



BladeCenter HS20

Type 7981

Installation and User's Guide

Welcome.

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

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

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

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

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

Before installing the BladeCenter HS20 Type 7981 blade server in a BladeCenter unit, complete the following procedures:

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

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

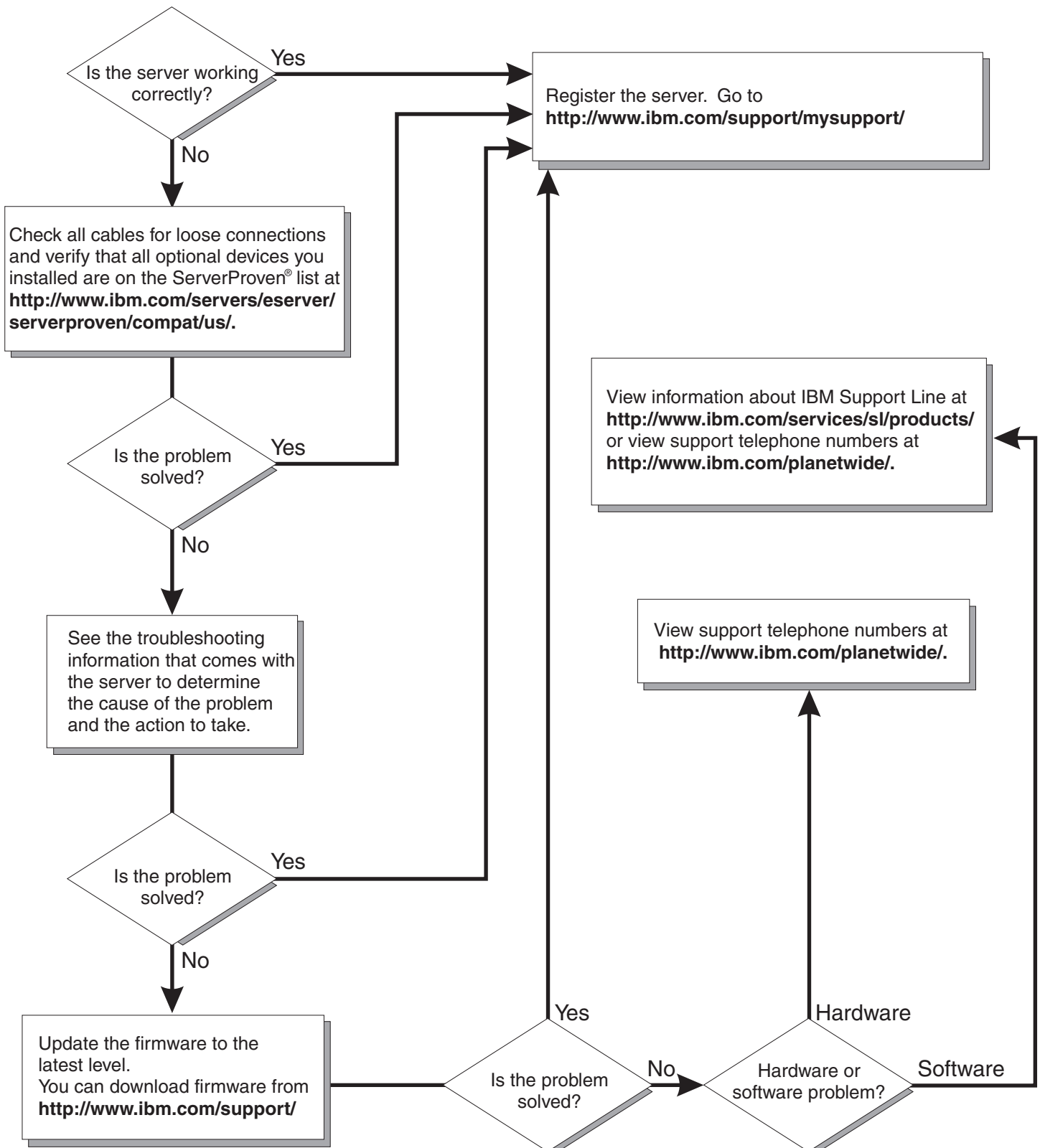
Configure the blade server.
See Chapter 4 for more information.

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

Install additional applications according to the instructions 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 HS20 Type 7981



Installation and User's Guide

Note: Before using this information and the product it supports, read the *Warranty and Support Information* document for your blade server on the *Documentation* CD and Appendix B, "Notices," on page 65.

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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 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)



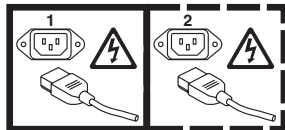
≥ 55 kg (121.2 lb)

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® HS20 Type 7981 blade server is based on the IBM Enterprise X-Architecture™ technologies¹. 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* provides information about:

- Setting up the blade server
- Starting and configuring the blade server
- Installing hardware options
- Installing the operating system
- Performing basic troubleshooting of the blade server

Packaged with this document are software CDs that help you to configure hardware, install device drivers, and install the operating system. To download the latest device drivers, go to <http://www.ibm.com/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 *Documentation* CD. You can obtain up-to-date information about the blade server at <http://www.ibm.com/support/>.

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 7981 and click **Search**.

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

1. For more information about IBM Enterprise X-Architecture, go to <http://www.ibm.com/servers/eserver/xseries/xarchitecture/enterprise/index.html>.

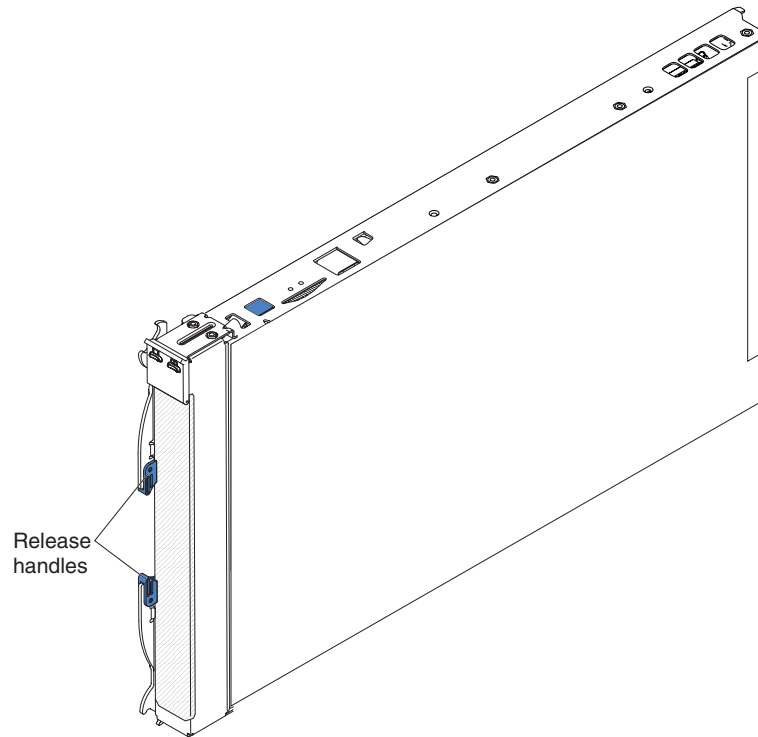
Record information about the blade server in the following table. You will need this information when you register the blade server with IBM. You can register the blade server at <http://www.ibm.com/support/mysupport/>.

Product name	BladeCenter HS20
Machine type	7981
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.

The BladeCenter HS20 blade server has the bezel shown in the following illustration.

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

- *Problem Determination and Service Guide*

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

- *Safety Information*

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

- *Warranty and Support Information*

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

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

The blade server might have features that are not described in the documentation that comes with the server. 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. The most recent versions of all 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

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

Hardware and software requirements

The IBM *Documentation CD* requires the following minimum hardware and software:

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

Using the Documentation Browser

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

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

- If Autostart is enabled, insert the CD into the CD drive. The Documentation Browser starts automatically.
- If Autostart is disabled or is not enabled for all users, use one of the following procedures:
 - If you are using a Windows operating system, insert the CD into the CD drive and click **Start --> Run**. In the **Open** field, type
`e:\win32.bat`

where *e* is the drive letter of the CD-ROM drive, and click **OK**.
 - If you are using Red Hat Linux, insert the CD into the CD drive; then, run the following command from the `/mnt/cdrom` directory:
`sh runlinux.sh`

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

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

To search all the documents, type a word or word string in the **Search** field and click **Search**. The documents in which the word or word string appears are listed in order of the most occurrences. Click a document to view it, and press 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 used in this document

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

The following notices and statements are used in this document:

- **Note:** These notices provide important tips, guidance, or advice.
- **Important:** These notices provide information or advice that might help you avoid inconvenient or problem situations.
- **Attention:** These notices indicate possible damage to programs, devices, or data. An attention notice is placed just before the instruction or situation in which damage could occur.
- **Caution:** These statements indicate situations that can be potentially hazardous to you. A caution statement is placed just before the description of a potentially hazardous procedure step or situation.
- **Danger:** These statements indicate situations that can be potentially lethal or extremely hazardous to you. A danger statement is placed just before the description of a potentially lethal or extremely hazardous procedure step or situation.

Features and specifications

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

Note: Power, cooling, removable-media drives, external ports, and advanced system management are provided by the BladeCenter unit.

<p>Microprocessor:</p> <p>Supports up to two Dual-Core Intel® Xeon Processor LV microprocessors</p> <p>Note: Use the Configuration/Setup Utility program to determine the type and speed of the microprocessors in your blade server.</p> <p>Memory:</p> <ul style="list-style-type: none"> • Dual channel 400 MHz (DDR2) with 4 dual inline memory module (DIMM) slots • Type: 2-way interleaved, DDR2, PC3200, ECC SDRAM registered x4 DIMMs • Supports 512 MB, 1 GB, 2GB, and 4 GB DIMMs (as of the date of this publication) for up to 16 GB of total memory. <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"> • Dual-channel gigabit Ethernet controller • Expansion card interface • ATI Radeon 7000M video controller • LSI 1064 S Serial Attached SCSI (SAS) 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) • Intelligent Platform Management Interface (IPMI) • 4 USB buses for communication with keyboard, mouse, and removable media drives <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 (2998.69 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: 5.4 kg (12 lb)
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Note: The operating system in the blade server must provide USB support for the blade server to recognize and use the keyboard, mouse, CD drive, and diskette drive. The BladeCenter unit uses USB for internal communications with these devices.

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, including the following functions:

- Provides RS-485 interfaces to the management module
- Provides support for:
 - Intelligent Platform Management Interface (IPMI)
 - The operating system
 - Power control and advanced power management
 - Reliability, availability, and serviceability (RAS) features
 - Serial over LAN (SOL)

- **Disk drive support**

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

- **IBM Director**

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

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

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

- **Integrated network support**

The blade server comes with an integrated Broadcom BCM5704S Dual Gigabit Ethernet controller, which supports connection to a 10-Mbps, 100-Mbps, or 1000-Mbps network through an Ethernet-compatible switch module in the BladeCenter unit. The controller supports Wake on LAN[®] technology.

- **I/O-expansion**

The blade server has connectors on the system board for 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**

The blade server supports up to 16 GB of system memory. The memory controller provides support for up to four industry-standard 1.8 V, 240-pin, double-data-rate (DDR2-400), PC3200, registered synchronous dynamic random-access memory (SDRAM) with error correcting code (ECC) DIMMs. For the most current list of supported DIMMs, see the ServerProven[®] list at <http://www.ibm.com/servers/eserver/serverproven/>.

- **Light path diagnostics**

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

- **Power throttling**

Each blade server is powered by two BladeCenter redundant power-supply modules. By enforcing a power policy known as power domain oversubscription, the BladeCenter unit can share the power load between two power modules to ensure efficient power for each device in the BladeCenter unit. This policy is enforced when the initial power is applied to the BladeCenter unit or when a blade server is inserted into the BladeCenter unit.

