IBM

@server

BladeCenter T
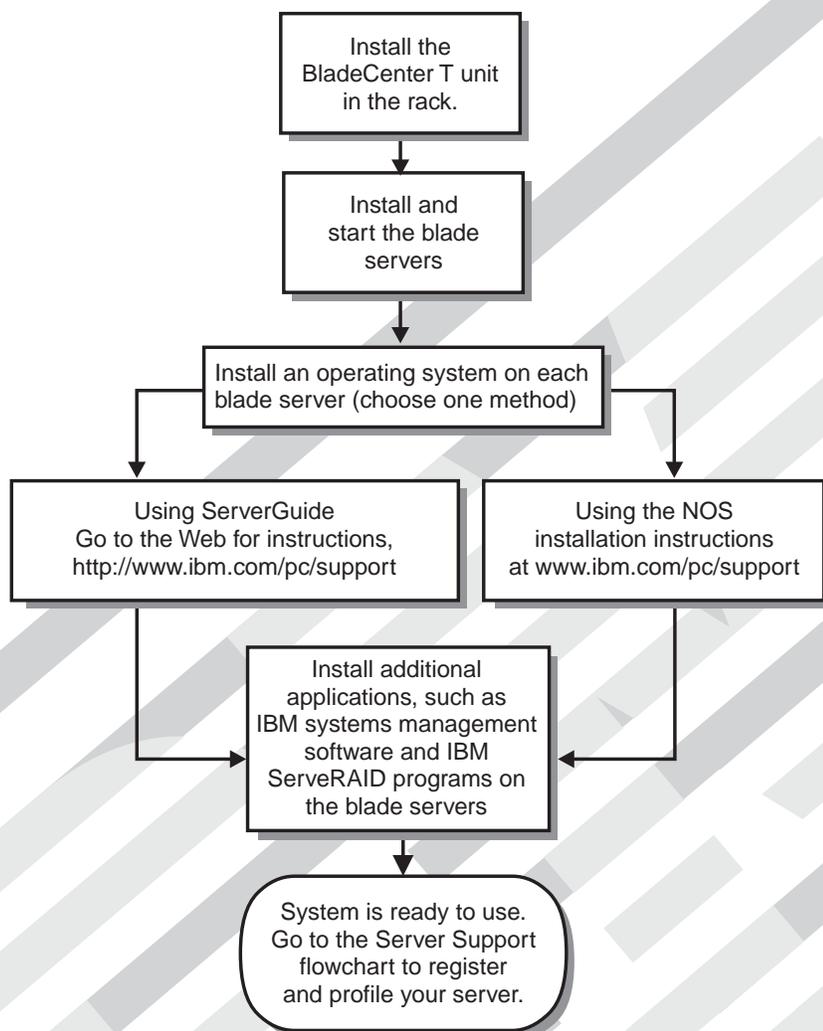### Types 8720 and 8730

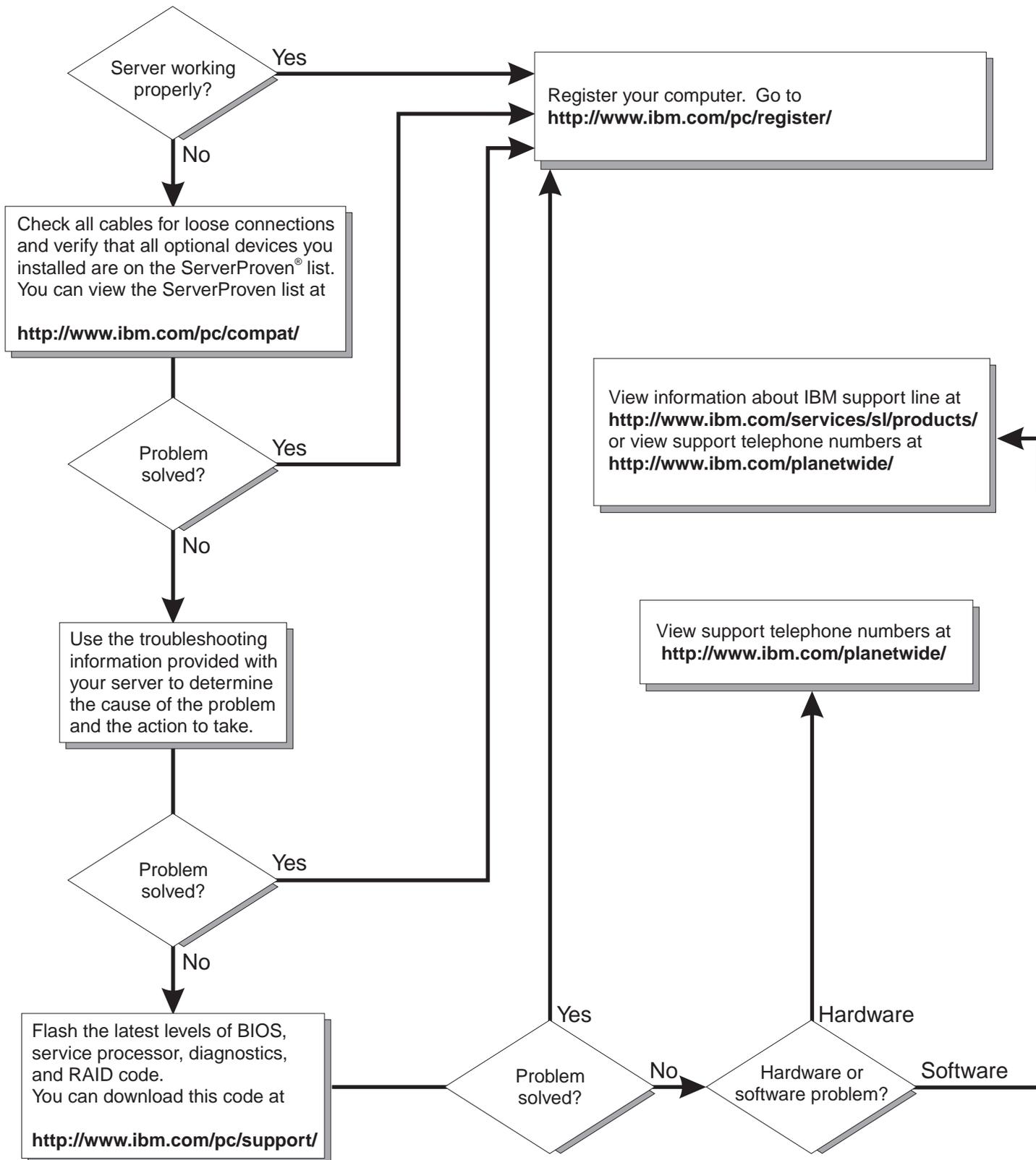# Installation and User's Guide

Welcome. . .

This *Installation and User's Guide* contains information for setting up, configuring, and using your BladeCenter T unit.
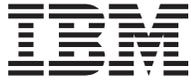
For detailed information about your BladeCenter T unit, view the publications on the Documentation CD.

You can also find the most current information about your BladeCenter T unit and servers on the IBM Web site at: http://www.ibm.com/pc/support

```
┌─────────────────────┐
│   Install the       │
│ BladeCenter T unit  │
│   in the rack.      │
└─────────────────────┘
          │
          ▼
┌─────────────────────┐
│   Install and       │
│  start the blade    │
│     servers         │
└─────────────────────┘
          │
          ▼
┌────────────────────────────────┐
│ Install an operating system on each│
│ blade server (choose one method)  │
└────────────────────────────────┘
     │                        │
     ▼                        ▼
┌──────────────────────┐  ┌──────────────────────┐
│   Using ServerGuide  │  │   Using the NOS      │
│ Go to the Web for    │  │ installation         │
│ instructions,        │  │ instructions         │
│ http://www.ibm.com/  │  │ at www.ibm.com/pc/   │
│ pc/support           │  │ support              │
└──────────────────────┘  └──────────────────────┘
          │                        │
          ▼                        ▼
     ┌────────────────────────────────┐
     │   Install additional           │
     │   applications, such as        │
     │   IBM systems management       │
     │   software and IBM             │
     │   ServeRAID programs on        │
     │   the blade servers            │
     └────────────────────────────────┘
                   │
                   ▼
     ┌────────────────────────────────┐
     │   System is ready to use.      │
     │   Go to the Server Support     │
     │   flowchart to register        │
     │   and profile your server.     │
     └────────────────────────────────┘
```

Server Support

Server working properly? — **Yes** → 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 solved? — **Yes** → Register your computer. Go to **http://www.ibm.com/pc/register/**

No

Use the troubleshooting information provided with your server to determine the cause of the problem and the action to take.

Problem solved? — **Yes** → Register your computer. Go to **http://www.ibm.com/pc/register/**

No

Flash the latest levels of BIOS, service processor, diagnostics, and RAID code.
You can download this code at

http://www.ibm.com/pc/support/

Problem solved? — **Yes**

No → Hardware or software problem?

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

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

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

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BladeCenter T Types 8720 and 8730

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 85 and Appendix C, "Notices," on page 101.

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.

Statement 1:

DANGER

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

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

Statement 2:

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

Do not:

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

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

Statement 3:

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

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

DANGER

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

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

Statement 4:
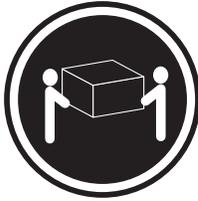
≥ 18 kg (39.7 lb)   ≥ 32 kg (70.5 lb)   ≥ 55 kg (121.2 lb)
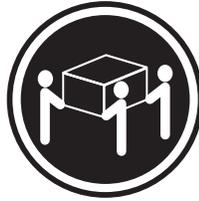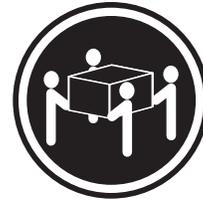
CAUTION:
Use safe practices when lifting.

Statement 5:

CAUTION:
The power control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.
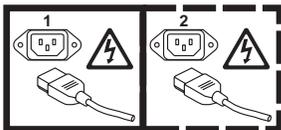
Statement 8:

CAUTION:
Never remove the cover on a power supply or any part that has the following label attached.

Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

Statement 12:

CAUTION:
The following label indicates a hot surface nearby.

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 20:

CAUTION:
To avoid personal injury, before lifting the unit, remove all the blades to reduce the weight.

Statement 21:

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

Chapter 1. Introduction

The IBM® @server BladeCenter™T Types 8720 and 8730 units are rack-mounted, high-density, high-performance blade server systems developed for NEBS telecommunications network applications and other applications requiring physical robustness.

The BladeCenter T unit uses blade servers, switches, and other components that are common to the IBM BladeCenter product line. This common component strategy makes it ideal for applications in telecommunications networks that need high levels of computing power and access to common off-the-shelf middleware packages that are used in IT data centers. The BladeCenter T unit supports up to eight blade servers and four I/O modules, making it ideally suited for networking environments that require a large number of high-performance servers in a small amount of space. The BladeCenter T unit provides common resources that are shared by the blade servers, such as power, cooling, system management, network connections, backplane, and I/O (CD-ROM drive and connectors for USB, keyboard, video, mouse, and network interfaces).

Performance, ease of use, reliability, robustness (NEBS/ETSI compliance), and expansion capabilities were key considerations in the design of the BladeCenter T unit. These design features make it possible for you to customize the system hardware to meet your needs today, while providing flexible expansion capabilities for the future.

This *Installation and User's Guide* provides information about:
- Setting up and cabling the BladeCenter T unit
- Starting and configuring the BladeCenter T unit
- Installing options in the BladeCenter T unit
- Performing basic troubleshooting of the BladeCenter T unit

This *Installation and User's Guide* and other documents that provide detailed information about the BladeCenter T unit are provided in Portable Document Format (PDF) on the IBM *BladeCenter T Documentation* CD.

The BladeCenter T unit comes with a three-year limited warranty. You can obtain up-to-date information about the BladeCenter T Type 8720 or 8730 model and other IBM xSeries® server products at http://www.ibm.com/eserver/xseries/.

You can register the BladeCenter T unit and blade servers at http://www.ibm.com/pc/register/.

Record information about your BladeCenter T unit in the following table. You will need this information when you register the BladeCenter T unit with IBM.

Product name	IBM @server BladeCenter T unit
Machine type (8720 or 8730)	_____
Model number	_____
Serial number	_____

The serial number and model number are located in three places on the BladeCenter T unit:

- Top of the BladeCenter T unit.
- Front of the bezel assembly.
- Front of the BladeCenter T unit.

The labels on the top and the front of the bezel assembly of the BladeCenter T unit are shown in the following illustration.
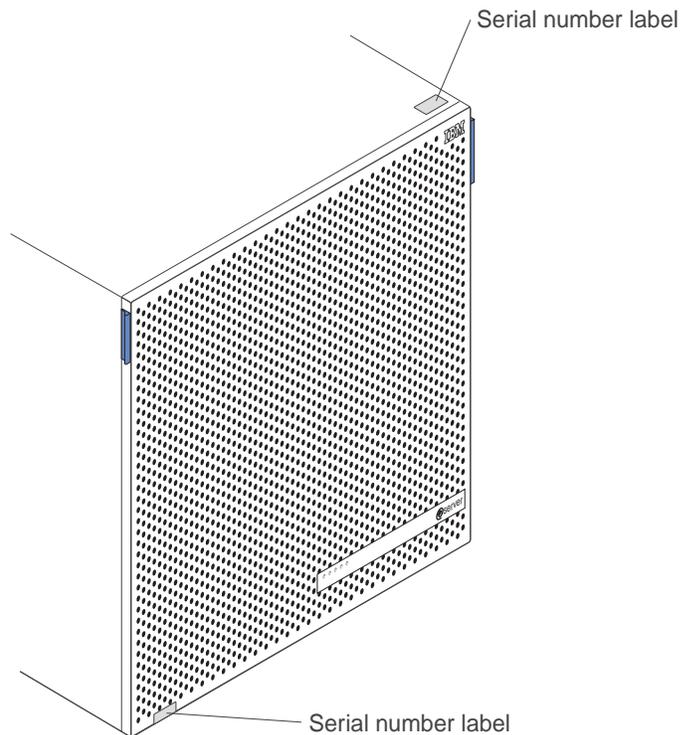
A set of user labels comes with each blade server. When you install a blade server in the BladeCenter T unit, write identifying information on a label and place the label on the BladeCenter T unit bezel.

The following illustration shows the placement of the label, to the side of the blade server, on the BladeCenter T unit.

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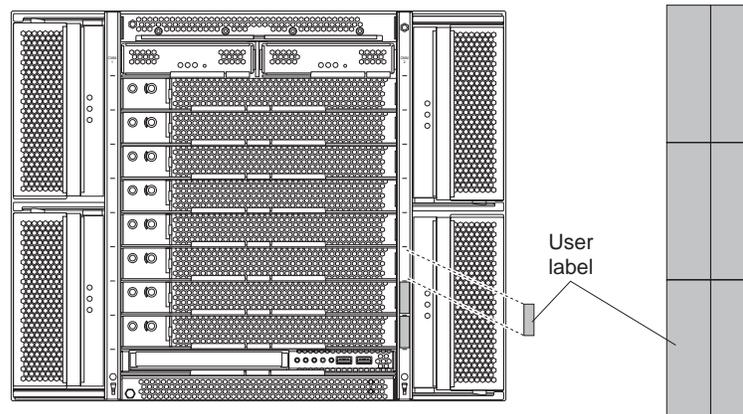
Important: Do not place the label on the blade server itself or in any way block the ventilation holes on the blade server.

Inventory Checklist

The IBM BladeCenter T Type 8720 or 8730 unit comes with the following items:

- Bezel assembly (with filter)
- BladeCenter T unit lift handles (4)
- One alarm panel cable
- Two power distribution unit (PDU) power cords (Type 8730 only)
- Documentation package, which includes the IBM *BladeCenter T Documentation* CD

Related documentation

In addition to this *Installation and User's Guide*, the following documentation is provided in PDF on the IBM *BladeCenter T Documentation* CD that comes with your IBM BladeCenter T unit:

- *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 T rack installation instructions
  These documents contain instructions for installing the BladeCenter T unit in a 4-post and 2-post rack.
- *BladeCenter T Management Module Installation Guide*
  This document contains instructions for installing an IBM BladeCenter T management module option in a BladeCenter T unit and creating the initial configuration.
- *BladeCenter T Management Module User's Guide*
  This document contains instructions for using the Web interface to configure the management modules in a BladeCenter T unit.
- *BladeCenter T Types 8720 and 8730 Hardware Maintenance Manual and Troubleshooting Guide*
  This document contains information to help you solve BladeCenter T problems yourself, and it contains information for service technicians.

- *BladeCenter HS20 Type 8832 Installation and User's Guide*
  This document contains instructions for setting up a BladeCenter HS20 blade server and basic instructions for installing some options. It also contains general information about the blade server.
- *BladeCenter HS20 Type 8832 Hardware Maintenance Manual and Troubleshooting Guide*
  This document contains information to help you solve BladeCenter HS20 problems yourself, and it contains information for service technicians.
- *BladeCenter HS40 Type 8839 Installation and User's Guide*
  This document contains instructions for setting up a BladeCenter HS40 blade server and basic instructions for installing some options. It also contains general information about the blade server.
- *BladeCenter HS40 Type 8839 Hardware Maintenance Manual and Troubleshooting Guide*
  This document contains information to help you solve BladeCenter HS40 problems yourself, and it contains information for service technicians.
- *Installation and User's Guide* for each BladeCenter T option
  These documents contain instructions for setting up and configuring the option, such as a switch module, and a description of the option features.

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

Your BladeCenter T unit or blade servers might have features that are not described in the documentation that you received with the BladeCenter T unit. The documentation might be updated occasionally to include information about those features, management-module firmware updates, or technical updates. These updates are available from the IBM Web site. Complete the following steps to check for updated documentation and technical updates:

1. Go to http://www.ibm.com/pc/support/.
2. In the **Learn** section, click **Online publications**.
3. On the ″Online publications″ page, in the **Brand** field, select **Servers**.
4. In the **Family** field, select **BladeCenter T**.
5. Click **Continue**.

In addition to reviewing the documents in this library, review the IBM @server *BladeCenter T Planning and Installation Guide* at http://www.ibm.com/pc/support/ for information to help you prepare for system installation and configuration.

Features and specifications of the BladeCenter T Type 8720 unit

The following table provides a summary of the features and specifications of the BladeCenter T Type 8720 unit.

Table 1. BladeCenter T Type 8720 features and specifications

Media tray (on front):
• DVD/CD-RW drive: slim IDE
• Two Universal Serial Bus (USB) v1.1 ports
• System-status panel
 	
Module bays (on front):
• Eight hot-swap blade bays
• Four hot-swap power-module bays
• Two hot-swap management-module bays
 	
Module bays (on rear):
• Four hot-swap I/O module bays
• Four hot-swap blower bays
• One hot-swap KVM (keyboard, video, mouse) module
• One hot-swap LAN module
 	
Power modules:
• Standard: Two 1300-watt or greater hot-swap -48 V dc (-48 to -60 V dc) power modules
  – Power modules 1 and 2 supply power to:
    - Blade bays 1 through 4
    - Management modules 1 and 2
    - I/O modules 1 and 2
    - Media tray
    - All KVM, LAN, and alarm interfaces
    - All four blower modules
  – Power modules 1 and 2 provide redundancy to each other
• Maximum: Four 1300-watt or greater hot-swap -48 V dc (-48 to -60 V dc) power modules
  – Power modules 3 and 4 supply power to:
    - Blade bays 5 through 8
    - I/O modules 3 and 4
  – Power modules 3 and 4 provide redundancy to each other
  – Blowers are powered by all four power modules
 	
LAN module:
• Two 10/100 Mb Ethernet remote management connections
• One DSUB 15P alarm connector
 	
KVM module:
• Video port (analog)
• PS/2® keyboard port
• PS/2 mouse port
• System-status panel
	I/O modules:
	• Standard: None
	• Maximum: Four
	  – Two hot-swap 1 Gb Ethernet four-port switch modules
	  – Two hot-swap switch modules of another network-communication standard, such as Fibre Channel
	
	Management module:
	• Standard: One hot-swap management module providing system-management functions for the BladeCenter T unit
	• Maximum: Two hot-swap management modules (one active, one redundant)
	
	Redundant cooling:
	Four variable-speed hot-swap blowers
	
	Front bezel with changeable filter
	
	Upgradeable microcode:
	• Management-module firmware
	• I/O-module firmware (not all I/O module types)
	• Blade server service processor firmware (BIOS, service processor)
	
	Size (8 U):
	• Height: 349.25 mm (13.75 in. or 8 U)
	• Depth: 508 mm (20 in.) from front of chassis to rear I/O connector plane Maximum depth: 600 mm (23.62 in.) including bezel, handles, and cable bend radius.
	• Width: 442 mm (17.4 in.)
	• Weight:
	  – Fully configured with modules and blade servers: Approx. 86.64 kg (191 lb)
	  – Fully configured without blade servers: Approx. 44.45 kg (98 lb)
	
	Security features:
	• Login password for remote connection
	• Secure Shell (SSH) for command-line interface
	• Secure socket layer (SSL) security for remote Web management access
	
	Predictive Failure Analysis® (PFA) alerts:
	• Blowers
	• Blade-dependent features
	• Power supplies
		Declared acoustical noise emission levels for normal operations:
		• Sound-power levels (upper-limit): 7.5 bels
		• Sound-pressure levels (average), for four one-meter bystander positions: 59 dBA
		
		The noise emission levels stated are the declared upper limit sound-power levels, in bels, for a random sample of machines. All measurements made in accordance with ISO 7779 and reported in conformance with ISO 9296.
		
