



BladeCenter T
Type 8267

Installation and User's Guide





BladeCenter T

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Note: Before using this information and the product it supports, read the general information in “Notices” on page 77, the *IBM Safety Information* and the *Environmental Notices and User Guide* on the IBM *Documentation CD*, and the *Warranty Information* document.

The most recent version of this document is available at <http://www.ibm.com/supportportal/> .

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Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الأمنية

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

在安裝本产品之前，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 pečítajte Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

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

Läs säkerhetsinformationen innan du installerar den här produkten.

Safety statements

These statements provide the caution and danger information that is used in this documentation.

Important:

Each caution and danger statement in this documentation is labeled with a number. This number is used to cross reference an English-language caution or danger statement with translated versions of the caution or danger statement in the *Safety Information* document.

For example, if a caution statement is labeled "Statement 1," translations for that caution statement are in the *Safety Information* document under "Statement 1."

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

Statement 1



DANGER

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

To avoid a shock hazard:

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

To Connect:

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

To Disconnect:

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

Statement 2



CAUTION:

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

Do not:

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

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

Statement 3



CAUTION:

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

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



DANGER

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

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

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

Statement 4



≥ 18 kg (39.7 lb)



≥ 32 kg (70.5 lb)



≥ 55 kg (121.2 lb)

CAUTION:

Use safe practices when lifting.

Statement 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 21



CAUTION:

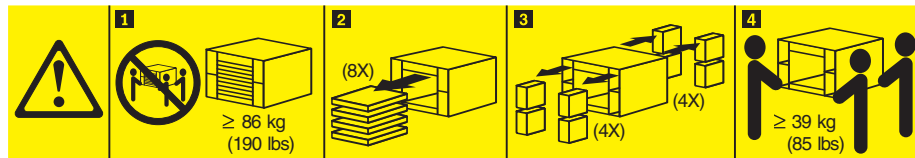
Hazardous energy is present when the blade is connected to the power source. Always replace the blade cover before installing the blade.

Statement 32



CAUTION:

To avoid personal injury, before lifting the unit, remove all the blades, power supplies, and removable modules to reduce the weight.

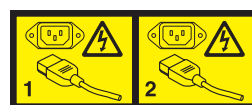


Statement 33



CAUTION:

This device does not provide a power control button. Removing power supply modules or turning off the server blades does 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.



Rack Safety Information, Statement 2



DANGER

- Always lower the leveling pads on the rack cabinet.
- Always install stabilizer brackets on the rack cabinet.
- Always install servers and optional devices starting from the bottom of the rack cabinet.
- Always install the heaviest devices in the bottom of the rack cabinet.

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.

Chapter 1. Introduction

The IBM BladeCenter® T Type 8267 unit is rack-mounted, high-density, high-performance blade server systems developed for demanding environments requiring physical robustness and improved cooling support

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 (DVD/CD-RW drive and connectors for USB, network interfaces, and, for blade servers that support the KVM function, keyboard, video, and mouse).

Performance, ease of use, reliability, robustness (designed for NEBS Level 3 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 *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 8267 model and other IBM server products at <http://www.ibm.com/supportportal/>.

You can register the BladeCenter T unit and blade servers at <http://www.ibm.com/support/mysupport>.

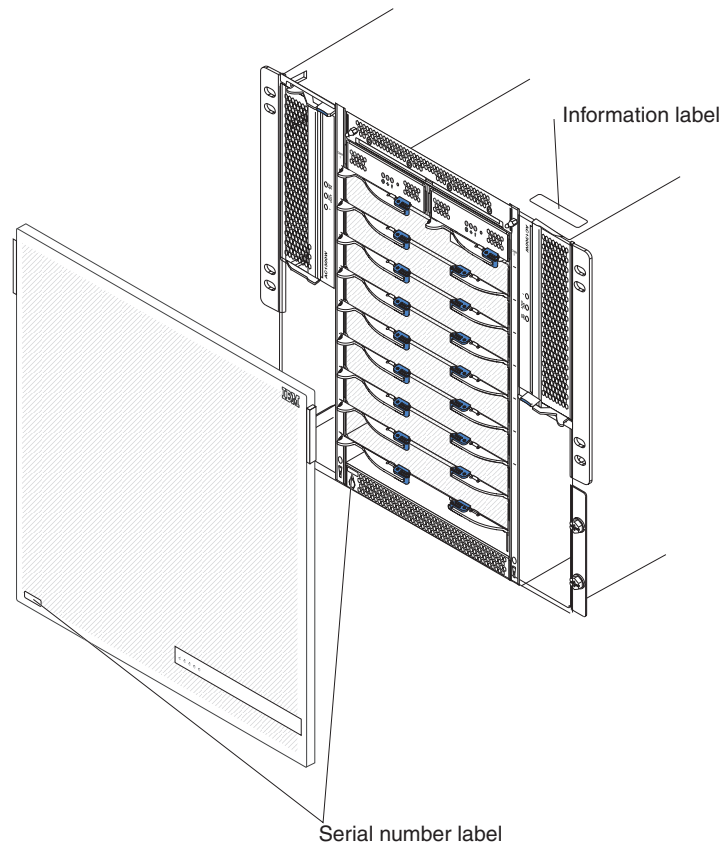
Record information about your BladeCenter T unit in the following table. You will need this information when you register the BladeCenter T unit with IBM.

Product name	IBM BladeCenter T unit
Machine type	8267
Model number	_____
Serial number	_____

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

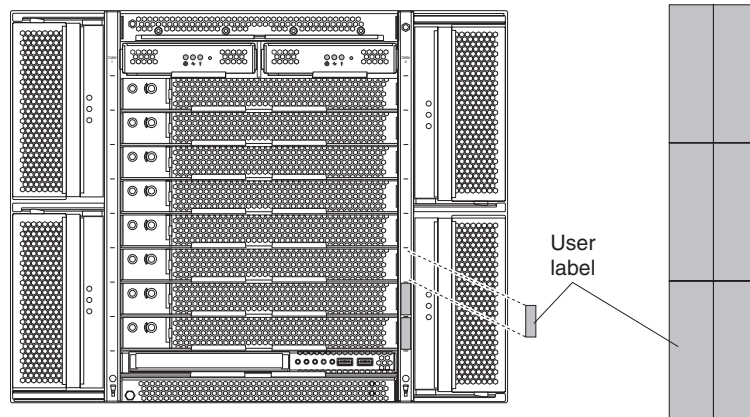
- Top of the BladeCenter T unit
- Front of the bezel assembly (if ordered with your system)
- Front of the BladeCenter T unit

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.



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 8267 unit comes with the following items:

- Bezel assembly with filter (if ordered with your system)
- BladeCenter T unit lift handles (4)
- Four power distribution unit (PDU) power cords
- Documentation package, which includes the IBM *Documentation CD*

Related documentation

In addition to this *Installation and User's Guide*, the following documentation is provided in PDF on the *IBM 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.

Note: The BladeCenter T unit can also be installed in some xSeries® and pSeries® racks, such as the IBM Netbay42 Enterprise Rack Model 9308. See the installation instructions that come with those racks.

- *BladeCenter T Type 8267 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.

Additional documents might be included on the *IBM 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. To check for updated documentation and technical updates, go to <http://www.ibm.com/supportportal/>.

Features and specifications

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

Table 1. Features and specifications

<p>Media tray (on front):</p> <ul style="list-style-type: none"> DVD/CD-RW drive: slim SATA Two Universal Serial Bus (USB) v2.0 high speed ports System-status panel <p>Module bays (on front):</p> <ul style="list-style-type: none"> Eight hot-swap blade bays Four hot-swap power-module bays Two hot-swap management module bays <p>Module bays (on rear):</p> <ul style="list-style-type: none"> 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 <p>Power modules:</p> <ul style="list-style-type: none"> Four 1300-watt power modules <ul style="list-style-type: none"> Power modules 1 and 2 supply power to: <ul style="list-style-type: none"> Blade bays 1 through 4 Management modules 1 and 2 I/O modules 1 and 2 Media tray All KVM, LAN, and serial interfaces All four blower modules Power modules 1 and 2 provide redundancy to each other Power modules 3 and 4 supply power to: <ul style="list-style-type: none"> 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 <p>LAN module:</p> <ul style="list-style-type: none"> Two 10/100 Mb Ethernet remote management connections One DB60 serial port connector <p>KVM module:</p> <ul style="list-style-type: none"> Video port (analog) USB keyboard port USB mouse port System-status panel 	<p>I/O modules:</p> <ul style="list-style-type: none"> Standard: None Maximum: Four <ul style="list-style-type: none"> Two hot-swap 1 Gb Ethernet four-port switch modules Two hot-swap switch modules of another network-communication standard, such as Fibre Channel <p>Management module: Two hot-swap management modules (one active, one redundant) providing system-management functions for the BladeCenter T unit.</p> <p>Redundant cooling: Four variable-speed hot-swap blowers</p> <p>Front bezel with changeable filter (depending on model)</p> <p>Upgradeable microcode:</p> <ul style="list-style-type: none"> management module firmware I/O-module firmware (not all I/O module types) Blade server service processor firmware (UEFI, service processor) <p>Size (8 U):</p> <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> Fully configured with modules and blade servers: Approx. 89.4 kg (197 lb) Shipping without blade servers: Approx. 52.6 kg (116 lb) <p>Security features:</p> <ul style="list-style-type: none"> Login password for remote connection Lightweight Directory Access Protocol (LDAP) and role based security for user authentication and authorization Secure Shell (SSH) for remote command-line interface Secure socket layer (SSL) security for remote web interface access 	<p>Environment:</p> <ul style="list-style-type: none"> Air temperature: <ul style="list-style-type: none"> Altitude: -60 to 1800 m (-197 ft to 6000 ft) <ul style="list-style-type: none"> BladeCenter T on: 5° to 40°C (41° to 104°F) BladeCenter T on (short term)(Short-term refers to a period of not more than 96 consecutive hours and a total of not more than 15 days in one year. (This refers to a total of 360 hours in any given year, but no more than 15 occurrences during that one-year period.))): -5° to 55°C (23° to 131°F)(For operation above 40°C (104°F), all power modules must be installed and energized to allow current-sharing between the paired power modules.) Altitude: 1800 m to 4000 m (6000 ft to 13000 ft) <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> 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: 95%, non-condensing at temperatures of 23°C (73°F) to 40°C (104°F) <p>Electrical input:</p> <ul style="list-style-type: none"> Sine-wave input (50 or 60 Hz single-phase) required Input voltage low range: <ul style="list-style-type: none"> Minimum: 100 V ac Maximum: 127 V ac Input voltage high range: <ul style="list-style-type: none"> Minimum: 200 V ac Maximum: 240 V ac Input current: <ul style="list-style-type: none"> Chassis: <ul style="list-style-type: none"> (2x) 14.8 Amps (Irms nominal) at 100VAC (2x) 7.2 Amps (Irms nominal) at 200VAC Input connector type: Four (4) C20 inputs, rated at 20 amps each
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Table 1. Features and specifications (continued)

Declared acoustical noise emission levels for normal operations: <ul style="list-style-type: none"> • Sound-power levels (upper-limit): 7.8 bels • Sound-pressure levels (average), for four one-meter bystander positions: 63 dBA <p>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.</p>	Predictive Failure Analysis (PFA) alerts: <ul style="list-style-type: none"> • Blowers • Blade-dependent features • Power supplies 	Heat output: <ul style="list-style-type: none"> • Input kilovolt-amperes (kVA) approx. <ul style="list-style-type: none"> – Minimum configuration: 0.2 kVA – Maximum configuration: 3.7 kVA • BTU output <ul style="list-style-type: none"> – Ship configuration: 673 Btu/hour (197 watts) – Full configuration: 12640 Btu/hour (3707 watts)
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Notes:

1. For details about the BladeCenter T unit port specifications, see BladeCenter T unit power, controls, and indicators.
2. For information about which types of I/O modules can be installed in which I/O-module bays, see I/O modules.
3. The operating system in the blade server must provide USB support for the blade server to recognize and use the keyboard, mouse, and DVD/CD-RW drive. The BladeCenter T unit uses USB for internal communication with these devices.