The following settings for this policy are available:

- Redundant without performance impact
- Redundant with performance impact
- Nonredundant

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

- Advanced Configuration and Power Interface (ACPI)
- Automatic error retry or recovery
- Automatic server restart
- Built-in monitoring for temperature, voltage, hard disk drives, and flash drives
- Chipkill™ memory for dual inline memory modules (DIMMs) with a capacity of 1 GB or greater
- Customer-upgradeable basic input/output system (BIOS) code
- Customer support center 24 hours per day, 7 days a week²
- Diagnostic support of Ethernet controllers
- Error codes and messages
- ECC protection on the L2 cache
- ECC memory
- Failover Ethernet support
- Light path diagnostics feature
- Power-on self-test (POST)
- Predictive Failure Analysis (PFA) alerts
- Service processor that communicates with the management module to enable remote blade server management
- SDRAM with serial presence detect (SPD) and vital product data (VPD)
- System error logging
- VPD (includes information stored in nonvolatile memory for easier remote viewing)
- Wake on LAN capability

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

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 Intel-processor-based 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 2000 Server, Windows Server 2003, Windows XP Professional, AIX, i5/OS, Red Hat Linux, SUSE Linux, VMware, and Novell NetWare. For a complete list of operating systems that support IBM Director, see the IBM Director Compatibility Document. This document is in Portable Document Format (PDF) at <http://www.ibm.com/pc/support/site.wss/document.do?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.

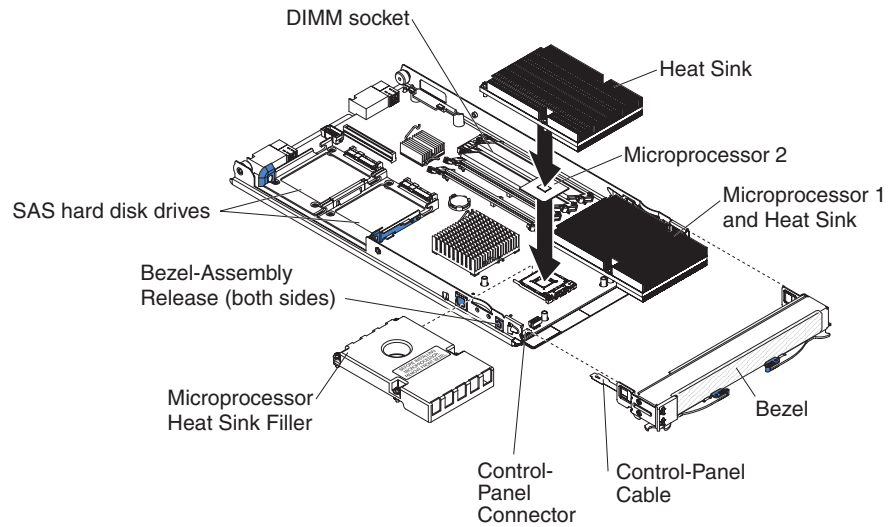
IBM Director also provides an extensible platform that supports advanced server tools that are designed to reduce the total cost of managing and supporting networked systems. By deploying IBM Director, you can achieve reductions in ownership costs through the following benefits:

- 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 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.

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 a BladeCenter HS20 Type 7981 blade server.



Chapter 2. Power, controls, jumpers, switches, and indicators

This chapter describes the power features, how to turn on and turn off the blade server, what the controls and indicators mean, and where the system board jumpers and switches are located and how to use them.

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 “Understanding the control panel and LEDs” on page 14) to start the blade server.

Notes:

1. Wait until the power-on LED on the blade server flashes slowly before pressing the blade server power-control button. During this time, the service processor in the management module is initializing; therefore, the power-control button on the blade server does not respond.
 2. While the blade server is powering-up, the power-on LED on the front of the server is lit. See “Understanding the control panel and LEDs” on page 14 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 means of the service processor in the management module.
 - If the operating system supports the Wake on LAN feature and the blade server power-on LED is flashing slowly, the Wake on LAN feature can turn on the blade server, if the Wake on LAN feature has not been disabled through the management-module.

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 “Understanding the control panel and LEDs”). This starts an orderly shutdown of the operating system, if this feature is supported by the operating system.

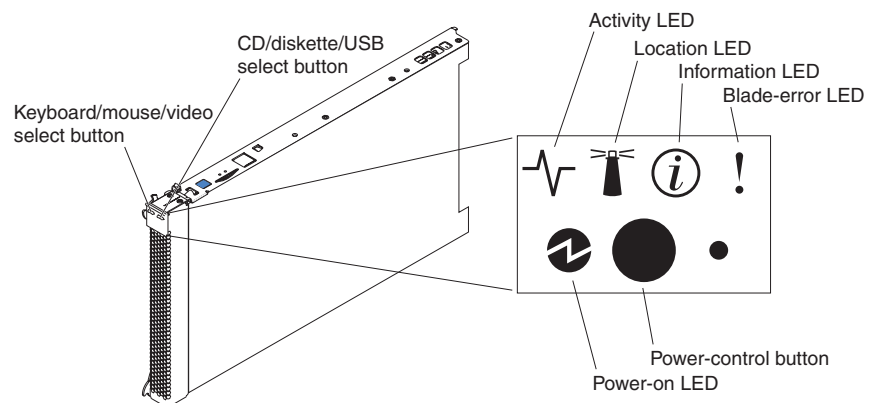
Note: After turning off the blade server, wait at least 5 seconds before you press the power-control button to turn on the blade server again.

- 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.

Understanding the control panel and LEDs

This section describes the controls and LEDs on the BladeCenter HS20 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.



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

You can also press keyboard keys in the following sequence to switch keyboard/video/mouse control between blade servers:

NumLock NumLock *blade_server_number* Enter

Where *blade_server_number* is the two-digit number for the blade bay in which the blade server is installed.

Although the keyboard that is attached to the BladeCenter unit might be a PS/2 style keyboard, internal communication with it is through the USB. The operating system in the blade server must provide USB support for the blade server to recognize and use the keyboard and mouse. When you are not running an operating system that has USB device drivers, such as in the following situations, the keyboard responds very slowly:

- Running the blade server integrated diagnostics
- Running a BIOS update diskette on a blade server
- Updating the diagnostics on a blade server
- Running the Broadcom firmware CD for a blade server

If there is no response when you press the keyboard/video/mouse select button, you can use the management-module Web interface to determine whether local control has been disabled on the blade server.

If you install Microsoft Windows on the blade server while it is not the current owner of the keyboard, video, and mouse, a delay of up to 1 minute occurs the first time you switch the keyboard, video, and mouse to the blade server. During this one-time-only delay, the blade server device manager enumerates the keyboard, video, and mouse and loads the device drivers. All subsequent switching takes place in the normal keyboard-video-mouse switching time frame (up to 20 seconds).

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

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

Activity LED: When this green LED is lit, it indicates that there is activity on the hard disk drive, flash 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 will be 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 system error log. The information LED can be turned off through the management-module Web interface or through IBM Director Console.

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

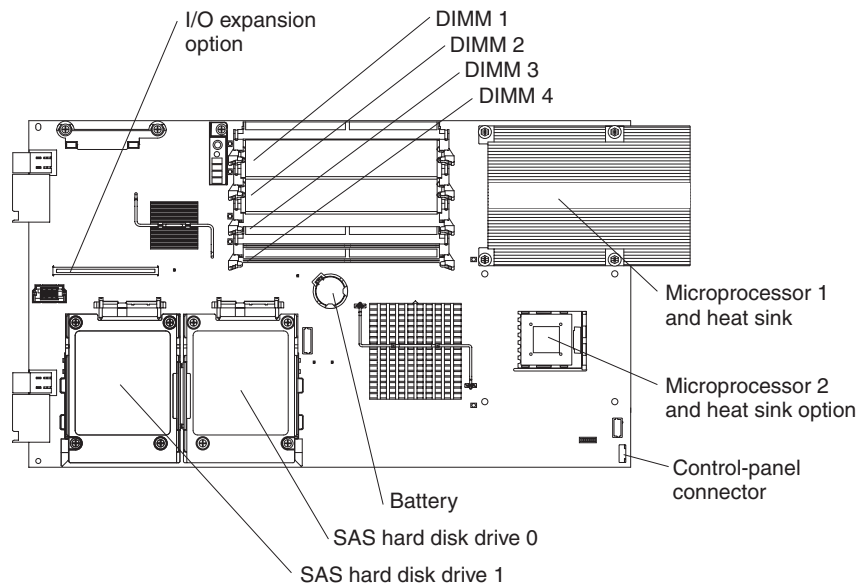
- Flashing rapidly: The service processor (BMC) on the blade server is handshaking with the management module.
- Flashing slowly: The blade server has power but is not turned on.
- Lit continuously: The blade server has power and is turned on.

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.

System board illustration

The following illustration shows the system board components, including connectors for user-installable options, for the blade server.



Using system board switches

The following illustration shows the location of switch block 2 (SW2). Table 1 on page 17 describes the function of each switch on the switch block.

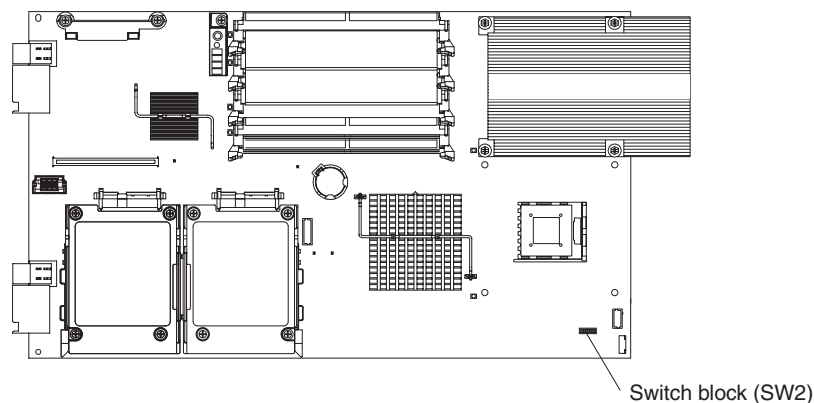


Table 1. Switch block 2 (SW2) settings

Switch number	Description
SW2	<p>Switch block 2 has eight switches:</p> <ul style="list-style-type: none"> • 1 - BIOS backup page <ul style="list-style-type: none"> – Off: the BIOS starts from the Primary BIOS page. – On: the BIOS starts from the backup BIOS page. • 2 - Wake On LAN bypass <ul style="list-style-type: none"> – Off: Enabled – On: Disabled (default) • 3 - Reserved • 4 - Power on override <ul style="list-style-type: none"> – Off: Normal operation (default) – On: Enabled • 5 - Reserved • 6 - Clear CMOS <ul style="list-style-type: none"> – Off: Disabled – On: Enabled • 7 - Reserved • 8 - Bypass power-on password during next server start <ul style="list-style-type: none"> – Off: Disabled (default) – On: Enabled

Using light path diagnostics to troubleshoot the system board

You have to remove the blade server from the BladeCenter unit, open the cover, and press the light path diagnostics switch (SW4) to light any error LEDs that were turned on during processing. These LEDs can be used to help troubleshoot system board component problems. See the illustrations in this section, and Table 2 on page 18 and Table 3 on page 19 for information about locating light path diagnostics LEDs and what to do if there is an error LED lit. Table 7 on page 61 provides more information about the light path diagnostics LED locations, settings, and error solutions. Refer to these illustrations and tables when solving problems with the blade server.