		Environment:
		• Air temperature:
		  – Altitude: -60 to 1800 m (-197 ft to 6000 ft)
		    - BladeCenter T on: 5° to 40°C (41° to 104°F)
		    - BladeCenter T on (short term): -5° to 55°C (23° to 131°F)
		  – Altitude: 1800 m to 4000 m (6000 ft to 13000 ft)
		    - BladeCenter T on: 5° to 30°C (41° to 86°F)
		    - BladeCenter T on (short term): -5° to 45°C (23° to 113°F)
		  – System unit off: uncontrolled
		• Rate of temperature change: 30°C/hour (54°F/hour)
		• Humidity:
		  – BladeCenter T on: 5% to 85%
		  – BladeCenter T on (short term): 5% to 90% not to exceed 0.024 water/kg of dry air
		  – BladeCenter T off: uncontrolled
		
		Electrical input:
		• dc power
		• Input voltage: -48 V dc to -60 V dc
		
		Heat output:
		• Input kilovolt-amperes (kVA) approx.
		  – Minimum configuration: 0.2 kVA
		  – Maximum configuration: 3.3 kVA
		• BTU output
		  – Ship configuration: 673 Btu/hour (197 watts)
		  – Full configuration: 11229 Btu/hour (3291 watts)

Features and specifications of the BladeCenter T Type 8730 unit

The following table provides a summary of the features and specifications of the BladeCenter T Type 8730 unit.

Table 2. BladeCenter T Type 8730 features and specifications

Media tray (on front):
• DVD/CD-RW drive: slim IDE
• Two Universal Serial Bus (USB) v1.1 ports
• System-status panel
 	
Module bays (on front):
• Eight hot-swap blade bays
• Four hot-swap power-module bays
• Two hot-swap management-module bays
 	
Module bays (on rear):
• Four hot-swap I/O module bays
• Four hot-swap blower bays
• One hot-swap KVM (keyboard, video, mouse) module
• One hot-swap LAN module
 	
Power modules:
• Standard: Two 1300-watt or greater 220-volt (200-240 V ac) hot-swap power modules
  – Power modules 1 and 2 supply power to:
    - Blade bays 1 through 4
    - Management modules 1 and 2
    - I/O modules 1 and 2
    - Media tray
    - All KVM, LAN, and alarm interfaces
    - All four blower modules
  – Power modules 1 and 2 provide redundancy to each other
• Maximum: Four 1300-watt or greater 220-volt (200-240 V ac) hot-swap power modules
  – Power modules 3 and 4 supply power to:
    - Blade bays 5 through 8
    - I/O modules 3 and 4
  – Power modules 3 and 4 provide redundancy to each other
  – Blowers are powered by all four power modules
 	
LAN module:
• Two 10/100 Mb Ethernet remote management connections
• One DSUB 15P alarm connector
 	
KVM module:
• Video port (analog)
• PS/2 keyboard port
• PS/2 mouse port
• System-status panel
	I/O modules:
	• Standard: None
	• Maximum: Four
	  – Two hot-swap 1 Gb Ethernet four-port switch modules
	  – Two hot-swap switch modules of another network-communication standard, such as Fibre Channel
	
	Management module:
	• Standard: One hot-swap management module providing system-management functions for the BladeCenter T unit
	• Maximum: Two hot-swap management modules (one active, one redundant)
	
	Redundant cooling:
	Four variable-speed hot-swap blowers
	
	Front bezel with changeable filter
	
	Upgradeable microcode:
	• Management-module firmware
	• I/O-module firmware (not all I/O module types)
	• Blade server service processor firmware (BIOS, service processor)
	
	Size (8 U):
	• Height: 349.25 mm (13.75 in. or 8 U)
	• Depth: 508 mm (20 in.) from front of chassis to rear I/O connector plane Maximum depth: 600 mm (23.62 in.) including bezel, handles, and cable bend radius.
	• Width: 442 mm (17.4 in.)
	• Weight:
	  – Fully configured with modules and blade servers: Approx. 86.64 kg (191 lb)
	  – Fully configured without blade servers: Approx. 44.45 kg (98 lb)
	
	Security features:
	• Login password for remote connection
	• Secure Shell (SSH) for command-line interface
	• Secure socket layer (SSL) security for remote Web management access
	
	Predictive Failure Analysis (PFA) alerts:
	• Blowers
	• Blade-dependent features
	• Power supplies
		Declared acoustical noise emission levels for normal operations:
		• Sound-power levels (upper-limit): 6.7 bels
		• Sound-pressure levels (average), for four one-meter bystander positions: 57 dBA
		
		The noise emission levels stated are the declared upper limit sound-power levels, in bels, for a random sample of machines. All measurements made in accordance with ISO 7779 and reported in conformance with ISO 9296.
		
		Environment:
		• Air temperature:
		  – Altitude: -60 to 1800 m (-197 ft to 6000 ft)
		    - BladeCenter T on: 5° to 40°C (41° to 104°F)
		    - BladeCenter T on (short term): -5° to 55°C (23° to 131°F)
		  – Altitude: 1800 m to 4000 m (6000 ft to 13000 ft)
		    - BladeCenter T on: 5° to 30°C (41° to 86°F)
		    - BladeCenter T on (short term): -5° to 45°C (23° to 113°F)
		  – System unit off: uncontrolled
		• Rate of temperature change: 30°C/hour (54°F/hour)
		• Humidity:
		  – BladeCenter T on: 5% to 85%
		  – BladeCenter T on (short term): 5% to 90% not to exceed 0.024 water/kg of dry air
		  – BladeCenter T off: uncontrolled
		
		Electrical input:
		• Sine-wave input (50 or 60 Hz single-phase) required
		• Input voltage:
		  – Minimum: 200 V ac
		  – Maximum: 240 V ac
		
		Heat output:
		• Input kilovolt-amperes (kVA) approx.
		  – Minimum configuration: 0.2 kVA
		  – Maximum configuration: 3.1 kVA
		• BTU output
		  – Ship configuration: 673 Btu/hour (197 watts)
		  – Full configuration: 10440 Btu/hour (3060 watts)

The IBM @server BladeCenter T Documentation CD

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

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

  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

    `e:\win32.bat`

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

What the BladeCenter T unit offers

The design of the BladeCenter T unit takes advantage of advancements in server technology. It provides up to eight functionally separate servers and their shared resources in a single center. The BladeCenter T unit with blade servers installed has the following features:
- **IBM Enterprise X-Architecture**

  IBM Enterprise X-Architecture™ technology leverages proven innovative IBM technologies to build powerful, scalable, reliable Intel™-processor-based servers. Enterprise X-Architecture technology includes features such as light path diagnostics, Predictive Failure Analysis (PFA), scalability, and Real Time Diagnostics.
- **Expansion capabilities**

  You can add blade servers to the BladeCenter T unit as needed, to a maximum of eight blade servers.

  Note: If any blade server or option is in blade bay 5 through 8 or if an I/O module is in I/O-module bay 3 or 4, power modules must be present in all four power-module bays.

  Some blade servers have connectors for options that add capabilities to the blade server, such as an I/O expansion card to add a network interface, or a storage expansion unit to add SCSI hard disk drives.
- **Hot-swap capabilities**

  The front bays on the BladeCenter T unit are hot-swap blade, power-module, and management-module bays; the rear bays on the BladeCenter T unit are hot-swap I/O, KVM, LAN, and blower-module bays. You can add, remove, or replace blade

servers or power, management, I/O, KVM, LAN or blower modules in hot-swap bays within specified time limits and without removing power from the BladeCenter T unit. See Chapter 3, "Removing and installing BladeCenter T modules and options," on page 25 for detailed instructions.

Attention: To maintain proper system cooling, each unoccupied bay must contain a filler blade or filler module.

- **Redundancy capabilities**

  The following redundant components in the BladeCenter T unit enable continued operation if one of the components fails:

  – Power modules: In normal operation, the redundant power modules provide redundant power feeds to share the system load. If one of the power modules fails, the working power module handles the entire load. You can then replace the failed power module without shutting down the BladeCenter T unit.

  – Blowers: In normal operation, the redundant blower modules share the system load. If one of the blowers fails, the other three working blowers handle the entire load. You can then replace the failed blower without shutting down the BladeCenter T unit.

  – Management modules: Only one management module is active at a time. If a second management module has been installed and the active management module fails, the secondary (redundant) management module becomes the active management module containing the current BladeCenter T configuration and status information. You can then replace the failed management module without shutting down the BladeCenter T unit.

  – BladeCenter T backplane characteristics: The backplane has the following redundancy characteristics:

    - Hot-pluggable connectors for the following components:

      - Eight blade servers
      - Four I/O modules
      - Two management modules
      - Four power supplies
      - Four blowers

    - Redundant high-speed SERDES interconnects between blade servers and switches

    - Support for redundant management modules

      - Redundant I2C communications between management modules and all modules (except the blade servers)

      - Redundant RS-485 communications between management modules and blade servers

      - Redundant analog video connections from blade servers to management modules

      - Redundant USB connections between blade servers and management modules

      - Redundant, secure Ethernet management port between switches and management modules

- **Redundant network connection capabilities**

  Configuring a pair of Ethernet switch modules in I/O-module bays 1 and 2 provides support for Ethernet failover configured on blade servers. See "Configuring an I/O module" on page 68 for more information. If the I/O expansion options in your blade servers can be configured for failover,

configuring a pair of switch modules in I/O-module bays 3 and 4 provides support for the failover configured on the I/O expansion options.

Note: A system configuration with I/O expansion options in I/O-module bays 3 and 4 requires a unit configuration with power supplies in power-module bays 3 and 4.

Other network-interface I/O expansion options, such as the IBM BladeCenter Fibre Channel Expansion Card, can have similar capability for redundant network connections. See the documentation that comes with the I/O expansion module and I/O module for more information about configuring for redundant network connections.

- **System-management capabilities**

  The BladeCenter T unit comes with a service processor in the management module. The service processor in the management module, the system-management firmware that is provided with your BladeCenter T unit, and the service processor in each blade server, enable you to remotely manage the BladeCenter T unit, its components, and the blade servers. The management module also multiplexes the keyboard, mouse, and video ports and the USB port across the multiple blade servers.

  The service processor in each blade server provides blade server system monitoring, event recording, and alert capability.

  See Chapter 5, "Configuring the BladeCenter T unit," on page 61 for more information.

- **Network environment support**

  This BladeCenter T unit supports up to two Ethernet-compatible I/O modules (switch modules or pass-thru modules), for blade server integrated Ethernet controller communication with the network. Each I/O module provides one internal connection to each blade server, up to eight internal connections per I/O module.

  The BladeCenter T unit also supports two additional I/O modules, for a total of four I/O modules. The two additional I/O modules support the network interface on the optional I/O expansion card installed on one or more blade servers in the BladeCenter T unit.

  Note: The two additional I/O modules must be compatible with the network interface on the optional I/O expansion cards in the blade servers.

  Each of these two additional I/O modules provides one internal connection to the optional I/O expansion card, up to eight internal connections per I/O module.

Reliability, availability, and serviceability features

Three of the most important features in server design are reliability, availability, and serviceability (RAS). These factors help to ensure the integrity of the data that is stored on your blade server; that your blade server is available when you want to use it; and that should a failure occur, you can easily diagnose and correct the failure with minimal inconvenience.

The BladeCenter T unit has the following RAS features:
- Shared key components, such as power, cooling, backplane, and I/O
- All components serviced from the front or rear of the BladeCenter T unit
- Automatic error retry and recovery
- Automatic restart after a power failure
- Built-in monitoring for blower, power, temperature, and voltage
- Built-in monitoring for module redundancy
- Customer support center 24 hours a day, 7 days a week[1]
- Error codes and messages
- Fault-resistant startup
- Remote system management through the management module
- Remote management module firmware upgrade
- Remote upgrade of blade server service processor microcode
- Built-in self-test (BIST)
- Predictive Failure Analysis (PFA) alerts
- Redundant components
  - Blowers with speed-sensing capability
  - I/O modules
  - Management modules
  - Power modules
- Redundant system features in the backplane
- Hot-swap components
  - Blade servers
  - Blowers with speed-sensing capability
  - I/O modules
  - KVM module
  - LAN module
  - Management module
  - Media tray
  - Power modules
- System automatic inventory at startup
- System error logging

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1. Service availability will vary by country. Response time varies; may exclude holidays.

Major components of the BladeCenter T Types 8720 and 8730

The following illustration shows the major components of the BladeCenter T unit.

Note: The illustrations in this document might differ slightly from your hardware.
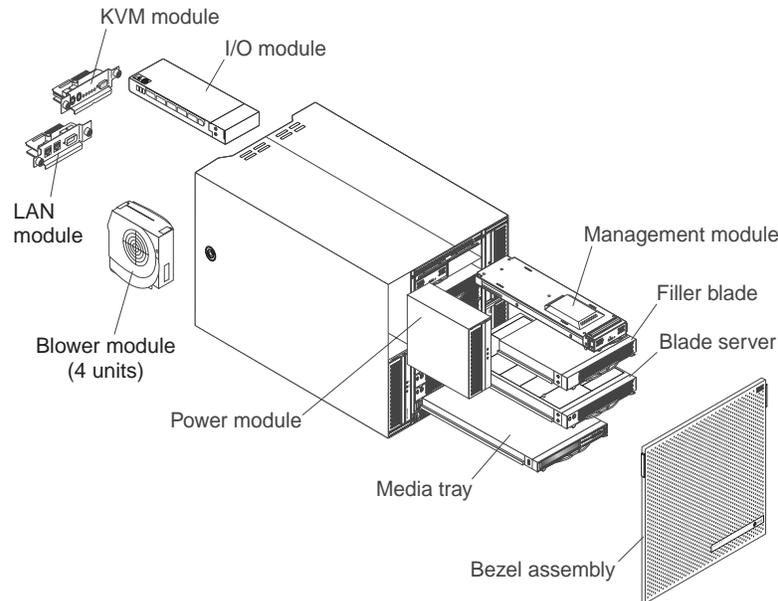
Attention: To maintain proper system cooling, each module bay must contain either a module or a filler module; each blade bay must contain either a blade server or a filler blade.

Front view

The following illustration shows the components on the front view of the BladeCenter T Types 8720 and 8730 unit.
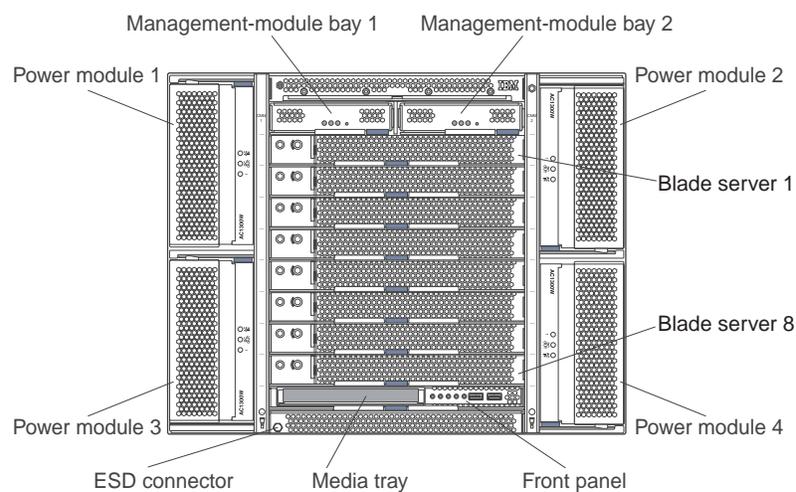
See Chapter 4, "BladeCenter T components, controls, and LEDs," on page 51 for details about the components and indicators.

Rear view Type 8720

The following illustration shows the components on the rear of the BladeCenter T Type 8720 unit.

See Chapter 4, "BladeCenter T components, controls, and LEDs," on page 51 for details about the components and indicators.

Rear view Type 8730

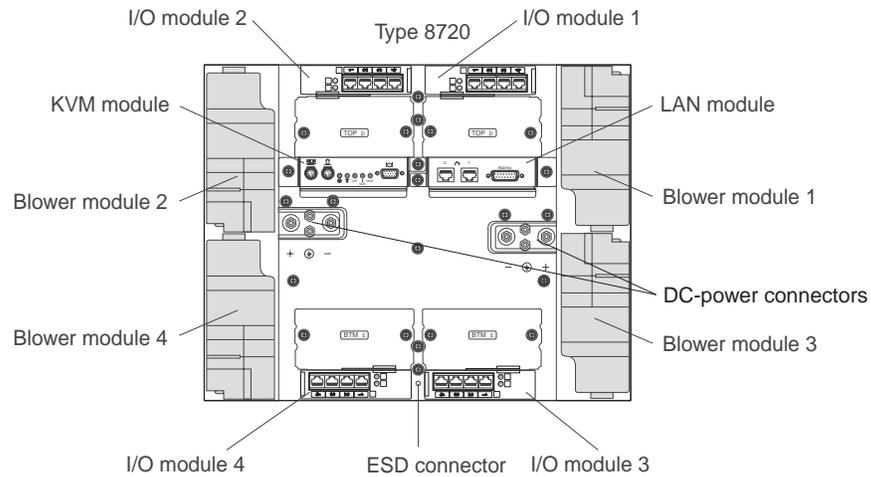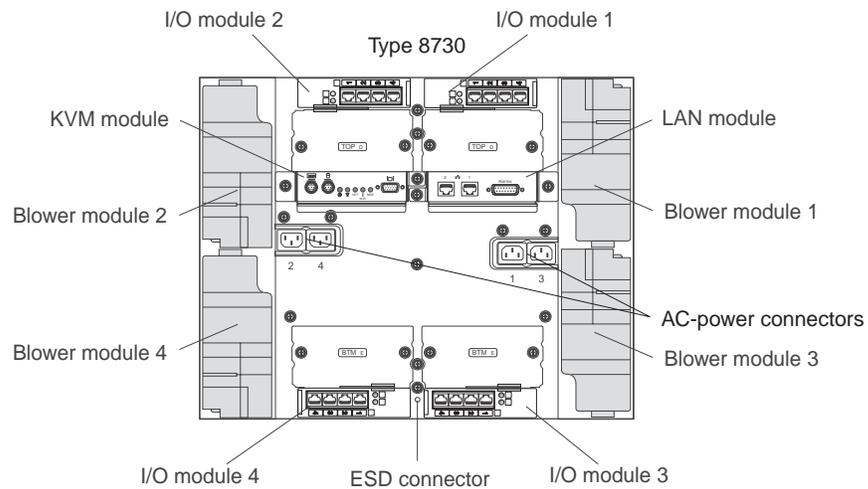The following illustration shows the components on the rear of the BladeCenter T Type 8730 unit.

See Chapter 4, "BladeCenter T components, controls, and LEDs," on page 51 for details about the components and indicators.

Chapter 2. Setting up the BladeCenter T hardware

This chapter provides instructions for setting up, connecting to system power, starting, and shutting down the BladeCenter T unit.

Rack installation guidelines

Statement 20:

CAUTION:
To avoid personal injury, before lifting the unit, remove all the blades to reduce the weight.

Statement 4:
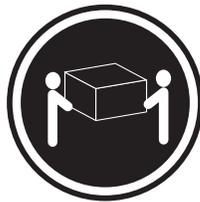
| ≥ 18 kg (39.7 lb) | ≥ 32 kg (70.5 lb) | ≥ 55 kg (121.2 lb) |
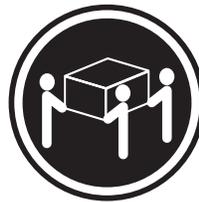
CAUTION:
Use safe practices when lifting.

Before you begin to install the BladeCenter T unit in a rack, read the following information:

- Install the BladeCenter T unit in a rack before installing any blowers, power modules, or blade servers in the BladeCenter T unit.
- If your BladeCenter unit has blowers, power modules, or blade servers already installed, remove them first. See Chapter 3, "Removing and installing BladeCenter T modules and options," on page 25 for detailed instructions on removing these devices.

   Important: Reinstalling a blade server into a different bay than the one from which it was removed could have unintended consequences. Some configuration information and update options are established according to bay number. You might need to reconfigure the blade server.

- Detailed instructions for installing and cabling a BladeCenter T unit in a rack are in the rack installation instructions that come with the rack kits.

Option installation guidelines

Before you begin to install options in the BladeCenter T unit, read the following information:

- Read the safety information beginning on page vii and the guidelines in "Handling static-sensitive devices" on page 17. This information will help you work safely with your BladeCenter T unit and options.
- Blue on a component indicates touch points, where you can grip the component to remove it from or install it in the server, open or close a latch, and so on.
- Orange on a component or an orange label on or near a component indicates that the component can be hot-swapped, which means that you can remove or install the component while the BladeCenter T unit is running. (Orange can also indicate touch points on hot-swap components.) See the instructions for removing or installing a specific hot-swap component for any additional procedures that you might have to perform before you remove or install the component.
- You do not have to disconnect the BladeCenter T unit from power to install or replace any of the hot-swap modules in the BladeCenter T unit. You must shut down the operating system and turn off a hot-swap blade server on the front of the BladeCenter T unit before removing the blade server, but you do not have to shut down the BladeCenter T unit itself.
- For a list of supported options for your server, go to http://www.ibm.com/pc/compat/.

System reliability considerations

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

- Each of the module bays on the front and rear of the BladeCenter T unit has either a module or filler module installed.
- Each of the blade bays on the front of the BladeCenter T unit has either a blade server or filler blade installed.
- Each of the drive bays in a blade server storage expansion option has either a hot-swap drive or a filler panel installed.
- Each of the PCI slots in a blade server PCI I/O expansion option has either a PCI adapter or a PCI filler bracket installed
- A removed hot-swap module or drive is replaced within 1 minute of removal.
- A removed hot-swap blade is replaced within 20 minutes of removal.
- A failed blower is replaced as soon as possible, to restore cooling redundancy.

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.

Use an ESD wrist strap and the ESD connectors on the BladeCenter T unit. Electrostatic discharge (ESD) is the release of stored static electricity that can damage electric circuits. Static electricity is often stored in your body and discharged when you come in contact with an object with a different potential. The ESD wrist strap safely channels the electricity from your body to a proper ground (the BladeCenter T unit).