The IBM BladeCenter T Documentation CD

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

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

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 Ctrl+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 *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 “Removing and installing power modules” 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 (5° to 40°C or 41° to 104°F), 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. For operation above 40°C (104°F), all power modules must be installed and energized to allow current-sharing between the paired power modules.
- **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 the documentation for your management module for instructions. 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 (for blade servers that support the KVM function) 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 “Configuring the BladeCenter unit” on page 55 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 week¹
- 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

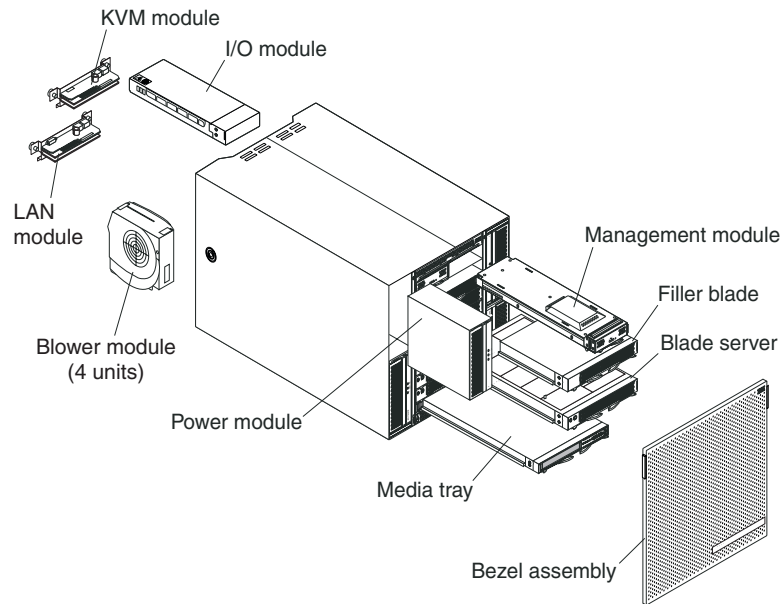
1. Service availability will vary by country. Response time varies; may exclude holidays.

- Media tray
- Power modules
- System automatic inventory at startup
- System error logging

Major components of the BladeCenter T Type 8267

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

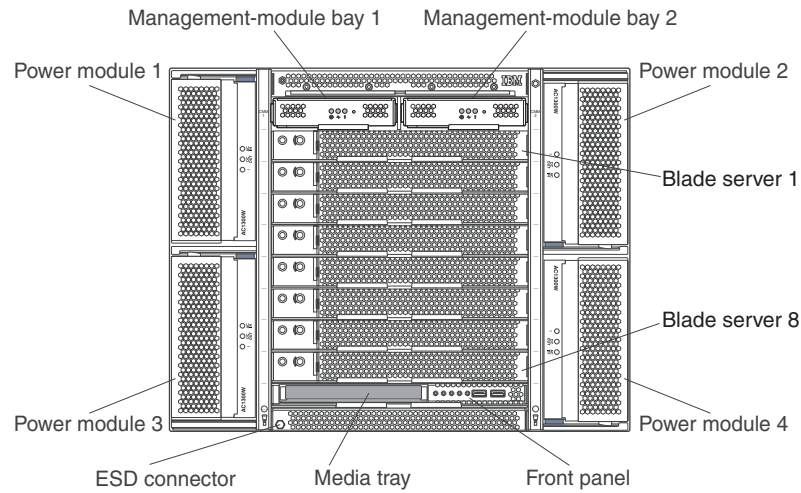
Note: The illustrations in this document might differ slightly from your hardware.



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

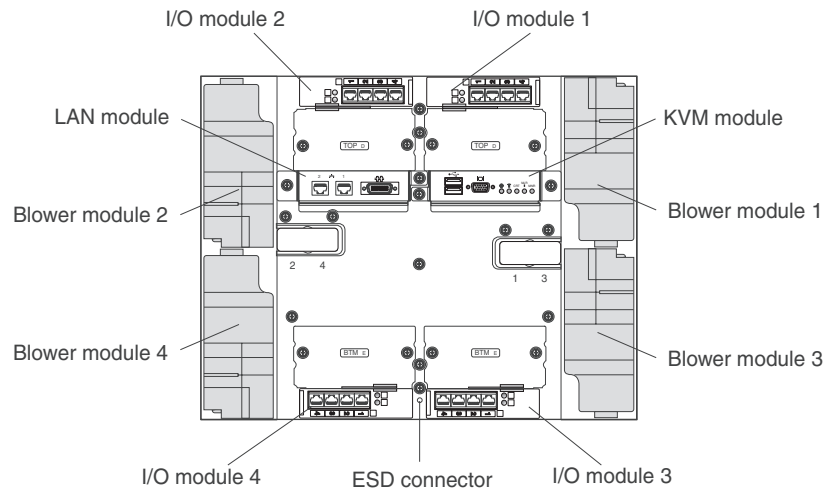
The following illustration shows the components on the front view of the BladeCenter T unit.



See Chapter 4, “BladeCenter T components, controls, and LEDs,” on page 45 for details about the components and indicators.

Rear view

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



See Chapter 4, “BladeCenter T components, controls, and LEDs,” on page 45 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.

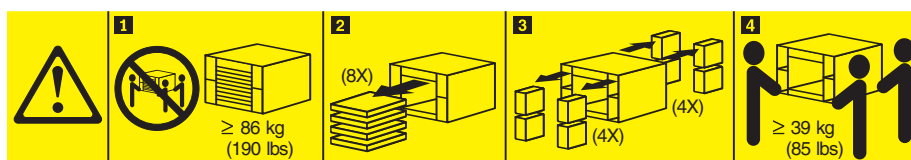
Rack installation guidelines

Statement 32



CAUTION:

To avoid personal injury, before lifting the unit, remove all the blades, power supplies, and removable modules to reduce the weight.



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 “Removing and installing power modules” 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 “Safety” on page v and the guidelines in “Handling static-sensitive devices” on page 14. 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/servers/eserver/serverproven/compat/us/>.

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.

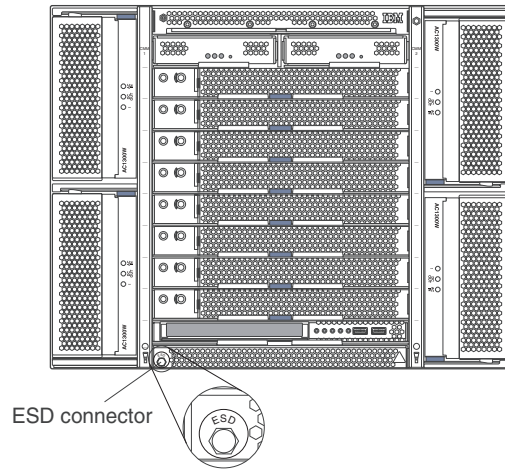
Handling static-sensitive devices

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.

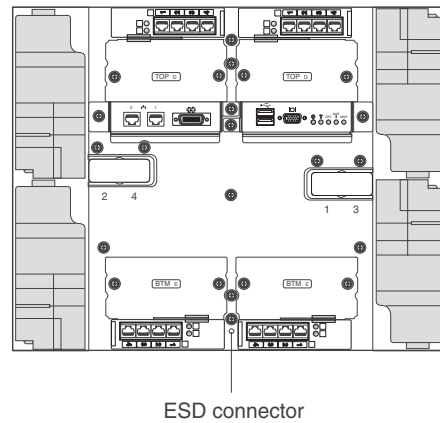
Use an ESD wrist strap and the ESD connectors on the BladeCenter T unit. Electrostatic discharge (ESD) is the release of stored static electricity that can damage electric circuits. Static electricity is often stored in your body and discharged when you come in contact with an object with a different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



Location of ESD connector (rear of unit)



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 “Removing and installing power modules” on page 25 for detailed instructions for removing modules and fillers from the BladeCenter T unit.
- Install the BladeCenter T unit in a rack before connecting to power or installing any blowers, power modules, or blade servers in the BladeCenter T unit. See “Rack installation guidelines” on page 13 for more information.

Statement 1



DANGER

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

To avoid a shock hazard:

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

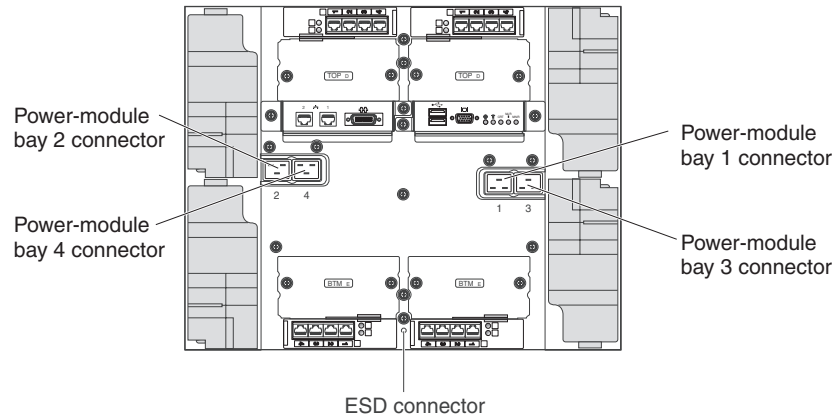
To Connect:

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

To Disconnect:

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

The BladeCenter T unit comes with one pair of 1300W 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.



There are four IEC320 power connectors on the rear of the BladeCenter T 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 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.

Note: The BladeCenter T unit does not require an external Surge Protective Device (SPD).

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.

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.

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

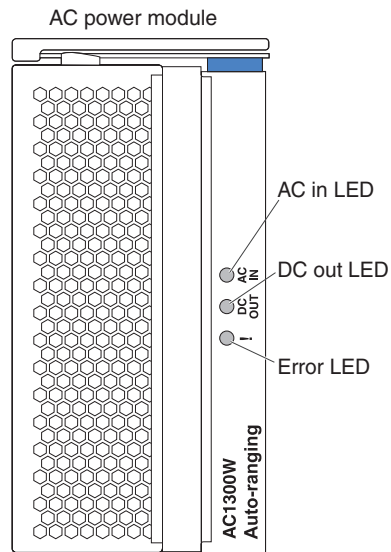
Complete the following steps to start the BladeCenter T unit:

1. Read the information in System reliability considerations.
2. Reinstall the four blowers into the rear of the BladeCenter T unit if you have not done so already. See Removing and installing blower modules 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 “Installing a power module” on page 27 for detailed instructions.



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 the 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 Media tray 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 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 Media tray 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 Documentation CD that comes with the blade server 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.

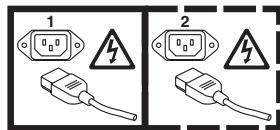
1. See your blade server operating-system documentation for the procedure to shut down the operating system in the blade servers; then, shut down each operating system.
2. Press the power-control button on the front of each blade server. Wait until the solid green power LED on the blade server goes to 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 IBM BladeCenter T Type 8267 units do not have a power switch. The units also have more than one connection to power. To remove all electrical current from the unit, make sure that all connections to input power are disconnected at the power input terminals or connectors.

3. Disconnect all power cords on the BladeCenter T unit from the ac 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
- Bezel air filter
- Power module
- Media tray
- Management module
- Blower module
- KVM module
- LAN module
- I/O modules
- Blade server

See the “Rear view” on page 49 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 that support those I/O functions, 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.

