To establish a Serial over LAN (SOL) connection to the blade server, you must configure the SOL feature on the blade server and start an SOL session as described in the *IBM BladeCenter Serial over LAN Setup Guide*. In addition, the management module must be configured as described in the *IBM BladeCenter Management Module User's Guide*, and the BladeCenter unit must be configured as described in the *IBM BladeCenter Serial over LAN Setup Guide*. If you plan to use the IBM BladeCenter management-module command-line interface to perform Web interface functions, see the *IBM BladeCenter Management Module Command-Line Interface Reference Guide* for information and instructions.

Because the firmware code in the blade server uses auto-configuration, additional blade server configuration programs are not required for the blade server. However, if you have attached other devices to the blade server or the BladeCenter unit, you must configure those devices as described in the documentation that comes with those devices or with the BladeCenter unit. You do not have to set any passwords to use the blade server. If you change the battery or replace the system board and chassis assembly, you must reset the date and time through your operating system.

With an SOL session established on the blade server, while the firmware is running POST and before the operating system loads, a POST menu with POST indicators is displayed. The POST indicators are the words *Memory*, *Keyboard*, *Network*, *SCSI*, and *Speaker* that are displayed as each component is tested. The POST menu provides the following configuration utilities:

- **System Management Services (SMS)**

The System Management Services (SMS) Utility program is part of the basic input/output system (BIOS). Use the SMS Utility program to view information about your system or partition, to configure the blade server, and to perform tasks such as changing the boot list (startup devices and options) and setting the network parameters. The SMS Utility program can be used for AIX or Linux partitions. See “Using the SMS Utility program” on page 28 for more information.

- **Default boot list**

Use this utility to initiate a system boot in service mode through the default service mode boot list. This mode attempts to boot from the first device of each type found in the list.

Note: This is the preferred method of loading standalone AIX diagnostics from CD.

- **Stored boot list**

Use this utility to initiate a system boot in service mode in one of the following ways:

- Through the customized service mode boot list that the AIX operating system established when the AIX operating system was first booted
- Manually through the AIX service aids

- **Open firmware prompt**

This utility is for advanced users of the IEEE 1275 specifications only.

For information about setting up the network configuration for remote management, such as with the IBM Director products, see the *IBM BladeCenter Planning and Installation Guide* for your BladeCenter unit. You can obtain the planning guides from <http://www.ibm.com/support/>.

Note: The IBM Remote Deployment Manager (RDM) program does not support the BladeCenter JS21 Type 8844 blade server.

Using the SMS Utility program

This section contains the instructions to start the SMS Utility program and the descriptions of the menu choices.

Starting the SMS Utility program

Complete the following steps to start the SMS Utility program:

1. Turn on or restart the blade server, and establish an SOL session with it. (For more information, see the *BladeCenter Management Module Command-Line Interface Reference Guide* or *BladeCenter Serial Over LAN Setup Guide*.)
2. When the POST menu and indicators are displayed, press the 1 key after the word *Keyboard* is displayed and before the word *Speaker* is displayed.
3. Follow the instructions on the screen.

SMS Utility menu choices

The following choices are on the SMS Utility main menu. Depending on the version of the firmware in the blade server, some menu choices might differ slightly from these descriptions.

- **Select Language**

Select this choice to change the language that is used to display the SMS menus.

- **Setup Remote IPL (Initial Program Load)**

Select this choice to enable and set up the remote startup capability of the blade server or partition. You can also select this choice to enable and set up the Ethernet controllers.

- **Change SCSI Settings**

Select this choice to view and change the addresses of the SCSI and SAS controllers that are attached to the blade server.

- **Select Console**

Select this choice to select the console on which the SMS menus are displayed.

- **Select Boot Options**

Select this choice to view and set various options regarding the installation devices and boot devices.

- **Firmware Boot Side Options**

Select this choice to select the boot image (permanent or temporary) that will be used the next time that the blade server is started.

- **Progress Indicator History**

Select this choice to view various options that might help with the servicing of a system that is failing; such as, viewing the progress indicator history.

Firmware updates

IBM will periodically make firmware updates available for the blade server.