Use an ESD wrist strap whenever you are working on the BladeCenter T unit, especially when you are handling modules, options, and blade servers. To work properly, the wrist strap must have a good contact at both ends (touching your skin at one end and connected to the ESD connector on the front or back of the BladeCenter T unit).

Location of ESD connector (front of unit)
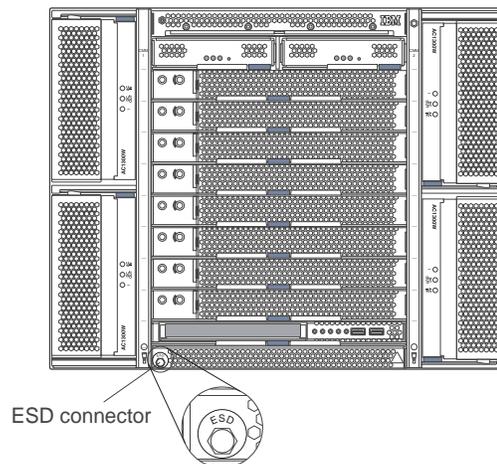
ESD connector

Location of ESD connector (rear of unit)

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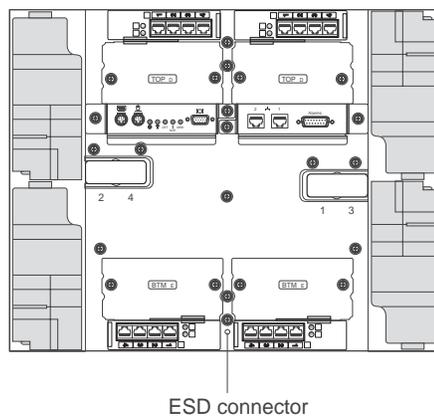
To reduce the possibility of electrostatic discharge, observe the following precautions:

- 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 system 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 system unit without setting the device down. If it is necessary to set down the device, place it back into its static-protective package. Do not place the device on the system unit or on a metal surface.
- Take additional care when handling devices during cold weather. Heating reduces indoor humidity and increases static electricity.

Connecting the BladeCenter T unit to power

The BladeCenter T unit can support two or four power modules.

Attention: Remove all power modules or confirm that they are removed, before making the power connections. See Chapter 3, "Removing and installing BladeCenter T modules and options," on page 25 for detailed instructions for removing modules and fillers from the BladeCenter T unit.

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.	

Connecting the BladeCenter T type 8720 to dc power

The BladeCenter T Type 8720 unit comes with one pair of dc hot-swap power modules in power-module bays 1 and 2. Each active power module supplies 12-volt power to the blade bay that it services. The BladeCenter T unit supports a second pair of power modules in power-module bays 3 and 4. Power modules are not needed in bays 3 and 4 unless you install blade servers and options in blade bays 5 through 8, or I/O modules in I/O-module bays 3 or 4.
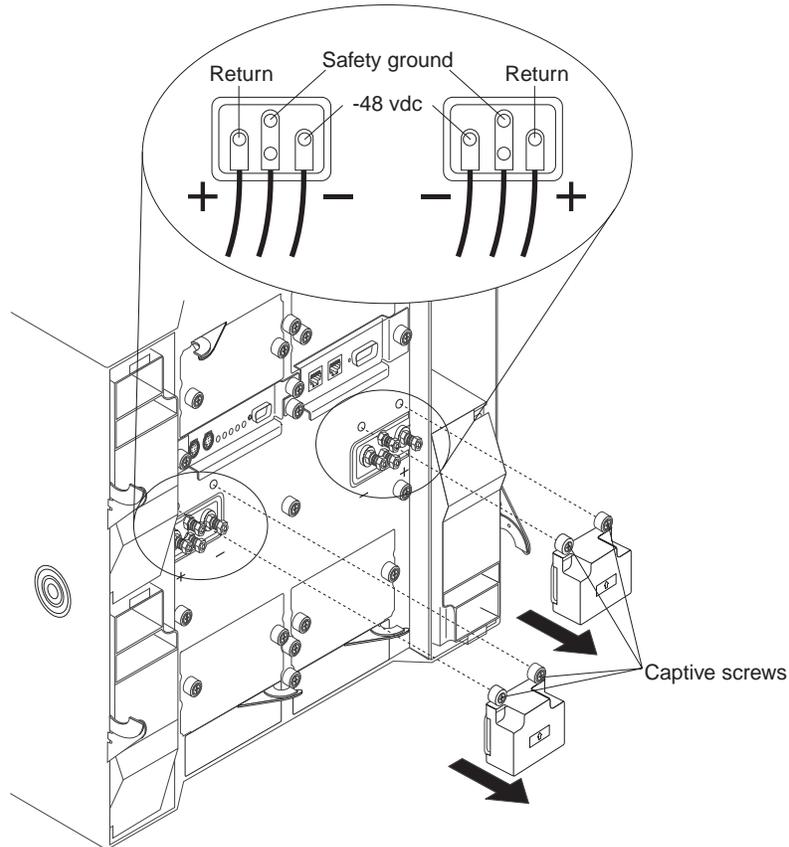
The BladeCenter T unit does not have a power switch. The BladeCenter T Type 8720 (dc power) unit has two dc-power terminal connectors each powering two power modules. The left connection (looking from the rear) supplies power to power-module bays 2 and 4, and the connection on the right supplies power to power-module bays 1 and 3. Each dc terminal has four #M6 (0.25-inch) studs, one for -48 V dc, one for RETURN, and two for connecting the safety ground wire. The following guidelines are provided for connecting to the -48 V dc power source:

- DC wire rating of 4AWG (7x7x34/36 TC), 105C, 300V UL 10198, CSA approved and VW1 rated
- Ring terminal designed for M6 stud, 4AWG wire, wire size (circular Mil area) of 33100-52600, and a wire insulation diameter of 12.8 mm to 13.1 mm
- A two-lug ring terminal, required by NEBS for connecting the single safety ground wire

To provide true redundant power, BladeCenter T power modules 1 and 3 must be connected to a different power source than power modules 2 and 4.

Connecting the BladeCenter T type 8730 to ac power

The BladeCenter T Type 8730 unit comes with one pair of 220-volt hot-swap ac power modules in power-module bays 1 and 2. The BladeCenter T unit supports a second pair of power modules in power-module bays 3 and 4. Each active power module supplies 12-volt power to the blade bays that it services.

Type 8730

Power-module bay 2 connector

Power-module bay 4 connector

Power-module bay 1 connector

Power-module bay 3 connector
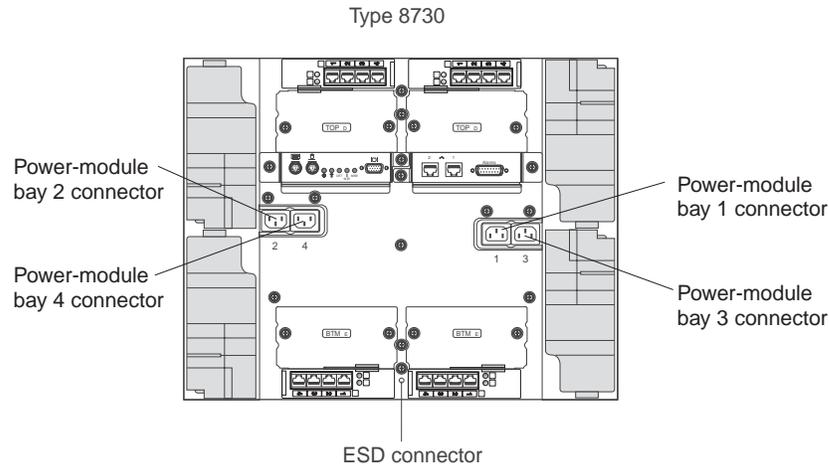
ESD connector

There are four IEC320 power connectors on the rear of the Type 8730 (ac power) unit, marked 1-4 on the rear panel. Power is applied to the corresponding power modules according to the numbering convention on the rear panel. (For example, power connector 1 supplies power to power module 1, and so on.)

The BladeCenter T unit does not have a power switch. To start the BladeCenter T Type 8730 (ac power) unit, connect one end of a power cord into input power connector 1 and 2 on the rear of the BladeCenter T unit, and the other end of each power cord into a 220-volt power distribution unit (PDU) that is connected into an appropriate electrical outlet.

Important: In a redundant pair of power modules, a power module that is not connected to a 220-volt power source creates a nonredundant condition.

If you have a second pair of power modules to install in power-module bays 3 and 4; then, connect power cords to input power connectors 3 and 4 on the rear of the BladeCenter T unit, and the other end of each power cord into a 220-volt power distribution unit (PDU) that is connected into an appropriate electrical outlet.

To provide true redundant power, BladeCenter T power modules 1 and 3 must be connected to a different power source than power modules 2 and 4. Connect BladeCenter T power modules 1 and 3 to a different PDU than power modules 2 and 4; then, connect each PDU to an ac power source (building power source or service entrance) that is controlled by a separate circuit breaker.

Starting the BladeCenter T unit

Complete the following steps to start the BladeCenter T unit:

1. Read the information in "System reliability considerations" on page 16.

2. Reinstall the four blowers into the rear of the BladeCenter T unit if you have not done so already. See Chapter 3, "Removing and installing BladeCenter T modules and options," on page 25 for detailed instructions.

   Note: The blowers will not start until the power modules are installed.

3. When the power connections are in place, you can reinstall the power modules in the BladeCenter T unit. After you connect power to the BladeCenter T unit, all the power-module bays receive power. To start the BladeCenter T unit, install power modules in all four power-module bays or install power modules in power-module bays 1 and 2 and filler modules in bays 3 and 4. See Chapter 3, "Removing and installing BladeCenter T modules and options," on page 25 for detailed instructions.

   AC power module   DC power module
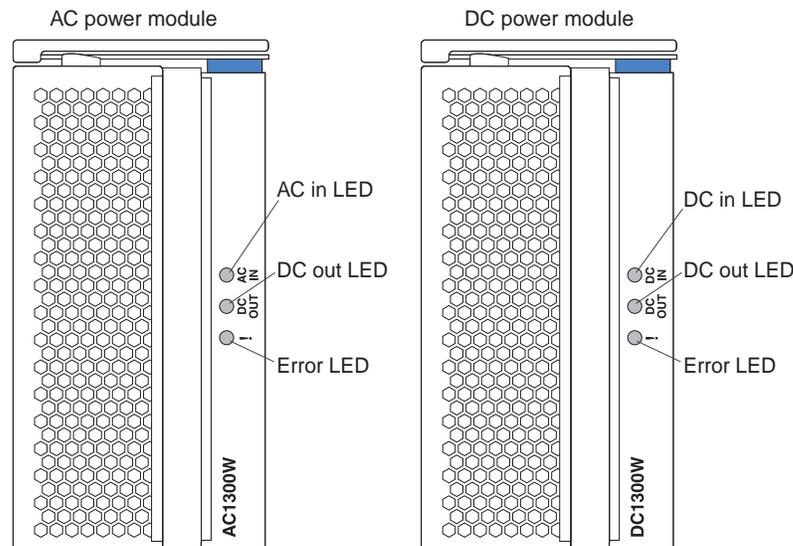
   Make sure that the LEDs on the power modules indicate that they are operating correctly. Make sure that the input and output power LEDs on each power module are lit, and the error LEDs are not lit.

4. Before proceeding, make sure that the LEDs on the blower modules indicate that they are operating correctly. Make sure that power LED on each blower is lit, and the error LEDs are not lit.

5. Make sure that the following BladeCenter T modules are installed correctly. See Chapter 4, "BladeCenter T components, controls, and LEDs," on page 51 for the location of the LEDs on these modules.

   - Media tray
   - KVM module
   - LAN module
   - Management module
   - I/O modules

6. Install the blade servers or filler modules in all of the blade server bays before you power on any of the blade servers. See "Removing and installing a blade server or filler module" on page 47 for detailed instructions. Make sure that the power LED on each blade server is flashing.

7. Install the bezel assembly on the front of the BladeCenter T unit by inserting the bottom bezel hooks into the bezel slots at the bottom of the BladeCenter T unit. Push in the bottom and the top of the bezel assembly until they both lock firmly into place.

Notes:
1. Within 2 minutes after power has been connected to the BladeCenter T unit, the management module applies power to the I/O modules.
2. If a power failure occurs, the BladeCenter T unit restarts automatically when power is restored.
3. The blade-server power button turns on or turns off the blade server if local power control has not been disabled through the management module.
4. The blade-server power button turns on the blade server only if the green power light on the blade server is flashing slowly. If the light flashes rapidly, the blade server has not yet synchronized with the management module, and pressing the power button will have no effect. See Chapter 4, "BladeCenter T components, controls, and LEDs," on page 51 for more information about the controls and indicators on the BladeCenter T unit modules.

See the Installation and User's Guide for your blade server on the IBM *BladeCenter T Documentation* CD for the location of the blade server LEDs.

Shutting down the BladeCenter T unit

You can shut down the BladeCenter T unit by turning off the blade servers and disconnecting the BladeCenter T unit from the power source.

Complete the following steps to shut down the BladeCenter T unit.

1. See your blade server operating-system documentation for the procedure to shut down the operating system in the blade servers; then, shut down each operating system.

2. Press the power-control button on the front of each blade server. Wait until the solid green power LED on the blade server goes to a slow flash indicating that the blade server drives have stopped spinning.

   Statement 5:

   CAUTION:
   The power control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.
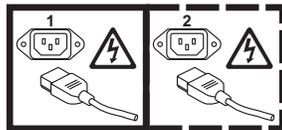
   Note: The BladeCenter T Type 8720 and 8730 units do not have a power switch.

3. If you have a BladeCenter T Type 8720 (dc-power) unit, switch the circuit breaker to the Off position. If you have a BladeCenter T Type 8730 (ac-power) unit, disconnect all power cords on the BladeCenter T unit from the power distribution unit (PDU).

   Note: After you disconnect the BladeCenter T unit from power, wait at least 5 seconds before you connect the BladeCenter T unit to power again.

Chapter 3. Removing and installing BladeCenter T modules and options

This chapter provides instructions for removing and installing modules, options, and blade servers in the BladeCenter T unit.

Each module is keyed so that it can be inserted only in an appropriate bay. For example, you can insert an I/O module only in an I/O-module bay.

This section describes the following BladeCenter T modules and options and how to remove and install them:

- Bezel assembly
- Power module
- Media tray
- Management module
- Blower module
- KVM module
- LAN module
- I/O modules
- Blade server

See the"Rear view" on page 55 and "Front view" on page 51 for the location of each module. These modules supply common functions to the blade servers that are installed in the blade bays at the front of the BladeCenter T unit.

The KVM module and media tray supply I/O (CD-ROM drive, USB ports, keyboard, video, and mouse) that is available to all the blade servers, selected by any one blade server at a time.

Attention: To help ensure proper cooling, performance, and system reliability, make sure that each of the module bays on the front and rear of the BladeCenter T unit has a module or filler module installed. When replacing components, do not operate the BladeCenter T unit for more than the following time limits:

- 1 minute without either a module or a filler module installed in each module bay
- 20 minutes without a server blade or blade filler

Preinstallation steps

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

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.

Complete the following steps before you install or remove a module or option in the BladeCenter T unit.

Note: These instructions assume the BladeCenter T unit is connected to power.

1. Read the safety information beginning on page vii and the guidelines in "Handling static-sensitive devices" on page 17. This information will help you work safely with your BladeCenter T unit and options.
2. If you are installing or removing a module at the front of the BladeCenter T unit, complete the following steps:
   a. Remove the bezel assembly from the front of the BladeCenter T unit. See "Removing the bezel assembly" on page 28 for instructions.
   b. Connect an ESD wrist strap to the ESD connector at the front of the BladeCenter T unit (see the illustration on page 17 for the location of the ESD connector).
3. If you are installing or removing a module at the rear of the BladeCenter T unit, connect an ESD wrist strap to the ESD connector at the rear of the BladeCenter T unit (see the illustration on page 17 for the location of the ESD connector).
4. Go to the instructions for the module or option you wish to install.

Removing and installing the bezel assembly

The BladeCenter T unit comes with a bezel assembly containing a removable and replaceable air filter. There are software features in the management-module that detect a clogged filter and generate system alerts based on the severity of the airflow reduction. The typical service interval for the filter is approximately three to six months depending on your environment.

See the *BladeCenter T Types 8720 and 8730 Hardware Maintenance Manual and Troubleshooting Guide* for information for servicing and replacing the filter.
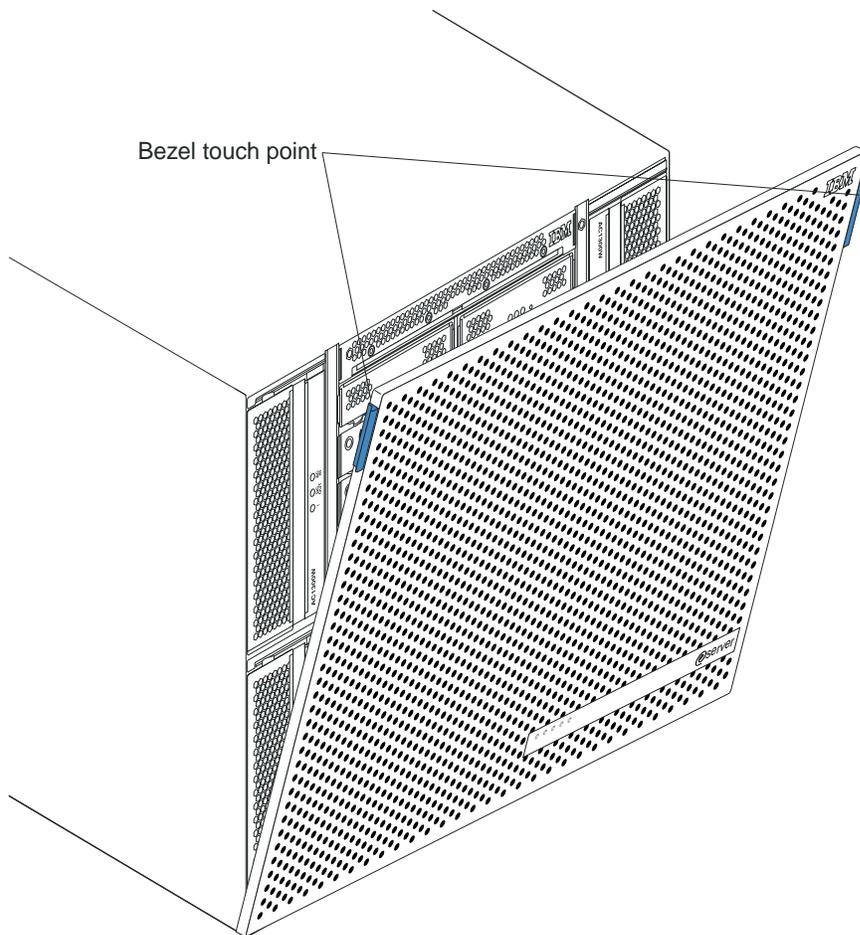
Bezel touch point

Removing the bezel assembly

Complete the following steps if you are removing the bezel assembly from the front of the BladeCenter T unit:

1. Forcefully pull forward on the blue touch points at the top sides of the bezel.
2. Lift the bezel assembly up and out of the BladeCenter T unit. Carefully set the bezel assembly aside in a safe location.

Installing the bezel assembly

Complete the following steps if you are installing the bezel assembly at the front of the BladeCenter T unit:

1. Insert the bottom bezel hooks into the bezel slots at the bottom of the BladeCenter T unit.
2. Push in the bottom and the top of the bezel assembly until they both lock firmly into place.

Removing and installing power modules

The BladeCenter T unit is separated into two power domains. To support devices in power domain B, a power-supply module option (consisting of two power modules) must be installed.

The following table summarizes the modules that are powered by each power domain.

Power domain	Power-module bays	Modules powered by the power domain
A	1 and 2	I/O-module bays 1 and 2 Management-module bays 1 and 2 Media tray Blade bays 1 through 4
B	3 and 4	Blade bays 5 through 8 I/O-module bays 3 and 4

All flour blowers are required for redundant system operation. Power for all four blowers is shared by all installed power modules. One failed blower creates a nonredundant configuration.

If a power module fails or an input power failure occurs, BladeCenter T units that are configured for redundant power operation will operate in a nonredundant mode. You must replace the failing power module or restore input power as soon as possible to regain redundant power operation.

Important:
1. The power modules must be installed in pairs in a domain and must match each other in capacity (wattage, amperage, and so on).
2. To provide true redundant power, BladeCenter T power modules 1 and 3 must be connected to a different input power source than power modules 2 and 4.