Power is available to relight the light path diagnostics LEDs for a small period of time after the blade server is removed from the BladeCenter unit. During that period of time, you can relight the light path diagnostics LEDs for a maximum of 25 seconds (or less, depending on the number of LEDs that are lit and the length of time the blade server is removed from the BladeCenter unit) by pressing the light path diagnostics button. The light path diagnostics power present LED (CR111) is lit when the light path diagnostics button is pressed if power is available to relight the blade-error LEDs. If the light path diagnostics power present LED (CR111) is not lit when the light path diagnostics button is pressed, no power is available to light the blade-error LEDs, and they will be unable to provide any diagnostic information.

The following illustration shows the LEDs on the system board.

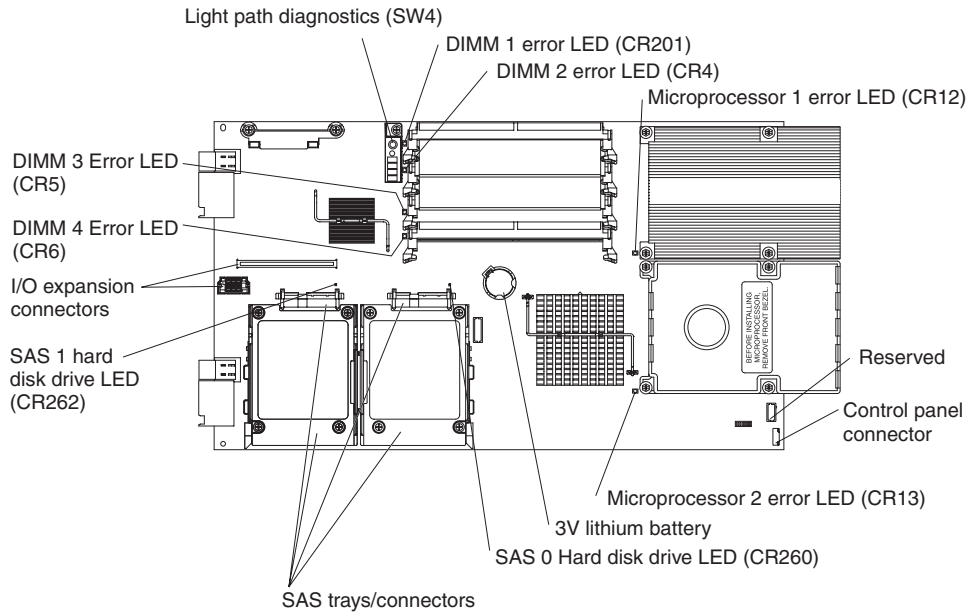


Table 2. System board LEDs

LED name and location	Description
DIMM 1 error LED (CR201)	There is a problem with the corresponding DIMM.
DIMM 2 error LED (CR4)	
DIMM 3 error LED (CR5)	
DIMM 4 error LED (CR6)	
SAS hard disk drive LED (CR260 and CR262)	Reserved
BMC fault LED (CR11)	There is a problem with the BMC.
Microprocessor 1 error LED (CR12)	There is a problem with the corresponding microprocessor.
Microprocessor 2 error LED (CR13)	
System board fault LED (CR30)	There is a problem with the system board.

The following illustration shows the light path diagnostics panel on the system board.

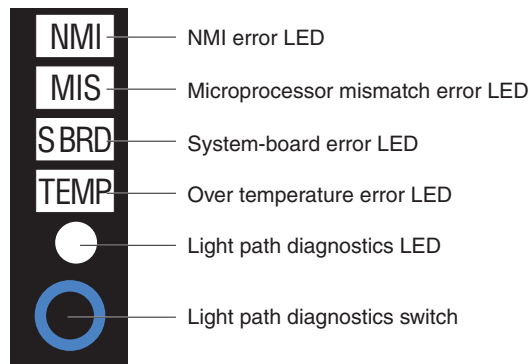


Table 3. Light path diagnostics panel LEDs

LED error	Action
NMI	Check error log for additional information. Restart the blade server. If the error still exists, call for service.
MIS (microprocessor speed mismatch)	Check microprocessors to make sure that they are the same speed.
S BRD (system board)	Restart the blade server. If the error still exists, call for service.
TEMP (over temperature)	Check the BladeCenter blowers for correct operation and the air inlets for obstructions. Make sure that the temperature of the room where the blade server is installed is within the limits specified by the “Features and specifications” on page 7.
Light path diagnostics LED (CR111)	Lights to show that the light path diagnostics circuit is active and functioning. Check the other light path diagnostic LEDs for errors.
Light path diagnostics button (SW4)	Press SW4 to find faults on the system board. If the microprocessor or memory LED is lit, reseal the component. If the LED remains lit, replace the defective component.

See “Diagnosing problems using light path diagnostics” on page 59 for information on what action to take if there is a component error.

Chapter 3. Installing options

This chapter provides instructions for installing hardware options in the blade server. Some option-removal instructions are provided in case you need to remove one option to install another.

Installation guidelines

Before you begin installing options in the blade server, read the following information:

- Read the safety information beginning on page v and the guidelines in “Handling static-sensitive devices.” This information will help you work safely with the blade server and options.
- 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.
- For a list of supported options for the blade server, go to <http://www.ibm.com/servers/eserver/serverproven/>.

System reliability guidelines

To help ensure proper cooling and system reliability, observe the following guidelines:

- Make sure that microprocessor socket 2 always contains either a microprocessor heat sink filler or a microprocessor and heat sink. If the blade server has only one microprocessor, it must be installed in the microprocessor socket 1.
- To maintain proper system cooling, do not operate the BladeCenter unit without a blade server, expansion unit, or filler installed in each blade bay. See the documentation for your BladeCenter unit for additional information.

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.

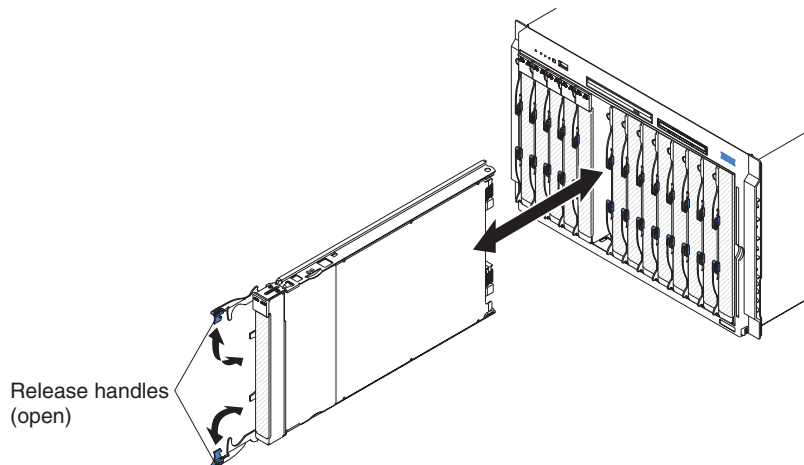
To reduce the possibility of damage from electrostatic discharge, observe the following precautions:

- When working on a BladeCenter unit, use an electrostatic discharge (ESD) wrist strap, especially when you will be handling modules, options, and blade servers. To work properly, the wrist strap must have a good contact at both ends (touching your skin at one end and firmly connected to the ESD connector on the front or back of the BladeCenter unit).

- Limit your movement. Movement can cause static electricity to build up around you.
- Handle the device carefully, holding it by its edges or its frame.
- Do not touch solder joints, pins, or exposed circuitry.
- Do not leave the device where others can handle and damage it.
- While the device is still in its static-protective package, touch it to an *unpainted* metal part of the BladeCenter unit or any *unpainted* metal surface on any other grounded rack component in the rack you are installing the device in 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 handling 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 BladeCenter type 8677. The appearance of your BladeCenter unit might be different, see the documentation for your BladeCenter unit.



Attention:

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

To remove the blade server, complete the following steps:

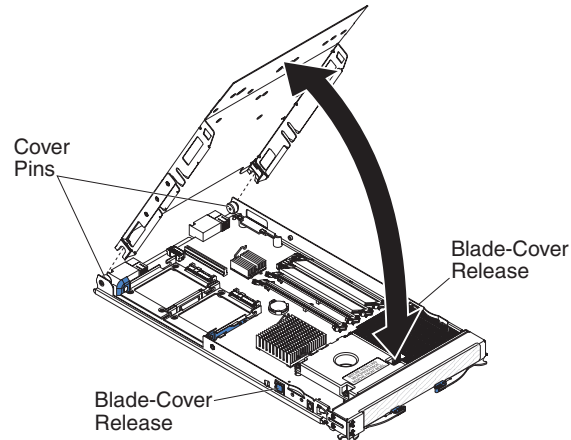
1. If the blade server is operating, shut down the operating system; then, press the power-control button (behind the blade server control panel door) to turn off the blade server (see “Turning off the blade server” on page 14 for more information).

Attention: Wait at least 30 seconds, until the hard disk drives stop spinning, before proceeding 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 further back in the bay move into place to cover the bay temporarily.
4. Place either a filler blade or another blade in the bay within 1 minute. The recessed spring-loaded doors will move out of the way as you insert the blade or filler blade.

Opening the blade server cover

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



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

1. Read the safety information beginning on page v and “Installation guidelines” on page 21.
2. If the blade server is installed in a BladeCenter unit, remove it (see “Removing the blade server from the BladeCenter unit” on page 22 for instructions).
3. Carefully lay the blade server down on a flat, non-conductive 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 for future use.

Statement 21:



CAUTION:

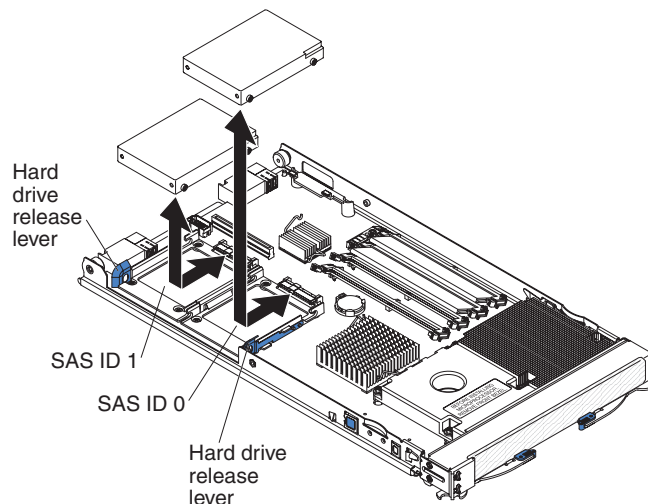
Hazardous energy is present when the blade server is connected to the power source. Always replace the blade cover before installing the blade server.

Installing a SAS hard disk drive

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

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

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



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

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

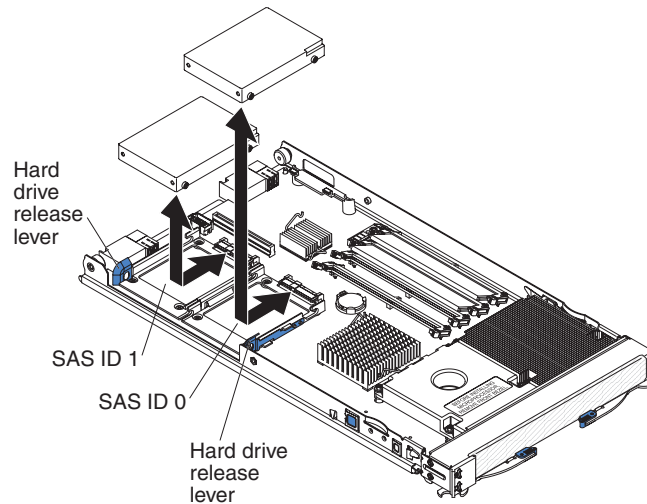
1. Read the safety information beginning on page v and “Installation guidelines” on page 21.
2. Shut down the operating system, turn off the blade server, and remove the blade server from the BladeCenter unit. See “Removing the blade server from the BladeCenter unit” on page 22 for instructions.
3. Carefully lay the blade server on a flat, non-conductive surface.
4. Open the blade server cover (see “Opening the blade server cover” on page 23 for instructions).
5. Locate SAS connector 0 or SAS connector 1.