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

At some time, you might have to update the service processor (BMC) to apply the latest firmware. Download the latest firmware for the service processor from <http://www.ibm.com/support/>. Use the management-module Web interface to update the service processor (BMC) firmware. The Web interface is described in the *IBM BladeCenter Management Module User's Guide*.

To update the management-module firmware through the management-module Web interface, complete the following steps:

1. Start the management-module Web interface. For more information, see the *IBM BladeCenter Management Module User's Guide*.
2. In the "BladeCenter Management Module" configuration window, in the **MM Control** section, click **Firmware Update**.
3. In the **Update MM Firmware** section, click **Browse** to locate the firmware files that you downloaded. Follow the instructions in the readme file to update the firmware.
4. Click **Update**.

If you need to update the host firmware code (BIOS code), follow these instructions:

- If you are using the AIX operating system, use the *Standalone Diagnostics* CD that is discussed in Chapter 6, "Solving problems," on page 37.
- If you are using the Linux operating system, use the Linux **update_flash** command. See your operating-system documentation for more information.

Notes:

- The **update_flash** command can only be performed if the Linux service tools have been installed on the blade server.
- If you have to recover the system firmware, see the *Problem Determination and Service Guide*.

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 will vary according to the blade server type and the operating system that is installed. See “Blade server Ethernet controller enumeration” 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 JS21 Type 8844 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/support/>.

The Ethernet controllers in your blade server support failover, which provides automatic redundancy for the Ethernet controllers. Without failover, only one Ethernet controller can be connected from each server 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** → **Admin/Power/Restart** in the management-module Web 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 that is 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, communications from the expansion card should be 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 SAS 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, RAID level-1, and RAID level-10 arrays in operating systems that are on the ServerProven list at <http://www.ibm.com/servers/eserver/serverproven/compat/us/>. For the blade server, you must configure the SAS RAID array through the optional ServeRAID™ Manager program.

The IBM *ServeRAID Support* CD contains the ServeRAID Manager program, which you can use to configure the hard disk drives for use with the SAS controller. For details about using these programs, see the documentation on the IBM *ServeRAID Support* CD.

Important: Depending on your RAID configuration, you must create the array *before* you install the operating system in the blade server. See the IBM *ServeRAID Support* CD for more information.

Before you can create a RAID array, you must reformat the hard disk drives so that the sector size of the drives changes from 512 MB to 528 MB. If you later decide to remove the hard disk drives, delete the RAID array before you remove the drives. If you decide to delete the RAID array and reuse the hard disk drives, you must reformat the drives so that the sector size of the drives changes from 528 MB to 512 MB.

Updating IBM Director

If you plan to use IBM Director to manage the blade server, you must check for the latest applicable IBM Director updates and interim fixes.

To install the IBM Director updates and any other applicable updates and interim fixes, 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. Check for the latest version of IBM Director:
 - a. Go to http://www.ibm.com/servers/eserver/xseries/systems_management/xseries_sm/dwnl.html.
 - b. If the drop-down list shows a newer version of IBM Director than what comes with the blade server, follow the instructions on the Web page to download the latest version.
2. Install IBM Director.
3. Download and install any applicable updates or interim fixes for the blade server:
 - a. Go to <http://www.ibm.com/support/>.
 - b. Click **Downloads and drivers**.
 - c. From the **Category** list, select **BladeCenter (Blades)**.
 - d. From the **Select by system** list, locate **BladeCenter JS21**. Next to **BladeCenter JS21**, click **Hardware only** or the operating system that is on the blade server: **AIX** or **Linux**.
 - e. In the **Search within results** field, type director and click **Search**.
 - f. Select any applicable update or interim fix that you want to download.
 - g. Click the link for the executable (.exe) file to download the file, and follow the instructions in the readme file to install the update or interim fix.
 - h. Repeat steps 3f and 3g for any additional updates or interim fixes that you want to install.

