IBM

@server

BladeCenter JS20
Type 8842

Installation and User's Guide

Welcome. . .

Thank you for buying an IBM blade server. Your server takes advantage of IBM POWER microarchitecture, and it features superior performance, availability, and scalability.

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

For information about your BladeCenter unit and other BladeCenter components, 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

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Before installing the BladeCenter JS20 Type 8842, you should have completed the following procedures:

- Installed and configured the rack according to the documentation that came with the rack.
- Installed and configured the BladeCenter unit into the rack. See the documentation provided with the BladeCenter unit to install the unit into the rack.
- Supplied 200 - 240 V ac to the BladeCenter unit.

↓

Install options into the blade server:
- Drives
- Memory modules
- I/O expansion card
See Chapter 4 for more information.

↓

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

↓

Configure the BladeCenter components for Serial Over LAN (SOL) support. See Chapter 5 for more information.
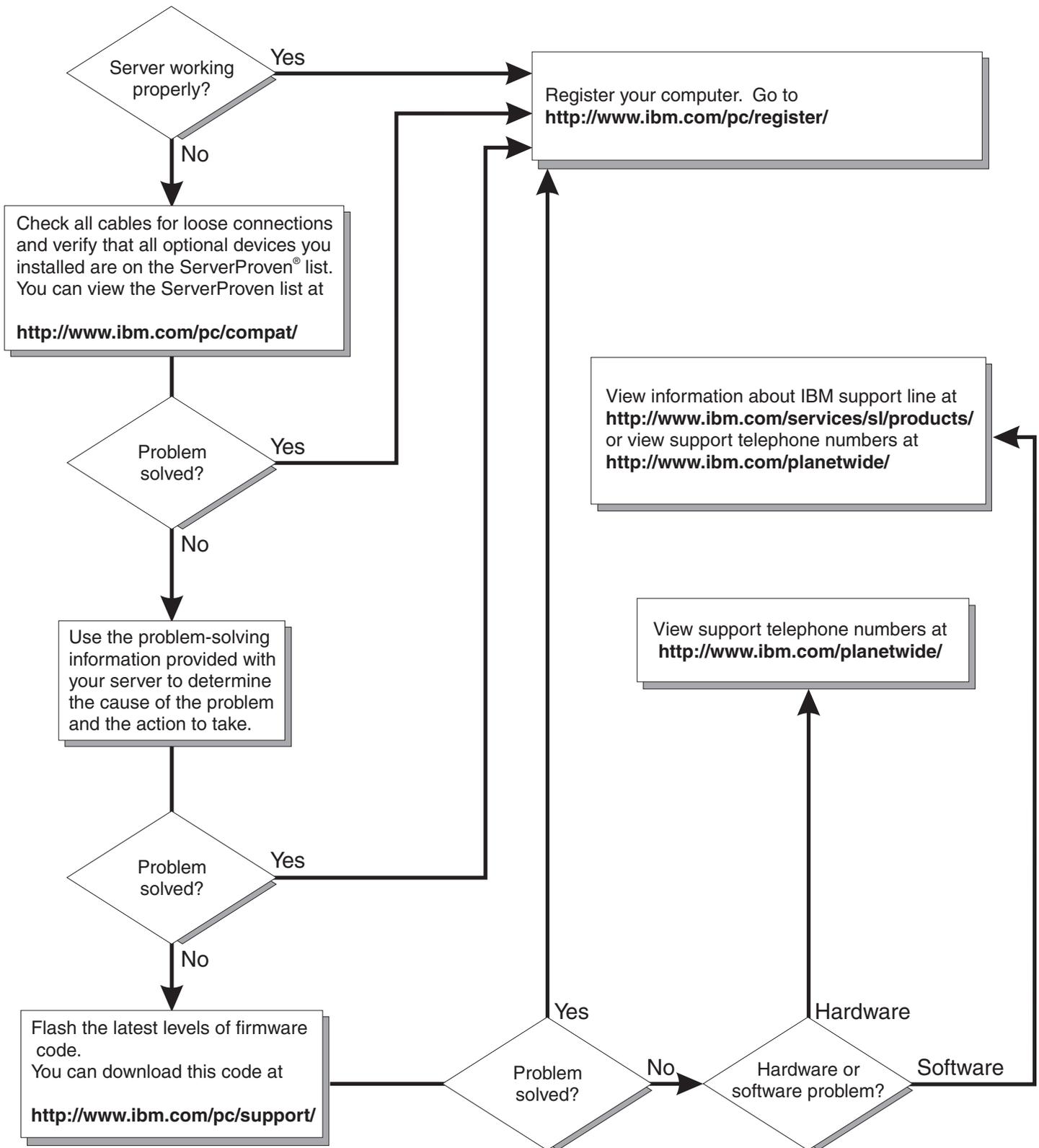
↓

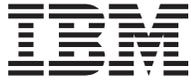Establish an SOL session with the blade server. See Chapter 6 for more information.

↓

Install the operating system. See Chapter 7 for more information.

↓

Install additional applications according to instructions provided with the application.

↓

The blade server is now ready to use. Be sure to register and profile your server with IBM support.

Server Support

```
┌─────────────────┐
│ Server working  │──── Yes ────────────────────────────►┌──────────────────────────────────┐
│ properly?       │                                       │ Register your computer.  Go to   │
└────────┬────────┘                          ┌───────────►│ http://www.ibm.com/pc/register/  │
         │                                   │            └──────────────────────────────────┘
         No                                  │      ┌────►
         ▼                                   │      │
┌──────────────────────────────────┐         │      │
│ Check all cables for loose        │         │      │
│ connections and verify that all   │         │      │
│ optional devices you installed    │         │      │
│ are on the ServerProven® list.    │         │      │
│ You can view the ServerProven     │         │      │
│ list at                           │         │      │
│                                   │         │      │
│ http://www.ibm.com/pc/compat/     │         │      │
└────────┬─────────────────────────┘         │      │
         │                                    │      │
         ▼                                    │      │
┌─────────────────┐                           │      │        ┌──────────────────────────────────┐
│ Problem         │──── Yes ──────────────────┘      │        │ View information about IBM       │
│ solved?         │                                  │        │ support line at                  │
└────────┬────────┘                                  │        │ http://www.ibm.com/services/sl/products/│
         │                                           │        │ or view support telephone        │
         No                                          │        │ numbers at                       │
         ▼                                           │        │ http://www.ibm.com/planetwide/   │
┌─────────────────────────────┐                      │        └──────────────────────────────────┘
│ Use the problem-solving     │                      │
│ information provided with    │                      │
│ your server to determine     │                      │
│ the cause of the problem     │                      │
│ and the action to take.      │                      │
└────────┬────────────────────┘                      │        ┌──────────────────────────────────┐
         │                                            │        │ View support telephone numbers at│
         ▼                                            │        │ http://www.ibm.com/planetwide/   │
┌─────────────────┐                                   │        └──────────────────────────────────┘
│ Problem         │──── Yes ──────────────────────────┘
│ solved?         │
└────────┬────────┘
         │
         No
         ▼
┌──────────────────────────────┐           ┌─────────────┐      ┌────────────────────┐
│ Flash the latest levels of   │    Yes    │ Problem     │  No  │ Hardware or        │  Software
│ firmware code.               │◄──────────│ solved?     │─────►│ software problem?  │──────►
│ You can download this code at│           └─────────────┘      └────────────────────┘
│                              │                              Hardware
│ http://www.ibm.com/pc/support/│
└──────────────────────────────┘
```

IBM

@server

BladeCenter JS20
Type 8842

Installation and User's Guide

Note: Before using this information and the product it supports, read the general information in Appendix B, "IBM Statement of Limited Warranty Z125-4753-07 11/2002," on page 101 and Appendix C, "Notices," on page 119

Contents

Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الآمنية

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

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

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

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

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

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

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

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

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

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

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

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

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

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

Перед установкой продукта прочтите инструкции по
технике безопасности.

Pred inštaláciou tohto zariadenia si pečítaje Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

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

Läs säkerhetsinformationen innan du installerar den här produkten.

Important:

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

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

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

Statement 1:

DANGER

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

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

Statement 2:

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

Do not:

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

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

Statement 3:

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

- **Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.**

- **Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.**
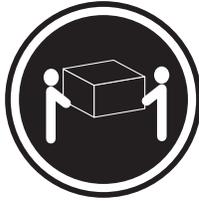

DANGER

> **Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following.**
>
> **Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.**

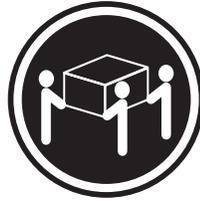Class 1 Laser Product
Laser Klasse 1
Laser Klass 1
Luokan 1 Laserlaite
Appareil À Laser de Classe 1

Statement 4:

![Caution triangle symbol]

![Lifting symbol - two people] ![Lifting symbol - two people] ![Lifting symbol - four people]
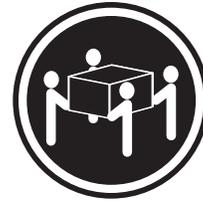
≥ 18 kg (39.7 lb)   ≥ 32 kg (70.5 lb)   ≥ 55 kg (121.2 lb)

CAUTION:
Use safe practices when lifting.

Statement 5:

![Caution and electrical hazard symbols]

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.

![Caution and electrical hazard symbols with power cord diagram showing outlets 2 and 1]

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.

WARNING: Handling the cord on this product or cords associated with accessories sold with this product, will expose you to lead, a chemical known to the State of California to cause cancer, and birth defects or other reproductive harm. *Wash hands after handling.*

ADVERTENCIA: El contacto con el cable de este producto o con cables de accesorios que se venden junto con este producto, pueden exponerle al plomo, un elemento químico que en el estado de California de los Estados Unidos está considerado como un causante de cancer y de defectos congénitos, además de otros riesgos reproductivos. *Lávese las manos después de usar el producto.*

Chapter 1. Introduction

The IBM® BladeCenter™ JS20 Type 8842, also known as the blade server, is based on the IBM POWER™ architecture technologies.

Your blade-model server is one of up to 14 blade servers that can be installed in the IBM @server® BladeCenter™ Type 8677 (the BladeCenter unit). This high-performance blade server is well-suited for networking environments that require outstanding microprocessor performance, efficient memory management, flexibility, and reliable data storage.

Notes:

- The maximum number of blade servers that the BladeCenter unit supports varies by the wattage of the power supplies that are installed in the BladeCenter unit. For more information about determining the power requirements for your blade server, see the *IBM @server BladeCenter Power Module Upgrade Guidelines Technical Update* on the IBM *BladeCenter Documentation* CD.
- Two power modules are required to support the blade servers in blade bays 1 through 6 in the BladeCenter unit. If you install blade servers in these blade bays, you must install power modules in power-module bays 1 and 2 in the BladeCenter unit.
- Four power modules are required to support the blade servers in blade bays 7 through 14 in the BladeCenter unit. If you install blade servers in these blade bays, you must install power modules in power-module bays 1 through 4 in the BladeCenter unit.

This *Installation and User's Guide* provides information to help you:
- Set up your blade server
- Start and configure your blade server
- Install options
- Install your operating system
- Perform basic troubleshooting of your blade server

Additional or updated technical information about your blade server is available from the IBM support Web site. Complete the following steps to check for new or updated documentation for your blade server:

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 JS20**.
5. Click **Continue**.

This *Installation and User's Guide* and other related documentation are provided in Portable Document Format (PDF) on the IBM *BladeCenter Documentation* CD.

You can obtain the latest information about your BladeCenter JS20 Type 8842 model and other IBM @server products at http://www.ibm.com/eserver/.

You can register your blade server at http://www.ibm.com/pc/register/.

Record information about your blade server in the following table.

Product name	BladeCenter JS20
Machine type	8842
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.

Release
levels
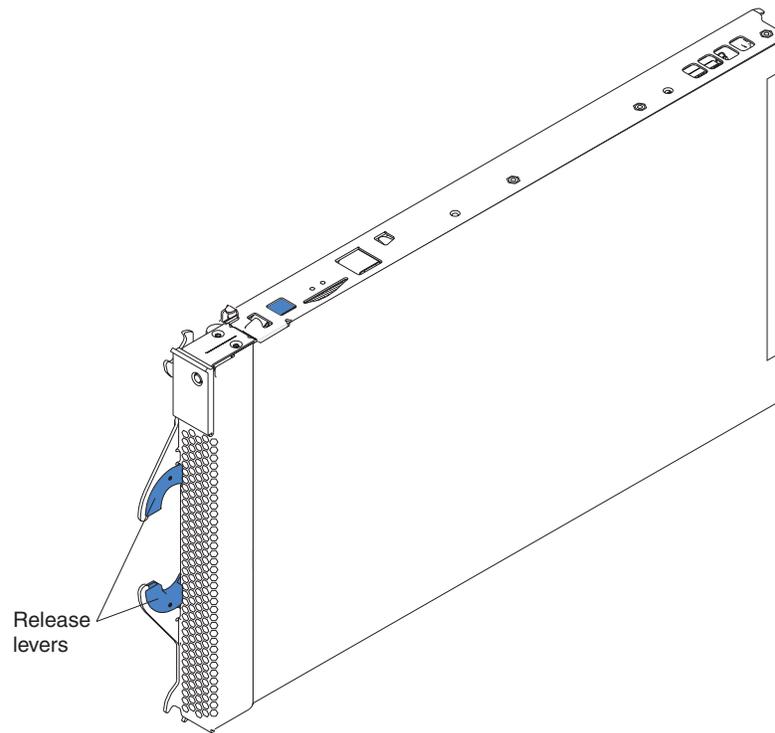
Related documentation

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 JS20 Type 8842:

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

- *BladeCenter JS20 Type 8842 Hardware Maintenance Manual and Troubleshooting Guide*: This document contains the information to help you solve BladeCenter JS20 problems yourself, and it contains information for service technicians.

- *IBM BladeCenter Management Module User's Guide*: This document contains instructions for installing, starting, configuring, and using the management module. This document also provides general information about the management module and contains a description of the management module features.

- *IBM @server BladeCenter Management Module Command Line Interface Reference Guide*: This document contains instructions for installing, starting, configuring, and using the IBM @server BladeCenter management-module command-line interface. This document also provides general information about the BladeCenter management-module command-line interface and contains a description of its features.

- *BladeCenter Management Module Installation Guide*: This document contains instructions for installing, setting up, starting, and configuring the management module.

- *@server BladeCenter Type 8677 Installation and User's Guide*: This document contains instructions for setting up and configuring the BladeCenter unit and basic instructions for installing some options in the BladeCenter unit. It also contains general information about the BladeCenter unit.

- *@server BladeCenter Type 8677 Hardware Maintenance Manual and Troubleshooting Guide*: This document contains the information to help you solve BladeCenter problems yourself, and it contains information for service technicians.

- *@server BladeCenter Type 8677 Rack Installation Instructions*: This document 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 document contains instructions for setting up, installing, and configuring the IBM 4-Port Gb Ethernet Switch Module for BladeCenter and a description of the switch-module features.

- *Nortel Networks Layer 2-7 GbE Switch Module for IBM BladeCenter Installation Guide*: This document contains instructions for setting up, installing, and configuring the Nortel Networks Layer 2-7 GbE Switch Module for IBM @server BladeCenter and a description of the switch-module features.

- *IBM @server BladeCenter 2-Port Fibre Channel Switch Module Installation Guide*: This document contains instructions for setting up, installing, and configuring the IBM @server BladeCenter 2-Port Fibre Channel Switch Module, and a description of the switch module features.

- *Technical Update for IBM eServer BladeCenter Fiber Channel Switch Module version 1.00*: This document contains updated information about the IBM @server BladeCenter 2-Port Fibre Channel Switch Module.

- *IBM @server Serial Over LAN (SOL) Setup Guide*: This document contains instructions for establishing a Serial Over LAN (SOL) connection, enabling the

SOL feature, and configuring the blade server so that you can run SOL sessions and use the BladeCenter management-module command-line interface. This document also contains instructions for updating and configuring BladeCenter components for SOL operation using the management-module Web-based management and configuration program.

- *IBM @server BladeCenter Power Module Upgrade Guidelines Technical Update*: This document contains information that helps you determine the power requirements for your blade server.

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

In addition to reviewing the documentation in this library, be sure to review the *IBM @server BladeCenter Planning and Installation Guide* located at http://www.ibm.com/pc/eserver/bladecenter on the World Wide Web for information to help you prepare for system installation and configuration.

The IBM BladeCenter Documentation CD

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

Hardware and software requirements

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

- Microsoft® Windows NT® 4.0 (with Service Pack 3 or later), Windows® 98, Windows 2000, Windows XP, SUSE LINUX, or Red Hat Linux
- 100 MHz microprocessor
- 32 MB of RAM
- Adobe Acrobat Reader 3.0 (or later) or xpdf, which comes with Linux operating systems

   Note: Acrobat Reader software is included on the CD, and you can install it when you run the Documentation Browser.

Using the Documentation Browser

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

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

- If Autostart is enabled, insert the CD into your CD-ROM drive. The Documentation Browser starts automatically.
- If Autostart is disabled or is not enabled for all users:
  - If you are using a Windows operating system, insert the CD into your CD-ROM drive and click **Start --> Run**. In the **Open** field, type `x:\win32.bat` (where *x* is the drive letter of your CD-ROM drive), and click **OK**.

– If you are using a Linux operating system, insert the CD into your CD-ROM drive; then, run the following command from the /mnt/cdrom directory: `sh runlinux.sh`

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

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

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

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

Notices and statements used in this document

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

The following notices and statements are used in this document:
- **Notes:** 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 potential damage to programs, devices, or data. An attention notice is placed just before the instruction or situation in which damage could occur.
- **Caution:** These statements indicate situations that can be potentially hazardous to you. A caution statement is placed just before the description of a potentially hazardous procedure step or situation.
- **Danger:** These statements indicate situations that can be potentially lethal or extremely hazardous to you. A danger statement is placed just before the description of a potentially lethal or extremely hazardous procedure step or situation.

Features and specifications

The following table provides a summary of the features and specifications of your BladeCenter JS20 Type 8842.

Through the BladeCenter management module, you can view the blade server firmware code and other hardware configuration information.

Note: Power, cooling, removable-media drives, external ports, and advanced system management are provided by the IBM @server BladeCenter Type 8677. For more information, see the @server *BladeCenter Type 8677 Installation and User's Guide* on the IBM *BladeCenter Documentation* CD.

Microprocessor:
 	
Two IBM PowerPC® microprocessors with 512 KB ECC L2 cache
 	
Memory:
• Four double-data rate (DDR) PC2700 sockets
• Minimum: 512 MB
• Maximum: 4 GB
• Type: Two-way interleaved, DDR, PC2700, ECC SDRAM registered x8 DIMMs only
• Supports 256 MB, 512 MB, and 1 GB dual inline memory modules (DIMMs)
 	
Drives and I/O expansion card:
• Support for up to two internal IDE 2.5-inch hard disk drives
  or
• Support for one internal IDE 2.5-inch hard disk drive in IDE connector 1 and one optional I/O expansion card in IDE connector 2
Note: Installing an I/O expansion card increases network connections.
	Size:
	• Height: 24.5 cm (9.7 inches)
	• Depth: 44.6 cm (17.6 inches)
	• Width: 2.9 cm (1.14 inches)
	• Maximum weight: 5.4 kg (12 lb)
	
	Integrated functions:
	• 800 MHz front-side bus (FSB)
	• One dual-port Gigabit Ethernet controller
	• Light path diagnostics
	• Local service processor
	• One IDE hard disk drive controller with two channels
	• RS-485 interface for communication with BladeCenter management module
	• Serial Over LAN (SOL)
	
	Predictive Failure Analysis® (PFA) alerts:
	• Microprocessors
	• Memory
	• Hard disk drives
		Environment:
		• Air temperature:
		  – Blade server on: 10° to 35°C (50° to 95°F). Altitude: 0 to 914 m (0 to 3000 ft)
		  – Blade server on: 10° to 32°C (50° to 90°F). Altitude: 914 m to 2133 m (3000 ft to 7000 ft)
		  – Blade server off: -40° to 60°C (40° to 140° F)
		• Humidity:
		  – Blade server on: 8% to 80%
		  – Blade server off: 5% to 80%
		
		Electrical input:
		• Input voltage: 12 V dc

What your IBM BladeCenter JS20 Type 8842 offers

Your blade server is designed to take advantage of advancements in memory management and data storage. Your blade server includes:

- **IBM PowerPC® 970 microarchitecture**

  IBM PowerPC 970 microarchitecture technology leverages proven innovative IBM technologies to build powerful, scalable, reliable IBM-processor-based servers. PowerPC 970 microarchitecture technology includes features such as light path diagnostics, Predictive Failure Analysis (PFA), and Advanced System Management.[1]

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

  Your blade server supports two IBM PowerPC 970 microprocessors and comes with two microprocessors installed. Together, these two microprocessors enhance performance. 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. 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/.

- **Integrated network environment support**

  Your blade server comes with one integrated dual-port Gigabit Ethernet controller. Each Ethernet controller port 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 port provides full-duplex (FDX) capability, which enables simultaneous transmission and reception of data on the Ethernet local area network (LAN). The controller supports 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 for adding more network communication capabilities to the blade server.

- **Large system memory**

  The memory bus in your blade server supports up to 4 GB of system memory. The memory controller provides support for up to four industry-standard 2.5 V, 184-pin, double-data-rate (DDR), PC2700, registered synchronous dynamic random-access memory (SDRAM) with error correcting code (ECC) dual inline memory modules (DIMMs). For the most current list of supported DIMMs, see the ServerProven® list at http://www.ibm.com/pc/us/compat/.

- **Light path diagnostics**

  Light path diagnostics provides light-emitting diodes (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. For more information, see "Light path diagnostics overview" on page 92.

- **Serial Over LAN**

  Your blade server supports Serial Over LAN (SOL) technology, which provides advanced remote management capability. It provides the ability to redirect server serial data over a LAN without the use of serial concentrators. It also eliminates the need for serial cabling by internally rerouting serial packets over the LAN.

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1. For more information about IBM PowerPC microarchitecture, go to http://www-3.ibm.com/chips/products/powerpc/.

The SOL feature is accessed through the management-module command-line interface. The SOL feature does not require any special client software because it is designed to work with existing standard Telnet consoles. For more information, see Chapter 5, "Configuring your blade server," on page 41, Chapter 6, "Running a Serial Over LAN session," on page 57, and the *IBM @server BladeCenter Management Module Command Line Interface Reference Guide* on the IBM *BladeCenter Documentation* CD.

