



IBM BladeCenter S
Type 7779/8886

Installation and User's Guide





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Note

Note: Before using this information and the product it supports, read the general information in Notices; and read the *IBM Safety Information* and the *IBM Systems Environmental Notices and User Guide* on the *IBM Documentation CD*.

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Chapter 1. Introduction

The BladeCenter S Type 8886 is a high-density, high-performance rack-mounted server system. It supports up to six blade servers that can share common resources, such as power, cooling, management, and I/O resources within a single BladeCenter S chassis. In addition, it provides support for up to twelve 3.5-inch, hot-swappable SAS or SATA hard disk drives or twenty-four 2.5-inch, hot-swappable SAS hard disk drives.

The BladeCenter S system provides the following features:

- **IBM® Enterprise X-Architecture Technology**

IBM Enterprise X-Architecture Technology leverages proven innovative IBM technologies to build powerful, scalable, and reliable blade servers. It provides features such as IBM Predictive Failure Analysis (PFA) and real-time diagnostics.

- **Server expansion capabilities**

You can add up to six blade servers to the BladeCenter S chassis. Some blade servers have connectors for additional optional devices that you can use to add capabilities to the blade server. For example, you can connect either a storage expansion unit or a PCI expansion unit to a blade server. Alternatively, you can add optional I/O expansion cards to add network interfaces or storage through I/O modules. SAS expansion cards provide access through SAS connectivity modules or SAS RAID controller modules that are installed in I/O bays 3 and 4 to the hard disk drives in the BladeCenter S chassis.

Note: SAS connectivity modules support the use of SAS or SATA hard disk drives. SAS RAID controller modules support the use of SAS hard disk drives only.

- **Hot-swap capabilities**

Bays in the BladeCenter S chassis are hot-swappable. For example, you can add, remove, or replace a blade server or a SAS or SATA hard disk drive without removing power from the BladeCenter S chassis.

The midplane provides hot-pluggable connectors for the following components:

- Six blade servers
- Four I/O modules
- One advanced management module
- One serial pass-thru module
- Four power modules
- Four fan modules
- Two disk storage modules
- One media tray

- **High-availability design**

Components in the BladeCenter S system enable continued operation if one of the components fails:

- **Power modules.** In normal operation, the power modules provide power to share the system load. If a power module fails, the working power modules can continue to handle the entire load. You can replace a power module without shutting down the BladeCenter S system.

Note: The power management policy that you have implemented for the BladeCenter S system determines the result of a power module failure.

Power modules also provide cooling fans for the disk storage modules. Therefore, if you are using disk storage module 1, you must install power modules 1 and 2. If you are using disk storage module 2, you must install power modules 3 and 4.

- **Fan modules.** In normal operation, fan modules share the cooling in the BladeCenter S system. If one fan module fails, the other three fan modules handle the entire load. You can replace a fan module without shutting down the BladeCenter S system.
- **BladeCenter S system midplane.** The midplane has the following characteristics:
 - Redundant high-speed serialize/deserialize (SERDES) interconnects between blade servers and switches
 - I2C communication between the advanced management module and all modules (except blade servers)
 - RS-485 (EIA 485) communication between the advanced management module and blade servers
 - Analog video connectors from the blade servers to the advanced management module
 - USB connections between the blade servers and the advanced management module

- **Systems management**

The advanced management module is used to communicate with the service processor in each blade server to provide system monitoring, event recording, and alerts. You can manage the BladeCenter S chassis, its devices, and the blade servers remotely.

Related documentation

In addition to this document, the following related documentation is provided in Portable Document Format (PDF) on the IBM *BladeCenter Documentation* CD that comes with your BladeCenter S chassis.

Note: The latest and most up-to-date product information for the BladeCenter S Types 7779 and 8886 can be found at the IBM Systems Information Center, which is at <http://publib.boulder.ibm.com/infocenter/systems/index.jsp>. To access the BladeCenter S system documentation from this site, click **Systems hardware > BladeCenter information > Chassis > BladeCenter S (8886)**.

In addition to the product documentation, online education is also available at this location.

- *BladeCenter S Types 7779 and 8886 Planning Guide*

This document contains information to plan for the physical installation and configuration of the BladeCenter S Types 7779 and 8886.

- *BladeCenter S Types 7779 and 8886 Problem Determination and Service Guide*

This document contains information for troubleshooting your BladeCenter S system and solving problems.

- *Serial over LAN Setup Guide*

This guide provides detailed Serial over LAN configuration information for your BladeCenter S system.

- *Safety Information*

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

- *Warranty and Support*

This document contains information about the terms of the warranty and getting service and assistance.

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

The BladeCenter S chassis might have features that are not described in the documentation that comes with the BladeCenter S chassis. The documentation might be updated occasionally to include information about those features, or technical updates might be available to provide additional information that is not included in the BladeCenter documentation. These updates are available from the IBM Web site. To check for updated documentation, go to <http://publib.boulder.ibm.com/infocenter/bladectr/documentation/index.jsp>.

The IBM BladeCenter Documentation CD

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

Hardware and software requirements

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

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

Using the Documentation CD

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

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

- If Autostart is enabled, insert the CD into the DVD 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 the DVD drive, and click **Start > Run**. In the **Open** field, type:
`e:\win32.bat`
where *e* is the drive letter of your DVD drive, and click **OK**.

- If you are using a Red Hat Linux, insert the CD into the DVD drive; then, run the following command from the /mnt/cdrom directory:

```
sh runlinux.sh
```

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

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

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

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

Notices and statements in this document

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

The following notices and statements are used in this document:

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

Features and specifications

The following table provides a summary of the features and specifications of the BladeCenter S chassis.

<p>Media tray (on front):</p> <ul style="list-style-type: none"> • One DVD drive (can be either a CD-RW/DVD-ROM or DVD/RW drive) • Two USB v2.0 ports • Front system LED panel • Two battery backup unit bay locations, which support the SAS RAID controller modules <p>Blade bays (on front): Six hot-swap blade server bays</p> <p>Disk storage module bays (on front): Two storage bays, each containing up to six 3.5-inch disk drive bays or twelve 2.5-inch disk drive bays.</p> <p>Module bays (on rear):</p> <ul style="list-style-type: none"> • One hot-swap advanced management module bay • Four hot-swap power module bays • Four hot-swap fan module bays • Four hot-swap I/O module bays • One hot-swap serial pass-thru module bay <p>Power modules:</p> <ul style="list-style-type: none"> • Minimum: Two hot-swap power modules. • Maximum: Four hot-swap power modules <p>Cooling:</p> <p>Four variable-speed, hot-swap fan modules</p> <p>Two fans in each power supply cool the disk storage modules</p> <p>Management module:</p> <ul style="list-style-type: none"> • One hot-swap advanced management module 	<p>Upgradeable microcode:</p> <ul style="list-style-type: none"> • Advanced management module firmware • I/O module firmware • Blade server firmware • Disk storage module firmware <p>Security features:</p> <ul style="list-style-type: none"> • Login password for remote connection • Secure Sockets Layer (SSL) security for remote management access • Lightweight Directory Access Protocol (LDAP) <p>Predictive Failure Analysis (PFA) alerts:</p> <ul style="list-style-type: none"> • Fan modules • Blade-dependent features <p>Size (7 U):</p> <ul style="list-style-type: none"> • Height: 306.3 mm (12 in.) • Depth: 733.4 mm (28.9 in.) • Width: 444 mm (17.5 in.) • Weight: <ul style="list-style-type: none"> – Fully configured weight with blade servers: approximately 108.86 kg (240 lb) – Empty chassis without modules or blade servers: approximately 40.82 kg (90 lb) 	<p>Environment:</p> <ul style="list-style-type: none"> • Air temperature: <ul style="list-style-type: none"> – BladeCenter S system on: <ul style="list-style-type: none"> - Altitude: 0 to 914 m (3000 ft) 10° to 35°C (50° to 95°F) - Altitude: 914 m to 2134 m (3000 ft to 7000 ft) 10° to 32°C (50° to 90°F) – BladeCenter S system off: -40° to 60°C (-40° to 140°F). • Humidity: 8% to 80% • Acoustics: declared sound power level: 6.3 to 6.8 bels <p>Electrical input:</p> <ul style="list-style-type: none"> • Sine-wave input (50 - 60 Hz single-phase) required • Input voltage (110 V ac): <ul style="list-style-type: none"> – Minimum: 100 Vrms – Maximum: 127 Vrms • Input voltage (220 V ac): <ul style="list-style-type: none"> – Minimum: 200 Vrms – Maximum: 240 Vrms <p>Heat output: Approximate heat output in British thermal units (BTU) per hour:</p> <ul style="list-style-type: none"> • Minimum configuration: 1365 Btu per hour (400 watts) • Maximum configuration: 11942 Btu per hour (3500 watts)
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Components of the BladeCenter S system

BladeCenter S system components include an advanced management module, blade servers, I/O modules, disk storage modules, power modules, fan modules, a serial pass-thru module, and a media tray.

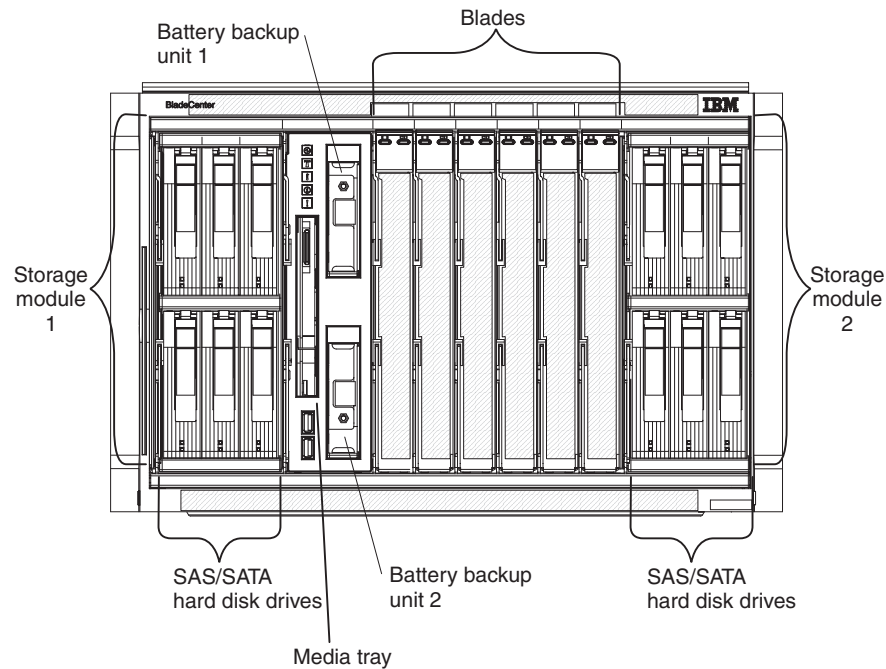
Front view of the BladeCenter S chassis

Blade servers, disk storage modules, and the media tray are installed in the front of the BladeCenter S chassis.

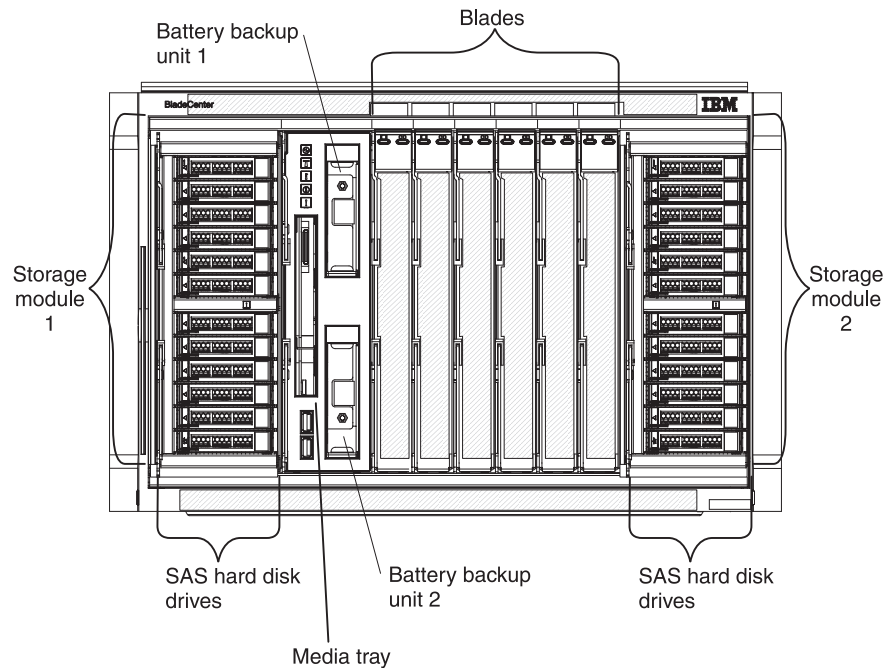
Note: For proper cooling, each bay in the BladeCenter S chassis must have either a device or a filler installed.

As the BladeCenter S chassis can support either 3.5-inch disk drives or 2.5-inch disk drives in the storage bays, the front view of the chassis can appear as either of the following.

3.5-inch disk drive configuration:



2.5-inch disk drive configuration:



Disk storage modules

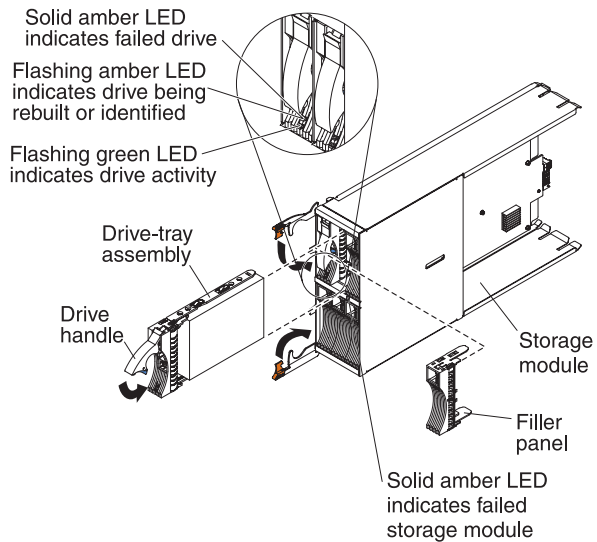
You can install a maximum of two disk storage modules in the BladeCenter S chassis and each disk storage module contains hot-swap hard disk drives. A disk storage module and the hard disk drives installed in that disk storage module are commonly referred to as *integrated shared storage* because this storage is integrated in the BladeCenter S chassis and shared among the blade servers in the BladeCenter S system.

Each disk storage module can support up to six hot-swap, 3.5-inch or twelve hot-swap, 2.5-inch hard disk drives. For 3.5-inch hard disk drives, if you are installing SAS connectivity modules, both SAS and SATA hard disk drives are supported, and you can use both types of hard disk drives in each disk storage module. If you are installing SAS RAID controller modules, you must install SAS hard disk drives. For 2.5-inch hard disk drives, please note that only SAS hard disk drives are supported. Thus, only SAS RAID controllers can be used.