Attention: Do not press on the top of the drive. Pressing the top could damage the drive.

6. Put the drive into the tray and push it, from the rear edge of the drive, into the connector until the drive moves past the lever at the back of the tray.
7. If you have other options to install or remove, do so now; otherwise, go to “Completing the installation” on page 34.

Removing a SAS hard disk drive

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



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

1. Read the safety information beginning on page v and “Installation guidelines” on page 21.
2. Shutdown 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 22 for instructions.
3. Carefully lay the blade server on a flat, non-conductive surface.
4. Open the blade server cover (see “Opening the blade server cover” on page 23 for instructions).
5. Locate SAS connector 0 or SAS connector 1. Pull the blue lever at the back of the hard disk drive tray away from the hard disk drive to disengage the drive from its tray.
6. From the rear edge of the drive, slide the drive out of the SAS connector.

Installing memory modules

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

- The system board contains four DIMM connectors and supports two-way memory interleaving.
- A DIMM option consists of a pair of DIMMs. The DIMM options available for the blade server are 1 GB (2 x 512 MB), 2 GB (2 x 1 GB), 4 GB (2 x 2 GB), and 8 GB (2 x 4 GB). Depending on the memory configuration set in blade server BIOS, the blade server can support a minimum of 1 GB and a maximum of 16 GB of system memory.
- The blade server comes with two DIMMs, in the DIMM 1 and DIMM 2 memory connectors.
- When you install additional DIMMs, be sure to install them as a pair, in DIMM connectors 3 and 4.

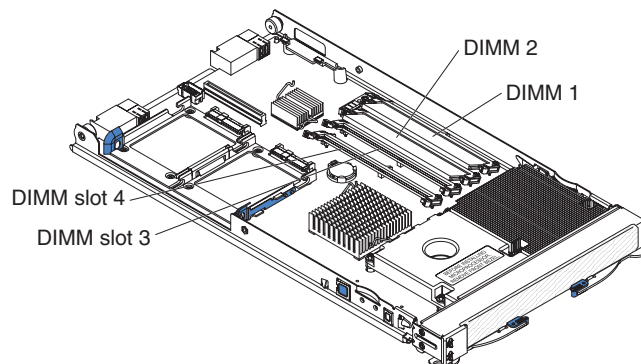
- Install the DIMMs in the following order:

Pair	DIMM connectors
First	1 (J113) and 2 (J111)
Second	3 (J112) and 4 (J110)

- When you install memory, you must install a pair of matched DIMMs.
- 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 does not have to be DIMMs of the same size, type, technology, and physical design as the first pair.
- If you wish to take advantage of Chipkill memory, each DIMM installed in your blade server must support the Chipkill technology.
- Install only 1.8 V, 240-pin, DDR2, PC3200, registered SDRAM with ECC DIMMs that are compatible with the latest PC3200 SDRAM Registered DIMM specification. For a current list of supported DIMMs for the blade server, see the ServerProven list at <http://www.ibm.com/servers/eserver/serverproven/compat/us/>.
- Installing or removing DIMMs changes the configuration information for the blade server. After installing or removing a DIMM, you must change and save the new configuration information by using the Configuration/Setup Utility program. When you restart the blade server, it displays a message indicating that the memory configuration has changed. Start the Configuration/Setup Utility program and select **Save Settings**. See “Configuration/Setup Utility menu choices” on page 40 for more information.

To install a DIMM, complete the following steps:

1. Read the safety information beginning on page v and “Installation guidelines” on page 21.
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 22 for instructions.
4. Carefully lay the blade server on a flat, non-conductive surface.
5. Open the blade server cover (see “Opening the blade server cover” on page 23 for instructions).



6. Locate the DIMM connectors on the system board (see the above illustration). Determine the connectors into which you will install the DIMMs.
7. Touch the static-protective package that contains the DIMM option to any *unpainted* metal surface on the BladeCenter unit or any *unpainted* metal surface on any other grounded rack component in the rack you are installing the DIMM option in for at least 2 seconds; then, remove the DIMM from its package.

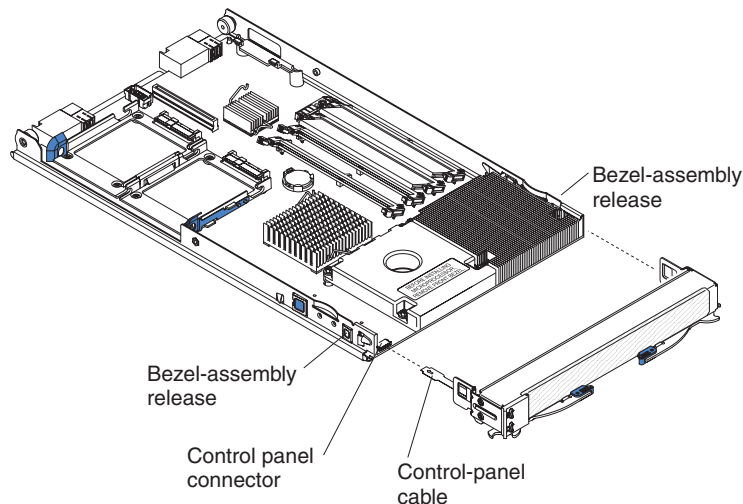
8. To install the DIMMs, repeat the following steps for each DIMM that you install:
 - a. Turn the DIMM so that the DIMM keys align correctly with the connector on the system board.

Attention: To avoid breaking the retaining clips or damaging the DIMM connectors, handle the clips gently.
 - b. Insert the DIMM by pressing the DIMM along the guides into the connector. Make sure that the retaining clips snap into the closed positions.

Important: If there is a gap between the DIMM and the retaining clips, the DIMM has not been correctly installed. In this case, open the retaining clips and remove the DIMM; then, reinsert the DIMM.
9. If you have other options to install or remove, do so now; otherwise, go to “Completing the installation” on page 34.

Removing the blade server bezel assembly

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



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

1. Read the safety information beginning on page v and “Installation guidelines” on page 21.
2. Open the blade server cover (see “Opening the blade server cover” on page 23 for instructions).
3. Press the bezel-assembly release and pull the bezel assembly away from the blade server approximately 1.2 cm (0.5 inch).
4. Disconnect the control-panel cable from the control-panel connector.
5. Pull the bezel assembly away from the blade server.
6. Store the bezel assembly in a safe place.

Installing an additional microprocessor

The blade server comes with one or two microprocessors installed on the system board. The blade server supports two microprocessors. With two microprocessors, the blade server can operate as a symmetric multiprocessing (SMP) server. With SMP, certain operating systems and application programs can distribute the processing load between the microprocessors. If the blade server comes with one microprocessor, you can install a second microprocessor.

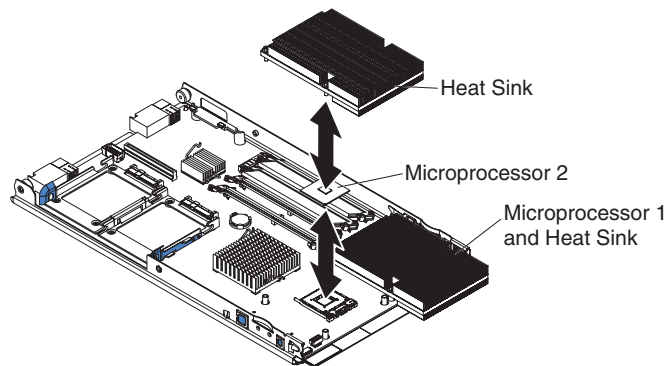
Note: If you install a second microprocessor, you must install the same microprocessor type and speed as the first microprocessor.

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

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

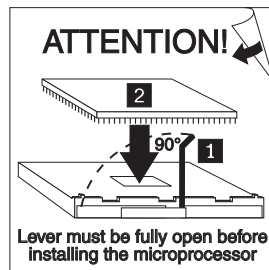
- Always install microprocessors that have the same cache size and type, the same clock speed, and identical internal and external clock frequencies (including system bus speed).
- Make sure that the microprocessor with the lowest feature set is the startup (bootstrap) microprocessor, which is installed in the microprocessor 1 socket (U66).
- For a list of microprocessors that the blade server supports, go to the ServerProven list at <http://www.ibm.com/servers/eserver/serverproven/compat/us/>.
- Before installing a new microprocessor, download and install the most current level of BIOS code, from <http://www.ibm.com/support>.
- The microprocessors terminate themselves; therefore, no terminator card is required if microprocessor socket 2 is empty. However, for proper airflow, this socket must contain a microprocessor heat-sink filler, sometimes called a microprocessor baffle.
- The microprocessor speeds are automatically set for this server; therefore, you do not have to set any microprocessor frequency-selection jumpers or switches.

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



To install an additional microprocessor, complete the following steps:

1. Read the safety information beginning on page v and “Installation guidelines” on page 21.
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 22 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 23 for instructions).
5. Remove the bezel assembly (see “Removing the blade server bezel assembly” on page 27 for instructions).
6. Locate the microprocessor socket on the system board.
7. Remove the four screws that secure the heat-sink filler and then remove the filler from the microprocessor socket.
8. Install the microprocessor:
 - a. If present, remove the protective label, shown below, from the surface of the microprocessor socket.

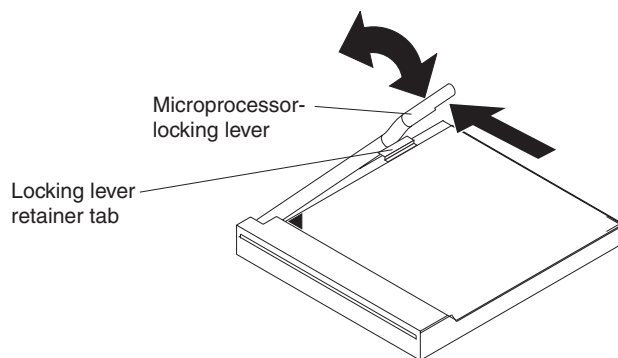


- b. Touch the static-protective package that contains the new microprocessor to any *unpainted* metal surface on the blade server or any *unpainted* metal surface on any other grounded rack component in the rack you are installing the microprocessor in for at least 2 seconds; then, remove the microprocessor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

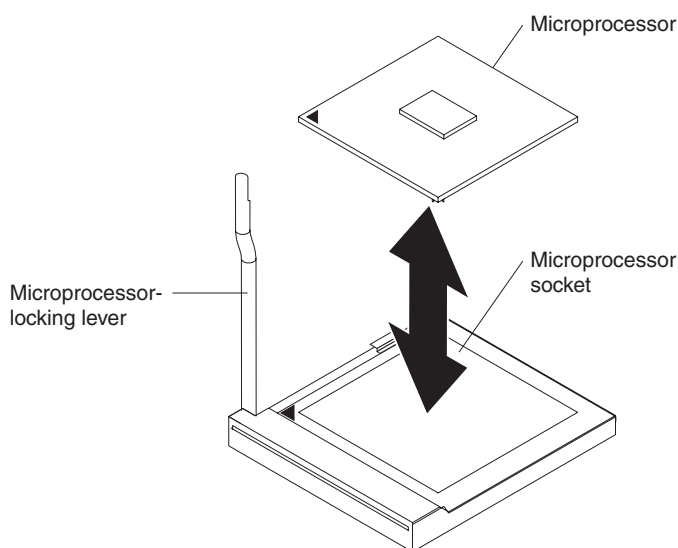
Attention: Do not use any tools or sharp objects to lift the locking lever on the microprocessor socket. Doing so might result in permanent damage to the system board.