Reliability, availability, and serviceability features

Three important features in server design are reliability, availability, and serviceability (RAS). These RAS features are designed to help you protect the integrity of the data stored on your blade server; help ensure that your blade server is available when you want to use it; and, in the event of a failure, help you 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:
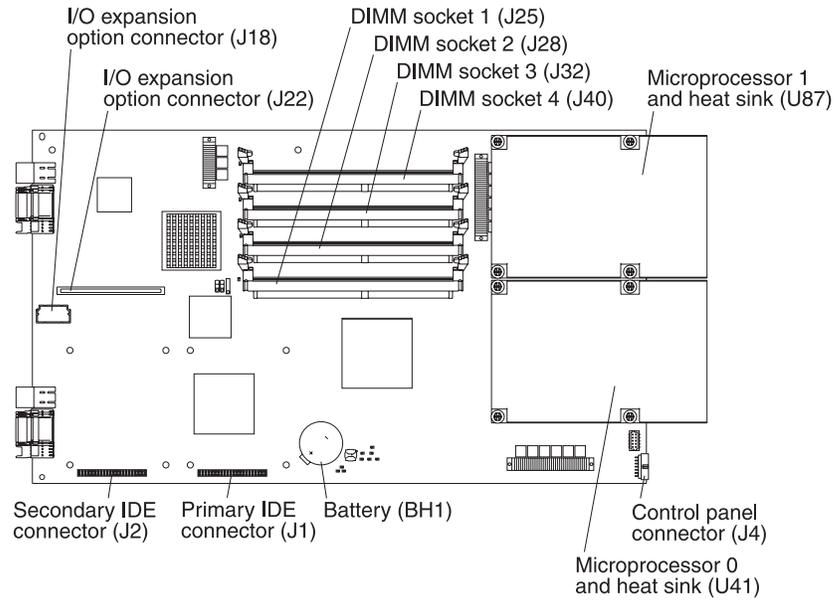- Automatic error retry or recovery
- Automatic server restart
- Built-in monitoring for temperature, voltage, and hard disk drives
- Customer-upgradeable system firmware code
- Customer support center 24 hours per day, 5 days a week (Monday through Friday)[2]
- Diagnostic support of Ethernet controller ports
- Error codes and messages
- Error correcting code (ECC) protection on the Level 2 (L2) cache
- ECC memory
- Light path diagnostics
- Power-on self-test (POST)
- Predictive Failure Analysis (PFA) alerts
- 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
- 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.

System-board internal and option connectors

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

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

I/O expansion option connector (J18)

I/O expansion option connector (J22)

DIMM socket 1 (J25)

DIMM socket 2 (J28)

DIMM socket 3 (J32)

DIMM socket 4 (J40)

Microprocessor 1 and heat sink (U87)

Secondary IDE connector (J2)

Primary IDE connector (J1)

Battery (BH1)

Control panel connector (J4)

Microprocessor 0 and heat sink (U41)

System-board LEDs

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 must remove the blade server from the BladeCenter unit, open the cover, and press the light path diagnostics button (SW1) to light any error LEDs that were turned on during processing.

Notes:

- 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 (SW1).

- Error LED CR29 is not used.
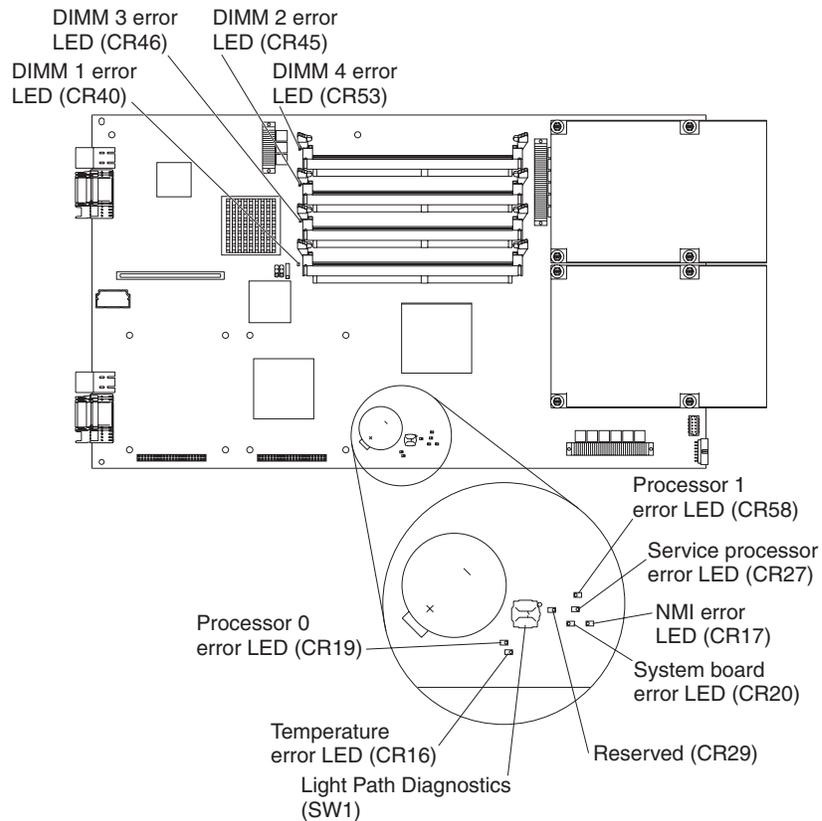
Preinstallation requirements

Before you install components or perform configuration tasks, make sure that:

- You have read the safety information beginning on page vii and the information in "Installation guidelines" on page 21.
- You have reviewed the documentation that comes with each device and any applicable information in the "Related documentation" on page 3.
- You have correctly configured the rack in which you will install the BladeCenter unit.
- You have installed the BladeCenter unit in a rack according to the @server *BladeCenter Type 8677 Rack Installation Instructions* on the IBM *BladeCenter Documentation* CD.
- The BladeCenter unit is correctly configured according to the instructions in "Configuring the BladeCenter unit for the Serial Over LAN (SOL) feature" on page 42.

  Note: For additional information, see the @server *BladeCenter Type 8677 Installation and User's Guide* and *IBM @server BladeCenter Management Module Command-Line Interface Reference Guide* on the IBM *BladeCenter Documentation* CD.

- You have installed the power modules in the BladeCenter unit according to the instructions in the @server *BladeCenter Type 8677 Installation and User's Guide* on the IBM *BladeCenter Documentation* CD.

  Note: For the latest updates about power modules, see the *IBM @server BladeCenter Power Module Upgrade Guidelines Technical Update* on the IBM *BladeCenter Documentation* CD.

- You have installed and configured the management module in the BladeCenter unit according to the instructions in:
  - "Management-module configuration" on page 46.
  - The *BladeCenter Management Module Installation Guide* on the IBM *BladeCenter Documentation* CD.
- You have installed and configured the Ethernet switch modules in the BladeCenter unit according to the instructions in the *IBM 4-Port Gb Ethernet Switch Module for BladeCenter Installation and User's Guide* or *Nortel Networks Layer 2-7 GbE Switch Module for IBM BladeCenter Installation Guide* on the IBM *BladeCenter Documentation* CD.

  Note: If the IBM 4-Port Gb Ethernet Switch Module for BladeCenter is installed in your BladeCenter unit and you must replace the CD-ROM media tray in your BladeCenter unit, you must also update the microcode in the Ethernet switch module.

- You have installed and configured a second Ethernet switch module in I/O bay 2 of the BladeCenter unit, if you plan to install the operating system through the Ethernet network.

  Note: This Ethernet switch module must be of the same type that you installed in I/O bay 1 of the BladeCenter unit.

- Your BladeCenter unit has the correct CD-ROM media tray as described in "Checking the status of the CD-ROM media tray" on page 12.

Checking the status of the CD-ROM media tray

If your BladeCenter unit was shipped to you before June 2003, the CD-ROM media tray might require an update for correct CD-ROM operation with the blade server. From the management-module Web-based management and configuration program main menu, you can select settings that you want to view or change. The navigation pane (on the left side of the management module window) contains navigational links that you use to manage your BladeCenter unit and check the status of the components (modules and blade servers).

Complete the following steps to determine whether the media tray requires replacement:

1. In the navigation pane, select **Hardware VPD**.
2. In the management module window (on the right side), go to the "BladeCenter Hardware VPD" table. Look for "Media Tray" in the "Module Name" column. If the part number is not 49P2522, then you have a down level component that must be replaced with part number 49P2522.

If the media tray requires replacement, call the IBM Support Center (1-800-IBM-SERV) to report the down level component as a failed part and request a replacement media tray that can be used with your blade server. Before you can install and use the blade server in the BladeCenter unit, the media tray must be replaced in the BladeCenter unit as described in the @server *BladeCenter Type 8677 Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *BladeCenter Documentation* CD.

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

Important: To generate faster blade-server startups from the network, connect the dynamic host configuration protocol (DHCP) server to the Ethernet switch module in I/O bay 2 in the BladeCenter unit. The system firmware code in the blade server detects this Ethernet controller first. The Ethernet controller in each blade server is then associated with the switch module in I/O bay 2.

Notes:
- 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. Before the LED flashes, the service processor in the BladeCenter management module is initializing, and the power-control button on the blade server will not respond.
- 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.
- After an orderly shutdown of the operating system occurs, the Wake on LAN feature is permanently enabled in the blade server system firmware code. Therefore, **Enabled** is the default setting. The Wake on LAN setting for each blade server is stored in the management-module nonvolatile random-access memory (NVRAM). To disable the Wake on LAN feature for one or more blade servers, use the BladeCenter management-module Web interface. For more information about the BladeCenter management-module Web interface, see the *BladeCenter Management Module User's Guide* on the IBM *BladeCenter Documentation* CD.
- Throughout this document, the management-module Web-based user interface is also known as the BladeCenter management-module Web interface.

After you connect the BladeCenter unit to power, 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.
- 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 it has not been disabled through the BladeCenter management-module Web interface, the blade server power-on LED is flashing slowly, and the Wake on LAN feature can turn on the blade server.

Turning off the blade server

When you turn off the blade server, it is still connected to power through the BladeCenter unit. The blade server can respond to requests from the service processor, such as a remote request to turn on the blade server.

To avoid loss of data, 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.

If the blade server has not been turned off, 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.

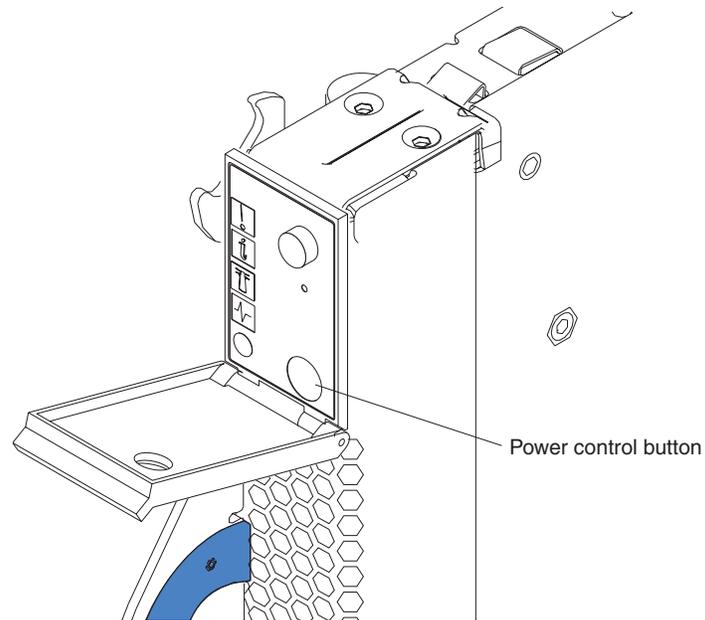- The BladeCenter management-module Web interface can turn off the blade server.

Note: After turning off the blade server, wait at least 30 seconds for the 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 LEDs on your blade server.

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.

Power control button

Notes:

- The control panel door is shown in the closed (normal) position in this illustration.
- The blade-error LED, information LED, and location LED can be turned off through the BladeCenter management-module Web interface.
- For additional information about errors, see Chapter 8, "Solving problems," on page 63.
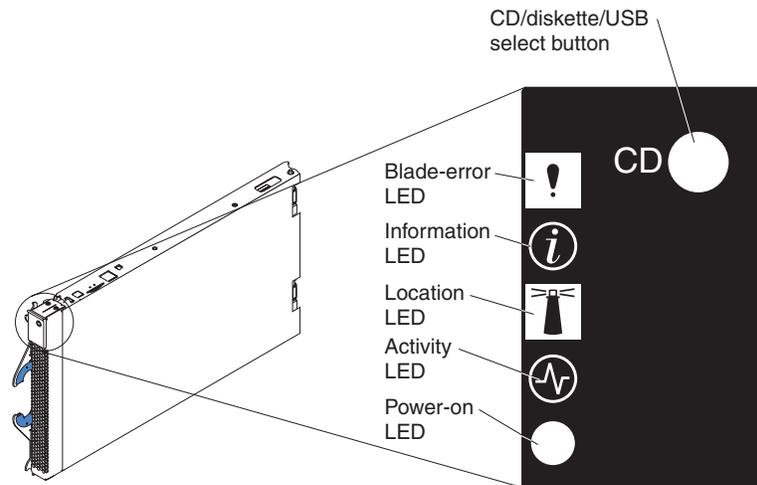
Blade-error LED: When this amber LED is lit, it indicates that a system error has occurred in the blade server.

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. The error might not require immediate service.

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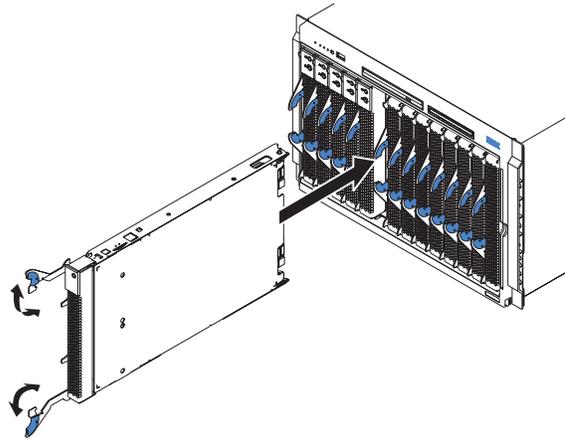
Activity LED: When this green LED is lit, it indicates that there is hard disk drive or network activity.

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 communicating with the BladeCenter management module.
- Flashing slowly - The blade server has ac power but is not turned on.
- Lit continuously (steady) - The blade server has ac power and is turned on.

Chapter 3. Installing the blade server in the BladeCenter unit

If you have options to install in your blade server, go to Chapter 4, "Installing and removing options and customer-replaceable units," on page 21 for instructions; then, return here. Otherwise, continue with the instructions in this chapter.

Notes:

- The maximum number of blade servers that the BladeCenter unit supports varies by the wattage of the power supplies that are installed in the BladeCenter unit. For more information about determining the power requirements for your blade server, see the *IBM @server BladeCenter Power Module Upgrade Guidelines Technical Update* on the IBM *BladeCenter Documentation* CD.

- Two power modules are required to support the blade servers in blade bays 1 through 6 in the BladeCenter unit. If you install blade servers in these blade bays, you must install power modules in power-module bays 1 and 2 in the BladeCenter unit.

- Four power modules are required to support the blade servers in blade bays 7 through 14 in the BladeCenter unit. If you install blade servers in these blade bays, you must install power modules in power-module bays 1 through 4 in the BladeCenter unit.

- To help ensure proper cooling, performance, and system reliability, do not operate the BladeCenter unit for more than 1 minute without a blade server or filler blade installed in each blade bay.

- When you remove a filler blade from a blade bay in the BladeCenter unit so that you can install a blade server, *do not* discard the filler blade. You will need the filler blade if you ever remove the blade server. For future use, store the filler blade in a static-protective environment, such as the static-protective package that comes with the blade server.

Complete the following steps to install a blade server into 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. Read the safety information beginning on page vii and "Installation guidelines" on page 21.
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.
4. Remove the filler blade from the bay that you selected. For future use, store the filler blade in a static-protective environment.
5. Make sure that the release levers on the blade server are in the open position (perpendicular to the blade server).
6. 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.
7. Push the release levers on the front of the blade server closed.
8. Turn on the blade server. See "Turning on the blade server" on page 13 for instructions.
9. The power-on LED on the blade control panel first flashes rapidly and then slowly. Make sure that the power-on LED is lit continuously (steady), indicating that the blade server is receiving power and is turned on.
10. (Optional) A set of user labels comes with the blade server. Write identifying information on one of the user labels for the blade server; then, place the label on the BladeCenter unit bezel just below the blade server, as shown in the following illustration.

Attach here
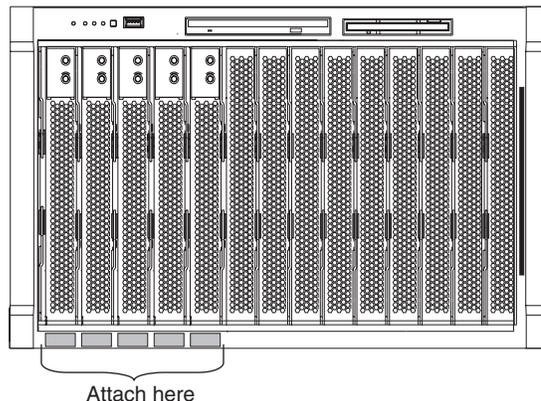
Important: Do not place the label on the blade server or in any way block the ventilation holes on the blade server.
11. If you have other blade servers to install, do so now.

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, such as incorrectly reconfiguring the blade server.

If this is the initial installation for a blade server in the BladeCenter unit, you must configure the BladeCenter unit for this blade server as described in Chapter 5, "Configuring your blade server," on page 41. Then, install the operating system. See Chapter 7, "Installing the operating system," on page 61 for more information.

Chapter 4. Installing and removing options and customer-replaceable units

This chapter provides instructions for adding options or customer-replaceable units (CRUs) to your blade server. CRUs are customer-replaceable components, such as memory modules, hard disk drives, and I/O expansion cards. (Some removal instructions are provided in case you need to remove one option or CRU to install another.)

Installation guidelines

Before you begin, 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.
- Read the information in "Preinstallation requirements" on page 11.
- 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 by typing the `shutdown -h now` command. If the blade server was not turned off, press the power-control button (behind the blade-server control panel door) to turn off the blade server. You do not have to shut down the BladeCenter unit itself.

System reliability guidelines

To help ensure proper cooling and system reliability, make sure that:

- The ventilation holes on the blade server are not blocked.
- Each of the blade bays on the front of the BladeCenter unit has a blade server or filler blade installed. Do not operate the BladeCenter unit for more than 1 minute without a blade server or filler blade installed in each blade bay.
- You have followed the reliability guidelines in the documentation that comes with the BladeCenter unit.
- You have not installed any small computer system interface (SCSI) devices. The blade server does not support SCSI devices. If you attach SCSI devices to the blade server, these devices will not be recognized or configured, and they will not operate.

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 damage it.
- While the device is still in its static-protective package, touch it to an unpainted metal part of the BladeCenter unit for at least 2 seconds. This drains static electricity from the package and from your body.
- Remove the device from its package and install it directly into the blade server or BladeCenter unit without setting the device down. If it is necessary to set down the device, put it back into its static-protective package. Do not place the device on your blade server cover or on a metal surface.
- Take additional care when handling devices during cold weather. Heating reduces indoor humidity and increases static electricity.
- Wear an electrostatic-discharge wrist strap, if one is available.

Removing the blade server from the BladeCenter unit

The following illustration shows how to remove the blade server from the
BladeCenter unit.
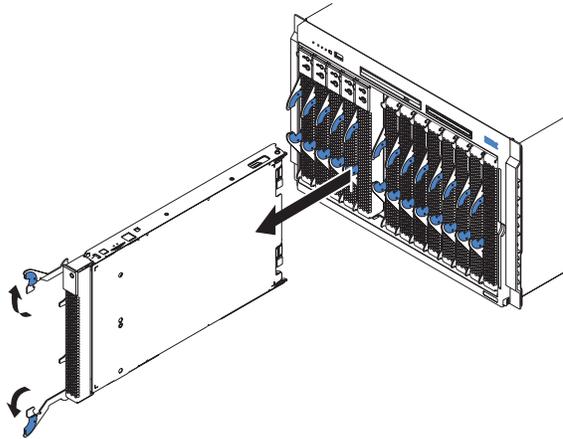
Attention:

- To maintain proper system cooling, do not operate the BladeCenter unit for more
  than 1 minute without a blade server or filler blade installed in each blade bay.
- Note the number of the bay that contains the blade server that you will remove.
  Reinstalling a blade server into a different bay from 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 have to reconfigure the blade server.

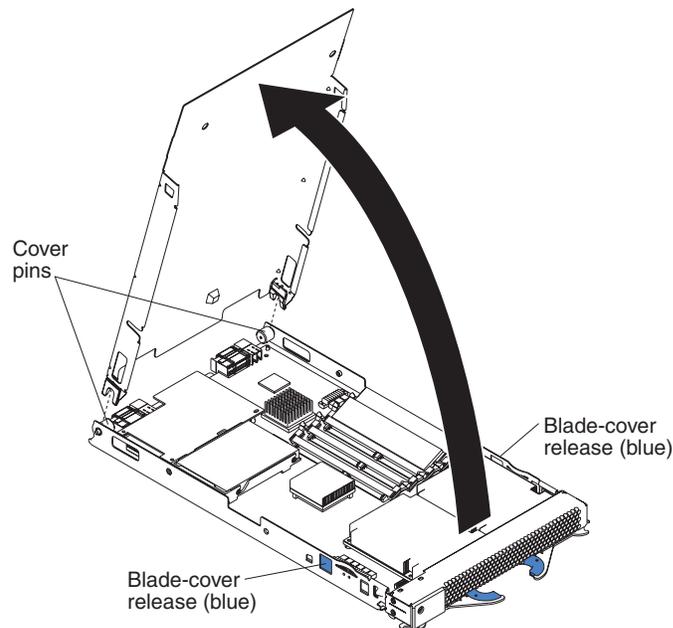Complete the following steps to remove the blade server:

1. Read the safety information beginning on page vii and "Installation guidelines"
   on page 21.
2. If the blade server is operating, the power-on LED is lit continuously (steady).
   Shut down the operating system by typing the `shutdown -h now` command. If the
   blade server was not turned off, 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 for the hard disk drives to stop spinning,
   before proceeding to the next step.
3. 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).
4. Pull the blade server out of the bay.
5. Place either a filler blade or a new blade server in the bay within 1 minute.

Opening the blade server cover

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

Cover pins

Blade-cover release (blue)

Blade-cover release (blue)

Complete the following steps to open the blade server cover:

1. Read the safety information beginning on page vii and "Installation guidelines" on page 21.
2. Carefully place the blade server on a flat, static-protective surface, with the cover side up.
3. Press the blue blade-cover release on each side of the blade server and lift the cover open, as shown in the illustration.
4. Lift the cover from the blade server and set it aside.