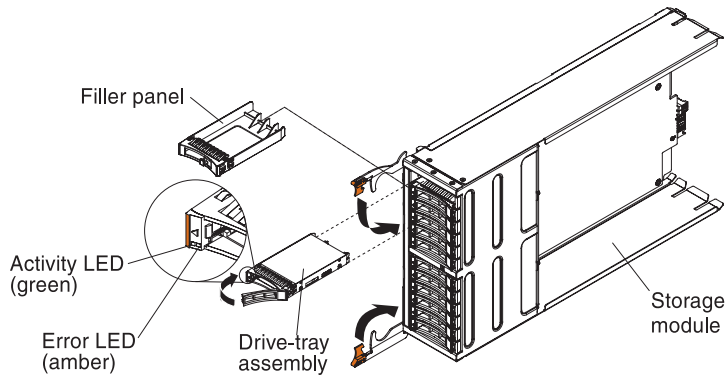
Within each disk storage module, hard disk drives are numbered either 1 through 6 from left to right, and top to bottom for the 3.5-inch hard disk drive configuration or 1 through 12 for the 2.5-inch hard disk drive configuration.

Note: Each hard disk drive bay must contain either a hard disk drive or a drive-bay filler.

Graphic showing close up of 6-disk disk storage module and indicators



Graphic showing close up of 12-disk disk storage module and indicators



Note: Four power modules are required in the BladeCenter S chassis if both disk storage modules are installed.

To access the hard disk drives in the disk storage module, the following devices must be installed:

- SAS I/O modules. For the 6-disk storage module, you can choose to install either SAS connectivity modules or SAS RAID controller modules. As for the 12-disk storage module, only the SAS RAID controller module can be installed.

Note: You cannot mix these module types in the same BladeCenter S chassis.

- SAS connectivity module. At least one SAS connectivity module must be installed. If a single SAS connectivity module is installed, it controls access to both disk storage modules in the BladeCenter S chassis. If two SAS connectivity modules are installed, the module in I/O module bay 3 controls access to disk storage module 1, and the module in I/O module bay 4 controls access to disk storage module 2.
- SAS RAID controller module. Two SAS RAID controller modules must be installed, one in I/O module bay 3 and the other in I/O module bay 4. Each SAS RAID controller module will have access to both storage modules (for high availability).

- A SAS expansion card in each of the blade servers, which provides access through the SAS I/O modules in I/O module bays 3 and 4 to the SAS or SATA hard disk drives in each disk storage module. This only applies to the 6-disk storage module.

There is one LED on each disk storage module:

Fault Solid (amber) when there is a disk storage module failure.

There are two LEDs on each hard disk drive:

Green Flashing when an operation, such as a read or a write, is being performed.

Amber

Flashing when the hard disk drive is being rebuilt (fast blink) or identified (slow blink).

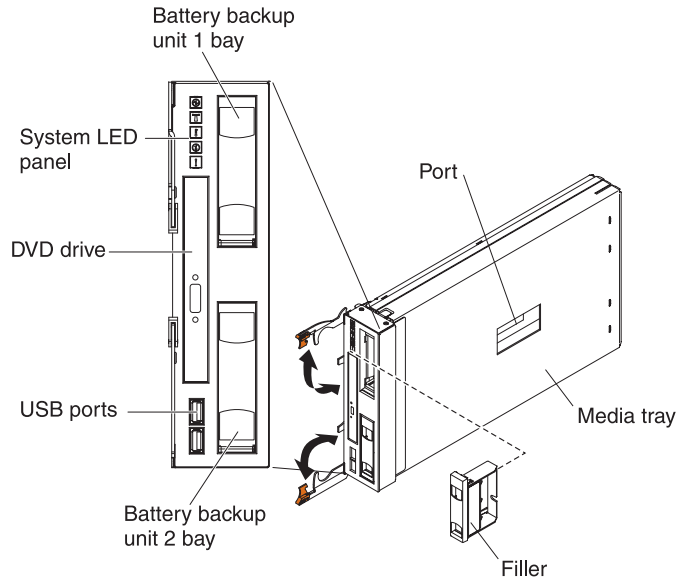
Note: When power is restored to the BladeCenter S chassis after a complete loss of power and you have implemented the hard disk drives as a mirrored array, the fault light will blink as the hard disk drive is being resynchronized.

This resynchronization occurs because the blade servers are attempting to power on before all of the disk storage modules and SAS connectivity modules or SAS RAID controller module are powered up and available. The mirrored array is accessible during resynchronization although performance may be slightly slower.

Solid when there is a drive failure.

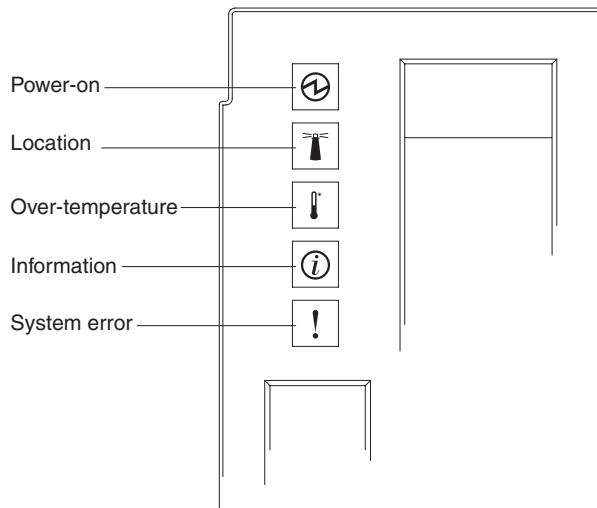
Media tray

The media tray contains the DVD drive (which can be either a CD-RW/DVD-ROM drive or a DVD/RW drive) and two USB v2.0 ports, which are shared by the blade servers. The media tray also contains two battery backup units, which provide backup for SAS RAID controller modules cache.



Note: The port on the side of the media tray is reserved for future use.

Controls and indicators



The media tray provides the following controls and indicators:

System LED panel

The LEDs on this panel provide status information for the BladeCenter S chassis.

Note: These LEDs are also displayed on the rear of the BladeCenter S chassis.

Power-on

Lit (green). Power is being supplied to the BladeCenter S chassis.
Off. The power subsystem, ac power, or the LED has failed.

Note: Even if the power-on LED is off, always remove the power cords from all power modules before you service the BladeCenter S chassis.

Location

Lit or flashing (blue). It has been turned on by the system administrator to aid in visually locating the BladeCenter S chassis. You can turn off the location LED through the Web interface or the IBM Director console.

Over-temperature

Lit (amber). The temperature in the BladeCenter S chassis exceeds the temperature limits, or a blade server reports an over-temperature condition. The BladeCenter S chassis might have already taken corrective action, such as increasing the fan speed. This LED turns off automatically when there is no longer an over-temperature condition.

Information

Lit (amber). A noncritical event has occurred that requires attention, such as the wrong I/O module being inserted into a bay, or power demands within the BladeCenter S chassis exceeding the capacity of the installed power modules.

You can turn off the information LED through the Web interface or the IBM Director console.

System error

Lit (amber). A system error has occurred, such as a module failure or a system error in a blade server. An LED on the failing component is also lit to assist in isolating the error.

DVD drive activity LED

Lit (green). The drive is in use.

DVD drive eject button

Press this button to open the DVD drive.

USB ports

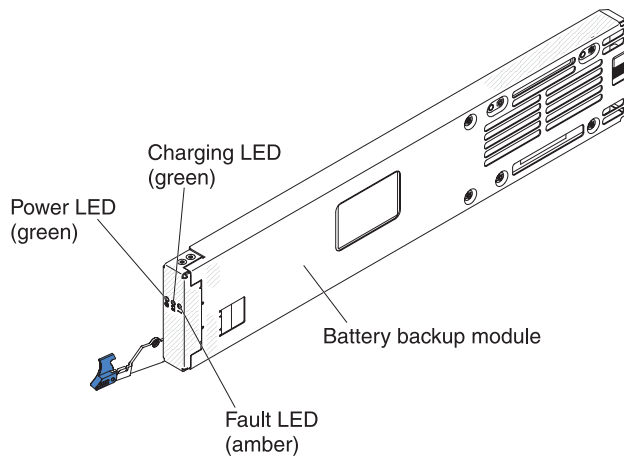
Connect USB devices to these ports.

Battery backup unit:

Battery backup units provide backup for SAS RAID controller modules cache.

Battery backup units are installed in the battery backup unit bays located in the media tray when you install SAS RAID controller modules. The battery backup unit in battery backup bay 1 provides backup support for the SAS RAID controller module in I/O module bay 3; the battery backup unit in battery backup bay 2 provides backup support for the SAS RAID controller module in I/O module bay 4.

Note: Both battery backup units are required if you install SAS RAID controller modules.



Controls and indicators

The battery backup unit provides the following indicators:

Power Lit (green). Power is being supplied to the battery backup unit.

Charging

Lit (green). The battery backup unit is being charged.

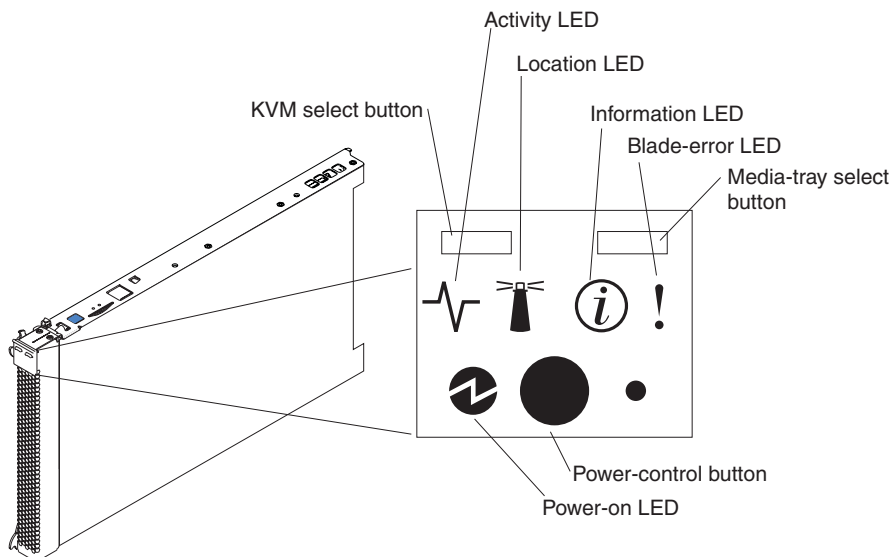
Fault Lit (amber). The battery backup unit has a failure. If the Fault LED is lit, replace the battery backup unit.

Blade server

Blade servers can contain components such as microprocessors, memory, Ethernet controllers, and hard disk drives. They receive power, network connection, and I/O devices (such as DVD drive, keyboard, mouse, video port, USB ports, and a remote monitoring port) from the BladeCenter S chassis.

A SAS expansion card must be installed in each blade server that will access the integrated shared storage.

Note: The control panel door is shown in the closed position in the following illustration. To access the power-control button, you must open the control panel door.



You can find the documentation for blade servers in the IBM Systems Information Center, which is at <http://publib.boulder.ibm.com/infocenter/systems/index.jsp>. To access the blade server documentation from this site, click **Systems hardware > BladeCenter information > Blade servers**.

To determine which blade servers are compatible with the BladeCenter S chassis, see the IBM ServerProven Web site at <http://www.ibm.com/servers/eserver/serverproven/compat/us/eserver.html>.

Controls and indicators

Blade servers typically provide the following controls and indicators:

KVM select button

When using an operating system that supports a local console and keyboard, press this button to associate the shared BladeCenter S chassis keyboard and video ports with the blade server.

Activity LED

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

Location LED

When this blue LED is lit, it has been turned on by the system administrator to aid in visually locating the blade server. The location LED can be turned off through the Web interface of the advanced management module or through the IBM Director Console.

Information LED

When this amber LED is lit, it indicates that information about a system error for the blade server has been placed in the advanced management module event log. The information LED can be turned off through the Web interface of the advanced management module or through the IBM Director console.

Blade-error LED

When this amber LED is lit, it indicates that a system error has occurred in the blade server. The blade-error LED will turn off after one of the following events:

- Correcting the error
- Reseating the blade server in the BladeCenter S chassis
- Cycling the BladeCenter S chassis power

Media-tray select button

Press this button to associate the shared BladeCenter S chassis media tray (removable-media drive and front-panel USB ports) with the blade server. The LED on the button flashes while the request is being processed, then is lit when the ownership of the media tray has been transferred to the blade server. It can take approximately 20 seconds for the operating system in the blade server to recognize the media tray.

If there is no response when you press the media-tray select button, use the advanced management module to determine whether local control has been disabled on the blade server.

Power-control button

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

The power-control button has effect only if local power control is enabled for the blade server. Local power control is enabled and disabled through the Web interface of the advanced management module.

Press down the power button for five seconds to begin powering down the blade server.

Power-on LED

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

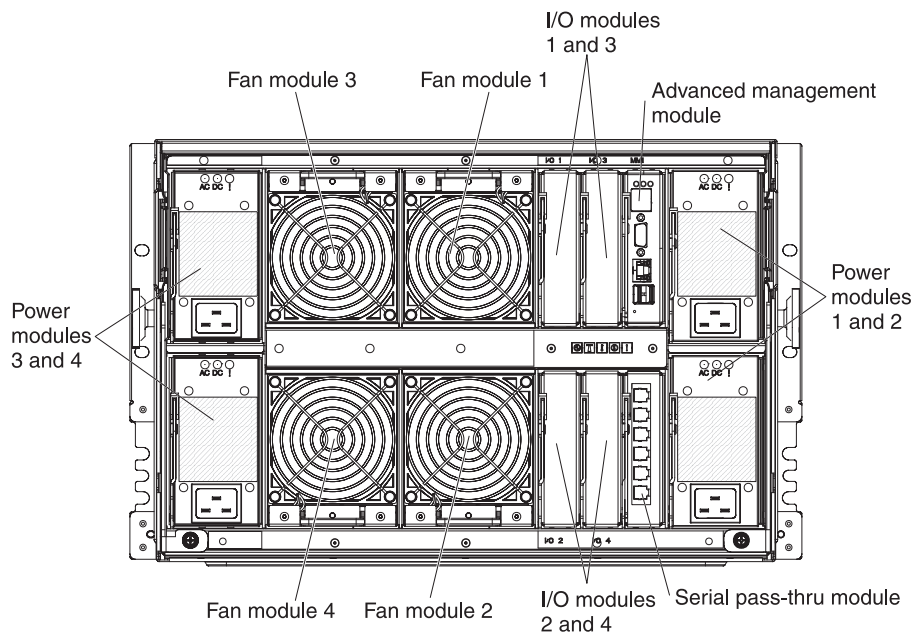
- Flashing rapidly: The service processor (BMC) is initializing the blade server.
- Flashing slowly: The blade server has completed initialization and is waiting for a power-on command.
- Lit continuously: The blade server has power and is turned on.

Rear view of the BladeCenter S chassis

Fan modules, I/O modules, power modules, the advanced management module, and the serial pass-thru module are in the rear of the BladeCenter S chassis.

Note: Each bay in the BladeCenter S chassis must have either a device or a filler installed.

The following illustration shows the rear of the BladeCenter S chassis.



