



@server

BladeCenter HS20

Type 8832

Installation and User's Guide

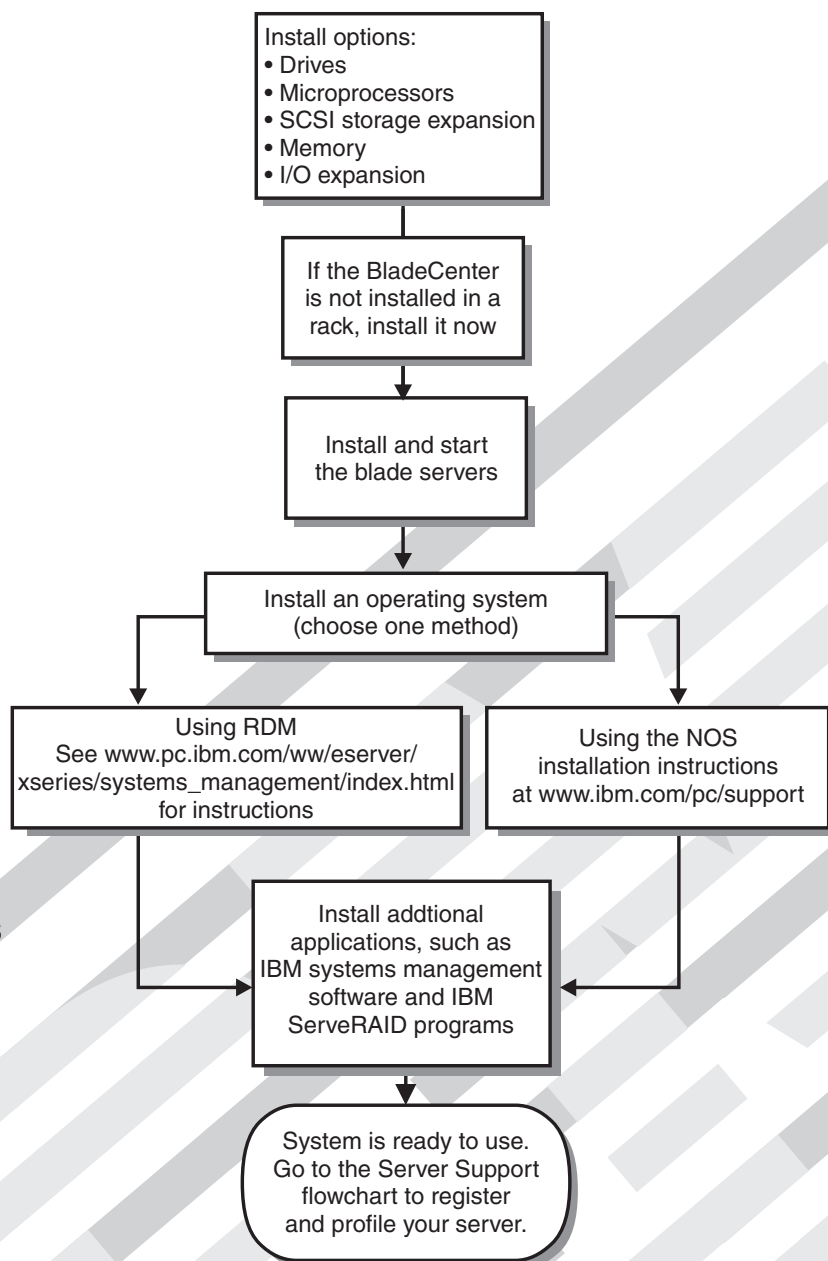
Welcome...

Thank you for buying an IBM server. Your server is based on Enterprise X-Architecture, and it features superior performance, availability, and scalability.

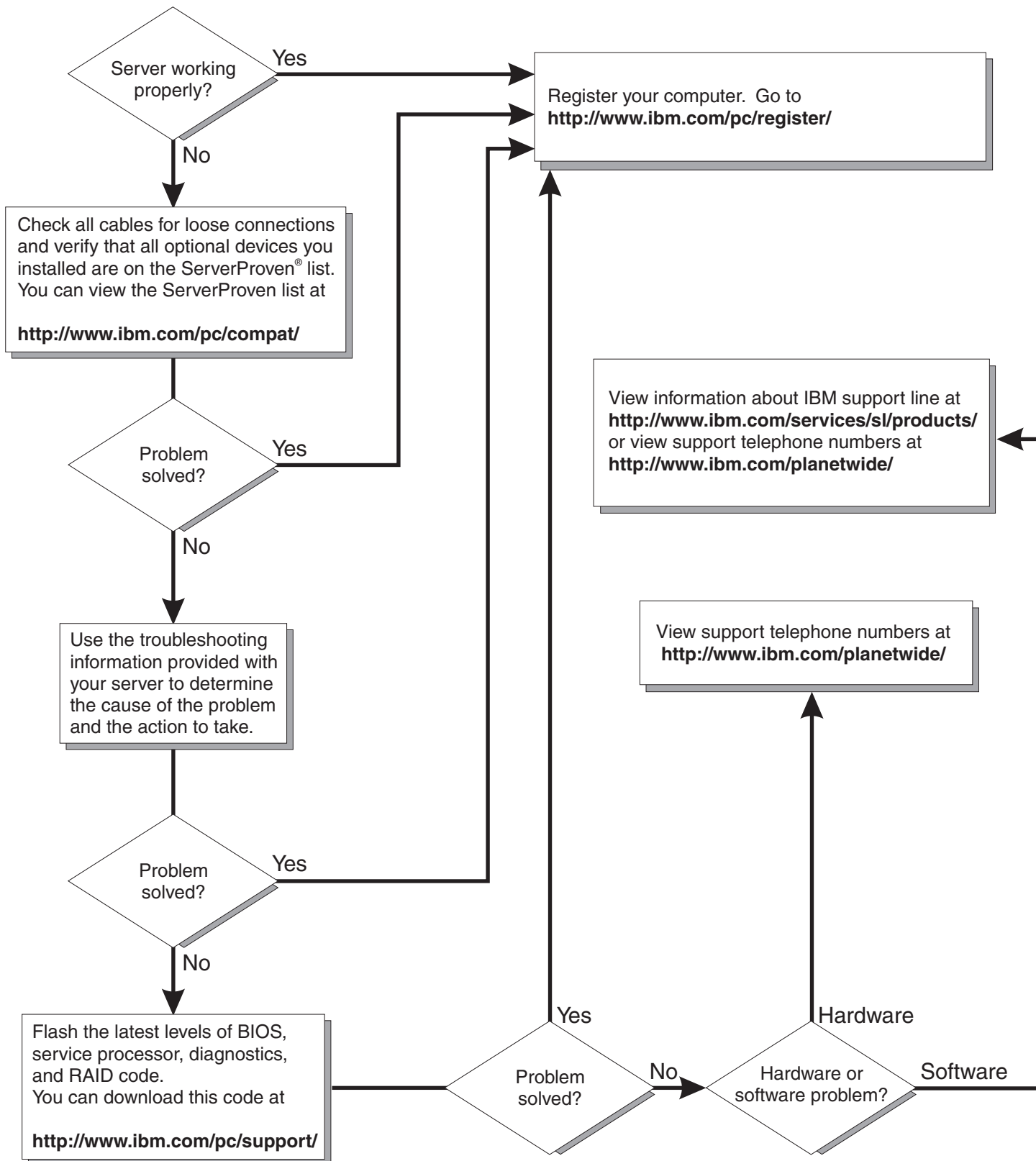
This server *Installation and User's Guide* contains information for setting up, configuring, and using your server.

For detailed information about your server, view the publications on the Documentation CD.

You can also find the most current information about your server on the IBM Web site at: <http://www.ibm.com/pc/support>



Server Support





@server

BladeCenter HS20

Type 8832

Installation and User's Guide

Note: Before using this information and the product it supports, read the general information in Appendix B, “Warranty information”, on page 67 and Appendix C, “Notices”, on page 79.

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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.

Statement 1:



DANGER

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

To avoid a shock hazard:

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

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

Statement 2:



CAUTION:

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

Do not:

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

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

Statement 3:



CAUTION:

When laser products (such as CD-ROMs, DVD drives, fiber optic devices, or transmitters) are installed, note the following:

- Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.
- Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.



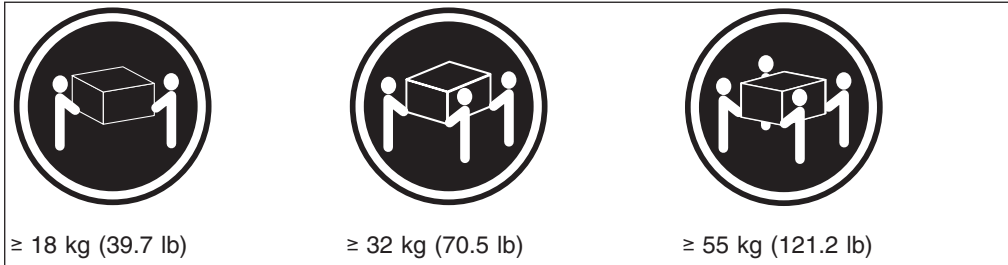
DANGER

Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following.

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

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

Statement 4:

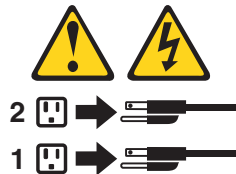


CAUTION:
Use safe practices when lifting.

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 8832 blade server is based on the IBM Enterprise X-Architecture™ technologies¹.

Your server is a blade-model server that is one of up to 14 blades that can be installed in the IBM @server BladeCenter Type 8677. This high-performance blade server is ideally suited for networking environments that require superior microprocessor performance, efficient memory management, flexibility, and reliable data storage.

This *Installation and User's Guide* provides information to:

- Set up your blade server
- Start and configure your blade server
- Install options
- Install your operating system
- Perform basic troubleshooting of your blade server

Your server might have features that are not described in the documentation that you received 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 your server documentation. These updates are available from the IBM Web site. Complete the following steps to check for updated documentation and technical updates:

1. Go to <http://www.ibm.com/pc/support/>.
2. In the **Learn** section, click **Online publications**.
3. On the "Online publications" page, in the **Brand** field, select **Servers**.
4. In the **Family** field, select **BladeCenter HS20**.
5. Click **Display documents**.

Packaged with the *Installation and User's Guide* 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 the IBM Support Web site at <http://www.ibm.com/pc/support/>.

This *Installation and User's Guide* and other publications that provide detailed information about your blade server are provided in Portable Document Format (PDF) on the IBM *BladeCenter Documentation* CD.

Your blade server comes with a three-year limited warranty. If you have access to the World Wide Web, you can obtain up-to-date information about your BladeCenter HS20 Type 8832 model and IBM xSeries™ server products at <http://www.ibm.com/eserver/xseries/>.

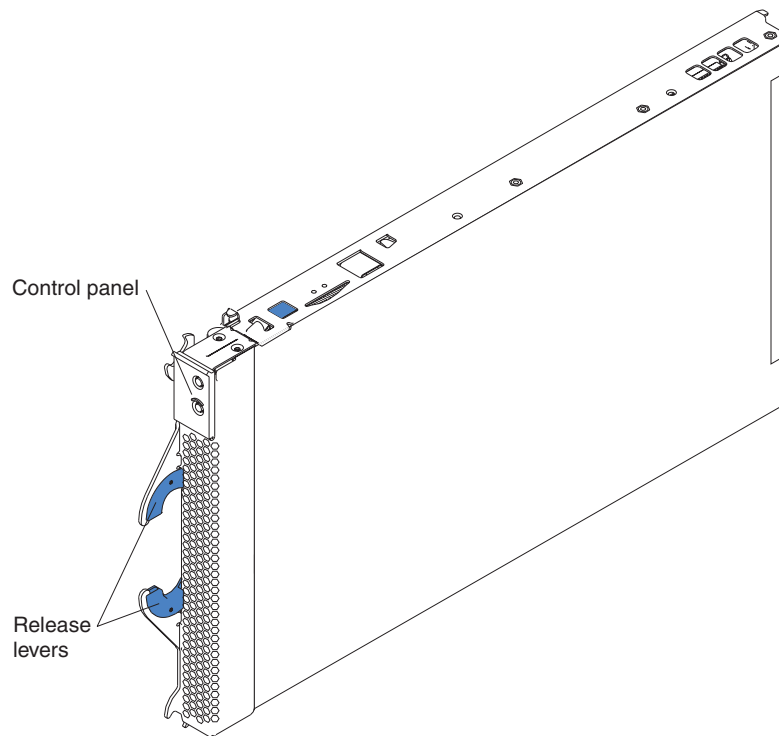
You can register the blade servers at <http://www.ibm.com/pc/register/>.

1. Enterprise X-Architecture technology takes full advantage of existing IBM technologies to build powerful, scalable, and reliable Intel processor-based servers. For more information about IBM Enterprise X-Architecture, go to <http://www.ibm.com/pc/us/eserver/xseries/xarchitecture/enterprise/index.html>.

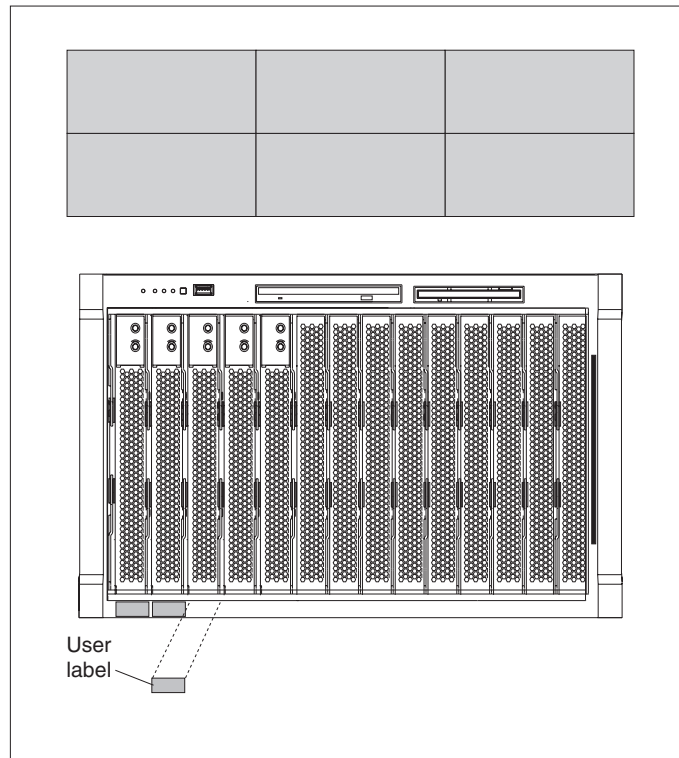
Record information about your BladeCenter HS20 blade server in the following table.

Product name	BladeCenter HS20
Machine type	8832
Model number	_____
Serial number	_____

The machine type, 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 right side of the blade server that is visible when the blade server is not in the BladeCenter unit. You will need these numbers when you register your blade server with IBM.



A set of user labels comes with the blade server. When you install the blade server in the BladeCenter unit, write whatever identifying information you want on a label and place it on the BladeCenter bezel just below the blade server, as shown in the following illustration.



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

Related publications

In addition to this *Installation and User's Guide*, the following documentation is provided in PDF on the IBM *BladeCenter Documentation* CD that comes with your IBM BladeCenter HS20 Type 8832 blade server:

- *Safety Information*: This publication 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* book.
- *BladeCenter HS20 Type 8832 Hardware Maintenance Manual and Troubleshooting Guide*: This publication contains the information to help you solve BladeCenter HS20 problems yourself, and it contains information for service technicians.
- *@server BladeCenter Type 8677 Installation and User's Guide*: This publication contains instructions for setting up and configuring the BladeCenter unit and basic instructions for installing some options. It also contains general information about the BladeCenter unit.
- *@server BladeCenter Type 8677 Hardware Maintenance Manual and Troubleshooting Guide*: This publication contains the information to help you solve BladeCenter problems yourself, and information for service technicians.
- *@server BladeCenter Type 8677 Rack Installation Instructions*: This publication contains instructions for installing the BladeCenter unit in a rack.
- *IBM 4-Port Gb Ethernet Switch Module for BladeCenter Installation and User's Guide*: This publication contains instructions for setting up and configuring the IBM 4-Port Gb Ethernet Switch Module for BladeCenter and a description of the switch module features.

Additional publications might be included on the IBM *BladeCenter Documentation* CD.

Features and specifications

The following table provides a summary of the features and specifications of your BladeCenter HS20 Type 8832 blade server.