Power module 1

Power module 2

Power module 3

Power module 4

Filler module

Release handle

Release button
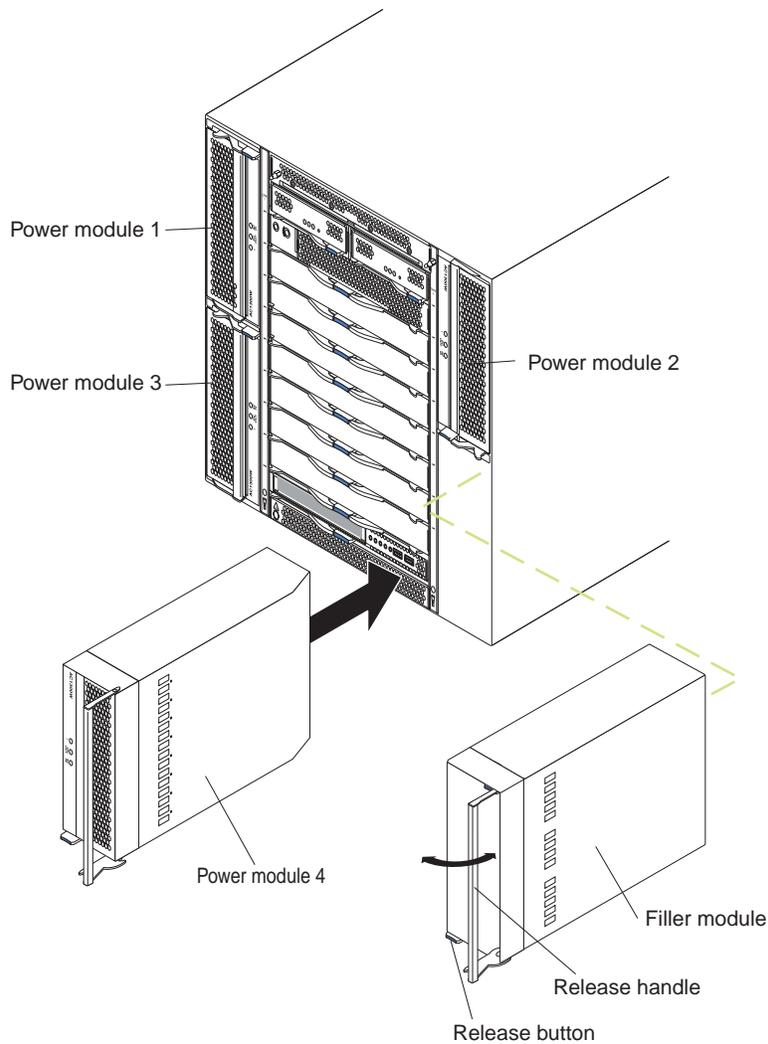
Removing a power module

Complete the following steps to remove a power module or filler panel from the front of the BladeCenter T unit. The procedure is the same for both ac-power and dc-power modules.

Attention: To help ensure proper cooling and system reliability, make sure that you replace a removed power module or filler panel with a power module within 1 minute.

Important: If you are removing a functional power module, make sure that both the ac-power LED and the dc-power LED on the remaining power module are lit; otherwise, shut down the operating systems and turn off all of the blade servers that are supported by the power module you are removing, before you remove it. (See the documentation that comes with the blade server for instructions for shutting down the blade server operating system and turning off the blade server.)

1. Press the blue release button on the front of the new power module to release the power-module handle; then, move the power-module handle outward until it is in the open position (90° from the closed position).

2. Grip the power-module handle with one hand and slowly pull the power module out of the bay. Use your other hand to support the bottom of the power module as you pull the power module out from the bay.

   Attention: Do not carry the power module by only the power-module handle. You must support the weight of the power module.

3. Place the power module in a safe location.

4. Within 1 minute, install either another power module or a filler module into the selected power-module bay.

Installing a power module

Complete the following steps to install a power module at the front of the BladeCenter T unit. The procedure is the same for both ac-power and dc-power modules.

Attention: To help ensure proper cooling and system reliability, make sure that you replace a removed power-module filler panel with a power module within 1 minute.

1. Note the orientation of the power module or filler you are removing; then, remove the filler or power module from the selected power-module bay and set it aside.

2. Press the blue release button on the front of the new power module to release the power-module handle; then, move the power-module handle outward until it is in the open position (90° from the closed position).

3. Grip the power-module handle with one hand and support the bottom of the power module with the other hand.

   Attention: Do not carry the power module by only the power-module handle. You must support the weight of the power module.

4. Orient the new power module to the selected power-module bay; then, slide the power module into the bay until it stops.

5. Push the power-module handle in until it locks into the latch next to the blue release button.

6. Make sure the LEDs on the power module indicate that it is operating correctly. Make sure that:

   • The input power LED is lit.

   • The output power LED is lit.

   • The error LED is not lit.

7. If you have other modules to install at the front of the unit, do so now. Otherwise reinstall the bezel assembly at the front of the BladeCenter T unit.

Removing and installing the media tray

The media tray is a hot-swap unit that is installed in the front of the BladeCenter T unit and contains the system-status panel, two USB connectors, and the CD-ROM drive. See "Media tray" on page 53 for information about the system-status panel controls and indicators.

Media tray

CD-ROM drive

System-status panel   USB connectors
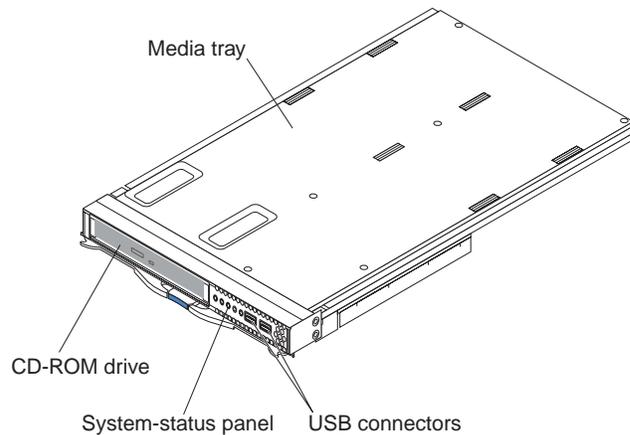
Use the instructions in this section to remove or install the media tray at the front of the BladeCenter T unit.

Release latch

Release button

Release latch
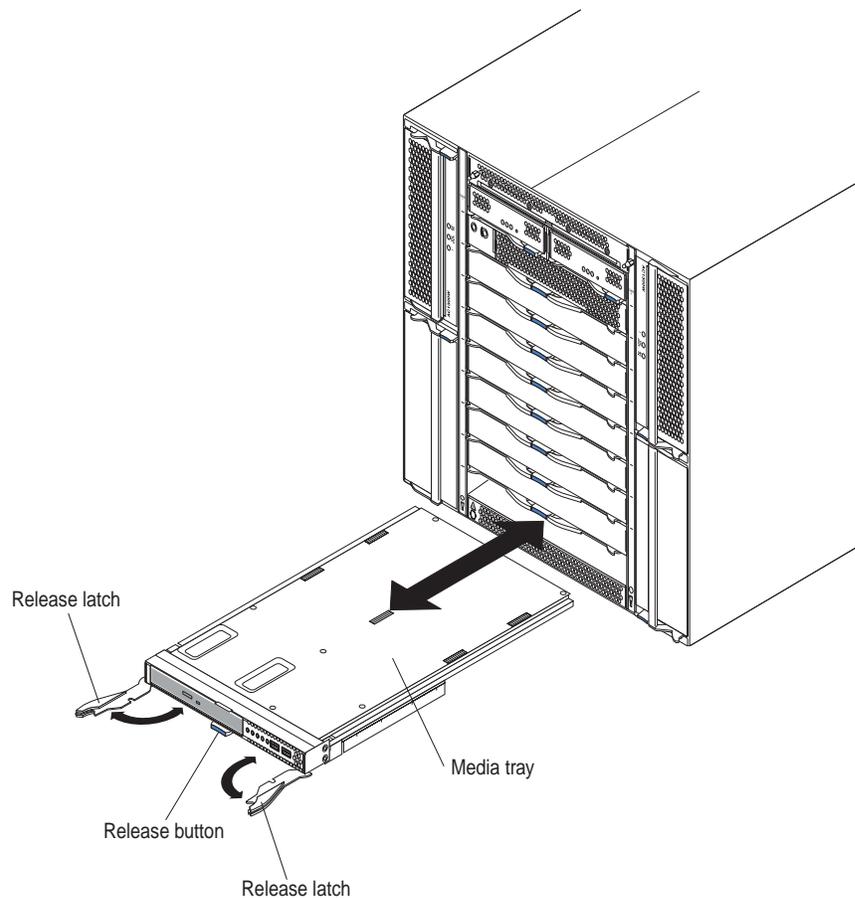
Media tray

Removing the media tray

Complete the following steps to remove the media tray in the front of the BladeCenter T unit:

1. Press the blue release button on the front of the media-tray module to release the latches. The latches swing out.
2. Make sure that the release latches are in the open position (90° from the closed position).
3. Grasp the media tray at the front of each side of the module and carefully pull the module all the way out of the bay. Set it in a safe place.
4. Within 1 minute, install another media tray into the BladeCenter T unit.

Installing the media tray

Complete the following steps to install the media tray in the front of the BladeCenter T unit:

1. Hold the media tray at the front of each side of the module and orient the media tray to the top of the media-tray bay. Carefully position the module into the rails in the media-tray bay.
2. Make sure that the release latches are in the open position (90° from the closed position).
3. Slide the media tray forward into the media-tray bay until it stops.
4. Push the media tray in until you feel it lock into position.
5. Push both release latches in until they lock into the latch next to the blue release button.
6. Make sure that the power LED is lit on the system-status panel.
7. If you have other modules to install at the front of the unit, do so now. Otherwise, reinstall the bezel assembly at the front of the unit.

Removing and installing management modules

The BladeCenter T unit comes with one hot-swap management module in management-module bay 1. You can add a second management module in management-module bay 2.

Note: Only one management module is active; the second management module, if present, provides redundancy.

MAC address

Release button

Management module

Release latch
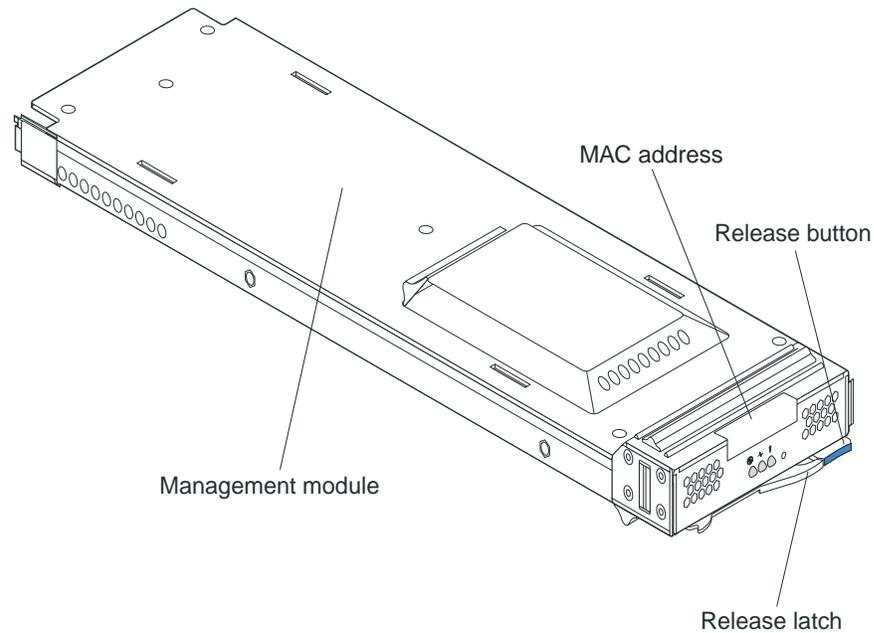
The management module functions as a service processor for the multiple blade servers. The management module configures the BladeCenter T unit and modules, configuring information such as switch module IP addresses. The management module also performs USB-to-PS/2 conversions for the system keyboard and mouse and can send the VGA signal stream to a remote console for viewing. See "Management module controls and indicators" on page 52 for information about the controls and indicators.

The service processor in the management module communicates with the service processor in each blade server for functions such as:

*   Blade server power-on requests
*   Blade server error and event reporting
*   Blade server requests for keyboard, mouse, and video
*   Blade server requests for CD-ROM drive and USB ports

The management module also communicates with the I/O modules, power modules, blower modules, and blade servers to detect presence or absence and any error conditions, sending alerts when required.

Use the instructions in this section to remove or install a management module at the front of the BladeCenter T unit.
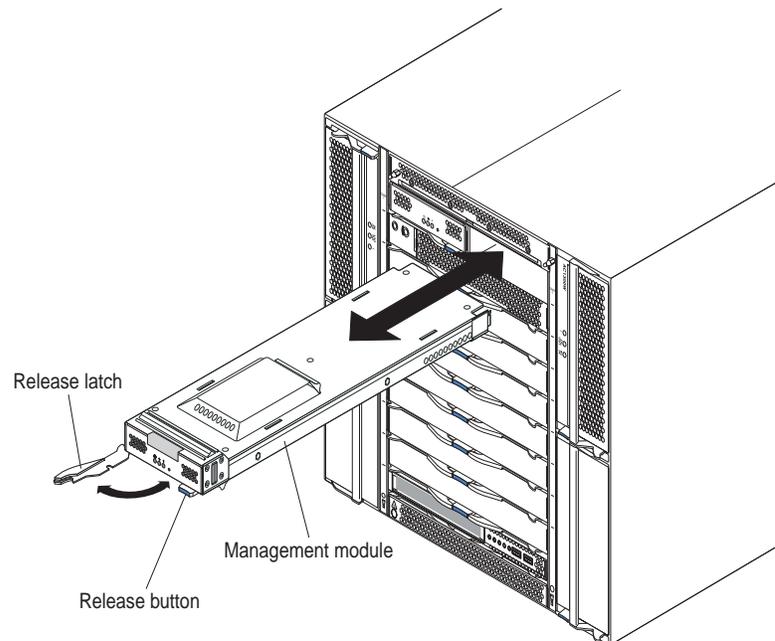
Removing a management module

Notes:

1. If you are removing the only management module in the BladeCenter T unit, to avoid unexpected termination of sessions, stop all management-module local and remote sessions before proceeding.

2. If you are removing the only management module in the BladeCenter T unit, be aware that as soon as you remove the module, the BladeCenter T blowers will increase to full speed.

3. If you are replacing the only management module in the BladeCenter T unit and the management module is functional, save the configuration file to another medium before you proceed (in the **MM Control** section in the navigation pane, click **Configuration File** and follow the instructions under **Save MM Configuration**); you will be able to restore the saved configuration file to the replacement management module.

4. If you have just installed a second management module in the BladeCenter T unit, do not remove the first (primary) management module for approximately 2 minutes; the second (secondary) management module needs the time to receive initial status information.

Complete the following steps to remove a management module or filler module from the front of the BladeCenter T unit:

1. Press the blue release button at the front of the management module.

2. Pull the release latch all the way toward the left side of the management module until it stops, as shown in the illustration. The module moves slightly out of the bay.

3. Grip the management module with one hand and slowly pull the management module out of the bay. Use your other hand to support the bottom of the management module as you pull it out from the bay. Within 1 minute, place either another module of the same type or a filler module in the bay.

4. If you placed another management module in the bay, make sure that the error LED on the management module is not lit.

5. If you have not already done so, configure the replacement management module. See the *IBM BladeCenter T Management Module User's Guide* for more information.

Installing a management module

Complete the following steps to install a management module in the BladeCenter T unit:

1. If you are installing a second management module, see the *IBM BladeCenter T Management Module User's Guide* for information about management-module redundancy.

2. If you are replacing a management module, remove the current module from the bay (see "Removing a management module" on page 35). If you are adding a management module, remove the filler module from the selected management-module bay and store the filler module for future use.

   Note: You will be able to apply a saved configuration file to the replacement management module. For more information about applying a saved configuration file, see "Saving and restoring the configuration file" on page 68.

3. If you have not already done so, touch the static-protective package that contains the new management module to an unpainted metal part of the BladeCenter T unit or any unpainted surface on any other grounded rack component for at least 2 seconds.

4. Remove the management module from its static-protective package.

5. Press the blue release button on the management module to open the release latch. Make sure that the release latch on the management module is in the open position (90° from the closed position).

6. Holding the management module at the front with one hand, and in the middle with the other hand, orient the management module to the bottom of the selected management-module bay and gently slide the management module into the bay until it stops. Push the management module in until the release latch starts to close.

7. Push the release latch on the front of the management module to the closed position.

8. Make sure that the error LED on the management module is not lit, indicating that the management module is operating correctly.

9. If this is the only management module in the BladeCenter T unit, configure the new management module. See the *IBM BladeCenter T Management Module User's Guide* for detailed instructions. If this is the secondary management module and you followed the instructions in the *IBM BladeCenter* T *Management Module User's Guide*, no configuring is necessary. The secondary management module receives the configuration and status information automatically from the primary management module when necessary. However, you must apply the latest level of firmware from the IBM Support Web site at http://www.ibm.com/pc/support/ to ensure smooth changeovers (see the *IBM BladeCenter T Management Module User's Guide* for more information).

   Note: Do not initiate any management module changeover for approximately 2 minutes after installing the secondary management module; the

secondary management module needs the time to receive initial configuration and status information.

10. If you have other modules to install at the front of the unit, do so now. Otherwise reinstall the bezel assembly on the front of the BladeCenter T unit.

Removing and installing blower modules

The BladeCenter T unit comes with four hot-swap blowers for cooling redundancy. The blowers are installed at the rear of the system. The blower speeds vary depending on the ambient air temperature at the front of the BladeCenter T unit. If a blower fails, the remaining blowers increase their speed to cool the BladeCenter T unit and blade servers.

All flour blowers are required for redundant system operation. Power for all four blowers is shared by all installed power modules. One failed blower creates a nonredundant configuration.

Note: Each power module has cooling fans that are independent from the system cooling.
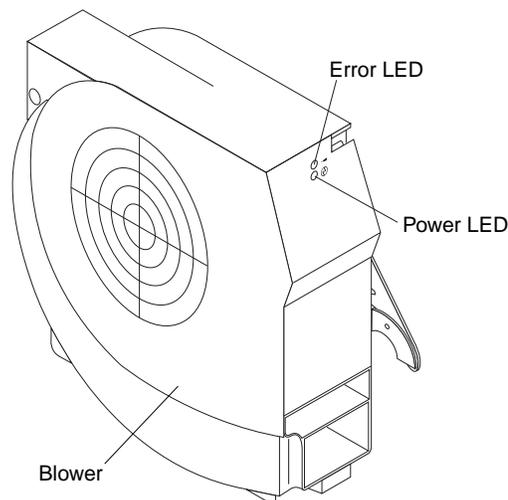
Important: Replace a failed blower as soon as possible to restore cooling redundancy.

Use the instructions in this section to remove or install a blower module at the rear of the BladeCenter T unit.

Note: Blowers on the left side of the system are installed with the release lever pointing upward, and blowers on the right side are installed with the release lever facing downward.

Error LED

Release latch
(open)

Power LED
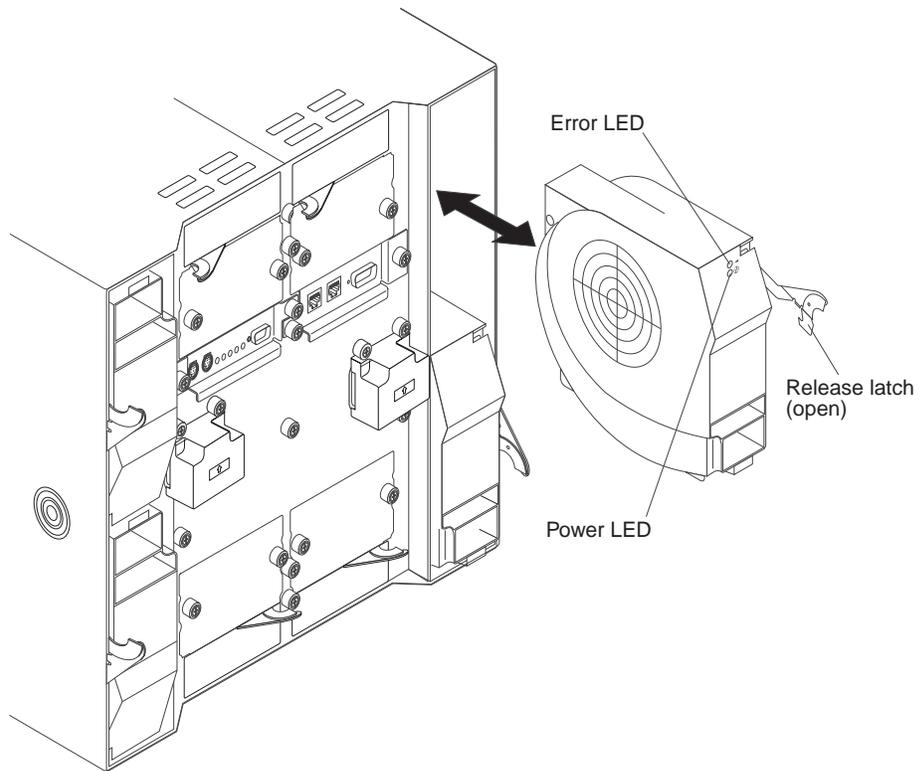
Removing a blower module

Use the following instructions to remove a blower at the rear of the BladeCenter T unit.

1. Press the release lever at the end of the release latch and pull the latch to the open position. The blower module moves slightly out of the bay.

2. Slide the module out of the blower bay and set it aside.

3. Within 1 minute, install another blower module into the bay.

Installing a blower module

Complete the following steps to install a blower module into the rear of the BladeCenter T unit.

