IBM IntelliStation M Pro
Type 9229

IBM

User's Guide

IBM IntelliStation M Pro
Type 9229

User's Guide

Note:

Before using this information and the product it supports, read the information in "Notices," on page 63.

Contents

Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الآمنية

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

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

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

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

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

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

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

.לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

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

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

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

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

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

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

Перед установкой продукта прочтите инструкции по
технике безопасности.

Pred inštaláciou tohto zariadenia si pečítaje Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

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

Läs säkerhetsinformationen innan du installerar den här produkten.

Statement 1:

DANGER

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

To avoid a shock hazard:

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

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

Statement 2:

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

Do not:

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

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

Statement 3:

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

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

DANGER

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

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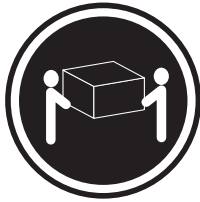
≥ 18 kg (39.7 lb)   ≥ 32 kg (70.5 lb)   ≥ 55 kg (121.2 lb)
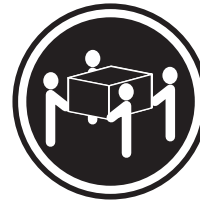
CAUTION:
Use safe practices when lifting.

Statement 5:

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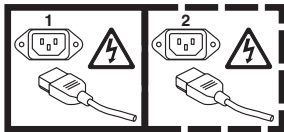
Statement 8:

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

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

Statement 26:

CAUTION:
Do not place any object on top of rack-mounted devices.

Statement 28:

CAUTION:
The battery is a lithium ion battery. To avoid possible explosion, do not burn the battery. Exchange it only with the IBM-approved part. Recycle or discard the battery as instructed by local regulations. In the United States, IBM has a process for collection of this battery. For information, call 1-800-426-4333. Have the IBM part number for the battery unit available when you call.

Important:

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

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

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

Important:

This computer is suitable for use on an IT power distribution system whose maximum phase to phase voltage is 240 V under any distribution fault condition.

Chapter 1. The IntelliStation M Pro computer

The IBM® IntelliStation® M Pro Type 9229 computer incorporates many of the latest advances in computing technology and can be expanded and upgraded as your needs change.

You can obtain up-to-date information about the computer and other IBM computer products at http://www.ibm.com/intellistation/.

Related documentation

This *User's Guide* provides general information about the computer, including information about features, how to configure the computer, how to install optional devices, and how to solve problems and get help. In addition to this *User's Guide*, the following documentation comes with the computer:

- *Installation Guide*

  This printed document contains setup and installation instructions.

- *Problem Determination and Service Guide*

  This document is in Portable Document Format (PDF) on the IBM *IntelliStation Documentation* CD and at http://www.ibm.com/support/. It contains information to help you solve problems that might occur in the computer.

- *Safety Information*

  This document is in PDF on the IBM *IntelliStation Documentation* CD. It contains translated caution and danger statements. Each caution and danger statement that appears in the documentation has a number that you can use to locate the corresponding statement in your language in the *Safety Information* document.

- *Warranty and Support Information*

  This document is in PDF on the IBM *IntelliStation Documentation* CD. It contains information about the terms of the warranty and about services and assistance.

- Readme files on the *Device Drivers and IBM Enhanced Diagnostics* CD

  Several readme files on the CD contain information about the preinstalled device drivers. Other readme files on the CD contain information about the various adapters and devices that might be installed in or attached to the computer. Diagnostics test programs are also stored on the *Device Drivers and IBM Enhanced Diagnostics* CD. These programs provide the primary methods of testing system components.

Depending on the computer model, additional documentation might be included on the IBM *IntelliStation Documentation* CD.

The computer might have features that are not described in the documentation that comes with the computer. 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 computer documentation. These updates are available from the IBM Web site. To check for updated documentation and technical updates, complete the following steps.

Note: Changes are made periodically to the IBM Web site. The actual procedure might vary slightly from what is described in this document.

1. Go to http://www.ibm.com/support/.
2. Under **Search technical support** type 9229 and click **Search**.

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 *IntelliStation Documentation* CD. Each statement is numbered for reference to the corresponding statement in the *Safety Information* document.

The following notices and statements are used in this document:

- **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 could occur.
- **Caution:** These statements indicate situations that can be potentially hazardous to you. A caution statement is placed just before the description of a potentially hazardous procedure step or situation.
- **Danger:** These statements indicate situations that can be potentially lethal or extremely hazardous to you. A danger statement is placed just before the description of a potentially lethal or extremely hazardous procedure step or situation.

Features and specifications

The following information is a summary of the features and specifications of the computer. Depending on the computer model, some features might not be available, or some specifications might not apply. Use the Configuration/Setup Utility program to determine the type and speed of the microprocessor.

Table 1. Features and specifications

Microprocessor:
- Supports one Intel® Core™ 2 Duo dual-core or quad-core microprocessor
- 2 or 4 MB Level-2 cache
- 1066 MHz front-side bus (FSB)

Memory:
- Minimum: 512 MB
- Maximum: 8 GB
- Type: PC2-5300, dual-data-rate 2 (DDR2) unbuffered error correcting code (ECC)
- Connectors: four dual inline memory module (DIMM) connectors

Internal drives:
- Hard disk drive: SATA or SAS
- One of the following drives:
  - DVD/CD-RW combo: IDE
  - CD-RW: IDE

Expansion bays:
- One slim-high 3.5-inch external drive bay (optional diskette drive)
- Two half-high 5.25-inch bays (optical drive installed in one bay)
- Three slim-high 3.5-inch internal drive bays (one hard disk drive installed)

PCI expansion slots:
- One PCI Express x8 slot (x4 electrical)
- Two PCI Express x16 slots (one x16 or two x8)
- One PCI 32-bit/33 MHz slot

Note: When you install the NVIDIA Quadro FX 3500 video adapter in the computer, do not set the analog resolution above 1600 x 1200 @ 60 Hz. This is the highest resolution supported for the NVIDIA Quadro FX 3500 video adapter. In addition, when you use a cathode ray tube (CRT) type monitor, the monitor cable must come with a ferrite suppression on both ends of the monitor cable.

Integrated functions:
- Broadcom 5752 10/100/1000 Ethernet controller with RJ-45 Ethernet connector
- Two serial connectors
- One parallel connector
- Four-port serial ATA controller
- Two IEEE 1394 (FireWire) ports (four-pin on front, six-pin on rear)
- Eight Universal Serial Bus (USB) connectors (two on front and six on rear)
- Keyboard connector
- Mouse connector
- Audio connectors
  - Line out (front and rear)
  - Mic (front)
  - Line in (rear)
- Single-channel IDE controller

Video adapter: (depending on the model)
- NVIDIA Quadro NVS 285 (DMS-59), PCI Express x16, with 128 MB DDR2 SDRAM and dual analog connectors, (or dual digital monitor capability with the purchase of an additional pigtail cable)
- NVIDIA Quadro FX 550 (DVI-I), PCI Express x16, with 128 MB GDDR3s synchronous dynamic random access memory (SDRAM) and dual DVI-I connectors
- NVIDIA Quadro FX 1500 (dual-link DVI-I), PCI Express x16, with 256 MB GDDR3 SDRAM and two dual DVI-I connectors
- NVIDIA Quadro FX 3500 (DVI-I), PCI Express x16, with 256 MB GDDR3 SDRAM and two dual DVI-I connectors