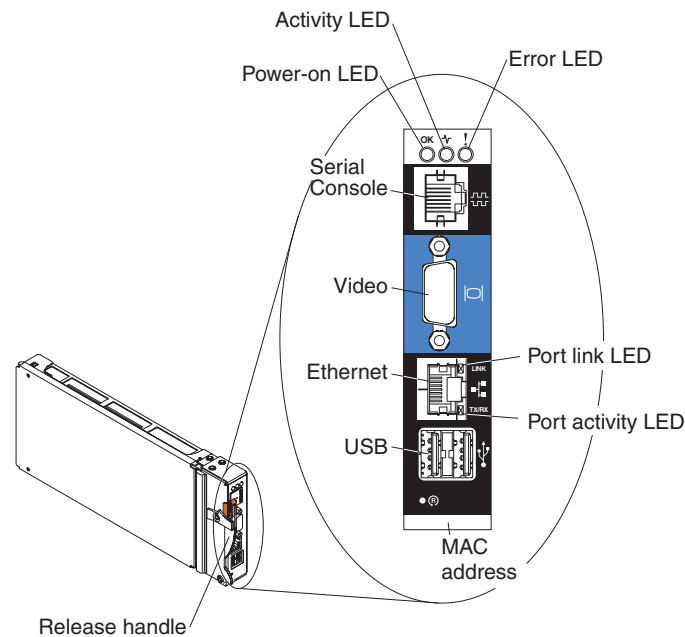
Advanced management module

The advanced management module is a hot-swap module that you use to configure and manage all installed BladeCenter components. The BladeCenter S chassis comes with one advanced management module in the advanced management module bay.

The advanced management module provides systems-management functions and keyboard/video/mouse (KVM) multiplexing for all blade servers in the BladeCenter S chassis that support KVM. It controls the following connections:

- A serial port for a local connection to another computer, such as a notebook computer
- The external video and USB connections for keyboard and mouse
- A 10/100 Mbps Ethernet connection

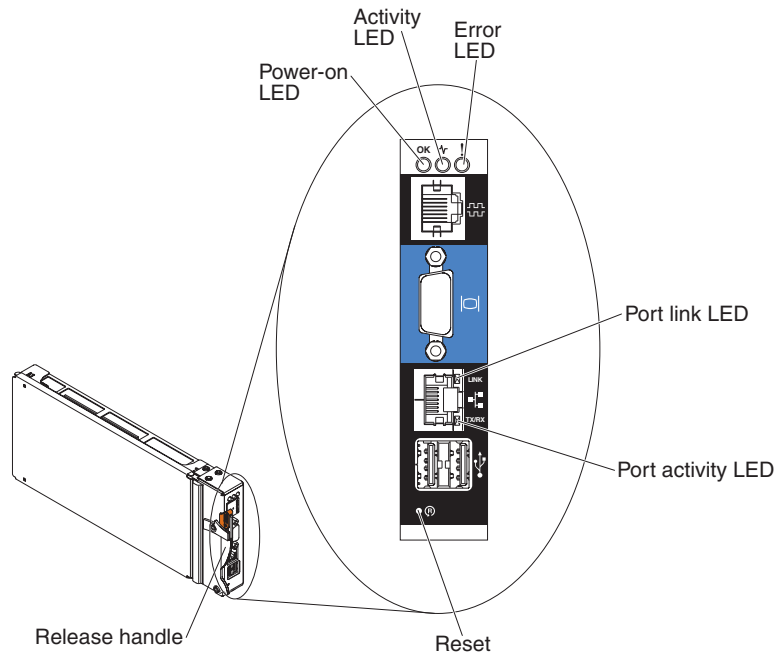
The advanced management module communicates with the service processor (also called the baseboard management controller, or BMC) in each blade server to support features such as blade server power-on requests, error and event reporting, KVM requests, and requests to use the BladeCenter S chassis shared media tray.



The BladeCenter S chassis supports a single advanced management module, and it must be installed in the advanced management module bay.

Advanced management module indicators and controls:

The advanced management module has several LEDs that you can use to obtain status about the advanced management module and the Ethernet connection.



The following advanced management module LEDs provide status information about the advanced management module and Ethernet connection:

Power-on

Lit (green). The advanced management module has power.

Activity

Lit (green). The advanced management module is actively controlling the BladeCenter S system.

Error

Lit (amber). An error has been detected in the advanced management module. When the error LED is lit, the BladeCenter system error LED is also lit.

Port Link

Lit (green). There is an active connection through the Ethernet port to the network.

Port activity

Flashing (green). There is activity through the Ethernet port over the network link.

Reset

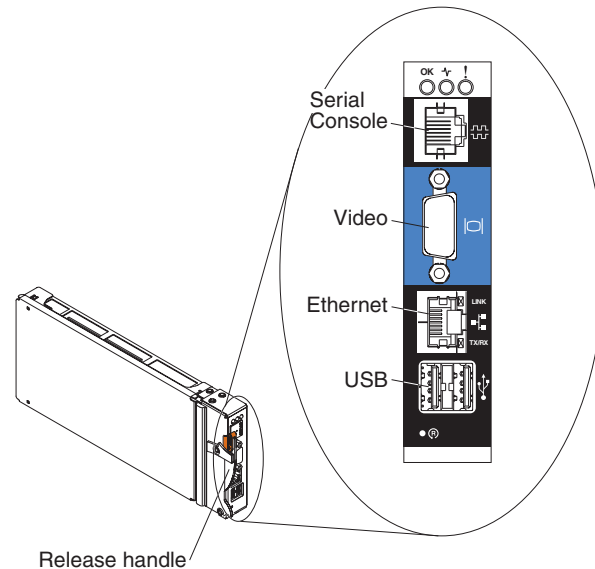
Insert a straightened paper clip into the reset pinhole and remove it to restart the advanced management module. The fan modules operate at full speed while the advanced management module is initializing.

Attention: If you push the paper clip in all the way and hold it for approximately 10 seconds, the advanced management module will be reset to the default configuration. Therefore, you should always make sure that you save your current configuration before resetting the advanced management module.

For more information about saving and restoring configurations, see the *IBM BladeCenter Advanced Management Module User's Guide*.

Advanced management module input and output connectors:

The advanced management module has a serial connector, a video connector, two USB connectors for keyboard and mouse, and an Ethernet connector for remote management.



Serial Console

Use this connection to configure and manage the BladeCenter components through the advanced management module command-line interface (CLI). For example, you can connect a notebook computer to the serial connector and use a terminal emulator program to configure the IP addresses, user accounts and other settings.

The serial pinout for the advanced management module is an EIA-561, as shown in the following table:

Contact (pin number)	Signal name
1	DSR (Data set ready)
2	DCD (Data carrier detect)
3	DTR (Data terminal ready)
4	GND (Ground)
5	Receive (RX)
6	Transmit (TX)
7	CTS (Clear to send)
8	RTS (Request to send)

Video Use this connector to connect a compatible SVGA or VGA video monitor to the BladeCenter S system.

Ethernet

Use this connector to connect the BladeCenter S system to a the management station, either through an Ethernet cable or on the network.

USB connectors

Use these connectors to connect a mouse and keyboard (or other USB

devices). Unlike the USB connectors on the media tray, these connectors are shared by the blade servers through the BladeCenter Keyboard, Video, Mouse (KVM) interface. The KVM interface owns these ports.

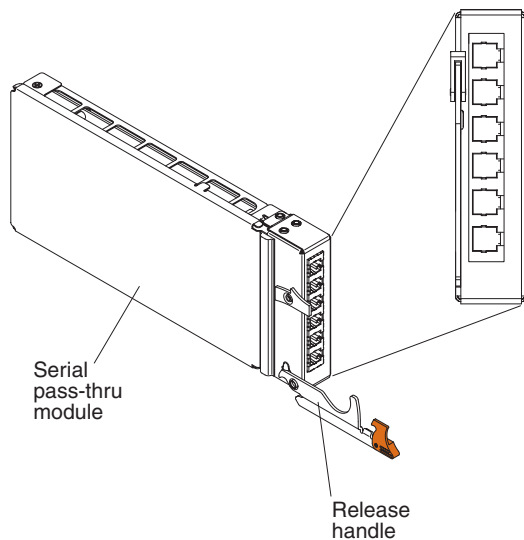
Note: If you connect a USB storage device to these connectors, the blade server has ownership of the media tray and can access the device. To switch ownership of the media tray to a specific blade server, press the **CD** button on that blade server.

Serial pass-thru module

The serial pass-thru module has six serial ports that you can use to directly attach a four-wire serial RJ-45 connector to each of the blade servers in the BladeCenter S chassis. If you use the serial pass-thru module, it must be installed in the serial pass-thru module bay.

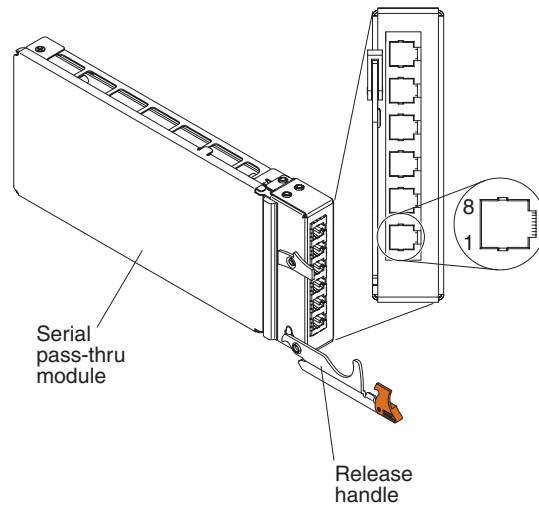
Note: See the documentation for the blade server that you are using to ensure that it supports this type of serial access.

The connectors are numbered 1 through 6, from top to bottom, and correspond to blade servers in blade server bays 1 through 6.



Serial pass-thru connector pinout

There are eight pins on each RJ-45 port, numbered 1 through 8, from bottom to top.

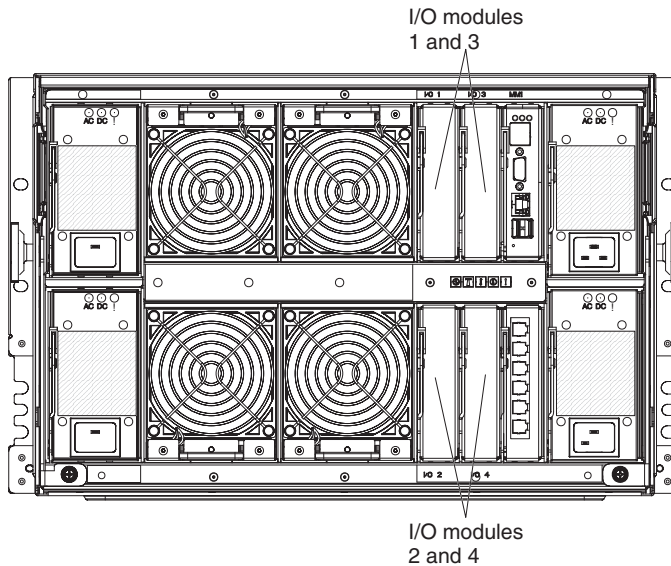


Contact (pin number)	Signal name	Signal direction
1	RTS (Request to send)	Output from blade server
2	Not used	n/a
3	RXD (Receive data)	Input to blade server
4	GND (Ground)	n/a
5	Not used	n/a
6	TXD (Transfer data)	Output from blade server
7	Not used	n/a
8	CTS (Clear to send)	Input to blade server

Note: The serial pass-thru module uses the DTE convention.

I/O modules

You can install up to four I/O modules in the BladeCenter S chassis, including Ethernet switch modules, Fibre Channel switch modules, pass-thru modules (optical and copper), SAS connectivity modules, and SAS RAID controller modules.



Note:

You can find the documentation for I/O modules at the IBM Systems Information Center, which is at <http://publib.boulder.ibm.com/infocenter/systems/index.jsp>. To access the I/O module documentation from this site, click **Systems hardware > BladeCenter information > I/O modules**.

To determine which I/O modules are compatible with the BladeCenter S chassis, see the IBM ServerProven Web site at <http://www.ibm.com/servers/eserver/serverproven/compat/us/eserver.html>.

I/O module bay 1

I/O module bay 1 supports any standard Ethernet or pass-thru module that connects to the two integrated Ethernet controllers in each of the blade servers.

Note: This I/O module bay is wired differently from I/O module bay 1 in a BladeCenter E or BladeCenter H chassis.

I/O module bay 2

I/O module bay 2 supports an optional I/O module, such as an Ethernet switch or a pass-thru module, that connects to the two integrated Ethernet controllers in each of the blade servers.

Note: If you install an I/O module in I/O module bay 2, you will also need to install an expansion card option, such as the 2/4 Port Ethernet Expansion Card, in each blade server that will access the external Ethernet network through the switch module in I/O module bay 2.

I/O module bays 3 and 4

I/O module bays 3 and 4 support SAS connectivity modules or SAS RAID controller modules.

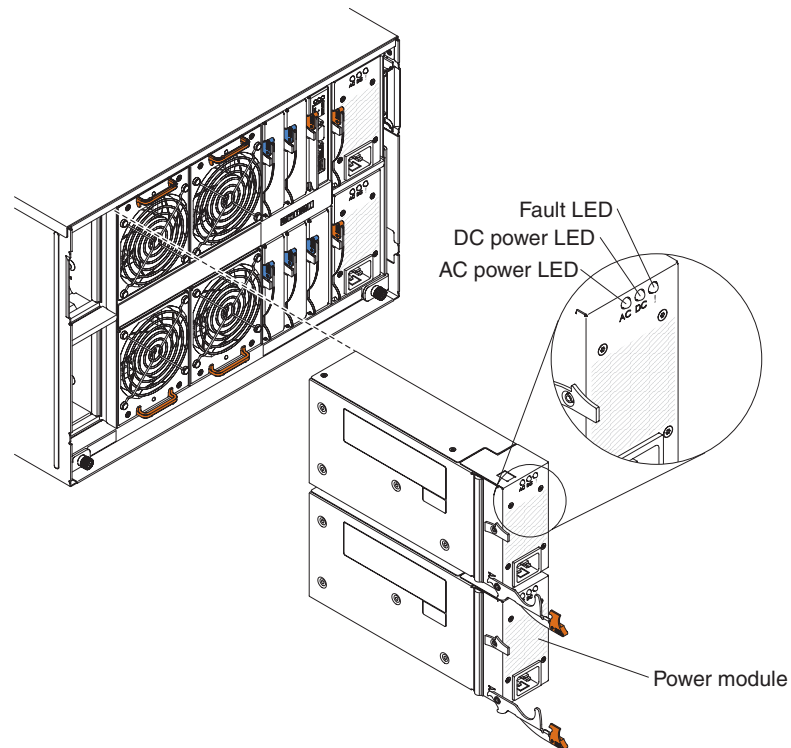
- If you are using the RAID storage solution, you must install two SAS RAID controller modules, one in I/O module bay 3 and one in I/O module bay 4. SAS RAID controller modules require a SAS expansion card option in each blade server that will access the integrated shared storage.
- If you are using only one SAS connectivity module, install the module in I/O module bay 3. You can install an additional SAS connectivity module in bay 4. A SAS connectivity module requires a SAS expansion card option in each blade server that will access the integrated shared storage.

The two bays also support Ethernet switch modules, Fibre Channel switch modules, and pass-thru modules (optical and copper) if the disk storage modules are not being used.

Important: I/O module bays 3 and 4 must both contain the same type of switch (either SAS connectivity modules, SAS RAID controller modules, Ethernet switch modules, pass-thru modules, or Fibre Channel switch modules).

Power modules

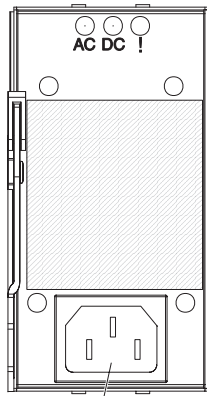
The BladeCenter S system supports up to four autoranging power modules that are capable of supporting either 110 V ac or 220 V ac.