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

Before you can replace a defective system board or blade-server bezel assembly, you must first remove the blade-server bezel assembly. The following illustration shows how to remove the bezel assembly from a blade server.
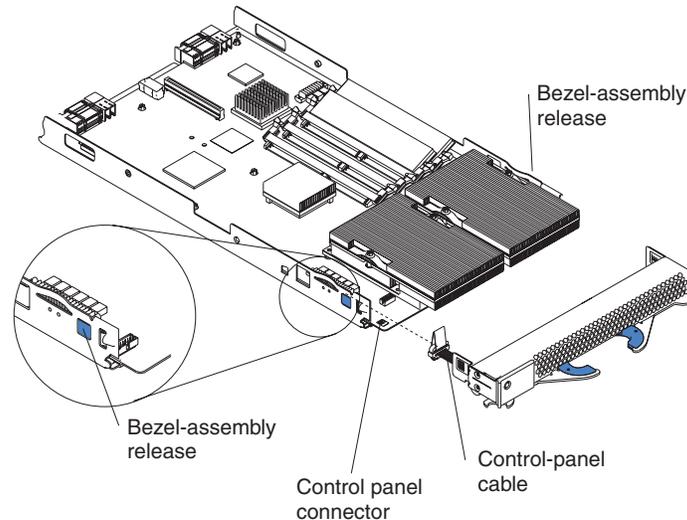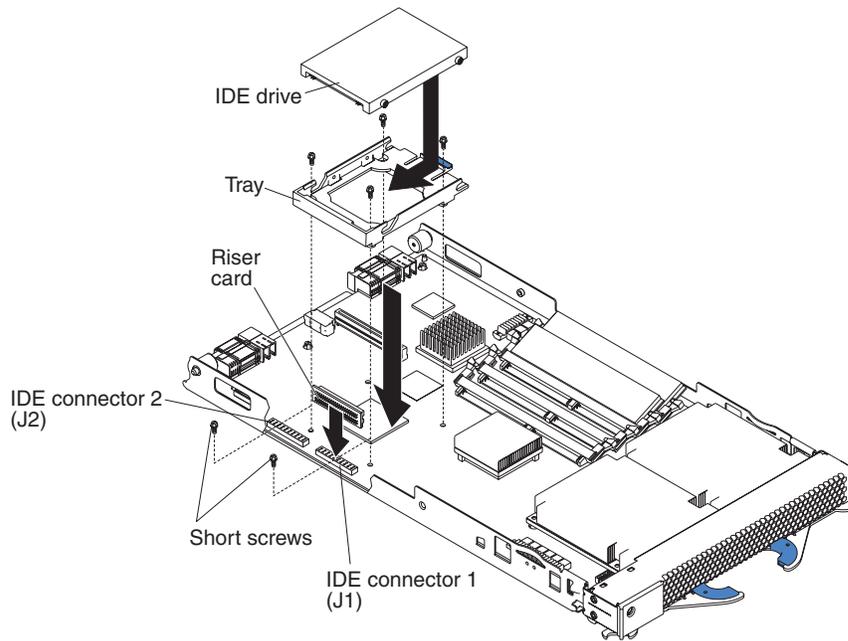

Complete the following steps to remove the blade-server bezel assembly:

1. Read the safety information beginning on page vii and "Installation guidelines" on page 21.
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 integrated drive electronics (IDE) hard disk drives. Each IDE connector is on a separate channel. Some models come with at least one IDE hard disk drive already installed.

Attention: To maintain proper system cooling, do not operate the BladeCenter unit for more than 1 minute without a blade server or filler blade installed in each blade bay.

IDE drive

Tray

Riser card

IDE connector 2 (J2)

Short screws

IDE connector 1 (J1)

Attention:

- Drives must be installed in the following order: IDE connector 1 (J1) first, then IDE connector 2 (J2).
- 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.
- Do not press on the top of the hard disk drive when installing it. Pressing the top could damage the hard disk drive.
- IDE hard disk drives must be set to Master.

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

1. Read the safety information beginning on page vii and "Installation guidelines" on page 21.
2. If the blade server is operating, shut down the operating system by typing the `shutdown -h now` command. If the blade server was not turned off, 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.
3. Remove the blade server from the BladeCenter unit. (See "Removing the blade server from the BladeCenter unit" on page 23 for instructions.) Carefully place the blade server on a flat, static-protective surface.
4. Open the blade server cover. See "Opening the blade server cover" on page 24 for instructions.
5. Insert the riser card from the option kit into an IDE connector on the blade server system board.
6. Place the tray from the option kit over the riser card as shown in the preceding illustration, aligning the tray with the screws on the system board. Note the four screws that are under the four screw holes in the tray. Set the tray aside and remove the four screws.
7. Replace the tray and secure the tray to the system board with screws from the hardware kit.

8. Set any jumpers or switches on the hard disk drive, if this requirement is specified on the drive label or in the documentation that comes with the drive.

9. Place the hard disk drive into the tray and, from the rear edge of the hard disk drive, push it 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 additional memory-module options. When you install memory, you must install a pair of matched dual inline memory modules (DIMMs).

Notes:

- The system board contains four DIMM connectors and supports two-way memory interleaving.

- The DIMM options available for your blade server are 256 MB, 512 MB, and 1 GB. Your blade server supports a minimum of 512 MB and a maximum of 4 GB of system memory.

- Both DIMMs in a pair must be the same size, speed, type, and technology. You can mix compatible DIMMs from various manufacturers.

- The second pair of DIMMs does not have to be the same size, speed, type, and technology as the first pair.

- The blade server does not support unregistered DIMMs. Install only 2.5 V, 184-pin, double-data-rate (DDR), PC2700, registered synchronous dynamic random-access memory (SDRAM) with error correcting code (ECC) DIMMs. These DIMMs must be compatible with the latest PC2700 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/.

- PC2700 DIMMs are compatible with earlier specifications and work in the PC2100 and PC1600 DIMM connectors.

- Installing or removing DIMMs changes the configuration information for the blade server. After you install or remove a DIMM, the new configuration information is automatically saved in the blade server firmware code. You can verify the latest configuration information by viewing the blade server firmware code as described in "Updating the firmware code for your blade server and the service processor" on page 55.

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

DIMM socket 4 (J40)
DIMM socket 3 (J32)
DIMM socket 2 (J28)
DIMM socket 1 (J25)
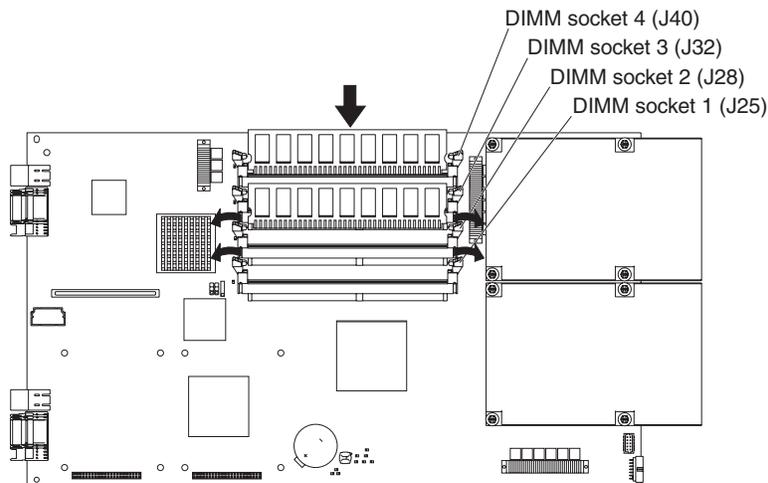
Before you begin, read the documentation that comes with your option.

Complete the following steps to install a DIMM:

1. Read the safety information beginning on page vii and "Installation guidelines" on page 21.

2. If the blade server is operating, shut down the operating system by typing the `shutdown -h now` command. If the blade server was not turned off, 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.

3. Remove the blade server from the BladeCenter unit. See "Removing the blade server from the BladeCenter unit" on page 23 for instructions.

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

5. Open the blade server cover. See "Opening the blade server cover" on page 24 for instructions.

6. Locate the DIMM connectors on the system board. Determine the connectors into which you will install the DIMMs.

   Your blade server comes with two 256 MB DIMMs installed in the DIMM 3 (J32) and DIMM 4 (J40) memory connectors. When you install additional DIMMs, be sure to install them as a pair, in DIMM connectors 1 and 2 (J25 and J28).

   Install the DIMMs in the following order:

Pair	DIMM connectors
First	3 and 4 (J32 and J40)
Second	1 and 2 (J25 and J28)

7. 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.

8. To install the DIMMs, repeat the following steps for each DIMM that you install:

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

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

   b. Insert the DIMM by pressing the DIMM along the guides into the connector. Make sure that the retaining clips snap into the closed positions.

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

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

Installing an I/O expansion card

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

When you add an I/O expansion card, you must make sure that the switch modules in I/O 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 I/O 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 that is installed in IDE connector 2. The I/O expansion card occupies the same space as this hard disk drive and replaces it. You cannot install a hard disk drive in IDE connector 2 while an I/O expansion card is installed in the blade server.
- When you install a Myrinet Cluster Expansion Card for IBM @server BladeCenter into a BladeCenter JS20 Type 8842, you must connect the cable from the I/O expansion card to the J7 connector on the system board.

Attention: 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.

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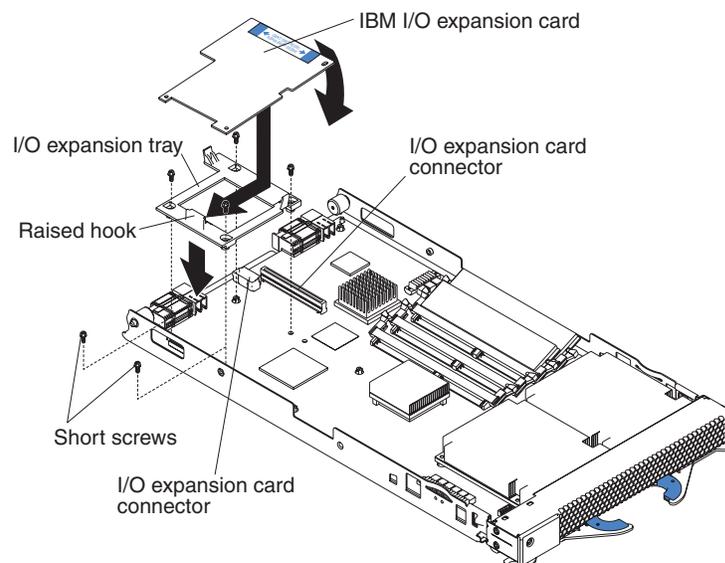
Complete the following steps to install an I/O expansion card:

1. Read the safety information beginning on page vii and "Installation guidelines" on page 21.

2. If the blade server is operating, shut down the operating system by typing the `shutdown -h now` command. If the blade server was not turned off, 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.

3. Remove the blade server from the BladeCenter unit (see "Removing the blade server from the BladeCenter unit" on page 23 for information).

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

5. Open the cover (see "Opening the blade server cover" on page 24 for instructions).

6. Install the I/O expansion card tray:

   - If an IDE hard disk drive is in IDE connector 2, remove the hard disk drive and tray. Save the four long screws that secured the tray to the system board.

   - If there is no IDE hard disk drive in IDE connector 2, remove the four screws as shown in the previous illustration.

   Secure the tray to the system board with the screws from the option kit, as shown in the previous illustration.

7. Install the I/O expansion card:

   a. Orient the I/O expansion card as shown in the previous illustration.

   b. 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 previous 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 card. Some documentation might also be on the IBM *BladeCenter Documentation* CD that comes with the BladeCenter unit.

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

Installing an Ethernet cable

One dual-port Gigabit Ethernet controller is integrated on the BladeCenter JS20 Type 8842 system board. To support Ethernet connections and the SOL feature and to configure your blade server, you must install an optional Ethernet-compatible switch module, such as the Nortel Networks Layer 2-7 GbE Switch Module for IBM @server BladeCenter or IBM 4-Port Gb Ethernet Switch Module for BladeCenter, in I/O bay 1 of the BladeCenter unit.

If you plan to use both Ethernet controller ports, you must install an identical Ethernet switch module in I/O bays 1 and 2, since both I/O bays require the same type of optional Ethernet-compatible switch module. Each controller port provides a 1000-Mbps full-duplex interface for connecting to one of the Ethernet-compatible switch modules in I/O bays 1 and 2. If you plan to attach additional Ethernet devices to the blade server or the BladeCenter unit, you must install an optional Ethernet-compatible switch module, such as the Nortel Networks Layer 2-7 GbE Switch Module for IBM @server BladeCenter or IBM 4-Port Gb Ethernet Switch Module for BladeCenter, in I/O bay 3 or 4 of the BladeCenter unit, to support these

additional Ethernet connections. If you install optional Ethernet-compatible switch modules in I/O bays 3 and 4, these switch modules must be identical.

The optional Ethernet switch modules contain four ports with RJ-45 connectors. These connectors provide a 10/100/1000 Base-T interface (either at half-duplex or full duplex) for connecting twisted-pair cable to the Ethernet network. You must purchase and install a compatible cable to connect these devices. To connect an Ethernet controller port to a repeater or switch module, use an unshielded twisted pair (UTP) cable with RJ-45 connectors at both ends. For 100 Mbps or higher operation, Category 5 cabling is required. For 10 Mbps operation, Category 3 cabling is required.

Notes:
- For more information about Ethernet requirements, see the documentation that comes with the Ethernet devices and the @server *BladeCenter Type 8677 Installation and User's Guide* on the IBM *BladeCenter Documentation* CD.
- For more information about the Ethernet switch modules, see the *IBM 4-Port Gb Ethernet Switch Module for BladeCenter Installation and User's Guide* or *Nortel Networks Layer 2-7 GbE Switch Module for IBM BladeCenter Installation Guide* on the IBM *BladeCenter Documentation* CD.
- For more information about the SOL feature, see Chapter 5, "Configuring your blade server," on page 41 and the *IBM @server BladeCenter Management Module Command Line Interface Reference Guide* on the IBM *BladeCenter Documentation* CD.

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-IBM-SERV 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 authorized reseller or IBM marketing representative.

Note: After you replace the battery, the blade server is automatically reconfigured; however, you must reset the system date and time through the operating system that you installed.

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.

Note: See "Battery return program" on page 121 for more information about battery disposal.

Complete the following steps to replace the battery:
1. Read the safety information beginning on page vii and "Installation guidelines" on page 21.
2. Follow any special handling and installation instructions that come with the battery.
3. If the blade server is operating, shut down the operating system by typing the `shutdown -h now` command. If the blade server was not turned off, 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.
4. Remove the blade server from the BladeCenter unit (see "Removing the blade server from the BladeCenter unit" on page 23 for information).
5. Open the blade server cover (see "Opening the blade server cover" on page 24 for instructions).
6. Locate the battery (connector BH1) on the system board.

Battery (BH1)
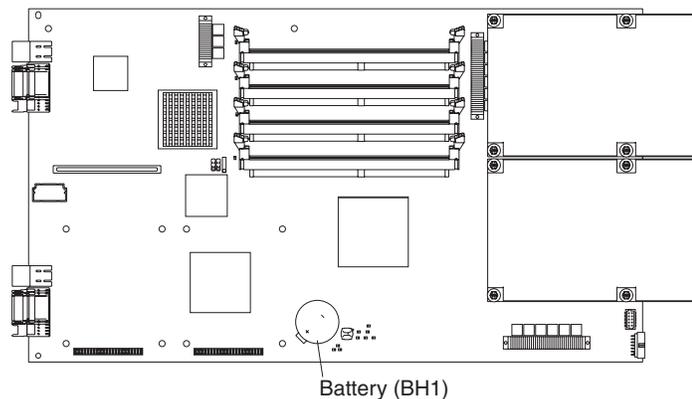
7. Remove the battery:

  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, press gently on the clip to make sure that the battery clip is touching the base of the battery socket.
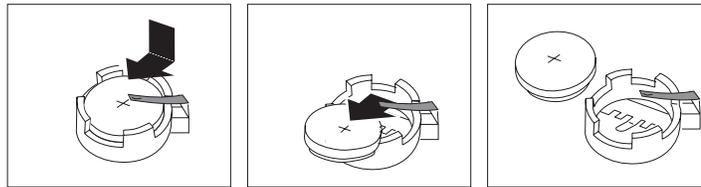
8. Insert the new battery:

  a. Tilt the battery so that you can insert it into the socket, under the battery clip. Make sure that the side with the positive (+) symbol is facing up.

  b. As you slide it under the battery clip, press the battery down into the socket.
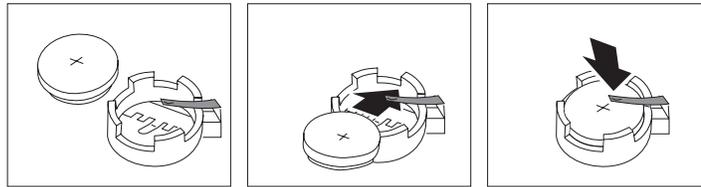
9. Close the blade server cover (see "Closing the blade server cover" on page 39).

   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.

10. Reinstall the blade server into the BladeCenter unit (see Chapter 3, "Installing the blade server in the BladeCenter unit," on page 17).

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

12. Reset the system date and time through the operating system that you installed. For additional information, see your operating-system documentation.

Replacing the system board

Two operational microprocessors and heat sinks are required on the system board in the blade server at all times. The microprocessors and heat sinks are not replaceable. Do not attempt to remove these components or any components that secure the microprocessors and heat sinks to the system board. You must replace the system board if any of these conditions exists:

- A microprocessor or heat sink becomes defective.
- Certain errors occur as described in "Firmware error codes" on page 80.
- The blade server does not restart after you recover the system firmware code as described in "Recovering the system firmware code" on page 96.

To obtain a new system board, you must order a new blade server. The replacement system board comes attached to the new blade server. To order a blade server, contact your IBM marketing representative or authorized reseller.

Important: After you replace the system board, you must either update the new blade server with the latest firmware or restore the pre-existing firmware from a diskette or CD image. You must also configure the new blade server and use the operating system to reset the system date and time.

Complete the following steps to replace the system board:

1. Read the safety information beginning on page vii and "Installation guidelines" on page 21.
2. If the blade server is operating, shut down the operating system by typing the `shutdown -h now` command. If the blade server was not turned off, 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.
3. Remove the blade server from the BladeCenter unit (see "Removing the blade server from the BladeCenter unit" on page 23 for information). The faulty system board is attached to the blade server.
4. Open the blade server cover (see "Opening the blade server cover" on page 24 for instructions).
5. Remove the blade-server bezel assembly (see "Removing the blade-server bezel assembly" on page 25).
6. Remove the following components from the faulty system board (see the applicable installation instructions in this chapter and reverse the steps), and place them on a flat, static-protective surface. Make sure that the following components are accessible for reinstallation:
   - IDE hard disk drives (see "Installing IDE hard disk drives" on page 25)
   - DIMMs (see "Installing memory modules" on page 27)
   - I/O expansion cards (see "Installing an I/O expansion card" on page 30)
   - Jumper J14, between jumpers J16 and J20 (for location, see the illustration in "Recovering the system firmware code" on page 96)
7. While the new blade server is still in its static-protective package, touch it to an unpainted metal part of the system unit for at least 2 seconds.
8. Remove the new blade server from its package and place it on a flat, static-protective surface.

   Note: The replacement system board is already attached to the new blade server.

9. Install the components that you removed from the faulty system board in step 6 on page 35 onto the replacement system board.
   - IDE hard disk drives (see "Installing IDE hard disk drives" on page 25)
   - DIMMs (see "Installing memory modules" on page 27)
   - I/O expansion cards (see "Installing an I/O expansion card" on page 30)
   - Jumper J14, between jumpers J16 and J20 (for location, see the illustration in "Recovering the system firmware code" on page 96)

   If you plan to increase the amount of memory in the blade server, install the new DIMMs on the new system board now. For additional information, see "Installing memory modules" on page 27.

10. Note the machine type, model number, and serial number on the blade-server bezel assembly. You will need this information to complete this step.

    Your replacement system board comes with a repair identification (RID) tag label. To ensure future entitlement for service, you must write the serial number of the original system board onto the RID tag label in this step. The part number for the RID tag is 13N0477.

    Use the RID tag label to transfer entitlement (machine type, model number, and serial number) from the previous blade server to the new blade server. Do not use a pencil or felt-tip pen to complete the RID tag label.

    Important:
    - The serial number of the failing system board must match the serial number that you reported when you called IBM for service.
    - Because the new system board does not have a serial number, you must transfer the original system-board serial number to the new system board. The first time that you turn on the new blade server, the firmware code will request that you enter the serial number. You must enter the original system-board serial number. If you enter a different serial number, the operating system that you installed might interpret this information as an incorrect serial number, and you might have to change your software-licensing agreement.
    - To maintain proper airflow, do not place the new label on the blade-server bezel assembly.

    Also, be sure to place the RID tag label on the bottom of the new blade server chassis.

11. Install the blade-server bezel assembly on the new blade server (see "Installing the blade-server bezel assembly" on page 38).

12. Close the blade server cover (see "Closing the blade server cover" on page 39).

    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.

13. Install the new blade server into the same BladeCenter unit I/O bay from which you removed the original blade server that contains the faulty system board (see Chapter 3, "Installing the blade server in the BladeCenter unit," on page 17).

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

    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 slowly flashes before you press the power-control button on the blade server.

15. Configure an SOL connection and attach it to this blade server.

    For additional information, see Chapter 5, "Configuring your blade server," on page 41 and Chapter 6, "Running a Serial Over LAN session," on page 57.

16. The blade server will boot to the Open Firmware command to enter the serial number from the previous (faulty) blade server.

    The blade server will not start until the serial number and other relevant information have been entered and verified at the prompts when the following checkpoint codes are displayed, as shown in the following example window. Depending on the blade server configuration, the text that is displayed in your system window might be slightly different.

    ```
    E1F0
    E1F1
    D099
    D100 > xxxxxxx  (The serial number from the old blade server system board)
    D101 > xxxxxxx  (Re-enter the serial number to verify)
    D102 > 8842  (The type number from the old blade server)
    D103 > 8842  (Re-enter the type number to verify)
    D104 > xxxx  (The model number from the old blade server)
    D105 > xxxx  (Re-enter the model number to verify)
    ```

    Note: These checkpoint codes are described in Chapter 8, "Solving problems," on page 63.

17. Reset the system date and time through the operating system that you installed. For additional information, see your operating-system documentation.

# 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 into the BladeCenter unit (see Chapter 3, "Installing the blade server in the BladeCenter unit," on page 17).

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

3. After you replace the battery or the system board, reset the system date and time through the operating system that you installed. For additional information, see your operating-system documentation.

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.
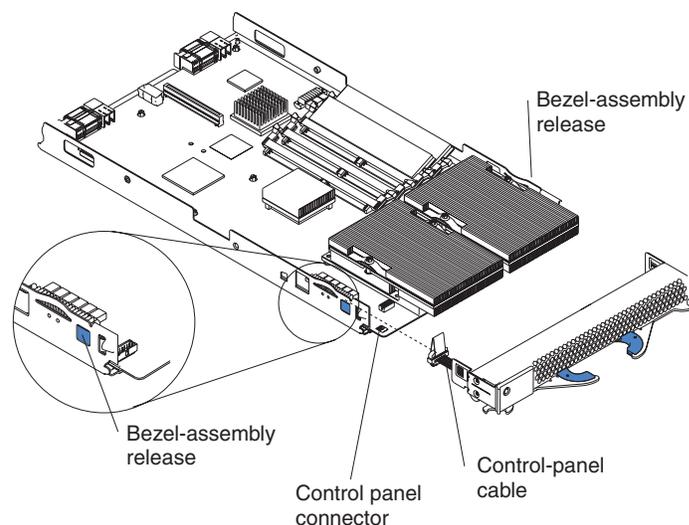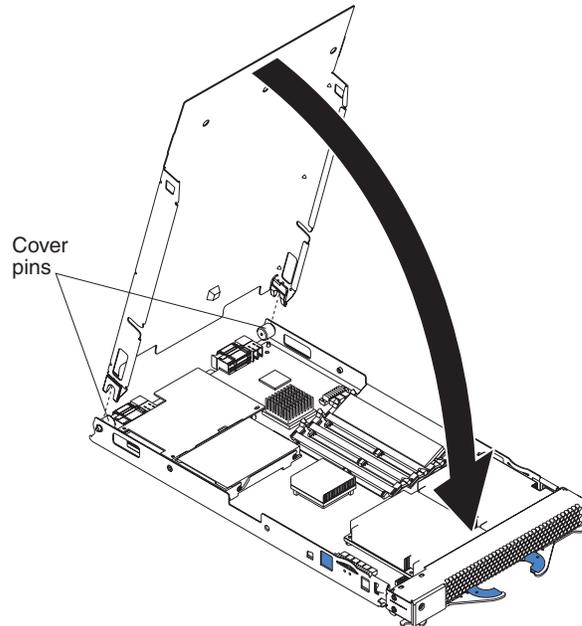

Complete the following steps to install the blade-server bezel assembly:

1. Read the safety information beginning on page vii and "Installation guidelines" on page 21.

2. Connect the control-panel cable to the control-panel connector on the system board.

3. Carefully slide the bezel assembly onto the blade server 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. 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. Read the safety information beginning on page vii and "Installation guidelines" on page 21.
2. If you removed the blade bezel assembly, replace it now. See "Installing the blade-server bezel assembly" on page 38 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, make sure 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.