1. Press the release lever at the end of the release latch and pull the latch to the open position.

2. Insert the blower into the selected blower bay.

3. Push the blower module into the bay until it stops. The release latch moves slightly toward the closed position.

4. Close the release latch until it locks into position.

5. Make sure that the blower power LED is lit and the blower error LED is not lit.

Removing and installing the KVM (keyboard, video, mouse) module

The KVM module is a hot-swap unit that is installed in the rear of the BladeCenter T unit and is held in place by captive thumbscrews. The KVM module provides the electrical and mechanical interface to the BladeCenter T unit for a local keyboard, RGB VGA video monitor, and a mouse. Five LEDs on the KVM module system-status panel are used for system status information: power, location, minor alarm, major alarm, and critical alarm. See "KVM (keyboard, video, mouse) module indicators and input/output connectors" on page 56 for information about the controls and indicators.
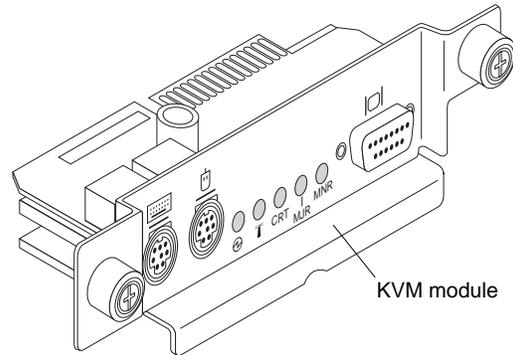
KVM module

Use the instructions in this section to remove or install the KVM module from the rear of the BladeCenter T unit. The KVM module is held in place by captive thumbscrews. You can use either your fingers or a screwdriver to install or remove the KVM module. If you use a screwdriver, make sure that you do not overtighten the thumbscrews.
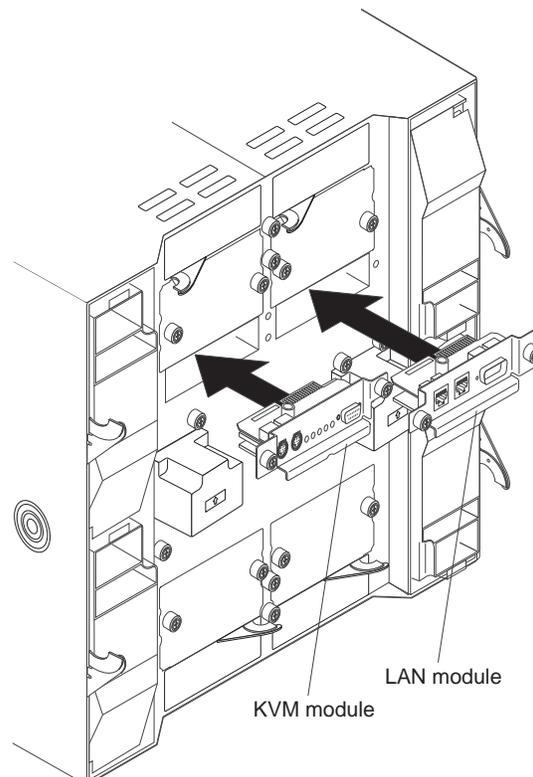

LAN module

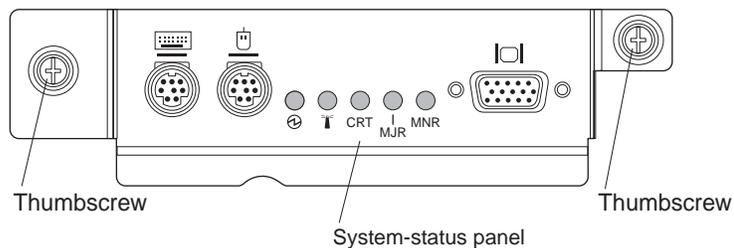KVM module

Removing the KVM module

Complete the following steps to remove the KVM module at the rear of the BladeCenter T unit.

1. Remove the keyboard, mouse, and video cables if any are connected.
2. Fully loosen each thumbscrew counterclockwise.
3. Hold the KVM module by both thumbscrews.
4. Carefully pull the KVM module outward from the KVM module bay until you feel it release.
5. Remove the KVM module from the bay and set it aside.
6. Within 1 minute, install a new KVM module.

Installing the KVM module

Complete the following steps to install the KVM module at the rear of the BladeCenter T unit

1. Hold the KVM module by both thumbscrews.

Thumbscrew   Thumbscrew

System-status panel

2. Position the KVM module into the rails inside the KVM-module bay.
3. Push the KVM module into the bay until you feel it stop. Make sure that it is snug.
4. Turn each thumbscrew clockwise until it is finger tight. If you use a screwdriver, make sure that you do not overtighten the thumbscrews.
5. Make sure that the power LED on the front of the KVM module is lit.
6. Connect any peripheral devices that you want to use at this time (for example, keyboard, mouse, and video monitor).

Removing and installing the LAN module

The LAN module is a hot-swap unit that is installed in the rear of the BladeCenter T unit and is held in place by captive thumbscrews. The LAN module provides the electrical and mechanical interface to the BladeCenter T system for the two local area network (Ethernet) connections, as driven from each management module, and the telco external alarms. This module contains two RJ45 connectors with LEDs for the management interface and one DSUB 15P male telco alarm connector. See the "LAN-module indicators and input/output connectors" on page 58 for more information.
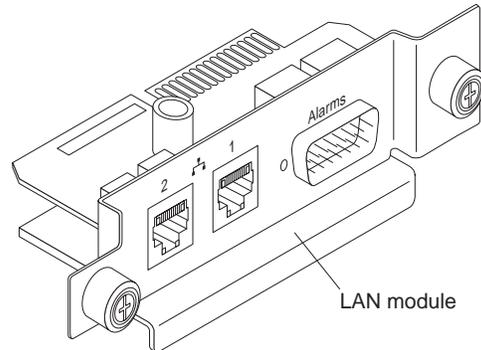
LAN module

Use the instructions in this section to remove or install the LAN module into the rear of the BladeCenter T unit (see the illustration of the KVM and LAN modules on page 39). The LAN module is held in place by captive thumbscrews. You can either use your fingers or a screwdriver to install or remove the LAN module. If you use a screwdriver, make sure that you do not overtighten the thumbscrews.

Thumbscrews

Remote management and console (Ethernet)

Alarms

Ethernet link LED   Ethernet activity LED   Alarms connector
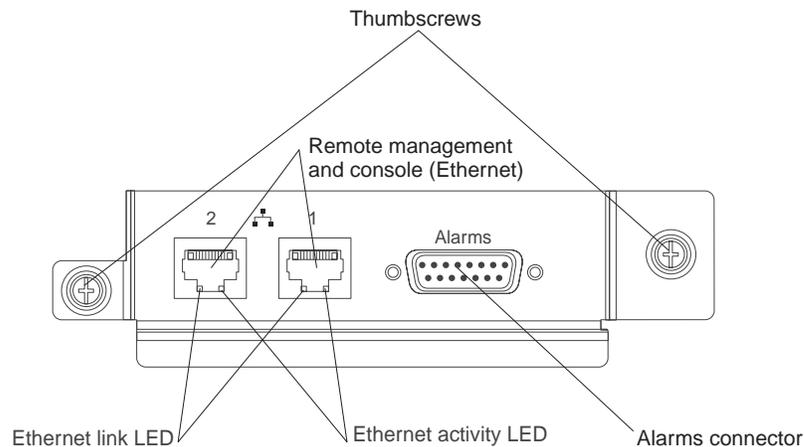
Removing the LAN module

Complete the following steps to remove a LAN module from the rear of the BladeCenter T unit:

1. Fully loosen each thumbscrew counter clockwise.
2. Grasp the LAN module by both thumbscrews.
3. Carefully pull the LAN module outward from the LAN module bay until you feel it release from the card edge connector on the backplane.
4. Remove the LAN module from the bay and set it aside.
5. Within 1 minute, install the new LAN module.

Installing the LAN module

Complete the following steps to install a LAN module into the rear of the BladeCenter T unit:

1. Hold the LAN module by both thumbscrews.
2. Position the LAN module into the rails inside the LAN module bay (see the illustration of the KVM and LAN modules on page 39).
3. Push the LAN module into the bay until it stops. Make sure that it is snug.
4. Turn each thumbscrew clockwise until it is finger tight. If you use a screwdriver, make sure that you do not overtighten the thumbscrews.

Removing and installing I/O modules

For blade server communication with the network, the BladeCenter T unit supports up to four hot-swap I/O modules. Table 3 identifies the types of I/O modules that you can install in each I/O-module bay. Go to the IBM Support Web site at http://www.ibm.com/pc/support/ to see the list of supported I/O modules.

The BladeCenter T unit supports a minimum of one hot-swap Ethernet switch module or pass-thru module, in I/O-module bay 1 or 2. This I/O module provides an internal connection to an integrated Ethernet controller in all the blade servers in the BladeCenter T unit, up to eight internal connections per I/O module. To provide an internal connection for the second integrated Ethernet controller in each blade server, install an Ethernet switch module or pass-thru module in the available I/O-module bay of the pair (I/O-module bay 1 or bay 2). The management modules are connected to the switch module through the backplane using a transformerless 100 Mbps connection and an I2C interface.

The BladeCenter T unit supports two additional I/O modules in I/O-module bays 3 and 4. Each of these I/O modules provides an internal connection to one of the two network-interface controllers on each of the I/O expansion options that are installed on blade servers in the BladeCenter T unit. The I/O module must be compatible with the network interface on each of the I/O expansion options. For example, if you install a Fibre Channel I/O expansion card on a blade server, the I/O modules that you install in I/O-module bays 3 and 4 must be Fibre Channel switch modules or pass-thru modules.

Important: The switch modules in I/O module bays 3 and 4 and all blade server interface options in the BladeCenter T unit, must use the same interface type. For example, if you install an Ethernet interface option on a blade server, the switch modules that you install in I/O module bays 3 and 4 must be Ethernet. All other interface options in the BladeCenter T unit must also be Ethernet interface options.

Note: You can use a pass-thru module in any I/O-module bay, provided that the associated controller in the blade servers or I/O expansion options is compatible with it.

The following table summarizes the types of modules that can be used in each I/O-module bay. See "Rear view" on page 55 for the location of the I/O-module bays on the BladeCenter T unit.

Table 3. Hot-swap I/O module types by location for redundancy

Bays	I/O-module function	Permissible I/O module
1 and 2	Network connections 1 and 2 (Ethernet) for all blade servers in the BladeCenter T unit	One of the following combinations: • Two Ethernet switch modules • Two pass-thru modules • One Ethernet switch module and one pass-thru module

Table 3. Hot-swap I/O module types by location for redundancy (continued)

| Bays	I/O-module function	Permissible I/O module
3 and 4	Network connections 3 and 4 (for all I/O expansion options on blade servers in the BladeCenter T unit)	One of the following combinations. • Two Ethernet switch modules • Two Fibre Channel switch modules • Two pass-thru modules **Important:** • The modules used must support the network interface that is used on the blade server I/O expansion options. • The I/O modules in bays 3 and 4 must be the same type.

Notes:

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

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

   a. Install only one Ethernet switch module or pass-thru module, in I/O-module bay 1.

   b. Make sure that the ports on the switch module or pass-thru module are enabled (**I/O Module Tasks → Management → Advanced Management** in the management module Web-based user interface).

   c. Enable only one of the Ethernet controllers on the blade server. Note the designation that the blade server operating system has for the controller.

   d. Ping an external computer on the network that is connected to the switch module or pass-thru module.

   If you can ping the external computer, the Ethernet controller that you enabled is associated with the I/O module in I/O-module bay 1. The other Ethernet controller in the blade server is associated with the I/O module in I/O-module bay 2.

3. If you have installed an I/O expansion option on a blade server, communications from the option are routed to I/O-module bays 3 and 4. You can verify which controller on the option is routed to which I/O-module bay by performing the test in note 2, using a controller on the I/O expansion option and a compatible switch module or pass-thru module in I/O-module bay 3 or 4.

Use the instructions in this section to remove or install an I/O module at the rear of the BladeCenter T unit.
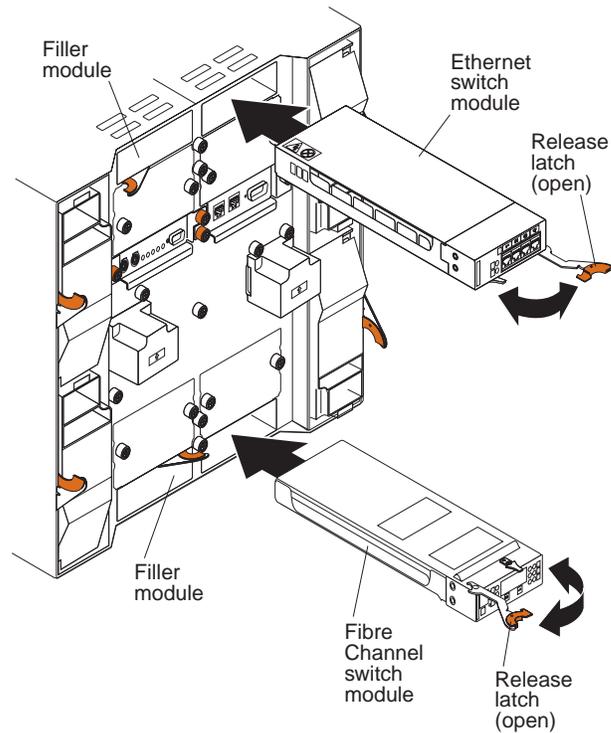
Removing an I/O module

Use the following instructions to remove an I/O module or filler module from the rear of the BladeCenter T unit.

1. Press the release lever at the end of the release latch and pull the latch to the open position. The I/O module moves slightly out of the bay.
2. Slide the I/O module out of the I/O-module bay and set it aside.
3. Within 1 minute, install another I/O module or filler module into the bay.

Installing an I/O module

Complete the following steps to install an I/O module into the rear of the BladeCenter T unit.

1. Press the release lever at the end of the release latch and pull the latch to the open position.
2. Insert the I/O module into the selected I/O-module bay.
3. Push the I/O module into the bay until it stops. The release latch moves slightly toward the closed position.
4. Close the release latch until it locks into position.

Blade servers

The BladeCenter T unit supports up to eight high-performance blade servers. Each blade server is an enclosure that contains microprocessors, memory, a control chip set, an I/O bus, Ethernet controllers, hard disk drives or flash drives, and user-interface controls, and connectors for expansion options. The blade server receives its power, network connection, and I/O devices (CD-ROM, keyboard, mouse, and video ports, USB port, remote monitoring port) from the BladeCenter T unit, reducing the number of cables that are required.

Blade server expansion options

Some blade servers contain connectors for options that add capabilities to the blade server. You can add these options before installing the blade server in the BladeCenter T unit.

Go to http://www.ibm.com/pc/compat/ for a list of available options for your IBM blade server.

I/O expansion option

Some blade servers have connectors for adding an I/O expansion option, such as an IBM BladeCenter Fibre Channel Expansion Card. The BladeCenter T unit routes network communication signals from the I/O expansion option to I/O modules 3 and 4 on the BladeCenter T unit. The I/O expansion option is attached directly to the blade server and does not occupy an additional blade bay.

Note: If an I/O expansion option is installed on any blade server, I/O modules that are compatible with that network interface must be installed in I/O-module bays 3 and 4 on the BladeCenter T unit. See "Removing and installing I/O modules" on page 43 for more information.

Expansion unit option

You can install an optional BladeCenter SCSI Storage Expansion Unit or Peripheral Card Interface (PCI) I/O Expansion Unit on your blade server.

Storage Expansion Unit option: Some blade servers have a connector for adding an expansion unit, such as an IBM BladeCenter SCSI Storage Expansion Unit. The storage expansion unit supports up to two hot-swap SCSI hard-disk drives. The expansion option is attached directly to the blade server and occupies an additional blade server bay.

PCI I/O-expansion Unit option: Some blade servers have a connector for adding an expansion unit, such as an IBM BladeCenter PCI I/O Expansion Unit. The PCI I/O-expansion unit supports up to two PCI-X adapters. The expansion unit is attached directly to the blade server and occupies an additional blade server bay.

Removing and installing a blade server or filler module

Use the instructions in this section to remove or install a blade server at the front of the BladeCenter T unit.

Important: Reinstalling a blade server into a different bay than the one from which it was removed could have unintended consequences. Some configuration information and update options are established according to bay number. You might need to reconfigure the blade server.

Attention: To maintain proper system cooling, do not operate the BladeCenter T unit for more than 20 minutes without either a blade server or a filler blade installed in each blade bay. If you fail to replace a blade server or filler blade within 20 minutes, system performance might be affected.
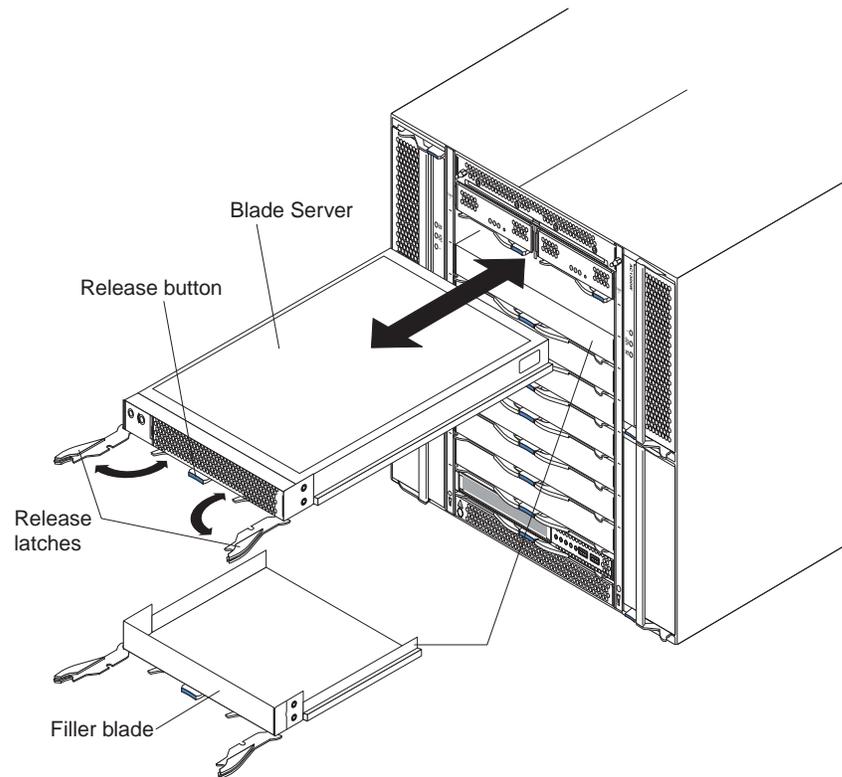
Installing a blade server

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

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.

1. Install any options that you need, such as disk drives or memory, in the blade server. See the documentation that comes with the blade server for instructions.
2. Select the bay for the blade server.

    Notes:

    a. If a blade server has a SCSI Storage Expansion Unit or PCI I/O-expansion Unit installed on it, the blade server and expansion option require an additional adjacent blade bay.
    b. If you install a blade server or option in bay 5 through 8, you must install power modules in power-module bays 3 and 4.

3. Remove the filler blade from the bay and store in a safe place.
4. Make sure that the release latches on the blade server are in the open position (horizontal to the blade server).
5. Slide the blade server into the bay until it stops.
6. Push the release latches on the front of the blade server until they are closed.
7. Turn on the blade server by pressing the power-control button on the blade server control panel. See the documentation that comes with the blade server for more instructions.
8. Make sure that the power LED on the blade server control panel is lit, indicating that the blade server is receiving power.
9. (Optional) Write identifying information on one of the user labels that come with the blade server; then, place the label on the BladeCenter T unit to the right of the blade server, as shown in the following illustration.
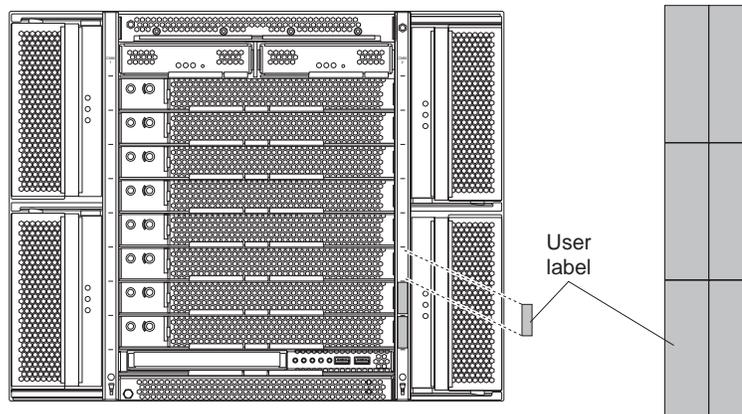
Important: Do not place the label on the blade server or in any way block the ventilation holes on the blade server.

10. If you have other modules to install at the front of the unit, do so now. Otherwise reinstall the bezel assembly on the front of the BladeCenter T unit.

   Note: Reinstall the bezel assembly on the BladeCenter T unit after you have finished installing the blades. However, if you installed an option such as a PCI I/O Expansion Unit with PCI adapters that require cables, you will not be able to install the bezel assembly, which contains an air filter for the BladeCenter T unit. If you cannot install the bezel assembly, a filter must be provided on the rack.

If this is the initial installation for a blade server in the BladeCenter T unit, you must configure the blade server with the blade server Configuration/Setup Utility program and install the blade server operating system. See the documentation that comes with the blade server for instructions.

Removing a blade server

Complete the following steps to remove a blade server from the BladeCenter T unit.

Note: If you do not shut down a blade server properly, it cannot be restarted using the Wake on LAN feature.

1. Shut down the blade server operating system; then, press the blade server power-control button (behind the blade server control panel door) to turn off the blade server. Wait at least 30 seconds until the drives stop spinning, before proceeding to the next step.
2. Open the two release latches as shown in the illustration on page 47. The blade server moves slightly out of the bay.
3. Pull the blade server out of the bay.
4. Place either a filler blade or another blade server in the bay within 20 minutes.

Chapter 4. BladeCenter T components, controls, and LEDs

This section describes the components, controls and light-emitting diodes (LEDs) and how to start and shut down the BladeCenter T unit.