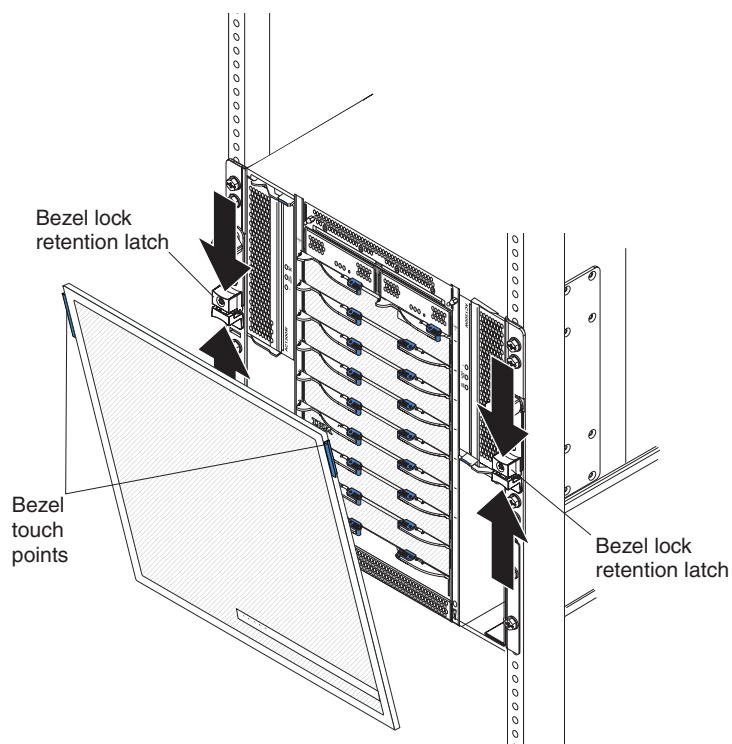
1. Read the safety information beginning on page “Safety” on page v and the guidelines in “Handling static-sensitive devices” on page 14. This information will help you work safely with your BladeCenter T unit and options.
2. If you are installing or removing a module at the front of the BladeCenter 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 23 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 14 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 14 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

Depending on your model, 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. Be sure to replace the air filter when indicated.

Important: If the BladeCenter T unit contains any blade servers with standard (high-profile) release levers, the bezel assembly will not fit on the chassis. The bezel assembly and air filter can be used only if all blade servers in the chassis have low-profile release levers.

See “Removing and installing the bezel air filter” on page 24 for instructions for removing and replacing the bezel air filter.



Removing the bezel assembly

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

1. Squeeze the upper and lower halves of the bezel lock retention latches together to open the bezel locks on each side as shown in the illustration; then, 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:

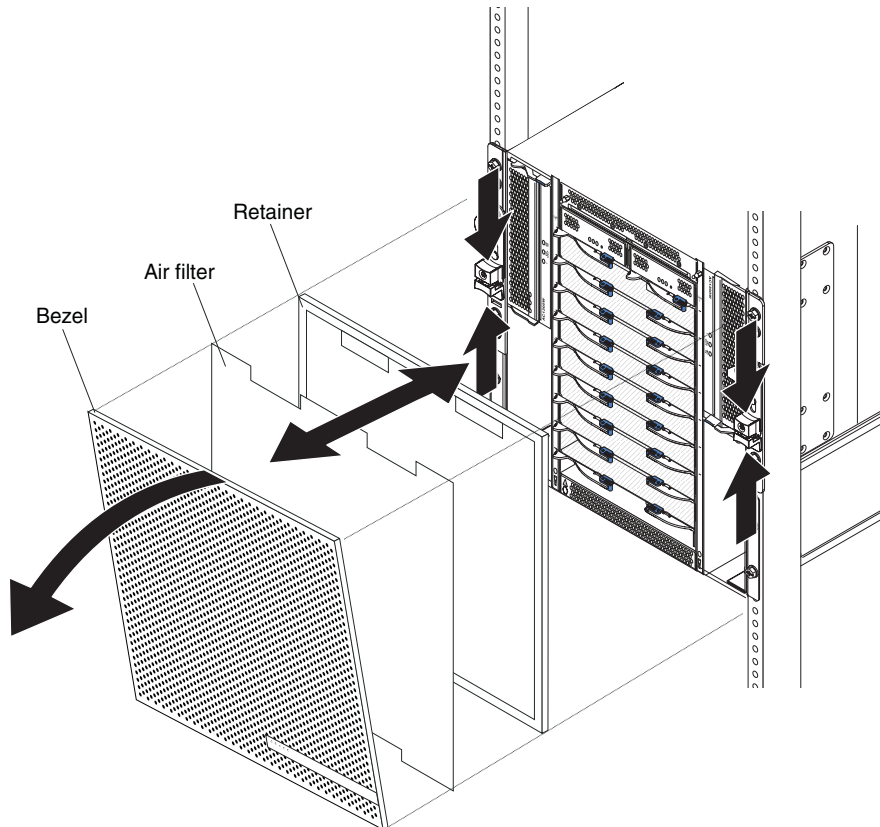
1. Ensure that the bezel lock is open; then, insert the bottom bezel hooks into the bezel slots at the bottom of the BladeCenter T unit.
2. Push in the bottom and the top of the bezel assembly until they both click firmly into place; then, close the bezel locks by sliding the bottom half of the bezel lock retention latch down until it stops.

Removing and installing the bezel air filter

The air filter is installed behind the front bezel of the BladeCenter T unit.

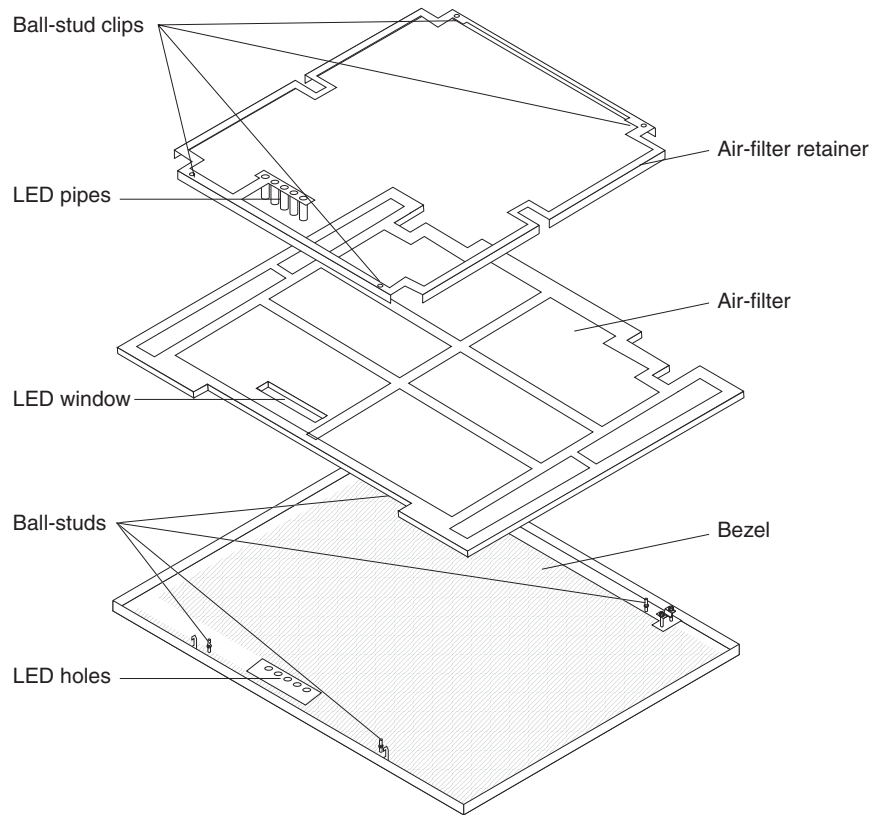
Important: If the BladeCenter T unit contains any blade servers with standard (high-profile) release levers, the bezel assembly will not fit on the chassis. The bezel assembly and air filter can be used only if all blade servers in the chassis have low-profile release levers.

- Read “Option installation guidelines” on page 13.
- Read “Safety” on page v.
- Read “Handling static-sensitive devices” on page 14.



Complete the following steps to replace the front bezel air filter in the BladeCenter T unit:

1. Remove the bezel from the front of the BladeCenter T unit (see “Removing the bezel assembly” on page 23 for instructions).
2. Place the bezel front-side down on a work surface.
3. Remove the air-filter retainer by pulling the retainer upwards and off the ball-stud fasteners on the bezel.
4. Remove the old air filter from the bezel frame.
5. Remove the new air filter from its packaging.



6. Align the LED window of the filter with the holes for the LEDs on the bezel and lay the filter into the bezel frame.
7. Align the air-filter retainer over the filter with the ball-stud clips facing down and the LED light pipe lined up with the LED holes on the bezel.
8. Gently push the air-filter retainer down until it snaps into the ball-stud fasteners on the back of the bezel.
9. Install the bezel on the front of the system (see “Installing the bezel assembly” on page 24 for instructions).

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.

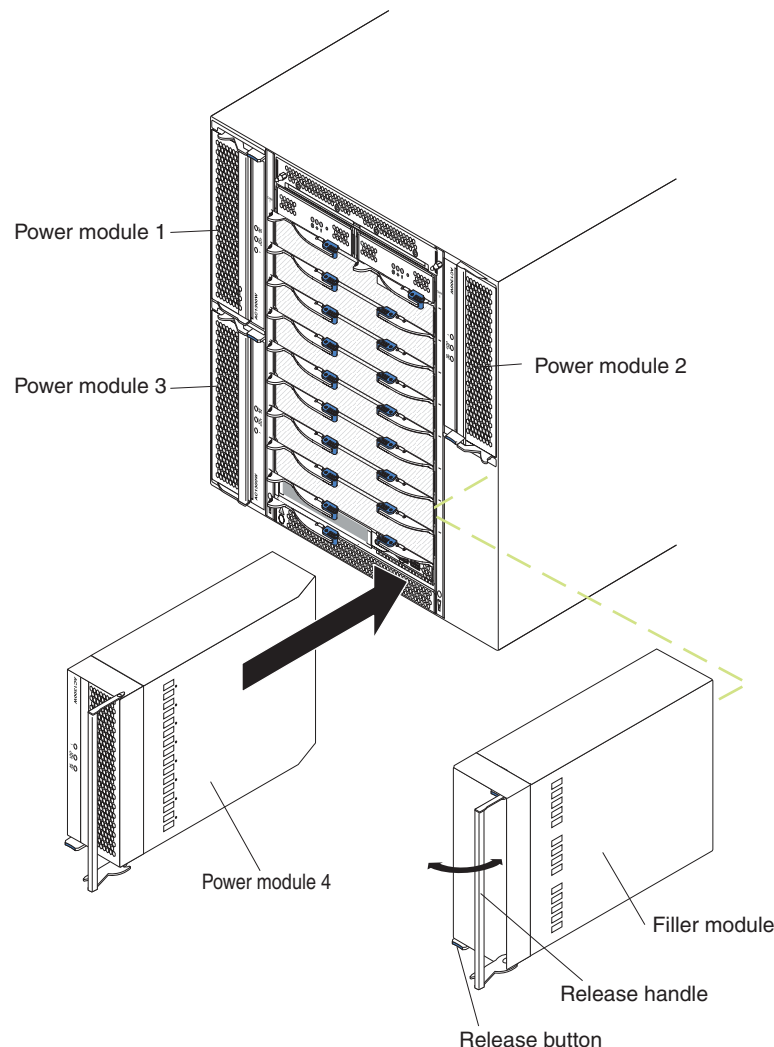
The following table summarizes the modules that are powered by each power domain.

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 four 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.

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.



Removing a power module

Complete the following steps to remove a power module or filler panel from the front of the BladeCenter T unit.

