Chapter 4. Installing options

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

Installing the BladeCenter unit in a rack

Statement 20:

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

Statement 4:

≥ 18 kg (39.7 lb)

≥ 32 kg (70.5 lb)

≥ 55 kg (121.2 lb)

CAUTION:
Use safe practices when lifting.

Install the BladeCenter unit in a rack before installing any blade servers in the BladeCenter unit. If your BladeCenter unit has blade servers already installed, remove them first. Blade servers are installed from the front of the BladeCenter unit, without sliding the BladeCenter unit into or out of the rack. Detailed instructions for installing a BladeCenter unit in a rack are in the *Rack Installation Instructions* that come with your BladeCenter unit.

Installation guidelines

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

- Read the “Important safety information” on page vii and the guidelines in “Handling electrostatic discharge-sensitive devices” on page 88. This information will help you work safely with your BladeCenter unit and options.
- The orange color on components and labels in your BladeCenter unit identifies hot-swap components. You can install or remove hot-swap modules and, with

some restrictions, hot-swap blade servers while the BladeCenter unit is running. For complete details about installing or removing a hot-swap component, see the detailed information in this chapter.

- The blue color on components and labels identifies touch points where you can grip a component, move a latch, and so on.
- You do not need to disconnect the BladeCenter unit from power to install or replace any of the hot-swap modules on the rear of the BladeCenter unit. You need to shut down the operating system and turn off a hot-swap blade server on the front of the BladeCenter unit before removing the blade server, but you do not need to shut down the BladeCenter unit itself.
- For a list of supported options for your BladeCenter unit, go to http://www.ibm.com/pc/compat/ on the World Wide Web.

System reliability considerations

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

- Each of the module bays on the rear of the BladeCenter unit has either a module or filler module installed.
- Each of the blade bays on the front of the BladeCenter unit has either a blade server or filler blade installed.
- Each of the drive bays in a blade server storage expansion option has either a hot-swap drive or a filler panel installed.
- A removed hot-swap module, blade server, or drive is replaced within two minutes of removal.
- Cables for the option modules are routed according to the illustrations and instructions in this document.
- A failed blower is replaced as soon as possible, to restore cooling redundancy.

Handling static-sensitive devices

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

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

- Limit your movement. Movement can cause static electricity to build up around you.
- Handle the device carefully, holding it by its edges or its frame.
- Do not touch solder joints, pins, or exposed printed circuitry.
- Do not leave the device where others can handle and damage it.
- While the device is still in its static-protective package, touch it to an *unpainted* metal part of the BladeCenter unit or rack where the BladeCenter unit is installed for at least 2 seconds. This drains static electricity from the package and from your body.
- Remove the device from its package, and install it directly into the system unit without setting the device down. If it is necessary to set down the device, place it back into its static-protective package. Do not place the device on your system unit or on a metal surface.
- Take additional care when handling devices during cold weather. Heating reduces indoor humidity and increases static electricity.

Installing and removing modules

The procedures for installing or removing a module on the BladeCenter unit are nearly identical for all modules except the blower modules. To install or remove a blower module, see “Replacing a blower module” on page 47. To install or remove all other modules, follow the instructions in this section.

Every module is keyed so that it can be inserted only in an appropriate bay. You can insert an I/O module only in an I/O-module bay, for example. In addition, most modules must be installed in a specific sequence or under specific circumstances.

The BladeCenter modules

Your BladeCenter unit contains the following hot-swap modules: power modules, I/O modules, management module, and blower modules. See “Rear view” on page 10 for the location of each module. These modules supply common functions to the blade servers that are installed in the blade bays in the front of the BladeCenter unit.

The chassis and the management module supply I/O (optical drive, USB port, keyboard, video, and mouse) that is available to all the blade servers, selected by any one blade server at a time. The chassis can contain up to 14 blade servers.

Attention: To help ensure proper cooling, performance, and system reliability, make sure that each of the module bays on the rear of the BladeCenter unit has a module or filler module installed. When replacing a module, do not operate the BladeCenter unit for more than one minute without either a module or a filler module installed in each module bay.