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

Front view

This section identifies the components, controls, and LEDs on the front of your BladeCenter T unit.
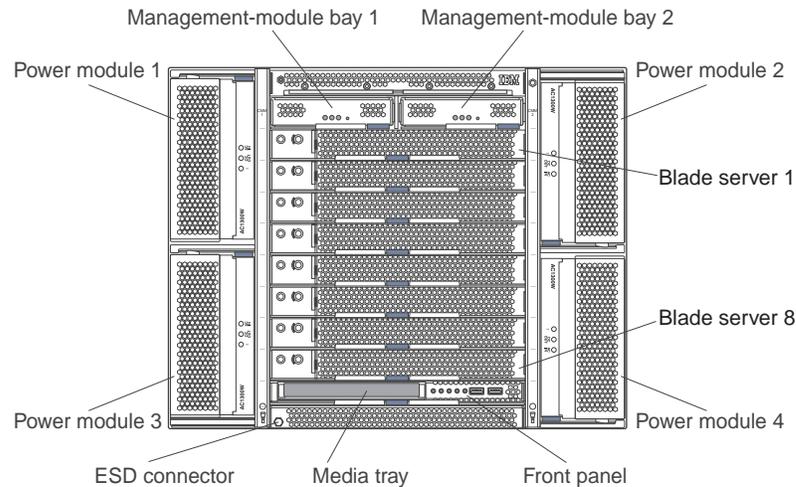

System service cards

These cards contain system service instructions and a writable area for your use. The cards are located in a slot just above the management-module bays. To access the service cards, slide out the cards as shown in the following illustration.
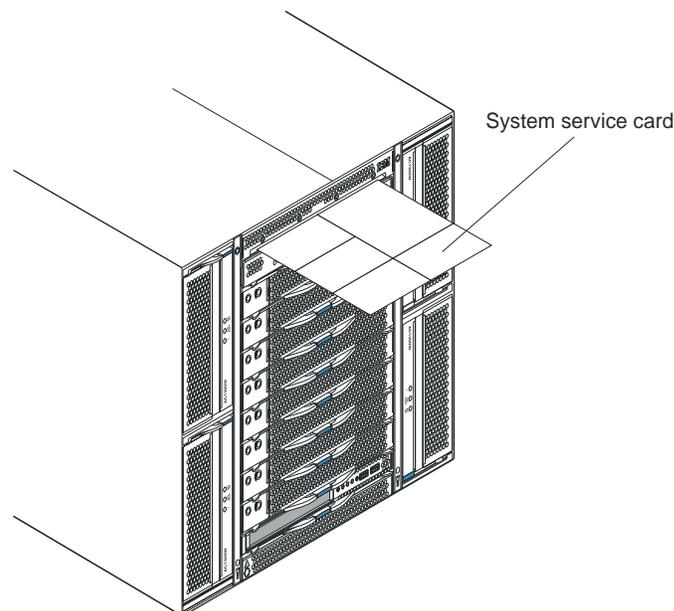
Management module controls and indicators

These management-module controls and indicators provide status information about the management module and remote management connection. For additional information, see the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *BladeCenter T Documentation* CD.

Management Module

Power

IP reset button

Active

Error
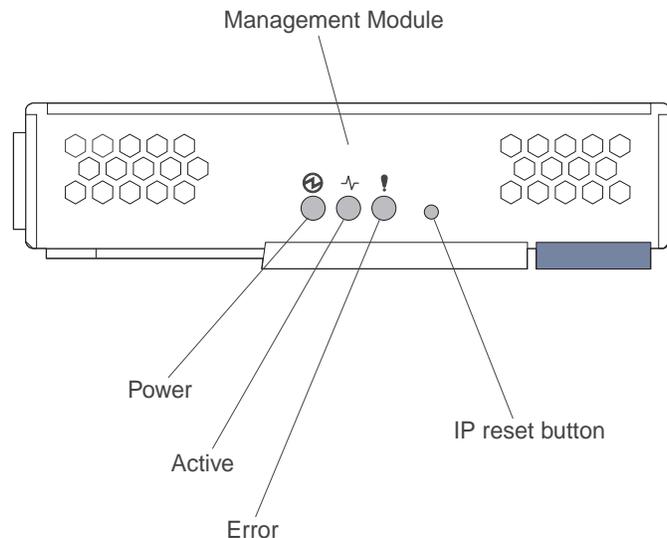
Management module LEDs: These LEDs provide status information about the management module and remote management connection.

- **Power:** When this green LED is lit, it indicates that the management module has power.
- **Active:** When this green LED is lit, it indicates that the management module is actively controlling the BladeCenter T unit. Only one management module actively controls the BladeCenter T unit. If two management modules are installed in the BladeCenter T unit, this LED is lit on only one.
- **Error:** When this amber LED is lit, it indicates that an error has been detected somewhere on the management module. When this LED is lit, the system error LED (critical, major, or minor) on each of the BladeCenter T system-status panels is also lit.

Management module IP reset button: *Do not* press this button unless you intend to erase your configured IP addresses for the management module and lose connection with the remote management station, the switch modules, and the blade servers. If you press this button, you will have to reconfigure the management module settings (see the information beginning with "Setting up the remote connection" on page 63 for instructions).

Press this recessed button to reset the IP configuration of the management module network interfaces (Ethernet 1, Ethernet 2, gateway address, and so on) to the factory defaults and then restart the management module.

Use a straightened paper clip to press the button.

Media tray

The media tray is a hot-swap unit that is installed on the front of the BladeCenter T unit and contains the system-status panel, I/O, and CD-ROM drive.
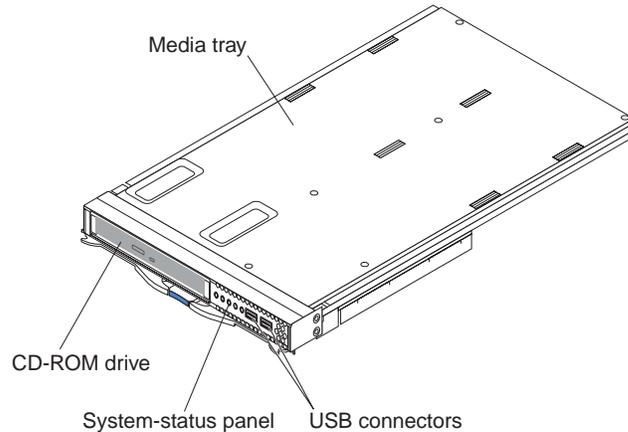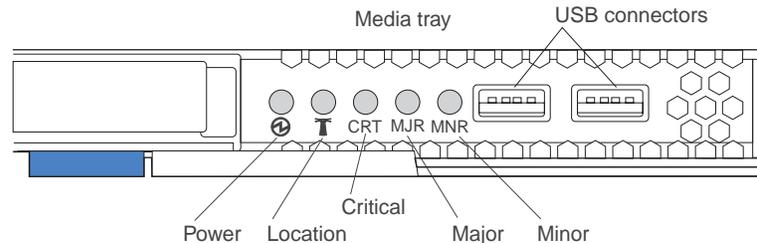

The following illustration shows the system-status LEDs on the system-status panel on the front of the BladeCenter T unit.

The system-status panel on the front of the BladeCenter T system has five system-status LEDs and two USB connectors.

System status LEDs: The LEDs on this part of the panel provide status information for the BladeCenter T unit.

- **Power:** When continuously lit, this green LED indicates the presence of power in the BladeCenter T unit. The LED turns off when the power source is interrupted.

  Attention: If the power LED is off, it does not mean electrical power is not present in the BladeCenter T unit. The LED might be burned out. To remove all electrical power from the BladeCenter T unit, you must disconnect all power cords from the rear of the BladeCenter T unit.

- **Location:** This blue LED is for system identification. A system administrator or servicer uses this LED to locate a specific BladeCenter T unit for service or repair. You can turn off the location LED through the Web interface or a remote management console.

Alarm LEDs: These LEDs provide alarm notifications for the BladeCenter T unit.

- **CRT (Critical alarm, amber (default) or red):** When continuously lit, this LED indicates the presence of a critical system fault. The system comes with amber as the default. See the *BladeCenter T Management Module User's Guide* for information on setting the color of this LED.
  A critical system fault is an error or event that is unrecoverable. In this case, the system cannot continue to operate. An example is the loss of a large section of memory that causes the system to be incapable of operating.

- **MJR (Major alarm, amber (default) or red):** When continuously lit, this LED indicates the presence of a major system fault. The system comes with amber as
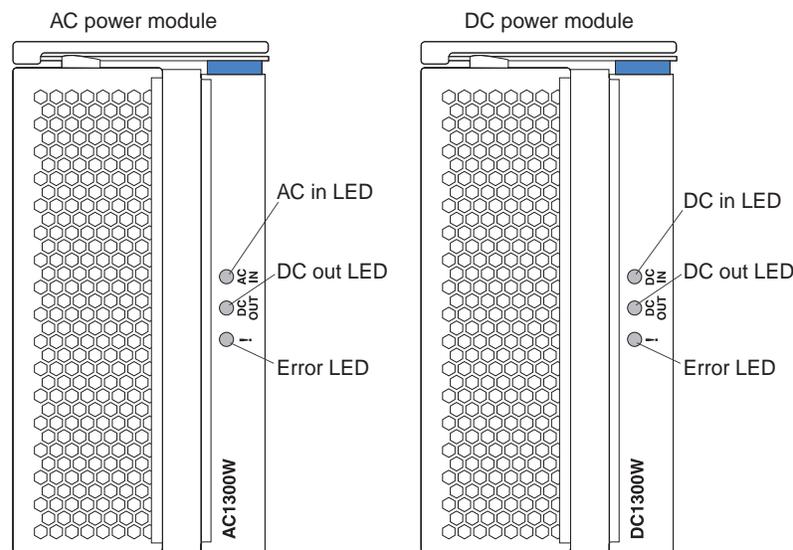
the default. See the *BladeCenter T Management Module User's Guide* for information on setting the color of this LED.
A major system fault is an error or event that has a discernible impact to system operation. In this case, the system can continue to operate but with reduced performance. An example is the loss of one of two mirrored disks.

- **MNR (Minor alarm, amber):** When continuously lit, this LED indicates the presence of a minor system fault. A minor system fault is an error or event that has little impact to system operation. An example is a correctable ECC error.

USB connectors: There are two USB connectors on the front system-status panel. You can use these USB connectors to connect two USB peripheral devices without an external hub. If more devices are required, you can connect an external hub to any of the built-in connectors.

Power modules

AC power module DC power module

AC in LED
DC out LED
Error LED
AC1300W

DC in LED
DC out LED
Error LED
DC1300W

Power module LEDs: Each power module has three LEDs to indicate the status of the power module.

- **AC (or DC) in:** When continuously lit, this green LED indicates that the input power source is working. If the LED is not lit, it indicates that the input power source is not present or is incorrect.
- **DC out:** When continuously lit, this green LED indicates that the output power is present. If the LED is not lit, it indicates that the output power is not present.
- **! (Error):** When continuously lit, this amber LED indicates that there is a error condition within the power module.

Rear view

This section identifies the components and indicators on the rear of the BladeCenter T unit.
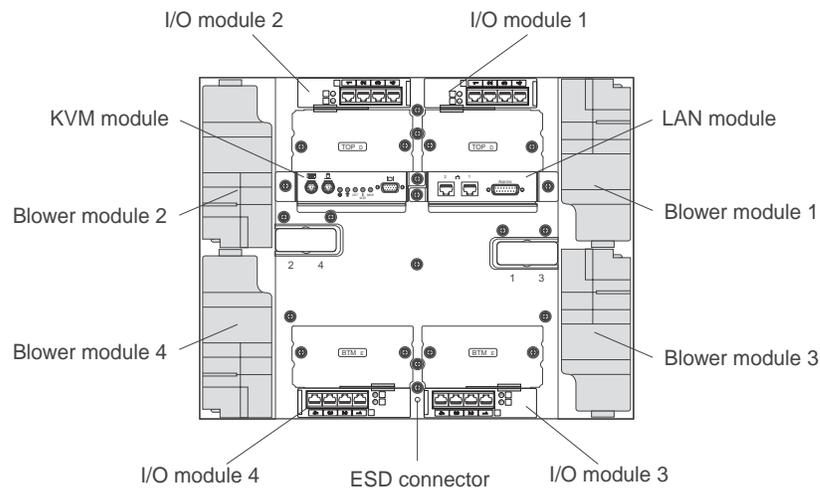
Blower modules

Blower modules

The blower modules are hot-swap units that are installed into the rear of the system. The BladeCenter T unit comes with four blowers that are in a 3+1 redundancy configuration. All the cooling requirements are met if one blower fails. All blowers contain a backflow device that prevents the system from drawing air into the exhaust port of a failed blower. The management module in the BladeCenter T unit controls the blower speed and detects blower failures.
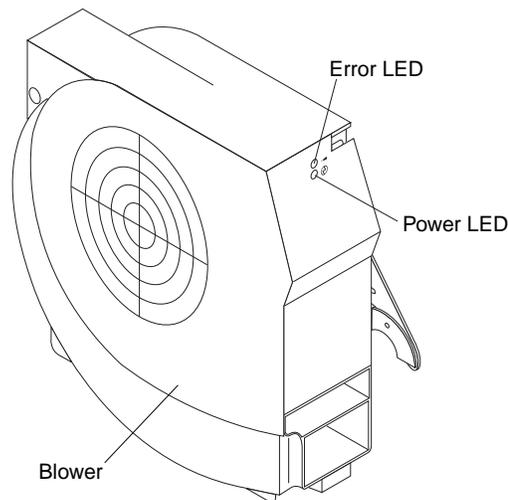
Blower LEDs: The LEDs on each blower provide status information about the blower.

- **Power:** When this green LED is lit, it indicates that the blower module has power.
- **Error:** This amber LED is lit and stays lit when an error has been detected in the blower. The system error LED on the BladeCenter system-status panels is also lit.

KVM (keyboard, video, mouse) module indicators and input/output connectors
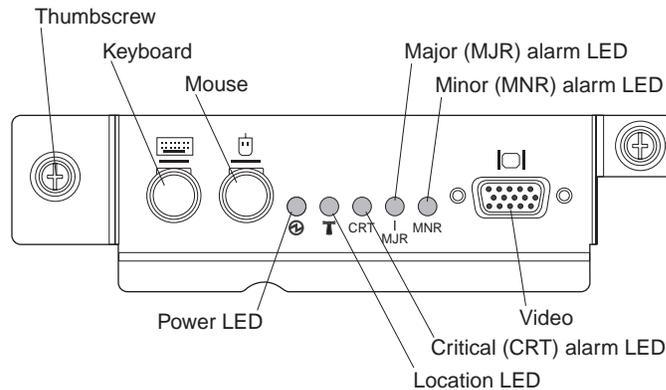
The KVM module is a hot-swap module that is installed on the rear of the BladeCenter T unit and is held in place by captive thumbscrews. This module contains two PS/2 connectors for the keyboard and mouse, a system-status panel, and an HD-15 video connector.

System-status LEDs: These LEDs provide status information for the BladeCenter T unit.

- **Power:** When continuously lit, this green LED indicates the presence of power in the BladeCenter T unit. The LED turns off when the power source is interrupted.

  Attention: If the power LED is off, it does not mean electrical power is not present in the BladeCenter T unit. The LED might be burned out. To remove all electrical power from the BladeCenter T unit, you must disconnect all power cords from the rear of the BladeCenter T unit.

- **Location:** This blue LED is for system identification. A system administrator or servicer uses this LED to locate a specific BladeCenter T unit for service or repair. You can turn off the location LED through the Web interface or a remote management console.

Alarm LEDs: These LEDs provide alarm notifications for the BladeCenter T unit.

- **CRT (Critical alarm, amber (default) or red):** When continuously lit, this LED indicates the presence of a critical system fault. The system comes with amber as the default. See the *BladeCenter T Management Module User's Guide* for information on setting the color of this LED.
  A critical system fault is an error or event that is unrecoverable. In this case, the system cannot continue to operate. An example is the loss of a large section of memory that causes the system to be incapable of operating.

- **MJR (Major alarm, amber (default) or red):** When continuously lit, this LED indicates the presence of a major system fault. The system comes with amber as the default. See the *BladeCenter T Management Module User's Guide* for information on setting the color of this LED.
  A major system fault is an error or event that has a discernible impact to system operation. In this case, the system can continue to operate but with reduced performance. An example is the loss of one of two mirrored disks.

- **MNR (Minor alarm, amber):** When continuously lit, this LED indicates the presence of a minor system fault. A minor system fault is an error or event that has little impact to system operation. An example is a correctable ECC error.

Connectors: The KVM module has the following I/O connectors:

- **Keyboard connector:** The BladeCenter T KVM module contains one PS/2-style keyboard connector.

  Use this connector to connect a PS/2 keyboard to the BladeCenter T unit.

  ```
  6  ○  ▯  ○  5
  4  ○      ○  3
       ○  ○
       2    1
  ```
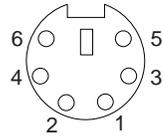
- **Mouse connector:** The BladeCenter T KVM module contains one PS/2-style mouse connector.

  Use this connector to connect a PS/2 mouse to the BladeCenter T unit.

  ```
  6  ○  ▯  ○  5
  4  ○      ○  3
       ○  ○
       2    1
  ```
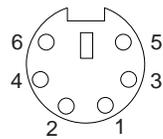
- **Video connector:** The BladeCenter T KVM module contains one standard video connector. The integrated video controller on each blade server is compatible with SVGA and VGA and communicates through this video port.

  Use this connector to connect a video monitor to the BladeCenter T unit.

  ```
  5              1
  ( ○ ○ ○ ○ ○ )
    ○ ○ ○ ○ ○
    ○ ○ ○ ○ ○
  15            11
  ```
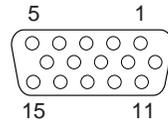
LAN-module indicators and input/output connectors

The LAN module is a hot-swap module that is installed on the rear of the BladeCenter T unit and is held in place by captive thumbscrews. The LAN module provides the electrical and mechanical interface to the BladeCenter T unit for the two local area network (Ethernet) connections, as driven from each management module, and the telco external alarms. This module contains two RJ-45 connectors with LEDs and one DSUB 15P telco alarm connector.
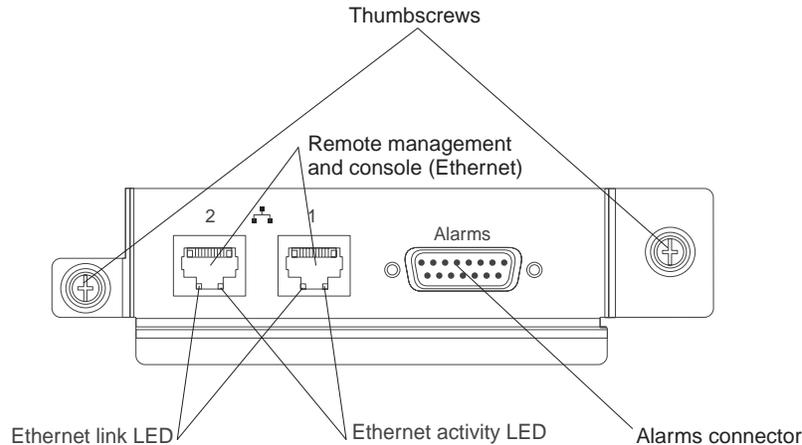
LAN-module LEDs: These LEDs provide status information about the LAN connection:

- **Ethernet link:** When this green LED is lit, there is an active connection through the port to the network.
- **Ethernet activity:** When this green LED is flashing, it indicates that there is activity through the port over the network link.

LAN-module connectors:

- **Remote management and console (Ethernet) connectors:** The LAN module provides two Ethernet RJ-45 connectors.

  The BladeCenter T LAN module contains two 10/100 Mb Ethernet connectors that provide the remote connections, driven from each management module, to the network management station on the network.

  Use these ports for remote management and remote console.

  The network management station, through these connectors, can access control functions running in the management module, the service processor on each blade server, or within each switch module. However, it cannot use these ports to communicate with application programs running in the blade servers. The network management station must direct those communications through a network connected to the external ports in the I/O modules in the BladeCenter T unit.

- **Alarms connector:** The LAN module provides one telco DB15 alarms connector (male) for critical, major, and minor telco alarms. Each of the alarms has a relay that enables multiple system alarm indicators to be daisy-chained together. Table 4 on page 59 shows the pinouts for the telco alarms connector.
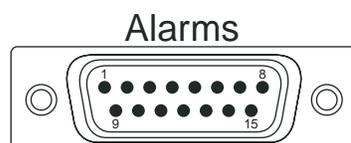
Note: The service processor, management module, or systems-management function must monitor the alarm reset inputs to maintain the fault condition that you set for the unit. The alarm reset inputs can be voltages in excess of standard logic levels, so you must to electrically or optically isolate them from the monitoring logic.

Table 4. Alarms connector pinout

Pin #	Description	I/O	Pin #	Description	I/O
1	Minor alarm reset +	I	9	Minor alarm normally closed	O
2	Minor alarm reset -	I	10	Minor alarm common	O
3	Major alarm reset +	I	11	Major alarm normally open	O
4	Major alarm reset -	I	12	Major alarm normally closed	O
5	Critical alarm normally open	O	13	Major alarm common	O
6	Critical alarm normally closed	O	14	Reserved	O
7	Critical alarm common	O	15	Reserved	O
8	Minor alarm normally open	O			

The electrical specifications for the alarms connector are as follows:

– **Outputs**

- Voltage range: 0 V dc to -100 V dc (maximum current 0.3 A at 100 V dc)
- Current range: 0 A to 1 A (maximum voltage 30 V dc at 1 A)
- Worst-case VA: 1 A at -30 V dc (30 VA maximum) indefinitely

– **Inputs**

- Voltage range: 0 V dc to -100 V dc (including transients)
- Differential input voltage: 3 V dc to 72 V dc

– **Reset input activation**

Pulse width: 200 ms (minimum) to 300 ms

I/O modules

You can install a maximum of four I/O modules at the rear of the system (a maximum of four Gbit Ethernet switches, or a maximum of two Gbit Ethernet switches and two Fibre Channel switches). The minimum system configuration requires one Gbit Ethernet switch or pass-thru module. The I/O switch modules provide high-performance connectivity between the blade servers.

See the documentation that comes with each I/O module for a description of the LEDs and connectors on the I/O module.