There are two types of power modules. These power modules are identical except for the power cord connector; one power module has a C14 connector and the other power module has a C20 connector. Both types of power modules can be installed in the same chassis.

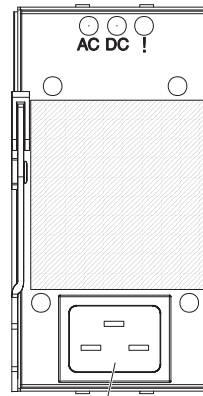
Table 1. Power modules used in the BladeCenter S system

Power module with C14 connector



C14 connector

Power module with C20 connector



C20 connector

Within the BladeCenter S chassis, all power supplies are combined into a single power domain, which distributes power to each of the blade servers and modules through the system midplane.

You must install a minimum of two power modules. If you install only two power modules, install them in power module bays 1 and 2 (the top and bottom power module bays on the right as you face the rear of the BladeCenter S chassis).

Note: You must install all four power modules if you are using both disk storage modules.

If you disengage or remove all devices from the front of the BladeCenter S chassis (media tray, blade servers, and disk storage modules), the power modules will be disabled.

Indicators and controls

There are three LEDs on each power module:

AC power

Lit (green). Power is being supplied to the power module.

DC power

Lit (green). Power is being supplied from the power module to the BladeCenter S chassis midplane.

Fault Lit (amber). There is a fault with the power module.

Note: Before unplugging the AC power cord from the power module or removing the power module from the BladeCenter S chassis, verify that the capacity of the remaining power modules are sufficient to meet the minimum power requirements for all components in the BladeCenter S chassis. You can view power status and requirements through the advanced management module.

For information on accessing and using the advanced management module, see the *Advanced Management Module User's Guide*.

1. Verify that the power modules are properly connected to an AC power source. All power modules in the BladeCenter S chassis must be

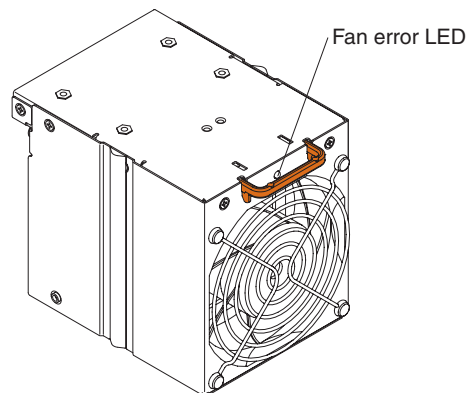
connected to the same power input voltage (either 110 V ac or 220 V ac). Do not mix power input voltages.

2. Unplug the AC power cord from the power module and plug it in again.
3. Reseat the power supply.
4. Swap the AC power cord with a power cord that is known to be working.
5. Move the power module to another power module bay in the BladeCenter S chassis.

Fan modules

The BladeCenter S chassis comes with four installed hot-swap fan modules.

The fan modules (sometimes called *fan packs*) are designed to provide cooling airflow to the blade servers and I/O modules. Each fan module contains two fans.



Indicators and controls

Each fan module has a single LED:

Error Lit (amber). One of the fans in the fan module has failed.

Note: If one of the fans in the fan module fails, the other fan will begin operating at full speed.

Systems and storage management

IBM provides products that you can use to manage your BladeCenter S system and the integrated shared storage that is available.

IBM Director

IBM Director provides a comprehensive entry-level workgroup hardware manager. It includes advanced self-management capabilities for maximum system availability and support for multiple operating systems, including Microsoft Windows, AIX, Linux, and i5/OS.

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

- View and modify the hardware configuration of remote systems
- Monitor the usage, health, and performance of critical components, such as microprocessors, disks, and memory
- Centrally manage individual or large groups of IBM and non-IBM x86-processor-based servers, desktop computers, workstations, and notebook computers on a variety of platforms
- Inventory your environment
- Perform updates to managed systems, such as device drivers and firmware
- Automatically perform an action based on events or schedules, if IBM Director is configured to do so

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 and to download the latest version of IBM Director, go to <http://www.ibm.com/systems/management/director/>.

Storage Configuration Manager

Storage Configuration Manager is a Web based device management application.

Storage Configuration Manager provides user and programmatic interfaces that you need to configure and monitor multiple instances of different types of storage related devices, including either the SAS connectivity modules or the SAS RAID controller modules, and the SAS controllers on the expansion cards in each blade server. It includes a Web-based graphical user interface. It can be installed as a stand-alone application or as an extension to IBM Director 5.20.2.

You can connect to the Storage Configuration Manager component of the application from any computer on the network that it is installed on, using a standard Web browser (Internet Explorer 6.x or later, Firefox 1.0 or later).

Instead of using Storage Configuration Manager, you have the option of configuring the integrated shared storage from the configuration wizard of the advanced management module if you choose one of the predefined configurations that are provided. However, you must install Storage Configuration Manager if you decide to modify an existing configuration or create your own customized configuration.

To download Storage Configuration Manager go to <http://www.ibm.com/systems/support/management> and select **IBM Storage Configuration Manager**.

Chapter 2. Installing the BladeCenter S Types 7779 and 8886

Install the BladeCenter S system in your facility by setting up and configuring all of the hardware components.

Before you begin the installation process, make sure that you have completed all planning activities.

There are many different methods for setting up and configuring the components in your BladeCenter S system. In general, you must complete these procedures:

1. Prepare to install the BladeCenter S system.
2. Set up the BladeCenter S system hardware.
3. Optionally, install IBM Director, if you are going to use it to manage your BladeCenter S system.

Installation guidelines

Before you remove or replace a component, read the following information.

- Read Safety and “Handling static-sensitive devices” on page 28. This information will help you work safely.
- Observe good housekeeping in the area where you are working. Place removed covers and other parts in a safe place.
- You do not have to disconnect the BladeCenter S system from power to install or replace any of the hot-swap modules. You must shut down the operating system and turn off a hot-swap blade server before you remove it, but you do not have to remove power from the BladeCenter S system itself.
- Do not attempt to lift an object that you think is too heavy for you. If you have to lift a heavy object, observe the following precautions:
 - Make sure that you stand safely without slipping.
 - Distribute the weight of the object equally between your feet.
 - Use a slow lifting force. Never move suddenly or twist when you lift a heavy object.
 - To avoid straining the muscles in your back, lift by standing or by pushing up with your leg muscles.
- Make sure that you have an adequate number of properly grounded electrical outlets for the BladeCenter S system.
- Back up all important data before you make changes to disk drives.
- Have a small flat-blade screwdriver available.
- Orange on a component or an orange label on or near a component indicates that the component may be hot-swapped, which means that you can remove or install the component while the BladeCenter S system 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.
- Blue on a component indicates touch points, where you can grip the component to remove it from or install it in the BladeCenter S chassis, open or close a latch, and so on.

System reliability guidelines

To help ensure proper system cooling and system reliability, make sure the following requirements are met.

- Each of the module bays on the front and rear of the BladeCenter S chassis has either a module or a module bay filler installed in it.
- Each of the blade bays on the front of the BladeCenter S chassis has either a blade server or a blade bay filler installed in it.
- Each of the disk storage module bays has a disk storage module or disk storage module filler installed in it. If a disk storage module is installed, each of the drive bays has a hard disk drive or a hard disk drive bay filler installed in it.
- Each of the drive bays in a blade server storage expansion option has either a hot-swap drive or a filler panel installed.
- You have followed the cabling instructions that come with optional adapters.
- Cables for the optional modules are routed correctly.
- A failed fan module is replaced as soon as possible.

Handling static-sensitive devices

Make sure that you read these guidelines before handling static-sensitive devices.

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

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

- Limit your movement. Movement can cause static electricity to build up around you.
- The use of a grounding system is recommended. For example, wear an electrostatic-discharge wrist strap, if one is available.
- Handle the device carefully, holding it by its edges or its frame.
- Do not touch solder joints, pins, or exposed circuitry.
- Do not leave the device where others can handle and damage it.
- While the device is still in its static-protective package, touch it to an unpainted metal part of the BladeCenter S chassis or rack 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 immediately without setting down the device. If it is necessary to set down the device, put it back into its static-protective package.
- Take additional care when you handle devices during cold weather. Heating reduces indoor humidity and increases static electricity.

Preparing to install your BladeCenter S system

Use this checklist to prepare for the installation of the BladeCenter S system hardware.

1. Verify that you have received all hardware.
2. Obtain all firmware updates that you will need.
3. Obtain configuration, systems management, and storage configuration software, if needed.
4. Review the Safety guidelines.

Verifying ship group contents

Make sure that you have received all of the hardware that you are expecting.

Depending on your order, you might receive several boxes. Each box might contain one or more components.

You can use your order to confirm that you have received all of the boxes that you expected to receive. To verify that you have received the required hardware in each box, complete the following steps:

1. Open the packing list that is provided with each box.
2. Confirm that the box contains all components that are listed on the packing list.

Obtaining firmware and device drivers

During the installation of the BladeCenter S system, you might have to update the firmware for one or more of the components. Therefore, consider obtaining all firmware updates before you begin the installation process.

The following BladeCenter S system components have firmware that can be updated:

- Advanced management module
- Blade servers
- I/O modules, including the SAS connectivity module and the SAS RAID controller module
- Disk storage modules

In addition, some of the optional hardware devices that you can order for the BladeCenter S system have device drivers that you must install.

For example, Ethernet controllers are integrated on each blade server system board. The Ethernet controllers provide 1000-Mbps full-duplex capability only, which enables simultaneous transmission and reception of data to the external ports on the Ethernet switches. You do not have to set any jumpers or configure the controller for the blade server operating system. However, you must install a device driver in the blade server to enable the blade server operating system to address the Ethernet controller.

See the documentation that comes with your hardware options for information about installing any required device drivers.

To obtain the latest firmware and device drivers, complete the following steps:

1. Go to <http://www.ibm.com/systems/support/>.
2. Under **Product Support**, click **BladeCenter**.

3. Under **Popular links**, select **Software and device drivers**.
4. Select **BladeCenter S** to display the matrix of downloadable files.
5. Select the blade servers and other devices that you will install in the BladeCenter S chassis to download the firmware and device drivers.

Obtaining configuration, systems management, and storage management software

IBM Director and Storage Configuration Manager are provided with the BladeCenter S system.

IBM Director

To obtain the latest version of IBM Director, go to the Support for IBM Systems Management Web site at <http://www.ibm.com/systems/support/management>.

Storage Configuration Manager

To obtain the latest version of Storage Configuration Manager, go to the Support for IBM Systems Management Web site at <http://www.ibm.com/systems/support/management>.

Setting up your BladeCenter S system

Use this checklist to set up the BladeCenter S system hardware.

Before you begin, make sure that you have at least 7 U of available space in your rack to install the BladeCenter S chassis.

1. Remove components that are installed in the BladeCenter S chassis to decrease the weight, making it easier to install in a rack.
2. Install the BladeCenter S chassis in a rack.
3. Install the components that you removed (and any other components or optional devices that you have ordered).
4. Cable all components in the BladeCenter S chassis to the appropriate external devices.
5. Connect the BladeCenter S system to power.
6. If you are installing IBM Director, set up the IBM Director server.

Removing components

Before you install the BladeCenter S chassis in a rack, remove components to reduce the weight of the unit so that it can safely be installed in the rack.

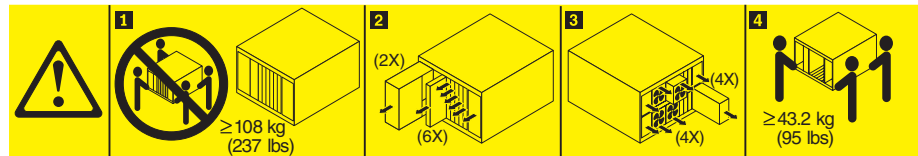
The weight of a fully populated BladeCenter S system is approximately 108.86 kg (240 lb). Attempting to lift this much weight can cause personal injury. Therefore, you should remove modules and blade servers from the BladeCenter S chassis before you attempt to install the unit in a rack. An empty BladeCenter S chassis (all modules and blade servers removed) is approximately 40.82 kg (90 lb).

Statement 32



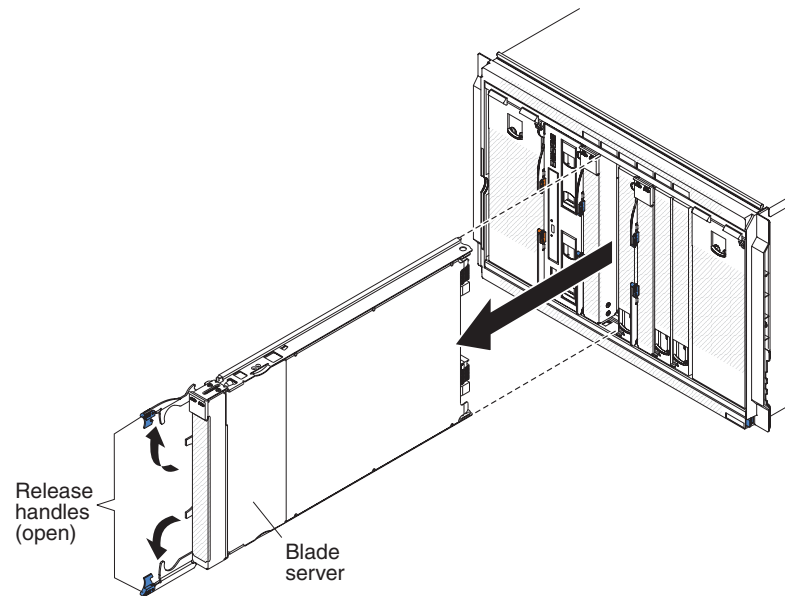
CAUTION:

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



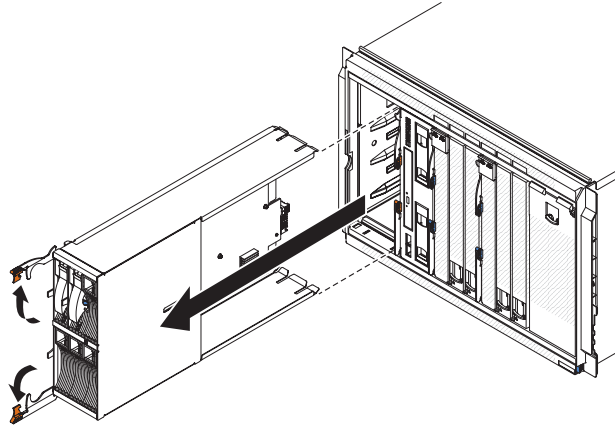
1. Remove components from the front of the BladeCenter S chassis.
 - a. Read Safety and “Handling static-sensitive devices” on page 28.
 - b. Remove all blade servers.

Important: Typically, you should record the bay location of the blade server when you remove it so that you can reinstall it back in the same bay. However, when you initially receive the BladeCenter S system, the configuration that you choose for the zoning of the SAS connectivity modules, if SAS connectivity modules are installed in the BladeCenter S chassis, dictates the correct location of the blade servers.

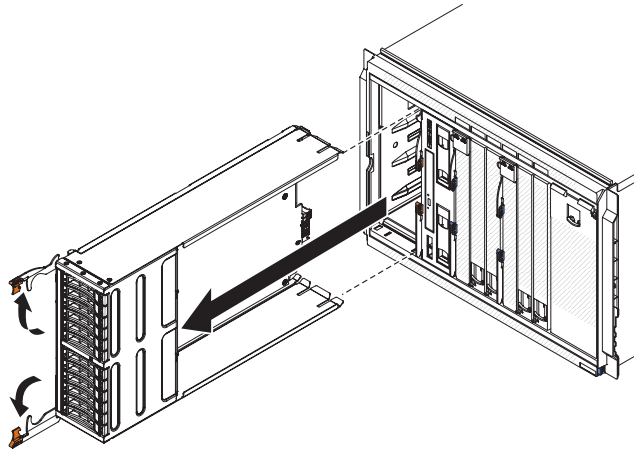


c. Remove all disk storage modules.