- c. Rotate the locking lever on the microprocessor socket from its closed and locked position until it stops or clicks in the fully open position (approximately a 90° angle), as shown.

Attention: You must make sure that the locking lever on the microprocessor socket is in the fully open position before you insert the microprocessor in the socket. Failure to do so might result in permanent damage to the microprocessor, microprocessor socket, or system board.



- d. Center the microprocessor over the microprocessor socket. Align the triangle on the corner of the microprocessor with the triangle on the corner of the socket and carefully press the microprocessor into the socket.



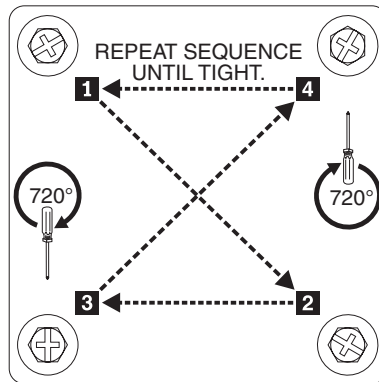
Attention:

- Do not use excessive force when pressing the microprocessor into the socket.
 - Make sure that the microprocessor is oriented and aligned correctly in the socket before you try to close the lever.
- e. Carefully close the lever to secure the microprocessor in the socket.
9. Install a heat sink on the microprocessor.

Attention:

- Do not set down the heat sink after you remove the plastic cover.
 - Do not touch the thermal grease on the bottom of the heat sink. Touching the thermal grease will contaminate it. If the thermal grease on the microprocessor or heat sink becomes contaminated, contact your service technician.
- a. Remove the plastic protective cover from the bottom of the heat sink.
 - b. Make sure that the thermal material is still on the bottom of the heat sink; then, align and place the heat sink on top of the microprocessor in the retention bracket, thermal material side down. Press firmly on the heat sink.
 - c. Align the four screws on the heat sink with the holes on the heat-sink retention module.

- d. Press firmly on the captive screws and tighten them with a screwdriver, alternating between screws until they are tight. Follow the diagram on the heat-sink, and shown below, for the screw tightening sequence. Each screw should be rotated two full rotations at a time. Repeat until the screws are tight. Do not overtighten the screws by using excessive force.



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

Installing an I/O-expansion card

If I/O-expansion is supported by the BladeCenter unit in which the blade server is installed, you can add an I/O-expansion card to the blade server. I/O-expansion cards give the blade server additional connections for communicating on a network. Your blade server supports the installation of one I/O-expansion card of small-form-factor or standard-form-factor design.

You cannot install both sizes of an I/O-expansion card in a blade server at the same time. You can install a small-form-factor expansion card in addition to two SAS hard disk drives, or you can install a standard-form-factor I/O-expansion card into a blade server with one SAS hard disk drive.

The blade server supports a number of LAN daughter cards, such as:

- Gigabit Ethernet expansion card
- Fibre Channel expansion card
- Myrinet expansion card

See the ServerProven list at <http://www.ibm.com/servers/eserver/serverproven/> for a list of available I/O-expansion cards and their form-factor types.

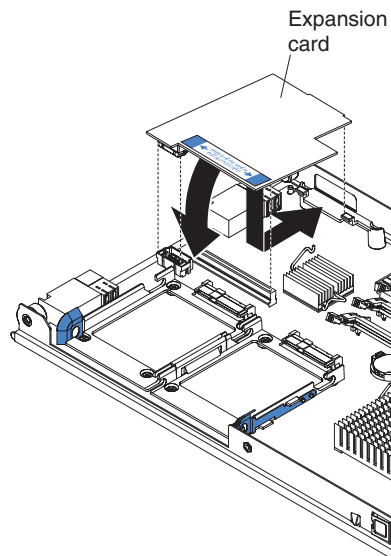
When you add an I/O-expansion card, you must make sure that the I/O-modules it is mapped to both support the expansion card network-interface type. These I/O-modules are typically installed in I/O-module bays 3 and 4 on the BladeCenter unit. For example, if you add an Ethernet expansion card to a blade server installed in a Type 8677 BladeCenter unit, the I/O-modules in I/O-module bays 3 and 4 on the BladeCenter unit must both be compatible with the expansion card. All other expansion cards that are installed on other blade servers in the BladeCenter unit must also be compatible with these I/O-modules. In this example, you could then install two Ethernet switch modules, two pass-thru modules, or one Ethernet switch module and one pass-thru module. Because pass-thru modules are compatible with a variety of I/O-expansion cards, installing two pass-thru modules would enable the use of several different types of compatible I/O-expansion cards on blade servers within the same BladeCenter unit.

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

Installing a small-form-factor expansion card

Install a small-form-factor expansion card near SAS connector 1 (J159). To install a small-form-factor expansion card, complete the following steps:

1. Read the safety information beginning on page v and “Installation guidelines” on page 21.
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 22 for instructions.
3. Carefully lay the blade server on a flat, non-conductive surface.
4. Open the cover (see “Opening the blade server cover” on page 23 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 tray; then, gently pivot the card into the expansion card connectors.

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

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

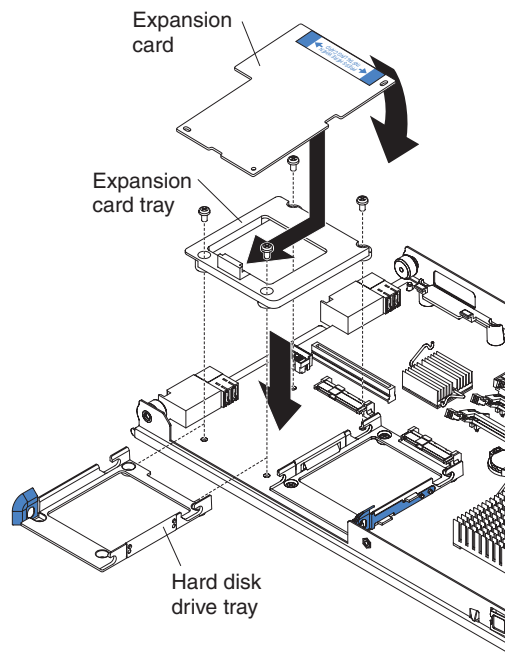
Installing a standard-form-factor expansion card

If a SAS drive is connected to SAS connector 1 (J159), you must remove it and the SAS drive tray before you can install a standard-form-factor expansion card and tray (see “Removing a SAS hard disk drive” on page 25). You cannot have both a drive that is connected to SAS connector 1 and a standard-form-factor expansion card installed in the blade server. If you are removing the SAS disk drive, backup any information on it that you want to keep to another storage device.

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

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

1. Read the safety information beginning on page v and “Installation guidelines” on page 21.
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 22 for instructions.
3. Carefully lay the blade server on a flat, non-conductive surface.
4. Open the cover (see “Opening the blade server cover” on page 23 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 25 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. The following illustration shows how to install the expansion card.



- a. Install the expansion card tray where you removed the SAS drive tray with the label of the card tray positioned towards the expansion slot. Secure the tray 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 card tray; then, gently pivot the wide end of the card into the expansion card connectors.

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

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

Completing the installation

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

1. Reinstall the blade server bezel assembly, if you removed it (see “Installing the blade server bezel assembly” on page 35 for information on installing the bezel assembly).
2. Close the blade server cover, unless you installed an optional expansion unit (see “Closing the blade server cover” on page 35).

Statement 21:



CAUTION:

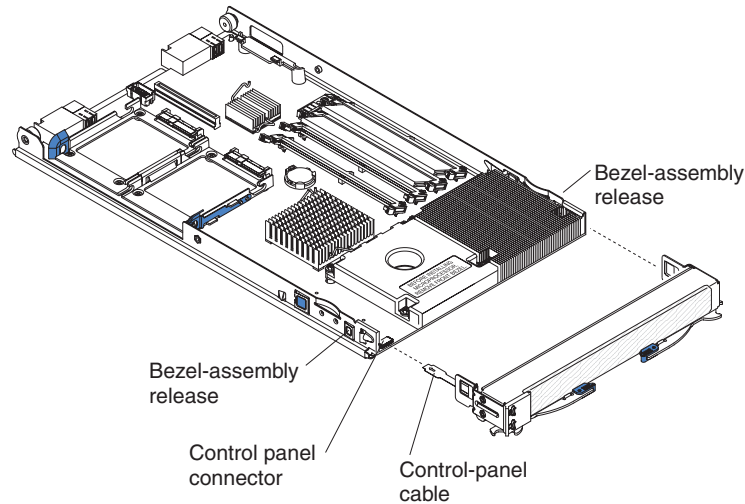
Hazardous energy is present when the blade server is connected to the power source. Always replace the blade cover before installing the blade server.

3. Reinstall the blade server into the BladeCenter unit (see “Installing the blade server in a BladeCenter unit” on page 36).
4. Turn on the blade server (see “Turning on the blade server” on page 13).
5. For certain options, run the blade server Configuration/Setup Utility program (see “Updating the blade server configuration” on page 37).

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 pressing the power-control button.

Installing the blade server bezel assembly

The following illustration shows how to install the blade server bezel assembly.



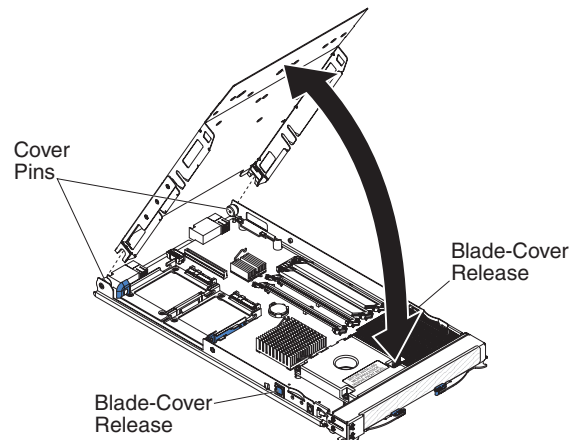
To install the blade server bezel assembly, complete the following steps:

1. Read the safety information beginning on page v and “Installation guidelines” on page 21.
2. Connect the control-panel cable to the control-panel connector on the system board.
3. Carefully slide the bezel assembly onto the blade server until it clicks into place.

Closing the blade server cover

Important: The blade server cannot be inserted into the BladeCenter unit until the cover is installed and closed or an expansion unit is installed. Do not attempt to override this protection.

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



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

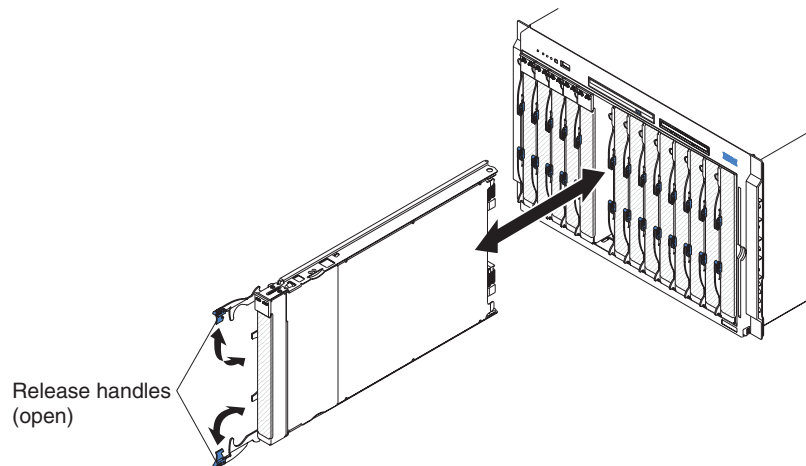
1. Read the safety information beginning on page v and “Installation guidelines” on page 21.
2. If you removed the blade bezel assembly, replace it now (see “Installing the blade server bezel assembly” for instructions).
3. Lower the cover so that the slots at the rear slide down onto the pins at the rear of the blade server, as shown in the illustration. Before closing the cover, check

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

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

Installing the blade server in a BladeCenter unit

The following illustration shows how to install the blade server into BladeCenter type 8677. The appearance of your BladeCenter unit might be different, see the documentation for your 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 beginning on page v and “Installation guidelines” on page 21 through “Handling static-sensitive devices” on page 21.
2. If you have not done so already, install any options that you want, such as SAS drives or memory, in the blade server.
3. Select the bay for the blade server.