Management module

Your BladeCenter unit comes with one hot-swap management module in the management bay. You can add a management module in management bay 2.

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

The management module functions as a service processor and a keyboard/video/mouse (KVM) multiplexor for the multiple blade servers. The management module also configures the BladeCenter unit and modules, configuring information such as the I/O module IP addresses. The management module provides the following external connections: keyboard, mouse, and video for use by a local console, and one RJ-45 connector for a 10/100 Mbps Ethernet remote management connection. Advanced management modules also provide an RJ-45 connector for serial management connection.

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

- Blade server power-on requests
- Blade server error and event reporting
- Blade server requests for keyboard, mouse, and video
- Blade server requests for removable media drives

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

I/O (switch) modules

For blade server communication with the network, your BladeCenter unit supports from one to four hot-swap I/O modules. Table 1 on page 35 identifies the type of I/O module you can install in each I/O-module bay. Go to the IBM Support Web site at http://www.ibm.com/systems/support to see the list of supported I/O modules. Your BladeCenter unit supports a minimum of one hot-swap Ethernet switch module or pass-thru module, in I/O-module bay 1. This I/O module provides an internal connection to Ethernet Link 1 in all the blade servers in the BladeCenter unit, up to 14 internal connections per I/O module. To provide an internal connection for Ethernet Link 2 in each blade server, install an Ethernet switch module or pass-thru module in I/O-module bay 2.

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

Note: The BladeCenter unit supports either four Ethernet switch modules or two Ethernet switch modules and up to two fibre channel switch modules. No more than two fibre channel switch modules can be connected to the BladeCenter unit.

If you install an I/O expansion option on any blade server, you must install a hot-swap I/O module of the same network interface (or an optical pass-thru module) in I/O-module bay 3 to obtain network connection 3 for the option; to provide network connection 4 for the option, install the same type of I/O module in I/O-module bay 4 as you installed in I/O-module bay 3. For example, if you install a Fibre Channel I/O expansion option on a blade server, the I/O modules you install in I/O-module bays 3 and 4 must both be Fibre Channel or both be optical pass-thru, and all other I/O expansion options in the BladeCenter unit must also be Fibre Channel I/O expansion options.

Notes:

1. All blade server I/O expansion options in the BladeCenter unit must use the same type of network interface.
2. You can mix four-port 1-Gb Ethernet switch modules with other supported Ethernet switch modules to achieve the total number of Ethernet switch modules you need in the BladeCenter unit.
3. You can use a pass-thru module in any I/O-module bay, provided that the controller in the blade servers or I/O expansion options is compatible with the network switch to which the pass-thru module is connected.

The following table summarizes the types of modules that can be used in each I/O-module bay. See “Rear view” on page 10 for the location of the I/O-module bays on the BladeCenter unit.

Table 1. Hot-swap I/O module types by location

Bays	I/O-module function	Permissible I/O module
1 and 2	Network connections 1 and 2 (Ethernet) for all blade servers in the BladeCenter unit	One of the following combinations: • Two Ethernet switch modules • Two pass-thru modules • One Ethernet module and one pass-thru module
3 and 4	Network connections 3 and 4 (from all blade server I/O expansion options on blade servers in the BladeCenter unit)	One of the following combinations: • Two Ethernet switch modules • Two Fibre Channel switch modules • Two pass-thru modules • One pass-thru module and one Ethernet switch module • One pass-thru module and one Fibre Channel switch module **Important:** • The modules used must support the network interface used on the I/O expansion options. • You cannot combine Ethernet and Fibre Channel switch modules in bays 3 and 4.

Notes:

1. The enumeration of the Ethernet controllers in a blade server is operating-system dependent. You can verify the Ethernet controller designations a blade server uses through your operating system settings.
2. The routing of an Ethernet controller to a particular I/O-module bay depends on the type of blade server. You can verify which Ethernet controller is routed to which I/O-module bay by using the following test:
   a. Install only one Ethernet switch module or pass-thru module, in I/O-module bay 1.
   b. Make sure the ports on the switch module or pass-thru module are enabled (see the *User's Guide* or *Command-Line Interface Reference Guide* for your management module type for instructions).
   c. Enable only one of the Ethernet controllers on the blade server. Note the designation the blade server operating system has for the controller.
   d. Ping an external computer on the network connected to the switch module.