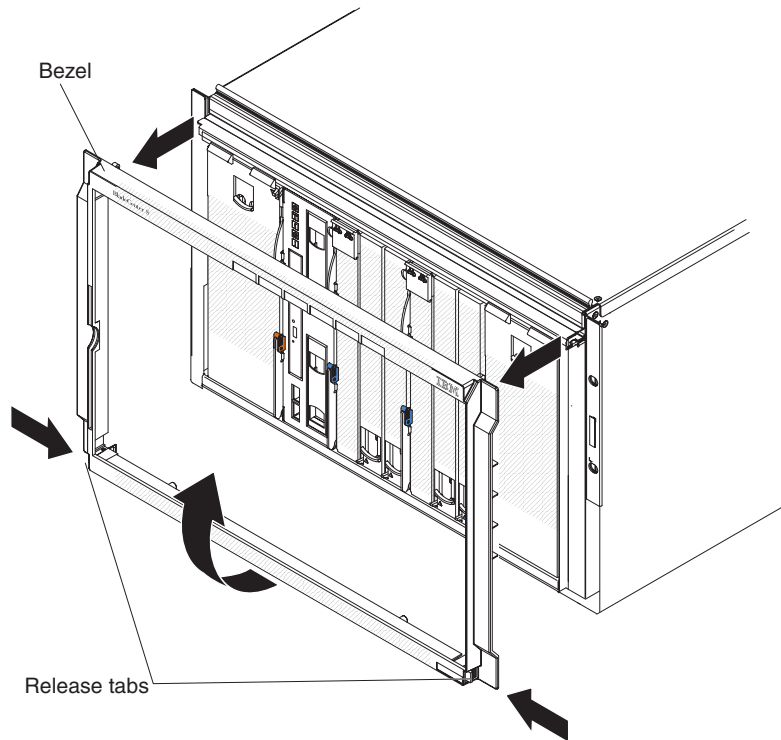
Graphic showing the removal of a 6-disk storage module



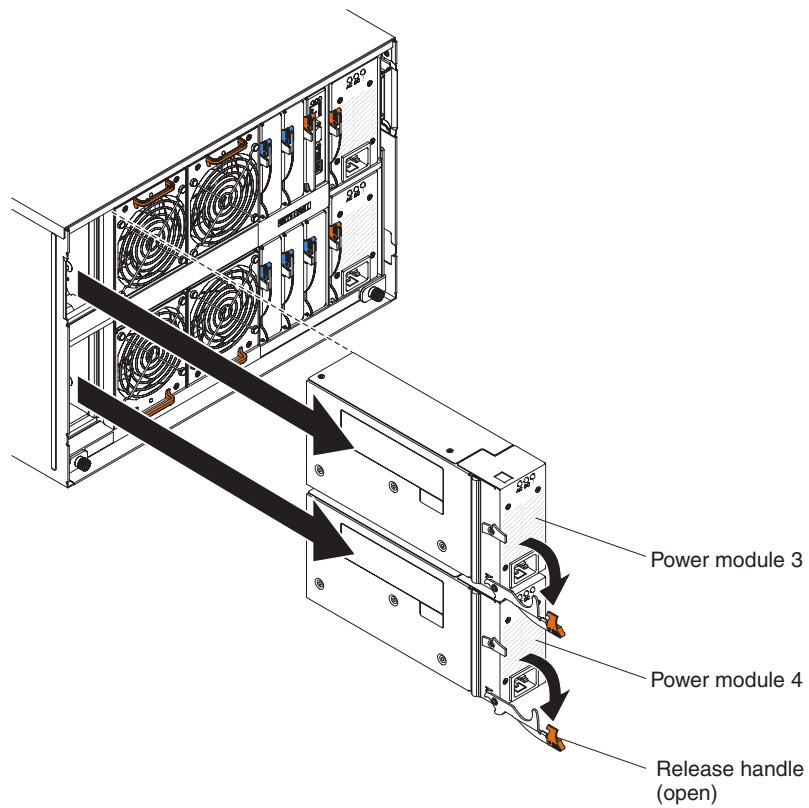
Graphic showing the removal of a 12-disk storage module



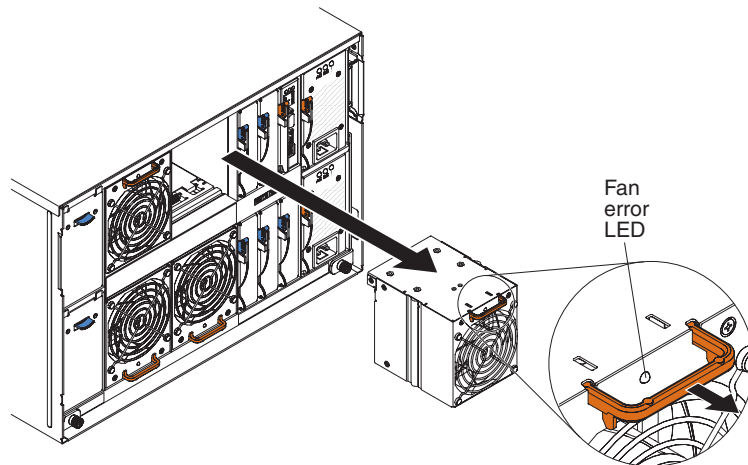
2. Remove the bezel from the front of the BladeCenter S chassis.



3. Remove components from the rear of the BladeCenter S chassis.
 - a. Remove all power modules.



- b. Remove all fan modules.



Installing the BladeCenter S chassis in a rack

Use the rack template and the rack installation kit that comes with the BladeCenter S system to correctly install it in a rack.

Before you begin, review the “Installation guidelines” on page 27.

If you are installing the BladeCenter S chassis in the Office Enablement Kit, see the *Office Enablement Kit Installation and User’s Guide*.

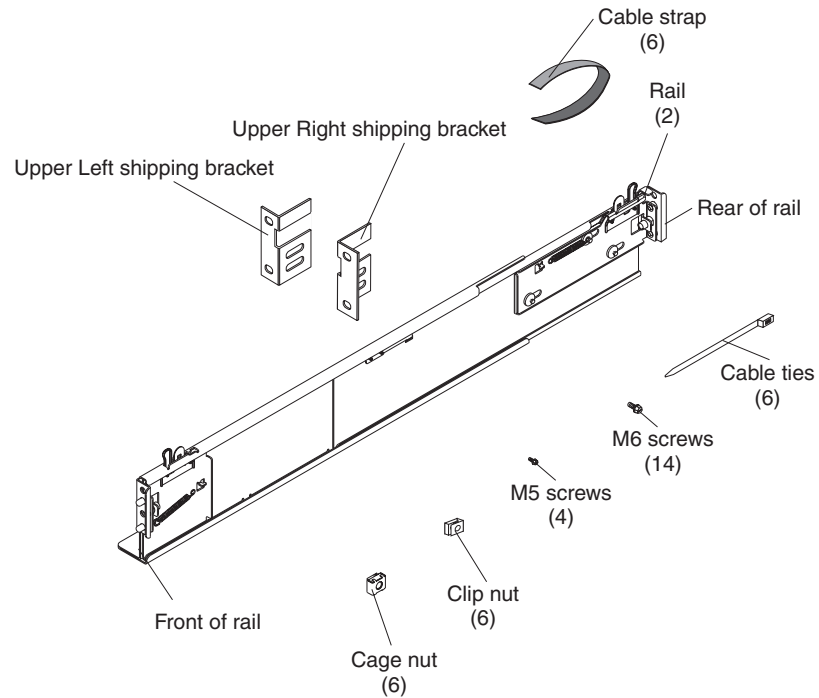
Rack requirements:

- Make sure that the room air temperature is below 35°C (95°F).
- Do not block any air vents; usually, 15 cm (6 in.) of air space in the rear and 5 cm (2 in.) in the front provides proper airflow.
- Three or more people are required to install the device in a rack.
- Do not leave any unused U space within a rack open. Blank filler panels must be used to prevent recirculation of warm air.
- Install your BladeCenter S chassis only in a rack cabinet with perforated front and rear doors or in a rack that is equipped with an IBM Rear Door Heat eXchanger.
- Do not extend more than one device out of the rack at the same time.
- Remove the rack doors and side panels to provide easier access during installation.
- The rack-mounting flanges must have holes and clearances per EIA-310-D.
- Make sure that there is sufficient room in front of the front EIA flange to provide minimum bezel clearance of 70 mm (2.76 inches) deep.
- Make sure that there is sufficient room behind the rear of the rear EIA flanges to provide for adequate cable management and routing.
- Rack weight-handling capacity must be sufficient for the aggregate weight of the BladeCenter S chassis, blade servers, power distribution units, and power cables.
- The rack must be stabilized with stabilization brackets and leveling pads so that it does not become unstable when it is fully populated.

To install the BladeCenter S chassis in a rack, complete the following steps:

1. Read Safety and “Handling static-sensitive devices” on page 28.

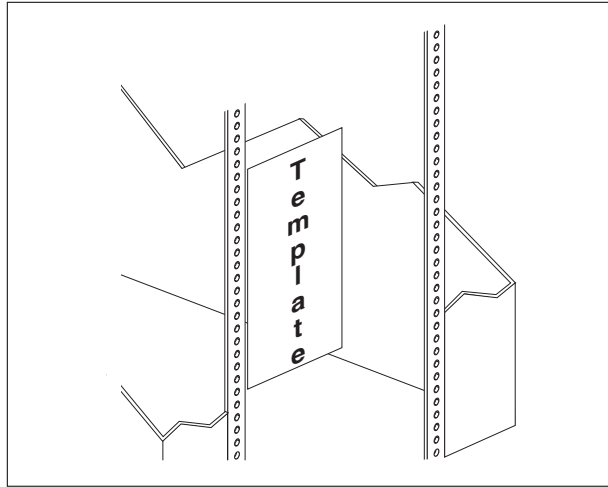
2. Make sure that you have all of the parts of the rack installation kit that are needed to install the BladeCenter S chassis in a rack. If any parts are missing or damaged, contact your place of purchase.



Note: Left and right shipping brackets are required only when the BladeCenter S chassis is shipped while it is installed in a rack cabinet. An initial set of shipping brackets is provided in the rack installation kit. If you need to order additional shipping brackets, you must order the miscellaneous parts kit.

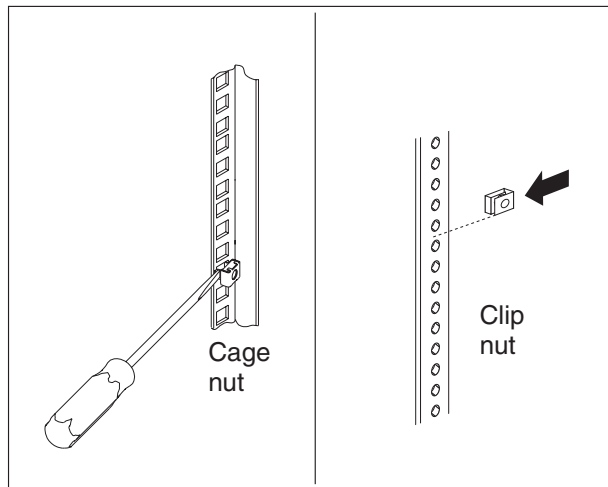
See the *IBM BladeCenter S Type 8886 Problem Determination and Service Guide* for the Miscellaneous parts kit part number.

3. Position the rack-mounting template that is supplied with your BladeCenter S system on the rack so that the edges of the template do not overlap any other installed devices. Line up and select the holes on the front and rear of the rack in the locations that are indicated by the arrows on the template.

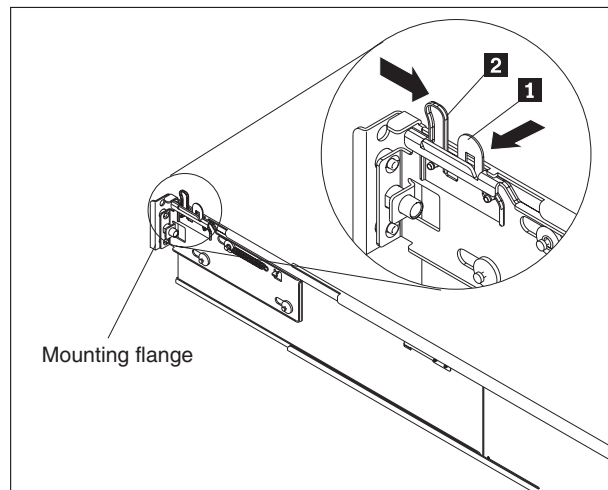


4. Use a screwdriver to install the cage nuts or the clip nuts, as required for your rack, in the locations that are indicated on the template.

Note: For racks with square holes, use the cage nuts. For racks with round holes, use the clip nuts.

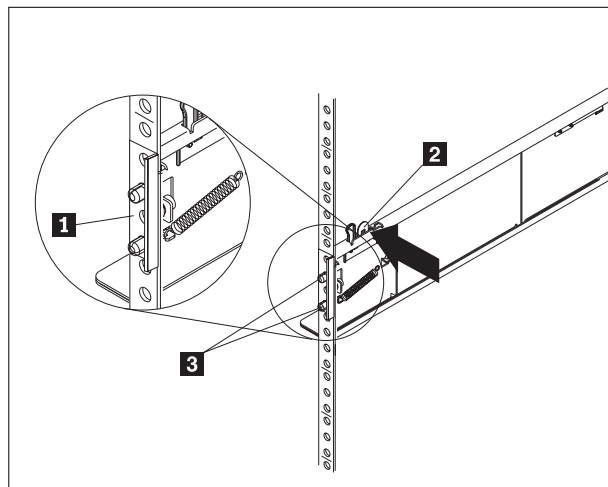


5. Before you install the rails in the rack, fully extend each rail. A set of rail pins and a mounting flange are on each end of the rail. Retract the rail pins by pressing in the rail latch **1** and then pulling the finger pull **2** toward the center of the rail.

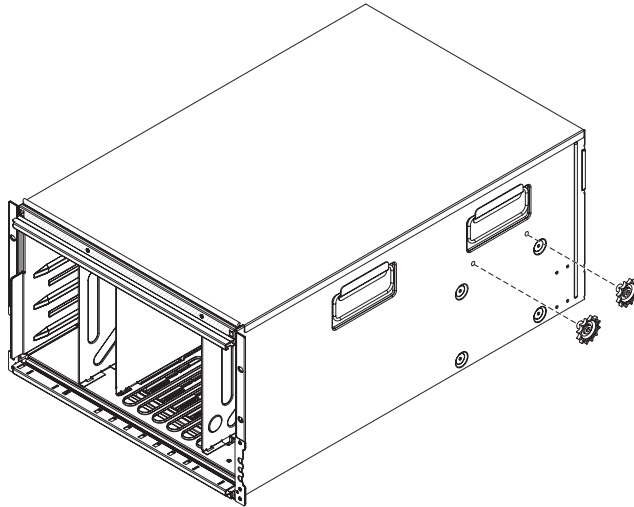


6. Pull each end of the rail away from its center until the rail is fully extended. A locking mechanism prevents the rail from being extended too far.
7. Position the rail in the desired location on the rack and align the pins on each end of the rail with the applicable holes on the rack **1**. Release the rail latches and finger pulls **2** on each end to allow the rail pins to pass through the rail and the mounting flange **3**. Repeat steps 5 through 7 for the other rail.