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.

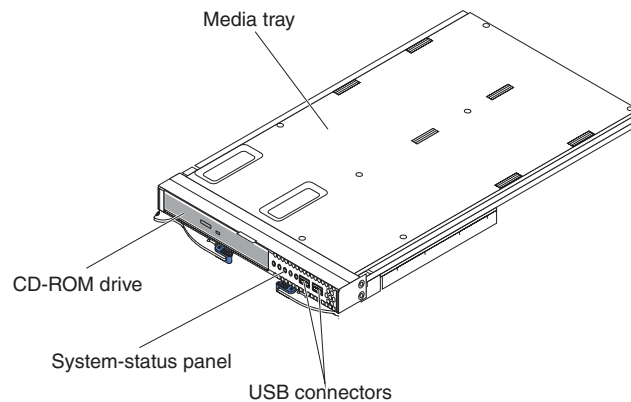
Attention: To help ensure proper cooling and system reliability, make sure that you replace a removed power-module filler panel with a power module within 1 minute.

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.

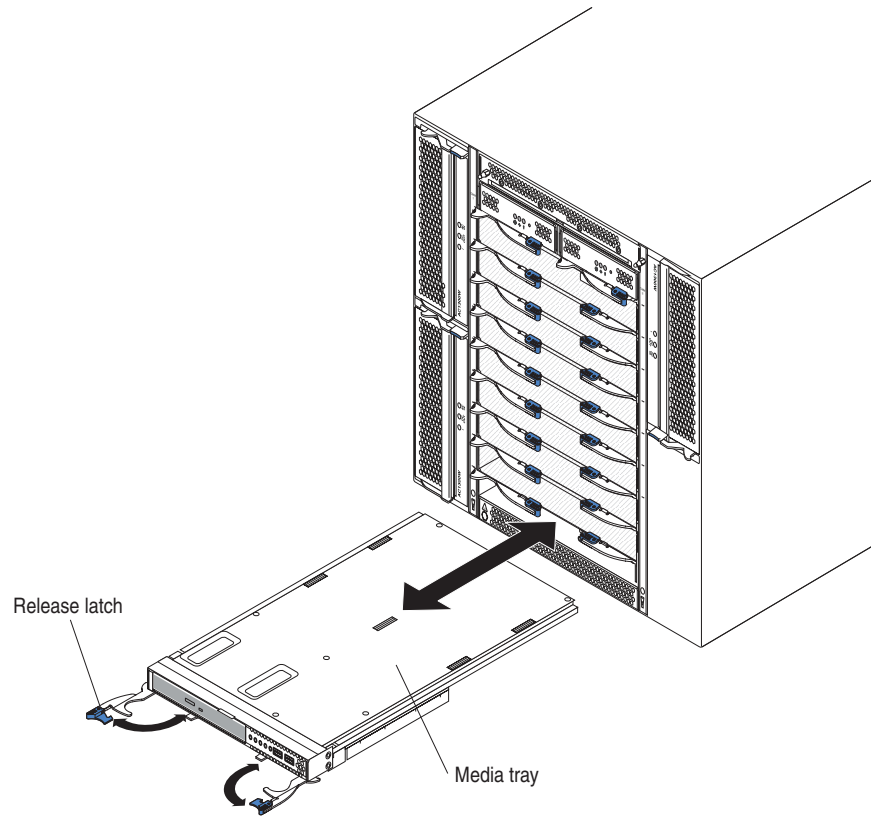
- The output power LED is lit.
 - The error LED is not lit.
7. If you have other modules to install at the front of the unit, do so now.
Otherwise reinstall the bezel assembly at the front of the BladeCenter T unit.

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 Chapter 4, “BladeCenter T components, controls, and LEDs,” on page 45 for information about the system-status panel controls and indicators.



Use the instructions in this section to remove or install the media tray at the front of the BladeCenter T unit.



Removing the media tray

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

1. Open the two release levers as shown in the illustration. The media tray moves out of the bay approximately 0.6 cm (0.25 inch).
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:

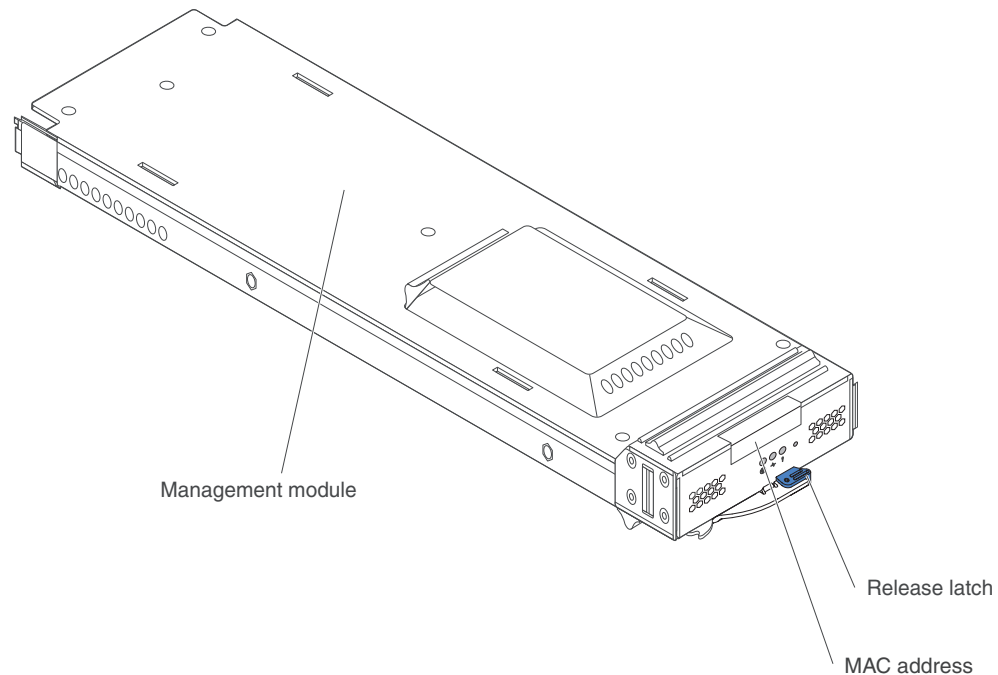
1. Hold the media tray at the front of each side of the module and orient the media tray to the top of the media-tray bay. Carefully position the module into the rails in the media-tray bay.
2. Make sure that the release latches are in the open position (90° from the closed position).
3. Slide the media 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.
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 two hot-swap management modules.

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



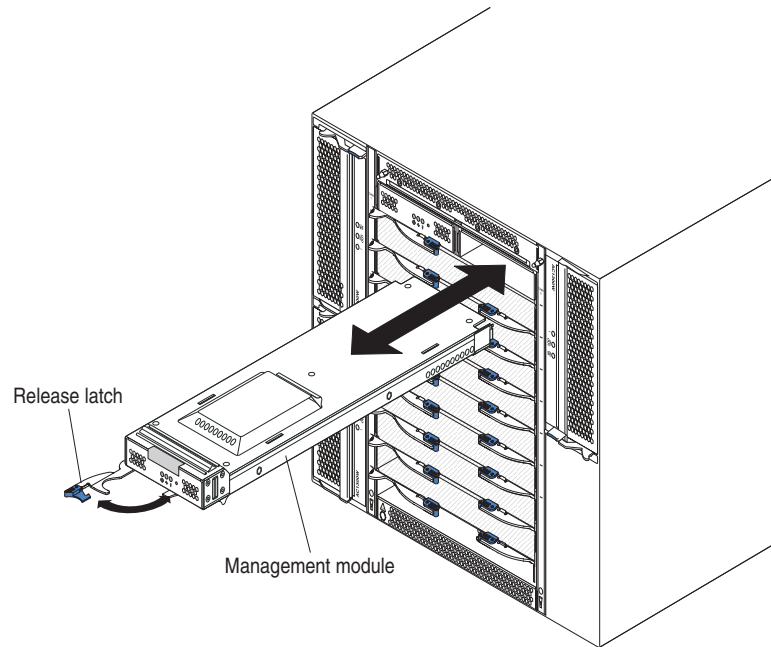
The management module performs system-management functions for the BladeCenter T unit. Through the management module, you configure the BladeCenter T unit and modules, and such information as the Internet protocol (IP) addresses of the management module and I/O modules. The management module can also send the video graphics array (VGA) data stream to a remote console for viewing. See Chapter 4, “BladeCenter T components, controls, and LEDs,” on page 45 for information about the controls and indicators.

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 optical 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. 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.
2. 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.

Important: Within 1 minute, you must place either another module of the same type or a filler module in the bay.

Installing a management module

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

1. If you are replacing a management module, remove the current module from the bay (see “Removing and installing management modules” on page 30). 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. See the documentation for your management module for instructions.

2. 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.
3. Remove the management module from its static-protective package.
4. Pull the release latch and make sure that the release latch on the management module is in the open position (90° from the closed position).
5. 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.
6. Push the release latch on the front of the management module to the closed position.
7. Make sure that the error LED on the management module is not lit, indicating that the management module is operating correctly.
8. If this is the primary management module in the BladeCenter T unit, configure the new management module. See the documentation that comes with the management module for detailed instructions. If this is the secondary management module and you followed the instructions in the documentation for the management module, 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 website at <http://www.ibm.com/support/> to ensure smooth changeovers (see the documentation for the management module for more information).

Notes:

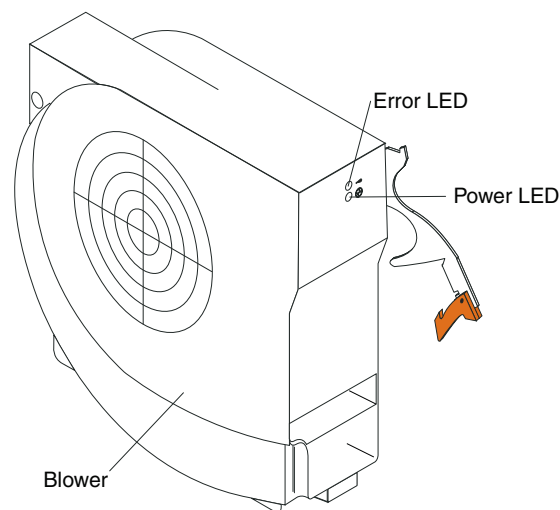
- a. Do not initiate any management module changeover for approximately 2 minutes after installing the secondary management module; the secondary management module needs the time to receive initial configuration and status information.
 - b. Reinstall the bezel assembly on the BladeCenter T unit after you have finished installing the management module. However, if you connected a cable to the serial port on the management module, 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.
9. 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 four 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.