   If you can ping the external computer, the Ethernet controller you enabled is associated with the switch module in I/O-module bay 1. The other Ethernet controller in the blade server is associated with the switch module in I/O-module bay 2.
3. If you have installed an I/O expansion option on a blade server, communications from the option are routed to I/O-module bays 3 and 4. You can verify which controller on the option is routed to which I/O-module bay by performing the test in note 2, using a controller on the I/O expansion option and a compatible switch module or pass-thru module in I/O-module bay 3 or 4.

Power modules

Note: The IBM BladeCenter E type 8677 chassis must be configured to support 2320-watt power modules. See the *IBM BladeCenter E 2320 Watt Power Modules Installation Guide* for specific information and instructions.

Your BladeCenter unit comes with one pair of 220-volt hot-swap power modules in power bays 1 and 2 that provides power to all the BladeCenter modules and to blade bays 1 through 6. The BladeCenter unit supports a second pair of power modules in power bays 3 and 4 that provides power to blade bays 7 through 14.

Each pair of power modules is redundant. If either power module fails, the remaining power module continues to supply power, but there is no redundancy; the failed power module must be replaced as soon as possible.

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

The following table summarizes the application for each power module

Bays	Power module function
1 and 2	Provides power to all the BladeCenter modules and to blade bays 1 through 6
3 and 4	Provides power to blade bays 7 through 14

Power modules are not needed in bays 3 and 4 until you begin installing blade servers and options in blade bays 7 through 14.

Note: If you install a blade server that has a storage expansion unit option attached in blade bay 6, the option will use blade bay 7; power modules will be required in power bays 1, 2, 3 and 4.

Each active power module supplies 12 volts of power to the blade bays it services.

Important: Plug one end of each power-module power cord into the power module; plug the other end of the power cord into a 220-volt power distribution unit (PDU).

Blower modules

Your BladeCenter unit comes with two hot-swap blowers for cooling redundancy. The blower speeds vary depending on the ambient air temperature at the front of the BladeCenter. If the ambient temperature is 72°F or below, the BladeCenter blowers will run at 30% of their maximum rotational speed, increasing their speed as required to control internal BladeCenter temperature. If the ambient temperature is above 72°F, the blowers will run at 80% of their maximum rotational speed, increasing their speed as required to control internal BladeCenter temperature. If a blower fails, the remaining blower continues to cool the BladeCenter unit and blade servers.

Important: Replace a failed blower as soon as possible, to restore cooling redundancy.

Installing a module

The following illustration shows how to install a power module, management module, or I/O module in the rear of the BladeCenter unit. See “Replacing a blower module” on page 47 for information about replacing a blower module.

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

Statement 8:

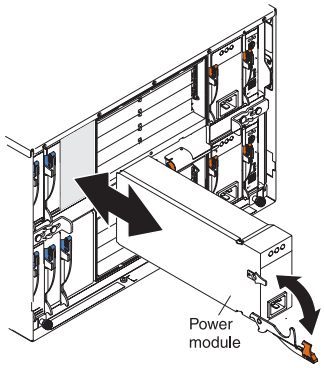
CAUTION:
Never remove the cover on a power supply or any part that has the following label attached.

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

Complete the following steps to install a module:

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

1. Read the safety information beginning on page 85 and “Installation guidelines” on page 31 through “Handling static-sensitive devices” on page 32.
2. Remove the acoustic module option, if installed, from the rear of the BladeCenter unit. See “Installing and removing the acoustic module option” on page 40 for instructions.
3. Remove the filler module from the bay.
4. Ensure that the release lever on the module is in the open position (perpendicular to the module).
5. Slide the module into the appropriate module bay until it stops.
6. Push the release lever on the front of the module closed.