Power supply:
One 400-watts (115 - 230 V ac)

Cooling:
- One speed-controlled microprocessor fan and one power-supply fan
- One power-supply fan

Electrical input:
- Sine-wave input (50 or 60 Hz) required
- Input voltage and frequency ranges automatically selected
- Input voltage low range:
  - Minimum: 90 V ac
  - Maximum: 137 V ac
- Input voltage high range:
  - Minimum: 180 V ac
  - Maximum: 265 V ac
- Input kilovolt-amperes (kVA) approximately:
  - Minimum: 0.10 kVA
  - Maximum: 0.37 kVA

Heat output:
Approximate heat output in British thermal units (Btu) per hour:
- Minimum configuration: 341 Btu per hour (100 watts)
- Maximum configuration: 1239 Btu per hour (363 watts)

Environment:
- Air temperature:
  - Computer on: 10° to 35°C (50° to 95°F) Altitude: 0 to 2134 m (7000 ft)
  - Computer off: -40° to +60°C (-40° to +140°F) Maximum altitude: 2133 m (7000 ft)
- Humidity (operating and storage): 8% to 80%

Acoustical noise emissions:
- Sound power, idle: 4.0 bel
- Sound power, operating: 4.4 bel

Size:
- Height: 430 mm (16.9 in.)
- Depth: 445 mm (17.5 in.)
- Width: 178 mm (7.0 in.)
- Weight: 12.5 kg (27.5 lb) to 15.5 kg (34.1 lb) depending upon configuration

What the computer offers

The computer uses the following features and technologies:

- **PCI Express x16 graphics**

  The computer comes with a graphics adapter installed in the PCI Express x16 slot. This high-performance adapter supports high resolutions and includes many performance-enhancing features for the operating-system environment.

  Note: When you install the NVIDIA Quadro FX 3500 video adapter in the computer, do not set the analog resolution above 1600 x 1200 @ 60 Hz. This is the highest resolution supported for the NVIDIA Quadro FX 3500 video adapter. In addition, when you use CRT type monitor, the monitor cable must come with a ferrite suppression on both ends of the monitor cable.

- **Large system-memory capacity**

  The computer supports up to 8 GB of system memory. The memory controller supports error correcting code (ECC) for up to four industry-standard PC2-5300, 667 MHz, 1.8 V, 240-pin, double-data-rate 2 (DDR2), unbuffered, synchronous dynamic random access memory (SDRAM) dual inline memory modules (DIMMs).

- **Systems-management capabilities**

  The computer comes with features that a network administrator or file server can use to remotely manage and control the computer. These features include Wake on LAN®, Remote Administration, IBM Director Agent, and System Migration Assistant. See "Software available on the World Wide Web" on page 6 and "Managing the computer" on page 17 for more information.

- **Integrated network support**

  The computer comes with an integrated Ethernet controller, which supports connection to a 10 Mbps, 100 Mbps, or 1 Gbps network. For more information, see "Configuring the Broadcom NetXtreme Gigabit Ethernet controller" on page 25. The controller supports Wake on LAN technology.

Software

The computer comes with preinstalled Microsoft® Windows®[1] XP Professional, Windows Vista Business, or Red Hat Enterprise Linux® Workstation and a variety of software, including application programs, diagnostic tools, and device drivers.

Important: The software, other than the operating system, is licensed under the terms of the IBM International License Agreement for Non-Warranted Programs. Use of the computer signifies acceptance of this license agreement. For detailed instructions for viewing the license agreement, see "Viewing the license agreement" on page 13.

---

1. The Microsoft Certificate of Authenticity is your assurance that the Windows software in your computer is legally licensed from Microsoft Corporation.

Preinstalled software

In addition to the operating system, the preinstalled software includes some or all of the following programs. Some programs might require setup and configuration before use.

- **Device drivers**

  Device drivers for factory-installed features are preinstalled on the computer and on the *Device Drivers and IBM Enhanced Diagnostics* CD. The latest device drivers are also available at http://www.ibm.com/support/.

- **DVDCreator**

  This software comes on Windows XP models that have DVD write capability. You can use it to create DVDs.

- **IBM Drive Letter Access**

  You can use this program on Windows XP models to copy files to CD-R or CD-RW media.

- **IBM Enhanced Diagnostics**

  The IBM Enhanced Diagnostics that comes on the *Device Drivers and IBM Enhanced Diagnostics* CD is a self-starting diagnostics CD that is used to test hardware components in the computer.

- **Intervideo MediaOne**

  You can use this program to read or create copies of CDs or DVDs.

- **Norton Internet Security**

  You can use this program to detect and remove viruses from the computer.

- **Online Books**

  You can use this program to access documentation for the computer.

- **Product Recovery program**

  You can use this program on Windows XP and Windows Vista models to recover the operating system and other software programs in the event of a system failure.

  Attention: The Product Recovery program is on a hidden hard disk drive partition. Do not delete or otherwise destroy this partition.

- **Sonic RecordNow Business Edition**

  You can use this program on Windows XP models to record data or audio to CD-R or CD-RW media or to create copies of existing CDs.

- **WinDVD** or **LinDVD**

  This software comes on Windows XP and Red Hat Linux models that have DVD read capability. You can use it to play DVDs.

You must have Internet access to use some of these programs. For more information about connecting to the Internet, see the operating-system documentation that comes with the computer.

See "Using preinstalled software" on page 12 for additional information about the preinstalled software.

Important:

1. You can reinstall the device drivers and applications that come with the computer from the directories on the hard disk.

2. The device drivers and some programs are also available at
   http://www.ibm.com/support/ and on the *Device Drivers and IBM Enhanced
   Diagnostics* CD.

Device drivers and diagnostics on CD

In addition to the IBM-preinstalled programs and device drivers, device drivers and
diagnostics test programs are also provided on the *Device Drivers and IBM
Enhanced Diagnostics* CD.

Software available on the World Wide Web

The following software is available from the IBM Web site:

- **IBM Director Agent**

  You can use IBM Director Agent to view detailed information about the hardware
  and software, set up alerts, monitor a variety of system resources, and manage
  your asset security. IBM Director Agent streamlines and automates personal
  computer (PC) systems-management and support tasks, such as asset
  deployment and tracking.

- **Remote Deployment Manager**

  Remote Deployment Manager (RDM) is a graphical, server-based system
  deployment program that enables mass unattended installations of operating
  systems, software images, device drivers, and basic input/output system (BIOS)
  code updates to remote systems. When RDM is used with the Wake on LAN
  feature, it can remotely turn on the computer so that the installation can be done
  while the computer is not being used.

See the product documentation for these tools to determine whether the operating
system supports them. To download any of the tools or to get information about
them, go to http://www.ibm.com/eserver/xseries/systems_management/.

Reliability, availability, and serviceability features

Three important computer design features are reliability, availability, and serviceability (RAS). The RAS features help to ensure the integrity of the data that is stored in the computer, the availability of the computer when you need it, and the ease with which you can diagnose and correct problems.