You can use the Configuration/Setup Utility program in your server to determine the specific type of microprocessor that is in the blade server.

Note: Power, cooling, removable-media drives, external ports, and advanced system management are provided by the IBM @server BladeCenter Type 8677.

<p>Microprocessor:</p> <p>Supports up to 2 microprocessors</p> <ul style="list-style-type: none"> • Intel Xeon Processor • 512 KB ECC L2 cache • 533 MHz front-side bus (FSB) <p>Memory:</p> <ul style="list-style-type: none"> • Four double data rate (DDR) PC1600 sockets • Minimum: 512 MB • Maximum: 4 GB (8 GB with availability of 2 GB DIMMs) • Type: 2-way interleaved, DDR, PC2100, ECC SDRAM registered x4 (Chipkill™) DIMMs only <p>Note: PC2100 DIMMs are backward-compatible and can function in the PC1600 sockets</p> <ul style="list-style-type: none"> • Supports 256 MB, 512 MB, and 1 GB (2 GB when available) dual inline memory modules (DIMMs) <p>Drives:</p> <ul style="list-style-type: none"> • Support for up to two internal IDE 2.5-inch hard disk drives • Support for up to two Ultra320 SCSI hot-swap hard disk drives available in an optional SCSI storage expansion unit 	<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) <p>Integrated functions:</p> <ul style="list-style-type: none"> • Two Gigabit Ethernet controllers • ATI Rage XL video controller • Light Path Diagnostics™ • Local service processor • IDE hard disk drive controller • RS-485 interface for communication with BladeCenter management module • USB buses for communication with keyboard, mouse, diskette drive, and CD-ROM drive <p>Predictive Failure Analysis® (PFA) alerts:</p> <ul style="list-style-type: none"> • Microprocessor • Memory • Hard disk drives 	<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 95°F). Altitude: 914 m to 2134 m (2998.69 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>Electrical input:</p> <ul style="list-style-type: none"> • Input voltage: 12 V dc
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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-ROM drive, and diskette drive. The BladeCenter unit uses USB for internal communications with these devices.

Notices and statements used in this book

The caution and danger statements used in this book also appear in the multilingual Safety Information book provided on the IBM *BladeCenter Documentation* CD. Each caution and danger statement is numbered for reference to the corresponding statement in the safety book.

The following notices and statements are used in the documentation:

- **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.

What your IBM BladeCenter HS20 Type 8832 offers

The design of your blade server takes advantage of advancements in memory management and data storage. Your blade server includes:

- **IBM Enterprise X-Architecture**
IBM Enterprise X-Architecture technology leverages proven innovative IBM technologies to build powerful, scalable, reliable Intel-processor-based servers. Enterprise X-Architecture technology includes features such as Light Path Diagnostics, Predictive Failure Analysis (PFA) and Advanced System Management.
- **Impressive performance using the latest microprocessor technology**
Your blade server supports up to two Intel Xeon microprocessors. Your blade server comes with at least one microprocessor installed; you can install an additional microprocessor to further enhance performance and symmetric multiprocessing (SMP) capability.
- **Large system memory**
The memory bus in your blade server supports up to 4 GB (8 GB with availability of 2 GB DIMMs) of system memory. The memory controller provides support for up to four industry-standard 2.5 V, 184-pin, double-data-rate (DDR), PC2100, registered synchronous dynamic random-access memory (SDRAM) with error correcting code (ECC) DIMMs. For the most current list of supported DIMMs, see the Server Proven list.
- **Light Path Diagnostics**
The Light Path Diagnostics feature provides LEDs to assist in isolating problems with the blade server. An LED on the blade server control panel is lit if an unusual condition or a problem occurs. If this happens, you can look at the LEDs on the system board to locate the source of the problem.
- **Integrated network environment support**
Your blade server comes with two integrated Gigabit Ethernet controllers. Each Ethernet controller has an interface for connecting to 10/100/1000-Mbps networks

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

- **I/O expansion**

Your blade server comes with two connectors on the system board for an optional I/O expansion card, such as the IBM HS20 Fibre Channel Expansion Card, for adding more network communication capabilities to the blade server.

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 stored on your blade server; that your blade server is available when you want to use it; and that should a failure occur, you can easily diagnose and repair the failure with minimal inconvenience.

The following is a list of some of the RAS features that your blade server supports:

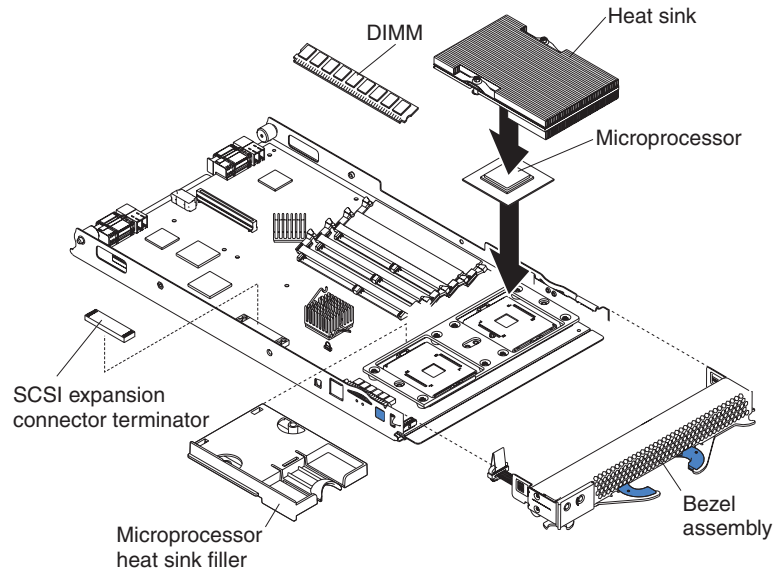
- Advanced Configuration and Power Interface (ACPI)
- Automatic error retry or recovery
- Automatic server restart
- Built-in monitoring for temperature, voltage, and hard disk drives
- Chipkill memory
- Customer-upgradeable basic input/output system (BIOS) code
- Customer support center 24 hours per day, 7 days a week²
- Diagnostic support of Ethernet controllers
- Error codes and messages
- Error correcting code (ECC) protection on the L2 cache
- ECC memory
- Failover Ethernet support
- Hot-swap drives on optional small computer system interface (SCSI) storage expansion unit
- Light Path Diagnostics feature
- Power-on self-test (POST)
- Predictive Failure Analysis (PFA) alerts
- Processor serial number access
- Service processor that communicates with the BladeCenter management module to enable remote blade server management
- SDRAM with serial presence detect (SPD) and vital product data (VPD)
- System error logging
- Vital product data (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.

Major components of the BladeCenter HS20 Type 8832 blade server

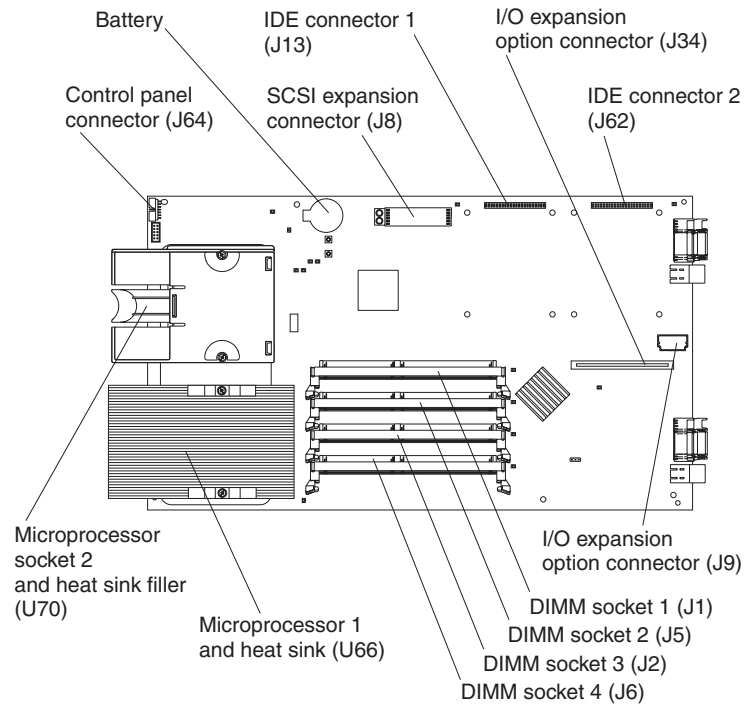
The following illustration shows the locations of major components in your blade server. You need to remove the blade server from the BladeCenter unit and remove the blade server cover to see the components.

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



System board illustration

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

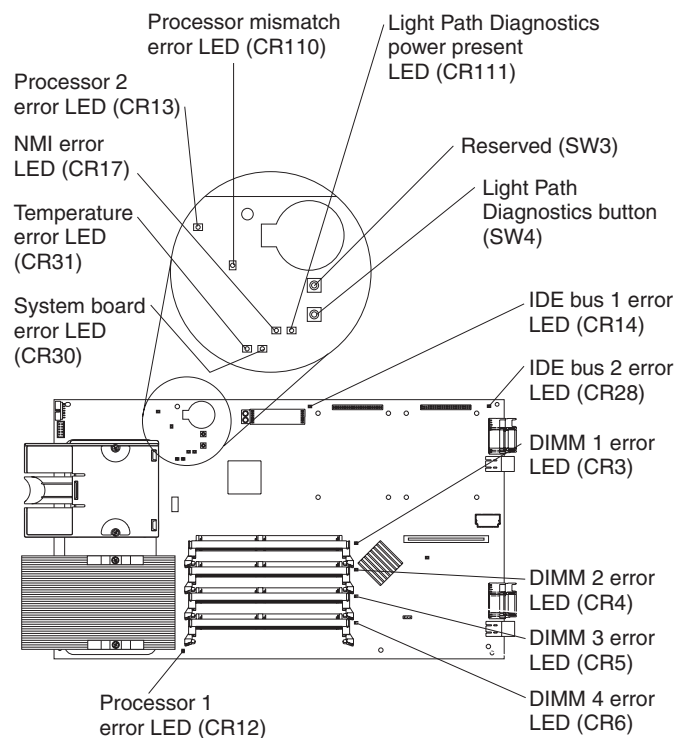


Note: The SCSI expansion connector (J8) requires a terminator unless an expansion option is connected to it.

System-board LED locations

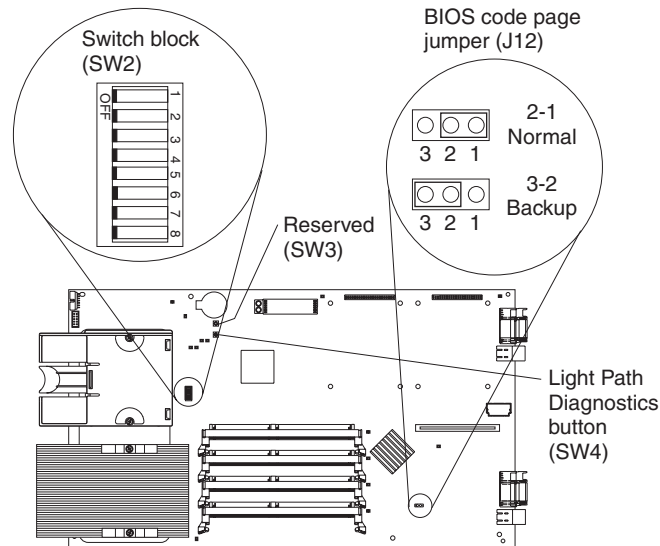
The following illustration shows the location of the LEDs on the system board. You might need to refer to this illustration when solving problems with the blade server. You need to remove the blade server from the BladeCenter unit, open the cover, and press the Light Path Diagnostics button to light any error LEDs that were turned on during processing.

Note: Power is available to relight the Light Path Diagnostics LEDs for a short 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) lights 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 does not light 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.



Switches and jumpers

The following illustration shows the location of the switches and jumpers on the system board.



Switches

Table 1 describes the function of each switch on switch block (SW2).

Table 1. Switch block (SW2)

Switch number	Default value	Switch description
1 through 7	Off	Reserved.
8	Off	Power-on password override. Changing the position of this switch bypasses the power-on password check the next time the blade server is turned on and starts the Configuration/Setup Utility program so that you can change or delete the power-on password. You do not need to move the switch back to the default position after the password is overridden. See "Using passwords" on page 48 for additional information about the power-on password.

Jumpers

When the BIOS code page jumper (J12) is moved from pins 1 and 2 to pins 2 and 3, you can start the blade server from a backup BIOS page. The default position is pins 1 and 2. See the blade server *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *BladeCenter Documentation* CD for complete details.

Note: If you start the blade server from the backup page because the primary BIOS page has become damaged, you need to flash the primary BIOS code.

Chapter 2. Blade server power, controls, and indicators

This chapter describes the power features, how to turn on and turn off the blade server, and what the controls and indicators mean.

Turning on the blade server

After you connect the BladeCenter unit 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) to start the server.

Notes:

1. After you connect the power cords of your BladeCenter unit to the electrical outlets, 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 BladeCenter 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 “Blade server controls and LEDs” on page 15 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 BladeCenter management module to do so).
 - You can turn on the blade server remotely by means of the service processor in the BladeCenter management module.
 - If your 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 Web interface.

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 your operating system before you turn off the blade server. See your 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). This starts an orderly shutdown of the operating system, if this feature is supported by your 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.

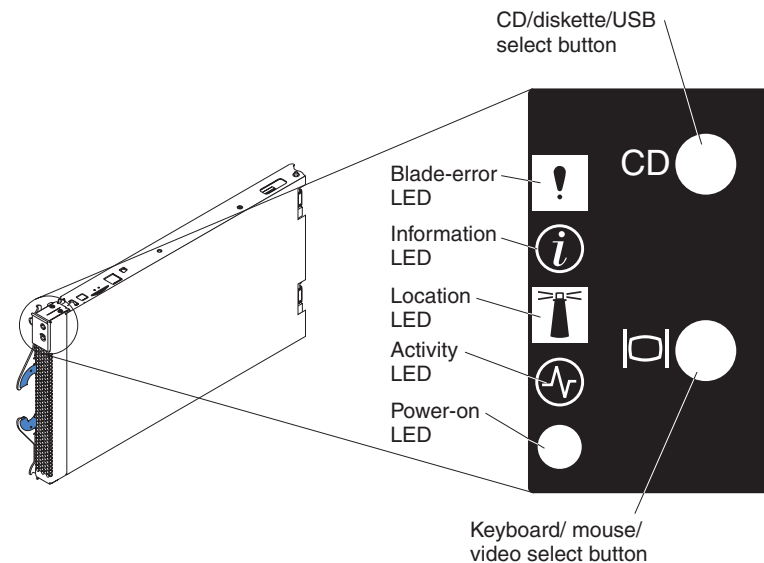
- If the operating system stops functioning, you can press and hold the power-control button for more than 4 seconds to turn off the blade server.
- The management module can turn off the blade server.

Note: After turning off the blade server, wait at least 30 seconds for its hard disk drives to stop spinning before you remove the blade server from the BladeCenter unit.

Blade server controls and LEDs

This section describes the controls and light-emitting diodes (LEDs) on your blade server.

Note: The control panel door is shown in the closed (normal) position in this illustration.



CD/diskette/USB select button: Press this button to associate the CD-ROM drive, diskette drive, and USB port with this blade server. The LED on this button flashes while the request is being processed, then is steady when the ownership of the CD-ROM drive, diskette drive, and USB port has been transferred to this blade server. It can take up to 20 seconds for the operating system in this blade server to recognize the CD-ROM drive, diskette drive, and USB port.

If there is no response when you press the CD/diskette/USB select button, you can use the management-module Web interface to see if local control has been disabled on the blade server.

Blade-error LED: When this amber LED is lit, it indicates that a system error has occurred in the blade server.

Information LED: When this amber LED is lit, it indicates that information about a system error for this blade server has been placed in the BladeCenter system error log.