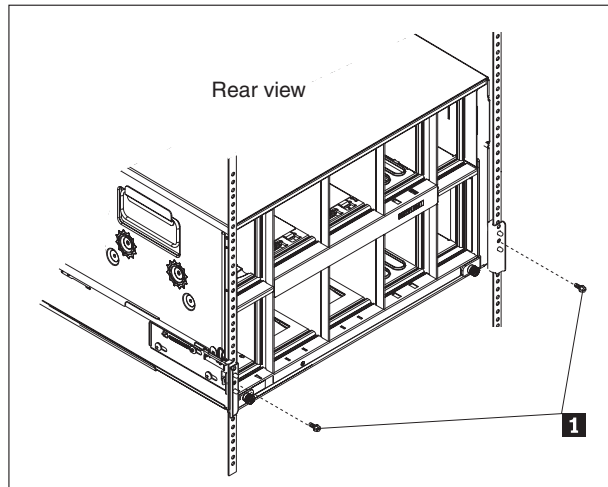
Note: Make sure that the rail pins protrude through the mounting flanges and the rack cabinet rails.



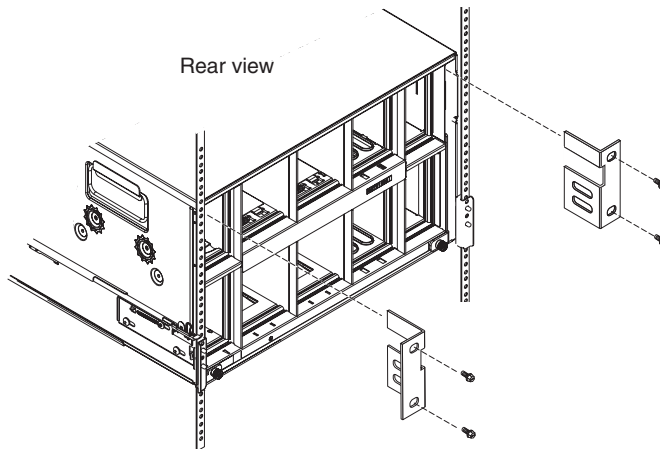
8. Remove the two blue shipping screws from each side of the BladeCenter S chassis.



9. Slide the BladeCenter S chassis into the front of the rack. Insert one M6 screw **1** in the center hole of each rail on the rear of the rack cabinet.



10. Optionally, install the shipping brackets. There is a set of shipping brackets provided in the BladeCenter S chassis rack installation kit.

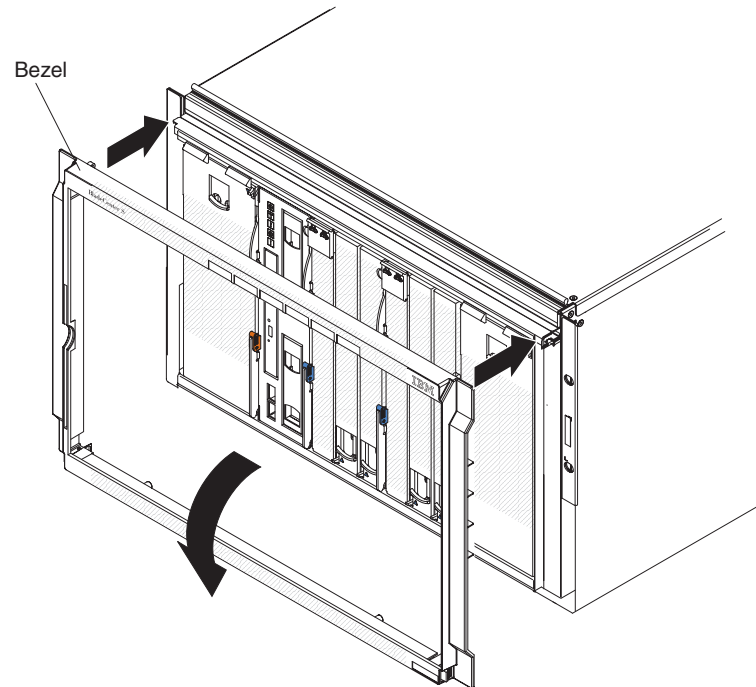


To install the upper right shipping bracket (if you are facing the rear of the BladeCenter S chassis):

- a. Align the first shipping bracket so that the bottom of the shipping bracket will fit into the slot to the right of power module bay 1. Insert the shipping bracket into the slot.
- b. Align the holes in the shipping bracket with the holes in the rack cabinet.
- c. Secure the shipping bracket to the rack cabinet with the screws that are provided.

Repeat these steps for the upper left shipping bracket.

11. Insert four M6 screws in the front of the BladeCenter S chassis to secure it to the rack cabinet.
12. Install the bezel on the front of the BladeCenter S chassis.

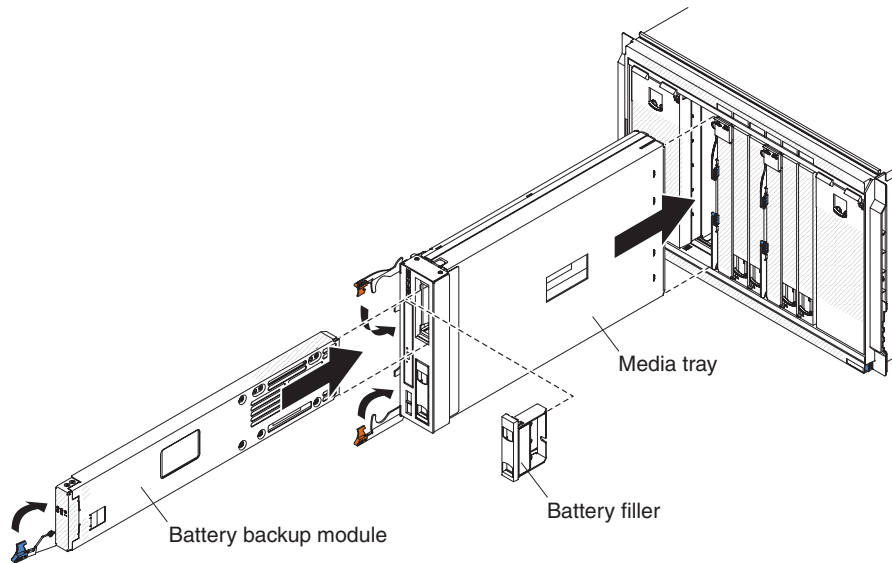


Installing components

After you install the BladeCenter S chassis in a rack, install all components in the BladeCenter S chassis.

Installing the battery backup unit

If you are installing SAS RAID controller modules, you will also need to install two battery backup units. To install a battery backup unit, slide the unit into the media tray and close the release handle.



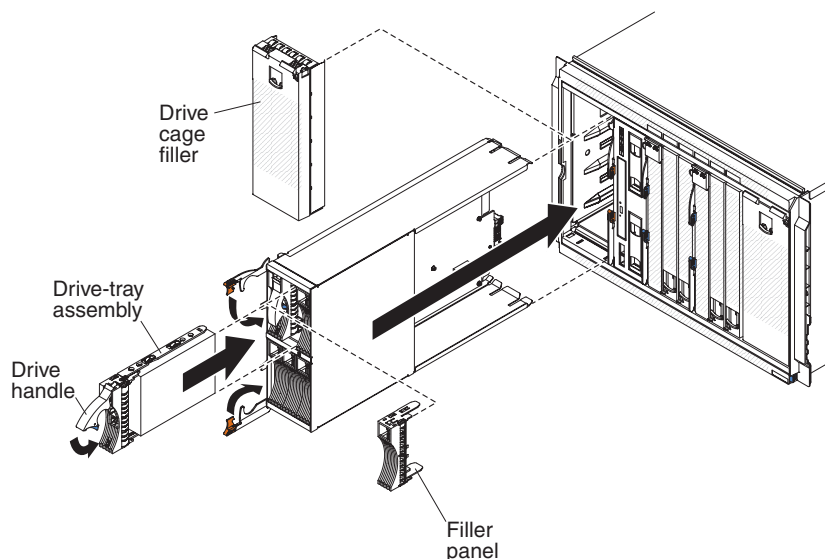
1. Open the release handle (rotate the handle down).
2. Slide the battery backup unit into the media tray.
3. Close the release handle (rotate the handle up)

Installing a disk storage module

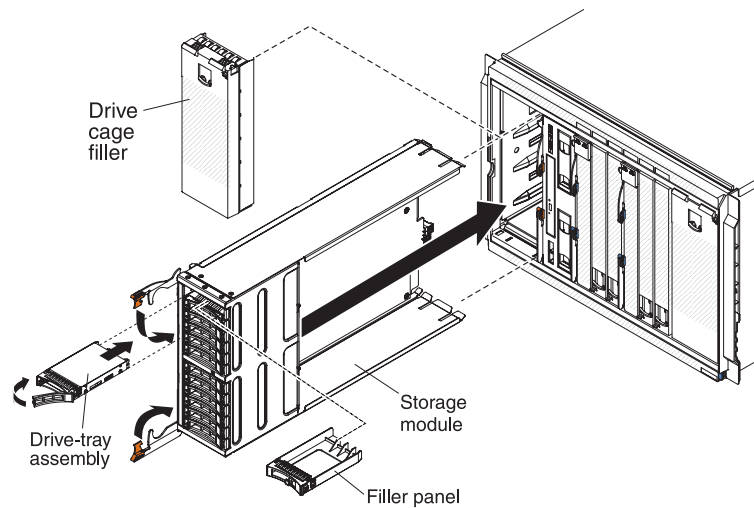
To install a disk storage module, open the release handles on the disk storage module and slide the disk storage module into the disk storage module bay. Then, you can install hard disk drives into the disk storage module by opening the release handle on the hard disk drive and sliding the hard disk drive into the hard disk drive bay.

Note: Four power modules are required in the BladeCenter S chassis if two disk storage modules are installed. If you are installing a disk storage module in disk storage module bay 2, you must have power modules installed in power module bays 3 and 4.

Graphic illustrating the installation of a 6-disk storage module



Graphic illustrating the installation of a 12-disk storage module



1. Read Safety and “Handling static-sensitive devices” on page 28.
2. Open the release handles on the disk storage module (rotate the top handle up and the bottom handle down).
3. Slide the disk storage module into the disk storage module bay until it stops.
4. Close the release handles (rotate the top handle down and the bottom handle up).
5. Install hard disk drives:
 - a. Open the release handle on the hard disk drive (rotate the handle up).
 - b. Slide the hard disk drive into the disk storage module until it stops.

Important: If SAS connectivity modules are installed in the BladeCenter S chassis, the drive bay that you use is determined by the SAS connectivity module zoning configuration that you have selected for the BladeCenter S system. Please note this only applies to the 6-disk storage module.

If SAS RAID controller modules are installed in the BladeCenter S chassis, make sure that you install SAS hard disk drives. SATA hard disk drives are not currently supported when using SAS RAID controller modules.

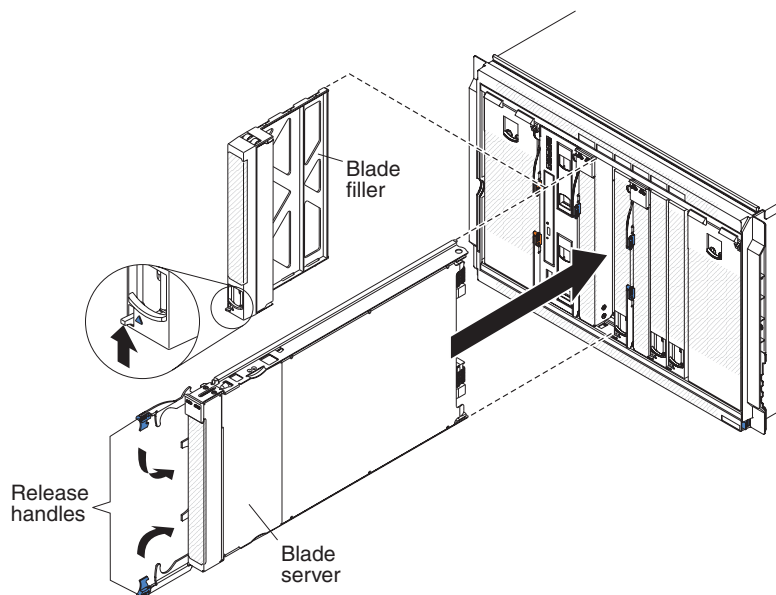
- c. Close the release handle (rotate the handle down).

Installing a blade server

Install a blade server in the front of the BladeCenter S chassis by opening the two release handles on the blade server, sliding the blade server into the blade server bay, and closing the release handles. Before you install a blade server into BladeCenter S chassis, make sure that you have installed any optional hardware devices, such as a SAS expansion card option, in the blade server.

You can find the documentation for blade servers in the IBM Systems Information Center, which is at <http://publib.boulder.ibm.com/infocenter/systems/index.jsp>. To access the blade server documentation from this site, click **Systems hardware > BladeCenter information > Blade servers**.

To determine which blade servers are compatible with the BladeCenter S chassis, see the IBM ServerProven Web site at <http://www.ibm.com/servers/eserver/serverproven/compat/us/eserver.html>.



1. Read Safety and "Handling static-sensitive devices" on page 28.
2. Select the bay for the blade server. Depending on the blade server type and the optional devices that are installed in the blade server, two or more adjacent bays might be required.

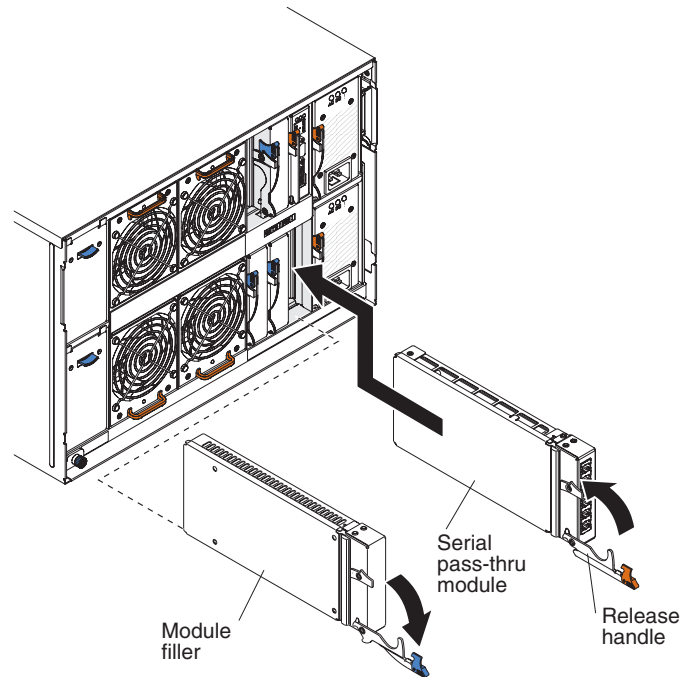
Important: If SAS connectivity modules are installed, the blade server bay that you use when installing a blade server is determined by the SAS connectivity module zoning configuration that you have selected for the BladeCenter S system. See the *IBM BladeCenter S Type 8886 Planning Guide* for more information about zoning configuration.