Input/output connectors and devices

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

The blade server does not support a direct connection to a monitor, keyboard, or mouse. Therefore, to enable communication between the blade server and these devices, you must establish an SOL connection and perform the configuration tasks that are described in Chapter 5, "Configuring your blade server," on page 41. In addition, you must start an SOL session as described in Chapter 6, "Running a Serial Over LAN session," on page 57.

Chapter 5. Configuring your blade server

This chapter contains instructions for establishing a Serial Over LAN (SOL) connection, enabling the SOL feature, and configuring the blade server so that you can run SOL sessions and use the BladeCenter management-module command-line interface. This chapter also explains how to update and configure BladeCenter components for SOL operation using the management-module Web-based management and configuration program. The IBM @server BladeCenter management-module command-line interface provides access to the text-console command prompt on each blade server through an SOL connection, enabling the blade servers to be managed from a remote location.

You also can perform many configuration procedures using the management-module command-line interface. See the *IBM @server BladeCenter Management Module Command-Line Interface Reference Guide* on the IBM *BladeCenter Documentation* CD for information and instructions. In addition, you can use the simple network management protocol (SNMP) to perform configuration procedures. SNMP commands are described in the *IBM @server BladeCenter Management Module Command-Line Interface Reference Guide* on the IBM *BladeCenter Documentation* CD. For additional information about SNMP, see also the *IBM 4-Port Gb Ethernet Switch Module for BladeCenter Installation and User's Guide* or *Nortel Networks Layer 2-7 GbE Switch Module for IBM BladeCenter Installation Guide* on the IBM *BladeCenter Documentation* CD.

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

For information about setting up your network configuration for remote management, 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.

Note: Before you can run programs on the blade server, you must establish an SOL connection and install an operating system on the blade server. For information about installing your operating system, see Chapter 7, "Installing the operating system," on page 61.

Using the Serial Over LAN (SOL) feature on the blade server

Before you can perform the following tasks, you must establish an SOL connection and start an SOL session on the blade server:
- Establishing a communications channel between the blade server and a compatible monitor (or video console), keyboard, and mouse.
- Installing the operating system on the blade server.
- Configuring the SOL feature.
- Running diagnostics programs.
- Having the blade server serviced.

To support the SOL feature and to configure your blade server, you must install a compatible Ethernet switch module in I/O bay 1 of the BladeCenter unit. Examples of compatible Ethernet switch modules are the IBM 4-Port Gb Ethernet Switch Module for BladeCenter and the Nortel Networks Layer 2-7 GbE Switch Module for IBM BladeCenter. For more information about these switch modules, see the *IBM 4-Port Gb Ethernet Switch Module for BladeCenter Installation and User's Guide* or *Nortel Networks Layer 2-7 GbE Switch Module for IBM BladeCenter Installation Guide* on the IBM *BladeCenter Documentation* CD. For more details, see the following information:

- Chapter 6, "Running a Serial Over LAN session," on page 57.
- The *IBM @server BladeCenter Management Module Command Line Interface Reference Guide* on the IBM *BladeCenter Documentation* CD.

Note: The BladeCenter unit supports up to four Ethernet switch modules.

The SOL feature is accessed through the management-module command-line interface. For information about using the command-line interface, see "Using the command-line interface" on page 56 and the *IBM @server BladeCenter Management Module Command Line Interface Reference Guide* on the IBM *BladeCenter Documentation* CD.

Configuring the BladeCenter unit for the Serial Over LAN (SOL) feature

This section provides instructions for configuring the BladeCenter unit to operate using SOL. The BladeCenter unit needs to be configured only once. The settings in this section are used by all components in the BladeCenter unit. See "Configuring the BladeCenter components for Serial Over LAN operation" on page 46 for SOL configuration steps that are specific to each BladeCenter component.

SOL configuration that is shared by all BladeCenter components is performed using the management-module Web-based user interface. The management-module Web-based user interface supports only configuration and monitoring of the command-line interface and SOL and cannot be used to start command-line interface or SOL sessions.

Note: Throughout this document, the management-module Web-based user interface is also known as the BladeCenter management-module Web interface.

Some SOL configuration can also be performed using the management-module command-line interface. See the *IBM @server BladeCenter Management Module Command-Line Interface Reference Guide* on the IBM *BladeCenter Documentation* CD for information and instructions.

After you install the operating system (including the Ethernet device drivers) on your blade server, you can use either Telnet or Secure Shell (SSH) sessions to communicate with the blade server. An SOL session must be used for the initial installation of the operating system.

Before you continue with the configuration tasks, read the information in "Preinstallation requirements" on page 11.

Before you begin

The BladeCenter unit must be correctly configured before you can use the command-line interface and SOL. Hardware and firmware required for the command-line interface and SOL are as follows:

Hardware:

SOL operation has the following hardware requirements:

- An SOL-capable blade server. You can use the console command to control a blade server through SOL only on blade server types that support SOL functionality and that have an integrated system management processor firmware level of version 1.00 or later.
- An SOL-capable Ethernet I/O module installed in I/O-module bay 1. The following I/O modules support SOL operation:
  - IBM 4-Port Gb Ethernet Switch Module for BladeCenter
  - Nortel Networks Layer 2-7 GbE Switch Module for IBM @server BladeCenter
- For the BladeCenter JS20 Type 8842, SOL uses the first network interface (Ethernet 1) of the blade server to communicate.

Firmware:

Make sure that you are using the latest versions of device drivers and firmware code for your blade server, the management module, and other BladeCenter components. Also, make sure that you are using the latest versions of basic input/output system (BIOS) code for the management module and other BladeCenter components. Go to the IBM Support Web site, http://www.ibm.com/pc/support/, for the latest information about upgrading the device drivers, firmware code, and BIOS code for BladeCenter components. The latest instructions are in the documentation that come with the updates.

The following table lists the minimum firmware levels that are required for BladeCenter components to support SOL operation. Go to the IBM Support Web site, http://www.ibm.com/pc/support/, for the latest firmware information. For additional information, see "Updating the firmware code for your blade server and the service processor" on page 55.

Table 1. Minimum firmware levels required for SOL

Component	Firmware level
IBM @server BladeCenter Management Module	1.09 or later (BRET57G)
IBM @server BladeCenter JS20 Type 8842 Broadcom Ethernet Controller Diagnostic Utility	1.06 or later
IBM @server BladeCenter JS20 Type 8842 Broadcom Ethernet Controller Linux Device Driver	7.1.22 or later
IBM 4-Port Gb Ethernet Switch Module for BladeCenter	81 or later
Nortel Networks Layer 2-7 GbE Switch Module for IBM @server BladeCenter	20.0.1.3 or later

Starting the management and configuration program in the management module

Complete the following steps to start the Web-based management and configuration program:

1. Access and log onto the BladeCenter management-module Web interface as described in the IBM @server *BladeCenter Type 8677 Installation and User's Guide* on the IBM *BladeCenter Documentation* CD.

2. Open a Web browser. In the address or URL field, type the Internet protocol (IP) address or host name that is assigned for the management-module remote connection.

   The Enter Network Password window opens.

3. Type your user name and password. Before you log onto the management module for the first time, contact your system administrator regarding whether your organization has assigned a user name and password to you. Use the initial (default) user name and password the first time that you log onto the management module. If you have an assigned user name and password, use them for all subsequent logins. All login attempts are documented in the event log.

   Note: The initial user ID and password for the management module are:
   - User ID: USERID (all capital letters)
   - Password: PASSW0RD (note the number zero, not the letter O, in PASSW0RD)

4. Follow the instructions that appear on the screen. Be sure to set the timeout value that you want for your Web session.

   The BladeCenter management and configuration window opens.

Global SOL settings and status

Use the **Serial Over LAN** choice under **Blade Tasks** to view and change the global SOL settings that are used by all blade servers installed in the BladeCenter unit. You can also use this choice to enable or disable SOL for each blade server.

The default management-module SOL settings provide the best overall SOL performance. You can modify these settings to meet requirements that are specific to your BladeCenter unit or network configuration. The default SOL values are as follows:

- Serial Over LAN: Enabled

  Use this field to enable or disable SOL globally for the BladeCenter unit. The SOL feature works only if SOL is enabled for the BladeCenter unit *and* the blade server. If SOL is not already enabled for the blade server, you must enable SOL.

- SOL VLAN ID: 4095

  This value is fixed and cannot be modified.

- BSMP IP Address Range: *x.x.x.x*

  This is a mandatory field where *x.x.x.x* is the base IP address for blade servers that are installed in the BladeCenter unit. The IP address that SOL uses to communicate with each blade server is based on the IP address that is set in this field. For example, if the entered value is 10.1.1.1, then the blade server in blade bay 1 has an IP address of 10.1.1.1, the blade server in blade bay 2 has an IP address of 10.1.1.2, and so on.

- Accumulate timeout: 5
- Send threshold: 250
- Retry count: 3

Note: The firmware code sets the retry interval.

If you make changes, you must click **Save** to save your changes.

Use the Serial Over LAN Status table lets to monitor the SOL status for each blade server. You can also use it to enable or disable SOL for each blade server and globally for the BladeCenter unit. SOL must be enabled both globally for the BladeCenter unit and individually for each blade server where you plan to start an SOL session. SOL is enabled globally and on blade servers by default.

Serial Over LAN Status

Click the checkboxes in the first column to select one or more blade servers; then, click one of the links below the table to enable or disable SOL on the selected blades.

Note: You have to enable the global "Serial over LAN" flag above before enabling SOL on individual blade servers.

☐	Bay	Name	SOL	SOL Session	BSMP IP Address
	1	No blade present			
	2	Blade does not suppport SOL	n/a	n/a	n/a
	3				
	4	No blade present			
☐	5	SN#J1RNE34911N	Disabled	Not ready	10.10.10.84
	6	No blade present			
	7	No blade present			
	8	No blade present			
	9	No blade present			
	10	No blade present			
	11	No blade present			
	12	No blade present			
	13	No blade present			
	14	No blade present			

Disable Serial Over LAN
Enable Serial Over LAN

The SOL Session status has three possible states:

Not ready
> This status indicates that no SOL session is available between the management module and the blade server. It might indicate that an SOL session setup failure must be investigated.

Ready This status indicates that an SOL session is established between the management module and the blade server. This SOL session is available to connect to a Telnet session, if requested by a user.

Active This status indicates that there is an SOL session between the management module and the blade server and that this session is currently connected to a Telnet session.

Complete the following steps to configure the global SOL settings for your BladeCenter unit:

1. Start the Web-based management and configuration program (see "Starting the management and configuration program in the management module" on page 44).

2. In the navigation pane, click **Blade Tasks → Serial Over LAN**. In the management-module information page that opens, make sure that the settings match the default values that are described in this section (beginning on page 45) or are set to the values required by your network configuration.

Configuring the BladeCenter components for Serial Over LAN operation

This section contains the information about configuring BladeCenter components for SOL operation. Use it in addition to the information in "Configuring the BladeCenter unit for the Serial Over LAN (SOL) feature" on page 42. It contains the following subsections:

- "Management-module configuration"
- "BladeCenter JS20 Type 8842 configuration" on page 48
- "IBM 4-Port Ethernet Switch Module for BladeCenter configuration" on page 49
- "Nortel Networks Layer 2-7 GbE Switch Module for IBM @server BladeCenter firmware update" on page 50

Management-module configuration

Before you configure the management module for SOL operation, review the following information:

- The management-module external network interface (eth0) configuration must be valid for your production network. This configuration can be obtained from a DHCP server or set statically.

- The management-module internal network interface (eth1) and the Ethernet I/O module configuration can be different from that of the management-module external network interface (eth0); however, the management-module internal network interface (eth1) and the Ethernet I/O module configuration must be in the same subnet. The management-module internal interface (eth1) is exposed to the external network through the management module; therefore, the configuration must not conflict with any other addresses on your production network. If you use a configuration for the Ethernet I/O module that is not valid for your production network, you will not be able to update the firmware or manage your Ethernet I/O module through the Telnet or the Web interfaces.

- The SOL Blade System Management Processors (BSMP) address range can be any valid IP address. These addresses are used for internal communications and are not exposed to the external network.

Complete the following steps to update the management-module firmware and configure the management module to enable SOL:

1. Start the Web-based management and configuration program (see "Starting the management and configuration program in the management module" on page 44).
2. Complete the following steps to update the BladeCenter management module firmware:
   a. Download the latest management-module firmware from the IBM Support Web site, http://www.ibm.com/pc/support/; then, uncompress and store the firmware update files in a temporary location on the client computer.
   b. Three packet (.pkt) files are used to update the firmware for the management module. Complete the following steps for each of the packet files:
      1) In the navigation pane, click **MM Control** → **Firmware Update**.
      2) Click **Browse...**; then, select a firmware update packet (.pkt) file to update and click **Open**.
      3) Click **Update**; then, click **Continue** to confirm.
         A message is displayed when the update is complete.
      4) Repeat these steps for each of the remaining firmware update packet files.
   c. Complete the following steps to restart the management module. Do not restart the management module until all of the firmware update packet files are installed.
      1) In the navigation pane, click **MM Control** → **Restart MM**.
      2) Click **Restart**.
      3) Click **OK** to confirm.
      4) Restarting the management module ends the current Web-based management and configuration program session. Click **Yes** to end the session.
3. Start the Web-based management and configuration program (see "Starting the management and configuration program in the management module" on page 44). You must wait approximately 10 seconds for the management module to restart before attempting start the Web-based management and configuration program.
4. Complete the following steps to enable SOL for the management module:
   a. Complete the following steps to configure the internal network interface (eth1) settings:
      1) In the navigation pane, click **MM Control** → **Network Interfaces**.
      2) Scroll to the **Internal Ethernet Interface (eth1)** section.
      3) Make sure that **Interface** is set to **Enabled**.
      4) Set the **Static IP Configuration** fields to the values that are required for your physical network.
         - **IP address**: x.xxx.xxx.xxx
         - **Subnet mask**: xxx.xxx.xxx.xxx
         - **Gateway address**: x.xxx.xxx.xxx

5) Click **Save**; then, click **OK** or **Yes** to confirm. *Do not* restart the management module.

b. Complete the following steps to configure the Ethernet I/O module network settings:

1) In the navigation pane, click **I/O Module Tasks → Management**.

2) Scroll to the **Bay 1 (Ethernet SM)*** section.

3) Configure and save the **New Static IP Configuration** fields, if they are not already correct as listed in the **Current IP Configuration** section.

   - **IP address**: x.xxx.xxx.xxx
   - **Subnet mask**: *xxx.xxx.xxx.xxx*
   - **Gateway address**: *x.xxx.xxx.xxx*

   If any values were changed, click **Save**.

c. Complete the following steps to configure the Serial Over LAN settings:

1) In the navigation pane, click **Blade Tasks → Serial Over LAN**.

2) Scroll to the **Serial Over LAN Configuration** section and set the following values:

   - Set **Serial Over LAN** to **Enabled**.
   - **BSMP IP address range**: *x.x.x.x*
   - Set **Accumulate timeout**. The default value is 5.
   - Set **Send threshold**. The default value is 250.
   - Set **Retry count**. The default value is 3.

3) Click **Save**.

   Do not attempt to enable or disable SOL on any of the blade servers that are listed in the **Serial Over LAN Status** section.

   Note: The blowers in the BladeCenter unit might become audible when the management module restarts.

5. Complete the following steps to restart the management module.

a. In the navigation pane, click **MM Control → Restart MM**.

b. Click **Restart**.

c. Click **OK** to confirm.

d. Restarting the management module ends the current Web-based management and configuration program session. Click **Yes** to end the session.

e. Wait approximately 10 seconds; then, start a new Web-browser session and reconnect to the Web-based management and configuration program.

The management module is now enabled for SOL.

BladeCenter JS20 Type 8842 configuration

After you install the blade server in the BladeCenter unit, the blade server is automatically configured. The blade server has built-in support for the SOL feature. The Broadcom Ethernet controller device driver is installed after you install the operating system. The blade server is automatically reconfigured after you install software or hardware. IBM will periodically make firmware updates available for your blade server. Before you continue, you can make sure that your blade server has the latest version of firmware code. For additional information, see "Updating the firmware code for your blade server and the service processor" on page 55.

IBM 4-Port Ethernet Switch Module for BladeCenter configuration

Before you continue, make sure that:

- You are already connected to the BladeCenter management-module Web interface.
- You have enabled the spanning tree feature for all Ethernet switch modules.

Complete the following steps to update the firmware of the IBM 4-Port Gb Ethernet Switch Module for BladeCenter. No configuration is required for the IBM 4-Port Gb Ethernet Switch Module for BladeCenter to enable SOL.

Note: You will not be able to perform this procedure if the values for the network configuration of the IBM 4-Port Gb Ethernet Switch Module for BladeCenter are not within the same subnet as the BladeCenter management-module network interfaces (eth0 and eth1). See "Management-module configuration" on page 46 for information.

1. Start the IBM 4-Port Gb Ethernet Switch Module for BladeCenter Web-based interface:

    a. Obtain the latest version of IBM 4-Port Gb Ethernet Switch Module for BladeCenter firmware from the IBM Support Web site, http://www.ibm.com/pc/support/.

    b. Start the Web-based management and configuration program (see "Starting the management and configuration program in the management module" on page 44).

    c. In the navigation pane, click **I/O Module Tasks → Management**.

    d. Scroll to the **Current IP Configuration** section and make sure that it contains values that are within the same subnet as the BladeCenter management-module network interfaces (eth0 and eth1). If the values are not in the same subnet, you must modify them before you continue. See "Management-module configuration" on page 46 for information.

    e. Scroll to the **Bay 1 (Ethernet SM)*** section; then, click **Advanced Management**.

    f. Scroll to the **Start Telnet/Web Session** section; then, click **Start Web Session**. This will start a new Web browser and connect to the IBM 4-Port Gb Ethernet Switch Module for BladeCenter management-module Web interface.

    g. Log in to the IBM 4-Port Gb Ethernet Switch Module for BladeCenter management-module Web interface. The default user name is USERID, and the default password is PASSW0RD (note the number zero, not the letter O, in PASSW0RD).

2. Update the IBM 4-Port Gb Ethernet Switch Module for BladeCenter firmware:

    a. Click **Maintenance**.

    b. Click **Using Browser**.

    c. Click **Upgrade Firmware/Configuration**.

    d. Click **Browse**; then, and select the firmware update file that you obtained in step 1a.

    e. Click **Start**; then, click **Yes** to confirm each time you are asked a question.

    f. Close the Web browser.

3. Complete the following steps to restart the I/O module:

    a. In the navigation pane, click **I/O Module Tasks → Power/Restart**.

b. Select your IBM 4-Port Gb Ethernet Switch Module for BladeCenter, labeled **Ethernet SM**, and click **Restart Module(s) and Run Standard Diagnostics**.

   c. Click **OK** to confirm.

The IBM 4-Port Gb Ethernet Switch Module for BladeCenter is now enabled for SOL.

Nortel Networks Layer 2-7 GbE Switch Module for IBM @server BladeCenter firmware update

Before you continue, make sure that:

- You are already connected to the BladeCenter management-module Web interface
- You have enabled the spanning tree feature for all Ethernet switch modules

No configuration is required for the Nortel Networks Layer 2-7 GbE Switch Module for IBM @server BladeCenter to enable SOL.

Notes:

- You will not be able to perform this procedure if the values for the network configuration of the Nortel Networks Layer 2-7 GbE Switch Module for IBM @server BladeCenter are not within the same subnet as the BladeCenter management-module network interfaces (eth0 and eth1). See "Management-module configuration" on page 46 for information.
- These steps require that an accessible trivial file transfer protocol (TFTP) server is present on your production network.

Complete the following steps to update the firmware of the Nortel Networks Layer 2-7 GbE Switch Module for IBM @server BladeCenter:

1. Obtain the latest version of Nortel Networks Layer 2-7 GbE Switch Module for IBM @server BladeCenter firmware from the IBM Support Web site, http://www.ibm.com/pc/support/.

2. Extract the firmware file in a temporary directory.

3. Copy the two image files, GbESM-AOS-*x.x.x.x*-os.img and GbESM-AOS-*x.x.x.x*-boot.img, from the temporary directory to the root of the TFTP server.

   where:

   x.x.x.x is the firmware code level of the Ethernet switch module

4. Update the Nortel Networks Layer 2-7 GbE Switch Module for IBM @server BladeCenter firmware, following the instructions that come with the update file that you downloaded. Make sure that you restart the switch module after updating its firmware.

5. Complete the following steps to connect to the Nortel Networks Layer 2-7 GbE Switch Module for IBM @server BladeCenter Telnet interface:

   a. In the navigation pane, click **I/O Module Tasks → Management**.

   b. Scroll to the **Current IP Configuration** section and make sure that it contains values that are within the same subnet as the BladeCenter management-module network interfaces (eth0 and eth1). If the values are not in the same subnet, you must modify them before you continue. See "Management-module configuration" on page 46 for information.

    c. Scroll to the **Bay 1 (Ethernet SM)*** section; then, click **Advanced Management**.

    d. Scroll to the **Start Telnet/Web Session** section; then, click **Start Telnet Session**. This will start a new Telnet session and connect to the Nortel Networks Layer 2-7 GbE Switch Module for IBM @server BladeCenter management-module Web interface.

    e. Log in to the Nortel Networks Layer 2-7 GbE Switch Module for IBM @server BladeCenter management-module Web interface. The default password is admin.

    f. Type n and then press Enter when prompted to run Setup Up to configure the Nortel Networks Layer 2-7 GbE Switch Module for IBM @server BladeCenter.

6. Update the Nortel Networks Layer 2-7 GbE Switch Module for IBM @server BladeCenter operating-system image:

    Note: There are two operating-system images (image 1 and image 2) in the Nortel Networks Layer 2-7 GbE Switch Module for IBM @server BladeCenter. This I/O module usually starts image 1. However, you must determine which operating-system image is being used before you update the firmware for this I/O module.

    a. At the Telnet prompt, type /boot/cur to determine which operating-system image is being used. The output from the /boot/cur command will specify the image that is being used. The text of the output is similar to Currently set to boot software image1.

        Note: You must use image 2 for the command in the next step if the output from the /boot/cur command states that image 2 is currently empty.

    b. At the Telnet prompt, type /boot/gtimg imageX TFTPAddr GbESM-AOS-x.x.x.x-os.img.

       where:

       imageX is the name of the operating-system image (image 1 or image 2) that was determined in the previous step

       TFTPAddr is the IP address of the TFTP server on your production network, where the image files are located

       x.x.x.x is the firmware code level of the Ethernet switch module

       Press Enter.

    c. Type y and press Enter when prompted to confirm the download operation.

    d. Wait for the flash operation to be completed.