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

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

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

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

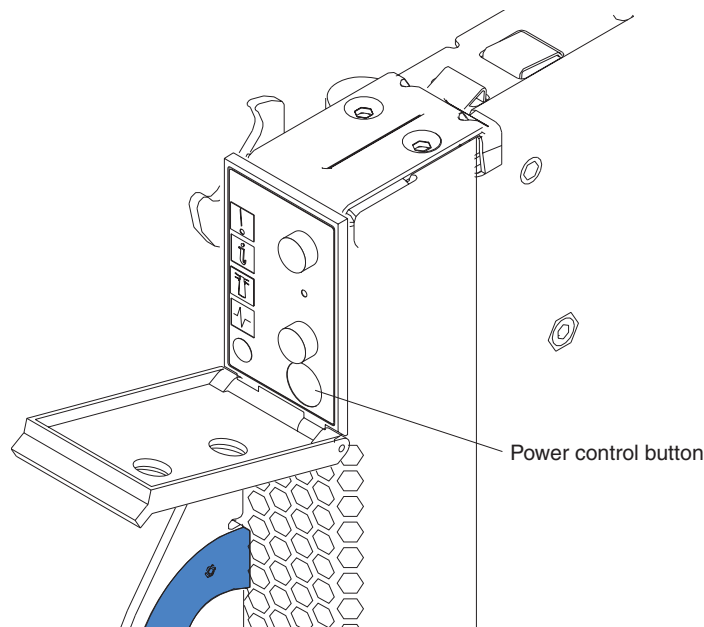
Keyboard/mouse/video select button: Press this button to associate the keyboard port, mouse port, and video port with this blade server. The LED on this button flashes while the request is being processed, then is steady when the ownership of the keyboard, mouse, and video has been transferred to this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

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

You can also press keyboard keys in the following sequence to switch keyboard/mouse/video 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.



Power-control button: This button is behind the control panel door. Press this button to manually turn the blade server on or off.

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 BladeCenter management-module Web interface.

Notes:

1. The operating system in the blade server must provide USB support for the blade server to recognize and use the keyboard, mouse, CD-ROM drive, and diskette drive. The BladeCenter unit uses USB for internal communication with these devices.
2. Although the keyboard attached to the BladeCenter unit is a PS/2[®]-style keyboard, communication with it is through a USB bus. When you are running an operating system that does not have USB drivers, such as in the following instances, 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
3. If you install Microsoft[®] Windows[®] 2000 on the blade server while it is not the current owner of the keyboard, video, and mouse, a delay of up to one 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).
4. The blade-error LED, information LED, and location LED can be turned off through the BladeCenter management-module Web interface or the IBM Director console. The IBM Director program is a system-management product that comes with the BladeCenter unit.

Chapter 3. Installing options

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

Installation guidelines

Before you begin to install options in your blade server, read the following information:

- Read the safety information beginning on page vii and the guidelines in “Handling static-sensitive devices”. This information will help you work safely with your blade server and options.
- Back up all important data before you make changes to disk drives.
- For a list of supported options for your blade server, go to <http://www.ibm.com/pc/us/compat/>.
- 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.

System reliability considerations

To help ensure proper cooling and system reliability, make sure that microprocessor socket 2 always contains either the microprocessor heat sink filler or a microprocessor and heat sink.

Handling static-sensitive devices

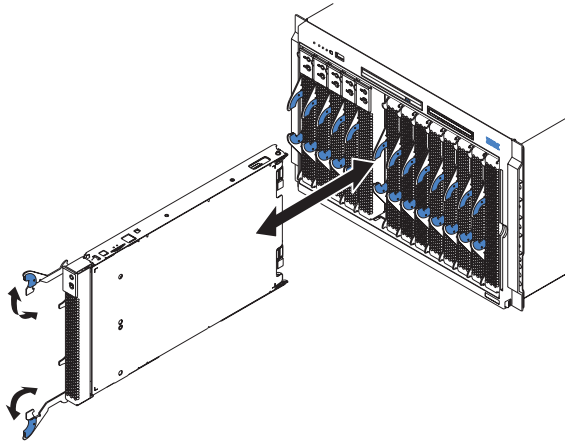
Attention: Static electricity can damage electronic devices and your system. To avoid damage, keep static-sensitive devices in their static-protective packages until you are ready to install them.

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

- 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 printed circuitry.
- Do not leave the device where others can handle and possibly damage the device.
- While the device is still in its static-protective package, touch it to an unpainted metal part of the system unit for at least two seconds. (This drains static electricity from the package and from your body.)
- Remove the device from its package and install it directly into your system unit without setting it down. If it is necessary to set the device down, place it in its static-protective package. Do not place the device on your blade server cover or on a metal table.
- Take additional care when handling devices during cold weather because 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 the BladeCenter unit.



Attention:

- To maintain proper system cooling, do not operate the BladeCenter unit for more than one minute without either 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.

Complete the following steps to remove the blade server:

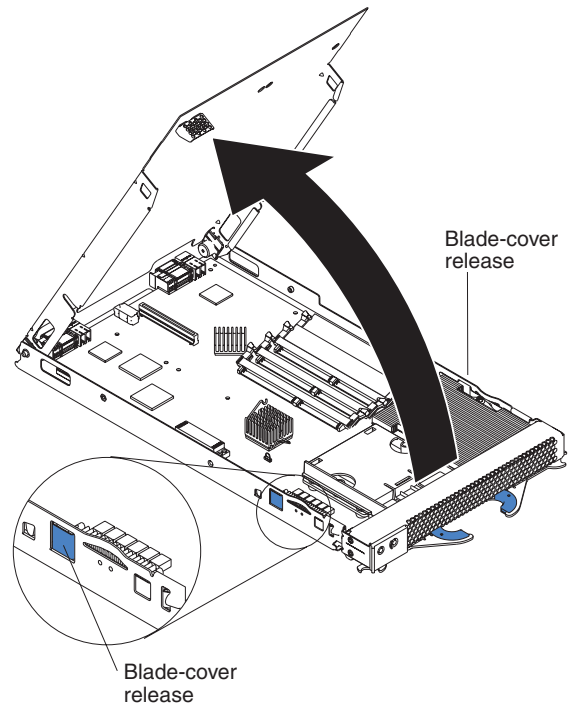
1. If the blade server is operating, shut down the operating system; then, press the power-control button (behind the blade server control panel door) to turn off the blade server. See “Blade server controls and LEDs” on page 15 for more information about the location of the power-control button.

Attention: Wait at least 30 seconds, until the drives stop spinning, before proceeding to the next step.

2. Open the two release levers 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 server in the bay within one minute. The recessed spring-loaded doors will move out of the way as you insert the blade server or filler blade.

Opening the blade server cover

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



Complete the following steps to open the blade server cover:

1. Review the information in “Safety” beginning on page vii and “Installation guidelines” on page 19.
2. Carefully lay the blade server down on a flat, non-conductive surface, with the cover side up.
3. Press the blade-cover release on each side of the blade server and lift the cover open, as shown in the illustration.
4. Lay the cover flat, or lift it from the blade server.

Statement 21:

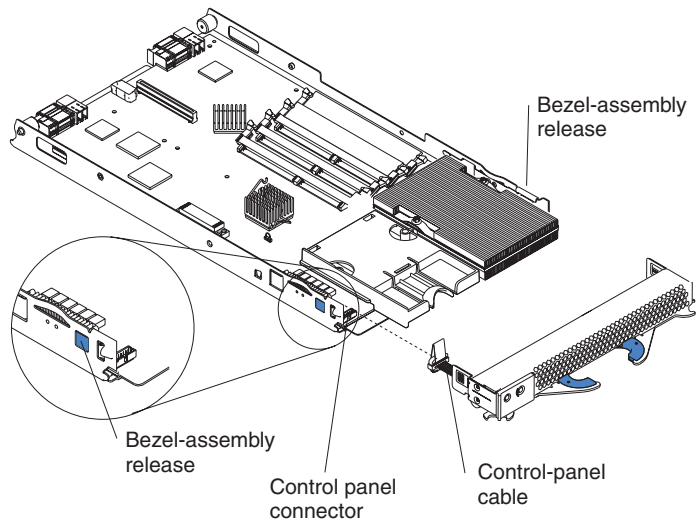


CAUTION:

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

Removing 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 from a blade server.



Complete the following steps to remove the blade server bezel assembly:

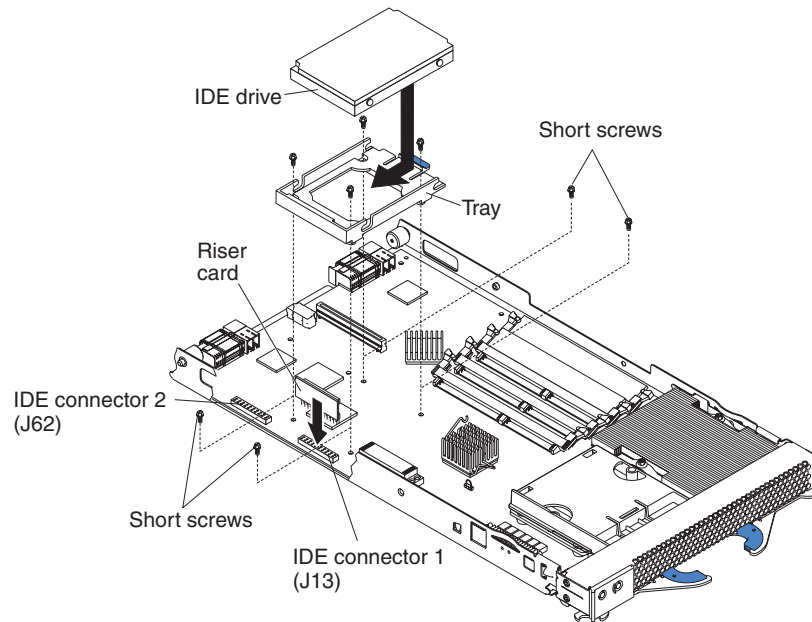
1. Review the information in “Safety” beginning on page vii and “Installation guidelines” on page 19.
2. Open the blade server cover.
3. Press the bezel-assembly release and pull the bezel assembly away from the blade server approximately 1.2 cm (0.5 inch).
4. Disconnect the control-panel cable from the control-panel connector.
5. Pull the bezel assembly away from the blade server.
6. Store the bezel assembly in a safe place.

Installing IDE hard disk drives

Your blade server has two connectors on the system board for installing optional 2.5-inch IDE hard disk drives. Each IDE connector is on a separate bus. Some models come with at least one IDE hard disk drive already installed.

Two IDE drives can be used to implement and manage RAID level-1 under both the Linux and Microsoft Windows 2000 operating systems.

Attention: To maintain proper system cooling, do not operate the BladeCenter unit for more than one minute without either a blade server, expansion unit, or filler blade installed in each blade bay.



Complete the following steps to install a 2.5-inch IDE hard disk drive.

Note: Do not install a hard disk drive in IDE connector 2 if you intend to also install an optional I/O expansion card. The I/O expansion card occupies the same area as the second IDE hard disk drive.

1. Review the information in “Safety” beginning on page vii and “Installation guidelines” on page 19.
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 20 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 21 for instructions.
5. Insert the riser card from the option kit into an IDE connector on the blade server system board.

Important: Drives must be installed in the following order: IDE connector 1 (J13) first, then IDE connector 2 (J62).

6. Place the hard disk drive tray from the option kit over the riser card as shown in the illustration, aligning the tray with the screw holes on the system board. The screw holes have screws in them.
7. Remove the tray temporarily; then, remove the screws from the screw holes on the system board and replace the tray. Secure the tray to the system board with screws from the kit.
8. Set any jumpers or switches on the hard disk drive.

Important: Both IDE hard disk drives must be set to Master.

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

9. Place the hard disk drive into the tray and push it, from the rear edge of the hard disk drive, into the connector on the riser card until the hard disk drive moves past the lever at the back of the tray. The hard disk drive clicks into place.

10. If you have other options to install or remove, do so now; otherwise, go to “Completing the installation” on page 38.

Installing memory modules

You can increase the amount of memory in your blade server by installing memory-module options. When you install memory, you must install a pair of matched dual inline memory modules (DIMMs).

Notes:

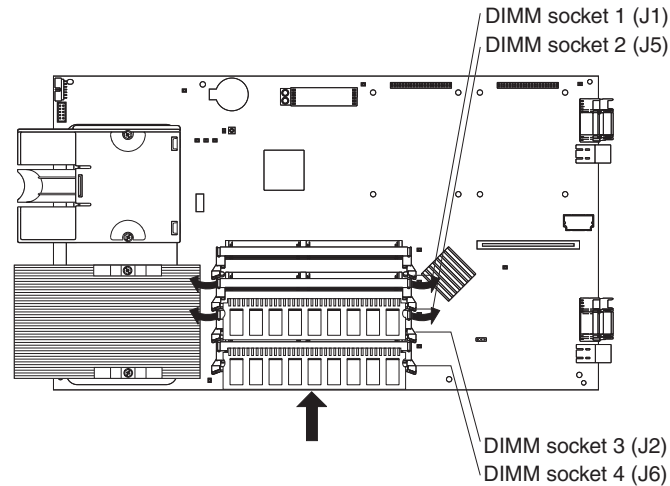
1. The system board contains four DIMM connectors and supports two-way memory interleaving.
2. The DIMM options available for your blade server are 256 MB, 512 MB, and 1 GB (2 GB when available). Your blade server supports a minimum of 512 MB and a maximum of 4 GB (8 GB with availability of 2 GB DIMMs) of system memory.
3. Your blade server comes with two 256 MB DIMMs installed in the DIMM 3 and DIMM 4 memory connectors (J2 and J6, respectively). When you install additional DIMMs, be sure to install them as a pair, in DIMM connectors 1 and 2 (J1 and J5).

Install the DIMMs in the following order:

Pair	DIMM connectors
First	3 and 4 (J2, J6)
Second	1 and 2 (J1, J5)

4. Both DIMMs in a pair must be the same size, speed, type, and technology. You can mix compatible DIMMs from various manufacturers.
5. The second pair does not have to be DIMMs of the same size, speed, type, and technology as the first pair.
6. Install only 2.5 V, 184-pin, double-data-rate (DDR), PC2100, registered synchronous dynamic random-access memory (SDRAM) with error correcting code (ECC) DIMMs. These DIMMs must be compatible with the latest PC2100 SDRAM Registered DIMM specification, which is available from <http://www.jedec.org/>. For a list of supported options for your blade server, go to <http://www.ibm.com/pc/us/compat/>.
7. PC2100 DIMMs are backward-compatible and work in the PC1600 sockets.
8. Installing or removing DIMMs changes the configuration information for the blade server. Therefore, 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, the system 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 45 for more information.

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



Before you begin, read the documentation that comes with your option.

Complete the following steps to install a DIMM:

1. Review the information in “Safety” beginning on page vii and “Installation guidelines” on page 19.
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 20 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 21 for instructions.
5. Locate the DIMM connectors on the system board. Determine the connectors into which you will install the DIMMs. (See note 3 on page 24.)
6. Touch the static-protective package that contains the DIMM option to any *unpainted* metal surface on the BladeCenter chassis or any *unpainted* surface on any other grounded rack component. Then, remove the DIMM from the package.
7. 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. Be 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 properly installed. In this case, open the retaining clips and remove the DIMM; then, reinsert the DIMM.
8. If you have other options to install or remove, do so now; otherwise, go to “Completing the installation” on page 38.

Installing an additional microprocessor

Your blade server comes with one or two microprocessors installed on the system board. Your blade server supports two microprocessors. With two microprocessors, your 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 your blade server comes with one microprocessor, you can install a second 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/pc/us/compat/>.

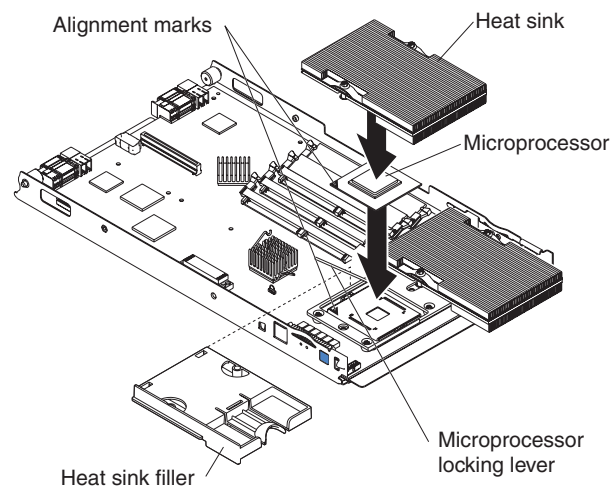
Attention: To ensure proper blade server operation when you install a second microprocessor, observe the following precautions:

- 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).
- Ensure that the microprocessor with the lowest feature set is the startup (bootstrap) microprocessor installed in the Microprocessor 1 socket (location U66).