The computer has the following RAS features:

- 24 hours a day, 7 days a week[2] customer support
- 3-year parts and 3-year labor limited warranty
- Advanced Configuration and Power Interface (ACPI)
- Alert Standard Format
- Automatic computer restart after a power failure
- Automatic error retry or recovery
- Boot-block recovery
- Built-in, menu-driven configuration and setup programs
- Built-in, menu-driven SAS configuration programs (some models)
- Cooling fan with speed-sensing capability
- Error codes and messages
- ECC DDR2 SDRAM with serial presence detect (SPD)
- Hard disk drive partition-based diagnostic programs
- Integrated Ethernet controller
- Integrated IEEE 1394 (FireWire) support
- Integrated SAS support using a SAS adapter
- Monitoring support for temperatures, voltages, and fan speed
- Power supply error LED
- Power-on self-test (POST)
- Predictive Failure Analysis® (PFA) on hard disk drives
- Read-only memory (ROM) checksums
- Upgradeable BIOS and power-on self-test (POST) code
- Wake on LAN capability

---

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

Chapter 2. Operating the computer

This chapter provides information about how to use the computer.

Controls, LEDs, and connectors

This following illustration shows the controls, LEDs, and connectors on the front of the computer. See "Input/output connectors" on page 57 for an illustration of the connectors on the rear of the computer.
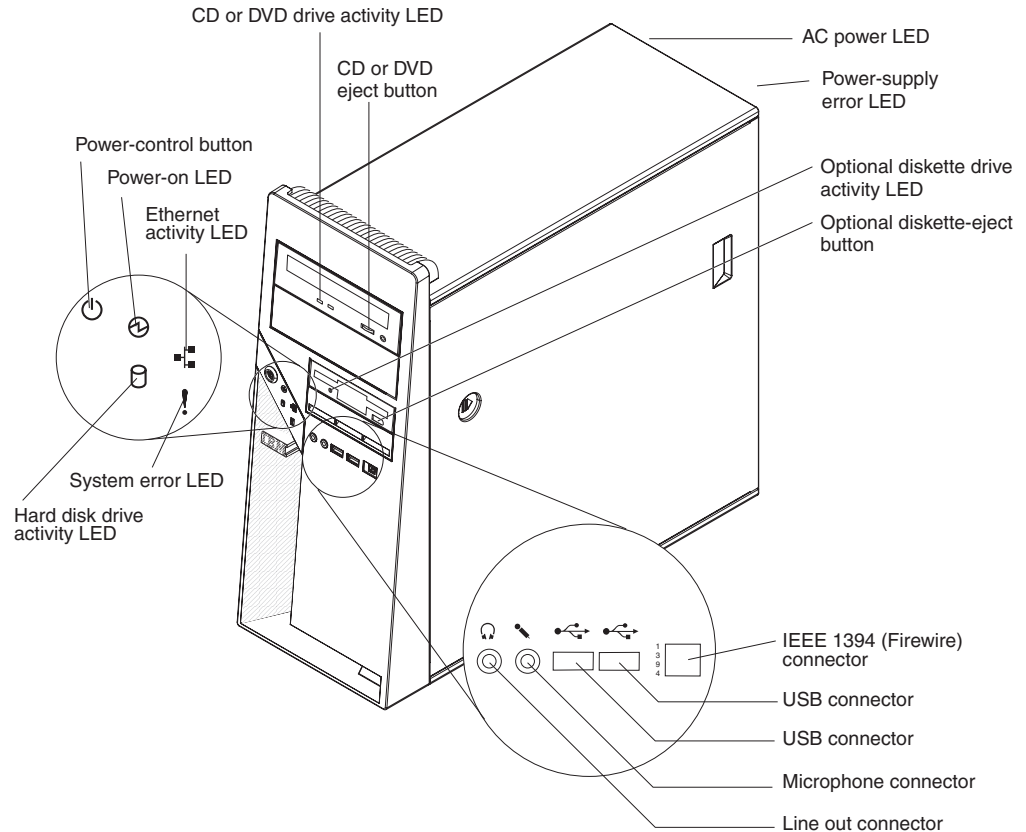
CD or DVD drive activity LED
> When this LED is lit, it indicates that the CD or DVD drive is in use.

CD or DVD eject button
> Press this button to insert or remove a CD or DVD.

AC power LED
> When this green LED is lit, it indicates that the computer is connected to an ac power source. This LED is on the rear of the computer.

Power-supply error LED
> When this amber LED is lit, it indicates that a power-supply error has occurred. This LED is on the rear of the computer.

Optional diskette drive activity LED
> When this LED is lit, it indicates that the diskette drive is in use.

Optional diskette-eject button
> Press this button to release a diskette from the diskette drive.

Note: The diskette drive is an optional feature on some models.

IEEE 1394 (FireWire) connectors
Use these connectors (four-pin on the front and six-pin on the rear) to connect FireWire devices, such as a digital video camera or an external hard disk drive.

USB connectors
Use these connectors to connect USB devices to the computer, using redundant Plug and Play technology.

Microphone connector (pink)
Use this connector to connect a microphone to the computer when you want to record voices or other sounds on the hard disk. You can also use this connector (and a microphone) with speech-recognition software.

Line out connector (green)
Use this connector to send audio signals from the computer to external devices, such as speakers with built-in amplifiers, headphones, a multimedia keyboard, or the audio line-in jack on a stereo system.

Hard disk drive activity LED
When this LED is lit, it indicates that the hard disk drive is in use.

System-error LED
When this LED is lit, it indicates that a system error has occurred. An LED on the system board might also be lit to help isolate the error. If the LED on the system board is not lit, check the error log.

Ethernet activity LED
When this LED is lit, it indicates that there is activity between the computer and the network. There are two of these LEDs, one on the front and one on the rear of the computer.

Power-on LED
When this LED is lit, it indicates that the computer is turned on.

Power-control button
Press this button to turn the computer on or off.

Turning on the computer

When the computer is connected to an ac power source but is not turned on, the operating system does not run, and all core logic is shut down; however, the computer can respond to remote requests to turn on the computer.

Notes:
1. Turn on all external devices, such as the monitor, before you turn on the computer.
2. The power-on LED on the front of the computer is lit when the computer is on and while it is being turned on.

Approximately 20 seconds after the computer is connected to ac power, the power-control button becomes active, and you can turn on the computer and start the operating system by pressing the power-control button. The computer can also be turned on in any of the following ways:

• If a power failure occurs while the computer is turned on, the computer will restart automatically when power is restored.

- When you connect the computer to power for the first time, the Wake on LAN feature can turn on the computer. If the computer was previously turned on, it must be turned off for the Wake on LAN feature to turn on the computer.

What you see and hear when you start the computer depends on the features that are installed and the settings in the Configuration/Setup Utility program.

If the power-on self-test (POST) detects a problem, there might be a series of beeps or no beep, and a numeric error message might be displayed on the screen. Write down any beep series and error code numbers with descriptions, and then see the *Problem Determination and Service Guide* for an explanation of the error codes.

On a computer running a Windows XP operating system, the following messages might be displayed briefly during startup:
- `Press F1 for Configuration/Setup Utility`, Press F12 for Boot Menu
- `<<< Press <CTRL><C> to start LSI Logic Configuration Utility >>>` (some models)
- `To start the Product Recovery program`, Press F11

On a computer running a Windows Vista operating system, the following messages might be displayed briefly during startup:
- `Press F1 for Configuration/Setup Utility`, Press F12 for Boot Menu
- `<<< Press <CTRL><C> to start LSI Logic Configuration Utility >>>` (some models)

To start the Product Recovery program in Windows Vista, watch the screen and when the operating system menu is displayed, quickly select **IBM Recovery Program**.