        Note: Type y and press Enter to start from the new image if you had to update the image 2 file because it was previously empty.

    e. Type exit and press Enter to terminate the Telnet session.

    f. Close the window in which the Telnet session was running.

7. Restart the Nortel Networks Layer 2-7 GbE Switch Module for IBM @server BladeCenter:

    a. In the navigation pane, click **I/O Module Tasks → Power/Restart**.

    b. Select the check box next to your Nortel Networks Layer 2-7 GbE Switch Module for IBM @server BladeCenter, labeled **Ethernet SM**, and click **Power Off Module(s)**.

    c. Click **OK** to confirm.

d. Select the check box next to your Nortel Networks Layer 2-7 GbE Switch
      Module for IBM @server BladeCenter, labeled **Ethernet SM**, and click
      Power On Module(s).

   e. Click **OK** to confirm.

      Note: You must wait approximately 60 seconds for the Nortel Networks
                Layer 2-7 GbE Switch Module for IBM @server BladeCenter to
                restart before continuing.

 8. Reconnect to the Nortel Networks Layer 2-7 GbE Switch Module for IBM
    @server BladeCenter by repeating step 5 on page 50.

 9. Update the Nortel Networks Layer 2-7 GbE Switch Module for IBM @server
    BladeCenter boot image:

    At the Telnet prompt, type `/boot/gtimg boot` *TFTPAddr* `GbESM-AOS-`*x.x.x.x-*
    `boot.img`.

    where:

    TFTPAddr is the IP address of the TFTP server on your production network,
    where the image files are located

    x.x.x.x is the firmware code level of the Ethernet switch module

    Press Enter.

10. Type `y` and press Enter when prompted to confirm the download operation.

11. Wait for the flash operation to be completed.

12. Type `exit` and press Enter to terminate the Telnet session.

13. Close the window in which the Telnet session was running.

14. Restart the Nortel Networks Layer 2-7 GbE Switch Module for IBM @server
    BladeCenter by repeating step 7 on page 51.

Completing the SOL configuration

Before you continue, make sure that you are already connected to the BladeCenter
management-module Web interface.

Complete the following steps to complete the SOL configuration:

1. Make sure that the global SOL parameters are correct for your BladeCenter unit
   (see "Global SOL settings and status" on page 44).

2. Make sure that the SOL settings for individual BladeCenter components are
   correct (see "Configuring the BladeCenter components for Serial Over LAN
   operation" on page 46).

3. Start the Web-based management and configuration program (see "Starting the
   management and configuration program in the management module" on page
   44).

4. Complete the following steps to enable SOL on the blade servers:

   a. In the navigation pane, click **Blade Tasks → Serial Over LAN**; then, scroll to
      the **Serial Over LAN Status** section.

   b. Select each blade server for which SOL will be enabled; then, click **Enable
      Serial Over LAN**.

      The SOL column of the table will show a status of Enabled for each blade
      server that was selected. The SOL Session column of the table indicates a
      status of Not Ready for each blade server that you selected.

5. Complete the following steps to start or restart the blade servers for which SOL was enabled:
   a. In the navigation pane, click **Blade Tasks → Power/Restart**.
   b. Select each blade server for which SOL was enabled; then, click either **Power On Blade** or **Restart Blade**, depending on the current status of the blade servers.
   c. Click **OK** twice to confirm.
6. Complete the following steps to check the SOL status of the blade servers:
   a. In the navigation pane, click **Blade Tasks → Serial Over LAN**; then, scroll to the **Serial Over LAN Status** section.
   b. Make sure that the SOL Session column of the table shows a status of Ready.

Installing and Configuring SSH for SOL

Before you continue, make sure that:
- You are already connected to the BladeCenter management-module Web interface.
- You can connect to the external IBM Web site.

Complete the following steps to install and configure Secure Shell (SSH) Server for SOL:

1. Start the Web-based management and configuration program (see "Starting the management and configuration program in the management module" on page 44).
2. If you have not previously installed the Secure Sockets Layer/Secure Shell (SSL/SSH) security key file, complete the following steps to install the SSL and SSH security file:
   a. Download the latest version of the SSL/SSH security key file from the IBM Support Web site, http://www.ibm.com/pc/support/. Scroll to the **Install SSL/SSH** section and click **BladeCenter firmware update**.
   b. In the navigation pane, click **MM Control → Security**.
   c. Click **Browse** and select the file that you downloaded.
   d. Click **Install SSL/SSH**.
   e. Scroll to the **Install SSL/SSH** section and click **configure and enable**.
3. Complete the following steps to generate the SSH Server Private Key:
   a. In the navigation pane, click **MM Control → Security**.
   b. Scroll to the **SSH Server Key Management** section and click **Generate SSH Server Private Key**.
   c. Click **OK** to confirm.
4. Complete the following steps to enable SSH:
   a. Scroll to the **Secure Shell (SSH) Server** section.
   b. Select **Enabled** for the **SSH Server** option; then, click **Save**.
   c. Click **OK** to confirm.

5. Complete the following steps to restart the management module:
   a. In the navigation pane, click **MM Control** → **Restart MM**.
   b. Click **Restart**.
   c. Click **OK** to confirm.
   d. Restarting the management module ends the current Web-based management and configuration program session. Click **Yes** to end the session.

You can now use an SSH client to start a secure Telnet session with the management module and secure SOL sessions with the blade servers.

Configuring the Gigabit Ethernet controller

One dual-port Gigabit Ethernet controller is integrated on the blade server system board. Each controller port provides a 1000-Mbps full-duplex interface for connecting to one of the Ethernet-compatible switch modules in I/O bays 1 and 2, which enables simultaneous transmission and reception of data on the Ethernet local area network (LAN). Each Ethernet-controller port on the system board is routed to a different switch module in I/O bay 1 or bay 2. The routing from the Ethernet-controller port to the I/O bay will vary according to whether an Ethernet adapter is enabled and the operating system that is installed. See "Blade server Ethernet controller enumeration" for information about how to determine the routing from the Ethernet-controller ports to I/O bays for your blade server.

Note: Other types of blade servers, such as the BladeCenter HS20 Type 8678, that are installed in the same BladeCenter unit as this BladeCenter JS20 Type 8842 might have different requirements for Ethernet controller routing. See the documentation that comes with the other blade servers for detailed information.

You do not have to set any jumpers or configure the controllers for the blade server operating system. However, you must install a device driver to enable the blade server operating system to address the Ethernet-controller ports. For device drivers and information about configuring your Ethernet-controller ports, see the Ethernet software documentation that comes with your blade server, or contact your IBM marketing representative or authorized reseller. For updated information about configuring the controllers, go to the IBM Support Web site at http://www.ibm.com/pc/support/.

Blade server Ethernet controller enumeration

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

The routing of an Ethernet controller or controller port to a particular BladeCenter unit I/O bay depends on the type of Ethernet expansion card that is installed. You can verify which Ethernet-controller port in this blade server is routed to which I/O bay by using the following test:

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

3. Enable only one of the Ethernet-controller ports on the blade server. Note the designation that the blade server operating system has for the controller port.

4. Ping an external computer on the network connected to the Ethernet switch module. If you can ping the external computer, the Ethernet-controller port that you enabled is associated with the switch module in I/O bay 1. The other Ethernet-controller port in the blade server is associated with the switch module in I/O bay 2.

Communications from optional Ethernet adapters and other I/O expansion cards are routed to I/O bays 3 and 4. You can verify which controller port on an expansion card is routed to which I/O bay by performing the same test, using a controller on the expansion card and a compatible switch module or pass-thru module in I/O bay 3 or 4:

- If you have removed an Ethernet adapter from the blade server and installed a different Ethernet adapter.
- If you have installed an I/O expansion card on the blade server.

Updating the firmware code for your blade server and the service processor

Your blade server contains firmware code. In addition, the service processor in your blade server comes with its own firmware code. IBM will periodically make firmware updates available for your blade server and the service processor. You can maintain the latest levels of firmware code for your blade server and the service processor in your blade server by installing firmware updates as they become available. Be sure to follow the instructions in this section.

Complete the following steps to view the current firmware code levels for your blade server and the service processor:

1. Access and log onto the BladeCenter management-module Web interface as described in the IBM @server *BladeCenter Type 8677 Installation and User's Guide* on the IBM *BladeCenter Documentation* CD.

2. From the **Blade Tasks** section, select **Firmware VPD**.

The **Blade Server Firmware VPD** window contains the build identifier, release, and revision. Compare this information to the firmware information on the IBM Support Web site at http://www.ibm.com/pc/support/. If these two types of information match, then your blade server has the latest firmware code. If these two types of information differ, download the latest firmware code from the IBM Support Web site. Follow the update instructions on the IBM Support Web site.

To apply the latest firmware code for your blade server service processor, flash the service processor. Download the latest firmware code 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. Follow the update instructions on the IBM Support Web site.

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

Notes:

- If you have to recover the system firmware code, see "Recovering the system firmware code" on page 96.
- The IBM Remote Deployment Manager (RDM) program does not support the BladeCenter JS20 Type 8842.

Using the command-line interface

The IBM @server BladeCenter management-module command-line interface provides direct access to BladeCenter management functions as an alternative to using the BladeCenter management-module Web interface. Using the command-line interface, you can issue commands to control the power and configuration of the blade server and other components installed in the BladeCenter unit. The command-line interface also provides access to the text-console command prompt for your blade server through an SOL connection. See the *IBM @server BladeCenter Management Module Command Line Interface Reference Guide* on the IBM *BladeCenter Documentation* CD for information and instructions.

Chapter 6. Running a Serial Over LAN session

The IBM @server BladeCenter management-module command-line interface provides a convenient method for entering commands that manage and monitor BladeCenter components. The blade server does not support a direct connection to a monitor, keyboard, or mouse. Therefore, to enable communication between the blade server and these devices, you must first configure the SOL feature on the blade server to establish an SOL connection as described in Chapter 5, "Configuring your blade server," on page 41 and then start an SOL session as described in this chapter.

This chapter contains the following information about running an SOL session:
- Starting the command-line interface
- Establishing a Telnet connection
- Establishing a Secure Shell (SSH) connection
- Starting an SOL session
- Ending an SOL session

In the BladeCenter environment, the integrated system management processor (ISMP) and network interface card (NIC) on each blade server route the serial data from the blade server serial communications port to the network infrastructure of the BladeCenter unit, including an Ethernet compatible I/O module that supports SOL communication. Configuration of BladeCenter components for SOL operation is done through the BladeCenter management module (see Chapter 5, "Configuring your blade server," on page 41). The management module also acts as a proxy in the network infrastructure to couple a client running a Telnet session with the management module to an SOL session running on a blade server, enabling the Telnet client to interact with the serial port of the blade server over the network. Because all SOL traffic is controlled by and routed through the management module, administrators can segregate the management traffic for the BladeCenter unit from the data traffic of the blade servers.

To start an SOL connection with a blade server, you must first start a Telnet command-line interface session with the management module. When this Telnet command-line interface session is running, you can start a remote console SOL session with any blade server in the BladeCenter unit that is set up and enabled for SOL operation. You can have as many as 14 simultaneous SOL sessions active (one for each of up to 14 blade servers) with six additional command-line interface sessions available for BladeCenter unit management. If security is a concern, you can use SSH sessions to establish secure Telnet command-line interface sessions with the BladeCenter management module before starting an SOL console redirect session with a blade server.

The most recent versions of all BladeCenter documentation are available from the IBM Web site. Complete the following steps to check for updated BladeCenter 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**.
5. Click **Continue**.

See Chapter 5, "Configuring your blade server," on page 41 for SOL setup instructions and the documentation for your operating system for information about commands that you can enter through an SOL connection. See the *IBM @server BladeCenter Management Module Command Line Interface Reference Guide* for information about:

- Command-line interface guidelines
- Command syntax and descriptions
- Command-line interface error messages

Selecting the command target

You can use the command-line interface to target commands to the management module or to other devices installed in the BladeCenter unit. The command-line prompt indicates the persistent command environment: the environment where commands are entered unless otherwise redirected. When a command-line interface session is started, the persistent command environment is "system"; this indicates that commands are being directed to the BladeCenter unit. See the *IBM @server BladeCenter Management Module Command Line Interface Reference Guide* for additional information.

Starting the command-line interface

Start the management-module command-line interface from a client computer by establishing a Telnet connection to the IP address of the management module or by establishing an SSH connection. You can establish up to 14 separate Telnet or SSH sessions to the BladeCenter management module.

Although a remote network administrator can access the management-module command-line interface through Telnet, this method does not provide a secure connection. As a secure alternative to using Telnet to access the command-line interface, SSH ensures that all data that is sent over the network is encrypted and secure.

The following SSH clients are available. Although some SSH clients have been tested, support or nonsupport of any particular SSH client is not implied.

- The SSH clients distributed with operating systems such as SUSE LINUX, Red Hat Linux, AIX®, and UNIX® (see your operating-system documentation for information). The SSH client of Red Hat Linux 8.0 Professional was used to test the command-line interface.
- The SSH client of cygwin (see http://www.cygwin.com for information)
- Putty (see http://www.chiark.greenend.org.uk/~sgatham/putty/ for information)

The following table shows the types of encryption algorithms that are supported by the client software versions.

Algorithm	SSH version 1.5 clients	SSH version 2.0 clients
Public key exchange	SSH 1-key exchange algorithm	Diffie-Hellman-group 1-sha-1
Host key type	RSA (1024-bit)	DSA (1024-bit)
Bulk cipher algorithms	3-des	3-des-cbc or blowfish-cbc
MAC algorithms	32-bit crc	Hmac-sha1

Establishing a Telnet connection

To log on to the management module using Telnet, complete the following steps:

1. Open a command-line window on the network-management workstation, type `telnet 192.168.70.125`, and press Enter. The IP address, 192.168.70.125, is the default IP address of the management module; if a new IP address has been assigned to the management module, use that one instead.

   A command-prompt window opens.

2. At the login prompt, type the management-module user ID. At the password prompt, type the management-module password. The user ID and password are case sensitive and are the same as those that are used for management-module Web access.

   A command prompt is displayed. You can now enter commands for the management module.

Establishing a Secure Shell (SSH) connection

To log on to the management module using SSH, complete the following steps:

1. Make sure that the SSH service on the network-management workstation is enabled. See your operating-system documentation for instructions.

2. Make sure that the SSH server on the BladeCenter management module is enabled. See the *IBM @server BladeCenter Management Module User's Guide* for instructions.

3. Start an SSH session to the management module using the SSH client of your choice. For example, if you are using the cygwin client, open a command-line window on the network-management workstation, type `ssh -x 192.168.70.125`, and press Enter. The IP address, 192.168.70.125, is the default IP address of the management module; if a new IP address has been assigned to the management module, use that one instead.

   A command prompt window opens.

4. Type the management-module user ID when prompted. At the password prompt, type the management-module password. The user ID and password are case sensitive and are the same as those that are used for management-module Web access.

   A command prompt is displayed. You can now enter commands for the management module.

Note: For information about installing and configuring the SSH, see "Installing and Configuring SSH for SOL" on page 53.

Starting an SOL session

Notes:

- The SOL feature must be enabled for both the BladeCenter unit and the blade server before you can start an SOL session with the blade server. See the *IBM @server BladeCenter Management Module Command Line Interface Reference Guide* for information about SOL commands. See your operating-system documentation for information about SOL commands that you can enter using the command-line interface. See Chapter 5, "Configuring your blade server," on page 41 for information about setting up and enabling SOL, and configuring a blade server for SOL.

- The BladeCenter management module automatically stores the previous 8 KB of serial data that was transmitted by each blade server, even when SOL sessions are not active. When an SOL session is established, all of the previous serial

data, up to 8 KB, is automatically displayed. If no previous data is available when the SOL session starts, the cursor will remain on the command line until new serial data is transmitted.

After you start a Telnet or SSL session to the BladeCenter management module, you can start an SOL session to any individual blade server that supports SOL using the **console** command. Therefore, you can have simultaneous SOL sessions active for each blade server installed in the BladeCenter unit.

Use the **console** command from the command line, indicating the target blade server, where *x* is the corresponding blade bay number:

`console -T system:blade[`*x*`]`

For example, to start an SOL connection to the blade server in blade bay 14, type

`console -T system:blade[14]`

A blade server that occupies more than one blade bay is identified by the lowest bay number that it occupies.

After an SOL session is started, all commands are sent to the blade server that is specified by the **console** command until the SOL session is ended, regardless of the persistent command target that was in effect before the SOL session.

To restart the blade server through an SOL session, use the following key sequence: Esc R Esc r Esc R

Complete the following steps to start a BladeCenter management-module Telnet CLI session:

1. From a command prompt, type `telnet` *location*

   Where *location* is the host name or IP address of the BladeCenter management module

2. Log on to the BladeCenter management module. The default user name is USERID, and the default password is PASSW0RD (note the number zero, not the letter O, in PASSW0RD).

Ending an SOL session

To end an SOL session, use the following key sequence: Esc (

The command-line interface will return to the persistent command target that was in effect before the SOL session.

To exit a BladeCenter management-module Telnet CLI session, type `exit` at the BladeCenter management-module Telnet CLI prompt after ending an SOL session.

Chapter 7. Installing the operating system

Important:

- Before you install the operating system on the blade server, make sure that you provide an SOL connection between the blade server and a compatible monitor (or video console), keyboard, and mouse. You must do this because the blade server does not support a direct connection to these devices. The SOL connection serves as a communications channel between the blade server and these devices. The SOL feature must be enabled for both the BladeCenter unit and the blade server before you can start an SOL session with the blade server. Therefore, do not disable this feature. If you have not already done so, you must configure the SOL feature on the blade server to establish an SOL connection and enable the SOL feature as described in Chapter 5, "Configuring your blade server," on page 41 and start an SOL session as described in Chapter 6, "Running a Serial Over LAN session," on page 57.

  See the *IBM @server BladeCenter Management Module Command Line Interface Reference Guide* for information about SOL commands. See your operating-system documentation for information about SOL commands that you can enter using the command-line interface.

- If you plan to install the operating system through the Ethernet network, you must install a second Ethernet switch module into I/O bay 2 of the BladeCenter unit. For additional information, see Chapter 5, "Configuring your blade server," on page 41.

  Note: This Ethernet switch module must be of the same type that you installed in I/O bay 1 of the BladeCenter unit.

- After you install the operating system on your blade server, you must install any service packs or update packages that come with the operating system. For additional information, see the instructions that come with your operating-system documentation and the service packs or update packages.

- The BladeCenter JS20 Type 8842 has no external USB ports; however, it can communicate with and use the USB diskette drive and CD-ROM drive that are in the BladeCenter unit chassis.

- Due to SOL requirements, you must select or install network device drivers *after* you install the operating system. This includes the BladeCenter JS20 Type 8842 Broadcom Ethernet controller device driver (for additional information, see the instructions that come with the device driver).

To install the operating system on a blade server, follow the operating-system installation instructions that come with the operating system. You can 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: The IBM Remote Deployment Manager (RDM) program does not support the BladeCenter JS20 Type 8842.

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.

Note: Some options have device drivers that you must install. See the documentation that comes with the options for information about installing any required device drivers.

If your operating system does not have the required device drivers, contact your IBM marketing representative or authorized reseller, or see your operating-system documentation for additional information.

Chapter 8. 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 JS20 Type 8842 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:

- **Diagnostic programs, firmware error codes, and location codes**

  The system diagnostic programs are provided in read-only memory (ROM). These programs test the major components of your blade server. For detailed descriptions of the firmware error codes, see "Firmware error codes" on page 80.

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

- Troubleshooting charts

  These charts list problem symptoms and steps to correct the problems. See the "Troubleshooting charts" on page 89 for more information.

- Light path diagnostics

  Use light path diagnostics to diagnose system errors. See "Light path diagnostics overview" on page 92 for more information.

- Power-on self-test (POST) firmware checkpoints and error codes. See "Checkpoint codes" on page 64 for more information.

  The firmware checkpoints are progress codes that your blade server displays during the power-on self-test (POST).

Notes:

- For additional information about firmware error codes, location codes, error logs, event logs, and firmware checkpoints, see the *BladeCenter JS20 Type 8842 Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *BladeCenter Documentation* CD.

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

- Before you have the blade server serviced, make sure that you provide an SOL connection between the blade server and a compatible monitor (or video console), keyboard, and mouse. To do this, you must configure the SOL feature on the blade server as described in Chapter 5, "Configuring your blade server," on page 41 and start an SOL session as described in Chapter 6, "Running a Serial Over LAN session," on page 57.

System checkout

If your system fails to start after installation or an error occurs while running, perform the following steps:

1. Visually check the blade server system board for any lit external LEDs.
   a. Turn off the server.
   b. Remove the blade server from the BladeCenter unit.
   c. Open the blade server and press and hold the light path diagnostics button. See "System-board LEDs" on page 10 for the location of the light path diagnostics button.
   d. Perform the steps in "Identifying problems using the light path diagnostics" on page 92 to identify lit error LEDs on the blade server.
      1) If any LEDs light, see "Light path diagnostics table" on page 93.
      2) If there is no error LED lit, proceed to the next step.
2. Reinstall the blade server in the same slot of the BladeCenter unit.
3. To test the blade server, turn on the blade server and start a Serial over LAN (SOL) session.
4. Observe the progress codes in the SOL window and record any power-on self-test (POST) error messages or system checkpoint codes that occur. If an error occurs, see "Firmware error codes" on page 80 for more information.
5. Review the BladeCenter management-module event log and Linux Syslog to see if an error was recorded. If there is a hardware error, contact a service support representative and provide the details of the problem. If there is no hardware error, contact a service support representative for more information to resolve your problem.

Checkpoint codes

The power-on self-test (POST) firmware checkpoints (progress codes) indicate the detection of a problem if the server stops on a checkpoint during the startup process.

- A four-digit code indicates successful completion of POST when the server does not stop on that checkpoint.
- A result other than a four-digit code indicates that POST might have detected a problem. Error messages also appear during startup if POST detects a hardware-configuration problem. The last POST firmware checkpoint code posted is the most likely failure.

Checkpoints display in the system console from the time that ac power is connected to the system until the operating system login prompt is displayed after a successful operating system startup. These checkpoints have the following forms:

Dxxx, Exxx   Dxxx and Exxx checkpoints indicate that a system processor is in control and is initializing the system resources. Control passes to the operating system when E105 displays on the operator panel display. Location code information might also display on the operator panel during this time.

    These codes range from Dxxx to EFFF.

Error codes   If a fault is detected, an 8-digit error code is displayed in the BladeCenter management-module event log. A location code might be displayed at the same time on the second line.

The management-module log, which can be accessed through the BladeCenter unit, contains the most recent error codes and messages that the system generated during POST.

Checkpoint code	Description	Suggested action
D001	Peripheral component interconnect (PCI) probe process complete; create PCI interrupt routing properties.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
D002	PCI adapter non-volatile random-access memory (NVRAM) hint created; system is restarting.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
D003	PCI probing is complete.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
D004	Start the console installation; loading the graphical interface package.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
D008	Initialize the console and flush the queues.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
D00D	Evaluate the NVRAM script.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
D010	First pass of the open firmware initialization is complete; establish parameters for restart.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
D011	First pass of the open firmware initialization is complete; control returned to the initialization firmware.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
D012	Second pass of the open firmware initialization is complete; control returned to the initialization firmware.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.