7. Attach any cables or cords required by the module. See “Input/output connectors” on page 46 for the location of connectors on the BladeCenter unit. Be sure to route the power cord on a power module through the strain-relief clamp on the power module.
8. Make sure the LEDs on the module indicate that it is operating properly. Verify that:
   - The dc power LED and the ac power LED on each power module are lit and that the power module error LED (2320-watt power modules only) on each power module is *not* lit.
   - The OK LED on the management module is lit.
   - The OK LED on each I/O module is lit.
9. If you have other modules to install, do so now; otherwise, go to step 10.
10. Replace the acoustic module option, if you removed it in step 2.

Removing a module

Complete the following steps to remove a power module, management module, or I/O module.

Note: These instructions assume the BladeCenter unit is connected to power.
Statement 8:

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

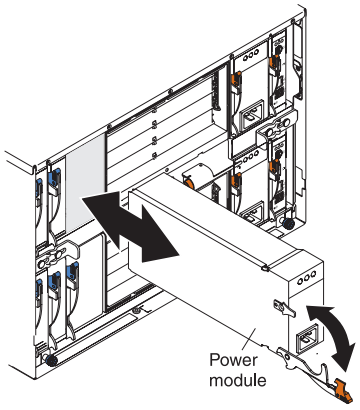
Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

1. Read the safety information beginning on page 85 and “Installation guidelines” on page 31 through “Handling static-sensitive devices” on page 32.
2. Remove the acoustic module option, if installed, from the rear of the BladeCenter unit. See “Installing and removing the acoustic module option” on page 40 for instructions.

   Important:

   a. If you are removing a functional power module, make sure before you remove the module that both the ac power LED and the dc power LED on the remaining power module are lit and that the power module error LED (2320-watt power modules only) on the remaining power module is *not* lit; otherwise, shut down the operating systems, and turn off all blade servers that are supported by the power module you are removing before you remove it. (See the documentation that comes with the blade server for instructions for shutting down the blade server operating system and turning off the blade server.)

   b. If you are removing a management module, you might prefer to stop all management module local and remote sessions before proceeding, to avoid unexpected termination of sessions.
3. Disconnect any cables from the module. For a power module, disconnect the power cord from the module.
4. Pull the release lever all the way toward the bottom of the module until it stops, as shown in the illustration. The module moves out of the bay approximately 0.6 cm (0.25 inch).
5. Slide the module out of the bay, and set it aside. Within 1 minute, place either another module of the same type or a filler module in the bay.



6. If you placed another module in the bay, reconnect any cables or power cords you disconnected in step 3; then, make sure the LEDs on the module indicate that it is operating properly. Verify that:
   - The dc power LED and the ac power LED on each power module are lit and that the power module error LED (2320-watt power modules only) on each power module is *not* lit.
   - The OK LED on the management module is lit.
   - The OK LED on each I/O module is lit.
7. Replace the acoustic module option, if you removed it in step 2.

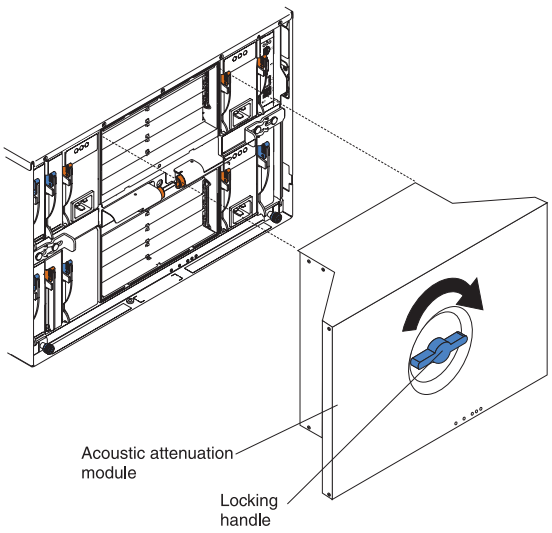
Installing and removing the acoustic module option

For server environments where noise reduction is essential, you might choose to install the BladeCenter acoustic attenuation module option (acoustic module) on the BladeCenter unit. The acoustic module reduces the sound level of the BladeCenter unit to below 7.2 Bel using a T-shaped baffle. The acoustic module is installed on the back of the BladeCenter unit, directly covering the blower modules and partially covering the other modules. The system LED panel is replicated on the acoustic module for visibility. Installing an acoustic module increases the length of a BladeCenter unit and requires use of an enterprise rack.