Notes:

1. For a list of microprocessors supported by your blade server, go to the ServerProven® list at <http://www.ibm.com/pc/us/compat/>.
2. Thoroughly review the documentation that comes with the microprocessor, so that you can determine whether you need to update the blade server BIOS code. The latest level of BIOS code for your blade server is available from the World Wide Web. See Appendix A, “Getting help and technical assistance”, on page 65 for the World Wide Web addresses.
3. The microprocessor sockets in this server contain built-in termination for the microprocessor bus; therefore, no terminator card is required if a second microprocessor is not installed in microprocessor socket 2. However, for proper airflow, this socket must contain a microprocessor heat-sink filler, sometimes called a microprocessor baffle.
4. The microprocessor speeds are automatically set for this server; therefore, you do not need to set any microprocessor frequency-selection jumpers or switches.

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



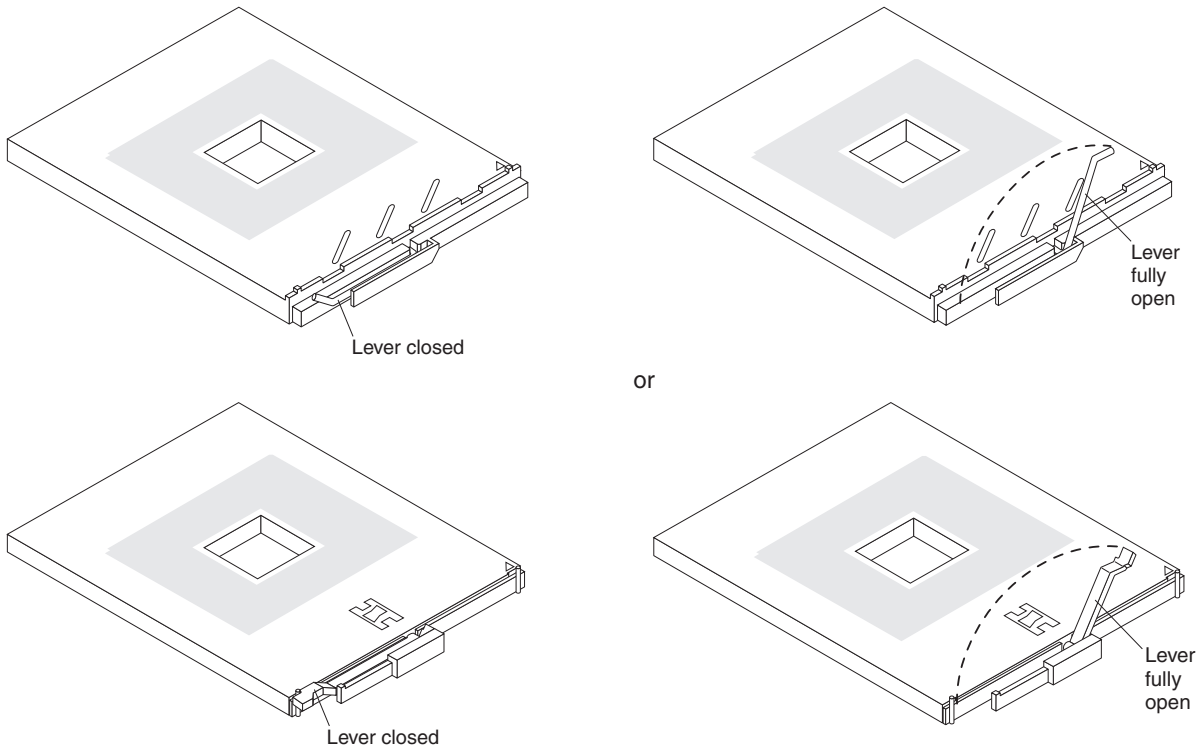
Complete the following steps to install an additional microprocessor:

1. Review the information in “Safety” beginning on page vii and “Installation guidelines” on page 19.

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 20 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 21 for instructions).
5. Remove the bezel assembly (see “Removing the blade server bezel assembly” on page 22 for instructions).
6. Locate the microprocessor socket on the system board.
7. Remove the heat-sink filler.
8. Install the microprocessor:
 - a. Remove the protective cover, tape, or label from the surface of the microprocessor socket, if one is present.
 - b. Touch the static-protective package containing the new microprocessor to any *unpainted* metal surface on the BladeCenter chassis or any *unpainted* surface on any other grounded rack component; then, remove the microprocessor from the package.

- 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 135° angle), as shown.

Attention: You must ensure 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, and 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.

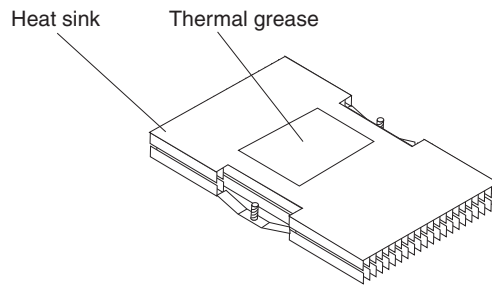
- e. Carefully close the lever to secure the microprocessor in the socket.

9. Install a heat sink on the microprocessor:

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

Attention:

- 1) Do not set down the heat sink after you remove the plastic cover.



- 2) 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.
 - b. Align and place the heat sink on top of the microprocessor in the retention bracket, grease side down. Press firmly on the heat sink.
 - c. Using a screwdriver, secure the heat sink to the retention bracket on the system board using the two captive mounting screws. Press firmly on the screws and tighten them, alternating between them. Do not overtighten the screws.
10. If you have other options to install or remove, do so now; otherwise, go to “Completing the installation” on page 38.

Installing an I/O expansion card

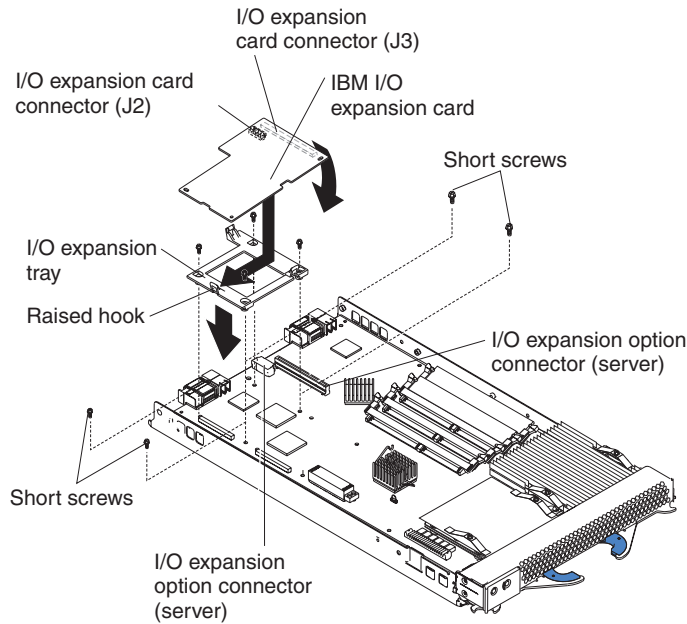
You can add an optional I/O expansion card to your blade server to give the blade server additional network connections for communicating on a network.

Attention: When you add an I/O expansion card, you must make sure that the switch modules in switch-module bays 3 and 4 on the BladeCenter unit both support the I/O expansion card network-interface type. For example, if you add an Ethernet expansion card to your blade server, the modules in switch-module bays 3 and 4 on the BladeCenter unit must both be compatible with the Ethernet expansion card. All other I/O expansion cards installed on other blade servers in the BladeCenter unit must also be compatible with these switch 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 allow use of several different types of compatible I/O expansion cards within the same BladeCenter unit.

Important: Installation of an I/O expansion card requires removal of the hard disk drive installed in IDE connector 2. The I/O expansion card occupies the same space as this hard disk drive and replaces it. You can not install a hard disk drive in IDE connector 2 while an I/O expansion card is installed in the blade server.

- If the hard disk drive installed in IDE connector 2 contains any information that you want to keep, back it up to another storage device.
- If the hard disk drive installed in IDE connector 2 is part of a RAID array, unconfigure this RAID array before removing the hard disk drive. See your operating system documentation for instructions.

The following illustration shows how to install an I/O expansion card on the blade server. The card is installed near IDE connector 2.



Complete the following steps to install an I/O expansion card:

1. Review the information in “Safety” beginning on page vii and “Installation guidelines” on page 19.
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 20 for information).
3. Carefully lay the blade server on a flat, non-conductive surface.
4. Open the cover (see “Opening the blade server cover” on page 21 for instructions).
5. If an IDE hard disk drive is in IDE connector 2, remove the hard disk drive and tray (save the screws that secured the tray to the system board); otherwise, remove the screws near IDE connector 2 that secure the system board to the chassis, as shown in the illustration.
6. Install the I/O expansion card:
 - a. Install the I/O expansion card tray. Secure the tray to the system board with the screws from the option kit, as shown in the illustration.
 - b. Orient the I/O expansion card as shown in the illustration.
 - c. Slide the notch in the narrow end of the card into the raised hook on the tray; then, gently pivot the wide end of the card into the I/O expansion card connectors, as shown in the illustration.

Note: For device driver and configuration information to complete the installation of the I/O expansion card, see the documentation that comes with the option. Some documentation might also be on the IBM *BladeCenter Documentation* CD that comes with the BladeCenter unit.

7. If you have other options to install or remove, do so now; otherwise, go to “Completing the installation” on page 38.

Installing a SCSI storage expansion unit

To use SCSI hard disk drives with your blade server, install a SCSI storage expansion unit, such as the IBM HS20 SCSI Storage Expansion Unit, on the blade server. You will then be able to install two 3.5-inch, hot-swap, SCSI, 1-inch (26 mm) slim-high hard disk drives in the expansion unit, for use by the blade server. The SCSI controller in the HS20 SCSI storage expansion unit supports RAID level-1 (embedded mirroring).

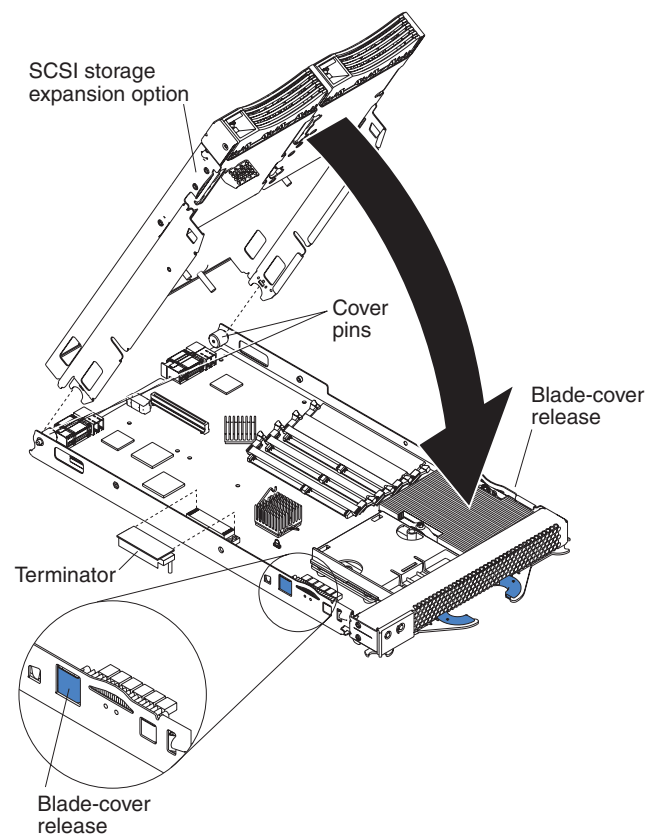
Important: To avoid potential performance and reliability problems when configuring or replacing drives in a mirrored configuration, ensure that the storage capacities and speeds of the drives are identical.

Notes:

1. After you install the SCSI storage expansion unit on your blade server, the blade server and expansion unit become a single unit that occupies two blade bays in the BladeCenter unit.
2. To ensure proper cooling and system reliability, make sure that each of the SCSI hard disk drive bays on the SCSI storage expansion unit contains either a hot-swap SCSI hard disk drive or a filler panel.

For a list of SCSI hard disk drives supported by your blade server, go to the ServerProven list at <http://www.ibm.com/pc/us/compat/>.

The following illustration shows how to install the SCSI storage expansion unit on the blade server.



Complete the following steps to install the SCSI storage expansion unit:

1. Review the information in “Safety” beginning on page vii and “Installation guidelines” on page 19.
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 20 for instructions).
3. Carefully lay the blade server on a flat, non-conductive surface.
4. Remove the blade server cover.
 - a. Open the blade server cover (see “Opening the blade server cover” on page 21 for instructions) and lift it off the blade server.
 - b. Store the cover in a safe place.
5. Locate the SCSI connector on the system board and remove the terminator from the connector.
6. Install the SCSI storage expansion unit:
 - a. Orient the storage expansion unit as shown in the illustration.
 - b. Lower the storage expansion unit so that the slots at the rear slide down onto the pins at the rear of the blade server.
 - c. Pivot the storage expansion unit closed and press it firmly into place until the cover-release latches click. The connector on the expansion unit automatically aligns with and plugs into the SCSI expansion connector (J8) on the system board.
7. Insert the combined blade server and expansion unit into two adjacent BladeCenter unit bays.

Note: When any blade server or option is in blade bays 7 through 14, power modules must be present in power bays 1 and 2, *and* power modules must be present in power bays 3 and 4.
8. Turn on the blade server.
9. If you have not already done so, install the LSI device drivers for your operating system. LSI device drivers are on the *Resource* CD that comes with the BladeCenter unit. You can also get the latest version of the drivers from the IBM Support Web site at <http://www.ibm.com/pc/support/>.

With the storage expansion unit installed on your blade server, you can install up to two hot-swap SCSI hard disk drives in the option and configure them for embedded mirroring (RAID level1). Each SCSI device must have a unique SCSI ID. This ID enables the SCSI controller in the I/O expansion card to identify the device and ensure that different devices on the same SCSI channel do not attempt to transfer data simultaneously. The SCSI IDs for the hard disk drives in the expansion unit are permanent (not configurable). Table 2 lists the SCSI IDs for the hard disk drives that are installed in the expansion unit. See “Installing a SCSI hot-swap hard disk drive” on page 33 for instructions for installing hard disk drives.

Table 2. SCSI IDs for hot-swap hard disk drives in the expansion unit

Device	SCSI ID
Drive bay 1	0
Drive bay 2	1

Note: SCSI ID 7 is usually reserved for the SCSI controller; however, this SCSI ID is changeable through the ServeRAID™ configuration program or the LSI configuration program utility.

Use the Configuration/Setup Utility program in the blade server to enable or disable the SCSI controller in the storage expansion unit. See the documentation that comes with the storage expansion unit for information about configuring the storage expansion unit and SCSI hard disk drives.

Installing a SCSI hot-swap hard disk drive

If you have installed a SCSI storage expansion unit on the blade server, you can install up to two SCSI hot-swap hard disk drives in the bays in the expansion unit.

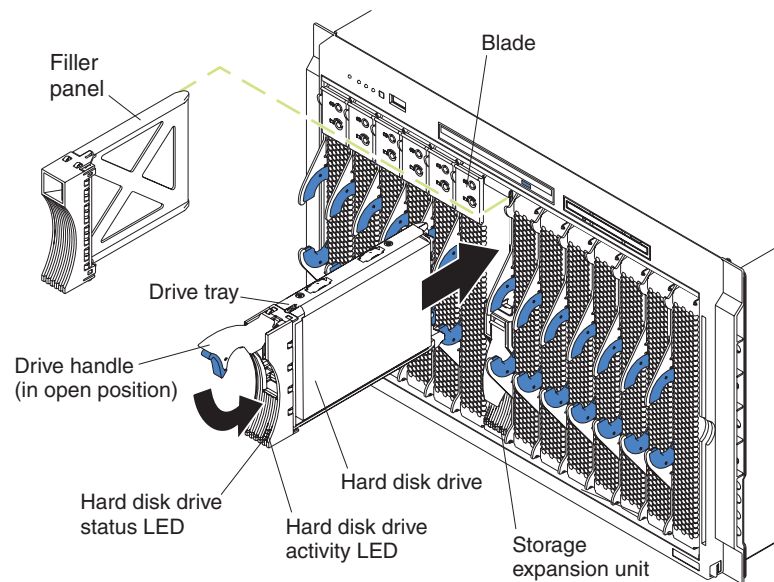
If a hot-swap hard disk drive in the expansion unit fails, you can replace it without turning off the blade server. Therefore, you have the advantage of continuing to operate your blade server while a hard disk drive in this unit is removed or installed.