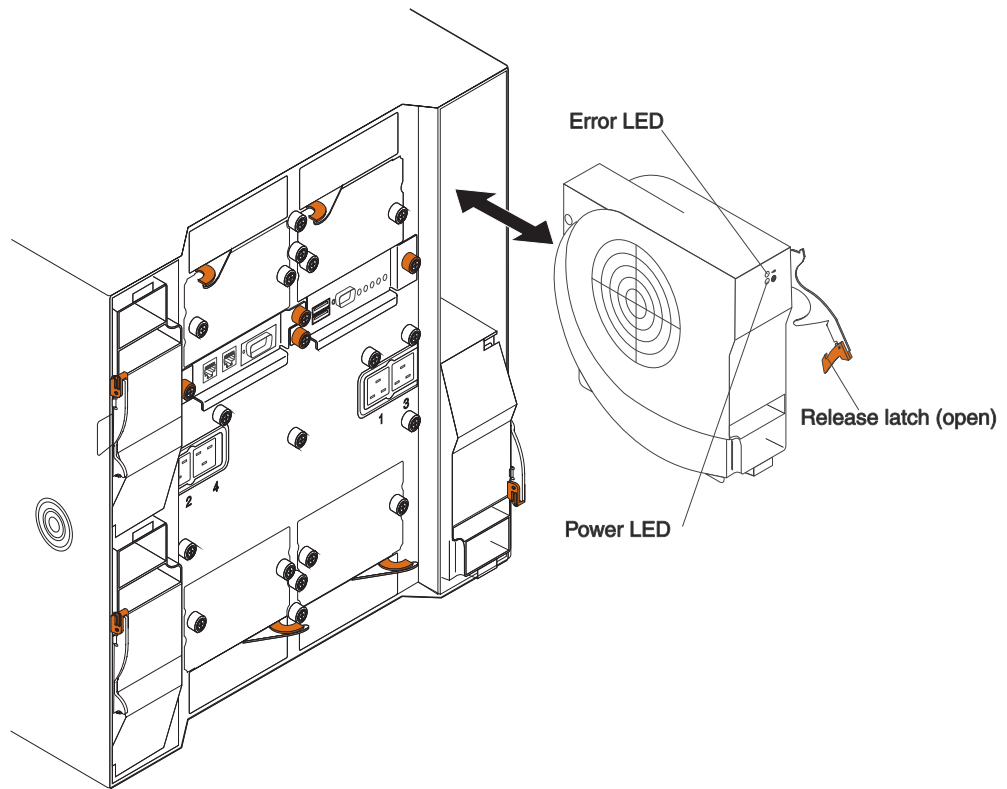
Note: Each power module has cooling fans that are independent from the system cooling.



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.



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.

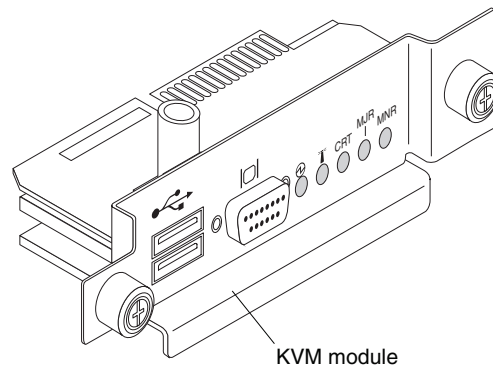
Installing a blower module

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

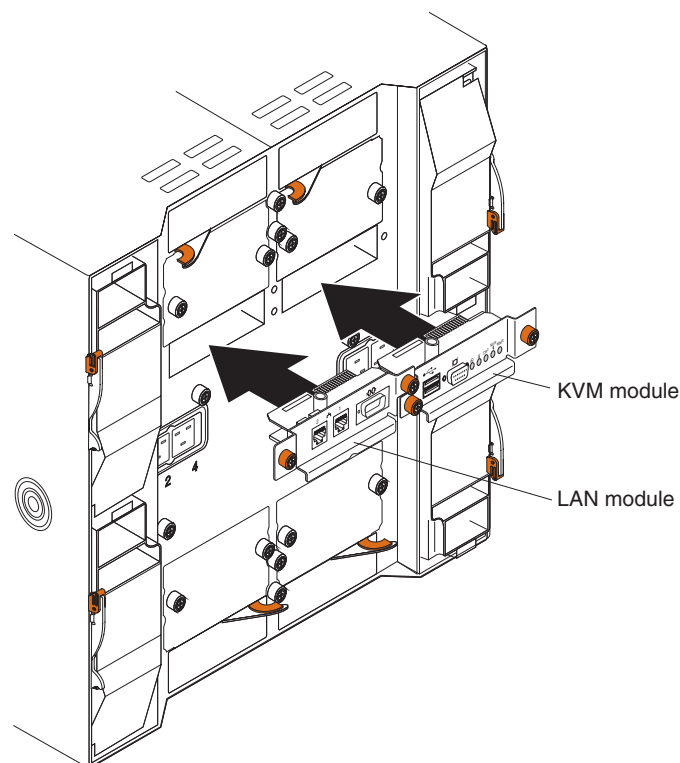
1. Press the release lever at the end of the release latch and pull the latch to the open position.
2. Insert the blower into the selected blower bay.
3. Push the blower module into the bay until it stops. The release latch moves slightly toward the closed position.
4. Close the release latch until it 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 LAN-module indicators and input/output connectors for information about the controls and indicators.



Use the instructions in this section to remove or install the KVM module from the rear of the unit. The KVM module is held in place by captive thumbscrews. You can use your fingers to install or remove the KVM module. Make sure that you do not overtighten the thumbscrews.



Removing the KVM module

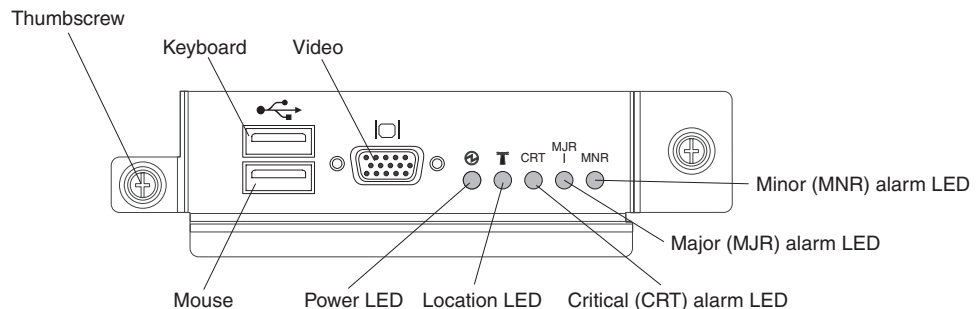
Complete the following steps to remove the KVM module at the rear of the BladeCenter T unit:

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:

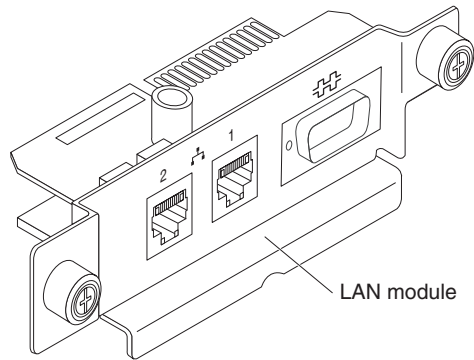
1. Hold the KVM module by both thumbscrews.



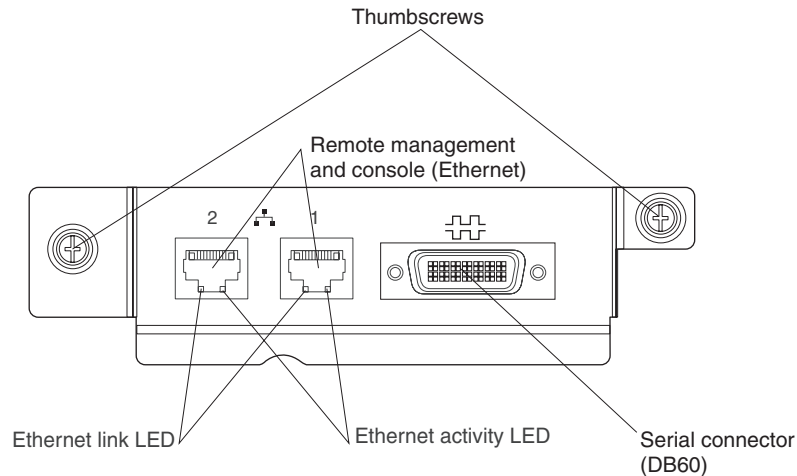
2. Position the KVM module into the rails inside the KVM-module bay.
3. Push the KVM module into the bay until you feel it stop. Make sure that it is snug.
4. Turn each thumbscrew clockwise until it is finger tight. Make sure that you do not overtighten the thumbscrews.
5. Make sure that the power LED 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 serial connector. See “LAN-module indicators and input/output connectors” on page 51 for more information.



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 in Removing and installing the KVM (keyboard, video, mouse) module). The LAN module is held in place by captive thumbscrews. You can use your fingers to turn the thumbscrews to install or remove the LAN module. Make sure that you do not overtighten the thumbscrews.



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 in Removing and installing the KVM (keyboard, video, mouse) module).
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. 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 2 on page 39 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/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 “Removing and installing I/O modules” for the location of the I/O-module bays on the BladeCenter T unit.

Table 2. Hot-swap I/O module types by location for redundancy

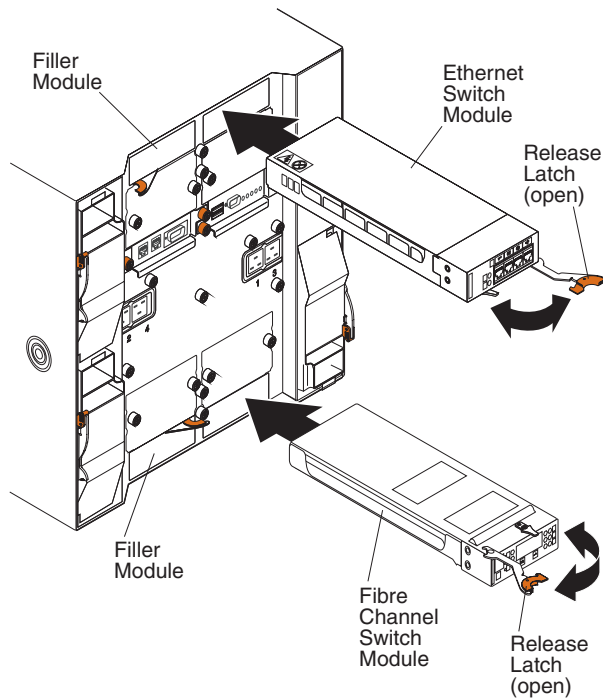
Bays	I/O-module function	Permissible I/O module
1 and 2	Network connections 1 and 2 (Ethernet) for all blade servers in the BladeCenter T unit	One of the following combinations: <ul style="list-style-type: none"> • Two Ethernet switch modules • Two pass-thru modules • One Ethernet switch module and one pass-thru 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. <ul style="list-style-type: none"> • Two Ethernet switch modules • Two Fibre Channel switch modules • Two pass-thru modules <p>Important:</p> <ul style="list-style-type: none"> • 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/servers/eserver/serverproven/compat/us/> 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 Table 2 on page 39 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:

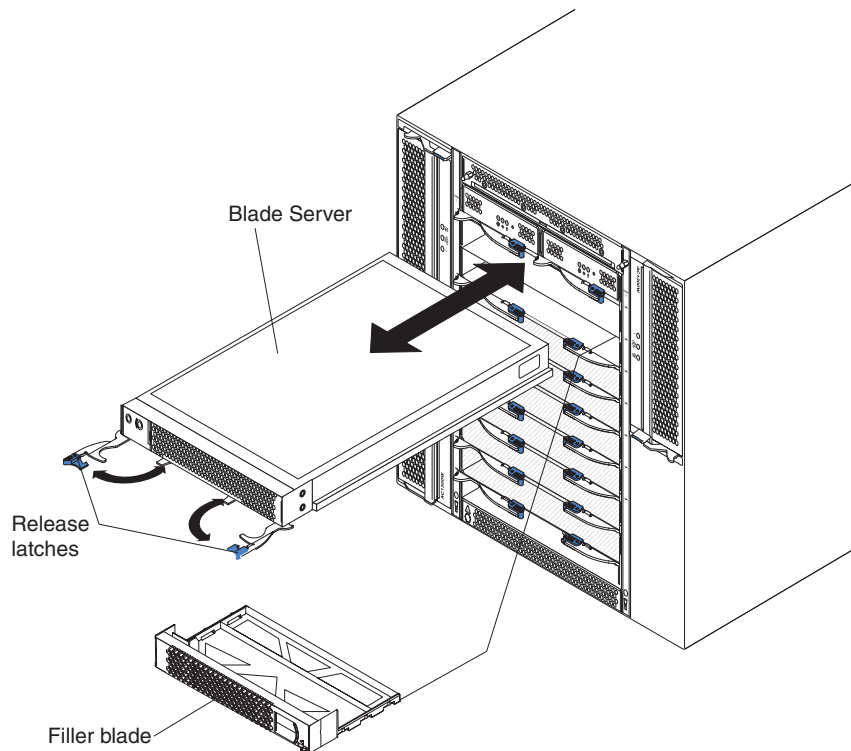
Some blade servers have a connector for adding an expansion unit, such as an IBM BladeCenter PCI I/O Expansion Unit. The PCI I/O-expansion unit supports up to two PCI-X adapters. The expansion unit is attached directly to the blade server and occupies an additional blade server bay.