Chapter 5. Configuring the BladeCenter T unit

The BladeCenter T unit automatically detects the modules and blade servers that are installed and stores the vital product data (VPD). When the BladeCenter T unit is started, the management module automatically configures the remote management port on the management module, accessed through the LAN module on the rear of the BladeCenter T unit, so that you can configure and manage the BladeCenter T unit and blade servers. You configure and manage the BladeCenter T unit remotely, through the management module, using the Web-based user interface.

Note: There are two ways to configure the switch modules; through the management-module Web interface, or through an external switch-module port enabled through the management module, using a Telnet interface or a Web browser. See the documentation that comes with the switch module for more information.

For the active management module to communicate with the I/O modules in the BladeCenter T unit, you must configure the IP addresses for the following internal and external ports:

- The external Ethernet (remote management) port on the management module, accessed through the LAN module on the rear of the BladeCenter T unit (see "Configuring the external Ethernet port" on page 67 for instructions). The initial management module autoconfiguration enables the network management station to connect to the management module to configure the port completely and to configure the rest of the BladeCenter T unit.
- The internal Ethernet port on the management module for communication with the I/O modules (see "Configuring the internal Ethernet port" on page 67 for instructions).
- The management port on each switch module provides for communication with the management module. You configure this port by configuring the IP address for the switch module (see "Configuring management ports on I/O modules" on page 68 for instructions).

  Note: Some types of I/O modules, such as the pass-thru module, have no management port.

See the documentation that comes with the I/O module to determine what else you must configure in the I/O module.

To communicate with the blade servers for functions such as deploying an operating system or application program over the network, you must also configure at least one external (in-band) port on an Ethernet switch module in I/O-module bay 1 or 2. See "What to configure" on page 68 for information about configuring external ports on Ethernet switch modules.

The management module supports the following Web browsers for remote access. The Web browser that you use must be Java™-enabled, must support JavaScript™ 1.2 or later, and must have the Java Virtual Machine (JVM) 1.4.1 or later Plug-in installed. The JVM Plug-in is available at the Java Web site at http://www.java.com/.

- Microsoft Internet Explorer 5.5 (with latest Service Pack installed), or later
- Netscape Navigator 4.72, or later (version 6 is not supported)
- Mozilla version 1.3, or later

For best results when using the Web browser, set the monitor to 256 colors. Use only the video resolutions and refresh rates given in the following table. These are the only video resolution and refresh rate combinations that are supported for all system configurations.

Resolution	Refresh rate
640 x 480	60 Hz
640 x 480	72 Hz
640 x 480	75 Hz
640 x 480	85 Hz
800 x 600	60 Hz
800 x 600	72 Hz
800 x 600	75 Hz
800 x 600	85 Hz
1024 x 768	60 Hz
1024 x 768	75 Hz

The Web interface does not support the double-byte character set (DBCS) languages.

The Web-based user interface communicates with the management and configuration program that is part of the firmware that comes with the management module. You can use this program to perform the following tasks:

- Defining the login IDs and passwords.
- Selecting recipients for alert notification of specific events.
- Monitoring the status of the BladeCenter T unit and blade servers.
- Controlling the BladeCenter T unit and blade servers.
- Accessing the I/O modules to configure them.
- Changing the startup sequence in a blade server.
- Setting the date and time.
- Using a remote console for the blade servers.
- Changing ownership of the keyboard, video, and mouse.
- Changing ownership of the CD-ROM drive and USB ports. (The CD-ROM drive in the BladeCenter T unit is viewed as a USB device by the blade server operating system.)
- Activating On Demand blade servers.
- Setting the active color of the critical (CRT) and major (MJR) alarm LEDs

You also can use the management and configuration program to view some of the blade server configuration settings. See "Management and configuration program" on page 64 for more information.

Setting up the remote connection

To configure and manage the BladeCenter T unit and blade servers, you must first set up the remote connection through an Ethernet port on the LAN module. The LAN module is on the rear of the BladeCenter T unit at the top-right side.
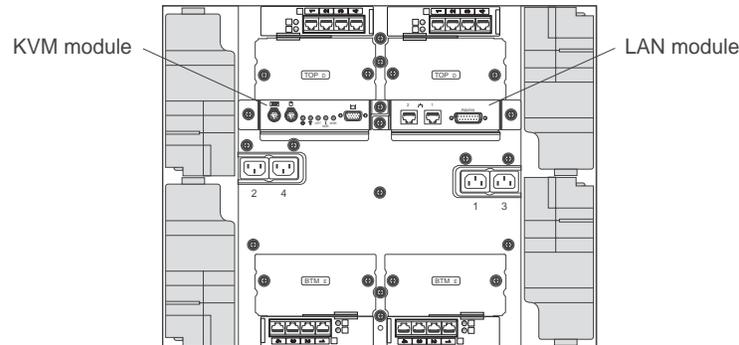
Cabling the Ethernet port

You can connect to an Ethernet port directly from a personal computer (PC) using a cross-over cable, or you can make the connection through an Ethernet switch.

The right Ethernet port on the LAN module is driven by management module 1, and the left Ethernet port of the LAN module is driven by management module 2.

Complete the following steps to connect the Ethernet cable to the management module.
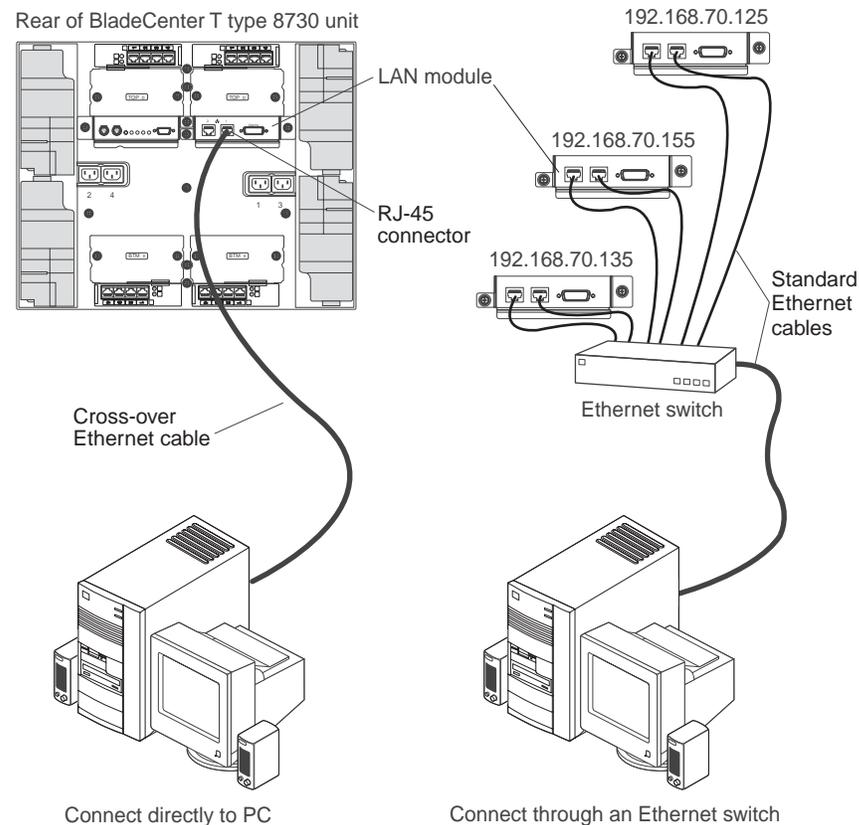
1. Connect one end of a Category 5 or higher Ethernet cable to an Ethernet connector on the LAN module. Connect the other end of an Ethernet cable to the network.
2. Check the Ethernet LEDs to make sure that the network connection is working. The following illustration shows the locations of the Ethernet LEDs on the LAN module.

Ethernet link   Ethernet activity
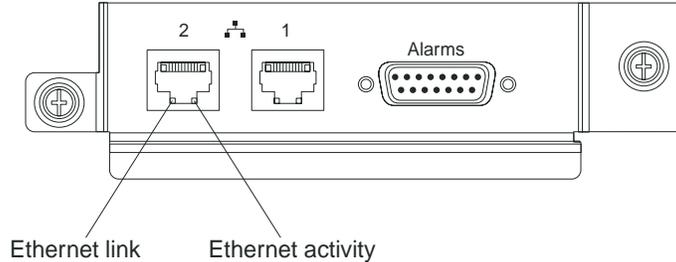
Ethernet link LED
> When this green LED is lit, there is an active connection through the port to the network.

Ethernet activity LED
> When this green LED is flashing, it indicates that there is activity through the port over the network link.

Management and configuration program

This section provides the instructions for setting up and using the management and configuration program in the management module.

Setting up the management and configuration program

Complete the following steps to set up the management and configuration program:

1. Connect a PC to the BladeCenter T management network.
2. At initial power-on, the management module configures the Ethernet port connection in one of the following ways:
   - If you have an accessible, active, and configured dynamic host configuration protocol (DHCP) server on the network, the host name, IP address, gateway address, subnet mask, and DNS server IP address are set automatically.
   - If the DHCP server does not respond within 2 minutes after the port is connected, the management module uses a default IP address of 192.168.70.125 and subnet mask of 255.255.255.0.

   Either of these actions enables the Ethernet to assign a connection.

   If you cannot communicate with a replacement management module through the Web interface. Press the IP reset button on the front of the management module to set the management module to the factory default IP addresses; then, access the management module using the factory IP address (see "Setting up the management and configuration program" for the factory IP addresses) and configure the management module.

   Note: If the IP configuration is assigned by the DHCP server, the network administrator can query the MAC address of the management-module network interface on the DHCP server to determine what IP address and host name are assigned.

Starting the management and configuration program

Complete the following steps to start the management and configuration program:

1. Open a Web browser. In the address or URL field, type the IP address or host name that is defined for the management-module remote connection (see "Setting up the management and configuration program" on page 64 for more details).

   The Enter Network Password window opens.

2. Type your user name and password. If you are logging in to the management module for the first time, you can obtain your user name and password from your system administrator. All login attempts are documented in the event log.

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

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

The BladeCenter T management and configuration window opens.

Note: The upper left corner of the management and configuration window shows the location and identity of the active management module.
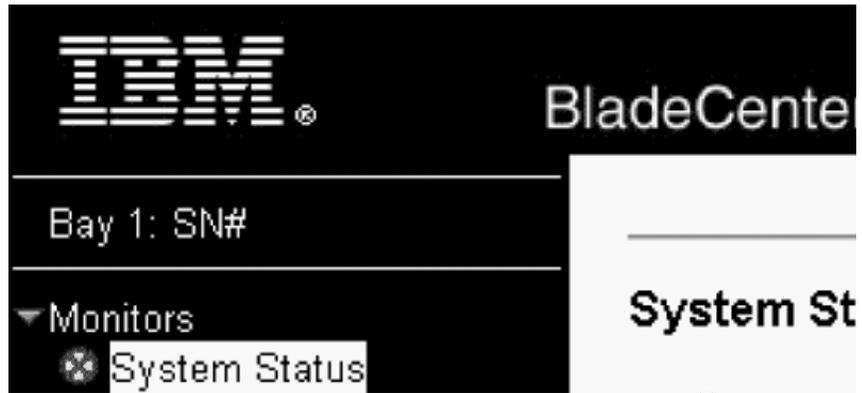
Setting management and configuration program options

From the 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 the BladeCenter T unit and check the status of the components (modules and blade servers). The following information describes the choices that you have to configure the external Ethernet port on the management module, the internal Ethernet port on the management module, and the external management port on each I/O module. See the *BladeCenter T Management Module User's Guide* on the *BladeCenter T Documentation* CD that comes with the BladeCenter T unit for a description of all the navigational links.

Configuring the external Ethernet port

Under **MM Control**, click **Network Interfaces → External Network Interface (eth0)**. This is the interface for the remote management and console port.

- Set **Interface** to **Enabled** to use the Ethernet connection.
- If you plan to use redundant management modules and want both to use the same IP address, disable DHCP and configure and use a static IP address (the IP configuration information will be transferred to the redundant management module automatically when needed). Otherwise, configure the DHCP setting as you prefer. You must configure the static IP address only if DHCP is disabled.
    - **IP address** - The IP address for the management module. The IP address must contain four integers from 0 through 255, separated by periods, with no spaces or consecutive periods. The default setting is 192.168.70.125.
    - **Subnet mask** - The subnet mask must contain four integers from 0 to 255, separated by periods, with no spaces. The default setting is 255.255.255.0
    - **Gateway address** - The IP address for your network gateway router. The gateway address must contain four integers from 0 through 255, separated by periods, with no spaces.

Configuring the internal Ethernet port

Under **MM Control**, click **Network Interfaces → Internal Network Interface (eth1)**. This interface communicates with the network-interface I/O modules, such as the Ethernet switch module or the Fibre Channel switch module.

- Specify the IP address to use for this interface. The IP addresses for the internal Ethernet port (eth1) and external Ethernet port (eth0) must be on the same subnet.
- (Optional) Configure the locally-administered MAC address for this interface; the other fields (data rate, duplex mode, maximum transmission unit (MTU), and burned-in MAC address) are read-only.

Configuring management ports on I/O modules

Under **I/O Module Tasks**, click **Management**; then, click the bay number that corresponds to the I/O module that you are configuring.

- In the **New Static IP address** fields, specify the IP address to use for this interface. The new static IP address must be on the same subnet as the internal network interface (eth1).
- Click **Advanced Management** → **Advanced setup**. Enable the external ports.
- Click **Advanced Management** → **Advanced setup**. (Optional) Enable external management.

Saving and restoring the configuration file

After you have configured the management module, you can save the configuration file to a drive attached to the system running the management-module Web interface. Then, if the configuration in the management module becomes damaged or if the management module is replaced, you can restore the saved configuration file to the management module. Use the management-module Web interface to save and restore the configuration file (**MM Control** → **Configuration File**).

Configuring an I/O module

To connect any of the blade servers to the network, you must have an Ethernet switch module installed in I/O-module bay 1 or 2, or a pass-thru module in I/O-module bay 1 or 2 connected to an external Ethernet switch. If you have an I/O expansion option installed on one or more blade servers, you must have compatible I/O modules (switch modules or other compatible modules) in I/O module bays 3 or 4. See "Removing and installing I/O modules" on page 43 for information about the location and purpose of each I/O module.

What to configure

You must configure switch-module IP addresses and subnet masks through the management-module Web interface to communicate with the management module and remote management station. This is in addition to the IP addresses that are configured on the management module. You might also have to use the user interface on the switch module to configure the switch external ports to operate in the correct link aggregation (trunking) mode, or to configure any VLANs or other special conditions.

To allow blade servers to communicate with the network, make sure that the External ports configuration item in the management module is set to **Enabled**. In the management-module Web interface, under **I/O Module Tasks**, click **Management ″ Bay *n* ″Advanced Management ″ Advanced Setup** and enable the item (where *n* is the number of the I/O bay).

To access the user interface using external ports on the switch module, make sure that the **External management over all ports** configuration item is set to enabled. See your network administrator before enabling this feature.

Because all blade servers in the BladeCenter T unit share access to the external LAN through the switch ports, you can configure the ports on a switch module to operate together as an aggregate link, or trunk. An aggregate link provides more bandwidth than a single link to the attached LAN.

Notes:

1. The attaching LAN switch must have a compatible multiport trunk configuration.

2. Configure link aggregation before you attach cables between the external ports and your LAN equipment.

Configure the switch through the user interface on the switch module, which you can access through the Web interface to the management module (click **I/O Module Tasks → Management → Advanced Management → Start Telnet/Web Session in the navigation pane**).

Important: For a remote management station, such as a management server, to communicate with the switch modules in the BladeCenter T unit, the management port of the switch module must be on the same subnet as the management module.

Supporting Ethernet failover

To have the BladeCenter T unit support Ethernet failover on the blade servers, set up the BladeCenter T unit and blade servers as follows:

1. Configure the Ethernet controllers in one or more blade servers for failover (see the blade server documentation and the operating-system documentation for information). When failover occurs on a blade server, the secondary Ethernet controller takes over network communication, using the I/O module associated with that controller.

2. Install a switch module or a pass-thru module that is connected to external Ethernet switches in both I/O-module bays 1 and 2.

3. Configure the Ethernet switch modules and your network infrastructure so that they can direct traffic to the same destinations.

Configuring the Ethernet controllers in the blade servers

Note: The BladeCenter T unit does not include an Ethernet switch module; this is an optional feature that must be purchased separately. An Ethernet switch module or a pass-thru module is connected to an external Ethernet switch must be installed in the BladeCenter T unit in I/O-module bay 1 or 2, or both, before the integrated Ethernet controllers on each blade server system board can be used.

The Ethernet controllers are integrated on each blade server system board. The Ethernet controllers provide 1-Gbps full-duplex capability only, which enables simultaneous transmission and reception of data to the external ports on the Ethernet switches. You do not need to set any jumpers or configure the controller for the blade server operating system. However, you must install a device driver on the blade server to enable the blade server operating system to address the Ethernet controller. For blade server device drivers and information about configuring the Ethernet controllers, see the Ethernet software CD that comes with your blade server.

BladeCenter T networking guidelines

Your networking administrator should assist in the configuration of the network infrastructure before you connect the BladeCenter T unit to a LAN switch or similar network device. This section provides additional guidelines that might be useful in setting up your system.

A BladeCenter T unit with two Ethernet switch modules and one management module has the internal configuration that is shown in the following illustration:

1 Gbps links

1 Gbps or
100 Mbps links

MAC
1a
1b   1
2a
2b   2
3a
3b   3
4a
4b   4
5a
5b   5
6a
6b   6
7a
7b   7
8a
8b   8

Switch A

10/100 Mbps

Mgmt
Mod

100 Mbps links

Switch B
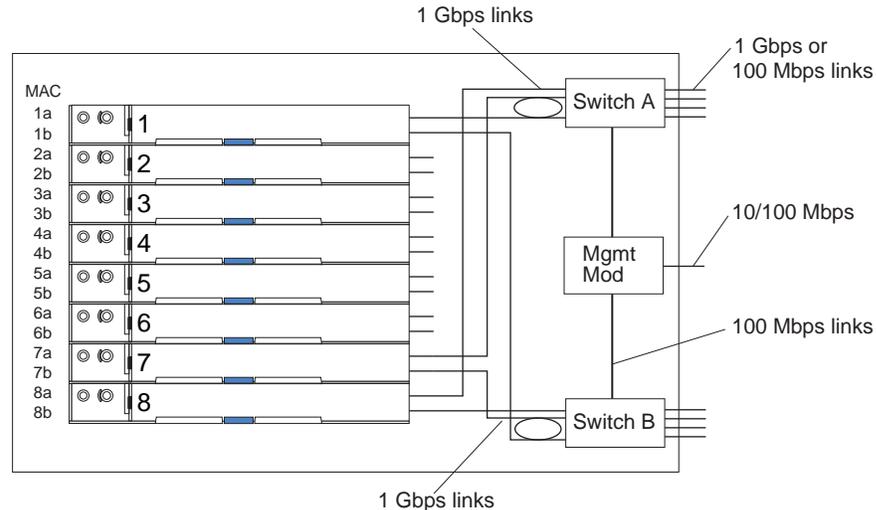
1 Gbps links

Note: 2nd switch module is optional

Each blade server has two independent Ethernet controllers, each with its own MAC address and a dedicated 1 Gbps link to one of the switch modules in I/O module bays 1 and 2 (controller 1 to switch A and controller 2 to switch B in the illustration). In this configuration (the default), the blade servers share access to four external ports on each switch. There is no internal data path between the two switches within the BladeCenter T unit; an external network device is required for data packets to flow from one internal switch to the other.

The management module has a separate internal 100 Mbps link to each switch. These links are for internal management and control only. No data packets are allowed to flow from application programs on the blade servers to the management module over this path. A separate, nonswitched path (not shown) is used for communication between the management module and a service processor on each blade server.

A typical, preferred BladeCenter T network topology is shown in the following illustration. See the *IBM @server BladeCenter T Planning and Installation Guide* for more information and other topologies and guidelines.

Multiport aggregation group
1 Gbps or 100 Mbps links

MAC
1a
1b
2a
2b
3a
3b
4a
4b
5a
5b
6a
6b
7a
7b
8a
8b

1
2
3
4
5
6
7
8

Switch A

Mgmt
Mod

Switch B

MAC
1a
1b
2a
2b
3a
3b
4a
4b
5a
5b
6a
6b
7a
7b
8a
8b

1
2
3
4
5
6
7
8

Switch A

Mgmt
Mod

Switch B

MAC
1a
1b
2a
2b
3a
3b
4a
4b
5a
5b
6a
6b
7a
7b
8a
8b

1
2
3
4
5
6
7
8

Switch A

Mgmt
Mod

Switch B

L2 Switch

10/100 Mbps
management
links

L2+ Switch

Dual
external
switches

L2+ Switch

IBM Director
 - Chassis management
 - Application deployment
 - Internal switches

Establishment
backbone

Network administrator
 - Infrastructure
   management
 - Network hardware
   and software

In this configuration, each BladeCenter T unit contains two Ethernet switch modules and one management module. The external ports on the switch modules are configured for multiport link aggregation groups, or trunks, as are the corresponding ports on the attached external LAN switches. Additionally, every port in the switch module in I/O-module bay 1 (switch A in this illustration) in the BladeCenter T units is connected to the same external LAN switch, and every port in the switch module in I/O-module bay 2 (switch B in this illustration) in the BladeCenter T units is connected to another external LAN switch.

Observe the following guidelines when creating this topology:

1. The external ports on the BladeCenter T switch modules are designed for point-to-point, full-duplex operation to a compatible LAN switch or router. Configure a corresponding multiport link aggregation group, or trunk, in both the switch module and the attached LAN switch before installing the cables. The connection options are as follows, in order of preference:

   • Multiport link aggregation group or trunk, 1 Gbps (1000 Mbps) per port
   • Single-uplink port, 1 Gbps
   • Multiport link aggregation group or trunk, 100 Mbps per port

2. Connect the management-module 10/100 Mbps Ethernet port to a separate layer 2 network for security. If a separate network is not available, you can attach the Ethernet ports of the management module and switch modules to the same layer 2 network.