Each hot-swap hard disk drive has two indicator LEDs. If the amber hard disk drive status LED for a hard disk drive is lit continuously, that hard disk drive is faulty and must be replaced.

Each hot-swap hard disk drive that you plan to install must be mounted in a hot-swap-drive tray. The hard disk drive must have a Single Connector Attachment (SCA) connector. Hot-swap-drive trays come with the hot-swap hard disk drives.

For a list of SCSI hard disk drives supported by your blade server, go to the ServerProven list at <http://www.ibm.com/pc/us/compat/>.

The following illustration shows how to install a SCSI hot-swap hard disk drive.



Complete the following steps to install a SCSI hot-swap hard disk drive in a storage expansion unit.

Attention: To maintain proper system cooling, do not operate the BladeCenter unit for more than one minute without either a hot-swap hard disk drive or a filler panel installed in each storage expansion unit bay.

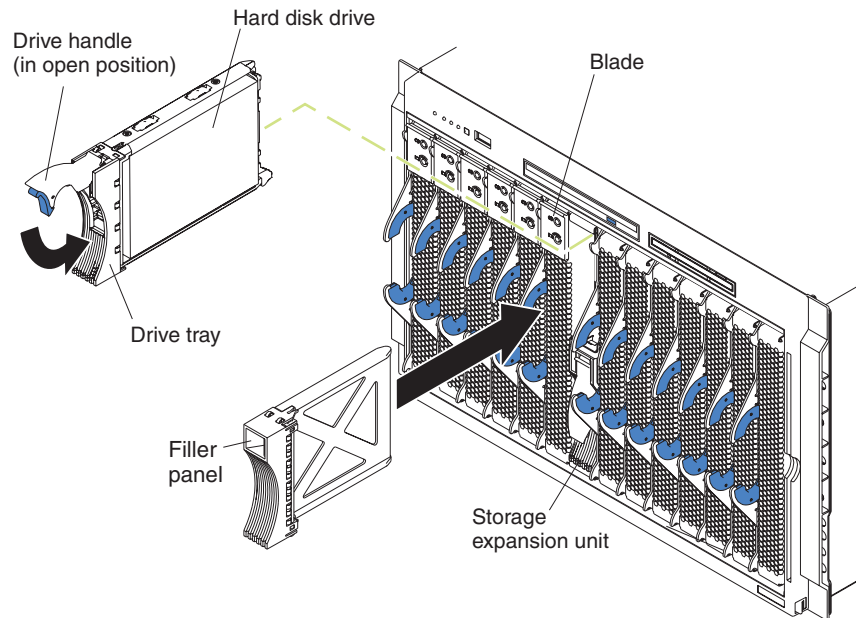
1. Review the information in “Safety” beginning on page vii and “Installation guidelines” on page 19.

2. Remove the filler panel from one of the empty hot-swap bays by inserting your finger into the depression at the top of the filler panel and pulling it away from the expansion unit.
3. Install the SCSI hot-swap hard disk drive:
 - a. Ensure that the tray handle is open (that is, perpendicular to the hard disk drive).
 - b. Align the hard disk drive assembly with the guide rails in the bay.
 - c. Gently push the hard disk drive assembly into the bay until it stops.
 - d. Push the tray handle to the closed (locked) position.
 - e. Check the hard disk drive LEDs to verify that the hard disk drive is operating properly.
 - If the amber hard disk drive status LED for a hard disk drive is lit continuously, that hard disk drive is faulty and needs to be replaced.
 - If the green hard disk drive activity LED is flashing, the hard disk drive is being accessed.

See the documentation that comes with the expansion unit for information about configuring the expansion unit and SCSI hard disk drives.

Replacing a SCSI hot-swap hard disk drive

If a hard disk drive in the storage expansion unit fails, you can replace it without turning off the blade server.



Complete the following steps to replace a SCSI hot-swap hard disk drive in a storage expansion unit hot-swap bay.

Attention: To maintain proper system cooling, do not operate the BladeCenter unit for more than one minute without either a hot-swap hard disk drive or a filler panel installed in each storage expansion unit bay.

1. Review the information in “Safety” beginning on page vii and “Installation guidelines” on page 19.
2. Locate the defective hard disk drive (look for an amber status LED that is lit on the front of the hard disk drive).
3. Make sure the hard disk drive has stopped spinning.
4. Move the handle on the hard disk drive to the open position (perpendicular to the hard disk drive), and pull the hot-swap hard disk drive assembly from the bay.
5. Within one minute, install the replacement hard disk drive in the hot-swap bay (see “Installing a SCSI hot-swap hard disk drive” on page 33 for instructions).

Replacing the battery

IBM has designed this product with your safety in mind. The lithium battery must be handled correctly to avoid possible danger. If you replace the battery, you must adhere to the following instructions.

Note: In the U. S., call 1-800-IBM-4333 for information about battery disposal.

If you replace the original lithium battery with a heavy-metal battery or a battery with heavy-metal components, be aware of the following environmental consideration. Batteries and accumulators that contain heavy metals must not be disposed of with normal domestic waste. They will be taken back free of charge by the manufacturer, distributor, or representative, to be recycled or disposed of in a proper manner.

To order replacement batteries, call 1-800-772-2227 within the United States, and 1-800-465-7999 or 1-800-465-6666 within Canada. Outside the U.S. and Canada, call your IBM reseller or IBM marketing representative.

Note: After you replace the battery, you must reconfigure your blade server and reset the system date and time.

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:

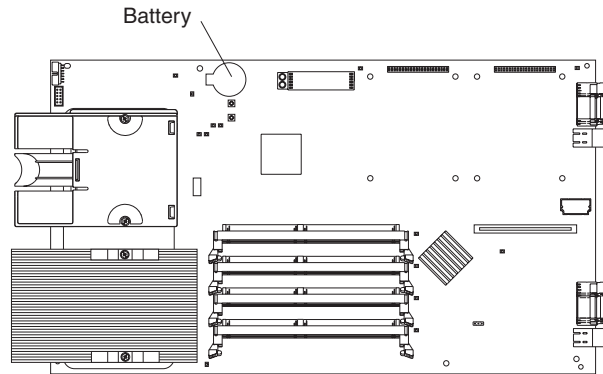
- **Throw or immerse into water**
- **Heat to more than 100°C (212°F)**
- **Repair or disassemble**

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

Complete the following steps to replace the battery:

1. Review the information in “Safety” beginning on page vii and “Installation guidelines” on page 19.
2. Follow any special handling and installation instructions supplied with the battery.
3. Turn off the blade server and remove the blade from the BladeCenter unit (see “Removing the blade server from the BladeCenter unit” on page 20 for instructions).
4. Open the blade server cover (see “Opening the blade server cover” on page 21 for instructions).

5. Locate the battery on the system board.

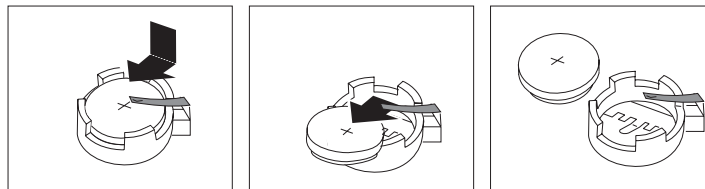


6. Remove the battery:
 - a. Use your finger to press down on one side of the battery; then, slide the battery out from its socket. The spring mechanism will push the battery out toward you as you slide it from the socket.

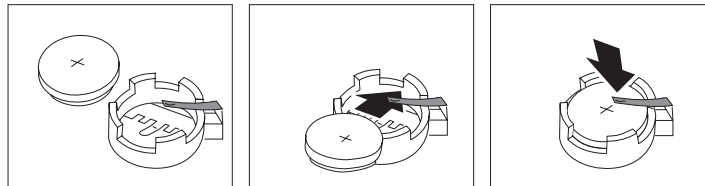
Note: You might need to lift the battery clip slightly with your fingernail to make it easier to slide the battery.

- b. Use your thumb and index finger to pull the battery from under the battery clip.

Note: After you remove the battery, ensure that the battery clip is touching the base of the battery socket by pressing gently on the clip.



7. Insert the new battery:
 - a. Tilt the battery so that you can insert it into the socket, under the battery clip.
 - b. As you slide it under the battery clip, press the battery down into the socket.



8. Close the blade server cover (see “Closing the blade server cover” on page 40).

Statement 21:



CAUTION:

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

9. Reinsert the blade server into the bay in the BladeCenter unit.
10. Turn on the blade server.
11. Start the blade server Configuration/Setup Utility program and set configuration parameters as needed. See “Using the Configuration/Setup Utility program” on page 45 for information.

Completing the installation

To complete the installation, perform 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 39).
2. Close the blade server cover, unless you installed the SCSI storage expansion unit option (see “Closing the blade server cover” on page 40).

Statement 21:



CAUTION:

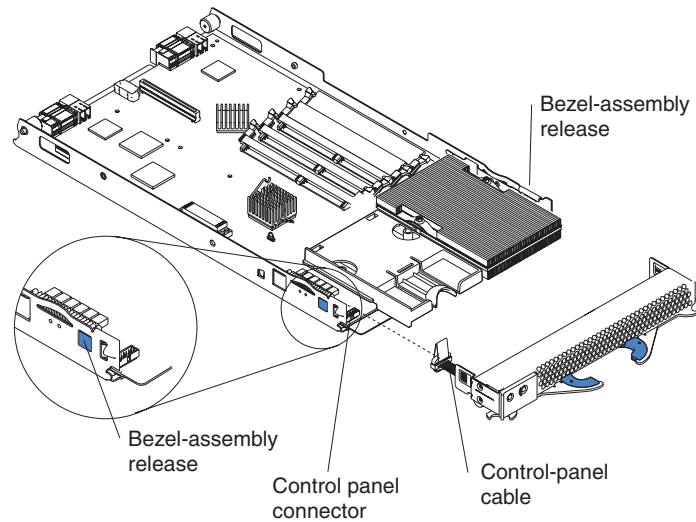
Hazardous energy is present when the blade server is connected to the power source. Always replace the blade cover before installing the blade server.

3. Reinstall the blade server into the BladeCenter unit (see “Installing the blade server in the BladeCenter unit” on page 41).
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 your blade server configuration” on page 42).

Note: If you have just connected the power cords of your BladeCenter unit to electrical outlets, you will have to wait until the power-on LED on the blade server flashes slowly before pressing the power-control button on a blade server.

Installing the blade server bezel assembly

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



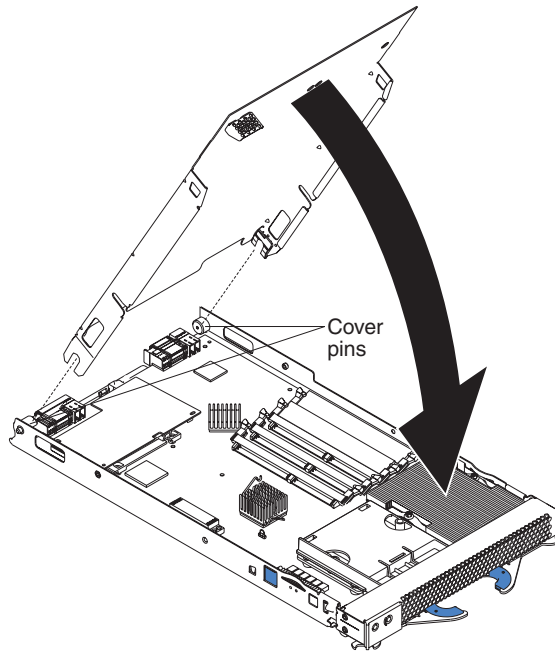
Complete the following steps to install the blade server bezel assembly.

1. Review the information in “Safety” beginning on page vii and “Installation guidelines” on page 19.
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 as shown in the illustration, 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 a SCSI storage expansion unit is installed. Do not attempt to override this protection.

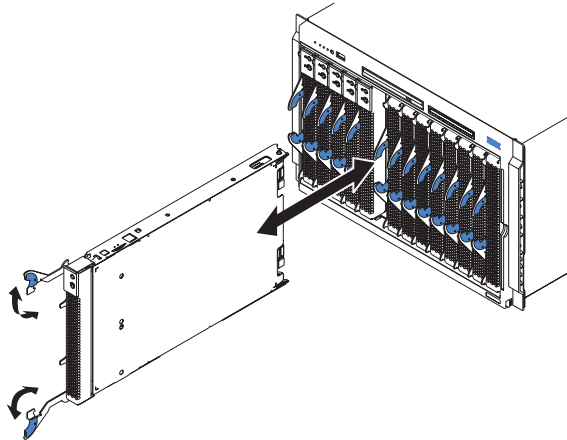
The following illustration shows how to close the blade server cover.



Complete the following steps to close the blade server cover:

1. Review the information in “Safety” beginning on page vii and “Installation guidelines” on page 19.
2. If you removed the blade bezel assembly, replace it now. See “Installing the blade server bezel assembly” on page 39 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 the BladeCenter unit



Complete the following steps to install a blade server in the BladeCenter unit.

Statement 21:



CAUTION:

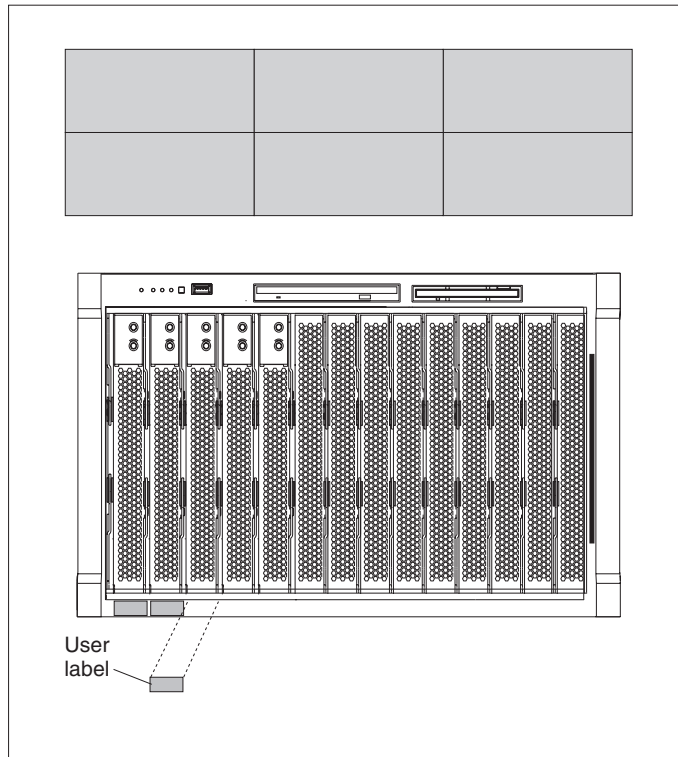
Hazardous energy is present when the blade server is connected to the power source. Always replace the blade cover before installing the blade server.

1. Review the information in “Safety” on page vii and “Installation guidelines” on page 19 through “Handling static-sensitive devices” on page 19.
2. If you have not done so already, install any options needed, such as disk drives or memory, in the blade server.
3. Select the bay for the blade server.

Notes:

- a. If the blade server has a SCSI storage expansion unit installed on it, the blade server and expansion option require two adjacent bays.
 - b. When any blade server or option is in blade bays 7 through 14, power modules must be present in power bays 1 and 2, *and* power modules must be present in power bays 3 and 4.
 - c. 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 BladeCenter unit for more than one minute without either a blade server, expansion unit, or filler blade installed in each blade bay.
4. Ensure that the release levers on the blade server are in the open position (perpendicular to the blade server).
 5. Slide the blade server into the bay until it stops. The spring-loaded doors further back in the bay that cover the bay opening move out of the way as you insert the blade server.
 6. Push the release levers 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. Verify 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. If desired, write identifying information on one of the user labels that come with the blade server; then, place the label on the BladeCenter bezel just below the blade server, as shown in the following illustration.



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 blades to install, do so now.

Attention: If you reinstall a blade server that you removed, you must install it in the same 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 bay than the one from which it was removed could have unintended consequences and you might need to reconfigure the blade server.

If this is the initial installation for a blade server in the BladeCenter unit, you need to configure the blade server with the blade server Configuration/Setup Utility and install the blade server operating system. See “Updating your blade server configuration” and Chapter 5, “Installing the operating system”, on page 53 for details.

Updating your blade server configuration

When you start your blade server for the first time after you add or remove an internal option or an external SCSI device (if the storage expansion unit has been installed), you might see a message telling you that the configuration has changed. The blade server Configuration/Setup Utility program automatically starts so that you can save the new configuration information. See “Using the Configuration/Setup Utility program” on page 45 for more information about the Configuration/Setup Utility program.