Notes:

- a. When any blade server or option is in blade bay 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.
 - b. To help ensure proper cooling, performance, and system reliability, make sure that each of the blade bays on the front of the BladeCenter unit has a blade server, expansion unit, or filler blade installed. Do not operate the system unit without either a blade server, expansion unit, or filler blade installed in each blade bay for more than 1 minute for a BladeCenter unit or 20 minutes for a BladeCenter T unit.
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 closed.
7. Turn on the blade server (see “Turning on the blade server” on page 13 for instructions).
8. Make sure that the power-on LED on the blade 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 user labels that come with the blade servers and place the label on a BladeCenter unit bezel.
See the documentation for your BladeCenter unit for information about the label placement.
Important: Do not place the label on the blade server or in any way block the ventilation holes on the blade server.
10. If you have other blade servers to install, do so now.

If you reinstall a blade server that you removed, you must install it in the same blade bay from which you removed it. Some blade server configuration information and update options are established according to bay number. Reinstalling a blade server into a different blade bay from the one from which it was removed could have unintended consequences, and you might have to reconfigure the blade server.

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

Updating the blade server configuration

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

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

The blade server comes with at least one microprocessor. If more than one microprocessor is installed, the blade server can operate as a symmetric multiprocessing (SMP) server. You might have to upgrade the operating system to support SMP. See Chapter 5, “Installing the operating system,” on page 49 and your operating-system documentation for additional information.

Input/output connectors and devices

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

The blade server has two selection buttons on the control panel: the media tray select button and the keyboard/video/mouse select button. See “Understanding the control panel and LEDs” on page 14 for information about these buttons and their functions.

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

Chapter 4. Configuring the blade server

The following configuration programs come with the blade server:

- **Configuration/Setup Utility program**

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

- **LSI Logic Configuration Utility program**

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

- **IBM ServerGuide Setup and Installation CD**

The ServerGuide program provides software-setup tools and installation tools that are designed for the blade server. Use this CD during the installation of the blade server to configure basic hardware features to simplify the installation of the operating system. For information about using this CD, see “Using the ServerGuide Setup and Installation CD” on page 43.

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

The PXE boot agent utility program is part of the BIOS code in the blade server. Use it to select the boot protocol and other boot options and to select a power-management option. For information about using this utility program, see “Using the PXE boot agent utility program” on page 45.

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

Using the Configuration/Setup Utility program

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

1. Turn on the blade server (see “Turning on the blade server” on page 13).
2. Immediately give the blade server control of the BladeCenter unit shared keyboard, video, and mouse ports.
 - If you are managing the blade server using the BladeCenter system console, press the KVM select button on the blade server (see “Understanding the control panel and LEDs” on page 14 for information).
 - If you are managing the blade server from a remote location, see the *IBM BladeCenter Management Module User's Guide*, *IBM BladeCenter Management Module Command-Line Interface Reference Guide*, or *IBM BladeCenter Serial over LAN Setup Guide* for information and instructions.
3. When the Configuration/Setup utility message appears, press **F1**.
4. Follow the instructions on the screen.

Configuration/Setup Utility menu choices

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

- **System Summary**

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

- **Processor Summary**

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

- **USB Device Summary**

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

- **System Information**

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

- **Product Data**

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

- **Devices and I/O Ports**

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

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

- **Remote Console Redirection**

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

- **Video**

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

- **System MAC Addresses**

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

- **Date and Time**

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

- **System Security**

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

- **Start Options**

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

- **Startup Sequence Options**

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

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

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

You can enable or disable the PXE option for either of the integrated Gigabit Ethernet controllers. The default setting is **Planar Ethernet 1**, which enables the PXE option for the first Ethernet controller on the system board.

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

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

This choice is on the full Configuration/Setup menu only.

- **Advanced Setup**

Select this choice to change settings for advanced hardware features.

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

- **Memory Settings**

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

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

To maintain optimum system operation in the event of a memory failure, you can set the **Memory Configuration** for memory **Mirroring** or **Sparing**. Memory mirroring stores duplicate data on two DIMMs to prevent data loss if a DIMM fails. Memory sparing removes the failed memory from the system configuration and activates a Hot Spare Memory pair of DIMMs to replace the failed memory pair of DIMMs. Before you can enable the memory mirroring or sparing, at least two pairs of identical DIMMs must be installed in the blade

server that adhere to the special requirements described in “Installing memory modules” on page 25. Set the **Memory Configuration** to **Flat** to disable memory mirroring and sparing.

– **CPU Options**

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

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

– **PCI Bus Control**

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

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

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

- **BMC Network Configuration**

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

- **BMC System Event Log**

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

• **Save Settings**

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

• **Restore Settings**

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

• **Load Default Settings**

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

• **Exit Setup**

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

Using passwords

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

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

You can use any combination of up to seven characters (A–Z, a–z, and 0–9) for the password. Keep a record of your password in a secure place.

If you forget the power-on password, you can regain access to the blade server in any of the following ways:

- Remove the blade server battery and then reinstall it (see the *Problem Determination and Service Guide* on the *Documentation CD*).
- Change the position of the power-on password override switch (switch 8 on switch block 2 on the system board) to bypass the power-on password check the next time the blade server is turned on. You can then start the Configuration/Setup Utility program and change the power-on password. You do not have to move the switch back to the previous position after the password is overridden. See “Using system board switches” on page 16 for the location of switch block 2.

Note: Shut down the operating system, turn off the blade server, and remove the blade server from the BladeCenter unit to access the switches.

Using the ServerGuide Setup and Installation CD

The *ServerGuide™ Setup and Installation CD* includes an easy-to-use setup and installation program that is designed for the IBM blade server. The ServerGuide program detects the blade server model and hardware options that are installed and uses that information during setup to configure the hardware. The ServerGuide program simplifies operating-system installations by providing updated device drivers and, in some cases, installing them automatically.

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

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

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

ServerGuide features

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

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

The ServerGuide program has the following features:

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

Setup and configuration overview

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

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

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

- Select your language.
- Select your keyboard layout and country.
- View the overview to learn about ServerGuide features.
- View the readme file to review installation tips for your operating system and adapter.
- Start the operating-system installation. You will need your operating-system CD.

Typical operating-system installation

You can use the ServerGuide program to shorten the installation time. The ServerGuide program provides the device drivers that are required for the hardware and for the operating system that you are installing. This section describes a typical ServerGuide operating-system installation.

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

1. After you have completed the setup process, the operating-system installation program starts. (You will need the operating-system CD to complete the installation.)
2. The ServerGuide program stores information about the blade server model, service processor, hard disk drive controllers, and network adapters. Then, the program checks the CD for newer device drivers. This information is stored and then passed to the operating-system installation program.
3. The ServerGuide program presents operating-system partition options that are based on the operating-system selection and the installed hard disk drives.
4. The ServerGuide program prompts you to insert the operating-system CD and restart the server. At this point, the installation program for the operating system takes control to complete the installation. The BladeCenter CD-ROM drive must be associated with the blade server before you perform this step.

Installing the operating system without ServerGuide

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

1. Go to <http://www.ibm.com/support/>.
2. In the **Download** section, click **Downloads & drivers**.
3. On the “Downloads and drivers” page, in the **Brand** field, select **Servers**.
4. In the **Family** field, select **BladeCenter HS20**.
5. Click **Continue**.
6. On the “Downloads and drivers” page, select **Operating System Installation**.
7. Select the instructions for the operating system.

Using the PXE boot agent utility program

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

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

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

1. Turn on the server.
2. When the Broadcom NetXtreme Boot Agent vX.X.X prompt appears, press Ctrl+S. You have 2 seconds (by default) to press Ctrl+S after the prompt appears.

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

3. Use the arrow keys or press Enter to select a choice from the menu.
4. Follow the instructions on the screen to change the settings of the selected items; then, press Enter.

Firmware updates

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

Important: To avoid problems and to maintain proper system performance, always ensure that the blade server BIOS, service processor, and diagnostic firmware levels are consistent for all blade servers within the BladeCenter unit.

Configuring the Gigabit Ethernet controllers

Two Ethernet controllers are integrated on the blade server system board. Each controller provides a 1000-Mbps full-duplex interface for connecting to one of the Ethernet-compatible I/O-modules in I/O-module bays 1 and 2, which enables simultaneous transmission and reception of data on the Ethernet local area network (LAN). Each Ethernet controller on the system board is routed to a different I/O-module in I/O-module bay 1 or bay 2. The routing from an Ethernet controller to I/O-module bay will vary based on 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 BladeCenter HS20 Type 7981 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, you can have only one Ethernet controller from each server attached to each virtual LAN or subnet. With failover, you can configure more than one Ethernet controller from each server to attach to the same virtual LAN or subnet. Either one of the integrated Ethernet controllers can be configured as the primary Ethernet controller. If you have configured the controllers for failover and the primary link fails, the secondary controller takes over. When the primary link is restored, the Ethernet traffic switches back to the primary Ethernet controller. (See the operating-system device-driver documentation for information about configuring for failover.)

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

Blade server Ethernet controller enumeration

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

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

1. Install only one Ethernet switch module or pass-thru module in I/O-module bay 1.
2. Make sure that the ports on the switch module or pass-thru module are enabled (click **I/O-module Tasks** → **Management** → **Advanced Management** in the management module Web-based user interface).

3. Enable only one of the Ethernet controllers on the blade server. Note the designation that the blade server operating system has for the controller.
4. Ping an external computer on the network connected to the switch module or pass-thru module. If you can ping the external computer, the Ethernet controller that you enabled is associated with the switch module or pass-thru module in I/O-module bay 1. The other Ethernet controller in the blade server is associated with the switch module or pass-thru module in I/O-module bay 2.

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

Configuring a RAID array

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

Two SAS hard disk drives in the blade server can be used to implement and manage RAID level-0 (striping) or RAID level-1 (mirror) arrays in operating systems that are listed on the ServerProven list at <http://www.ibm.com/servers/eserver/serverproven/>. For the blade server, you must configure the SAS RAID using the LSI Configuration Utility program.

Using the LSI Logic Configuration Utility program

You can use the LSI Logic Configuration Utility program to:

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

Starting the LSI Logic Configuration Utility program

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

1. Turn on the blade server (make sure that the blade server is the owner of the keyboard, video, and mouse) and watch the monitor screen.
2. When the Press Ctrl-C to start LSI Logic Configuration Utility prompt appears, press Ctrl+C.
3. Use the arrow keys to select the controller from the list of adapters; then, press Enter.
4. Follow the instructions on the screen to change the settings of the selected items; then, press Enter. If you select **SAS Topology** or **Advanced Adapter Properties**, additional screens are displayed.

Chapter 5. Installing the operating system

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

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

Important:

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

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

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

1. While the blade server is on, press the KVM select button on the front of the blade server to associate the BladeCenter unit CD-ROM drive with the blade server.
2. Insert the CD, and restart the blade server. If the CD does not start, see “*ServerGuide problems*” on page 54.
3. Follow the instructions on the screen to:
 - a. Select your language.
 - b. Select your keyboard layout and country.
 - c. View the overview to learn about *ServerGuide* features.
 - d. View the readme file to review installation tips about your operating system and adapter.
 - e. Start the setup and hardware configuration programs.
 - f. Start the operating-system installation. You will need your operating-system CD.