On a computer running a Red Hat Linux operating system, the following messages might be displayed briefly during startup:
- `Press F1 for Configuration/Setup Utility`, Press F12 for Boot Menu
- `<<< Press <CTRL><C> to start LSI Logic Configuration Utility >>>` (some models)

To start the Product Recovery Program in Red Hat Linux, watch the screen until the operating system selection menu is displayed and select **IBM Preload Recovery & Diagnostics**.

To use these features, press the applicable function key or keys quickly. The messages are displayed for only a short time. For more information about these messages, see "Using the Configuration/Setup Utility program" on page 21.

Use the Configuration/Setup Utility program to configure passwords, PCI adapters, and other options.

The operating system and application programs start from the hard disk. If the computer is attached to a network, the computer will begin attaching to any LANs and remote applications to which you have access. A network administrator can also start the computer remotely to download programs or gather information about computer performance. For more information, see "Wake on LAN" on page 18.

Using preinstalled software

This section contains information to assist you in setting up the preinstalled operating system and describes how to use the programs that come with the computer.

Running the operating-system setup program

The setup program runs automatically when you start the computer for the first time. The program prompts you to make choices or type information. If you need more detailed information than is provided in this *User's Guide*, see the operating-system documentation.

Important:
1. After you turn on the computer for the first time, you must complete the operating-system setup procedure before you turn off the computer; otherwise, unexpected results might occur.
2. The setup program might be slightly different from the one that is described in the operating-system documentation. Some choices are not available because they are preset.
3. During the setup procedure, you must indicate that you accept the license agreement.
4. For Windows XP and Windows Vista operating systems, the registration information is already displayed in the registration field. If the product ID number is not already displayed, you must type it. The product ID is on a label that is attached to the computer.

You will need the following information to complete the setup program:
- The documentation that comes with the computer.
- Network information from the network administrator, if the computer is being connected to a network.
- The printer model and port, if a printer is attached directly to the computer.

After the setup procedure is completed and the computer restarts, the desktop opens, and the computer is ready for use.

Installing other operating systems

The computer comes with Microsoft Windows XP Professional, Microsoft Windows Vista Business, or Red Hat Enterprise Linux Workstation preinstalled. To install another operating system, follow the instructions in the documentation that comes with the operating system.

If you are installing an operating system other than Microsoft Windows XP Professional, Microsoft Windows Vista Business, or Red Hat Enterprise Linux Workstation, follow the instructions in the readme files on the *Device Drivers and IBM Enhanced Diagnostics* CD to install the device drivers. You might also need additional software or device drivers.

Note: If you experience problems with the device drivers that are installed from the *Device Drivers and IBM Enhanced Diagnostics* CD, you can obtain the latest device drivers at http://www.ibm.com/support/.

Before you install any operating system, be sure to obtain the latest updates. Contact the operating-system manufacturer or, if applicable, check the manufacturer's Web site to obtain the updates.

Additional information about operating systems is posted periodically at http://www.ibm.com/support/.

Viewing the license agreement

The IBM International License Agreement for Non-Warranted Programs is viewable from the Access IBM folder. Use of the computer signifies acceptance of this agreement.

To view the license agreement in Windows XP or Windows Vista, complete the following steps:

1. From the Windows XP or Windows Vista desktop, click **Start → All Programs → Access IBM**.
2. Click **IBM License Agreement**.

For Red Hat Linux, when you start the computer, the License Agreement window opens. To accept the terms of the agreement, click **I Agree**. You can also view the license agreement by clicking the **IBM License Agreement** icon on the desktop.

Registering the computer

Registering the computer helps IBM provide better service to you. When IBM receives the registration information, the information is placed into a central technical support database. If you need technical assistance, the technical-support representative will have information about the computer. In addition, comments about the computer are reviewed by a team that is dedicated to customer satisfaction and are taken into consideration in making improvements to IBM computers.

To register the computer, go to http://www.ibm.com/support/mysupport/.

Creating an emergency recovery-repair diskette in Windows XP

Note: To create and use a diskette, you must add a diskette drive to the computer. To enable a USB diskette drive to work, you must disable the legacy diskette drive function in the Configuration/Setup Utility program (click **Startup Sequence Options → Legacy USB Support)**.

At your earliest opportunity, create a recovery-repair diskette and an IBM Enhanced Diagnostics diskette, and store them in a safe place. In the unlikely event that the computer becomes unusable, you can use the recovery-repair diskette to access the Product Recovery program. For more information about using the recovery-repair diskette see the *Problem Determination and Service Guide*.

In Windows XP, you can create a recovery-repair diskette from the c:\ibmtools directory or from the Product Recovery program partition.

To create a recovery-repair diskette from the c:\ibmtools directory, complete the following steps:

1. Start the computer and operating system.
2. Use Windows Explorer to display the directory structure of the hard disk.
3. Open the c:\ibmtools folder.
4. Double-click **rrdisk.bat** and follow the instructions on the screen.

To create a recovery-repair diskette from the Product Recovery program on the hard disk, complete the following steps:

1. Shut down the operating system and turn off the computer.
2. Wait for at least 5 seconds, then press and hold the F11 key while you restart the computer. When a menu is displayed, release the F11 key.
3. Use one of the following procedures:
   - If a menu is displayed in which you can select an operating system, use the arrow keys to select the operating system that is currently installed, press Enter, and then continue with the next step.
   - If an operating-system menu is not displayed, continue with the next step.
4. From the Product Recovery main menu, use the arrow keys to select **System utilities**, and then press Enter.
5. Use the arrow keys to select **Create a Recovery Repair diskette**, and then press Enter.
6. Follow the instructions on the screen.

See "Creating an IBM Enhanced Diagnostics diskette or CD in Windows XP" for information about how to create an IBM Enhanced Diagnostics diskette.

Creating an IBM Enhanced Diagnostics diskette or CD in Windows XP

Note: To create and use a diskette or CD, a diskette, CD-RW, or DVD/CD-RW combo drive must be installed in the computer. To enable a USB diskette drive to work, you must disable the legacy diskette drive function in the Configuration/Setup Utility program (click **Startup Sequence Options → Legacy USB Support**).

The IBM Enhanced Diagnostics diskette is a self-starting diagnostics diskette that is used to test hardware components in the computer. You can create an IBM Enhanced Diagnostics diskette from the Product Recovery program partition. You can create an IBM Enhanced Diagnostics CD from the World Wide Web.

To create an IBM Enhanced Diagnostics diskette from the Product Recovery program partition on the hard disk, complete the following steps:

1. Restart the computer.
2. When the message `To start the Product Recovery Program, Press F11` is displayed, quickly press F11.
3. Select **System utilities**.
4. Select **Create IBM Enhanced Diagnostics Diskette**.
5. Follow the instructions on the screen.

To download the latest CD image of the IBM Enhanced Diagnostics from the Web and create a startable IBM Enhanced Diagnostics CD, complete the following steps:

1. Go to http://www.ibm.com/support/.
2. Click **Search technical support**.
3. In the **Enter keyword(s)** field, type `diagnostics 9229`, and click **Search**.
4. From the "Search results" page, click the Enhanced Diagnostics item for the computer.
5. On the next page, click the CD image file for the Enhanced Diagnostics code and download it, using a writeable optional device (CD-RW or DVD/CD-RW combo drive).

For more information about using the IBM Enhanced Diagnostics program, see the *Problem Determination and Service Guide* on the IBM *IntelliStation Documentation* CD.