Some options have device drivers that you need to install. See the documentation that comes with your option for information about installing any required device drivers.

Your blade server comes with one or two microprocessors installed on the system board. If your blade server comes with two microprocessors, or your blade server comes with one microprocessor and you have installed an additional microprocessor, your blade server can now operate as an SMP server. Therefore, you might need to upgrade your operating system to support SMP. See Chapter 5, “Installing the operating system”, on page 53 and your operating-system documentation for additional information.

Input/output connectors and devices

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

The blade server has two selection buttons on the control panel: the CD/diskette/USB select button and the keyboard/mouse/video select button. See “Blade server controls and LEDs” on page 15 for information about these buttons and their function.

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

Chapter 4. Configuring your blade server

The following configuration programs are provided with your blade server:

- **Configuration/Setup Utility program**

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

- **PXE boot agent utility program**

The Preboot eXecution Environment (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, to display the PXE setup prompt or to disable it, to set the prompt display duration, and to select a power management option. For information about using this utility, see “Using the PXE boot agent utility program” on page 48.

The following product is available for purchase:

- **IBM Remote Deployment Manager Version 4.1 or later**

You can use the IBM Remote Deployment Manager (RDM) Version 4.1 or later product to install a BIOS update onto the blade server. For information about using this product, see “Using Remote Deployment Manager Version 4.1 or later” on page 49.

For information about setting up your network configuration for remote management, such as with the IBM Director products, see the *IBM @server BladeCenter Planning and Installation Guide*. You can obtain the planning guide from the Web site at <http://www.ibm.com/pc/eserver/bladecenter>.

Using the Configuration/Setup Utility program

This section provides the instructions to start the Configuration/Setup Utility program and descriptions of the menu choices.

Starting the Configuration/Setup Utility program

Complete the following steps to start the Configuration/Setup Utility program:

1. Turn on the blade server and watch the monitor screen.
2. When the message Press F1 for Configuration/Setup appears, press F1.
3. Follow the instructions that appear 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 your 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.

This choice is on the full and limited Configuration/Setup Utility menus.

- **System Information**

Select this choice to display information about your 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.

This choice is on the full Configuration/Setup Utility main menu.

- **Product Data**

Select this choice to view the machine type and model of your 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.

Select this choice to enable or disable the integrated IDE and Ethernet controllers.

- The default setting is **Enable** for the IDE and Ethernet controllers. If you select **Disable**, the system will not configure the disabled device, and the operating system will not detect the device. (This is equivalent to disconnecting the device.)

- **Date and Time**

Select this choice to set the system date and time, in 24-hour format (*hour:minute:second*). This choice is on the full Configuration/Setup Utility main menu only.

You can set a time to be added or subtracted from the system time that is sent to the service processor each time the blade server is started. Use the number keys to type the hours and minutes and + or – to add or subtract from the system time. If you want the system clock time to be the same as the service processor clock time, leave the value set at its default of 0.

- **System Security**

Select this choice to set a power-on password. See “Using passwords” on page 48 for more information about the password.

- **Start Options**

Select this choice to view or change the start options. This choice appears only on the full Configuration/Setup Utility main menu. Start options take effect when you start your 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 BladeCenter 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 Preboot eXecution Environment (PXE) option for either of the integrated Gigabit Ethernet controllers. The default setting for this menu item is **Enabled**, which enables the PXE option for the selected controller. To disable this option for a Gigabit Ethernet controller, select **Disabled**.

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

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

- **Advanced Setup**

Select this choice to change settings for advanced hardware features.

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

- **System Partition Visibility**

Select this choice to specify whether the System Partition is to be visible or hidden.

- **Memory Settings**

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

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

- **CPU Options**

Select this choice to enable or disable the microprocessor cache. In addition, you can set the microprocessor cache mode to write-back (WB) or write-through (WT). Write-back caching generally provides better system performance.

- **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.

- **Integrated System Management Processor 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 non-maskable interrupt (NMI) to the blade server.

- **Error Logs**

Select this choice to view or clear the POST error log.

- Select **POST Error Log** to view the three most recent error codes and messages that the system generated during POST.

From the **POST Error Log** menu, select **Clear event/error logs** to clear the Error log.

- **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.

Power-on password

If you set a power-on password, you must type the power-on password to complete the system startup, and you 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 through one of the following methods:

- Remove the blade server battery and then reinstall it (see “Replacing the battery” on page 36).
- 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 need to move the switch back to the previous position after the password is overridden. See “Switches and jumpers” on page 11 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 PXE boot agent utility program

This program is a built-in, menu-driven configuration utility program that you can use to:

- Select the boot protocol and other boot options
- Select whether to display the PXE setup prompt and the display duration
- Select a power management option

Note: The RPL selection for the boot protocol option is not supported for this server.

Starting the PXE boot agent utility program

Complete the following steps to start the PXE boot agent utility program:

1. Turn on the server.
2. When the Broadcom NetXtreme Boot Agent vX.X.X prompt appears, press Ctrl+S.

Notes:

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

- b. By default, you have 2 seconds after the prompt appears on the screen to press Ctrl+S.
3. Use the arrow keys or press Enter to select a choice from the menu.
 - Press Esc to return to the previous menu.
 - Press the F4 key to exit.
4. Follow the instructions on the screen to change the settings of the selected items; then, press Enter.

Using Remote Deployment Manager Version 4.1 or later

You can use the Remote Deployment Manager (RDM) Version 4.1 (or later) program to install a BIOS update onto a blade server. Follow the instructions in the documentation that comes with the RDM program to log in to the blade server and install a BIOS update.

Go to the following Web site for updated information about the RDM Version 4.1 program and for information about purchasing the software:
http://www.ibm.com/pc/ww/eserver/xseries/systems_management/index.html.

Firmware updates

IBM will periodically make firmware updates available for your blade server. Use the following table to determine the methods you can use to install these firmware updates.

Note: The current version of UpdateXpress does not provide support for the BladeCenter and blade server environment. UpdateXpress packages that provide support for the BladeCenter product, when they become available, can be downloaded from <http://www.ibm.com/pc/support/>.

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.

Firmware	Update diskette	RDM	Management module Web interface	Switch module Web interface	Switch module Telnet interface
Blade server BIOS code	Yes	Yes	No	No	No
Blade server diagnostic code	Yes	Yes ¹	No	No	No
Blade server service processor code	Yes	Yes	Yes	No	No

¹ User must set up a custom task.

Updating the service processor firmware

The service processor in your blade server provides the following features:

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

At some time, you might need to flash the service processor to apply the latest firmware. Download the latest firmware for your blade server service processor from the IBM Support Web site at <http://www.ibm.com/pc/support/>. Use the BladeCenter management-module Web interface to flash the service processor. The Web interface is described in the IBM *@server BladeCenter Type 8677 Installation and User's Guide* on the IBM *BladeCenter Documentation CD*.

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 switch modules in switch-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 switch module in switch-module bay 1 or bay 2. The routing from Ethernet controller to switch-module bay will vary based on blade server type and the operating system that is installed. See “Blade server Ethernet controller enumeration” on page 51 for information about how to determine the routing from Ethernet controller to switch-module bay for your 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 this BladeCenter HS20 Type 8832 blade server might have different Ethernet controller routing. See the documentation that comes with the other blade servers for detailed information.

You do not need 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 your Ethernet controllers, see the *Broadcom NetXtreme Gigabit Ethernet Software CD* that comes with your blade server. For updated information about configuring the controllers, go to the IBM Support Web site at <http://www.ibm.com/pc/support/>.

Your Ethernet controllers support failover, which provides automatic redundancy for your 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 your 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 to each other.

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 a blade server uses through your operating system settings.

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

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

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

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 Remote Deployment Manager (RDM) Version 4.1 (or later) program to log in to the blade server and install a supported Microsoft Windows operating system.
- Download the latest operating system installation instructions from the IBM Support Web page at <http://www.ibm.com/pc/support/> and install the operating system at the BladeCenter unit (local deployment).

Note: 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, CD-ROM drive, and diskette drive. The BladeCenter unit uses USB for internal communication with these devices.
2. Some operating systems, such as Red Hat Linux 7.3, permit you to select the type of mouse being used. If offered this choice, select USB instead of PS/2. Although the mouse is a PS/2-style device, communication with the mouse is through an internal USB bus in the BladeCenter chassis; therefore, the operating system in your blade server must recognize the mouse as a USB device.

Using RDM Version 4.1 or later

You can use the RDM version 4.1 (or later) program to install a supported Microsoft Windows operating system on a blade server. Follow the instructions in the documentation that comes with the RDM program to log in to the blade server and install a supported Microsoft Windows operating system.

Downloading installation instructions

Complete the following steps to download the installation instructions:

1. Go to the IBM Support Web page at <http://www.ibm.com/pc/support/>.
2. From the **Browse by product** list on the IBM Support Web page, select **Servers**.
3. Under **Select your product**, from the **Family** list, select your server model; then, select **Display documents**.
4. From the **View by document type** list, select **OS 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 your blade server.

If you cannot locate and correct the problem using the information in this section, see the *BladeCenter HS20 Type 8832 Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *BladeCenter Documentation* CD that comes with your BladeCenter unit, and the “Server Support” flowchart in the front of this book.

Diagnostic tools overview

The following tools are available to help you identify 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” and the *BladeCenter HS20 Type 8832 Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *BladeCenter Documentation* CD that comes with your BladeCenter unit for more information.

- **Troubleshooting charts**

These charts list problem symptoms and steps to correct the problems. See the “Troubleshooting charts” on page 58 for more information.

- **Diagnostic programs and error messages**

The system diagnostic programs are provided in ROM. These programs test the major components of your blade server. The IBM Director product provides a real-time diagnostic program that tests the major components of your blade server, including the BladeCenter CD-ROM drive and diskette drive, while the server operating system is running. See the documentation for the IBM Director product on the *IBM Director* CD that comes with the BladeCenter unit for more information.

Note: See the *BladeCenter HS20 Type 8832 Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *BladeCenter Documentation* CD that comes with your BladeCenter unit for more information.

- **Light Path Diagnostics feature**

Use the Light Path Diagnostics feature to identify system errors quickly. See the “Light Path Diagnostics feature overview” on page 62 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. You can use the following beep code descriptions to help identify and resolve problems that are detected during startup.

Note: See “Diagnostics” in the *BladeCenter HS20 Type 8832 Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *BladeCenter Documentation* CD that comes with your BladeCenter unit for more information about the POST beep codes.

One beep

Indicates successful completion of POST.

Repeating long beeps

Indicates that a memory error has occurred. Ensure that all DIMMs are correctly installed.

One long beep and two short beeps

Indicates that a video error has occurred and the BIOS code cannot initialize the video screen to display any additional information.

Beep codes for specific problems

Beep codes indicating specific system problems are listed in the following table.

Table 3. 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 boot from the backup BIOS code page. 2. Restart the blade server and flash 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. Verify that the system 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.

Note: See the “Diagnostics” in the *BladeCenter HS20 Type 8832 Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *BladeCenter Documentation* CD that comes with your BladeCenter unit for more information about the POST error messages.

Table 4. Abbreviated list of POST error messages

POST message	Failing device or problem found	Suggested action
161	Real-time clock battery has failed	Replace the battery yourself or call for service.
162	Change in device configuration	<p>Verify that your optional devices are turned on and installed correctly.</p> <p>Note: If you are unable to start the Configuration/Setup Utility program, view the system event log in the BladeCenter management module.</p>
163	Time of day has not been set	Set the correct date and time.
289	Failing DIMM was disabled	Verify that your memory is correct for your blade server and that it is installed properly.

Table 4. Abbreviated list of POST error messages (continued)

POST message	Failing device or problem found	Suggested action
301 303	Keyboard and keyboard controller	<ul style="list-style-type: none"> Verify that the keyboard/mouse/video select button LED on the front of the blade server is lit, indicating that the blade server is connected to the shared BladeCenter keyboard. Ensure 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 verify that the parallel-port setting is correct.
11xx	Serial port error	Verify that the serial cable is connected correctly.
1162	Serial port configuration conflict	Start the Configuration/Setup Utility program and ensure that the IRQ and I/O port assignments needed by the serial port are available.
1800	PCI adapter hardware interrupt	Start the Configuration/Setup Utility program and verify that the interrupt resource settings are correct.
2400 2462	Video controller and memory	<ul style="list-style-type: none"> Verify that the keyboard/mouse/video select button LED on the front of the blade server is lit, indicating that the blade server is connected to the shared BladeCenter monitor. Verify that the monitor is connected correctly to the BladeCenter unit.
00019xxx	Processor <i>x</i> is not functioning or failed the built-in test	Verify 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 ensure that the resources needed by the PCI adapter are available.
01295085	ECC-checking hardware test failed	Have the system board serviced.
012980xx 012981xx	Data for processor <i>x</i>	Download and install the latest system BIOS code level.
01298200	Microprocessor speed mismatch	Install microprocessors with identical speeds.
I9990305	POST could not find an operating system.	Install your operating system.

Troubleshooting charts

The following tables list problem symptoms and suggested solutions. See the *BladeCenter HS20 Type 8832 Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *BladeCenter Documentation* CD for more detailed troubleshooting charts. If you cannot find the problem in the troubleshooting 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.

Monitor problems

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

Monitor symptom	Suggested action
The monitor goes blank when you direct it to a working blade server, or goes blank when you start some application programs in the blade servers.	<p>Verify that the monitor cable is connected to the video port on the BladeCenter 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 persists, see the IBM <i>BladeCenter Type 8677 Hardware Maintenance Manual and Troubleshooting Guide</i> on the IBM <i>BladeCenter Documentation</i> CD.</p>
The screen is blank.	<p>Verify that:</p> <ol style="list-style-type: none">1. The keyboard/mouse/video select button LED on the front of the blade server is lit, indicating that the blade server is connected to the shared BladeCenter monitor.2. The system power cord is connected to the BladeCenter power module and a working electrical outlet.3. The monitor cables are connected properly.4. 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 display screen. If this occurs and the Boot Fail Count feature in the Start Options of the Configuration/Setup Utility program is set to Enabled (its default setting), you must restart the server three times to force the system BIOS to reset the CMOS values to the default memory configuration (memory connector or bank of connectors Enabled)</p> <p>If the items above are correct and the screen remains blank, call for service.</p>
Only the cursor appears.	<p>Verify 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>

Monitor symptom	Suggested action
The screen is wavy, unreadable, rolling, distorted, or has screen jitter.	<p>If the monitor self-tests show the monitor is working properly, 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. (Moving a color monitor while it is turned on might cause screen discoloration.) Then move the device and the monitor at least 305 mm (12 in.) apart. Turn on the monitor.</p> <p>Notes:</p> <ol style="list-style-type: none"> 1. To prevent diskette drive read/write errors, be sure the distance between monitors and diskette drives is at least 76 mm (3 in.). 2. Non-IBM monitor cables might cause unpredictable problems. 3. An enhanced monitor cable with additional shielding is available for the 9521 and 9527 monitors. For information about the enhanced monitor cable, see your IBM reseller or IBM marketing representative. <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, call for service.</p>

Mouse problems

Mouse symptom	Suggested action
The mouse does not work.	<ul style="list-style-type: none"> • Verify that the keyboard/mouse/video select button LED on the front of the blade server is lit, indicating that the blade server is connected to the shared BladeCenter mouse. • Make sure that the mouse cable is securely connected to the BladeCenter management module, and that the keyboard and mouse cables are not reversed. • Verify that the mouse works correctly with other blade servers. • Verify that the mouse is recognized as a USB device, not PS2, by your blade server. Although the mouse is a PS2-style device, communication with the mouse is through an internal USB bus in the BladeCenter chassis. Some operating systems permit you to select the type of mouse during installation of the operating system. Select USB. <p>If the problem remains, call for service.</p>

Power problems

Power symptom	Suggested action
The blade server does not turn on.	<ol style="list-style-type: none"> 1. Verify 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 BladeCenter power modules are lit. c. If the blade server or attached storage expansion unit is in blade bays 7 through 14, power modules are in power bays 1, 2, 3 and 4. d. The power-on 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 BladeCenter management-module Web interface to verify), or the blade server was instructed through the management module (Web interface or IBM Director) to turn on. 2. If you just installed an option 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.