Using RDM Version 4.20 or later to install the operating system

You can use RDM version 4.20 (or later) to install a supported Microsoft Windows operating system or Red Hat Advanced Server 2.1 on a blade server. Follow the instructions in the documentation that comes with RDM to install a supported operating system.

Note: To determine whether the operating system you plan to install supports RDM, see http://www.ibm.com/servers/eserver/xseries/systems_management/.

Downloading installation instructions

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

1. Go to the IBM Support Web page at <http://www.ibm.com/support>.
2. From the **Browse by product** list, select **Servers**.
3. Under **Select your product**, from the **Family** list, select your server model; then, select **Continue**.
4. On the "Important Information" page, select **Operating System Installation**. The available installation instructions are displayed.

Chapter 6. Solving problems

This section provides basic troubleshooting information to help you solve some common problems that might occur while setting up the blade server.

If you cannot locate and correct the problem using the information in this chapter, see the “Server Support” flowchart in the front of this document and the *Problem Determination and Service Guide* on the *Documentation CD* for your blade server.

Diagnostic tools overview

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

- **POST beep codes**

The power-on self-test beep codes indicate the detection of a problem.

- One beep indicates successful completion of POST.
- More than one beep indicates that POST detected a problem. Error messages also appear during startup if POST detects a hardware-configuration problem.

See “POST beep code descriptions” on page 52 for more information.

- **ServerGuide problems**

The table in “ServerGuide problems” on page 54 lists problem symptoms and steps to correct the problems.

- **Troubleshooting charts**

The “Troubleshooting charts” on page 55 list problem symptoms and steps to correct the problems.

- **Diagnostic programs and error messages**

Real Time Diagnostics tests the major components of the BladeCenter unit, including the management modules, I/O-modules, removable media drives, and the blade servers, while the operating system is running. Real Time Diagnostics can be plugged into an existing IBM Director environment or installed without IBM Director present. For documentation and download information for Real Time Diagnostics, see http://www.ibm.com/servers/eserver/xseries/systems_management/xseries_sm.html.

Note: See the *Problem Determination and Service Guide* for your blade server type for more information.

- **Light path diagnostics**

Use light path diagnostics to identify system errors quickly. See the “Light path diagnostics” on page 59 for more information.

POST beep code descriptions

POST emits one beep to signal successful completion. If POST detects a problem during startup, other beep codes might occur. Use the following beep code descriptions to help diagnose and solve problems that are detected during startup.

See “Diagnostics” in the *Problem Determination and Service Guide* for your blade server type for more information about the POST beep codes.

One beep

POST was completed successfully without finding any errors.

Repeating long beeps

A memory error has occurred. Make sure that all DIMMs are correctly installed.

One long beep and two small beeps

A video error has occurred, and the BIOS cannot initialize the monitor screen to display additional information.

Beep codes for specific problems

Additional beep codes are listed in the following table.

Table 4. POST beep code descriptions

Beep code	Descriptions of the POST beep codes
1-1-4	<p>BIOS ROM checksum in-progress or failure.</p> <p>Action:</p> <ol style="list-style-type: none">1. Move the BIOS code page jumper (J12) to pins 2 and 3 to start from the backup BIOS code page.2. Restart the blade server and update the BIOS code.3. Move the BIOS code page jumper back to pins 1 and 2 and restart the blade server. <p>If the problem remains, call for service.</p>
All other beep codes	<ol style="list-style-type: none">1. Make sure that the memory modules are installed correctly.2. Turn off the blade server; then, restart the blade server. If the problem remains, call for service.

POST error messages

The following table provides an abbreviated list of the error messages that might appear during POST. See “Diagnostics” in the *Problem Determination and Service Guide* for your blade server type for more information about the POST error messages.

Table 5. Abbreviated list of POST error messages

POST message	Failing device or problem found	Suggested action
161	The real-time clock battery has failed.	Replace the battery yourself or call for service.
162	A device configuration has changed.	Make sure that optional devices are installed correctly and turned on. Note: If you are unable to start the Configuration/Setup Utility program, view the system event log in the management module.
163	The time of day has not been set.	Set the date and time.
289	A failing DIMM was disabled.	Make sure that the installed memory is correct for your blade server type and that it is installed properly.
301 303	Keyboard and keyboard controller	<ul style="list-style-type: none"> • Make sure that the keyboard/video/mouse select button LED on the front of the blade server is lit, indicating that the blade server is connected to the shared keyboard. • Make sure that the keyboard cable is connected to the BladeCenter unit and nothing is resting on the keyboard keys.
962	Parallel port configuration error	Start the Configuration/Setup Utility program and make sure that the parallel-port setting is correct.
11xx	Serial port error	Make sure that the serial cable is connected correctly.
1162	Serial port configuration conflict	Start the Configuration/Setup Utility program and make sure that the IRQ and I/O port assignments that are needed by the serial port are available.
1800	PCI adapter hardware interrupt	Start the Configuration/Setup Utility program and make sure that the interrupt resource settings are correct.
2400 2462	Video controller and memory	<ul style="list-style-type: none"> • Make sure that the keyboard/video/mouse select button LED on the front of the blade server is lit, indicating that the blade server is connected to the shared monitor. • Make sure that the monitor is connected correctly to the BladeCenter unit.
00019xxx	Processor <i>x</i> is not functioning or failed the built-in test.	(Trained service technician only) Make sure that processor <i>x</i> is installed correctly. If the problem remains, replace processor <i>x</i> .
00180xxx	A PCI adapter requested a resource that is not available.	Start the Configuration/Setup Utility program and make sure that the resources that are needed by the PCI adapter are available.
01295085	The blade server failed the ECC-checking hardware test.	Have the system board serviced.
012980xx 012981xx	Data for processor <i>x</i>	Download and install the latest level of BIOS code.
01298200	Microprocessor speed mismatch	Install microprocessors with identical speeds.

Table 5. Abbreviated list of POST error messages (continued)

POST message	Failing device or problem found	Suggested action
I9990305	POST could not find an operating system.	Install an operating system.

ServerGuide problems

The following table lists problem symptoms and suggested solutions.

Table 6. ServerGuide Setup and Installation CD

Symptom	Suggested action
The <i>ServerGuide Setup and Installation</i> CD will not start.	<ul style="list-style-type: none"> • Make sure that the BladeCenter unit CD-ROM drive is associated with the blade server that you are configuring. • Make sure that the blade server supports the ServerGuide program. • If the startup (boot) sequence settings have been altered, make sure that the CD-ROM drive is first in the startup sequence.
The operating-system installation program continuously loops.	Make more space available on the hard disk.
The ServerGuide program will not start the operating-system CD.	Make sure that the operating-system CD is supported by the ServerGuide program. See the <i>ServerGuide Setup and Installation</i> CD label for a list of operating-system versions that support the ServerGuide program.
The operating system cannot be installed; the option is not available.	Make sure that the operating system is supported on your server. If the operating system is supported, either there is no logical drive defined (SAS RAID systems) or the ServerGuide System Partition is not present. Run the ServerGuide program and make sure that setup is complete.

Troubleshooting charts

The following tables list problem symptoms and suggested solutions. See the *Problem Determination and Service Guide* for your blade server type for more detailed troubleshooting charts. If you cannot find the problem in these charts, run the diagnostic programs. If you have run the diagnostic test programs, or if running the tests does not reveal the problem, call for service.

Memory problems

Symptom	Suggested action
The amount of system memory displayed is less than the amount of physical memory installed.	<p>Make sure that:</p> <ul style="list-style-type: none">• The DIMMs are seated correctly.• You have installed the correct type of memory.• If you changed the memory, you updated the memory configuration in the Configuration/Setup Utility program.• All banks of memory are enabled. The blade server might have automatically disabled a memory bank when it detected a problem, or a memory bank might have been manually disabled. <p>Check the POST error log for error message 289:</p> <ul style="list-style-type: none">• If the DIMM was disabled by a system-management interrupt (SMI), replace the DIMM.• If the DIMMs are not installed in pairs, install the DIMMs starting with DIMM 1 and DIMM 2. Make sure that there is not an unpopulated DIMM slot in the middle or that DIMM 3 and DIMM 4 are installed before DIMM 1 and DIMM 2.• If the system halts, make sure that the DIMMs installed in each pair are the same size, speed, type, technology, and physical design. Swap DIMM 3 and DIMM 4 with DIMM 1 and DIMM 2.• If the system error is an unsupported memory configuration, make sure that there is more than one DIMM installed. Install DIMMs in DIMM slots 1 and 2. If this does not fix the error, replace the DIMMs flagged in the management module log and indicated through light path diagnostics LEDs.• If the DIMM was disabled by the user or by POST, run the Configuration/Setup Utility program and enable the DIMM.• If this error remains, replace the DIMM. <p>If the problem remains, call for service.</p>

Microprocessor problems

Symptom	Suggested action
The blade server emits a continuous tone during POST.	<p>The startup (boot) microprocessor is not working correctly.</p> <p>The startup microprocessor might not be seated correctly, call for service.</p>

Monitor problems

Note: The monitor screen remains blank until it is directed to a blade server that is turned on; this is normal behavior.

Symptom	Suggested action
The monitor screen goes blank when you direct it to a working blade server, or it goes blank when you start some application programs in the blade servers.	<p>Make sure that the monitor cable is connected to the video connector on the management module. Some IBM monitors have their own self-tests. If you suspect a problem with your monitor, see the information that comes with the monitor for adjusting and testing instructions.</p> <p>If you still cannot find the problem, try using the monitor with another blade server. If the problem remains, see the <i>Problem Determination and Service Guide</i> for your BladeCenter unit.</p>
The screen is blank.	<p>Make sure that:</p> <ul style="list-style-type: none"> • The KVM select button LED on the front of the blade server is lit, indicating that the blade server is connected to the shared monitor. • The BladeCenter unit power cord is connected to the power module and a working electrical outlet. • The monitor cables are connected properly. • The monitor is turned on and the brightness and contrast controls are adjusted correctly. <p>Important: In some memory configurations, the 3-3-3 beep code might sound during POST followed by a blank monitor screen. If this occurs and the Boot Fail Count feature in the Start Options of the Configuration/Setup Utility program is enabled (its default setting), you must restart the blade server three times to force the system BIOS to reset the configuration settings to the default configuration (the memory connector or bank of connectors enabled).</p> <p>If the problem remains, call for service.</p>
Only the cursor appears.	<p>Make sure that the keyboard, video, and mouse on the BladeCenter unit have not been switched to another blade server.</p> <p>If the problem remains, call for service.</p>
The monitor has screen jitter, or the screen image is wavy, unreadable, rolling, or distorted.	<p>If the monitor self-tests show that the monitor is working correctly, consider the location of the monitor. Magnetic fields around other devices (such as transformers, appliances, fluorescent lights, and other monitors) can cause screen jitter or wavy, unreadable, rolling, or distorted screen images. If this happens, turn off the monitor.</p> <p>Move the device and the monitor at least 300 mm (12 in.) apart, and turn on the monitor.</p> <p>If the problem remains, call for service.</p>
Wrong characters appear on the screen.	<p>If the wrong language is displayed, update the firmware or operating system with the correct language in the blade server that has ownership of the monitor.</p> <p>If the problem remains, have the blade server serviced.</p>