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:

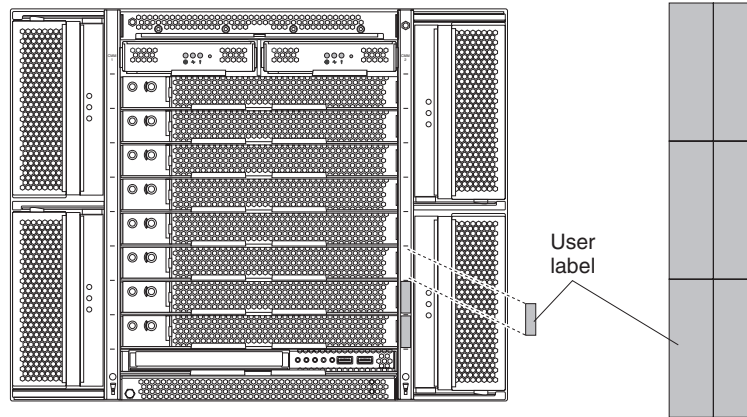
Hazardous energy is present when the blade is connected to the power source. Always replace the blade cover before installing the blade.

1. Install any options that you need, such as hard 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 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 “Removing a blade server” on page 43. 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.

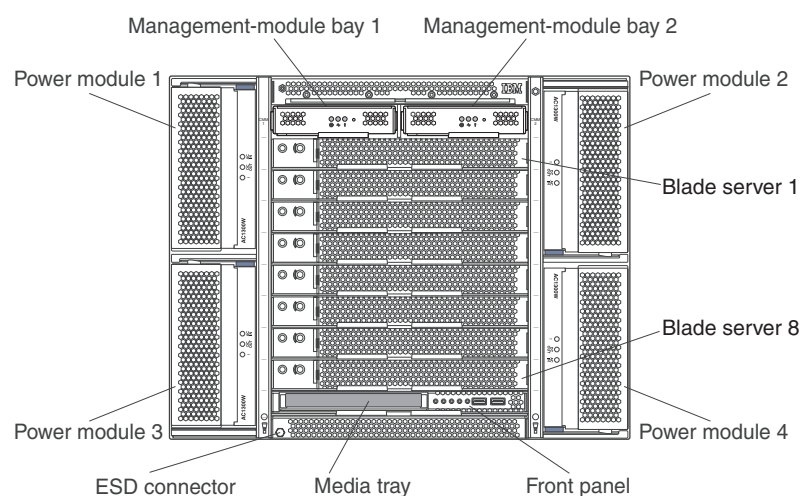
Chapter 4. BladeCenter T components, controls, and LEDs

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.

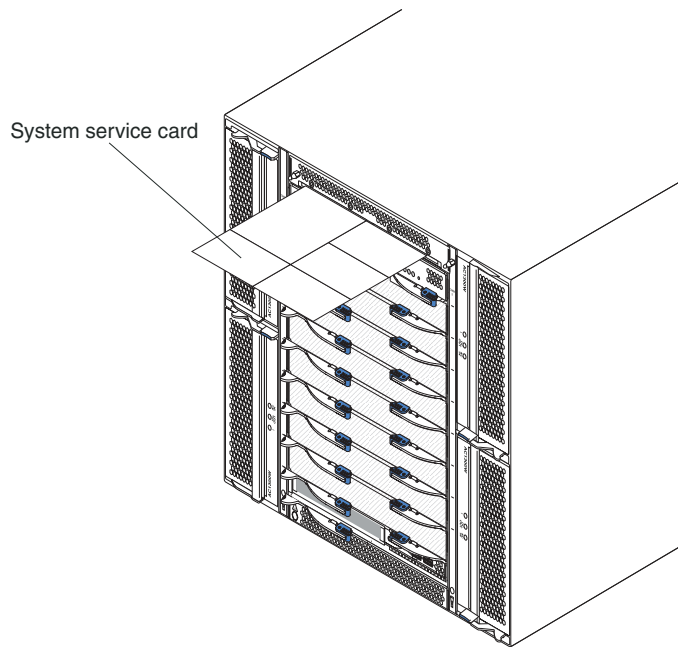
Front view

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



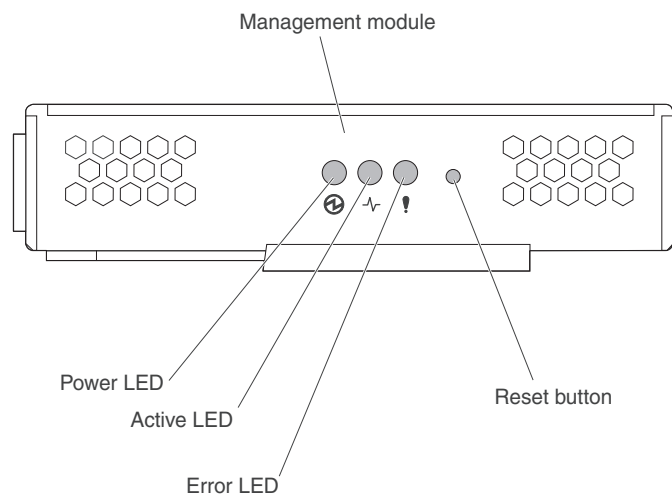
System service cards

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 Documentation CD.



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 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 your management module *User's Guide* and *Command Line Interface Reference Guide* for instructions).

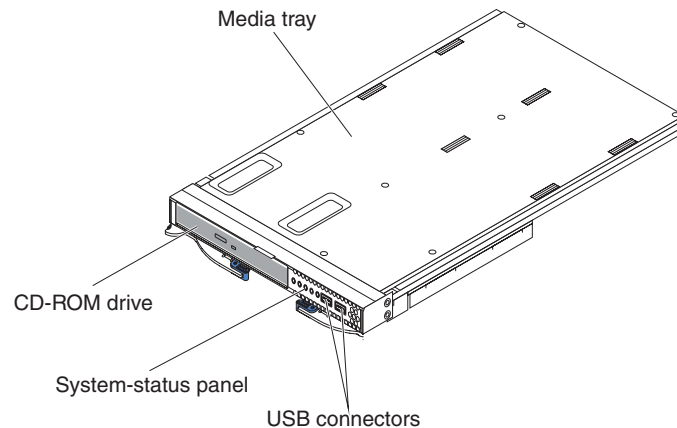
Press this recessed button to reset the IP configuration of the management module network interfaces (Ethernet 1, Ethernet 2, gateway address, and so on) to the factory defaults and then restart the management module.

Use a straightened paper clip to press the button.

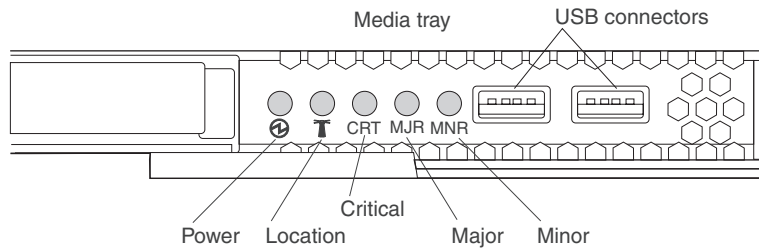
Serial connector: Use this connection for configuring and managing the BladeCenter components over a serial line through the command-line interface (CLI) user-interface. This port provides access and redirection to the serial-over-LAN (SOL) interface of any processor blade server. For example, you can connect a laptop device to the serial connector and use a terminal-emulator program to configure the assorted IP addresses, user accounts, and other management settings through the CLI user-interface.

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 media tray in the BladeCenter T unit.



The system-status panel on the front of the media tray in 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.

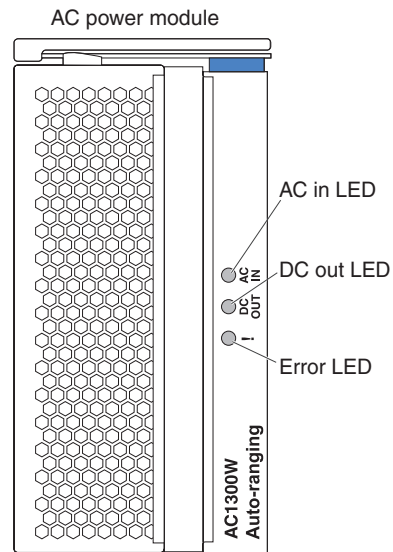
- **Power:** When continuously lit, this green LED indicates the presence of power in the BladeCenter T unit. The LED turns off when the power source is interrupted.
Attention: If the power LED is off, it does not mean electrical power is not present in the BladeCenter T unit. The LED might be burned 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 document for the management module 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 document for the management module 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

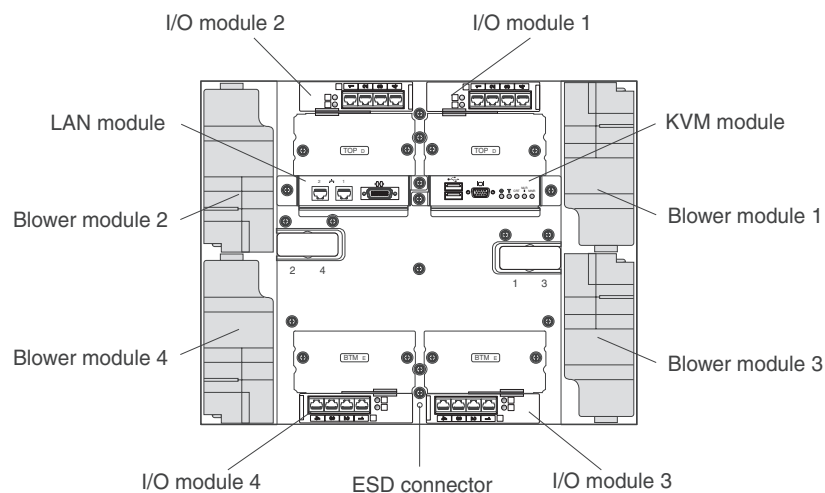


Power module LEDs: Each power module has three LEDs to indicate the status of the power module.

- **AC 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.

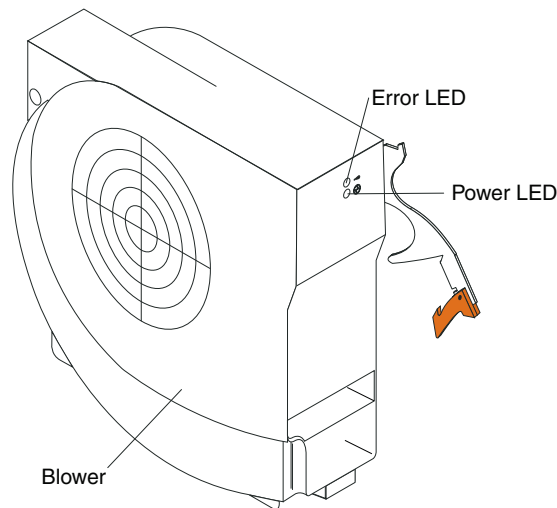
Rear view

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



Blower modules

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.