Memory problems

Memory symptom	Suggested action
The amount of system memory displayed is less than the amount of physical memory installed.	<p>Verify that:</p> <ul style="list-style-type: none"> • The memory modules are seated properly. • You have installed the correct type of memory. • If you changed the memory, you updated the memory configuration with the Configuration/Setup Utility program. • All banks of memory on the DIMMs are enabled. The server might have automatically disabled a DIMM bank when it detected a problem or a DIMM bank could have been manually disabled. <p>Look in 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 DIMM was disabled by the user or by POST: <ol style="list-style-type: none"> 1. Start the Configuration/Setup Utility program. 2. Enable the DIMM. 3. Save the configuration and restart the server. • If you continue to get this error, replace the DIMM. <p>If the problem remains, call for service.</p>

Microprocessor problems

Microprocessor symptom	Suggested action
The blade server emits a continuous tone during POST.	<p>The startup (boot) microprocessor is not working properly.</p> <p>Verify that the startup microprocessor is seated properly. If it is, replace the startup microprocessor.</p> <p>If the problem remains, call for service.</p>

Network connection problems

Network connection symptom	Suggested action
One or more blade servers are unable to communicate with the network.	<p>Verify that:</p> <ul style="list-style-type: none"> • The switch modules for the network interface being used are installed in the correct BladeCenter bays and are configured and operating correctly. See the IBM <i>@server BladeCenter Type 8677 Hardware Maintenance Manual and Troubleshooting Guide</i> on the IBM <i>BladeCenter Documentation</i> CD for details. • The settings in the switch module are appropriate for the blade server (settings in the switch module are blade server specific). <p>If you installed an optional I/O expansion card, verify 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 came with the option. • 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

Option symptom	Suggested action
An IBM option that was just installed does not work.	<p>Verify 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 came 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>Verify 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>

Service processor problems

Service processor symptom	Suggested action
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 a problem remains, call for service.

Light Path Diagnostics feature overview

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.

Identifying problems using the Light Path Diagnostics

This section provides the information to identify, using the Light Path Diagnostics, problems that might arise during installation. To locate the actual component that caused the error, you must locate the lit error LED on that component.

For example:

A blade server error has occurred and you have noted that the blade server blade-error LED is lit on the blade server control panel. You then:

1. Remove the blade server from the BladeCenter unit.
2. Place the blade server on a flat, non-conductive surface.
3. Remove the cover from the blade server.
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 “System-board LED locations” on page 10 for the location of the Light Path Diagnostics button and error LEDs, then see the “Light Path Diagnostics table” on page 63.

Light Path Diagnostics table

Use the following table to help determine the cause of the error and the action you should take.

Note: Power is available to relight the Light Path Diagnostics LEDs for a short 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) lights 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 does not light 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.

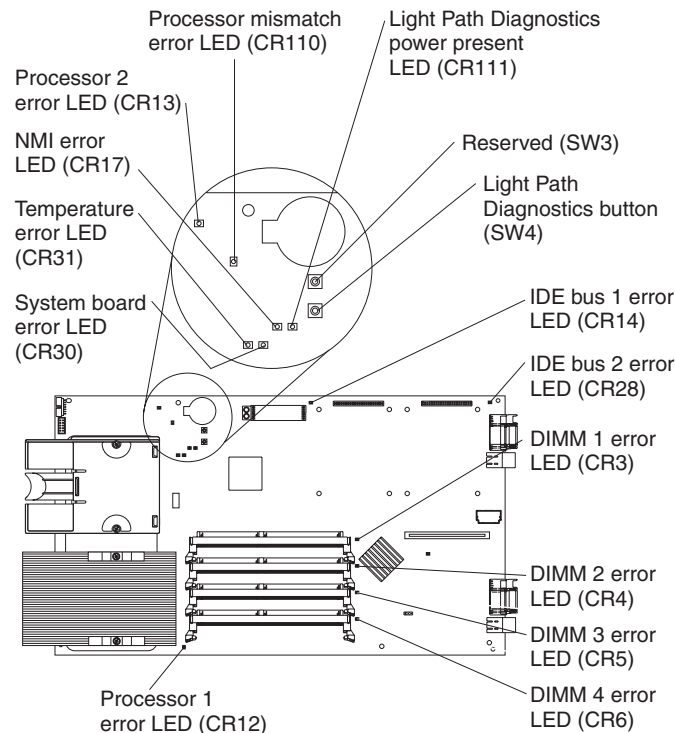


Table 5. Light Path Diagnostics

Lit blade-error LED	Cause	Action
None	An error has occurred and cannot be isolated, or the service processor has failed.	An error has occurred that is not represented by a Light Path Diagnostics LED. Check the system error log in the BladeCenter management module for more information about the error.

Table 5. Light Path Diagnostics (continued)

Lit blade-error LED	Cause	Action
DIMM x error	A memory error occurred.	<p>Replace the DIMM 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 error goes away. Check the system error log in the BladeCenter management module for information about the error.</p> <p>If the problem remains, have the blade server serviced.</p>
Processor x error	The microprocessor has failed.	<p>Verify that the microprocessor indicated by the lit LED is installed correctly. (See “Installing an additional microprocessor” on page 25 for installation instructions.)</p> <p>If the problem remains, have the microprocessor replaced.</p>
Temperature error	The system temperature has exceeded a threshold level.	<ol style="list-style-type: none"> 1. Check to see if a blower on the BladeCenter unit has failed. If it has, replace the fan. 2. Make sure the room temperature is not too high. (See “Features and specifications” on page 5 for temperature information.) <p>If the problem remains, have the blade server serviced.</p>
System board error	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>
IDE bus x error	The IDE bus indicated by the error LED has failed.	Have the blade server serviced.
NMI error	The system board has failed.	<ol style="list-style-type: none"> 1. Replace the blade server cover, reinsert the blade server in the BladeCenter unit, and then restart the server. 2. Check the system error log in the BladeCenter management module for information about the error. <p>If the problem remains, have the blade server serviced.</p>
Processor mismatch	The processors do not match.	<p>Verify 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 @server system, 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 is turned on.
- Use the troubleshooting information in your system documentation, and use the diagnostic tools that come with your system.
- Go to the IBM Support Web site at <http://www.ibm.com/pc/support/> to check for technical information, hints, tips, and new device drivers.
- Use an IBM discussion forum on the IBM Web site to ask questions.

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

Using the documentation

Information about your IBM @server system and preinstalled software, if any, is available in the documentation that comes with your system. That documentation includes printed books, online books, 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/pc/support/> and follow the instructions. Also, you can order publications through the IBM Publications Ordering System at <http://www.elink.ibm.com/public/applications/publications/cgibin/pbi.cgi>.

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 @server, xSeries, and IntelliStation® products, services, and support. The address for IBM xSeries information is <http://www.ibm.com/eserver/xseries/>. The address for IBM IntelliStation information is <http://www.ibm.com/pc/intellistation/>.

You can find service information for your IBM products, including supported options, at <http://www.ibm.com/pc/support/>.

Software service and support

Through IBM Support Line, you can get telephone assistance, for a fee, with usage, configuration, and software problems with @server and xSeries servers, IntelliStation workstations, and appliances. For information about which products are supported by Support Line in your country or region, go to <http://www.ibm.com/services/sl/products/>.

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

Hardware service and support

You can receive hardware service through IBM Integrated Technology Services or through your IBM reseller, if your reseller is authorized by IBM to provide warranty service. Go to <http://www.ibm.com/planetwide/> for support telephone numbers, or in the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

In the U.S. and Canada, hardware service and support is available 24 hours a day, 7 days a week. In the U.K., these services are available Monday through Friday, from 9 a.m. to 6 p.m.

Appendix B. Warranty information

This section contains information about your warranty period and the service and support that are provided by your warranty.

Warranty period

The warranty period varies by machine type and country or region.

Contact your place of purchase for warranty service information. Some IBM Machines are eligible for on-site warranty service depending on the country or region where service is performed.

Prior to on-site warranty service, you are required to go through problem determination with an IBM service specialist call center technician.

A warranty period of 3 years on parts and 1 year on labor means that IBM will provide warranty service without charge for:

1. parts and labor during the first year of the warranty period
2. parts only, on an exchange basis, in the second and third years of the warranty period. IBM will charge you for any labor it provides in performance of the repair or replacement.

The IBM Machine Warranties Web site at http://www.ibm.com/servers/support/machine_warranties/ contains a worldwide overview of the IBM Statement of Limited Warranty for IBM Machines, a glossary of terms used in the Statement of Limited Warranty, Frequently Asked Questions (FAQ), and links to Product Support Web pages. The IBM Statement of Limited Warranty is available from this Web site in 29 languages in Portable Document Format (PDF).

Machine - BladeCenter HS20 Type 8832

Country or region	Warranty period	Service delivery method
Worldwide	Parts - 3 years Labor - 3 years	On-site

Problem determination

Prior to on-site warranty service, you are required to go through problem determination with an IBM service specialist call center technician. The service specialist will run diagnostic tests on the hardware and check the software.

Running diagnostics

The IBM service specialist will help you determine whether your equipment is functioning as specified. It might be necessary to isolate the failing @server system; IBM component; or both from any active production environment to run diagnostics and perform defect-isolation programs. You are responsible for making the system, IBM component, or both available for running diagnostics and defect-isolation programs.

Checking software

The IBM service specialist will help you ensure that the correct BIOS code, firmware, device drivers, and other supporting IBM software are installed and correctly configured. It might be necessary to manually gather information about the

relevant software levels or run IBM-approved utility programs to gather this information. It might be necessary to isolate the failing system from any active production environment to gather this information. You are responsible, with assistance from the service specialist, for gathering this information. The IBM Statement of Limited Warranty does not include on-site assistance with this activity.

Warranty service and support

With the original purchase of an IBM @server system, you have access to extensive service and support. During the IBM Machine warranty period, you may call IBM or your reseller for problem-determination assistance under the terms of the IBM Statement of Limited Warranty.

The following services are available during the warranty period:

- **Problem determination** - Trained personnel are available to assist you with determining if you have a hardware problem and deciding what action is necessary to fix the problem.
- **IBM hardware repair** - If the problem is determined to be caused by IBM hardware under warranty, trained service personnel are available to provide the applicable level of service, either on-site or at an IBM service center as determined by IBM.
- **Engineering Change management** - Occasionally, there might be changes that are required after a product has been shipped from IBM. In those instances, IBM will make Engineering Changes (ECs) available that apply to your hardware.
- **Customer replaceable units (CRUs)** - Some parts of IBM @server systems are designated as customer replaceable units. IBM ships CRUs to you for replacement by you. CRUs include keyboards, monitors, memory, diskette drives, hard disk drives, and mice (this list is not inclusive of all CRUs).

The following items are not covered under warranty service:

- Replacement or use of non-IBM parts. All IBM parts contain a 7-character identification in the format IBM FRU XXXXXXXX.
- Identification of software problem sources.
- Installation of customer replaceable units (CRUs).
- Installation and configuration of BIOS code, firmware, or device drivers that are designated as customer installable.

See the IBM Statement of Limited Warranty for a full explanation of IBM warranty terms. Be sure to retain your proof of purchase to obtain warranty service.

Please have the following information ready when you call:

- The machine type and model of your IBM hardware product (if available)
- Serial numbers of your IBM hardware products
- A description of the problem
- The exact wording of any error messages
- Hardware and software configuration information

International Warranty Service

If you travel with your @server system or relocate it to a country or region where your system is sold and serviced by IBM or IBM resellers authorized to perform warranty service, International Warranty Service (IWS) is available during the warranty period. Eligible IBM systems are identified by their four-digit machine types.

You can obtain IWS through the service delivery method (such as depot, carry-in, or on-site) provided in the servicing country or region. Service methods and procedures vary by country or region, and some service or parts might not be available in all countries and regions. Service centers in certain countries or regions might not be able to service all models of a particular machine type. In addition, some countries or regions might have fees and restrictions that apply at the time of service.

To determine whether your system is eligible for IWS, go to <http://www.ibm.com/pc/support> and click **Warranty lookup**.

Purchasing additional services

During and after the warranty period, you can purchase additional services, such as support for IBM and non-IBM hardware, operating systems, and application programs; network setup and configuration; upgraded or extended hardware repair services; and custom installations. Service availability and service name might vary by country or region.

For more information about these services, contact your IBM marketing representative.

IBM Statement of Limited Warranty Z125-4753-06 8/2000

Part 1 - General Terms

This Statement of Limited Warranty includes Part 1 - General Terms and Part 2 - Country-unique Terms. The terms of Part 2 replace or modify those of Part 1. The warranties provided by IBM in this Statement of Limited Warranty apply only to Machines you purchase for your use, and not for resale, from IBM or your reseller. The term "Machine" means an IBM machine, its features, conversions, upgrades, elements, or accessories, or any combination of them. The term "Machine" does not include any software programs, whether pre-loaded with the Machine, installed subsequently or otherwise. Unless IBM specifies otherwise, the following warranties apply only in the country where you acquire the Machine. Nothing in this Statement of Limited Warranty affects any statutory rights of consumers that cannot be waived or limited by contract. If you have any questions, contact IBM or your reseller.

The IBM Warranty for Machines: IBM warrants that each Machine 1) is free from defects in materials and workmanship and 2) conforms to IBM's Official Published Specifications ("Specifications"). The warranty period for a Machine is a specified, fixed period commencing on its Date of Installation. The date on your sales receipt is the Date of Installation unless IBM or your reseller informs you otherwise.

If a Machine does not function as warranted during the warranty period, and IBM or your reseller are unable to either 1) make it do so or 2) replace it with one that is at least functionally equivalent, you may return it to your place of purchase and your money will be refunded.

Extent of Warranty: The warranty does not cover the repair or exchange of a Machine resulting from misuse, accident, modification, unsuitable physical or operating environment, improper maintenance by you, or failure caused by a product for which IBM is not responsible. The warranty is voided by removal or alteration of Machine or parts identification labels.

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Items Not Covered by Warranty: IBM does not warrant uninterrupted or error-free operation of a Machine. Any technical or other support provided for a Machine under warranty, such as assistance via telephone with "how-to" questions and those regarding Machine set-up and installation, will be provided **WITHOUT WARRANTIES OF ANY KIND.**

Warranty Service: To obtain warranty service for a Machine, contact IBM or your reseller. If you do not register your Machine with IBM, you may be required to present proof of purchase.

During the warranty period, IBM or your reseller, if approved by IBM to provide warranty service, provides without charge certain types of repair and exchange service to keep Machines in, or restore them to, conformance with their Specifications. IBM or your reseller will inform you of the available types of service for a Machine based on its country of installation. At its discretion, IBM or your reseller will 1) either repair or exchange the failing Machine and 2) provide the service either at your location or a service center. IBM or your reseller will also manage and install selected engineering changes that apply to the Machine.

Some parts of IBM Machines are designated as Customer Replaceable Units (called "CRUs"), e.g., keyboards, memory, or hard disk drives. IBM ships CRUs to you for replacement by you. You must return all defective CRUs to IBM within 30 days of your receipt of the replacement CRU. You are responsible for downloading designated Machine Code and Licensed Internal Code updates from an IBM Internet Web site or from other electronic media, and following the instructions that IBM provides.

When warranty service involves the exchange of a Machine or part, the item IBM or your reseller replaces becomes its property and the replacement becomes yours. You represent that all removed items are genuine and unaltered. The replacement may not be new, but will be in good working order and at least functionally equivalent to the item replaced. The replacement assumes the warranty service status of the replaced item. Many features, conversions, or upgrades involve the removal of parts and their return to IBM. A part that replaces a removed part will assume the warranty service status of the removed part.

Before IBM or your reseller exchanges a Machine or part, you agree to remove all features, parts, options, alterations, and attachments not under warranty service.

You also agree to

1. ensure that the Machine is free of any legal obligations or restrictions that prevent its exchange;
2. obtain authorization from the owner to have IBM or your reseller service a Machine that you do not own; and
3. where applicable, before service is provided:
 - a. follow the problem determination, problem analysis, and service request procedures that IBM or your reseller provides;
 - b. secure all programs, data, and funds contained in a Machine;
 - c. provide IBM or your reseller with sufficient, free, and safe access to your facilities to permit them to fulfill their obligations; and
 - d. inform IBM or your reseller of changes in a Machine's location.

IBM is responsible for loss of, or damage to, your Machine while it is 1) in IBM's possession or 2) in transit in those cases where IBM is responsible for the transportation charges.

Neither IBM nor your reseller is responsible for any of your confidential, proprietary or personal information contained in a Machine which you return to IBM or your reseller for any reason. You should remove all such information from the Machine prior to its return.