Installing the acoustic module option

Complete the following steps to install an acoustic module option on the BladeCenter unit:

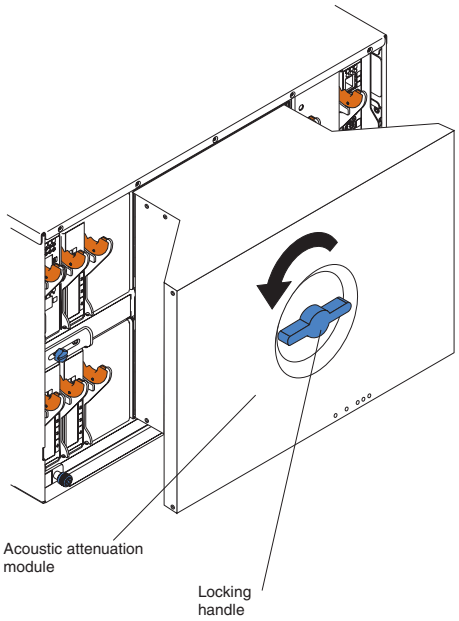
1. Place the acoustic module over the blower modules, aligning the corners of the acoustic module back with the guides on the chassis, and pushing the shaft into the hole between the blower modules.
2. Rotate the acoustic module handle approximately 2 turns clockwise until it tightens the acoustic module firmly into place.



Removing the acoustic module option

Complete the following steps to remove an acoustic module option from the BladeCenter unit:

1. Rotate the acoustic module handle approximately 2 turns counter-clockwise until it stops.
2. Carefully pull the acoustic module away from the BladeCenter unit, and set it aside.



Installing and removing blade servers

Your BladeCenter unit supports up to 14 high-performance blade servers. Each blade server is an enclosure that contains microprocessors, memory, a control chip set, an I/O bus, Ethernet controllers, hard disk drives, customer interface controls, and connectors for expansion options. The blade server receives its power, network connection, and I/O devices (removable media drives, keyboard, mouse, and video ports, USB port, remote monitoring port) from the BladeCenter unit, reducing the server physical size and reducing the number of cables needed.

Blade server expansion options

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

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

I/O expansion option

Some blade servers have connectors for adding an I/O expansion option, such as the IBM HS20 Fibre Channel Expansion Card. The BladeCenter unit routes network communication signals from the I/O expansion option to I/O modules 3 and 4 on the BladeCenter unit. The I/O expansion option is attached directly to the blade server but does not occupy an additional blade bay.

Note: If an I/O expansion option is installed on any blade server, I/O modules for that network interface must be installed in I/O-module bays 3 and 4 on the BladeCenter unit. See “I/O (switch) modules” on page 34 for more information.

Storage-expansion option

Some blade servers have a connector for adding a SCSI expansion unit, such as the IBM HS20 SCSI Storage Expansion Unit. The storage expansion unit supports up to two hot-swap SCSI hard disk drives. The expansion option is attached directly to the blade server.

Note: The SCSI controller in the SCSI storage expansion unit supports RAID level-1 (embedded mirroring).

Important:

1. To ensure proper cooling and system reliability, make sure that each of the SCSI hard disk drive bays on the SCSI storage expansion unit contains either a hot-swap SCSI hard disk drive or a filler panel.
2. Do not install a drive into IDE connector 2 on the blade server if you intend to also install an I/O expansion option. The I/O expansion option occupies the same area as the second IDE drive.
3. Two IDE drives can be used to implement and manage RAID level-1 under both the Linux and Microsoft Windows 2000 operating systems. Details of the implementation for Microsoft Windows 2000 can be found at http://support.microsoft.com/default.aspx?scid=kb;EN-US;q302969 on the World Wide Web.