3. Avoid network configurations that could lead to data loops, if possible. Loops will be created if you connect multiple ports from the same switch module to the same layer 2 network device without first enabling link aggregation. If you

implement configurations that include data loops, you must enable Spanning Tree Protocol on the switch-module external ports.

Using Remote Deployment Manager Version 4.11 Update 3 or later

You can use the Remote Deployment Manager (RDM) Version 4.11 Update 3 (or later) program to install a supported Microsoft Windows operating system or a BIOS update onto a blade server. Follow the instructions in the documentation that comes with the RDM program to install a supported Microsoft Windows operating system, supported Red Hat Advanced server 2.1, or BIOS code update.

Go to the following Web site for updated information about the RDM program and information about how to purchase the software or download an update: http://www.ibm.com/pc/ww/eserver/xseries/systems_management/sys_migration/rdm.html

Using IBM Director

For a complete list of operating systems that support IBM Director, see the IBM Director compatibility document. This document is in PDF at http://www.ibm.com/pc/ww/eserver/xseries/systems_management/nfdir/agent.html/. This document is updated every 6 to 8 weeks.

The IBM Director program is a systems-management product. Through the remote connection on the management module, you can use IBM Director on a management console to configure the BladeCenter T unit, modify the configuration, and set up more advanced features.

Notes:

1. Some tasks, such as software distribution, require an in-band connection from IBM Director Server through a campus (public) LAN to a switch-module port.

2. See the IBM Support Web site at http://www.ibm.com/pc/support/ for the version of IBM Director software that you can use to manage redundant management modules.

Communicating with the IBM Director software

For a complete list of operating systems that support IBM Director, see the IBM Director compatibility document. This document is in PDF at http://www.ibm.com/pc/ww/eserver/xseries/systems_management/nfdir/agent.html/. It is updated every 6 to 8 weeks.

Note: See the illustration on page 70 for an example of a typical network configuration. See the *IBM @server BladeCenter T Planning and Installation Guide* for more examples of network configurations. You can obtain the planning guide from http://www.ibm.com/pc/support/.

To communicate with the BladeCenter T unit, the IBM Director software needs a managed object (in the Group Contents pane of the IBM Director Management Console main window) that represents the BladeCenter T unit. If the BladeCenter T management-module IP address is known, the network administrator can create an IBM Director managed object for the unit. If the IP address is not known, the IBM Director software can automatically discover the BladeCenter T unit (out-of-band, using the Ethernet port on the management module) and create a managed object for the unit.

For the IBM Director software to discover the BladeCenter T unit, your network must initially provide connectivity from the IBM Director server to the BladeCenter T management-module Ethernet port. To establish connectivity, the management module attempts to use DHCP to acquire its initial IP address for the Ethernet port. If the DHCP request fails, the management module uses a static IP address. Therefore, the DHCP server (if used) must be on the management LAN for the BladeCenter T unit.

Notes:

1. All management modules are preconfigured with the same static IP address. You can use the management-module Web interface to assign a new static IP address for each BladeCenter T unit. If DHCP is not used and you do not assign a new static IP address for each BladeCenter T unit before attempting to communicate with the IBM Director software, only one BladeCenter T unit at a time can be added onto the network for discovery. Adding multiple units to the network without a unique IP address assignment for each BladeCenter T unit results in IP address conflicts.

2. For switch communication with the IBM Director server through the management-module external Ethernet port, the switch-module internal network interface and the management-module internal and external interfaces must be on the same subnet.

Chapter 6. Solving problems

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

If you cannot locate and correct the problem using the information in this section, see the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *BladeCenter T Documentation* CD for more information.

Diagnostic tools overview

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

- **Troubleshooting charts**

  These charts list problem symptoms and steps to correct the problems. See the "Troubleshooting charts" on page 76 for more information.

- **Diagnostic programs and error messages**

  The built-in self-test (BIST) program checks the BladeCenter T unit during startup and generates error messages if problems are found.

  The system diagnostic program, Real Time Diagnostics Version 1.3, tests the major components of your BladeCenter T unit. It is run from the IBM Director Management Console window (under the **BladeCenter T** task in the Task panel).

  Complete the following steps to obtain the Real Time Diagnostics program:

  1. Go to http://www.ibm.com/pc/support/.
  2. Select **Servers** from the list on the left side of the window.
  3. Select **Downloadable files** from the list on the left side of the window.
  4. In the **Downloadable files by category** list, select **Diagnostic**.
  5. Click the entry for Real Time Diagnostics and follow the instructions on that page.

- **Light path diagnostics feature**

  Use the light path diagnostics feature to identify system errors quickly. On the BladeCenter T unit, the light path diagnostics feature consists of the LEDs on the front of the BladeCenter T unit and on the front of the modules and blade servers.

Troubleshooting charts

You can use the troubleshooting charts in this section to find solutions to problems that have definite symptoms.

Note: The symptoms for monitor, keyboard, and mouse apply only to the devices connected to the management module; they do not apply to the remote console.

See the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *BladeCenter T Documentation* CD for more detailed information about testing the BladeCenter T unit. If you have run the diagnostic test programs or if running the tests does not reveal the problem, call for service.

Attention: If diagnostic error messages appear that are not listed in the *Hardware Maintenance Manual and Troubleshooting Guide*, make sure that your BladeCenter T unit has the latest level of firmware code installed.

If you have just added a new option and your system is not working, complete the following procedure before using the troubleshooting charts:

1. Remove the option that you just added.
2. Run the diagnostic tests to determine if your system is running correctly.
3. Reinstall the new device.

Monitor problems

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

Some IBM monitors have their own self-tests. If you suspect a problem with your monitor, see the information that comes with the monitor for instructions for testing and adjusting the monitor. If you cannot diagnose the problem, call for service.

Device	Suggested action
The monitor screen goes blank when you direct it to a working blade server or goes blank when you start some application programs in the blade servers.	Make sure that the monitor cable is connected to the video connector on the BladeCenter T KVM module and that the KVM module LEDs indicate that the module is functioning. Some IBM monitors have their own self-tests. If you suspect a problem with your monitor, see the information that comes with the monitor for adjusting and testing instructions. If you cannot diagnose the problem, try replacing the KVM module. If the problem remains, replace the monitor.
The screen is blank.	Make sure that: • The power cords are properly connected to the BladeCenter T unit. • The monitor cables are connected correctly. • The monitor is turned on and the brightness and contrast controls are adjusted correctly. • The monitor is owned by a blade server that is turned on. If the problem remains, call for service.
Only the cursor appears.	Try switching the monitor to another blade server. • If the problem goes away, troubleshoot the blade sever for which only the cursor appears. • If the problem remains, call for service.

Device	Suggested action
The monitor has screen jitter, or the screen image is wavy, unreadable, rolling, or distorted.	If the monitor self-tests show the monitor is working correctly, consider the location of the monitor. Magnetic fields around other devices (such as transformers, appliances, fluorescent lights, and other monitors) can cause screen jitter or wavy, unreadable, rolling, or distorted screen images. If this happens, turn off the monitor. (Moving a color monitor while it is turned on might cause screen discoloration.) Then move the device and the monitor at least 305 mm (12 in.) apart. Turn on the monitor. **Notes:** 1. Non-IBM monitor cables might cause unpredictable problems. 2. An enhanced monitor cable with additional shielding is available for the 9521 and 9527 monitors. For information about the enhanced monitor cable, contact your IBM marketing representative or authorized reseller. If the problem remains, call for service.
All other symptoms	Troubleshoot the blade server that is the current owner of the keyboard, video, and monitor.

Power problems

Device	Suggested action
The BladeCenter T unit does not start.	• Make sure that the power cords are properly connected to the BladeCenter T unit. • Make sure that the 220-volt PDU or electrical outlet is working correctly. • Make sure that the LEDs on the power module are on. • If you just installed an option, remove it, and restart the BladeCenter T unit. If the BladeCenter T unit now starts, you might have installed more options than the power module supports. If the problem remains, call for service.

Management module problems

Device	Suggested action
Management module does not complete changeover to redundant module on hardware failure.	Call for service.

Blower module problems

Device	Suggested action
Blower module operates at full speed, with no regulation.	Make sure that both blower modules are functioning (neither has failed). If a blower module has failed, replace the module as soon as possible.

Options problems

Device	Suggested action
An IBM option that was just installed does not work.	Make sure that: • The option is designed for the BladeCenter T unit. See the "Server Support" flowchart on the inside of the front cover for information about obtaining ServerProven® compatibility information from the World Wide Web. • You followed the installation instructions that come with the option. • The option is installed correctly. • You have not loosened any other installed options or cables. If the problem remains, call for service.
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 test instructions, use those instructions to test the option. If the problem remains, call for service.

Light path diagnostics feature

On the BladeCenter T system, the light path diagnostics feature consists of the LEDs on the front and rear of the BladeCenter T unit and on the front of the modules and blade servers. If a system-alarm LED on the system-status panels on the BladeCenter T unit is lit, one or more error LEDs on the BladeCenter T components also might be on. These LEDs help identify the cause of the problem.

Identifying problems using the light path diagnostics feature

This section provides the information to identify, using the light path diagnostics feature, 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.

The following example illustrates how to use the light path diagnostics feature to diagnose a system error:

1. Note that a BladeCenter T system-error LED is lit on the system-status panel.
2. Locate the module or blade server that also has an error LED lit (see Chapter 4, "BladeCenter T components, controls, and LEDs," on page 51 for the location of error LEDs; see the documentation that comes with your blade server for the location of error LEDs on the blade server).
   a. If the component is a module, replace the module.
   b. If the component is a blade server with its system error LED lit, follow the instructions in the documentation that comes with the blade server to isolate and correct the problem.

Light path diagnostics LEDs

A system-alarm LED on the system-status panel is lit when certain system errors occur. If one of the system-alarm LEDs on your BladeCenter T unit is lit, use the following table to help determine the cause of the error and the action you should take.

Note: You can configure the major and critical alarm LEDs to be either amber or red through the management module.

Table 5. Light path diagnostics

Lit LED	Cause	Action
BladeCenter T system-status panel		
Location	A condition has occurred in the BladeCenter T unit that has caused the remote system management to identify the BladeCenter T unit as needing attention.	Look for any information or error LEDs on the system-status panels, the modules, and the blade servers in this BladeCenter T unit, and follow the instructions in this table for those LEDs.
Minor (MNR)	A noncritical event has occurred that should be looked at, such as the wrong I/O module inserted in a bay.	Check the error log for the messages. Check the LEDs on the BladeCenter T unit and the blade servers to isolate the component.
Major (MJR)	A major system error has occurred, such as the loss of one of two mirrored disks. **Note:** You can configure the major error LED to be either red or amber through the management module.	• Check the error log for messages. • Look for an error LED on the modules and blade servers to locate the component: – If the error LED is on a module, follow the instructions for the module in this table. – If the error LED is on a blade server, see the documentation that comes with the blade server.
Critical (CRT)	A critical system error has occurred, such as nonredundancy on the power modules or a system error in a blade server. **Note:** You can configure the critical error LED to be either red or amber through the management module.	• Check the error log for messages. • Look for an error LED on the modules and blade servers to locate the component: – If the error LED is on a module, follow the instructions for the module in this table. – If the error LED is on a blade server, see the documentation that comes with the blade server.
Management module		
System error	A critical error has occurred in the management module.	• If your BladeCenter T unit has only one management module: 1. Try reseating the management module. 2. Restart the management module. If the problem remains, replace the management module. • If your BladeCenter T unit has two management modules, the BladeCenter T unit continues to function using the redundant module. Replace the failed management module.

Table 5. Light path diagnostics (continued)

Lit LED	Cause	Action
Active	Primary management module.	If your BladeCenter T has two management modules, the Active LED indicates which is the primary management module.
Power module		
System error	A critical error has occurred in the power module.	Reseat the power module. If the problem remains, replace the module. If your BladeCenter T unit has a redundant module for this power module, the BladeCenter T unit continues to function using the redundant module.
Blower module		
System error	The blower has failed or is operating too slowly.	Reseat the blower module. If the problem remains, replace the blower module as soon as possible, to regain cooling redundancy. The BladeCenter T unit continues to function. The remaining three blowers increase their speed to cool the BladeCenter T unit and blade servers.
I/O module		
System error	A critical error has occurred in the I/O module.	Reseat the I/O module. If the problem remains, replace the module.

Chapter 7. Sharing resources among the blade servers

The IBM @server BladeCenter T Type 8720 or 8730 unit provides resources that are available to all blade servers at all times, such as power modules, cooling, system management, and network I/O modules; no user intervention is required. Some resources are selectable for use by a single blade server at a time, such as the CD-ROM drive, USB port units (media tray), or the keyboard-video-mouse (KVM) module. There are several ways to select resources for a blade server:

- Each blade server has two selection buttons on the front of the blade: CD and |◯|.

    - To switch the keyboard, video, and mouse to a specific blade server, press the |◯| button on that blade server.
    - To switch the CD-ROM and USB ports to a specific blade server, press the CD button on that blade server.

    The management module immediately assigns the resource to the blade server requesting it.

- You can use the management module Web interface to change ownership of the keyboard, video, and mouse, or the CD-ROM drive, and USB ports (**Blade tasks→ Remote control**).

- You can press keyboard keys in the following sequence to switch KVM control between blade servers:

    NumLock NumLock *blade_server_number* Enter

    Where *blade_server_number* is the two-digit number for the blade bay in which the blade server is installed. When using some keyboards, such as the 28L3644 (37L0888) keyboard, you will need to hold down the Shift key while entering this key sequence.

Notes:

1. It can take up to 20 seconds for the operating system in the switched-to blade server to recognize the CD-ROM drive, and USB ports, or the keyboard, video, and mouse.

2. If you install Microsoft Windows 2000 on a blade server while it is not the current owner of the keyboard, video, and mouse, the first time the blade server requests ownership after the operating system has been installed, it can take up to 1 minute for the operating system to recognize the devices (this is a one-time-only occurrance).

3. The operating system in the blade server must provide USB support for the blade server to recognize and use the keyboard, mouse, and CD-ROM drive. The BladeCenter T unit uses USB for internal communication with these devices.

4. You can use the management-module Web interface to enable or disable the select buttons (**Blade tasks→ Remote control**) on the blade servers.

5. The monitor attached to the BladeCenter T management module normally shows the video output from the blade server that is the current owner of the keyboard, video, and mouse (KVM). When there is no actively selected video from any blade server, the video from blade server 8 is routed to the management module. While the management module is restarting, there is temporarily no current KVM owner. The video from blade server 8 displays on the monitor briefly until the management module uses its NVRAM values to

reestablish ownership of the KVM and media tray (CD-ROM drive, and USB ports). After that, the video from the blade server that is the current KVM owner is displayed on the monitor.

Attention: Do not switch the CD-ROM drive, and USB ports to another blade server while a transaction is taking place on the CD-ROM drive. (Activity lights on the CD-ROM drive must be off.) Data damage can occur.

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 or IntelliStation® 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 *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *BladeCenter T 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 or to submit a request for information.

You can solve many problems without outside assistance by following the troubleshooting procedures that IBM provides in the online help or in the publications that are provided with your system and software. The information that comes with your system also describes the diagnostic tests that you can perform. Most @server 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 or IntelliStation system and preinstalled software, if any, is available in the documentation that comes with your system. That documentation includes printed books, online books, readme files, and help files. See the troubleshooting information in your system documentation for instructions for using the diagnostic programs. The troubleshooting information or the diagnostic programs might tell you that you need additional or updated device drivers or other software. IBM maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates. To access these pages, go to http://www.ibm.com/pc/support/ and follow the instructions. Also, you can order publications through the IBM Publications Ordering System at
http://www.elink.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 and IntelliStation products, services, and support. The address for IBM @server 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 BladeCenter T units, 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 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.

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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.*

<u>**EUROPE, MIDDLE EAST, AFRICA (EMEA)**</u>

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.

How 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 - IBM @server **BladeCenter T Type 8720 or 8730**

Country or Region of Purchase	Warranty Period	Type of Warranty Service*
Worldwide	3 years	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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Important notes

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

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

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

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

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

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

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

Product recycling and disposal

This unit contains materials such as circuit boards, cables, electromagnetic compatibility gaskets, and connectors which may contain lead and copper/beryllium alloys that require special handling and disposal at end of life. Before this unit is disposed of, these materials must be removed and recycled or discarded according to applicable regulations. IBM offers product-return programs in several countries. Information on product recycling offerings can be found on IBM's Internet site at http://www.ibm.com/ibm/environment/products/prp.shtml.

Battery return program

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

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

In the Netherlands, the following applies.

Electronic emission notices

Federal Communications Commission (FCC) statement

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

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

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

Industry Canada Class A emission compliance statement

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

Avis de conformité à la réglementation d'Industrie Canada

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

Australia and New Zealand Class A statement

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

United Kingdom telecommunications safety requirement

Notice to Customers

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

European Union EMC Directive conformance statement

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

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

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

Taiwanese Class A warning statement

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

Chinese Class A warning statement

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

Japanese Voluntary Control Council for Interference (VCCI) statement

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

Power cords

For your safety, IBM provides a power cord with a grounded attachment plug to use with this IBM product. To avoid electrical shock, always use the power cord and plug with a properly grounded outlet.

IBM power cords used in the United States and Canada are listed by Underwriter's Laboratories (UL) and certified by the Canadian Standards Association (CSA).

For units intended to be operated at 115 volts: Use a UL-listed and CSA-certified cord set consisting of a minimum 18 AWG, Type SVT or SJT, three-conductor cord, a maximum of 15 feet in length and a parallel blade, grounding-type attachment plug rated 15 amperes, 125 volts.

For units intended to be operated at 230 volts (U.S. use): Use a UL-listed and CSA-certified cord set consisting of a minimum 18 AWG, Type SVT or SJT, three-conductor cord, a maximum of 15 feet in length and a tandem blade, grounding-type attachment plug rated 15 amperes, 250 volts.

For units intended to be operated at 230 volts (outside the U.S.): Use a cord set with a grounding-type attachment plug. The cord set should have the appropriate safety approvals for the country in which the equipment will be installed.

IBM power cords for a specific country or region are usually available only in that country or region.

IBM power cord part number	Used in these countries and regions
02K0546	China
13F9940	Australia, Fiji, Kiribati, Nauru, New Zealand, Papua New Guinea
13F9979	Afghanistan, Albania, Algeria, Andorra, Angola, Armenia, Austria, Azerbaijan, Belarus, Belgium, Benin, Bosnia and Herzegovina, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo (Democratic Republic of), Congo (Republic of), Cote D'Ivoire (Ivory Coast), Croatia (Republic of), Czech Republic, Dahomey, Djibouti, Egypt, Equatorial Guinea, Eritrea, Estonia, Ethiopia, Finland, France, French Guyana, French Polynesia, Germany, Greece, Guadeloupe, Guinea, Guinea Bissau, Hungary, Iceland, Indonesia, Iran, Kazakhstan, Kyrgyzstan, Laos (People's Democratic Republic of), Latvia, Lebanon, Lithuania, Luxembourg, Macedonia (former Yugoslav Republic of), Madagascar, Mali, Martinique, Mauritania, Mauritius, Mayotte, Moldova (Republic of), Monaco, Mongolia, Morocco, Mozambique, Netherlands, New Caledonia, Niger, Norway, Poland, Portugal, Reunion, Romania, Russian Federation, Rwanda, Sao Tome and Principe, Saudi Arabia, Senegal, Serbia, Slovakia, Slovenia (Republic of), Somalia, Spain, Suriname, Sweden, Syrian Arab Republic, Tajikistan, Tahiti, Togo, Tunisia, Turkey, Turkmenistan, Ukraine, Upper Volta, Uzbekistan, Vanuatu, Vietnam, Wallis and Futuna, Yugoslavia (Federal Republic of), Zaire
13F9997	Denmark
14F0015	Bangladesh, Lesotho, Macao, Maldives, Namibia, Nepal, Pakistan, Samoa, South Africa, Sri Lanka, Swaziland, Uganda

IBM power cord part number	Used in these countries and regions
14F0033	Abu Dhabi, Bahrain, Botswana, Brunei Darussalam, Channel Islands, China (Hong Kong S.A.R.), Cyprus, Dominica, Gambia, Ghana, Grenada, Iraq, Ireland, Jordan, Kenya, Kuwait, Liberia, Malawi, Malaysia, Malta, Myanmar (Burma), Nigeria, Oman, Polynesia, Qatar, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Seychelles, Sierra Leone, Singapore, Sudan, Tanzania (United Republic of), Trinidad and Tobago, United Arab Emirates (Dubai), United Kingdom, Yemen, Zambia, Zimbabwe
14F0051	Liechtenstein, Switzerland
14F0069	Chile, Italy, Libyan Arab Jamahiriya
14F0087	Israel
1838574	Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Brazil, Caicos Islands, Canada, Cayman Islands, Costa Rica, Colombia, Cuba, Dominican Republic, Ecuador, El Salvador, Guam, Guatemala, Haiti, Honduras, Jamaica, Japan, Mexico, Micronesia (Federal States of), Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Taiwan, United States of America, Venezuela
24P6858	Korea (Democratic People's Republic of), Korea (Republic of)
34G0232	Japan
36L8880	Argentina, Paraguay, Uruguay
49P2078	India
49P2110	Brazil
6952300	Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Caicos Islands, Canada, Cayman Islands, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guam, Guatemala, Haiti, Honduras, Jamaica, Mexico, Micronesia (Federal States of), Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Saudi Arabia, Thailand, Taiwan, United States of America, Venezuela

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