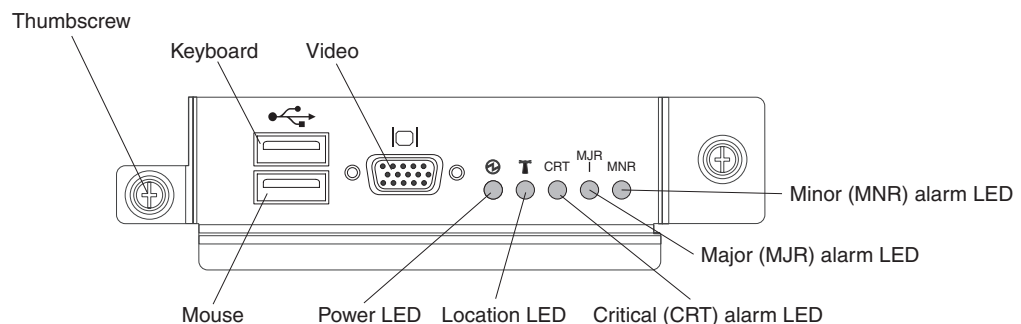


Blower LEDs: The LEDs on each blower provide status information about the blower.

- **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 panel 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 USB 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 Management Module User's Guide* on the IBM *BladeCenter T Advanced Management Module Documentation* CD 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 Management Module User's Guide* on the IBM *BladeCenter T Advanced Management Module Documentation* CD 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.

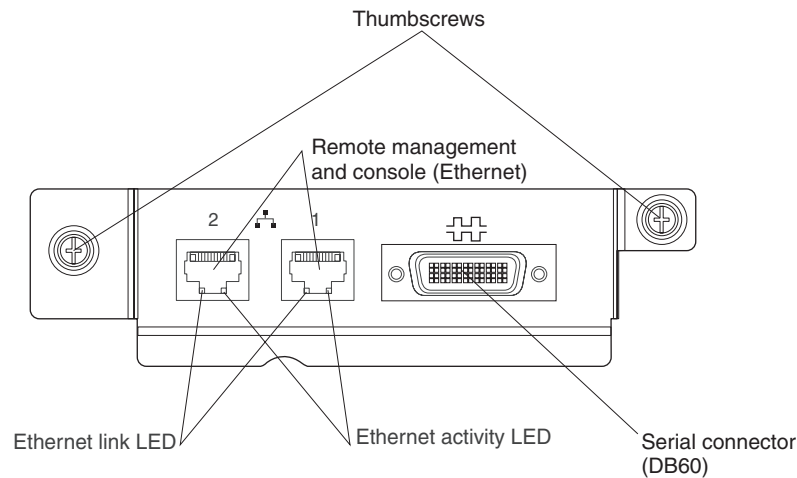
Connectors: The KVM module has the following I/O connectors:

- **Keyboard connector:** The BladeCenter T KVM module contains one USB keyboard connector.
Use this connector to connect a keyboard to the BladeCenter T unit.
- **Mouse connector:** The BladeCenter T KVM module contains one USB mouse connector.
Use this connector to connect a mouse to the BladeCenter T unit.
- **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.

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 DB60 serial 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:

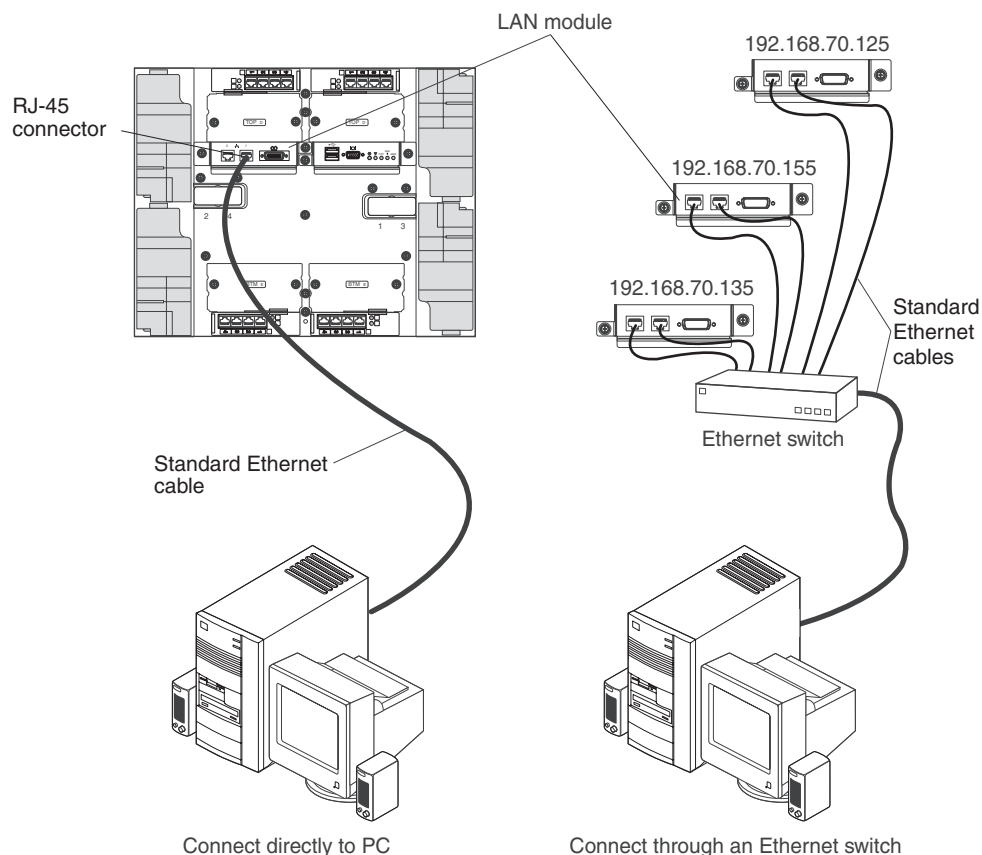
- **Remote management and console (Ethernet) connectors:** The LAN module provides two Ethernet RJ-45 connectors.

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.

- **Serial connector:** The LAN module provides one DB60 serial connector (female) for direct serial connection to each blade server using an external serial breakout cable (IBM part number 40K9605).



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.

Note: All Ethernet cables must be shielded and grounded at both ends per GR-1089-CORE.

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. Configuration and networking guidelines

The BladeCenter components are configured and managed using a management module. Depending on your management module type, you can configure the management module and the BladeCenter unit components using a local or remote connection and management-module user interfaces or system management tools. See the documentation for your management module for instructions about configuring the BladeCenter.

Configuring the BladeCenter unit

General configuration of the BladeCenter and installed components is performed through the management module. See the documentation for your management module for information and instructions. Some devices installed in the BladeCenter unit, such as I/O modules and blade servers, might also require additional configuration. See the documentation that comes with each device for information and instructions.

Configuring the management module

All management modules are preconfigured with the same static IP address. You can use the management module to assign a new static IP address. To establish connectivity, the management module attempts to use dynamic host control protocol (DHCP) to acquire its initial IP address for the management-module Ethernet port. If DHCP is not installed or is enabled and fails, the management module uses the static IP address. Use the management module to configure other BladeCenter component settings, such as user accounts, DHCP, or Wake on LAN. See the documentation for your management module for instructions.

Configuring I/O modules

You need to install and configure at least one external (in-band) port on an Ethernet switch module in I/O-module bay 1 or 2 to communicate with the Ethernet controllers integrated on each blade server. See the documentation for your management module for information about configuring external ports on I/O modules. For I/O device settings, see the documentation that comes with your I/O device.

Note: If a pass-thru module is installed in I/O-module bay 1 or 2, you will need to configure the network switch that the pass-thru module is connected to; see the documentation that comes with the network switch.

Configuring blade servers

To achieve blade server redundancy, you must configure the Ethernet controllers in one or more blade servers for failover. When failover occurs on a blade server, the secondary Ethernet controller takes over network communications, using the I/O module associated with that controller. Install a pair of Ethernet switches in I/O-module bays 1 and 2, then configure them and your network infrastructure so that they can direct traffic to the same destinations. You can also install a pass-thru

module that is connected to an external Ethernet switch in either or both of these I/O-module bays. See the documentation that comes with your blade server and operating system for instructions.

BladeCenter networking guidelines

The network administrator should assist in the configuration of the network infrastructure prior to connecting the BladeCenter unit to a LAN switch or similar network device.

Each blade server has two independent Ethernet controllers, each with its own MAC address and a dedicated 1000-Mbps link to one of the switch modules in I/O module bays 1 and 2. There is no internal data path between the two switches within the BladeCenter 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.

IBM Director

With IBM Director, a network administrator can perform the following tasks:

- View the hardware configuration of remote systems, in detail.
- Monitor the usage and performance of critical components, such as microprocessors, disks, and memory.
- Centrally manage individual or large groups of IBM and non-IBM Intel processor-based servers, desktop computers, workstations, and mobile computers on a variety of platforms.

IBM Director provides a comprehensive entry-level workgroup hardware manager. It includes the following key features:

- Advanced self-management capabilities for maximum system availability.
- Multiple operating-system platform support. 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/servers/eserver/xseries/systems_management/sys_migration/ibmdiragent.html and is updated every 6 to 8 weeks.
- Support for IBM and non-IBM servers, desktop computers, workstations, and mobile computers.
- Support for systems-management industry standards.
- Integration into leading workgroup and enterprise systems-management environments.
- Ease of use, training, and setup.

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

- Reduced downtime
- Increased productivity of IT personnel and users

- Reduced service and support costs

For more information about IBM Director, see the documentation on the *IBM Director* CD that comes with the BladeCenter unit, the IBM Director Information Center at http://publib.boulder.ibm.com/infocenter/eserver/v1r2/topic/dirinfo/fgm0_main.htm, and the IBM xSeries Systems Management Web page at http://www.ibm.com/servers/eserver/xseries/systems_management/xseries_sm.html, which present an overview of IBM Systems Management and IBM Director.

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 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” 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/supportportal/>.
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 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.	<p>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.</p> <p>If you cannot diagnose the problem, try replacing the KVM module. If the problem remains, replace the monitor.</p>
The screen is blank.	<p>Make sure that:</p> <ul style="list-style-type: none">• 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 and that supports the keyboard, video, and mouse (KVM) feature. <p>If the problem remains, call for service.</p>
Only the cursor appears.	<p>Try switching the monitor to another blade server.</p> <ul style="list-style-type: none">• 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.	<p>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.</p> <p>Notes:</p> <ol style="list-style-type: none"> 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. <p>If the problem remains, call for service.</p>
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.	<ul style="list-style-type: none"> • Make sure that the LEDs on the power module are on. • 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. • 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. <p>If the problem remains, call for service.</p>

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
<p>Blower module operates at full speed, with no regulation.</p> <p>Note: Blower modules will run at full speed to compensate for a failed or non-working blower.</p>	<ul style="list-style-type: none"> Check for a failed blower module. Look for any of these indications: <ul style="list-style-type: none"> Error LED is lit Blower fan is not blowing Fan speed of blowers in a pair differs by more than approximately 5 percentage points of each other, as viewed on the management module Web interface. <p>If a blower module has failed, replace the module as soon as possible.</p> <ul style="list-style-type: none"> Swap the blower modules in pairs (top-to-bottom or side-to-side). <ul style="list-style-type: none"> If relocating a blower to a known good blower bay fails to start the blower, the blower module has failed and needs to be replaced as soon as possible. Call for service to obtain a replacement blower. If swapping the blower modules produces no change, or if a known good blower is installed in a blower bay and fails to start, the problem is within the BladeCenter T unit or with the active management module. If you have redundant management modules, perform the following steps: <ol style="list-style-type: none"> Pull the active management module out of its bay to cause a failover to the redundant management module. Wait about two minutes for the redundant management module to assume full control of the blower speeds; then, recheck the blower status. If all blower speeds are normal, then the management module that was pulled is defective. Call for service to obtain a replacement management module. <p>If the management module that was pulled is not defective, or you do not have redundant management modules, call for service.</p> <p>Important: Leave a failed blower in place until a replacement is obtained. The blower, even if defective, blocks air from being pulled into the chassis from the open blower bay and causing improper cooling to other components in the BladeCenter T unit.</p>

Options problems

Device	Suggested action
An IBM option that was just installed does not work.	<p>Make sure that:</p> <ul style="list-style-type: none"> The option is designed for the 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. <p>If the problem remains, call for service.</p>
An IBM option that used to work does not work now.	<ul style="list-style-type: none"> 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. <p>If the problem remains, call for service.</p>

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 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 45 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 3. 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.