Installing a blade server

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

Statement 21:

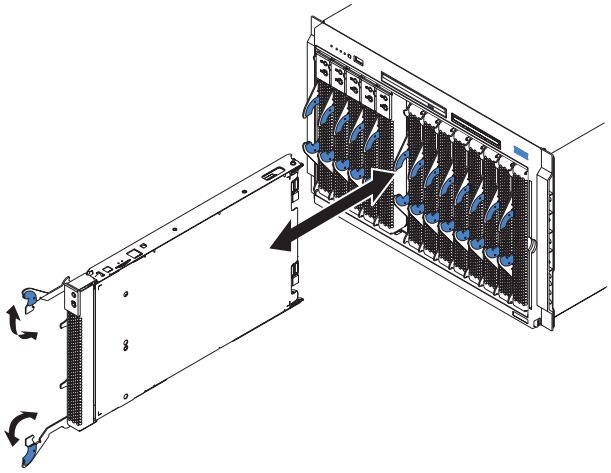
CAUTION:
Hazardous energy is present when the blade is connected to the power source. Always replace the blade cover before installing the blade.

1. Read the “Important safety information” on page vii, “Installation guidelines” on page 31, and “Handling electrostatic discharge-sensitive devices” on page 88.
2. Install any options needed, such as disk drives or memory, in the blade server. See the documentation that comes with the blade server for instructions.
3. Select the bay for the blade server.

   Notes:

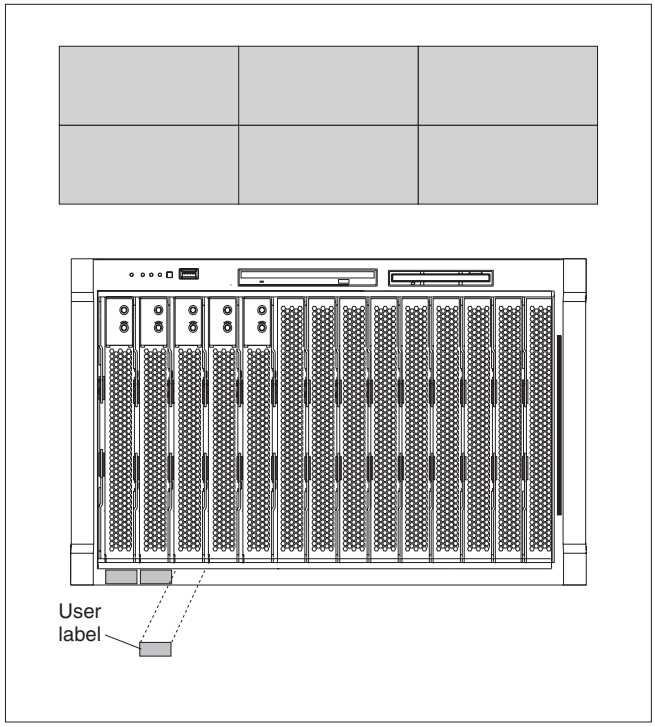
   a. If a blade server has an expansion option installed on it, the blade server and expansion option require two adjacent blade bays.

   b. If you install a blade server or option in bay 7 through 14, you must install power modules in power bays 3 and 4.
4. Remove the filler blade from the bay, and store it in a safe place.
5. Ensure that the release levers on the blade server are in the open position (perpendicular to the blade server).
6. Slide the blade server into the bay until it stops. The spring-loaded doors that cover the bay opening move out of the way as you insert the blade server.
7. Push the release levers on the front of the blade server until they are closed.



8. Turn on the blade server by pressing the power-control button on the blade server control panel. See the documentation that comes with the blade server for more instructions.
9. Verify that the power LED on the blade server control panel is lit, indicating that the blade server is receiving power.

10. If desired, write identifying information on one of the user labels that come with the blade server; then, place the label on the BladeCenter bezel just below the blade server, as shown in the following illustration.