Accessing the IBM Enhanced Diagnostics in Windows Vista

The diagnostics programs for the Windows Vista operating system are on the *Device Drivers and IBM Enhanced Diagnostics* CD. To run the diagnostics from the bootable *Device Drivers and IBM Enhanced Diagnostics* CD, complete the following steps:

1. Turn off the computer.
2. Insert the *Device Drivers and IBM Enhanced Diagnostics* CD into the CD or DVD drive.
3. Restart the computer.
4. Follow the instructions on the screen.

Using video features

The computer has a PCI Express x16 graphics adapter that renders 2D or 3D image quality and uses a standard video protocol for displaying text and graphic images. The adapter supports a variety of video modes (combinations of resolution, refresh rate, and color that are defined by a video standard for displaying text or graphics).

Video device drivers

To use the full capabilities of the graphics adapter, some operating systems and application programs require custom video device drivers. These device drivers provide greater speed, higher resolution, more available colors, and flicker-free images.

Device drivers for the graphics adapter and a readme file with instructions for installing the device drivers are provided on the *Device Drivers and IBM Enhanced Diagnostics* CD that comes with the computer and in the c:\ibmtools\drivers directory on the hard disk. Use the device-driver installation instructions if you have to reinstall the device drivers or if you need information about obtaining and installing updated device drivers. For more information about installing device drivers, see the *Problem Determination and Service Guide*.

Changing monitor settings

To get the best possible image on the screen and to reduce flicker, you might have to reset the resolution and refresh rate of the monitor. You can view and change monitor settings through the operating system by following the instructions in the readme files on the *Device Drivers and IBM Enhanced Diagnostics* CD or in the c:\ibmtools\drivers\ directory on the hard disk. See the operating-system documentation for more information about monitor settings.

Attention: Before you change monitor settings, review the documentation that comes with the monitor. Using a resolution or refresh rate that the monitor does not support might cause the screen to become unreadable and might damage the monitor. The information that comes with the monitor usually includes resolution and screen refresh rates that the monitor supports. If you need additional information, contact the manufacturer of the monitor.

If you are using a cathode ray tube (CRT) monitor, set the monitor for the highest noninterlaced refresh rate that it supports. If the monitor complies with the Video Electronics Standards Association (VESA) display data channel (DDC) standard, it is probably already set to the highest refresh rate the monitor and video controller support. If you are not sure whether the monitor is DDC-compliant, see the documentation that comes with the monitor.

If you are using a flat-panel monitor, the refresh rate does not have to be set to the highest noninterlaced refresh rate that the monitor supports. Flat-panel monitors produce flicker-free images even when they are operating at a minimum 60 Hz noninterlaced rate.

If you have a dual-monitor video adapter, see the video adapter device-driver readme file and documentation for more information about enabling dual monitors.

Using audio features

The computer has an integrated audio controller that supports Sound Blaster applications. It also has a single internal speaker and three types of audio connectors. The audio controller, enables you to record and play back sound and music to enhance multimedia applications. Optionally, you can connect external speakers to the line-out connector to provide improved sound with multimedia applications.

The audio connectors in the computer are 3.5 mm (0.125 in.) mini-jacks. For the location of the audio connectors, see "Input/output connectors" on page 57.

Line in

This connector accepts audio signals into the computer from external devices, such as the line output from a stereo, television, or a musical instrument. One line-in connector is on the rear of the computer.

Line out

This connector sends audio signals from the computer to external devices, such as speakers with built-in amplifiers, headphones, a multimedia keyboard, or the audio line-in jack on a stereo system. Line-out connectors are on both the front and the rear of the computer.

Microphone

Use this connector to connect a microphone to the computer when you want to record voice or other sounds on the hard disk. With a microphone attached to the computer, you can also use speech-recognition software. One microphone connector is on the front of the computer.

Using security features

To deter unauthorized use of the computer, you can use anti-intrusion features and other security features that are provided with the computer.

Anti-intrusion features

IBM anti-intrusion features help protect against the theft of computer components, such as the microprocessor, memory modules, or hard disk drives.

You can set the chassis-intrusion detector switch inside the computer to alert the network administrator each time the computer cover is removed. For more information about setting the chassis-intrusion alert, see Chapter 3, "Configuring the computer," on page 21.

Component protection

Each component in the computer has a serial number that you can register with a security company. You can register the components individually, or you can register the entire computer. By registering computer components, you can improve the chances of identifying the components if they are ever stolen and recovered. For more information about component registration, see http://www.ibm.com/support/.

Data protection

You can lose data from the hard disk due to security violations or viruses. Norton AntiVirus for IBM is available on the hard disk.

Updating system programs

System programs are the basic layer of software that is built into the computer. They include the POST, the BIOS code, and the Configuration/Setup Utility program.

System programs are stored in electrically erasable programmable read-only memory (EEPROM) on the system board. This is sometimes referred to as flash memory.

IBM occasionally makes changes and enhancements to the system programs. When updates are released, they are available as downloadable files on the World Wide Web (see ″Getting help and technical assistance″ in the *Installation Guide*). You can update system programs by starting the computer from a flash update diskette, or if the computer is connected to a network, a network administrator can update the system program remotely. Instructions for using system program updates are included in a readme file that comes with the downloadable files.

Managing the computer

The computer comes with features that a network administrator or server can use to remotely manage and control the computer. This section describes some of these network-management tools. See the product documentation for these tools to determine whether the operating system supports this software. For detailed information about these tools or to download any of this software, complete the following steps.

1. Go to http://www.ibm.com/support/.
2. Under **Support topics**, click **Downloads & drivers**.
3. Click **Driver matrices**.
4. Click **Systems Management**.
5. Click a product to get information about the product or to download the product.

The computer supports the following systems-management tools:

- **IBM Director Agent**

  IBM Director Agent streamlines and automates personal computer (PC) systems-management and support tasks, such as asset deployment and tracking. These tolls are available for IBM computers at no additional charge, and they help to reduce total cost of ownership of networked computers. IBM Director Agent is available from http://www.ibm.com/servers/eserver/xseries/systems_management/ibm_director/agent/.

You can use IBM Director Agent to view detailed information about the computer hardware and software, set up alerts, monitor a variety of system resources, and manage your asset security.

- **Wake on LAN**

  A network administrator can use the Wake on LAN feature to turn on the computer from a remote location. When the Wake on LAN feature is used with network-management software, many functions, such as data transfers, software updates, and POST or BIOS code updates can be performed on many computers simultaneously.

  Note: The Wake on LAN feature works only if the computer was correctly shut down and turned off.

- **Remote Administration**

  A network administrator can use the Remote Administration feature to remotely update the POST and BIOS code in the computer. Network-management software, such as Remote Deployment Manager (RDM), is required to take advantage of this feature.

- **Remote Deployment Manager**

  Remote Deployment Manager (RDM) is a graphical, server-based program that performs mass unattended installations of operating systems, software, device drivers, and BIOS code updates to remote systems. When RDM is used with the Wake on LAN feature, it can remotely turn on the computer so that installations can be done while the computer is not being used.

Shutting down the operating system

When you are ready to turn off the computer, use the shutdown procedure for the operating system to save data and prevent damage to the applications. See the operating-system documentation for more information.

If you are using the preinstalled Microsoft Windows XP operating system, complete the following steps to shut down the operating system and turn off the computer:

1. Save and close all files.
2. Close all open applications.
3. Click **Start**.
4. Click **Turn Off Computer,** and click **Turn Off** to confirm.