Checkpoint code	Description	Suggested action
D099	Start the system information validation utility.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
D100	The system serial number was found to be blank.	1. Enter a valid serial number. The backspace and delete keys can be used to edit the value entered. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
D101	A machine serial number has been entered.	Re-enter the serial number used for D100. The backspace and delete keys can be used to edit the value entered.
D102	The machine type field has been found to be blank.	1. Enter a valid machine type. The backspace and delete keys can be used to edit the value entered. 2. If the problem remains, you might have a problem with the system board. Contact a service support representative for assistance.
D103	The machine type has been entered.	Re-enter a valid machine type. The backspace and delete keys can be used to edit the value entered.
D104	The model field has been found to be blank.	1. Enter a valid machine model. The backspace and delete keys can be used to edit the value entered. 2. If the problem remains, you might have a problem with the system board. Contact a service support representative for assistance.
D105	The machine type has been entered.	Re-enter a valid machine type. The backspace and delete keys can be used to edit the value entered.
D106	The universal unique identifier (UUID) universal is blank; the new value has been calculated and the field has been updated.	This error indicates that you might have a problem with the system board. Contact a service support representative for assistance.
D5BB	There is a startup delay with the countdown for overriding or modifying the startup behavior.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for assistance.
E101	Create a run-time abstraction service (RTAS) node.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for assistance.
E102	Load and initialize the RTAS.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for assistance.

Checkpoint code	Description	Suggested action
E105	Transfer control to the operating system (normal mode startup).	• Perform the system checkout procedure. See "System checkout" on page 64. • See *BladeCenter JS20 Type 8842 Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *BladeCenter Documentation* CD.
E10A	Load the RTAS device tree.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E10B	Set the RTAS device properties.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for assistance.
E130	Build the device tree.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for assistance.
E134	Create the memory node.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for assistance.
E138	Create the options node.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for assistance.
E139	Create the aliases node and system aliases.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for assistance.
E13A	Create the packages node.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for assistance.
E140	Load the operating system.	See the *BladeCenter JS20 Type 8842 Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *BladeCenter Documentation* CD.
E141	Synchronize the operating-system boot list with the management-module boot list.	1. Make sure that the boot list is correct using the management-module boot list menu. 2. Perform the system checkout procedure. See "System checkout" on page 64. 3. This error indicates that you might have a problem with the system board. Contact a service support representative for assistance.

Checkpoint code	Description	Suggested action
E142	The management-module boot list is set from the operating-system boot list.	1. Make sure that the boot list is correct using the management-module boot list menu. 2. Perform the system checkout procedure. See "System checkout" on page 64. 3. This error indicates that you might have a problem with the system board. Contact a service support representative for assistance.
E143	The operating-system boot list is set from the management-module boot list.	1. Make sure that the boot list is correct using the management-module boot list menu. 2. Perform the system checkout procedure. See "System checkout" on page 64. 3. This error indicates that you might have a problem with the system board. Contact a service support representative for assistance.
E149	Create the startup manager node.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for assistance.
E14A	Build the vital product data-to-operating-system lookup table.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for assistance.
E14C	Create the terminal emulator node.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. If the problem remains, you might have a problem with the system board. Contact a service support representative for assistance.
E14D	Load the startup image.	See the *BladeCenter JS20 Type 8842 Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *BladeCenter Documentation* CD.
E150	Create the host (primary) PCI controller node.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. If the problem remains, you might have a problem with the system board. Contact a service support representative for assistance.
E151	Probe the PCI bus.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for assistance.
E152	Probe for the adapter firmware code; evaluate if present.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for assistance.

Checkpoint code	Description	Suggested action
E153	End the adapter firmware code probing and evaluation.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for assistance.
E154	Create the PCI bridge node.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. If the problem remains, you might have a problem with the system board. Contact a service support representative for assistance.
E155	Probing the PCI bridge secondary bus.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. If the problem remains, you might have a problem with the system board. Contact a service support representative for assistance.
E158	Reserved	Contact a service support representative for assistance.
E15B	Transfer control to the operating system (service-mode startup).	See the *BladeCenter JS20 Type 8842 Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *BladeCenter Documentation* CD.
E15F	Adapter vital product data (VPD) evaluation.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. If the problem remains, you might have a problem with the system board. Contact a service support representative for assistance.
E170	Beginning of the PCI bus probe.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. If the problem remains, you might have a problem with the system board. Contact a service support representative for assistance.
E172	First pass of the PCI device probe.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. If the problem remains, you might have a problem with the system board. Contact a service support representative for assistance.
E174	Establishing the host connection.	1. Make sure that the Boot Internet protocol (BOOTP) server is configured for this client. Correct any problems found, then, retry the operation. 2. Make sure that the network connections are correct; then, retry the operation. 3. Perform the system checkout procedure. See "System checkout" on page 64. 4. If there are no problems with the BOOTP server or the network connection, replace the system board. Contact a service support representative for assistance.

Checkpoint code	Description	Suggested action
E175	Boot Internet protocol (BOOTP) request.	1. Make sure that the BOOTP server is correctly configured for this client. Correct any problems found; then, retry the operation. 2. Make sure that network connections are correct, then retry operation. 3. Perform the system checkout procedure. See "System checkout" on page 64. 4. If there are no problems with the BOOTP server or the network connection, replace the system board. Contact a service support representative for assistance.
E176	Trivial file transfer protocol (TFTP) file transfer.	1. Make sure that the blade server is correctly configured; then, retry the operation. 2. Make sure that the network connections are correct; then, retry the operation. 3. If there are no problems with the BOOTP server or the network connection, replace the system board. Contact a service support representative for assistance.
E177	Transfer failure due to a TFTP error condition.	1. Make sure that the BOOTP server is correctly configured; then, retry the operation. 2. Make sure that the network connections are correct; then, retry the operation. 3. Perform the system checkout procedure. See "System checkout" on page 64. 4. If there are no problems with the BOOTP server or the network connection, replace the system board. Contact a service support representative for assistance.
E17B	Microprocessor clock-speed measurement.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. If the problem remains, you might have a problem with the system board. Contact a service support representative for assistance.
E191	Create an industry standard architecture (ISA) reserved node.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E19A	NVRAM auto-boot? variable not found - assume FALSE.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E19B	NVRAM menu? variable not found - assume FALSE.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.

Checkpoint code	Description	Suggested action
E19D	Create the NVRAM node.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E19E	Real-time-clock initialization .	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E1A1	The user requested startup to the Open Firmware prompt that was initiated by a keyboard entry.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E1A2	The user requested startup using the default service-mode boot list that was initiated by a keyboard entry.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E1A3	The user requested startup using the customized service-mode boot list that was initiated by a keyboard entry.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E1A5	The user requested startup to the Open Firmware prompt using a service-processor command.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E1A6	The user requested startup using the default service-mode boot list of the service-processor command.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E1A7	The user requested startup using the customized service-mode boot list of the service-processor command.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E1A8	System starting to the Open Firmware prompt.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.

Checkpoint code	Description	Suggested action
E1AA	System startup check for NVRAM settings.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E1AB	System starting using the default service-mode boot list.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E1AC	System startup using the customized service-mode boot list.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E1AD	System startup to the operating system.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E1AE	System started up to multiboot menu using the NVRAM settings.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E1AF	System started up to the utilities menu using the NVRAM settings.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E1B1	Create the serial node.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E1B2	XOFF received - waiting for XON.	Have the blade server serviced. Contact a service support representative for assistance.
E1B3	XON received.	Have the blade server serviced. Contact a service support representative for assistance.
E1B6	Reserved	Have the blade server serviced. Contact a service support representative for assistance.
E1BD	Reserved	Have the blade server serviced. Contact a service support representative for assistance.
E1C4	Create the ISA timer chip node.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.

Checkpoint code	Description	Suggested action
E1C5	Create the ISA interrupt controller (PIC) node.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E1C6	Create the direct memory access (DMA) node.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E1DB	Reserved	Have the blade server serviced.
E1DC	Reserved	Have the blade server serviced.
E1F0	Start the out-of-box-experience function.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E1F1	Begin the self-test sequence on startup devices.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E1F2	Reserved	Have the blade server serviced. Contact a service support representative for assistance.
E1F3	Reserved	Have the blade server serviced. Contact a service support representative for assistance.
E1F4	End the self-test sequence on startup devices.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E1F5	Build the boot list.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E1F6	Determine the startup-device sequence.	1. Make sure that the boot list is applicable by using the management-module boot list menu. 2. Perform the system checkout procedure. See "System checkout" on page 64. 3. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E1F7	No startup image located.	See the *BladeCenter JS20 Type 8842 Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *BladeCenter Documentation* CD.

Checkpoint code	Description	Suggested action
E1F8	Build the boot list for SCSI adapters. The location of the SCSI adapter being scanned is also displayed.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E1F9	Build the boot list for Fibre Channel adapters. The location of the SAN adapter being scanned is also displayed.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E1FC	Build the boot list for serial storage architecture (SSA) adapters. The location code of the SSA adapter being scanned is also displayed.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E1FD	E1FD and another progress code (Exxx) will alternate in the operator panel. The other code is where the error occurred.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E1FE	Build the boot list for Fibre Channel adapters. The world-wide port number (WWPN) of the storage area network (SAN) adapter being scanned is also displayed.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E1FF	Building the boot list for Fibre Channel adapters. The WWPN of the SAN adapter being scanned is also displayed.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E200	Master I^2C initialization.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E201	The flash RAM cyclic redundancy check (CRC) checksum is valid.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E202	Programmable interrupt controller (MPIC) initialization.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.

Checkpoint code	Description	Suggested action
E203	Disable the TimeBase (TB) function.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E204	CRC check of the image in RAM.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E206	Reenable the TimeBase (TB) function.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E209	Serial input/output (SIO), communication line 1 (COM1), and general purpose input/output (GPIO) initialization.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E20A	Load 256 K flash code into Level 2 (L2) cache.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E20B	Read startup mode.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E20C	Master goes to the Partition FirmWare (PFW).	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E20D	Startup mode has been obtained.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E20F	Run from Level 2 (L2) cache.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.

Checkpoint code	Description	Suggested action
E210	Load and relocate the hardware isolation layer (HIL).	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E211	CRC check of the image in flash RAM.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E212	Get processor status and presence.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E213	Memory initialization.	1. Make sure that the DIMMs are correctly installed and seated; then, restart the blade server. 2. Start the blade server from the backup flash image to recover the primary image. 3. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E214	Pattern 1 memory test.	1. Make sure that the DIMMs are correctly installed and seated; then, restart the blade server. 2. Start the blade server from the backup flash image to recover the primary image. 3. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E215	Pattern 2 memory test.	1. Make sure that the DIMMs are correctly installed and seated; then, restart the blade server. 2. Start the blade server from the backup flash image to recover the primary image. 3. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E216	Clear memory.	1. Make sure that the DIMMs are correctly installed and seated; then, restart the blade server. 2. Start the blade server from the backup flash image to recover the primary image. 3. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E217	Setup DMA address re-mapping logic (DART), HIL base, and storage description register 1 (SDR1).	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.

Checkpoint code	Description	Suggested action
E218	Copy the set of flash RAM to memory.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E219	Save the dual in-line memory module (DIMM) serial presence detects (SPDs) and the processor status and presence.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E21A	Running code from memory.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E21B	Load PFW into memory.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E21C	Run HyperTransport (HT) initialization.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E21D	Run PCI initialization.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E21E	Run I/O advanced programmable interrupt controller (APIC) initialization.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E21F	Building the partition fundamental data structure (PFDS).	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E2B0	Reserved	No action is required.
E2B1	Reserved	No action is required.
E440	Validate NVRAM and initialize partitions as needed.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.

Checkpoint code	Description	Suggested action
E441	Generate /options node and NVRAM configuration variable properties.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E442	Validate NVRAM partitions.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E443	Generate NVRAM configuration variable dictionary words.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E444	Clearing and rebuilding of NVRAM common hardware reference platform (CHRP) region initiated by operator.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E800	Start the instantiation of RTAS.	Have the blade server serviced. Contact a service support representative for assistance.
E810	Initialize input/output configuration (IOCONFIG) pfds.	Have the blade server serviced. Contact a service support representative for assistance.
E820	Initialize logical partition event (lpevent).	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E830	Initialize event scan.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E840	Initialize hot plug process.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E842	Initialize check exception buffers.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E843	Initialize interface and operating system access.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.

Checkpoint code	Description	Suggested action
E850	Initialize dynamic reconfiguration.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E860	Initialize sensors.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E865	Initialize vital product data (VPD).	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E870	Initialize pfds memory manager.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E875	Initialize rtas_last_error.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E876	Initialize rtas_error_inject.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E880	Initialize I/O quiesce acknowledgement memory.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.
E890	Initialize Open Firmware.	Have the blade server serviced. Contact a service support representative for assistance.
EAA1	Probe PCI-PCI bridge.	1. Perform the system checkout procedure. See "System checkout" on page 64. 2. This error indicates that you might have a problem with the system board. Contact a service support representative for more information.

Firmware error codes

The following table provides an abbreviated list of the 8-digit alphanumeric firmware error codes that might appear during system initialization or operation.

Notes:

- When you are solving a problem with the BladeCenter JS20 Type 8842 blade server, you must determine whether the problem is in the BladeCenter JS20 Type 8842 blade server or to the BladeCenter unit.

  – There is a blade-server problem if the BladeCenter unit contains more than one blade server and only one of the blade servers has the symptom.

  – If all of the blade servers have the same symptom, the problem is in the BladeCenter unit. For more information, see the @server *BladeCenter Type 8677 Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *BladeCenter Documentation* CD.

- See the "Diagnostics" in the *BladeCenter JS20 Type 8842 Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *BladeCenter Documentation* CD that comes with your BladeCenter unit for more information about the firmware error codes.

Table 2. Abbreviated list of firmware error codes

Error code	Failing device or problem found	Suggested action
20A80000	Insufficient information to start the server.	1. Contact your network administrator to make sure that the server and gateway network are correct. 2. Contact a service support representative for assistance.
20A80001	The client Internet Protocol (IP) address is already in use by another network device.	1. Contact your network administrator to make sure that the server and gateway network are correct. 2. Contact a service support representative for assistance.
20A80002	Cannot get the gateway IP address.	1. Contact your network administrator to make sure that the server and gateway network are correct. 2. Contact a service support representative for assistance.
20A80003	Cannot get the server hardware address.	1. Contact your network administrator to make sure the server and gateway network are correct. 2. Contact a service support representative for assistance.
20A80004	Boot Internet protocol (BOOTP) failed.	1. Make sure that the BOOTP server is correctly configured for this client. 2. Check the network connection. If the network connection is good, retry the operation. If there is no network connection, contact your network administrator. 3. If there are no problems with the BOOTP server or the network connection, replace the system board. Contact a service support representative for more information.

Table 2. Abbreviated list of firmware error codes (continued)

Error code	Failing device or problem found	Suggested action
20A80005	The trivial file transfer protocol (TFTP) failed.	1. Make sure that the BOOTP server is correctly configured for this client. 2. Check the network connection. If the network connection is good, retry the operation. If there is no network connection, contact your network administrator. 3. If there are no problems with the BOOTP server or the network connection, replace the system board. Contact a service support representative for more information.
20A80006	The startup image is too large.	1. Make sure that the BOOTP server is correctly configured for this client. 2. Check the network connection. If the network connection is good, retry the operation. If there is no network connection, contact your network administrator. 3. If there are no problems with the BOOTP server or the network connection, replace the system board. Contact a service support representative for more information.
20D0000F	The device failed the self-test; error or location code information might not be available.	• If a location code is specified, replace the device at that location. • Perform the system checkout procedure. See "System checkout" on page 64.
20D00010	The device failed the self-test; cannot locate package.	1. If a location code is reported with the error, replace the device at that location code. 2. Replace the system board. Contact a service support representative for more information.
20D00011	The run-time extraction services (RTAS) program attempt to allocate memory failed.	Perform the system checkout procedure. See "System checkout" on page 64.
20D008 *xx*	Failure to access VPD data. Where *xx* is: **xx** **Description** **0E, 0F** Machine type or model **10, 11** System serial number **16, 17** Universal unique identifier (UUID) **1E** Startup (boot) mode	Perform the system checkout procedure. See "System checkout" on page 64.
20D00900	The blade server failed to generate a UUID value.	1. Replace the memory in the blade server. 2. Replace the system board. Contact a service support representative for assistance.
20D00901	The blade server failed to communicate with the service processor.	Have the blade server serviced. Contact a service support representative for assistance.

Table 2. Abbreviated list of firmware error codes (continued)

Error code	Failing device or problem found	Suggested action
20D00902	The blade server is starting from the permanent (B) firmware code page.	If the blade server was set to start from the primary (B) firmware code page, this is an informational message. If it was not, this indicates that the blade server was unable to start from the backup (A) firmware code page. Go to "Recovering the system firmware code" on page 96. Have the blade server serviced.
20D1000A	The Hypervisor function to get or set the time-of-day (TOD) reported an error.	Complete the following steps: 1. Check for firmware or system processor updates. 2. Replace the blade server. Contact a service support representative for assistance.
20D10004	The blade server failed to locate service processor device-tree node.	Perform the system checkout procedure. See "System checkout" on page 64.
20D10005	The blade server failed to restart.	Perform the system checkout procedure. See "System checkout" on page 64.
20D10006	The blade server failed to restart a partition.	Perform the system checkout procedure. See "System checkout" on page 64.
20D10007	Partition firmware error before stdout ready.	Perform the system checkout procedure. See "System checkout" on page 64.
20D1000A	Server failed to send the startup-failure message to the service processor.	Perform the system checkout procedure. See "System checkout" on page 64.
20D10010	Stack underflow from the Fibre Channel adapter.	1. Check the http://www.ibm.com/pc/support/ Web site for microcode updates for the Fibre Channel adapter. Apply the latest update, if one is available. 2. If an update is not available, contact a system administrator for assistance. 3. Perform the system checkout procedure. See "System checkout" on page 64.
20EE000B	The blade server could not find the operating system among the devices in the boot list. **Note:** The startup sequence is also known as the boot list.	• If you have not installed an operating system on the blade server, install it now. • If you have installed an operating system on the blade server, make sure that the startup sequence contains at least one device with a valid operating-system startup image. If the problem remains, have the blade server serviced. Contact a service support representative for assistance.
20EE000F	Unable to find the package node.	Perform the system checkout procedure. See "System checkout" on page 64.
20EE0010	Unable to process the root vpd method.	Perform the system checkout procedure. See "System checkout" on page 64.
20EE0011	Unable to process the vpd method.	Perform the system checkout procedure. See "System checkout" on page 64.
20EE0012	Unable to process the mem-dimm-vpd method.	Perform the system checkout procedure. See "System checkout" on page 64.

Table 2. Abbreviated list of firmware error codes (continued)

Error code	Failing device or problem found	Suggested action
20EE0015	The blade server failed to read the VPD startup path field value.	1. Make sure that the boot list in the management module is correct. 2. Perform the system checkout procedure. See "System checkout" on page 64.
20EE0016	The blade server failed to update the VPD with the new startup path field value.	1. Make sure that the boot list in the management module is correct. 2. Perform the system checkout procedure. See "System checkout" on page 64.
20EE0020	The environment variable, startup-device, exceeds the maximum number of characters.	1. Make sure that the boot list in the management module is correct. 2. Perform the system checkout procedure. See "System checkout" on page 64.
20EE0021	The environment variable, startup-device, contains more than five entries.	1. Make sure that the boot list in the management module is correct. 2. Perform the system checkout procedure. See "System checkout" on page 64.
20EE0022	The environment variable, startup-device, contains an entry that exceeds 255 characters in length.	1. Make sure that the boot list in the management module is correct. 2. Perform the system checkout procedure. See "System checkout" on page 64.
20EE0023	The blade server failed to set the operating-system boot list from the management-module boot list.	1. Make sure that the boot list in the management module is correct. 2. Check the http://www.ibm.com/pc/support/ Web site for firmware updates for the management module, service processor, and blade server. Apply the latest updates, if they are available. 3. If updates are not available, contact your system administrator for assistance. If the problem remains, call for service.
20EE0100	The firmware code on an I/O adapter is not supported on the blade server. This error code only affects the start-time operation, not the adapter functionality under the operating system.	This is an informational message. The adapter firmware code device driver is not supported on the blade server. For a list of supported operating systems and other options, go to http://www.ibm.com/pc/us/compat/. Remove the adapter and replace it with an adapter whose firmware-code device driver is supported on the blade server.

20FF0001	Problem with VPD.	• If a location code is specified, replace the device at that location.
		• If an error LED is lit, see "Light path diagnostics table" on page 93. Then, replace the failing component, if it is user-replaceable.
		• Have the blade server serviced if:
		  – There is no location code or error LED to indicate the failing component.
		  – The failing component is not user-replaceable.

Table 2. Abbreviated list of firmware error codes (continued)

Error code	Failing device or problem found	Suggested action
21020010	The USB CD-ROM drive remained busy longer than the amount of allocated time.	1. Retry the operation. 2. Check the http://www.ibm.com/pc/support/ Web site for firmware updates for the management module, service processor, and blade server. Apply the latest updates, if they are available. 3. If updates are not available, contact a system administrator for assistance. 4. If the problem remains, replace the USB CD-ROM drive. 5. If the problem remains, replace the system board. For replacement instructions, see "Replacing the system board" on page 35.
21020011	The USB CD-ROM drive: processing of ATA or ATAPI command was not completed within the amount of allocated time.	1. Retry the operation. 2. If the problem remains, the CD in the USB CD-ROM drive might not be readable. Remove the CD and insert another CD. 3. If the problem remains, replace the USB CD-ROM drive. 4. If the problem remains, replace the system board. Contact a service support representative for assistance.
21020012	The USB CD-ROM drive: execution of ATA or ATAPI command by the USB CD-ROM failed.	1. Make sure that the required cables are correctly attached to the power and signal connectors on the USB CD-ROM drive. Make sure that the cables are not damaged. If the cables are damaged, replace them, then, retry the operation. 2. If the problem remains, the CD in the USB CD-ROM drive might not be readable. 3. Contact a service support representative for assistance.
21020013	The USB CD-ROM drive: startable CD is missing.	1. Retry the operation. 2. If the problem remains, remove the CD and insert another CD. The CD in the USB CD-ROM drive might not be readable. 3. If the problem remains, replace the USB CD-ROM drive. 4. If the problem remains, replace the system board. Contact a service support representative for assistance.

Table 2. Abbreviated list of firmware error codes (continued)

Error code	Failing device or problem found	Suggested action
21020014	The USB CD-ROM drive: the CD has been changed.	1. Retry the operation. 2. Check the http://www.ibm.com/pc/support/ Web site for firmware updates for the management module, service processor, and blade server. Apply the latest updates, if they are available. 3. If updates are not available, contact your system administrator for assistance. 4. If the problem remains, replace the USB CD-ROM drive. 5. If the problem remains, replace the system board. Contact a service support representative for assistance.
21020015	The USB CD-ROM drive: failure of ATA or ATAPI packed command processing by USB CD-ROM drive.	1. If the problem remains, remove the CD and insert another CD. The CD in the USB CD-ROM drive might not be readable. 2. Check the http://www.ibm.com/pc/support/ Web site for firmware updates for the management module, service processor, and blade server. Apply the latest updates, if they are available. 3. If updates are not available, contact a system administrator for assistance. 4. If the problem remains, replace the USB CD-ROM drive. 5. If the problem remains, replace the system board. Contact a service support representative for assistance.
22000001	Peripheral component interconnect (PCI) Ethernet adapter failure.	Replace the adapter.
22001001	PCI Ethernet adapter failure.	Replace the adapter.
22001002	PCI Ethernet adapter failure.	Replace the adapter.
22010001	PCI Ethernet adapter failure.	Replace the adapter.
22011001	PCI Ethernet adapter failure.	Replace the adapter.
22003002	Gigabit Ethernet adapter failure.	If the location code identifies a slot: 1. Reseat the adapter and restart the blade server. 2. Replace the adapter. 3. Check the http://www.ibm.com/pc/support/ Web site for system firmware updates. Apply the latest update, if one is available. 4. If an update is not available, contact a system administrator for assistance. If the location code identifies the system, replace the system board. Contact a service support representative for assistance.