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

11. If you have other blade servers to install, do so now.

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

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

Removing a blade server

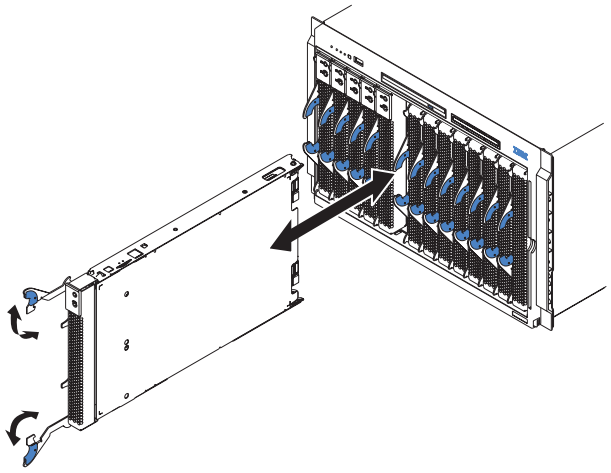
Complete the following steps to remove a blade server from the BladeCenter unit.

Attention:

- To maintain proper system cooling, do not operate the BladeCenter unit for more than one minute without either a blade server or a filler blade installed in each blade bay. If you fail to replace a blade server or filler blade within one minute, system performance might be affected.
- Make note of the bay number. Some configuration information and update options are established according to bay; if you reinstall the blade server in a different bay than the one from which it was removed, unintended consequences could occur.

1. Read the “Important safety information” on page vii, “Installation guidelines” on page 31, and “Handling electrostatic discharge-sensitive devices” on page 88.
2. Shut down the blade server operating system; then, press the blade server power-control button (behind the blade server control panel door) to turn off the blade server.

   Attention: Wait at least 30 seconds until the drives stop spinning, before proceeding to the next step.
3. Open the two release levers as shown in the illustration. The blade server moves out of the bay approximately 0.6 cm (0.25 inch).
4. Pull the blade server out of the bay. Spring-loaded doors move down to cover the bay temporarily.
5. Place either a filler blade or another blade server in the bay within two minutes. The spring-loaded doors will move out of the way as you insert the blade server or filler blade.



Completing the installation

After you connect the cables to the modules and route the cables (if necessary, see the *Rack Installation Instructions* for information about routing the cables), start the BladeCenter unit (if it is not already started), and verify that it is working properly, as follows:

1. Start the BladeCenter unit by connecting the power-module power cords to a 220-volt power source (a 220-volt power distribution unit (PDU) that is connected to a 220-volt ac power outlet or directly to a 220-volt ac power outlet).
2. Make sure the LEDs on the modules indicate that they are operating properly. Verify that:
   - The dc power LED and the ac power LED on each power module are lit and that the power module error LED (2320-watt power modules only) on each power module is *not* lit.
   - The OK LED on each management module is lit.
   - The OK LED on each I/O module is lit.
3. Make sure the Power-on LED on each blade server is lit, either steady or blinking.

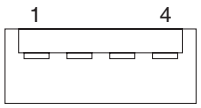
See “BladeCenter unit power, controls, and indicators” on page 11 for information about starting the BladeCenter unit and the location of the LEDs on the modules. See the *Installation and User's Guide* for your blade server for the location of the LEDs on the blade servers.

Input/output connectors

Your BladeCenter has one Universal Serial Bus (USB) version 1.1 or 2.0 connector, depending on BladeCenter unit type, on the front of the BladeCenter unit. All other input/output connectors are provided by devices installed in the BladeCenter unit, such as management modules or I/O modules. See the documentation for these devices for information about the input/output connectors and their function.

Use the USB connector to connect a USB device other than a mouse or keyboard to the BladeCenter unit. Using Plug and Play technology, USB devices are configured automatically.

The following illustration shows a USB connector.



Use a USB cable to connect a device to a USB connector. If you need to connect more USB devices than the BladeCenter unit has USB connectors, use a USB hub to connect additional devices.

If you connect a USB keyboard that has a mouse port, the keyboard emulates a mouse, and you cannot disable the mouse settings in the blade server Configuration/Setup Utility program.