If you are using the preinstalled Windows Vista operating system, complete the following steps to shut down the operating system and turn off the computer:

1. Save and close all files.
2. Close all open applications.
3. Click **Start**.
4. Click the arrow that is next to the **Lock** button; then, select **Shut Down**.

If you are using the preinstalled Red Hat Linux operating system, complete the following steps to shut down the operating system and turn off the computer:

1. Save and close all files that you are working with.
2. Close all open applications.
3. Click **Red Hat Linux Main Menu Button** → **Logout** → **Shutdown**.
4. Click **OK** to confirm.

Turning off the computer

When you turn off the computer and leave it connected to ac power, the computer can respond to requests, such as a remote request to turn on the computer. To remove all power from the computer, you must disconnect it from the power source.
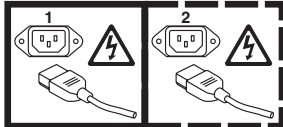
Some operating systems require an orderly shutdown before you turn off the computer. See the operating-system documentation for information about shutting down the operating system.

Statement 5:

CAUTION:

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

The computer can be turned off in any of the following ways:

- You can turn off the computer through the operating system. If this feature is supported by the operating system, it will turn off the computer after you perform an orderly shutdown of the operating system.

  To turn off the computer through the Microsoft Windows XP operating system, click **Start → Turn Off Computer**, and click **Turn Off**.

  To turn off the computer through the Microsoft Windows Vista operating system, click **Start** then click the arrow that is next to the **Lock** button; then, select **Shut Down**.

  To turn off the computer through the Red Hat Linux operating system, click **Red Hat Linux Main Menu Button → Logout → Shutdown**, and click **Yes**.

- You can press the power-control button on the front of the computer to start an orderly shutdown of the operating system and turn off the computer, if the operating system supports this feature.

  Note: After you turn off the computer, wait at least 5 seconds before you press the power-control button to turn on the computer again.

- You can press and hold the power-control button for more than 4 seconds to cause an immediate shutdown of the computer. You can use this feature to turn off the computer if the operating system stops functioning.

Chapter 3. Configuring the computer

The following configuration programs are available to configure the computer:

- **Configuration/Setup Utility program**

  The Configuration/Setup Utility program is part of the basic input/output system (BIOS). You can use this program to configure serial port assignments, change interrupt request (IRQ) settings, change the device startup sequence, set the date and time, set passwords, and set the chassis-intrusion detector. For information about using this utility program, see "Using the Configuration/Setup Utility program" on page 21.

- **Boot Menu program**

  The Boot Menu program is part of the BIOS. Use it to override the startup sequence that is set in the Configuration/Setup Utility program and temporarily assign a device to be first in the startup sequence. For information about using this utility program, see "Using the Boot Menu program" on page 24.

- **Broadcom NetXtreme Gigabit Ethernet Boot Agent**

  The Broadcom NetXtreme Gigabit Ethernet Boot Agent is part of the BIOS. You can use it to configure the network as a startable device, and you can customize where the network startup option occurs in the startup sequence. Enable and disable the Broadcom NetXtreme Gigabit Ethernet Boot Agent from the Configuration/Setup Utility program. For information, see "Enabling the Broadcom NetXtreme Gigabit Ethernet Boot Agent" on page 25.

- **Broadcom NetXtreme Gigabit Ethernet controller configuration**

  To configure the integrated Gigabit Ethernet controller, see "Configuring the Broadcom NetXtreme Gigabit Ethernet controller" on page 25.

- **LSI Logic Configuration Utility program**

  Use the LSI Logic Configuration Utility program to configure the integrated SAS/SATA controller with RAID capabilities and the devices that are attached to it. For information about using this program, see "Using the LSI Logic Configuration Utility program" on page 25.

- **PS/2 keyboard or mouse configuration**

  To configure a PS/2 keyboard or mouse, see "Configuring a PS/2 keyboard or mouse" on page 27.

Using the Configuration/Setup Utility program

This section provides instructions for starting the Configuration/Setup Utility program and descriptions of the menu choices that are available.

Starting the Configuration/Setup Utility program

To start the Configuration/Setup Utility program, complete the following steps:

1. Turn on the computer and watch the monitor screen. If the computer is already on when you start this procedure, you must shut down the operating system, turn off the computer, wait a few seconds until all in-use LEDs are turned off, and restart the computer.

2. When the message `Press F1 for Configuration/Setup`, `Press F12 for Boot Menu` is displayed, press F1. (This prompt is displayed on the screen for only a few seconds. You must press F1 quickly.) If you have set both a power-on password and an administrator password, you must type the administrator

password to access the full Configuration/Setup Utility menu. if you do not type the administrator password, a limited Configuration/Setup Utility menu is available.

3. Follow the instructions on the screen.

Configuration/Setup Utility menu choices

The following choices are on the Configuration/Setup Utility main menu. Depending on the version of the BIOS, some menu choices might differ slightly from these descriptions.

Note: When you use the computer for the first time, you might want to use the Configuration/Setup Utility menu choice **Load Default Settings** to reset the Configuration/Setup Utility menu choices to the factory default settings, in case they were changed before you received the computer. Otherwise, some choices might not be displayed in the menu.

- **System Summary**

  Select this choice to view configuration information, including the amount of installed memory. When you make configuration changes through other choices in the Configuration/Setup Utility program, the changes are reflected in the system summary; you cannot change settings directly in the system summary.

  This choice is on the full and limited Configuration/Setup Utility menu.

  – **Processor Summary**

    Select this choice to view the processor information, including the type, speed, and cache size of the microprocessor.

- **System Information**

  Select this choice to view information about the computer. When you make changes through other choices in the Configuration/Setup Utility program, some of those changes are reflected in the system information; you cannot change settings directly in the system information.

  This choice is on the full Configuration/Setup Utility menu only.

- **Devices and I/O Ports**

  Select this choice to view or change assignments for devices and input/output (I/O) ports.

  Select this choice to enable or disable the Ethernet controllers, and standard connectors (such as serial and parallel). **Enable** is the default setting for all controllers. If you disable a device, it cannot be configured, and the operating system will not be able to detect it (this is equivalent to disconnecting the device). If you disable the integrated Ethernet controller and no Ethernet adapter is installed, the computer will have no Ethernet capability.

  This choice is on the full Configuration/Setup Utility menu only.

  – **Remote Console Redirection**

    Select this choice to enable and configure serial remote video and keyboard redirection.

  – **Video**

    Select this choice to view the video information.

- **Date and Time**

  Select this choice to set the date and time in the computer, in 24-hour format (*hour*:*minute*:*second*).

  This choice is on the full Configuration/Setup Utility menu only.

- **System Security**

Select this choice to set passwords. See "Using passwords" on page 24 for more information about passwords. You can also enable the chassis-intrusion detector to alert you each time the computer cover is removed.

– **Administrator Password**

  This choice is on the full Configuration/Setup Utility menu only.

  Select this choice to set or change an administrator password. An administrator password is intended to be used by a system administrator; it limits access to the full Configuration/Setup Utility menu. If an administrator password is set, the full Configuration/Setup Utility menu is available only if you type the administrator password at the password prompt.

– **Power-on Password**

  Select this choice to set or change a power-on password.

- **Startup Option**

  Select this choice to view or change the startup options. Changes in the startup options take effect when you restart the computer.

  You can set keyboard operating characteristics or specify whether the computer starts with the keyboard number lock on or off. This choice is on the full Configuration/Setup Utility menu only.