Chapter 5. Installing the operating system

Before you install the operating system on the blade server, make sure that the blade server is turned on. If you are not using an unattended network-installation method to install your operating system, you must first provide a Serial over LAN (SOL) connection to the blade server to install your operating system. If you have not already done so, configure the SOL feature on the blade server to establish an SOL connection and enable the SOL feature; then, start an SOL session. For instructions, see the *IBM BladeCenter Serial over LAN Setup Guide* and the *BladeCenter Management Module Command-Line Interface Reference Guide*. For information about SOL commands, see the documentation for your operating system.

Important:

- If you plan to install the operating system through the Ethernet network, you must install and configure a second Ethernet switch module into the applicable I/O-module bay of the BladeCenter unit. For additional information, see:
 - “Configuring the Gigabit Ethernet controllers” on page 30
 - “Blade server Ethernet controller enumeration” on page 30
 - The documentation that comes with the Ethernet switch module that you are using
- After you install the operating system on the blade server, you must install any service packs or update packages that come with the operating system. For additional information, see the instructions that come with your operating-system documentation and the service packs or update packages.
- The blade server has no external USB ports; however, it can communicate with and use the removable-media drives and USB port that are in 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 in the BladeCenter unit (or external diskette drive on a BladeCenter T unit). The BladeCenter unit (or BladeCenter T unit) uses USB for internal communication with these devices.
- For the BladeCenter JS21 Type 8844 blade server, if you plan to install an Ethernet expansion card (standard or small form-factor), first install the operating system to allow the onboard ports to be recognized and configured before the ports on the expansion card. If you install the Ethernet expansion card *before* you install the operating system, the expansion card ports will be assigned before the onboard ports. (This statement does *not* apply to the BladeCenter JS20 Type 8842 blade server.)

The JS21 Type 8844 blade server supports the following operating systems:

- AIX 5L™ V 5.2 and V 5.3 (32 bit and 64 bit)
- Red Hat Enterprise Linux for POWER™ 3 AS, ES, WS (32 bit and 64 bit)
- Red Hat Enterprise Linux for POWER 4 AS, ES, WS (32 bit and 64 bit)
- SUSE Linux for POWER Enterprise Server 9 (32 bit and 64 bit)
- Red Hat Enterprise Linux for POWER 2.1 AS, ES, WS

Downloading the installation instructions

To install the operating system on a blade server, you can download the latest operating-system installation instructions from <http://www.ibm.com/support/> and install the operating system. Local deployment for supported operating systems might require an integrated CD that contains the operating system with service packs applied. Instructions for creating an integrated CD are in the latest operating-system installation instructions at <http://www.ibm.com/support/>.

Notes:

1. Some optional devices have device drivers that you must install. See the documentation that comes with the devices for information about installing any required device drivers.
If your operating system does not have the required device drivers, contact your IBM marketing representative or authorized reseller, or see your operating-system documentation for additional information.
2. Before you install an Ethernet expansion card, first install the operating system, as described in this chapter.
3. The IBM Remote Deployment Manager (RDM) program does not support the BladeCenter JS21 Type 8844 blade server. However, you can use the following programs for remote deployment:
 - For AIX, Red Hat Linux, or SUSE Linux operating-system deployments, you can use Cluster Systems Management (CSM) from IBM. Go to <http://www.ibm.com/servers/eserver/clusters/software/>.
 - For AIX operating-system deployments, you can use Network Installation Manager (NIM) from IBM. See your AIX operating-system documentation for additional information.
 - For SUSE Linux operating-system deployments, you can use the AutoYast utility program from Novell, Inc. Go to <http://www.suse.de/~nashif/autoinstall/>.

After you configure the blade server hardware, complete the following steps to download the latest operating-system installation instructions:

1. Go to <http://www.ibm.com/support/>.
2. From the **Support by product** list, select **Servers**.
3. Under **Select your server**, select **Blade servers**.
4. Under **Select your product**, select **BladeCenter JS21** from the **Hardware** list. Select your operating system from the **Software** list; then, click **Go**.
5. Click the **Install and use** tab. Locate the **Product documentation** heading under **Software**. The available installation instructions are displayed on the “Operating system installation instructions” page.

After you install the operating system, be sure to install the ppc64 Linux utilities that apply to your operating system. Instructions for installing these utilities are in the same documentation that describes how to install the operating system.