3. Open both release handles (rotate the top handle up and the bottom handle down).
4. Slide the blade server into the blade server bay until it stops.
5. Close both release handles (rotate the top handle down and the bottom handle up).
6. (Optional) Write identifying information on one of the labels that come with the BladeCenter S chassis; then, place the label on the BladeCenter S chassis top bezel, just above the blade server.

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

Installing a serial pass-thru module

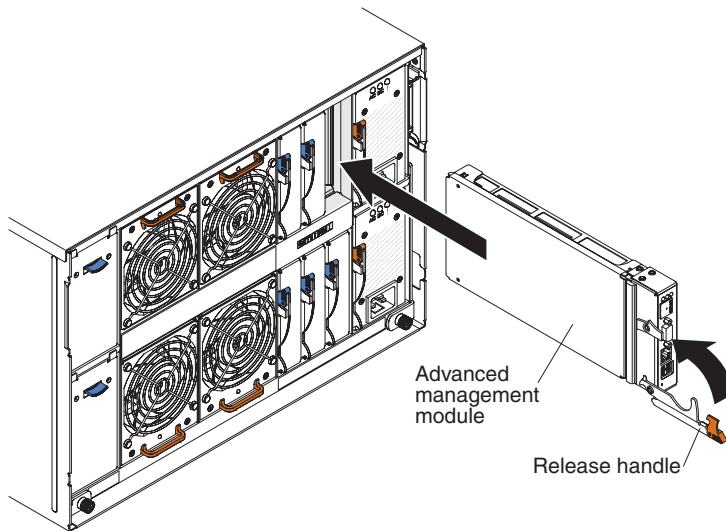
Install a serial pass-thru module in the rear of the BladeCenter S chassis by opening the release handle and sliding the serial pass-thru module into the module bay.



1. Read Safety and “Handling static-sensitive devices” on page 28.
2. Open the release handle (rotate the handle down).
3. Slide the module into the serial pass-thru module bay until it stops.
4. Close the release handle (rotate the handle up).

Installing an advanced management module

To install an advanced management module, open the release handle on the module and slide it into the advanced management module module bay.

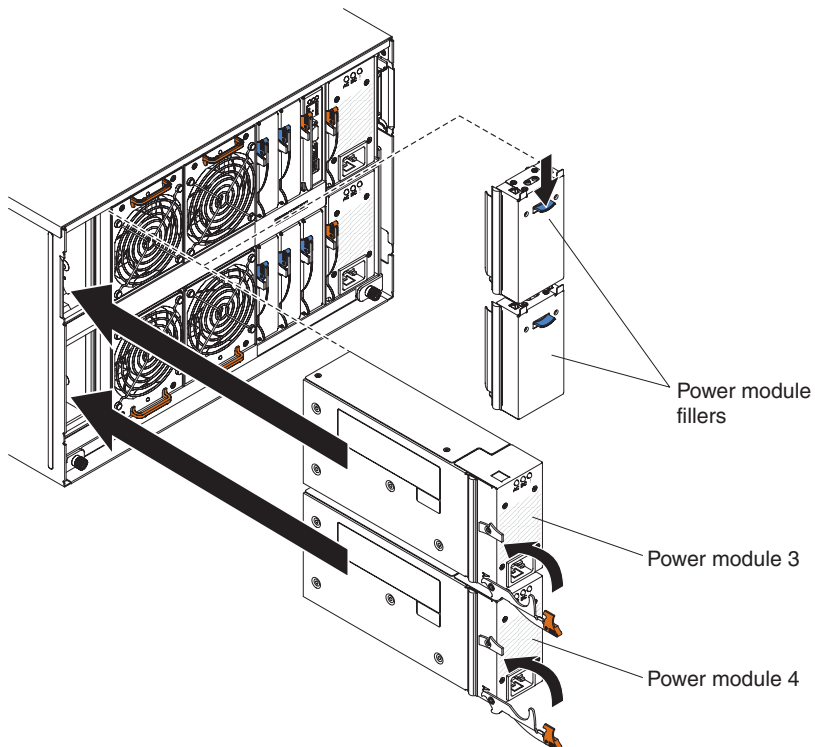


1. Read Safety and “Handling static-sensitive devices” on page 28.
2. Open the release handle (rotate the handle down).
3. Slide the advanced management module into the advanced management module bay until it stops.
4. Close the release handle (rotate the handle up).

Installing a power module

To install a power module, open the release handle, slide the power module into the power module bay, and close the release handle.

Note: On the rear of the power module, there is a plastic strain-relief tie that should not be removed.

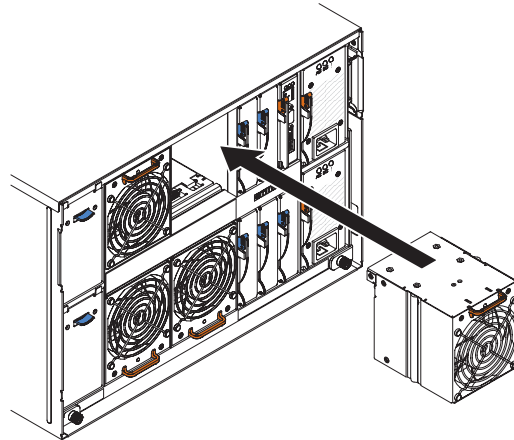


1. Read Safety and “Handling static-sensitive devices” on page 28.

2. Open the release handle (rotate the handle down).
3. Slide the module into the power module bay until it stops.
4. Close the release handle (rotate the handle up).

Installing a fan module

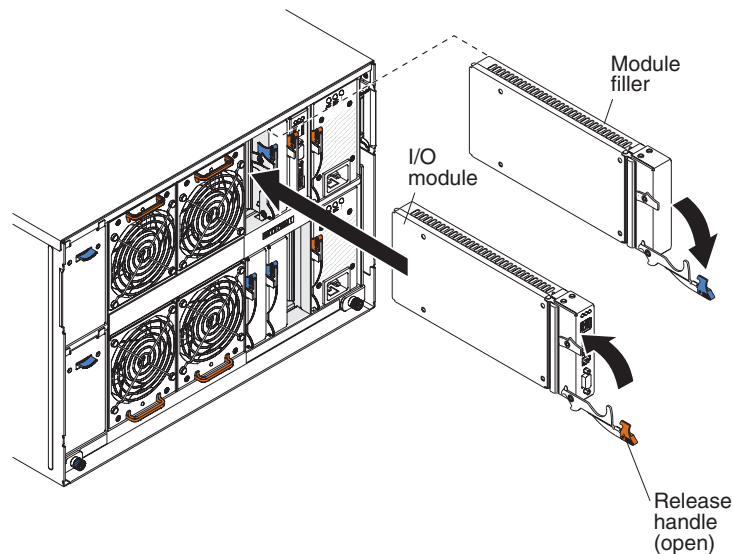
To install a fan module, slide it into the fan module bay until the fan handle locks.



1. Read Safety and “Handling static-sensitive devices” on page 28.
2. Slide the module into the fan module bay until the fan handle locks.

Installing an I/O module

To install an I/O module, open the release handle, slide the module into the I/O module bay of the BladeCenter S chassis. Before installing an I/O module, read any installation instructions that comes with that I/O module.



Note:

You can find the documentation for I/O modules at the IBM Systems Information Center, which is at <http://publib.boulder.ibm.com/infocenter/systems/index.jsp>. To access the I/O module documentation from this site, click **Systems hardware > BladeCenter information > I/O modules**.

To determine which I/O modules are compatible with the BladeCenter S chassis, see the IBM ServerProven Web site at <http://www.ibm.com/servers/eserver/serverproven/compat/us/eserver.html>.

1. Read Safety and “Handling static-sensitive devices” on page 28.
2. Open the release handle (rotate the handle down).
3. Slide the module into the module bay until it stops.
4. Close the release handle (rotate the handle up).

The placement of the I/O module in the BladeCenter S chassis depends on the type of I/O module being installed. For example, an Ethernet switch module is typically deployed in I/O module bay 1 or I/O module bay 2. SAS connectivity modules or SAS RAID controller modules are deployed in I/O module bays 3 and 4.

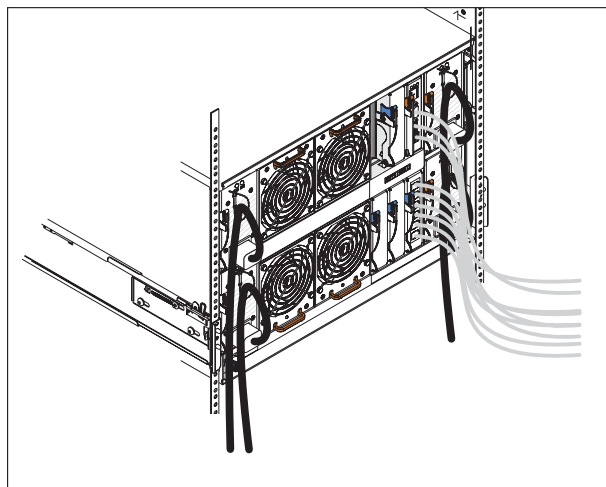
Note:

- If you install an Ethernet switch module in I/O module bay 2, you must also install an expansion card option, such as the 2/4 Port Ethernet Expansion Card, in each of the blade servers that will access the Ethernet network through that I/O module.
- If you install SAS connectivity modules, you must also install a SAS expansion card option in each of the blade servers that will access the integrated shared storage. You can install SAS or SATA hard disk drives in the disk storage modules.
- If you install SAS RAID controller modules, you must also install a SAS expansion card option in each of the blade servers that will access the integrated shared storage. In addition, you must install SAS hard disk drives in the disk storage modules.

Cabling the BladeCenter S chassis

Attach all cables to the rear of the BladeCenter S chassis and secure them to the rack cabinet rails.

1. Attach the power cords and other cables to the rear of the BladeCenter S chassis.



Up to three sets of power cords are provided with the BladeCenter S system. Use the power cords that you need for your environment.

2. Route the power cables through the plastic strain-relief ties.

3. Route all cables along the rack cabinet rails.

Important: Allow slack in all cables to avoid tension in the cables and to allow you to remove adjacent modules from the BladeCenter S chassis without having to remove the cables.

4. Use the cable ties and cable straps to secure the cables together and attach them to the rack cabinet rails.

Connecting the BladeCenter S chassis to power

Power is supplied to the BladeCenter S chassis when you connect one end of each power cord to a power connector on the rear of the BladeCenter S chassis and the other end of each power cord to a power distribution unit (PDU) or appropriate electrical outlet. The BladeCenter S chassis does not have a power switch.

After you connect and route the cables, supply power to the BladeCenter S chassis and verify that it is working correctly:

1. Connect each power cord from the power supplies to a 110 V ac or 220 V ac PDU or electrical outlet.
2. Verify that the following LEDs are lit:
 - The power-on LED on the system LED panel.
 - The dc power and ac power LEDs on each power module.
 - The OK LED on the advanced management module.
 - The OK or Power LED on each I/O module.

Note: Initially, the port fault LEDs on the SAS connectivity module might be flashing amber because the external ports are disabled by default. The ports will be enabled when you complete the initial configuration of the advanced management module.

- The power-on LED on each blade server. You might have to turn on each blade server separately.

Disconnecting power from the BladeCenter unit

Disconnect power from the BladeCenter S chassis by shutting down all blade servers and disconnecting the BladeCenter S chassis from all power sources.

1. Shut down each blade server. See the documentation that comes with your blade server for information about shutting down the operating system on the blade server.
2. Disconnect all power cords on the BladeCenter unit from the power connectors.

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

Chapter 3. Installing IBM Director Server (optional)

IBM Director is a comprehensive systems manager that is designed for use across the full IBM Systems server family, including BladeCenter systems. An integrated, easy-to-use suite of tools, IBM Director provides clients with flexible systems-management abilities to help maximize system availability and lower IT costs. With IBM Director, IT administrators can view and track the hardware configuration of remote systems and monitor the component performance of microprocessors, disks, and memory.

IBM Director communicates with the advanced management module through the Ethernet port on the advanced management module. If you are going to use IBM Director to manage your BladeCenter S system, make sure that it is installed on a server that meets the documented system requirements and that the advanced management module is on a network that is reachable from the IBM Director server.

Note: IBM Director communicates over the TCP command mode port. You might have to increase the maximum number of simultaneous connections that can be made over this port to prevent conflicts with other applications. You can modify the setting through the advanced management module Web interface (Network Protocols page).

IBM Director has the capability to use the zone configurations that you create with Storage Configuration Manager. You can use Storage Configuration Manager to create an initial zone configuration for a BladeCenter S system and use IBM Director to distribute the configuration to other BladeCenter S systems.

Note: For more information about Storage Configuration Manager, see the *IBM Storage Configuration Manager Planning, Installation, and Configuration Guide*.

To download the latest version of IBM Director, go to <http://www.ibm.com/systems/support/management> and select **Product Family**.

Chapter 4. Configuring the BladeCenter S system

Configuring the BladeCenter S system involves performing all of the tasks that are necessary to set up a functioning BladeCenter S system on which you can begin to install applications.

Before you configure the BladeCenter S system, make sure that you have completed all installation activities.

After you have completed the initial configuration, you can begin to install and configure applications.

You can also optionally install Storage Configuration Manager to manage the SAS connectivity modules or SAS RAID controller modules and integrated shared storage.

Configuring I/O modules

You must enable at least one external port on an Ethernet switch module in I/O module bay 1 to communicate with the Ethernet controllers that are integrated in each blade server.

There are two ways to access an I/O module to configure it:

- Using a Web browser and accessing the Web interface for the I/O module, using its IP address. You can obtain the IP address from the System Status page of the advanced management module Web interface.
- Using a program such as Telnet and accessing the command-line interface (CLI) for the I/O module, using its IP address.

To configure an I/O module, complete the following steps:

1. Access the I/O module, using its IP address.
2. Configure the I/O module. See the documentation that comes with the I/O module for information about configuration.
3. Update the firmware for the I/O module, if necessary. See the documentation that comes with the I/O module for information about updating firmware.

Note: If a pass-thru module is installed in I/O module bay 1, you must configure the network switch that the pass-thru module is connected to. See the documentation that comes with the network switch for more information.

You can find the documentation for I/O modules at the IBM Systems Information Center, which is at <http://publib.boulder.ibm.com/infocenter/systems/index.jsp>. To access the I/O module documentation from this site, click **Systems hardware > BladeCenter information > I/O modules**.

To determine which I/O modules are compatible with the BladeCenter S chassis, see the IBM ServerProven Web site at <http://www.ibm.com/servers/eserver/serverproven/compat/us/eserver.html>.


Configuring blade servers

Configuring a blade server involves setting up the SAS storage, installing the operating system, and updating the firmware.

Be sure to refer to the documentation for the blade server that you are configuring. It contains specific instructions that might differ slightly from those listed in this section.

For more information about blade servers, see the IBM Systems Information Center, which is at <http://publib.boulder.ibm.com/infocenter/systems/index.jsp>. To access the blade server documentation from this site, click **Systems hardware > BladeCenter information > Blade servers**.

Although there are several ways to access the blade server, consider using KVM access when you perform the initial setup of a blade server. Attach a monitor to the video connector on the advanced management module. Attach a USB keyboard and mouse to the USB connectors on the advanced management module or the USB connectors on the media tray.

Note: If you are using KVM, you must press the  on the blade server that you are configuring to assign the monitor and keyboard to the blade server.