Table 2. Abbreviated list of firmware error codes (continued)

Error code	Failing device or problem found	Suggested action
22003003	Gigabit Ethernet adapter failure.	If there is no adapter in the PCI slot in the blade server, replace the system board. Contact a service support representative for assistance.
		If there is an adapter in the PCI slot in the blade server, perform the following steps:
		1. Turn off the blade server.
		2. Remove the adapter; then, turn on the blade server.
		3. If the problem no longer exists, replace the adapter that you removed.
		If the problem remains, replace the system. Contact a service support representative for assistance.
25A00001	Level 2 (L2) cache controller failure.	Replace the system board. Contact a service support representative for assistance.
25A10001	L2 cache static random-access memory (SRAM) failure.	Replace the system board. Contact a service support representative for assistance.
25A80xxx	Nonvolatile random-access memory (NVRAM) problems.	NVRAM errors are caused by low-battery voltage or power outages that occur during normal system usage. Except for firmware error code 2580000, these error codes are warnings that the NVRAM data content had to be reestablished, and do not require any component replacement, unless the problem remains. When one of these error occurs, any system customization (for example, the startup device sequence) has been lost.
		If the problem remains, replace the system board. Contact a service support representative for assistance.
25A8000	Initialization failed; the device failed the test.	If the problem remains, replace the system board. Contact a service support representative for assistance.
25A80100	The NVRAM data validation check failed.	1. Turn off the blade server; then, turn it on.
		2. Retry the operation before replacing any system component.
		If the problem remains, replace the system board. Contact a service support representative for assistance.
25A80201	Unable to expand target partition while saving configuration variable.	If the problem remains, replace the system board. Contact a service support representative for assistance.
25A80202	Unable to expand target partition while writing BladeCenter management-module event log entry.	If the problem remains, replace the system board. Contact a service support representative for assistance.
25A80203	Unable to expand target partition while writing VPD data.	If the problem remains, replace the system board. Contact a service support representative for assistance.
25A80210	Setenv/$Setenv parameter error; name contains a null character.	If the problem remains, replace the system board. Contact a service support representative for assistance.
25A80211	Setenv/$Setenv parameter error; value contains a null character.	If the problem remains, replace the system board. Contact a service support representative for assistance.
25A80999	NVRAMRC script evaluation error; stack unbalanced on completion.	This is a firmware debug environment error. No action is required. No component replacement is required.
		If the problem remains, have the blade server serviced.

Table 2. Abbreviated list of firmware error codes (continued)

Error code	Failing device or problem found	Suggested action
25C00000	No DIMMs were detected.	**Note:** For additional information about DIMMs, see "Installing memory modules" on page 27. 1. Make sure that the DIMMs are correctly seated. If necessary, reseat the DIMMs. 2. Restart the blade server. 3. Perform the system checkout procedure. See "System checkout" on page 64. If the problem remains, replace the system board. Contact a service support representative for assistance.
25C0*xx yy*	DIMM failure: where *xx* and *yy* are: **xx** **Description** **01** DIMM2 missing **10** DIMM1 missing **12** DIMM1 unsupported **14** DIMM1 failed **21** DIMM2 unsupported **22** DIMM1 and DIMM2 unsupported **41** DIMM2 failed **88** DIMM1 and DIMM2 mismatch **yy** **Description** **01** DIMM4 missing **10** DIMM3 missing **12** DIMM3 unsupported **14** DIMM3 failed **21** DIMM4 unsupported **22** DIMM3 and DIMM4 unsupported **41** DIMM4 failed **88** DIMM3 and DIMM4 mismatch	**Note:** For additional information about DIMMs, see "Installing memory modules" on page 27. 1. Make sure that all the DIMMs in the blade server are supported. Replace all the unsupported DIMMs. 2. Make sure that the DIMMs are installed in pairs. If the DIMMs are not installed in pairs, reinstall them in pairs. 3. Make sure that the DIMMs are correctly seated. If necessary, reseat the DIMMs. 4. Restart the blade server. 5. Remove and reinstall the DIMMs one at a time until the failing DIMM is isolated. If the problem remains, replace the system board. Contact a service support representative for assistance.

Table 2. Abbreviated list of firmware error codes (continued)

Error code	Failing device or problem found	Suggested action
26020008	PCI device firmware code evaluation error.	If the location code identifies a slot: 1. Reseat the adapter and restart the blade server. 2. Replace the adapter. 3. Check the http://www.ibm.com/pc/support/ Web site for system firmware updates. Apply the latest update, if one is available. 4. If an update is not available, contact a system administrator for assistance. If the location code identifies the system board, replace the system board. Contact a service support representative for assistance.
2B208888	Operating-system termination request has been received.	This is an informational message. No action is required.

2B2x00EE	An exception error has been reported for a microprocessor.	The type of interrupt that caused the exception is specified by the *x* as follows:
		    0 - Unknown interrupt
		    1 - System reset interrupt (SRI)
		    2 - Machine check interrupt
		    3 - Data storage interrupt (DSI)
		    4 - Instruction storage interrupt (ISI)
		    5 - External interrupt (EXI)
		    6 - Alignment interrupt (ALI)
		    7 - Program interrupt (SRI)
		    8 - Floating unavailable interrupt (FUI)
		
		Complete the following steps:
		1. Check the http://www.ibm.com/pc/support/ Web site for system firmware updates. Apply the latest update, if one is available.
		2. If an update is not available, contact a system administrator for assistance.
		
		If the problem remains, replace the system board. Contact a service support representative for assistance.

Troubleshooting charts

The following tables list problem symptoms and suggested solutions. See the *BladeCenter JS20 Type 8842 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, have the blade server serviced.

Notes:

- If you have problems with an adapter, monitor, keyboard, mouse, or power module, see the @server *BladeCenter HS20 Type 8678 Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *BladeCenter Documentation* CD for more information.
- If you have problems with an Ethernet or Fibre Channel switch module, IBM @server BladeCenter Optical Pass-Thru Module, I/O adapter, or other optional device that can be installed in the BladeCenter unit, see the applicable *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *BladeCenter Documentation* CD or other documentation that comes with the device for more information.

Power problems

Power symptom	Suggested action

The blade server does not turn on.	1. Make sure that:
	  a. The power-on 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 is in blade bays 7 through 14, power modules are in power-module bays 1, 2, 3, and 4.
	  d. The power-on LED on the blade-server control panel is flashing slowly.
	    • If the power-on LED is flashing rapidly and continues to do so, the blade server is not communicating with the management module; reseat 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 make sure), or the blade server was instructed through the management module (Web interface) 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, have the blade server serviced.

Memory problems

Memory symptom	Suggested action
The amount of system memory displayed is less than the amount of physical memory installed.	Make sure that: • The memory modules are seated correctly. • You have installed the correct type of memory. • 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 might have been manually disabled. • The DIMMs are not defective. If a DIMM is defective, replace it; then, restart the server. • The blade-server firmware code automatically updated the memory configuration, if you changed the memory. If the problem remains, call for service.

Network connection problems

Network connection symptom	Suggested action
One or more blade servers are unable to communicate with the network.	Make sure that: • 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 @server *BladeCenter Type 8677 Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *BladeCenter Documentation* CD for details. • The settings in the switch module are correct for the blade server (settings in the switch module are blade server specific). If you installed an optional I/O adapter, make sure that: • 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. • You have not loosened any other installed options or cables. • The new configuration information was saved in the blade-server firmware code. Whenever memory or an option is changed, the new configuration information is automatically saved in the blade-server firmware code. If the problem remains, call for service.

Option problems

Option symptom	Suggested action
An IBM option that was just installed does not work.	Make sure that: • 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. • You have not loosened any other installed options or cables. If the problem remains, call for service.

Option symptom	Suggested action
An IBM option that used to work does not work now.	Make sure that all of the option hardware and cable connections are secure. If the option comes with its own test instructions, use those instructions to test the option. If the problem remains, call for service.

Service processor problems

Service processor symptom	Suggested action
Service processor reports a general monitor failure.	1. If the blade server is operating, shut down the operating system. 2. If the blade server was not powered off, press the power-control button (behind the blade-server control panel door) to power off the server. 3. Remove the blade server from the BladeCenter unit. 4. Wait 30 seconds and reinstall the blade server into the BladeCenter unit. 5. Restart the blade server. If the problem remains, call for service.

Light path diagnostics 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, static-protective 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 LEDs" on page 10 for the location of the light path diagnostics button and error LEDs, then see the "Light path diagnostics table" on page 93.

Light path diagnostics table

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

Notes:

- 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 (SW1).

- Error LED CR29 is not used.
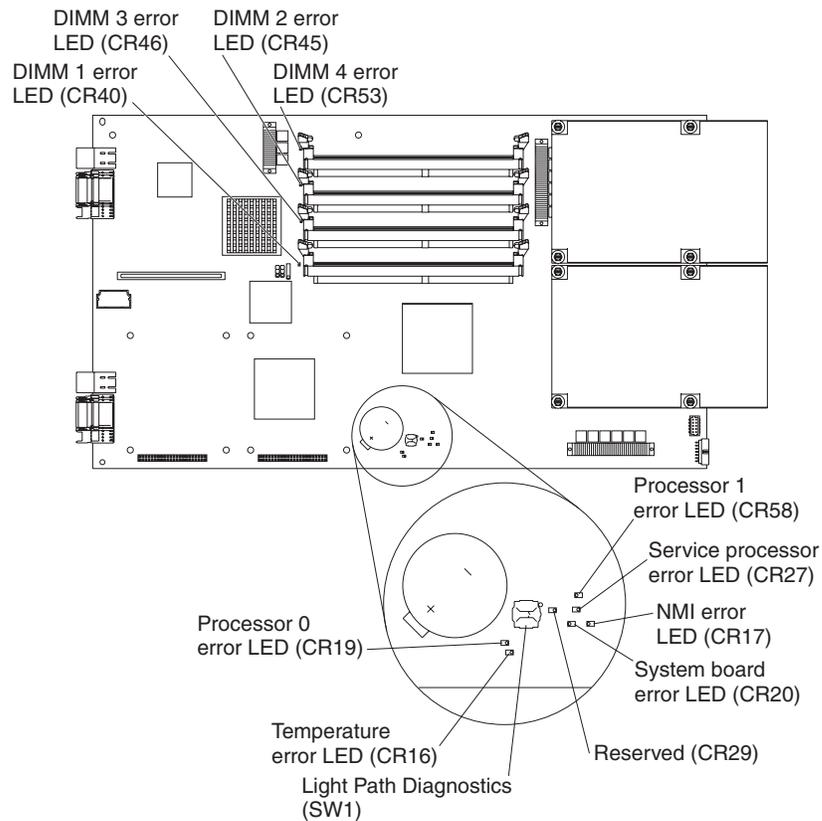
Table 3. Light path diagnostics

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 event log in the BladeCenter management module for more information about the error.
DIMM *x* error	A memory error occurred.	Replace the DIMM indicated by the lit DIMM failure LED. **Note:** Multiple DIMM LEDs do not necessarily indicate multiple DIMM failures. If more than one DIMM LED is lit, reseat or replace one DIMM at a time until error is corrected. Check the system event log in the BladeCenter management module for information about the error. If the problem remains, have the blade server serviced.
Processor *x* error	The microprocessor has failed.	**Attention:** To help ensure proper cooling and system reliability, two microprocessors and two heat sinks are required on the system board in the blade server at all times. The microprocessors and heat sinks on the system board are not replaceable. Therefore, if a microprocessor or heat sink becomes defective, you must replace the system board. Contact a service support representative for assistance.
Service processor error	The service processor has failed.	Have the blade server serviced. **Note:** There are two service processor error LEDs: CR27 (amber) and CR38 (green).
NMI error	The system board has failed.	1. Replace the blade server cover, reinsert the blade server in the BladeCenter unit, and then restart the server. 2. Check the system event log in the BladeCenter management module for information about the error. If the problem remains, have the blade server serviced.
System board error	The system board has failed.	Replace the blade server cover, reinsert the blade server in the BladeCenter unit, and then restart the server. If the problem remains, have the blade server serviced.

Table 3. Light path diagnostics (continued)

Lit blade-error LED	Cause	Action
Temperature error	The system temperature has exceeded a threshold level.	1. Check to see if a blower on the BladeCenter unit has failed. If it has, replace the blower. 2. Make sure the room temperature is not too high. (See "Features and specifications" on page 6 for temperature information.) If the problem remains, have the blade server serviced.
IDE bus *x* error	The IDE bus indicated by the error LED has failed.	1. Reseat or replace the hard disk drive (or other IDE device) on IDE bus *x*. 2. If the LED stays on, replace the system board as described in "Replacing the system board" on page 35. 3. Replace the blade server cover, reinsert the blade server in the BladeCenter unit, and then restart the server. If the problem remains, have the blade server serviced.
Processor *x* phase-locked loop (PLL) error	The microprocessor circuit is defective, and cannot process the required signals.	**Attention:** To help ensure proper cooling and system reliability, two microprocessors and two heat sinks are required on the system board in the blade server at all times. The microprocessors and heat sinks on the system board are not replaceable. Therefore, if a microprocessor or heat sink becomes defective, you must replace the system board. Contact a service support representative for assistance.
VRM error	The integrated VRM on the system board has failed.	1. To verify the error, replace the blade-server cover, reinsert the blade server in the BladeCenter unit, and then restart the server. 2. If the LED stays lit, replace the system board. Contact a service support representative for assistance.

Recovering the system firmware code

The system firmware is contained in two separate images in the flash memory of the blade server (primary and backup). If the primary image becomes damaged, such as from a power failure during a flash update, you can recover the primary image from the backup image. If this occurs, you can see one of two symptoms:

- The system automatically starts up from backup. This is indicated by the error code 20D00902.
- The system hangs or is non-responsive after the system is started with no checkpoints.

Note: The primary image is also known as the TEMP side of the flash module. The backup image is also known as the PERM side of the flash module.

If your system hangs, you can force the system to startup the backup image by using the code page jumper (J14).

Starting the backup image

To force the system to startup the backup image, complete the following steps:

Note: Do not perform these steps if the system error code 20D00902 has already occurred on your system.

1. Turn off the blade server.
2. Remove the blade server (see "Removing the blade server from the BladeCenter unit" on page 23).
3. Open the blade-server cover (see "Opening the blade server cover" on page 24 for instructions).
4. Remove the blade-server bezel assembly (see "Removing the blade-server bezel assembly" on page 25).
5. Locate jumper J14 (system firmware code page jumper) on the system board.

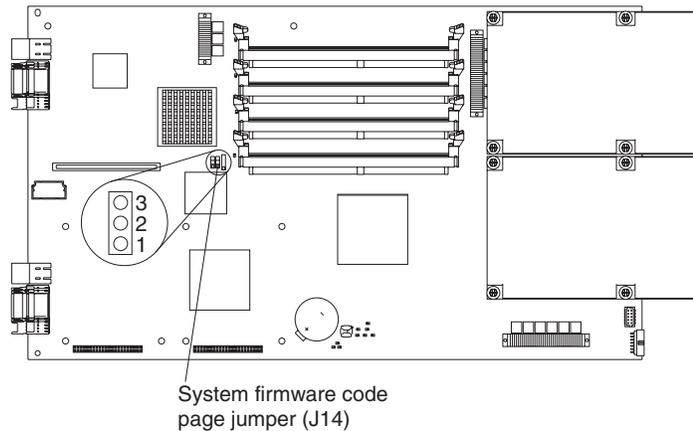
System firmware code
page jumper (J14)
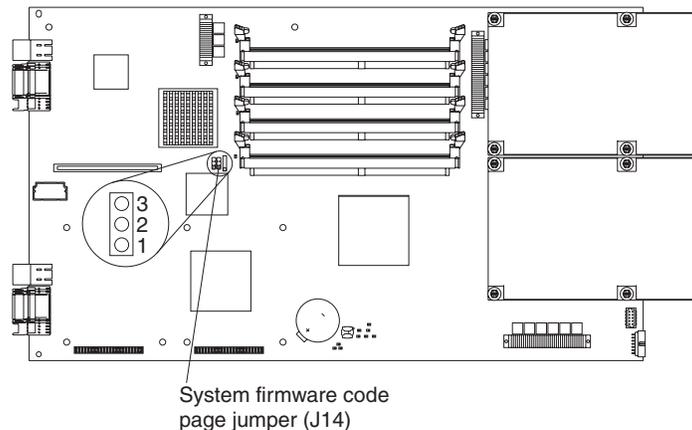
6. Move jumper J14 to pins 2 and 3 to enable system firmware recovery mode.
7. Replace the cover and reinstall the blade server in the BladeCenter unit, making sure that the blade server controls all relevant components and restart the blade server.
8. If the system starts with the operating system prompt, see "Recovering the primary image" on page 97. If the system does not start with the operating system prompt, replace the system board. Contact a service support representative for assistance.

Note: If the blade server does not restart, you must replace the system board. Contact a service support representative for assistance.

Recovering the primary image

To recover the primary image, you must perform the reject function. The reject function copies the backup image into the primary image. To perform the reject function, complete the following steps:

1. If you have not installed the ppc64 Linux utilities, perform the installation now. See http://techsupport.services.ibm/pc/support.

2. Reject the primary image. Type `update_flash -r.`

3. Shut down the blade server using the operating system.

4. If you have not moved jumper J14, restart the system.

5. If you moved jumper J14, complete the following steps:

   a. Turn off the blade server.

   b. Remove the blade server (see "Removing the blade server from the BladeCenter unit" on page 23).

   c. Open the blade-server cover (see "Opening the blade server cover" on page 24 for instructions).

   d. Remove the blade-server bezel assembly (see "Removing the blade-server bezel assembly" on page 25).

   e. Locate jumper J14 (system firmware code page jumper) on the system board.

System firmware code
page jumper (J14)

   f. Move jumper J14 to pins 1 and 2 to enable system firmware recovery mode.

g. Replace the cover and reinstall the blade server in the BladeCenter unit, making sure that the blade server controls all relevant components and restart 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.

You might need to update the firmware code to the latest version. See http://www.ibm/.com/pc/support for more information about how to update the firmware code.

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. Information about diagnostic tools is in the *BladeCenter JS20 Type 8842 Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *BladeCenter Documentation* CD or in the IntelliStation *Hardware Maintenance Manual* at the IBM Support Web site.
- 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.

You can solve many problems without outside assistance by following the troubleshooting procedures that IBM provides in the online help or in the documentation that is provided with your system and software. The information that comes with your system also describes the diagnostic tests that you can perform. Most @server, xSeries®, and IntelliStation® 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 documentation through the IBM Publications Ordering System at http://www.elink.ibmlink.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 @server and 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. IBM Statement of Limited Warranty Z125-4753-07 11/2002

Part 1 - General Terms

Part 1 - General Terms

This Statement of Limited Warranty includes Part 1 - General Terms, Part 2 - Country-unique Terms, and Part 3 - Warranty Information. 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. 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. **Nothing in this Statement of Limited Warranty affects any statutory rights of consumers that cannot be waived or limited by contract.**

What this Warranty Covers

IBM warrants that each Machine 1) is free from defects in materials and workmanship and 2) conforms to IBM's Official Published Specifications ("Specifications") which are available on request. The warranty period for the Machine starts on the original Date of Installation and is specified in Part 3 - Warranty Information. The date on your invoice or sales receipt is the Date of Installation unless IBM or your reseller informs you otherwise. 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. Unless IBM specifies otherwise, these warranties apply only in the country or region in which you purchased the Machine.

THESE WARRANTIES ARE YOUR EXCLUSIVE WARRANTIES AND REPLACE ALL OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. SOME STATES OR JURISDICTIONS DO NOT ALLOW THE EXCLUSION OF EXPRESS OR IMPLIED WARRANTIES, SO THE ABOVE EXCLUSION MAY NOT APPLY TO YOU. IN THAT EVENT, SUCH WARRANTIES ARE LIMITED IN DURATION TO THE WARRANTY PERIOD. NO WARRANTIES APPLY AFTER THAT PERIOD. SOME STATES OR JURISDICTIONS DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU.

What this Warranty Does not Cover

This warranty does not cover the following:
* any software programs, whether pre-loaded or shipped with the Machine, or installed subsequently;
* failure resulting from misuse (including but not limited to use of any Machine capacity or capability, other than that authorized by IBM in writing), accident, modification, unsuitable physical or operating environment, or improper maintenance by you;
* failure caused by a product for which IBM is not responsible; and
* any non-IBM products, including those that IBM may procure and provide with or integrate into an IBM Machine at your request.

The warranty is voided by removal or alteration of identification labels on the Machine or its parts.

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, is provided **WITHOUT WARRANTIES OF ANY KIND**.

How to Obtain Warranty Service

If the Machine does not function as warranted during the warranty period, contact IBM or your reseller to obtain warranty service. If you do not register the Machine with IBM, you may be required to present proof of purchase as evidence of your entitlement to warranty service.

What IBM Will Do to Correct Problems

When you call for service, you must follow the problem determination and resolution procedures that IBM specifies. A technician will attempt to make an initial diagnosis of your problem and help you resolve it over the telephone.

The type of warranty service applicable to your Machine is specified in Part 3 - Warranty Information.

You are responsible for downloading and installing designated Machine Code (microcode, basic input/output system code (called "BIOS"), utility programs, device drivers, and diagnostics delivered with an IBM Machine) and other software updates from an IBM Internet Web site or from other electronic media, and following the instructions that IBM provides.

If your problem can be resolved with a Customer Replaceable Unit ("CRU") (e.g., keyboard, mouse, speaker, memory, hard disk drive and other easily replaceable parts), IBM will ship these parts to you for replacement by you.

If the Machine does not function as warranted during the warranty period and your problem cannot be resolved over the telephone, through your application of Machine Code or software updates, or with a CRU, IBM or your reseller, if approved by IBM to provide warranty service, will either, at its discretion, 1) repair it to make it function as warranted, or 2) replace it with one that is at least functionally equivalent. If IBM is unable to do either, you may return the Machine to your place of purchase and your money will be refunded.

IBM or your reseller will also manage and install selected engineering changes that apply to the Machine.

Exchange of a Machine or Part

When the 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.

Your Additional Responsibilities

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 service request procedures that IBM or your reseller provides;
   b. backup or secure all programs, data, and funds contained in the Machine;
   c. provide IBM or your reseller with sufficient, free, and safe access to your facilities to permit IBM to fulfill its obligations; and
   d. inform IBM or your reseller of changes in the Machine's location.
4. (a) ensure all information about identified or identifiable individuals (Personal Data) is deleted from the Machine (to the extent technically possible), (b) allow IBM, your reseller or an IBM supplier to process on your behalf any remaining Personal Data as IBM or your reseller considers necessary to fulfill its obligations under this Statement of Limited Warranty (which may include shipping the Machine for such processing to other IBM service locations around the world), and (c) ensure that such processing complies with any laws applicable to such Personal Data.