  – **Startup Sequence Options**

  Select this choice to view the **Startup Sequence** menu. The startup sequence specifies the order in which the computer checks devices to find a boot record. The computer starts from the first boot record that it finds.

- **Advanced Setup**

  Select this choice to change values for advanced hardware features, such as CPU options and PCI configuration.

  Important: The computer might malfunction if these settings are incorrectly configured. Follow the instructions on the screen carefully.

  This choice is on the full Configuration/Setup Utility menu only.

  – **CPU Options**

    Select this choice to enable or disable the Dual-Core Processor Logic. The default status for the Dual-Core Processor Logic is **Enabled** for (some models).

  – **PCI Bus Control**

    Select this choice to view the system resources that are used by the installed PCI or PCI Express devices.

- **Error Logs**

  Select this choice to view or clear error logs.

  – **POST Error Log**

    Select this choice to view the three most recent error codes and messages that were generated during POST.

  – **System Event/Error Log**

    Select this choice to view the system event and error messages that the system generated during POST and runtime. Select **Clear event/error logs** to clear the event and error log.

- **Save Settings**

  Select this choice to save the changes that you have made in the settings.

- **Restore Settings**

  Select this choice to cancel the changes that you have made in the settings and restore the previous settings.

- **Load Default Settings**

  Select this choice to cancel the changes that you have made in the settings and restore the factory settings.
- **Exit Setup**

  Select this choice to exit from the Configuration/Setup Utility program. If you have not saved the changes that you have made in the settings, you are asked whether you want to save the changes or exit without saving them.

Using passwords

You can use any combination of up to eight characters (A–Z, a–z, and 0–9) for the power-on password or the administrator password.

If you set both a power-on password and an administrator password, you can type either password at the password prompt that appears as you start the computer. However, if you want to change the settings in the Configuration/Setup Utility program, you must type the administrator password to access the full Configuration/Setup Utility menu. If you type the power-on password, you have access to only the limited Configuration/Setup Utility menu.

Keep a record of the passwords in a secure place. If you forget the power-on password or administrator password, you can regain access to the computer through one of the following methods:

- If you have forgotten the power-on password and an administrator password is set, type the administrator password at the power-on prompt. Start the Configuration/Setup Utility program and change the power-on password.
- Remove the battery and then install the battery.

Using the Boot Menu program

The Boot Menu program is a built-in, menu-driven configuration program that you can use to temporarily redefine the first startup device without changing settings in the Configuration/Setup Utility program.

To use the Boot Menu program, complete the following steps:

1. Turn off the computer.
2. Restart the computer.
3. Press F12.
4. Select the startup device.

The next time the computer is started, it returns to the startup sequence that is set in the Configuration/Setup Utility program.

Enabling the Broadcom NetXtreme Gigabit Ethernet Boot Agent

The Broadcom NetXtreme Gigabit Ethernet Boot Agent is part of the BIOS. You can use it to configure the network as a startable device, and you can customize where the network startup option occurs in the startup sequence. Enable and disable the Broadcom NetXtreme Gigabit Ethernet Boot Agent from the Configuration/Setup Utility program.

To enable the Broadcom NetXtreme Gigabit Ethernet boot agent, complete the following steps:

1. From the Configuration/Setup Utility main menu, select **Devices and I/O Ports** and press Enter.
2. Select **Planar Ethernet** and use the Right Arrow (→) key to set it to **Enabled**.
3. Set the Network-Planar device as the first startup device under the **Startup Option → Startup Sequence Options** menu choice in the Configuration/Setup Utility program.
4. Under the **Startup Option** menu choice, select **Planar Ethernet PXE/DHCP** and use the Right Arrow key (→) to set it to **Planar Ethernet**.
5. Select **Save Settings** and press Enter.

Configuring the Broadcom NetXtreme Gigabit Ethernet controller

The Ethernet controller is integrated on the system board. It provides an interface for connecting to a 10 Mbps, 100 Mbps, or 1 Gbps network and provides full duplex (FDX) capability, which enables simultaneous transmission and reception of data on the network. If the Ethernet port in the computer supports auto-negotiation, the controller detects the data-transfer rate (10BASE-T, 100BASE-TX, or 1000BASE-T) and duplex mode (full-duplex or half-duplex) of the network and automatically operates at that rate and mode.

You do not have to set any jumpers or configure the controller. However, you must install a device driver to enable the operating system to address the controller. For device drivers and information about configuring the Gigabit Ethernet controller, see http://www.ibm.com/support/.

Using the LSI Logic Configuration Utility program

Use the LSI Logic Configuration Utility program to configure and manage redundant array of independent disks (RAID) arrays. Be sure to use this program as described in this document.

Use the LSI Logic Configuration Utility program to perform the following tasks:
- Perform a low-level format of a SAS/SATA hard disk drive
- Create an array of SAS/SATA hard disk drives with or without a hot-spare drive
- Set SAS/SATA protocol parameters on SAS/SATA hard disk drives

The integrated SAS/SATA controller with RAID capabilities supports redundant array of independent disks (RAID) arrays. You can use the LSI Logic Configuration Utility program to configure RAID 1 (IM), RAID 1E (IME), and RAID 0 (IS) for a single pair of attached devices. If you install a different type of RAID adapter, follow the instructions in the documentation that comes with the adapter to view or change SAS/SATA settings for attached devices.

In addition, you can download an LSI command-line configuration program from http://www.ibm.com/support/.

When you are using the LSI Logic Configuration Utility program to configure and manage arrays, consider the following information:

Note: Once you activate the onboard RAID or add an additional storage boot controller (for example, a RAID adapter), you can no longer use the Product Recovery CD (for Windows XP) or the Product Recovery DVD (for Windows Vista) to recover your operating system and applications because it will no longer function correctly. You will have to manually install the operating system and applications.

- The integrated SAS/SATA controller with RAID capabilities supports the following features:
  – Integrated Mirroring (IM) with hot-spare support (also known as RAID 1)

    Use this option to create an integrated array of two disks plus an optional hot spare. All data on the primary disk can be migrated.
  – Integrated Mirroring Enhanced (IME) with hot-spare support (also known as RAID 1E)

    Use this option to create an integrated mirror enhanced array of three to eight disks, including an optional hot spare.
  – Integrated Striping (IS) (also known as RAID 0)

    Use this option to create an integrated striping array of two to eight disks. All data on the array disk will be deleted.
- Hard disk drive capacities affect how you create arrays. The drives in an array can have different capacities, but the RAID controller treats them as if they all have the capacity of the smallest hard disk drive.
- If you use an integrated SAS/SATA controller with RAID capabilities to configure a RAID 1 (mirrored) array after you have installed the operating system, you will lose access to any data or applications that were previously stored on the secondary drive of the mirrored pair.
- If you install a different type of RAID controller, see the documentation that comes with the controller for information about viewing and changing SAS/SATA settings for attached devices.

Starting the LSI Logic Configuration Utility program

To start the LSI Logic Configuration Utility program, complete the following steps:

1. Turn on the computer.
2. When the prompt `<<< Press <CTRL><C> to start LSI Logic Configuration Utility >>>` is displayed, press Ctrl+C.
3. To select a controller (channel) from the list of adapters, use the arrow keys and press Enter.
4. To change the settings of the selected items, follow the instructions on the screen. If you select **Raid Properties**, **SAS Topology**, or **Advanced Adapter Properties**, additional screens are displayed.