Installing Linux service aids

Linux on POWER service aids for hardware diagnostics are available for customers who have installed and are running the Linux operating system. You can install these free diagnostics tools for effective diagnosis and repair of the system should a system error occur.

This service aid toolkit provides the key tools required to take advantage of such hardware reliability, availability, and serviceability (RAS) functions as first-failure data-capture and error-log analysis. With the toolkit installed, problem determination and correction are greatly enhanced and the likelihood of an extended system outage is reduced.

The Linux service aids for hardware diagnostics are separate from the operating-system installation and are available for download from the following Web site: <http://techsupport.services.ibm.com/server/lopdiags/>.

This Web site also contains instructions and technical information about the Linux service aids.

Note: The **update_flash** command can only be performed if the Linux service tools have been installed on the blade server.

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 25).
- 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* on the *BladeCenter JS21 Type 8844 Documentation CD*.

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

- **Power-on self-test (POST) firmware checkpoints and error codes**

The firmware checkpoints are progress codes that your blade server displays during POST. See the *Problem Determination and Service Guide* for more information.

- **Firmware error codes and location codes**

For detailed descriptions of the firmware error codes, see the *Problem Determination and Service Guide*.

Some firmware error codes also include location codes. The location code information is required to identify the failing component. Check the system-error logs and event logs to determine the location code information that corresponds to the firmware error code.

For additional information about location codes, error logs, and event logs, see the *BladeCenter JS21 Type 8844 Problem Determination and Service Guide*.

- **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 utilities for the Linux operating system**

Diagnostic utilities for the Linux operating system are available from IBM. To obtain these utilities and information about them, complete the following steps:

1. Go to <http://www.ibm.com/bladecenter/>.
2. On the **Blade servers** menu, click **Support**.
3. In the **Hardware** field, under **Select your product**, select **BladeCenter JS21**.

4. In the **Software** field, under **Select your product**, select **Linux on POWER environment**.
5. Click **Go**.

- **Diagnostic utilities for the AIX operating system**

An AIX operating-system diagnostic CD, also known as the *Standalone Diagnostics* CD, is available from IBM. You can start the CD from a CD drive or from NIM. Go to <http://www14.software.ibm.com/webapp/set2/sas/f/diags/home.html> to download the CD image. See the *Problem Determination and Service Guide* for instructions for using the diagnostic utilities.

- **Diagnostic utilities for other operating systems**

Other supported operating systems might have diagnostic tools that are available through the operating system. See your operating-system documentation for more information.

- **Light path diagnostics**

Use light path diagnostics LEDs on the system board to identify 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.

Notes:

- 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.
- Before you have the blade server serviced, make sure that you provide a Serial over LAN (SOL) connection to the blade server. To do this, you must configure the SOL feature on the blade server and start an SOL session as described in the *IBM BladeCenter Serial over LAN Setup Guide*.

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 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. Go to <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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Chipkill	Predictive Failure Analysis	XA-64
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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.

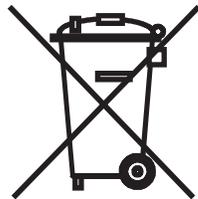
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Notice: This mark applies only to countries within the European Union (EU) and Norway.

This appliance is labeled in accordance with European Directive 2002/96/EC concerning waste electrical and electronic equipment (WEEE). The Directive determines the framework for the return and recycling of used appliances as applicable throughout the European Union. This label is applied to various products to indicate that the product is not to be thrown away, but rather reclaimed upon end of life per this Directive.

注意: このマークは EU 諸国およびノルウェーにおいてのみ適用されます。

この機器には、EU 諸国に対する廃電気電子機器指令 2002/96/EC(WEEE) のラベルが貼られています。この指令は、EU 諸国に適用する使用済み機器の回収とリサイクルの骨子を定めています。このラベルは、使用済みになった時に指令に従って適正な処理をする必要があることを知らせるために種々の製品に貼られています。

Remarque : Cette marque s'applique uniquement aux pays de l'Union Européenne et à la Norvège.

L'étiquette 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.



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

聲 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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