Mouse problems

Symptom	Suggested action
The mouse does not work.	<ul style="list-style-type: none">• Make sure that the KVM select button LED on the front of the blade server is lit, indicating that the blade server is connected to the shared mouse.• Make sure that the mouse cable is securely connected to the management module and that the keyboard and mouse cables are not reversed.• Make sure that the mouse works correctly with other blade servers.• Make sure that the mouse is recognized as a USB device, not PS/2, by the blade server. Although the mouse might be a PS/2-style device, communication with the mouse is through an internal USB bus in the BladeCenter unit. Some operating systems enable you to select the type of mouse during installation of the operating system. Select USB. <p>If the problem remains, call for service.</p>

Network connection problems

Symptom	Suggested action
One or more blade servers are unable to communicate with the network.	<p>Make sure that:</p> <ul style="list-style-type: none">• The I/O-modules for the network interface that you are using are installed in the correct bays and are configured and operating correctly. See the <i>Problem Determination and Service Guide</i> for your BladeCenter unit for details.• The settings in the switch module are correct for the blade server (settings in the switch module are blade server specific). <p>If you installed an optional expansion card, make sure that:</p> <ul style="list-style-type: none">• The expansion card is designed for the blade server. See the “Server Support” flowchart on the cover for information about obtaining ServerProven™ compatibility information from the World Wide Web.• You followed the installation instructions that come with the expansion card.• The option is installed correctly.• You have not loosened any other installed options or cables.• You updated the configuration information in the Configuration/Setup Utility program. Whenever memory or an option is changed, you must update the configuration. <p>If the problem remains, call for service.</p>

Option problems

Symptom	Suggested action
An IBM option that was just installed does not work.	<p>Make sure that:</p> <ul style="list-style-type: none"> • The option is designed for the blade server. See the “Server Support” flowchart on the cover for information about obtaining ServerProven compatibility information from the World Wide Web. • You followed the installation instructions that come with the option. • The option is installed correctly. • You have not loosened any other installed options or cables. <p>If the problem remains, call for service.</p>
An IBM option that used to work does not work now.	<p>Make sure that all of the option hardware and cable connections are secure.</p> <p>If the option comes with its own test instructions, use those instructions to test the option.</p> <p>If the problem remains, call for service.</p>

Power problems

Symptom	Suggested action
The blade server does not turn on.	<ol style="list-style-type: none"> 1. Make sure that: <ol style="list-style-type: none"> a. The power LED on the front of the BladeCenter unit is lit. b. The LEDs on all the power modules are lit. c. If the blade server or attached storage expansion unit is in blade bays 7 through 14 (in the BladeCenter unit) or blade bays 5 through 8 (in the BladeCenter T unit), power modules are in all four power bays. d. The power LED on the blade server control panel is flashing slowly. <ul style="list-style-type: none"> • If the power LED is flashing rapidly and continues to do so, the blade server is not communicating with the management module; reseal the blade server and go to step 3. • If the power LED is off, either the blade bay is not receiving power, the blade server is defective, or the LED information panel is loose or defective. e. Local power control for the blade server is enabled (use the management-module Web interface to verify), or the blade server was instructed through the management module (Web interface or IBM Director) to turn on. <p>Note: For more information about IBM Director, see the IBM Director documentation on the <i>IBM Director</i> CD.</p> 2. If you just installed an expansion card in the blade server, remove it and restart the blade server. If the blade server now turns on, troubleshoot the option (see the documentation that comes with the option for information). 3. Try another blade server in the blade bay; if it works, replace the faulty blade server. 4. If the problem remains, call for service.

Service processor (BMC) problems

Symptom	Suggested action
The service processor reports a general monitor failure.	Shut down the operating system and turn off the blade server; then, remove the blade server from the BladeCenter unit, wait for 30 seconds, reinstall the blade server in the BladeCenter unit, and restart the blade server. If the problem remains, call for service.

Light path diagnostics

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.

Diagnosing problems using light path diagnostics

This section provides information about using the light path diagnostics to diagnose problems that might occur during installation. To locate the actual component that caused the error, locate the lit error LED on that component.

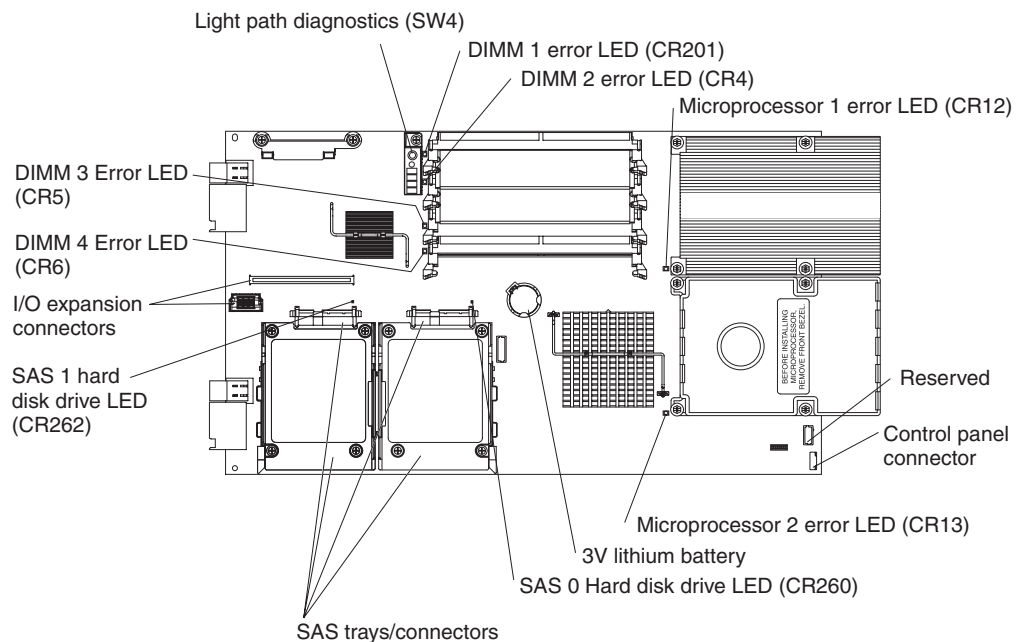
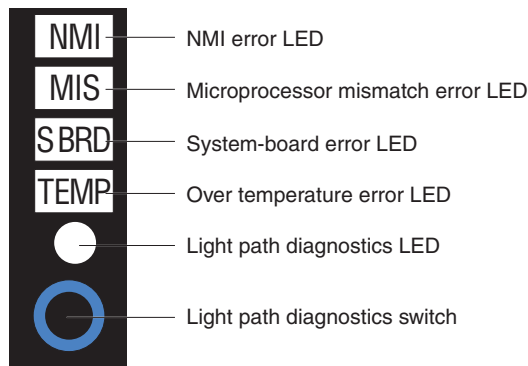
The following steps illustrate how to use the light path diagnostics to diagnose a system error:

1. Shut down the operating system, turn off the blade server, and remove the blade server from the BladeCenter unit (see “Turning off the blade server” on page 14 and “Removing the blade server from the BladeCenter unit” on page 22).
2. Place the blade server on a flat, static-protective surface.
3. Remove the cover from the blade server (see “Opening the blade server cover” on page 23).
4. Press and hold the light path diagnostics button to relight the LEDs that were lit before you removed the blade server from the BladeCenter unit. The LEDs will remain lit for as long as you press the button, to a maximum of 25 seconds.

See “Understanding the control panel and LEDs” on page 14 for more information about the control panel buttons and error LEDs. See Table 7 on page 61 for diagnostic LED descriptions.

Light path diagnostics LEDs

The following table lists the LEDs on the light path diagnostics panel, the problems that they indicate, and actions to solve the problems. The following illustrations show the light path diagnostics panel and LEDs on the system board.



Power is available to relight the light path diagnostics LEDs for a small period of time after the blade server is removed from the BladeCenter unit. During that period of time, you can relight the light path diagnostics LEDs for a maximum of 25 seconds (or less, depending on the number of LEDs that are lit and the length of time the blade server is removed from the BladeCenter unit) by pressing the light path diagnostics button. The light path diagnostics power present LED (CR111) is lit when the light path diagnostics button is pressed if power is available to relight the blade-error LEDs. If the light path diagnostics power present LED is not lit when the light path diagnostics button is pressed, no power is available to light the blade-error LEDs, and they will be unable to provide any diagnostic information.

Table 7. Light path diagnostics

LED	Problem	Action
None	An error has occurred and cannot be isolated, or the service processor has failed. The error is not represented by a light path diagnostics LED.	Check the system error log in the management module for more information about the error.
DIMM x error	A memory error has occurred.	<p>Replace the failing DIMM, which is indicated by the lit DIMM failure LED.</p> <p>Note: Multiple DIMM LEDs do not necessarily indicate multiple DIMM failures. If more than one DIMM LED is lit, reseal or replace one DIMM at a time until the error is corrected. Check the system error log in the management module for information about the error.</p> <p>If the problem remains, have the blade server serviced.</p>
SAS hard disk drive-LED	Reserved	Reserved
Processor x error	The microprocessor has failed.	<p>Make sure that the microprocessor that is indicated by the lit LED is installed correctly (see “Installing an additional microprocessor” on page 28 for installation instructions).</p> <p>If the problem remains, have the blade server serviced.</p>
Temperature error (TEMP)	The system temperature has exceeded a threshold level.	<ul style="list-style-type: none"> • Determine whether a blower on the BladeCenter unit has failed. If it has, replace the blower. • Make sure that the room temperature is not too high (see “Features and specifications” on page 7 for temperature information). <p>If the problem remains, have the blade server serviced.</p>
System board error (S BRD)	The system board has failed	<p>Replace the blade server cover, reinsert the blade server in the BladeCenter unit, and then restart the server.</p> <p>If the problem remains, have the blade server serviced.</p>
NMI error	The system board has failed.	<ul style="list-style-type: none"> • Replace the blade server cover, reinsert the blade server in the BladeCenter unit, and then restart the server. • Check the system error log in the management module for information about the error. <p>If the problem remains, have the blade server serviced.</p>
Processor mismatch (MIS)	The processors do not match.	<p>Make sure that microprocessors 1 and 2 have the same cache size and type and the same clock speed. Internal and external clock frequencies must be identical.</p> <p>If the problem remains, have the blade server serviced.</p>

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 system 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.

Note: For some IntelliStation models, the *Hardware Maintenance Manual and Troubleshooting Guide* is available only from the IBM support Web site.

- Go to the IBM support Web site at <http://www.ibm.com/support/> to check for technical information, hints, tips, and new device drivers or to submit a request for information.

You can solve many problems without outside assistance by following the troubleshooting procedures that IBM provides in the online help or in the documentation that is provided with your IBM product. The documentation that comes with IBM systems also describes the diagnostic tests that you can perform. Most systems, operating systems, and programs come with documentation that contains troubleshooting procedures and explanations of error messages and error codes. If you suspect a software problem, see the documentation for the operating system or program.

Using the documentation

Information about your IBM system and preinstalled software, if any, or optional device is available in the documentation that comes with the product. That documentation can include printed documents, online documents, readme files, and help files. See the troubleshooting information in your system documentation for instructions for using the diagnostic programs. The troubleshooting information or the diagnostic programs might tell you that you need additional or updated device drivers or other software. IBM maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates. To access these pages, go to <http://www.ibm.com/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 systems, optional devices, services, and support. The address for IBM xSeries® and BladeCenter information is <http://www.ibm.com/eserver/xseries/>. The address for IBM IntelliStation information is <http://www.ibm.com/intellistation/>.

You can find service information for IBM systems and optional devices at <http://www.ibm.com/support/>.

Software service and support

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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.

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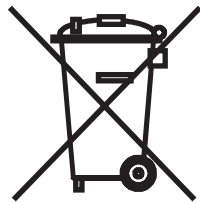
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Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment 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.

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Avis de conformité à la réglementation d'Industrie Canada

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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.

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Notice to Customers

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聲 明
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