1. Update the firmware for the blade server. See the documentation that comes with the blade server form information about updating firmware.
2. Start the blade server.
3. Optionally use the LSI configuration utility on the blade server to set the SAS hard disk drive configuration if you are installing SAS connectivity modules. You can implement integrated mirroring (IM), integrated mirroring enhanced (IME), or integrated striping (IS) for the hard disk drives.

Note: In addition to the LSI configuration utility, you can use MegaRAID Storage Manager (available on CD with the SAS expansion card option), or the ServerGuide program to configure your SAS storage.

- a. Some blade servers, such as the HS21 and LS21, might have two SAS controllers, one for the internal SAS controller (called Planar SAS) and one for the SAS expansion card. You must first access BIOS to either disable the internal SAS controller or the option ROM for the SAS expansion card.
 - If no hard disk drives are installed in the blade server, disable the internal SAS controller:
 - 1) When you are prompted, press F1 to access BIOS.
 - 2) Select **Device and I/O ports**.
 - 3) Disable the Planar SAS.
 - If hard disk drives are installed in the blade server, disable the option ROM for the SAS expansion card:
 - 1) When you are prompted, press F1 to access BIOS.
 - 2) Select **Advanced Setup > PCI Control > PCI ROM**.
 - 3) Disable the Option ROM for the SAS expansion card slot.

For more information about setting up the SAS hard disk drive configuration, see the *IBM BladeCenter SAS Expansion Card (CFFv) Installation and User's Guide*.

- b. Save the BIOS configuration and restart the blade server.

- c. When you are prompted, press **Ctrl-C** to start the LSI Configuration Utility.
 - d. Select the SAS expansion adapter and complete the following steps:
 - 1) Select **RAID Properties**.
 - 2) Select the type of volume that is to be created (IM Volume, IME Volume, or IS Volume) and follow the prompts.
 - e. After you create the volumes, exit the LSI Configuration Utility.
4. Assign the DVD drive on the media tray to the blade server that you are configuring by pressing **CD** on the front of the blade server.

For more information about assigning the media tray to the blade server, see “Selecting shared BladeCenter resources.”
 5. Insert the operating system media into the DVD drive.
 6. Set the DVD drive as the boot device for the blade server that you are configuring, if it is necessary for that blade server. You can do that from the advanced management module.
 7. Install the operating system. The ServerGuide program is a server installation assistant that simplifies the process of installing and configuring blade servers. If you are installing a Microsoft Windows operating system, consider using the ServerGuide CD that comes with your blade server. If you have already configured your SAS storage before using the ServerGuide program, make sure that you choose to retain the configuration when you begin installing the operating system.

Important: If you have two SAS connectivity modules installed, the blade server does not have internal hard disk drives installed, and you are installing the operating system one on of the disks or disk arrays in the storage modules:

- a. From the advanced management module Web interface, disable the ports for one of the SAS connectivity modules.
- b. Install the operating system to the disk or disk array.
- c. From the advanced management module Web interface, re-enable the ports for the SAS connectivity module.

If you are using IBM Director and RDM, these steps are performed by the software; you do not need to perform these steps.

Selecting shared BladeCenter resources

Some BladeCenter resources are selectable for use by a single blade server at a time, such as the media tray or the keyboard-video-mouse (KVM).

BladeCenter resources such as power modules, cooling, system management, and network I/O modules are available to most blade servers at all times; no user intervention is required. You can select the resources for a blade server in the following ways.


Attention: Do not switch ownership of the media tray to another blade server while a transaction is taking place on the DVD drive or an attached USB device. The data might become corrupted. Make sure that activity lights on the DVD drive are not lit.

- Most blade servers have two selection buttons on the front of the blade server

CD and .

- You can use the advanced management module Web interface to enable or disable the selection on the blade servers and change ownership of the media tray or the KVM (**Blade Tasks > Remote Control**).

The monitor that is attached to the advanced management module shows the video output from the blade server that is the current owner of the KVM.

- To switch the KVM to a specific blade server, press the  button on that blade server.
- To switch ownership of the media tray to a specific blade server, press the CD button on that blade server.

The BladeCenter S Types 7779 and 8886 assigns the resource to the blade server that is requesting it.

- On a keyboard that is directly attached to the advanced management module, 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 you use some keyboards, such as the 28L3644 (37L0888) keyboard, you must hold down the Shift key while you enter this key sequence.

It can take up to 20 seconds for the operating system in the switched-to blade server to recognize the media tray or the KVM. If you install Microsoft Windows 2000 on a blade server while it is not the current owner of the media tray or the KVM, 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).

Note: The operating system on the blade server must provide USB support for the blade server to recognize and use the media tray. The BladeCenter S system uses USB for internal communication with these devices.

Appendix A. Getting help and technical assistance

If you need help, service, or technical assistance or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you.

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 all cables to make sure that they are connected.
- Check the power switches to make sure that the system and any optional devices are turned on.
- Check for updated software, 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.
- If you have installed new hardware or software in your environment, check the <http://www.ibm.com/systems/info/x86servers/serverproven/compat/us/> IBM ServerProven website to make sure that the hardware and software is supported by your IBM product.
- Go to the <http://www.ibm.com/supportportal/> IBM Support Portal to check for information to help you solve the problem.
- Gather the following information to provide to IBM Support. This data will help IBM Support 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 and firmware levels
 - Other pertinent information such as error messages and logs
- Go to the <http://www.ibm.com/support/electronic/portal/> IBM Electronic Services website 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 Support

quickly and efficiently. IBM service technicians can start working on your solution as soon as you have completed and submitted an Electronic Service Request.

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

Using the documentation

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

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

Getting help and information from the World Wide Web

Up-to-date information about IBM products and support is available on the World Wide Web.

On the World Wide Web, up-to-date information about IBM systems, optional devices, services, and support is available at the <http://www.ibm.com/supportportal/> IBM Support Portal . IBM System x information is at the <http://www.ibm.com/systems/x/> IBM System x website . IBM BladeCenter information is at the <http://www.ibm.com/systems/bladecenter/> IBM BladeCenter website . IBM IntelliStation information is at the <http://www.ibm.com/systems/intellistation/> IBM Workstations website .

How to send DSA data to IBM

Use the IBM Enhanced Customer Data Repository to send diagnostic data to IBM.

Before you send diagnostic data to IBM, read the terms of use at http://www.ibm.com/de/support/ecurep/send_http.html Enhanced Customer Data Repository terms of use .

You can use any of the following methods to send diagnostic data to IBM:

- **Standard upload:** http://www.ibm.com/de/support/ecurep/send_http.html Enhanced Customer Data Repository standard upload website
- **Standard upload with the system serial number:** http://www.ecurep.ibm.com/app/upload_hw/ Standard Upload website
- **Secure upload:** http://www.ibm.com/de/support/ecurep/send_http.html#secure Enhanced Customer Data Repository secure upload website
- **Secure upload with the system serial number:** https://www.ecurep.ibm.com/app/upload_hw/ Secure Upload website

Creating a personalized support web page

You can create a personalized support web page by identifying IBM products that are of interest to you.

To create a personalized support web page, go to the <http://www.ibm.com/support/mysupport/> IBM Registration website . From this personalized page, you can subscribe to weekly email notifications about new technical documents, search for information and downloads, and access various administrative services.

Software service and support

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

For information about which products are supported by Support Line in your country or region, see the <http://www.ibm.com/services/supline/products/> IBM Support Line Supported Product List website .

For more information about Support Line and other IBM services, see the <http://www.ibm.com/services/> IBM IT Services website or see the <http://www.ibm.com/planetwide/> "Directory of worldwide contacts" website for support telephone numbers. In the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

Hardware service and support

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

To locate a reseller authorized by IBM to provide warranty service, go to the <http://www.ibm.com/partnerworld/> IBM PartnerWorld website and click **Find Business Partners** on the right side of the page. For IBM support telephone numbers, see the <http://www.ibm.com/planetwide/> "Directory of worldwide contacts" website . 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
3F, No 7, Song Ren Rd.
Taipei, Taiwan
Telephone: 0800-016-888

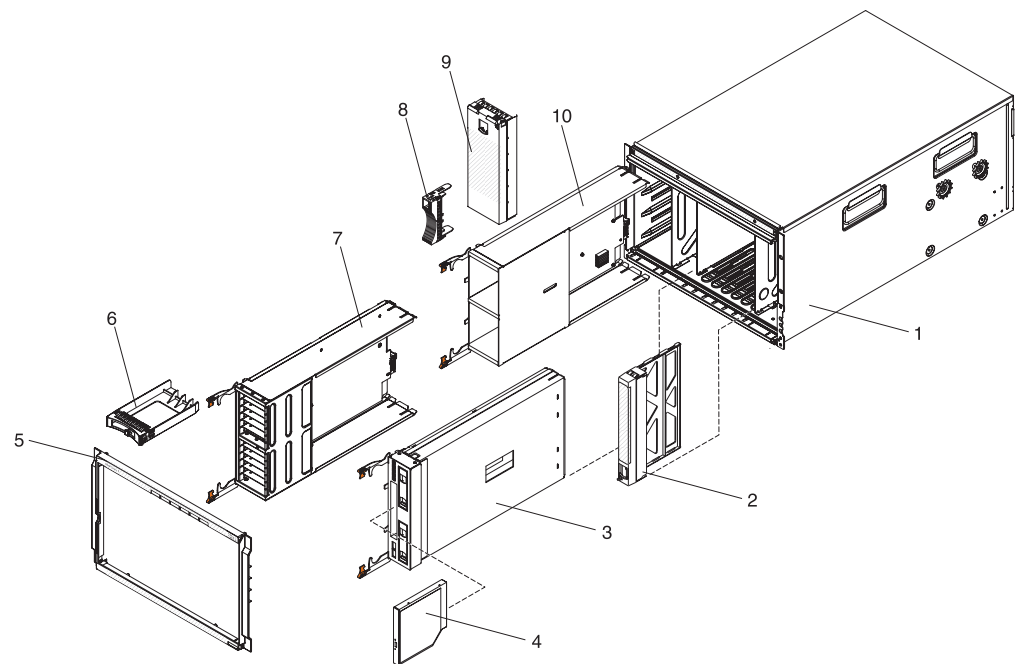
Appendix B. Parts listing

These illustrations identify the replaceable components that are available for the BladeCenter S Types 7779 and 8886 unit.

- **Consumable part.** Purchase and replacement of consumable parts (components, such as batteries and printer cartridges, that have depletable life) is your responsibility. If IBM acquires or installs a consumable part at your request, you will be charged for the service.
- **Tier 1 customer replaceable unit (CRU).** Replacement of Tier 1 CRUs is your responsibility. If IBM installs a Tier 1 CRU at your request, you will be charged for the installation.
- **Tier 2 customer replaceable unit.** You can install a Tier 2 CRU yourself or request IBM to install it, at no additional charge, under the type of warranty service that is designed for your computer.
- **Field replaceable unit (FRU).** FRUs must be installed only by trained service technicians.

Front view parts listing

The front of the BladeCenter S chassis contains components such as the media tray and bays for disk storage modules and blade servers.



See the *IBM BladeCenter S Type 8886 Problem Determination and Service Guide* for part numbers.

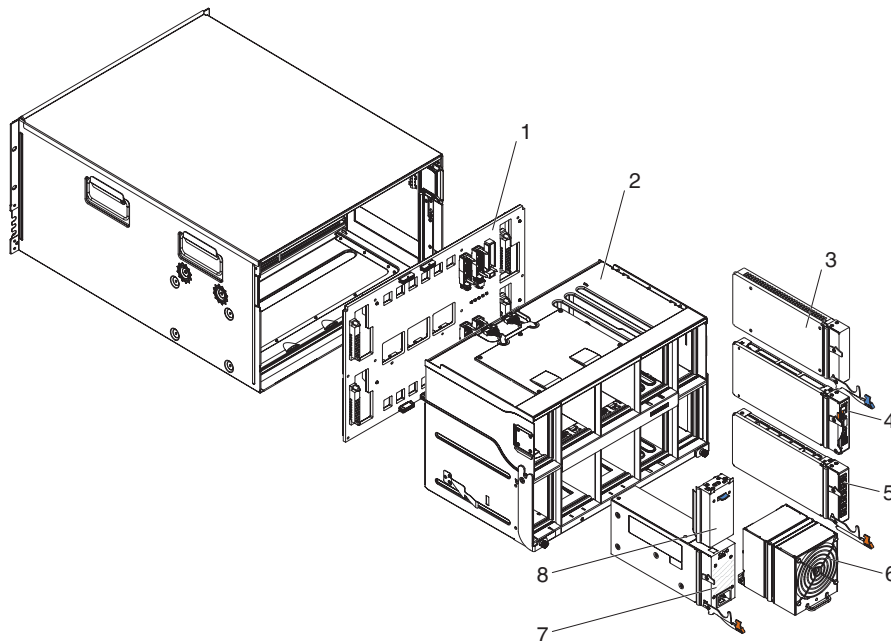
Index	Description
1	Chassis shell (without shuttle)
2	Filler, blade server
3	Media tray
4	DVD drive
5	Bezel
6	Filler, 2.5" hard disk drive
7	12-disk disk storage module
8	Filler, 3.5" disk storage module
9	Filler, disk storage module
10	6-disk disk storage module

Consumable parts (parts that are purchased separately) are not covered by the IBM Statement of Limited Warranty. The following consumable parts are available for purchase from the retail store.

Index	Description	Part number
	Battery backup unit	45W5002

Rear view parts listing

The rear of the BladeCenter S chassis contains components such as the management module, fan modules, and I/O modules.



See the *IBM BladeCenter S Types 7779 and 8886 Problem Determination and Service Guide* for part numbers.

Index	Description
1	Midplane
2	Shuttle (with card and cable assembly)
3	Filler, I/O module
4	Advanced management module
5	Serial pass-thru module
6	Fan module
7	Power supply
8	Filler, power supply
	Cable, fan module to midplane
	Miscellaneous parts kit
	Kit, rack

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Important notes

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.

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

Each solid-state memory cell has an intrinsic, finite number of write cycles that the cell can incur. Therefore, a solid-state device has a maximum number of write

cycles that it can be subjected to, expressed as “total bytes written” (TBW). A device that has exceeded this limit might fail to respond to system-generated commands or might be incapable of being written to. IBM is not responsible for replacement of a device that has exceeded its maximum guaranteed number of program/erase cycles, as documented in the Official Published Specifications for the device.

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

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 2. 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

Table 2. Limits for particulates and gases (continued)

Contaminant	Limits
	<ol style="list-style-type: none">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.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.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.

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Electronic emission notices

When you attach a monitor to the equipment, you must use the designated monitor cable and any interference suppression devices that are supplied with the monitor.

Federal Communications Commission (FCC) statement

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

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

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

Industry Canada Class A emission compliance statement

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

Avis de conformité à la réglementation d'Industrie Canada

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

Australia and New Zealand Class A statement

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Responsible manufacturer:

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

European Community contact:

IBM Deutschland GmbH
Technical Regulations, Department M372
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Telephone: +49 7032 15 2941
Email: lugi@de.ibm.com

Germany Class A statement

Deutschsprachiger EU Hinweis: Hinweis für Geräte der Klasse A EU-Richtlinie zur Elektromagnetischen Verträglichkeit

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IBM-Allee 1, 71139 Ehningen, Germany
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Generelle Informationen:

Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55022 Klasse A.

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Japan Electronics and Information Technology Industries Association (JEITA)
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People's Republic of China Class A electronic emission statement

中华人民共和国“A类”警告声明

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