Limitation of Liability: Circumstances may arise where, because of a default on IBM's part or other liability, you are entitled to recover damages from IBM. In each such instance, regardless of the basis on which you are entitled to claim damages from IBM (including fundamental breach, negligence, misrepresentation, or other

contract or tort claim), except for any liability that cannot be waived or limited by applicable laws, IBM is liable for no more than

1. damages for bodily injury (including death) and damage to real property and tangible personal property; and
2. the amount of any other actual direct damages, up to the charges (if recurring, 12 months' charges apply) for the Machine that is subject of the claim. For purposes of this item, the term "Machine" includes Machine Code and Licensed Internal Code.

This limit also applies to IBM's suppliers and your reseller. It is the maximum for which IBM, its suppliers, and your reseller are collectively responsible.

UNDER NO CIRCUMSTANCES IS IBM LIABLE FOR ANY OF THE FOLLOWING: 1) THIRD-PARTY CLAIMS AGAINST YOU FOR DAMAGES (OTHER THAN THOSE UNDER THE FIRST ITEM LISTED ABOVE); 2) LOSS OF, OR DAMAGE TO, YOUR RECORDS OR DATA; OR 3) SPECIAL, INCIDENTAL, OR INDIRECT DAMAGES OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES, LOST PROFITS OR LOST SAVINGS, EVEN IF IBM, ITS SUPPLIERS OR YOUR RESELLER IS INFORMED OF THEIR POSSIBILITY. SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU.

Governing Law: Both you and IBM consent to the application of the laws of the country in which you acquired the Machine to govern, interpret, and enforce all of your and IBM's rights, duties, and obligations arising from, or relating in any manner to, the subject matter of this Agreement, without regard to conflict of law principles.

Part 2 - Country-unique Terms

AMERICAS

BRAZIL

Governing Law: *The following is added after the first sentence:*

Any litigation arising from this Agreement will be settled exclusively by the court of Rio de Janeiro.

NORTH AMERICA

Warranty Service: *The following is added to this Section:*

To obtain warranty service from IBM in Canada or the United States, call 1-800-IBM-SERV (426-7378).

CANADA

Governing Law: *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:*

laws in the Province of Ontario.

UNITED STATES

Governing Law: *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:*

laws of the State of New York.

ASIA PACIFIC

AUSTRALIA

The IBM Warranty for Machines: *The following paragraph is added to this Section:*
The warranties specified in this Section are in addition to any rights you may have under the Trade Practices Act 1974 or other similar legislation and are only limited to the extent permitted by the applicable legislation.

Limitation of Liability: *The following is added to this Section:*

Where IBM is in breach of a condition or warranty implied by the Trade Practices Act 1974 or other similar legislation, IBM's liability is limited to the repair or replacement of the goods or the supply of equivalent goods. Where that condition or warranty relates to right to sell, quiet possession or clear title, or the goods are of a kind ordinarily acquired for personal, domestic or household use or consumption, then none of the limitations in this paragraph apply.

Governing Law: *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:*
laws of the State or Territory.

CAMBODIA, LAOS, AND VIETNAM

Governing Law: *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:*
laws of the State of New York.

The following is added to this Section:

Disputes and differences arising out of or in connection with this Agreement shall be finally settled by arbitration which shall be held in Singapore in accordance with the rules of the International Chamber of Commerce (ICC). The arbitrator or arbitrators designated in conformity with those rules shall have the power to rule on their own competence and on the validity of the Agreement to submit to arbitration. The arbitration award shall be final and binding for the parties without appeal and the arbitral award shall be in writing and set forth the findings of fact and the conclusions of law.

All proceedings shall be conducted, including all documents presented in such proceedings, in the English language. The number of arbitrators shall be three, with each side to the dispute being entitled to appoint one arbitrator.

The two arbitrators appointed by the parties shall appoint a third arbitrator before proceeding upon the reference. The third arbitrator shall act as chairman of the proceedings. Vacancies in the post of chairman shall be filled by the president of the ICC. Other vacancies shall be filled by the respective nominating party. Proceedings shall continue from the stage they were at when the vacancy occurred.

If one of the parties refuses or otherwise fails to appoint an arbitrator within 30 days of the date the other party appoints its, the first appointed arbitrator shall be the sole arbitrator, provided that the arbitrator was validly and properly appointed.

The English language version of this Agreement prevails over any other language version.

HONG KONG AND MACAU

Governing Law: *The following replaces “laws of the country in which you acquired the Machine” in the first sentence:*
laws of Hong Kong Special Administrative Region.

INDIA

Limitation of Liability: *The following replaces items 1 and 2 of this Section:*

1. liability for bodily injury (including death) or damage to real property and tangible personal property will be limited to that caused by IBM’s negligence;
2. as to any other actual damage arising in any situation involving nonperformance by IBM pursuant to, or in any way related to the subject of this Statement of Limited Warranty, IBM’s liability will be limited to the charge paid by you for the individual Machine that is the subject of the claim.

JAPAN

Governing Law: *The following sentence is added to this Section:*

Any doubts concerning this Agreement will be initially resolved between us in good faith and in accordance with the principle of mutual trust.

NEW ZEALAND

The IBM Warranty for Machines: *The following paragraph is added to this Section:*

The warranties specified in this Section are in addition to any rights you may have under the Consumer Guarantees Act 1993 or other legislation which cannot be excluded or limited. The Consumer Guarantees Act 1993 will not apply in respect of any goods which IBM provides, if you require the goods for the purposes of a business as defined in that Act.

Limitation of Liability: *The following is added to this Section:*

Where Machines are not acquired for the purposes of a business as defined in the Consumer Guarantees Act 1993, the limitations in this Section are subject to the limitations in that Act.

PEOPLE’S REPUBLIC OF CHINA (PRC)

Governing Law: *The following replaces this Section:*

Both you and IBM consent to the application of the laws of the State of New York (except when local law requires otherwise) to govern, interpret, and enforce all your and IBM’s rights, duties, and obligations arising from, or relating in any manner to, the subject matter of this Agreement, without regard to conflict of law principles.

Any disputes arising from or in connection with this Agreement will first be resolved by friendly negotiations, failing which either of us has the right to submit the dispute to the China International Economic and Trade Arbitration Commission in Beijing, the PRC, for arbitration in accordance with its arbitration rules in force at the time. The arbitration tribunal will consist of three arbitrators. The language to be used therein will be English and Chinese. An arbitral award will be final and binding on all the parties, and will be enforceable under the Convention on the Recognition and Enforcement of Foreign Arbitral Awards (1958).

The arbitration fee will be borne by the losing party unless otherwise determined by the arbitral award.

During the course of arbitration, this Agreement will continue to be performed except for the part which the parties are disputing and which is undergoing arbitration.

EUROPE, MIDDLE EAST, AFRICA (EMEA)

THE FOLLOWING TERMS APPLY TO ALL EMEA COUNTRIES:

The terms of this Statement of Limited Warranty apply to Machines purchased from IBM or an IBM reseller.

Warranty Service: If you purchase an IBM Machine in Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland or United Kingdom, you may obtain warranty service for that Machine in any of those countries from either (1) an IBM reseller approved to perform warranty service or (2) from IBM. If you purchase an IBM Personal Computer Machine in Albania, Armenia, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Georgia, Hungary, Kazakhstan, Kirghizia, Federal Republic of Yugoslavia, Former Yugoslav Republic of Macedonia (FYROM), Moldova, Poland, Romania, Russia, Slovak Republic, Slovenia, or Ukraine, you may obtain warranty service for that Machine in any of those countries from either (1) an IBM reseller approved to perform warranty service or (2) from IBM.

If you purchase an IBM Machine in a Middle Eastern or African country, you may obtain warranty service for that Machine from the IBM entity within the country of purchase, if that IBM entity provides warranty service in that country, or from an IBM reseller, approved by IBM to perform warranty service on that Machine in that country. Warranty service in Africa is available within 50 kilometers of an IBM authorized service provider. You are responsible for transportation costs for Machines located outside 50 kilometers of an IBM authorized service provider.

Governing Law: The applicable laws that govern, interpret and enforce rights, duties, and obligations of each of us arising from, or relating in any manner to, the subject matter of this Statement, without regard to conflict of laws principles, as well as Country-unique terms and competent court for this Statement are those of the country in which the warranty service is being provided, except that in 1) Albania, Bosnia-Herzegovina, Bulgaria, Croatia, Hungary, Former Yugoslav Republic of Macedonia, Romania, Slovakia, Slovenia, Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan, the laws of Austria apply; 2) Estonia, Latvia, and Lithuania, the laws of Finland apply; 3) Algeria, Benin, Burkina Faso, Cameroon, Cape Verde, Central African Republic, Chad, Congo, Djibouti, Democratic Republic of Congo, Equatorial Guinea, France, Gabon, Gambia, Guinea, Guinea-Bissau, Ivory Coast, Lebanon, Mali, Mauritania, Morocco, Niger, Senegal, Togo, and Tunisia, this Agreement will be construed and the legal relations between the parties will be determined in accordance with the French laws and all disputes arising out of this Agreement or related to its violation or execution, including summary proceedings, will be settled exclusively by the Commercial Court of Paris; 4) Angola, Bahrain, Botswana, Burundi, Egypt, Eritrea, Ethiopia, Ghana, Jordan, Kenya, Kuwait, Liberia, Malawi, Malta, Mozambique, Nigeria, Oman, Pakistan, Qatar, Rwanda, Sao Tome, Saudi Arabia, Sierra Leone, Somalia, Tanzania, Uganda, United Arab Emirates, United Kingdom, West Bank/Gaza, Yemen, Zambia, and Zimbabwe, this Agreement will be governed by English Law and disputes relating to it will be submitted to the exclusive jurisdiction of the English courts; and 5) in Greece, Israel, Italy, Portugal,

and Spain any legal claim arising out of this Statement will be brought before, and finally settled by, the competent court of Athens, Tel Aviv, Milan, Lisbon, and Madrid, respectively.

THE FOLLOWING TERMS APPLY TO THE COUNTRY SPECIFIED:

AUSTRIA AND GERMANY

The IBM Warranty for Machines: *The following replaces the first sentence of the first paragraph of this Section:*

The warranty for an IBM Machine covers the functionality of the Machine for its normal use and the Machine's conformity to its Specifications.

The following paragraphs are added to this Section:

The minimum warranty period for Machines is six months. In case IBM or your reseller is unable to repair an IBM Machine, you can alternatively ask for a partial refund as far as justified by the reduced value of the unrepaired Machine or ask for a cancellation of the respective agreement for such Machine and get your money refunded.

Extent of Warranty: *The second paragraph does not apply.*

Warranty Service: *The following is added to this Section:*

During the warranty period, transportation for delivery of the failing Machine to IBM will be at IBM's expense.

Limitation of Liability: *The following paragraph is added to this Section:*

The limitations and exclusions specified in the Statement of Limited Warranty will not apply to damages caused by IBM with fraud or gross negligence and for express warranty.

The following sentence is added to the end of item 2:

IBM's liability under this item is limited to the violation of essential contractual terms in cases of ordinary negligence.

EGYPT

Limitation of Liability: *The following replaces item 2 in this Section:*

as to any other actual direct damages, IBM's liability will be limited to the total amount you paid for the Machine that is the subject of the claim. For purposes of this item, the term "Machine" includes Machine Code and Licensed Internal Code.

Applicability of suppliers and resellers (unchanged).

FRANCE

Limitation of Liability: *The following replaces the second sentence of the first paragraph of this Section:*

In such instances, regardless of the basis on which you are entitled to claim damages from IBM, IBM is liable for no more than: *(items 1 and 2 unchanged).*

IRELAND

Extent of Warranty: *The following is added to this Section:*

Except as expressly provided in these terms and conditions, all statutory conditions,

including all warranties implied, but without prejudice to the generality of the foregoing all warranties implied by the Sale of Goods Act 1893 or the Sale of Goods and Supply of Services Act 1980 are hereby excluded.

Limitation of Liability: *The following replaces items one and two of the first paragraph of this Section:*

1. death or personal injury or physical damage to your real property solely caused by IBM's negligence; and
2. the amount of any other actual direct damages, up to 125 percent of the charges (if recurring, the 12 months' charges apply) for the Machine that is the subject of the claim or which otherwise gives rise to the claim.

Applicability of suppliers and resellers (unchanged).

The following paragraph is added at the end of this Section:

IBM's entire liability and your sole remedy, whether in contract or in tort, in respect of any default shall be limited to damages.

ITALY

Limitation of Liability: *The following replaces the second sentence in the first paragraph:*

In each such instance unless otherwise provided by mandatory law, IBM is liable for no more than:

1. *(unchanged)*
2. as to any other actual damage arising in all situations involving nonperformance by IBM pursuant to, or in any way related to the subject matter of this Statement of Warranty, IBM's liability, will be limited to the total amount you paid for the Machine that is the subject of the claim.

Applicability of suppliers and resellers (unchanged).

The following replaces the third paragraph of this Section:

Unless otherwise provided by mandatory law, IBM and your reseller are not liable for any of the following: *(items 1 and 2 unchanged)* 3) indirect damages, even if IBM or your reseller is informed of their possibility.

SOUTH AFRICA, NAMIBIA, BOTSWANA, LESOTHO AND SWAZILAND

Limitation of Liability: *The following is added to this Section:*

IBM's entire liability to you for actual damages arising in all situations involving nonperformance by IBM in respect of the subject matter of this Statement of Warranty will be limited to the charge paid by you for the individual Machine that is the subject of your claim from IBM.

UNITED KINGDOM

Limitation of Liability: *The following replaces items 1 and 2 of the first paragraph of this Section:*

1. death or personal injury or physical damage to your real property solely caused by IBM's negligence;
2. the amount of any other actual direct damages or loss, up to 125 percent of the charges (if recurring, the 12 months' charges apply) for the Machine that is the subject of the claim or which otherwise gives rise to the claim;

The following item is added to this paragraph:

3. breach of IBM's obligations implied by Section 12 of the Sale of Goods Act 1979 or Section 2 of the Supply of Goods and Services Act 1982.

Applicability of suppliers and resellers (unchanged).

The following is added to the end of this Section:

IBM's entire liability and your sole remedy, whether in contract or in tort, in respect of any default shall be limited to damages.

Appendix C. Notices

This information was developed for products and services offered in the U.S.A.

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Active PCI	PS/2
Active PCI-X	ServeRAID
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Chipkill	TechConnect
EtherJet	Tivoli
e-business logo	Tivoli Enterprise
@server	Update Connector
FlashCopy	Wake on LAN
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Important notes

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

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

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

When referring to hard disk drive capacity or communications volume, MB stands for 1 000 000 bytes, and GB stands for 1 000 000 000 bytes. Total user-accessible capacity may vary depending on operating environments.

Maximum internal hard disk drive capacities assume the replacement of any standard hard disk drives and population of all hard disk drive bays with the largest currently supported drives available from IBM.

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

IBM makes no representation or warranties regarding non-IBM products and services that are ServerProven, including but not limited to the implied warranties of merchantability and fitness for a particular purpose. These products are offered and warranted solely by third parties.

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

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

Product recycling and disposal

This unit contains materials such as circuit boards, cables, electromagnetic compatibility gaskets, and connectors which may contain lead and copper/beryllium alloys that require special handling and disposal at end of life. Before this unit is disposed of, these materials must be removed and recycled or discarded according to applicable regulations. IBM offers product-return programs in several countries. For country-specific instructions, refer to the following Web site:
<http://www.ibm.com/ibm/environment/products/prp.shtml>.

This product may contain a sealed lead acid, nickel cadmium, nickel metal hydride, lithium, or lithium ion battery. Consult your user manual or service manual for specific battery information. The battery must be recycled or disposed of properly. Recycling facilities may not be available in your area. For information on disposal of batteries, contact your local waste disposal facility.

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

Electronic emission notices

Federal Communications Commission (FCC) statement

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio

communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

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

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

Industry Canada Class A emission compliance statement

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

Avis de conformité à la réglementation d'Industrie Canada

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

Australia and New Zealand Class A statement

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

United Kingdom telecommunications safety requirement

Notice to Customers

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

European Union EMC Directive conformance statement

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

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

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

Taiwanese Class A warning statement

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

Chinese Class A warning statement

聲 明
此為 A 級產品。在生活環境中，
該產品可能會造成無線電干擾。
在這種情況下，可能需要用戶對其
干擾採取切实可行的措施。

Japanese Voluntary Control Council for Interference (VCCI) statement

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

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