Limitation of Liability

IBM is responsible for loss of, or damage to, your Machine only 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 are responsible for any of your confidential, proprietary or personal information contained in a Machine which you return to IBM for any reason. You should remove all such information from the Machine prior to its return.

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 ("LIC").

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, ITS SUPPLIERS OR RESELLERS LIABLE FOR ANY OF THE FOLLOWING EVEN IF INFORMED OF THEIR POSSIBILITY: 1) THIRD PARTY CLAIMS AGAINST YOU FOR DAMAGES (OTHER THAN THOSE UNDER THE FIRST ITEM LISTED ABOVE); 2) LOSS OF,

OR DAMAGE TO, DATA; 3) SPECIAL, INCIDENTAL, OR INDIRECT DAMAGES OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES; OR 4) LOST PROFITS, BUSINESS REVENUE, GOODWILL OR ANTICIPATED SAVINGS. SOME STATES OR JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU. SOME STATES OR JURISDICTIONS DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION 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 Statement of Limited Warranty, without regard to conflict of law principles.

THESE WARRANTIES GIVE YOU SPECIFIC LEGAL RIGHTS AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE OR JURISDICTION TO JURISDICTION.

Jurisdiction

All of our rights, duties, and obligations are subject to the courts of the country in which you acquired the Machine.

Part 2 - Country-unique Terms

AMERICAS

ARGENTINA

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

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the Ordinary Commercial Court of the city of Buenos Aires.

BRAZIL

Governing Law: *The following is added after the first sentence:*
Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the court of Rio de Janeiro, RJ.

PERU

Limitation of Liability: *The following is added at the end of this section:*

In accordance with Article 1328 of the Peruvian Civil Code the limitations and exclusions specified in this section will not apply to damages caused by IBM's willful misconduct ("dolo") or gross negligence ("culpa inexcusable").

NORTH AMERICA

How to Obtain 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

Limitation of Liability: *The following replaces item 1 of this section:*
1. damages for bodily injury (including death) or physical harm to real property and tangible personal property caused by IBM's negligence; and

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

What this Warranty Covers: *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, United States of America.

CAMBODIA, INDONESIA, LAOS, AND VIETNAM

Arbitration: *The following is added under this heading:*
Disputes arising out of or in connection with this Statement of Limited Warranty shall be finally settled by arbitration which shall be held in Singapore in accordance with the Arbitration Rules of Singapore International Arbitration Center ("SIAC Rules") then in effect. The arbitration award shall be final and binding for the parties without appeal and shall be in writing and set forth the findings of fact and the conclusions of law.

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 who shall act as chairman of the proceedings. Vacancies in the

post of chairman shall be filled by the president of the SIAC. 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.

All proceedings shall be conducted, including all documents presented in such proceedings, in the English language. The English language version of this Statement of Limited Warranty prevails over any other language version.

HONG KONG S.A.R. OF CHINA AND MACAU S.A.R. OF CHINA

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 of China.

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; and
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, the charge paid by you for the individual Machine that is the subject of the claim. For purposes of this item, the term "Machine" includes Machine Code and Licensed Internal Code ("LIC").

Arbitration: *The following is added under this heading:*

Disputes arising out of or in connection with this Statement of Limited Warranty shall be finally settled by arbitration which shall be held in Bangalore, India in accordance with the laws of India then in effect. The arbitration award shall be final and binding for the parties without appeal and shall be in writing and set forth the findings of fact and the conclusions of law.

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 who shall act as chairman of the proceedings. Vacancies in the post of chairman shall be filled by the president of the Bar Council of India. 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.

All proceedings shall be conducted, including all documents presented in such proceedings, in the English language. The English language version of this Statement of Limited Warranty prevails over any other language version.

JAPAN

Governing Law: *The following sentence is added to this section:*
Any doubts concerning this Statement of Limited Warranty will be initially resolved between us in good faith and in accordance with the principle of mutual trust.

MALAYSIA

Limitation of Liability: *The word "**SPECIAL**" in item 3 of the fifth paragraph is deleted.*

NEW ZEALAND

What this Warranty Covers: *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 "laws of the country in which you acquired the Machine" in the first sentence:*

laws of the State of New York, United States of America (except when local law requires otherwise).

PHILIPPINES

Limitation of Liability: *Item 3 in the fifth paragraph is replaced by the following:*

SPECIAL (INCLUDING NOMINAL AND EXEMPLARY DAMAGES), MORAL, INCIDENTAL, OR INDIRECT DAMAGES FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES; OR

Arbitration: *The following is added under this heading:*

Disputes arising out of or in connection with this Statement of Limited Warranty shall be finally settled by arbitration which shall be held in Metro Manila, Philippines in accordance with the laws of the Philippines then in effect. The arbitration award shall be final and binding for the parties without appeal and shall be in writing and set forth the findings of fact and the conclusions of law.

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 who shall act as chairman of the proceedings. Vacancies in the post of chairman shall be filled by the president of the Philippine Dispute Resolution Center, Inc. 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.

All proceedings shall be conducted, including all documents presented in such proceedings, in the English language. The English language version of this Statement of Limited Warranty prevails over any other language version.

SINGAPORE

Limitation of Liability: *The words* "**SPECIAL**" *and* "**ECONOMIC**" *in item 3 in the fifth paragraph are deleted.*

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.

Hot to Obtain Warranty Service: If you purchase a Machine in Austria, Belgium, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Monaco, Netherlands, Norway, Portugal, Spain, San Marino, Sweden, Switzerland, United Kingdom or Vatican State, 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, provided the Machine has been announced and made available by IBM in the country in which you wish to obtain service. If you purchased a Personal Computer Machine in Albania, Armenia, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Georgia, Hungary, Kazakhstan, Kyrgyzstan, 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 a 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 approved service provider. You are responsible for transportation costs for Machines located outside 50 kilometers of an IBM approved service provider.

*Add the following paragraph in **Western Europe** (Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Liechtenstein, Luxembourg, Monaco, Netherlands, Norway, Portugal, Spain, San Marino, Sweden, Switzerland, United Kingdom, Vatican State):*

The warranty for Machines acquired in Western Europe shall be valid and applicable in all Western Europe countries provided the Machines have been announced and made available in such countries.

Governing Law:

The phrase "the laws of the country in which you acquired the Machine" is replaced by:

1) "the laws of Austria" **in Albania, Armenia, Azerbaijan, Belarus, Bosnia-Herzegovina, Bulgaria, Croatia, Georgia, Hungary, Kazakhstan, Kyrgyzstan, FYR Macedonia, Moldova, Poland, Romania, Russia, Slovakia, Slovenia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan, and FR Yugoslavia;** 2) "the laws of France" **in Algeria, Benin, Burkina Faso, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo Republic, Djibouti, Democratic Republic of Congo, Equatorial Guinea, French Guiana, French Polynesia, Gabon, Gambia, Guinea, Guinea-Bissau, Ivory Coast, Lebanon, Madagascar, Mali, Mauritania, Mauritius, Mayotte, Morocco, New Caledonia, Niger, Reunion, Senegal, Seychelles, Togo, Tunisia, Vanuatu, and Wallis & Futuna;** 3) "the laws of Finland" **in Estonia, Latvia, and Lithuania;** 4) "the laws of England" **in 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, the United Kingdom, West Bank/Gaza, Yemen, Zambia, and Zimbabwe;** and 5) "the laws of South Africa" **in South Africa, Namibia, Lesotho and Swaziland.**

Jurisdiction: *The following exceptions are added to this section:*

1) **In Austria** the choice of jurisdiction for all disputes arising out of this Statement of Limited Warranty and relating thereto, including its existence, will be the competent court of law in Vienna, Austria (Inner-City); 2) **in 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, West Bank/Gaza, Yemen, Zambia, and Zimbabwe** all disputes arising out of this Statement of Limited Warranty or related to its execution, including summary proceedings, will be submitted to the exclusive jurisdiction of the English courts; 3) in **Belgium** and **Luxembourg**, all disputes arising out of this Statement of Limited Warranty or related to its interpretation or its execution, the law, and the courts of the capital city, of the country of your registered office and/or commercial site location only are competent; 4) **in France, Algeria, Benin, Burkina Faso, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo Republic, Djibouti, Democratic Republic of Congo, Equatorial Guinea, French Guiana, French Polynesia, Gabon, Gambia, Guinea, Guinea-Bissau, Ivory Coast, Lebanon, Madagascar, Mali, Mauritania, Mauritius, Mayotte, Morocco, New Caledonia, Niger, Reunion, Senegal, Seychelles, Togo, Tunisia, Vanuatu, and Wallis & Futuna** all disputes arising out of this Statement of Limited Warranty or related to its violation or execution, including summary proceedings, will be settled exclusively by the Commercial Court of Paris; 5) **in Russia**, all disputes arising out of or in relation to the interpretation, the violation, the termination, the nullity of the execution of this Statement of Limited Warranty shall be settled by Arbitration Court of Moscow; 6) **in South Africa, Namibia, Lesotho and Swaziland**, both of us agree to submit all disputes relating to this Statement of Limited Warranty to the jurisdiction of the High Court in Johannesburg; 7) **in Turkey** all disputes arising out of or in connection with this Statement of Limited Warranty shall be resolved by the Istanbul Central (Sultanahmet) Courts and Execution Directorates of Istanbul, the Republic of Turkey; 8) in each of the following specified countries, any legal claim arising out of this Statement of Limited Warranty will be brought before, and settled exclusively by, the competent court of a) Athens for

Greece, b) Tel Aviv-Jaffa for **Israel**, c) Milan for **Italy**, d) Lisbon for **Portugal**, and e) Madrid for **Spain**; and 9) **in the United Kingdom**, both of us agree to submit all disputes relating to this Statement of Limited Warranty to the jurisdiction of the English courts.

Arbitration: *The following is added under this heading:*

In Albania, Armenia, Azerbaijan, Belarus, Bosnia-Herzegovina, Bulgaria, Croatia, Georgia, Hungary, Kazakhstan, Kyrgyzstan, FYR Macedonia, Moldova, Poland, Romania, Russia, Slovakia, Slovenia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan, and FR Yugoslavia all disputes arising out of this Statement of Limited Warranty or related to its violation, termination or nullity will be finally settled under the Rules of Arbitration and Conciliation of the International Arbitral Center of the Federal Economic Chamber in Vienna (Vienna Rules) by three arbitrators appointed in accordance with these rules. The arbitration will be held in Vienna, Austria, and the official language of the proceedings will be English. The decision of the arbitrators will be final and binding upon both parties. Therefore, pursuant to paragraph 598 (2) of the Austrian Code of Civil Procedure, the parties expressly waive the application of paragraph 595 (1) figure 7 of the Code. IBM may, however, institute proceedings in a competent court in the country of installation.

In Estonia, Latvia and Lithuania all disputes arising in connection with this Statement of Limited Warranty will be finally settled in arbitration that will be held in Helsinki, Finland in accordance with the arbitration laws of Finland then in effect. Each party will appoint one arbitrator. The arbitrators will then jointly appoint the chairman. If arbitrators cannot agree on the chairman, then the Central Chamber of Commerce in Helsinki will appoint the chairman.

EUROPEAN UNION (EU)

THE FOLLOWING TERMS APPLY TO ALL EU COUNTRIES:

Consumers have legal rights under applicable national legislation governing the sale of consumer goods. Such rights are not affected by the warranties provided in this Statement of Limited Warranty.

How to Obtain Warranty Service: *The following is added to this section:*

To obtain warranty service from IBM in EU countries, see the telephone listing in Part 3 - Warranty Information.

You may contact IBM at the following address:
IBM Warranty & Service Quality Dept.
PO Box 30
Spango Valley
Greenock
Scotland PA16 0AH

AUSTRIA, DENMARK, FINLAND, GREECE, ITALY, NETHERLANDS, PORTUGAL, SPAIN, SWEDEN AND SWITZERLAND

Limitation of Liability: *The following replaces the terms of this section in its entirety:*

Except as otherwise provided by mandatory law:
1. IBM's liability for any damages and losses that may arise as a consequence of the fulfillment of its obligations under or in connection with this Statement of Limited Warranty or due to any other cause related to this Statement of Limited Warranty is limited to the compensation of only those damages and losses proved and actually arising as an immediate and direct consequence of the non-fulfillment of such obligations (if IBM is at fault) or of such cause, for a maximum amount equal to the charges you paid for the Machine. For purposes of this item, the term "Machine" includes Machine Code and Licensed Internal Code ("LIC").

    The above limitation shall not apply to damages for bodily injuries (including death) and damages to real property and tangible personal property for which IBM is legally liable.
2. **UNDER NO CIRCUMSTANCES IS IBM, ITS SUPPLIERS OR RESELLERS LIABLE FOR ANY OF THE FOLLOWING, EVEN IF INFORMED OF THEIR POSSIBILITY: 1) LOSS OF, OR DAMAGE TO, DATA; 2) INCIDENTAL OR INDIRECT DAMAGES, OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES; 3) LOST PROFITS, EVEN IF THEY ARISE AS AN IMMEDIATE CONSEQUENCE OF THE EVENT THAT GENERATED THE DAMAGES; OR 4) LOSS OF BUSINESS, REVENUE, GOODWILL, OR ANTICIPATED SAVINGS.**

FRANCE AND BELGIUM

Limitation of Liability: *The following replaces the terms of this section in its entirety:*

Except as otherwise provided by mandatory law:
1. IBM's liability for any damages and losses that may arise as a consequence of the fulfillment of its obligations under or in connection with this Statement of Limited Warranty is limited to the compensation of only those damages and losses proved and actually arising as an immediate and direct consequence of the non-fulfillment of such obligations (if IBM is at fault), for a maximum amount equal to the charges you paid for the Machine that has caused the damages. For purposes of this item, the term "Machine" includes Machine Code and Licensed Internal Code ("LIC").

    The above limitation shall not apply to damages for bodily injuries (including death) and damages to real property and tangible personal property for which IBM is legally liable.
2. **UNDER NO CIRCUMSTANCES IS IBM, ITS SUPPLIERS OR RESELLERS LIABLE FOR ANY OF THE FOLLOWING, EVEN IF INFORMED OF THEIR POSSIBILITY: 1) LOSS OF, OR DAMAGE TO, DATA; 2) INCIDENTAL OR INDIRECT DAMAGES, OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES; 3) LOST PROFITS, EVEN IF THEY ARISE AS AN IMMEDIATE CONSEQUENCE OF THE EVENT THAT GENERATED THE DAMAGES; OR 4) LOSS OF BUSINESS, REVENUE, GOODWILL, OR ANTICIPATED SAVINGS.**

THE FOLLOWING TERMS APPLY TO THE COUNTRY SPECIFIED:

AUSTRIA

What this Warranty Covers: *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 warranty period for Machines is 12 months from the date of delivery. The limitation period for consumers in action for breach of warranty is the statutory period as a minimum. 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.

The second paragraph does not apply.

What IBM Will Do to Correct Problems: *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 ("LIC").

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).

GERMANY

What this Warranty Covers: *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 twelve 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.

The second paragraph does not apply.

What IBM Will Do to Correct Problems: *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.

HUNGARY

Limitation of Liability: *The following is added at the end of this section:*

The limitation and exclusion specified herein shall not apply to liability for a breach of contract damaging life, physical well-being, or health that has been caused intentionally, by gross negligence, or by a criminal act.

The parties accept the limitations of liability as valid provisions and state that the Section 314.(2) of the Hungarian Civil Code applies as the acquisition price as well as other advantages arising out of the present Statement of Limited Warranty balance this limitation of liability.

IRELAND

What this Warranty Covers: *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 the terms of this section in its entirety:*

For the purposes of this section, a "Default" means any act, statement, omission, or negligence on the part of IBM in connection with, or in relation to, the subject matter of this Statement of Limited Warranty in respect of which IBM is legally liable to you, whether in contract or tort. A number of Defaults which together result in, or contribute to, substantially the same loss or damage will be treated as one Default occurring on the date of occurrence of the last such Default.

Circumstances may arise where, because of a Default, you are entitled to recover damages from IBM.

This section sets out the extent of IBM's liability and your sole remedy.
1. IBM will accept unlimited liability for death or personal injury caused by the negligence of IBM.
2. Subject always to the **Items for Which IBM is Not Liable** below, IBM will accept unlimited liability for physical damage to your tangible property resulting from the negligence of IBM.
3. Except as provided in items 1 and 2 above, IBM's entire liability for actual damages for any one Default will not in any event exceed the greater of 1) EUR 125,000, or 2) 125% of the amount you paid for the Machine directly relating to the Default.

Items for Which IBM is Not Liable

Save with respect to any liability referred to in item 1 above, under no circumstances is IBM, its suppliers or resellers liable for any of the following, even if IBM or they were informed of the possibility of such losses:
1. loss of, or damage to, data;
2. special, indirect, or consequential loss; or
3. loss of profits, business, revenue, goodwill, or anticipated savings.

SLOVAKIA

Limitation of Liability: *The following is added to the end of the last paragraph:*

The limitations apply to the extent they are not prohibited under §§ 373-386 of the Slovak Commercial Code.

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 the terms of this section in its entirety:*

For the purposes of this section, a "Default" means any act, statement, omission, or negligence on the part of IBM in connection with, or in relation to, the subject matter of this Statement of Limited Warranty in respect of which IBM is legally liable to you, whether in contract or tort. A number of Defaults which together result in, or contribute to, substantially the same loss or damage will be treated as one Default.

Circumstances may arise where, because of a Default, you are entitled to recover damages from IBM.

This section sets out the extent of IBM's liability and your sole remedy.
1. IBM will accept unlimited liability for:
    a. death or personal injury caused by the negligence of IBM; and
    b. any breach of its obligations implied by Section 12 of the Sale of Goods Act 1979 or Section 2 of the Supply of Goods and Services Act 1982, or any statutory modification or re-enactment of either such Section.
2. IBM will accept unlimited liability, subject always to the **Items for Which IBM is Not Liable** below, for physical damage to your tangible property resulting from the negligence of IBM.
3. IBM's entire liability for actual damages for any one Default will not in any event, except as provided in items 1 and 2 above, exceed the greater of 1) Pounds Sterling 75,000, or 2) 125% of the total purchase price payable or the charges for the Machine directly relating to the Default.

These limits also apply to IBM's suppliers and resellers. They state the maximum for which IBM and such suppliers and resellers are collectively responsible.

Items for Which IBM is Not Liable

Save with respect to any liability referred to in item 1 above, under no circumstances is IBM or any of its suppliers or resellers liable for any of the following, even if IBM or they were informed of the possibility of such losses:
1. loss of, or damage to, data;
2. special, indirect, or consequential loss; or
3. loss of profits, business, revenue, goodwill, or anticipated savings.

Part 3 - Warranty Information

This Part 3 provides information regarding the warranty applicable to your Machine, including the warranty period and type of warranty service IBM provides.

Warranty Period

The warranty period may vary by country or region and is specified in the table below.

Note: "Region" means either Hong Kong or Macau Special Administrative Region of China.

Machine - BladeCenter JS20 Type 8842

Country or Region of Purchase	Warranty Period	Type of Warranty Service*
Worldwide (except Japan)	Parts - 3 years, labor - 3 years	1 and 2
Japan	Parts - 3 years, labor - 1 year	1 and 2
* See "Types of Warranty Service" for the legend and explanations of warranty-service types.		

A warranty period of 3 years on parts and 1 year on labor means that IBM provides warranty service without charge for:
1. parts and labor during the first year of the warranty period; and
2. parts only, on an exchange basis, in the second and third years of the warranty period. IBM will charge you for any labor provided in performance of the repair or replacement(s) in the second and third year of the warranty period.

Types of Warranty Service

If required, IBM provides repair or exchange service depending on the type of warranty service specified for your Machine in the above table and as described below. Warranty service may be provided by your reseller if approved by IBM to perform warranty service. Scheduling of service will depend upon the time of your call and is subject to parts availability. Service levels are response time objectives and are not guaranteed. The specified level of warranty service may not be available in all worldwide locations, additional charges may apply outside IBM's normal service area, contact your local IBM representative or your reseller for country and location specific information.

1. **Customer Replaceable Unit ("CRU") Service**

   IBM will ship CRU parts to you for your replacement. If IBM instructs you to return the replaced CRU, you are responsible for returning it to IBM in accordance with IBM's instructions. If you do not return the defective CRU, if IBM so instructs, within 30 days of your receipt of the replacement CRU, IBM may charge you for the replacement.

2. **On-site Service**

   IBM or your reseller will either repair or exchange the failing Machine at your location and verify its operation. You must provide suitable working area to allow disassembly and reassembly of the IBM Machine. The area must be clean, well lit and suitable for the purpose. **For some Machines, certain repairs may require sending the Machine to an IBM service center.**

3. **Courier or Depot Service***

   You will disconnect the failing Machine for collection arranged by IBM. IBM will provide you with a shipping container for you to return your Machine to a designated service center. A courier will pick up your Machine and deliver it to the designated service center. Following its repair or exchange, IBM will arrange the return delivery of the Machine to your location. You are responsible for its installation and verification.

4. **Customer Carry-In or Mail-In Service**

   You will deliver or mail as IBM specifies (prepaid unless IBM specifies otherwise) the failing Machine suitably packaged to a location IBM designates. After IBM has repaired or exchanged the Machine, IBM will make it available for your collection or, for Mail-in Service, IBM will return it to you at IBM's expense, unless IBM specifies otherwise. You are responsible for the subsequent installation and verification of the Machine.

* This type of service is called ThinkPad® EasyServ or EasyServ in some countries.

The IBM Machine Warranty World Wide Web site at http://www.ibm.com/servers/support/machine_warranties/ provides a worldwide overview of IBM Limited Warranty for Machines, a Glossary of IBM definitions, Frequently Asked Questions (FAQs) and Support by Product (Machine) with links to Product Support pages. **The IBM Statement of Limited Warranty is also available on this site in 29 languages.**

To obtain warranty service contact IBM or your IBM reseller. In Canada or the United States, call 1-800-IBM-SERV (426-7378). In the EU countries, see the telephone numbers below.

EU Country Telephone List

Phone numbers are subject to change without notice.

Austria -- 43-1-24592-5901	Italy -- 39-02-482-9202
Belgium -- 02-718-4339	Luxembourg -- 352-360385-1
Denmark -- 4520-8200	Netherlands -- 020-514-5770
Finland -- 358-9-4591	Portugal -- 351-21-7915-147
France -- 0238-557-450	Spain -- 34-91-662-4916
Germany -- 07032-15-4920	Sweden -- 46-8-477-4420
Greece -- 30-210-688-1220	United Kingdom -- 01475-555-055
Ireland -- 353-1-815-4000	

Appendix C. Notices

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

IBM may not offer the products, services, or features discussed in this document in other countries. Consult your local IBM representative for information on the products and services currently available in your area. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service.

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Active Memory	POWER
Active PCI	PowerPC
Active PCI-X	Predictive Failure Analysis
AIX	PS/2
Alert on LAN	ServeRAID
Chipkill	ServerGuide
EtherJet	ServerProven
e-business logo	TechConnect
@server	ThinkPad
FlashCopy	Tivoli
IBM	Tivoli Enterprise
IntelliStation	Update Connector
NetBAY	Wake on LAN
Netfinity	XpandOnDemand
NetView	xSeries
OS/2 WARP	

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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.

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Avis de conformité à la réglementation d'Industrie Canada

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在这种情况下，可能需要用户对其
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