Table 3. Light path diagnostics (continued)



Lit LED	Cause	Action
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.	<ul style="list-style-type: none"> Check the error log for messages. Look for an error LED on the modules and blade servers to locate the component: <ul style="list-style-type: none"> 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.	<ul style="list-style-type: none"> Check the error log for messages. Look for an error LED on the modules and blade servers to locate the component: <ul style="list-style-type: none"> 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.	<ul style="list-style-type: none"> If your BladeCenter T unit has only one management module: <ol style="list-style-type: none"> Try reseating the management module. 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.
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		

Table 3. Light path diagnostics (continued)

Lit LED	Cause	Action
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 BladeCenter T 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 (on blade servers that support the KVM feature). 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.

Note: Some blade servers have only the CD selection button; those blade servers do not support the KVM function.

- 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, you will need to hold down the Shift key while entering this key sequence.

Notes:

1. The keyboard sequence switches KVM control only to a blade server that supports the KVM feature.
2. 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.
3. 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 occurrence).
4. 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.
5. Do not switch control of the shared CD-ROM drive or diskette drive to another blade server until the activity lights on both the CD-ROM drive and diskette drive are off, indicating that no read or write operations are in progress.

6. Before switching ownership of the CD-ROM drive to another blade server, safely stop the CD-ROM device on the blade server that currently owns it, using the facilities available through the operating system, such as a task bar icon or an unmount command.
7. You can use the management module Web interface to enable or disable the select buttons (**Blade tasks” Remote control**) on the blade servers.
8. 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. BladeCenter management module configuration worksheet

Use the worksheets in this appendix to record the information for configuring the management module in your BladeCenter unit. Information about using the worksheet is provided in the IBM *BladeCenter Management Module User's Guide* for your management module type.

General Settings

Management module name	
Contact name	
Physical location	
Clock settings	

Login profiles

Login ID	Password	Authority level	
		R/O	R/W

External network interface (eth0)

Interface	<input type="checkbox"/> Enabled <input type="checkbox"/> Disabled
DHCP	<input type="checkbox"/> DHCP with rollover to static <input type="checkbox"/> DHCP only <input type="checkbox"/> Static IP only
Host name	
Static IP configuration (configure only if DHCP is disabled)	
IP address	____.____.____.____
Subnet mask	____.____.____.____
Gateway IP address	____.____.____.____

Internal network interface (eth1)

Interface IP address	____.____.____.____
Subnet mask	____.____.____.____
Locally-administered MAC address	____.____.____.____

Alerts

Remote Alert Recipients		
Receives critical alerts only		
	Status	
	Notification method	<input type="checkbox"/> SNMP over LAN <input type="checkbox"/> e-mail over LAN <input type="checkbox"/> IBM Director
	Host name (or IP address)	
	e-mail address	
Global remote alert settings		
Remote alerts retry limit		
Delay between retries		
Include event log with e-mail alerts		<input type="checkbox"/> Yes <input type="checkbox"/> No
Alerts to be monitored		
Critical alerts		Select all critical alerts
		Hard disk drive
		Multiple blower failures
		Power failure
		Temperature
		VRM failure
		Multiple switch module failures
		Invalid configuration
Warning alerts		Select all critical alerts
		Single blower failure
		Temperature
		Voltage
		KVM/media tray switching failure
		Redundant module failure
System alerts		Power off
		Inventory
		Log 75% full

Network protocols

SNMP	
SNMP agent	<input type="checkbox"/> Enable <input type="checkbox"/> Disable
SNMP traps	<input type="checkbox"/> Enable <input type="checkbox"/> Disable
Community name	
Host name (or IP address)	
SMTP	
Host name (or IP address)	
DNS	
DNS	<input type="checkbox"/> Enable <input type="checkbox"/> Disable
DNS Server IP address 1	____.____.____.____
DNS Server IP address 2	____.____.____.____
DNS Server IP address 3	____.____.____.____

Security

Secure Socket Layer (SSL)	<input type="checkbox"/> Enabled <input type="checkbox"/> Disabled
Certificates	<input type="checkbox"/> Self-signed <input type="checkbox"/> Provided by a certificate authority

Appendix B. 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.

Use this information to obtain additional information about IBM and IBM products, determine what to do if you experience a problem with your IBM system or optional device, and determine 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.

If you believe that you require IBM to perform warranty service on your IBM product, the IBM service technicians will be able to assist you more efficiently if you prepare before you call.

- Check for updated firmware and operating-system device drivers for your IBM product. The IBM Warranty terms and conditions state that you, the owner of the IBM product, are responsible for maintaining and updating all software and firmware for the product (unless it is covered by an additional maintenance contract). Your IBM service technician will request that you upgrade your software and firmware if the problem has a documented solution within a software upgrade.

You can obtain the latest downloads for your IBM product from <http://www.ibm.com/support/fixcentral/systemx/groupView?query.productGroup=ibm%2FSystemx>.

- If you have installed new hardware or software in your environment, check <http://www.ibm.com/systems/info/x86servers/serverproven/compat/us/> to make sure that the hardware and software is supported by your IBM product.
- Use the troubleshooting information in your system documentation, and use the diagnostic tools that come with your IBM product. Information about diagnostic tools is in the *Problem Determination and Service Guide* on the IBM Documentation CD that comes with your product.
- Go to <http://www.ibm.com/supportportal/> to check for information to help you solve the problem.
- Gather the following information to provide to IBM service. This data will help IBM service quickly provide a solution to your problem and ensure that you receive the level of service for which you might have contracted.
 - Hardware and Software Maintenance agreement contract numbers, if applicable
 - Machine type number (IBM 4-digit machine identifier)
 - Model number
 - Serial number
 - Current system UEFI (or BIOS) and firmware levels
 - Other pertinent information such as error messages and logs
- Go to <http://www.ibm.com/support/electronic/portal/> to submit an Electronic Service Request. Submitting an Electronic Service Request will start the process

of determining a solution to your problem by making the pertinent information available to IBM service quickly and efficiently. IBM service technicians can start working on your solution as soon as you have completed and submitted an Electronic Service Request.

Using the documentation

Information about your IBM system and preinstalled software, if any, or optional device is available in the documentation that comes with the product. That documentation can include printed documents, online documents, readme files, and help files.

See the troubleshooting information in your system documentation for instructions for using the diagnostic programs. The troubleshooting information or the diagnostic programs might tell you that you need additional or updated device drivers or other software. IBM maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates. To access these pages, go to <http://www.ibm.com/supportportal/> .

You can find the most up-to-date information for System x products at <http://www.ibm.com/systems/x/> .

Getting help and information from the World Wide Web

Put your short description here; used for first paragraph and abstract.

On the World Wide Web, up-to-date information about IBM systems, optional devices, services, and support is available at <http://www.ibm.com/supportportal/> .

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Through IBM Support Line, you can get telephone assistance, for a fee, with usage, configuration, and software problems with your IBM products.

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You can receive hardware service through your IBM reseller or IBM Services.

To locate a reseller authorized by IBM to provide warranty service, go to <http://www.ibm.com/partnerworld/> and click **Find Business Partners** on the right side of the page. For IBM support telephone numbers, see <http://www.ibm.com/planetwide/> . 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.

IBM Taiwan product service

Use this information to contact IBM Taiwan product service.

台灣 IBM 產品服務聯絡方式：
台灣國際商業機器股份有限公司
台北市松仁路7號3樓
電話：0800-016-888

IBM Taiwan product service contact information:

IBM Taiwan Corporation
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Taipei, Taiwan
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Processor speed indicates the internal clock speed of the microprocessor; other factors also affect application performance.

CD or DVD drive speed is the variable read rate. Actual speeds vary and are often less than the possible maximum.

When referring to processor storage, real and virtual storage, or channel volume, KB stands for 1024 bytes, MB stands for 1,048,576 bytes, and GB stands for 1,073,741,824 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 can 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 that are available from IBM.

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Particulate contamination

Attention: Airborne particulates (including metal flakes or particles) and reactive gases acting alone or in combination with other environmental factors such as humidity or temperature might pose a risk to the device that is described in this document.

Risks that are posed by the presence of excessive particulate levels or concentrations of harmful gases include damage that might cause the device to malfunction or cease functioning altogether. This specification sets forth limits for particulates and gases that are intended to avoid such damage. The limits must not be viewed or used as definitive limits, because numerous other factors, such as temperature or moisture content of the air, can influence the impact of particulates or environmental corrosives and gaseous contaminant transfer. In the absence of specific limits that are set forth in this document, you must implement practices that maintain particulate and gas levels that are consistent with the protection of human health and safety. If IBM determines that the levels of particulates or gases in your environment have caused damage to the device, IBM may condition provision of repair or replacement of devices or parts on implementation of appropriate remedial measures to mitigate such environmental contamination. Implementation of such remedial measures is a customer responsibility.

Table 4. Limits for particulates and gases

Contaminant	Limits
Particulate	<ul style="list-style-type: none">• The room air must be continuously filtered with 40% atmospheric dust spot efficiency (MERV 9) according to ASHRAE Standard 52.21.• Air that enters a data center must be filtered to 99.97% efficiency or greater, using high-efficiency particulate air (HEPA) filters that meet MIL-STD-282.• The deliquescent relative humidity of the particulate contamination must be more than 60%².• The room must be free of conductive contamination such as zinc whiskers.
Gaseous	<ul style="list-style-type: none">• Copper: Class G1 as per ANSI/ISA 71.04-19853• Silver: Corrosion rate of less than 300 Å in 30 days
<p>1 ASHRAE 52.2-2008 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size. Atlanta: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.</p> <p>2 The deliquescent relative humidity of particulate contamination is the relative humidity at which the dust absorbs enough water to become wet and promote ionic conduction.</p> <p>3 ANSI/ISA-71.04-1985. Environmental conditions for process measurement and control systems: Airborne contaminants. Instrument Society of America, Research Triangle Park, North Carolina, U.S.A.</p>	

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*Information Development
IBM Corporation*

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Research Triangle Park, North Carolina 27709-2195
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In the request, be sure to include the publication part number and title.

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Electronic emission notices

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Federal Communications Commission (FCC) statement

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Avis de conformité à la réglementation d'Industrie Canada

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Responsible manufacturer:

International Business Machines Corp.
New Orchard Road
Armonk, New York 10504
914-499-1900

European Community contact:

IBM Technical Regulations, Department M456
IBM-Allee 1, 71137 Ehningen, Germany
Telephone: +49 7032 15-2937
Email: tjahn@de.ibm.com

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Armonk, New York 10504
914-499-1900

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IBM Deutschland
Technical Regulations, Department M456
IBM-Allee 1, 71137 Ehningen, Germany
Telephone: +49 7032 15-2937
Email: tjahn@de.ibm.com

Generelle Informationen:

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Japan Electronics and Information Technology Industries Association (JEITA)
Confirmed Harmonics Guidelines (products less than or equal to 20 A per phase)

Japan Electronics and Information Technology Industries Association (JEITA) statement

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求採取某些適當的對策。

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