When you have finished changing settings, press Esc to exit from the program; select **Save** to save the settings that you have changed.

Formatting a SAS/SATA hard disk drive

Low-level formatting removes all data from the hard disk. If there is data on the disk that you want to save, back up the hard disk before you perform this procedure.

Note: Before you format a SAS/SATA hard disk, make sure that the disk is not part of a mirrored pair. From the list of adapters, select the controller (channel) for the drive that you want to format. Select **SAS Topology**; then, highlight **Drive**. Press Alt+D.

To format a drive, complete the following steps:

1. From the list of adapters, select the controller (channel) for the drive that you want to format and press Enter.
2. Select **SAS Topology** and press Enter.
3. Select **Direct Attach Devices** and press Enter.
4. To highlight the drive that you want to format, use the Up Arrow and Down Arrow keys. To scroll left and right, use the Left Arrow and Right Arrow keys or the End key.
5. To start the low-level formatting operation, select **Format** and press Enter.

Creating a RAID array of SAS/SATA hard disk drives

To create a RAID array of SAS/SATA hard disk drives, complete the following steps:

1. From the list of adapters, select the controller (channel) for the drives that you want to mirror.
2. Select **RAID Properties**.
3. Select the type of array you want to create from the list.
4. Use the arrow keys to highlight the first drive in the pair; then, press the Minus (-) or Plus (+) key to change the mirror value to **Primary**.
5. Continue to select the next drive using the Minus (-) or Plus (+) key until you have all the drives for your array.
6. Press C to create the disk array.
7. Select **Apply changes and exit menu** to create the array.

Configuring a PS/2 keyboard or mouse

If you connect a PS/2 keyboard or mouse to the computer, you must configure the device in Windows so that the computer will come out of standby (power saving) when you press a key or move the mouse. To configure the keyboard or mouse, complete the following steps:

1. On the desktop, right-click the **My Computer** icon.
2. Click **Properties**.
3. Click the **Hardware** tab.
4. Click **Device Manager**.
5. From the list, double-click the keyboard or mouse.
6. In the device properties window, click the **Power Management** tab.
7. Select the **Allow this device to bring the computer out of standby** check box, and Click **OK**.

Chapter 4. Installing optional devices

This section provides instructions for installing and replacing hardware options in the computer. For a list of supported optional devices for the computer, see http://www.ibm.com/servers/eserver/serverproven/compat/us/.

Installation guidelines

Before you install optional devices, read the following information:

- Read the safety information that begins on page v and the guidelines in "Handling static-sensitive devices" on page 30. This information will help you work safely.
- When you install your new computer, take the opportunity to download and apply the most recent firmware updates. This step will help to ensure that any known issues are addressed and that your computer is ready to function at maximum levels of performance. To download firmware updates for your computer, go to http://www.ibm.com/support/and click **Downloads and drivers**.
- Observe good housekeeping in the area where you are working. Place removed covers and other parts in a safe place.
- 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 can 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 pushing up with your leg muscles.
- Make sure that you have an adequate number of properly grounded electrical outlets for the computer, monitor, and other devices.
- Back up all important data before you make changes to disk drives.
- Have a small flat-blade screwdriver available.
- When you have to access the inside of the computer, you might find it easier to lay the computer on its side.
- Blue on a component indicates touch points, where you can grip the component to remove it from or install it in the computer, open or close a latch, and so on.
- When you are finished working on the computer, reinstall all safety shields, guards, labels, and ground wires.

System reliability considerations

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

- Each of the drive bays has a drive or a filler panel and electromagnetic compatibility (EMC) shield installed in it.
- There is adequate space around the computer to allow the computer cooling system to work properly. Leave approximately 50 mm (2 in.) of open space around the front and rear of the computer. Do not place objects in front of the fans. For proper cooling and airflow, replace the computer cover before you turn on the computer. Operating the computer for extended periods of time (more than 30 minutes) with the computer cover removed might damage computer components.

- You have followed the cabling instructions that come with optional adapters.
- You have replaced a failed fan as soon as possible.

Handling static-sensitive devices

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

Notes:

1. If you are instructed to return a device or component, follow all packaging instructions. Use any packaging materials for shipping that are supplied to you.
2. Use product-specific electrostatic-discharge procedures when they exceed the requirements that are specified in this document.
3. Make sure that the electrostatic-discharge-protective devices that you use have been certified (ISO 9000) as fully effective.

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

Major components of the computer

The following illustration shows the major components in the computer.

Cover

Filler panel

EMC shield

Hard disk drive bracket

CD or DVD drive

System board

Memory module

Bezel

Heat sink

Front adapter retention bracket

Microprocessor

Air baffle
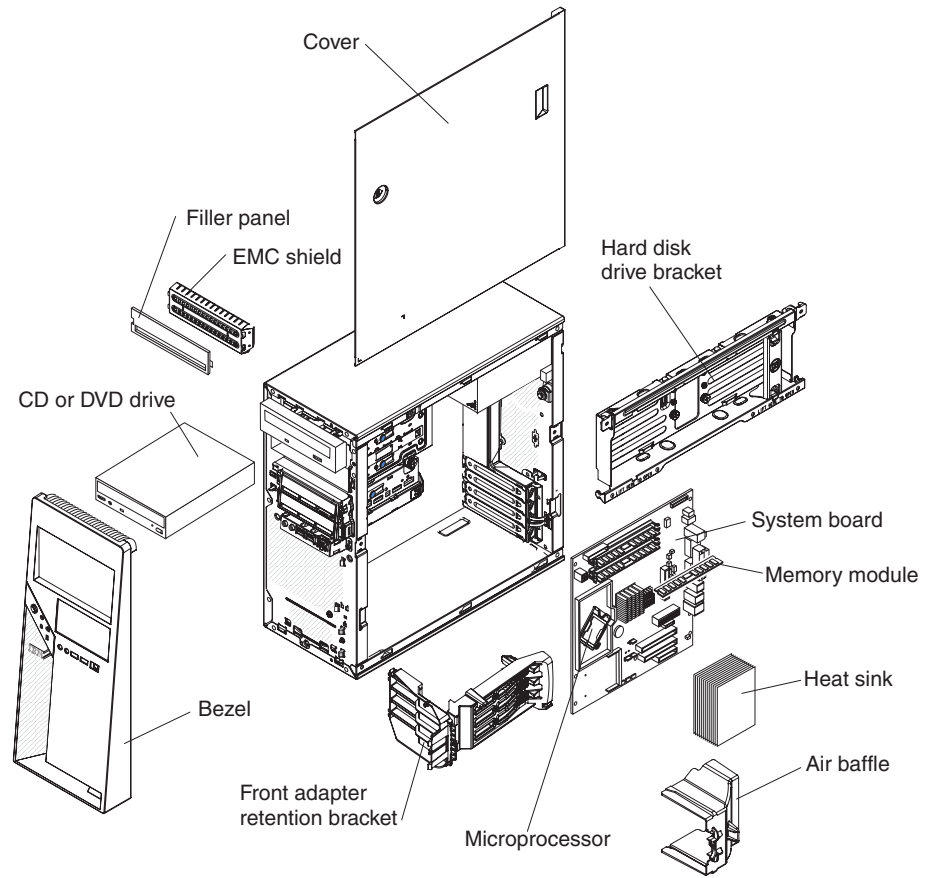
System-board optional-device connectors

The following illustration shows the connectors on the system board for user-installable optional devices.
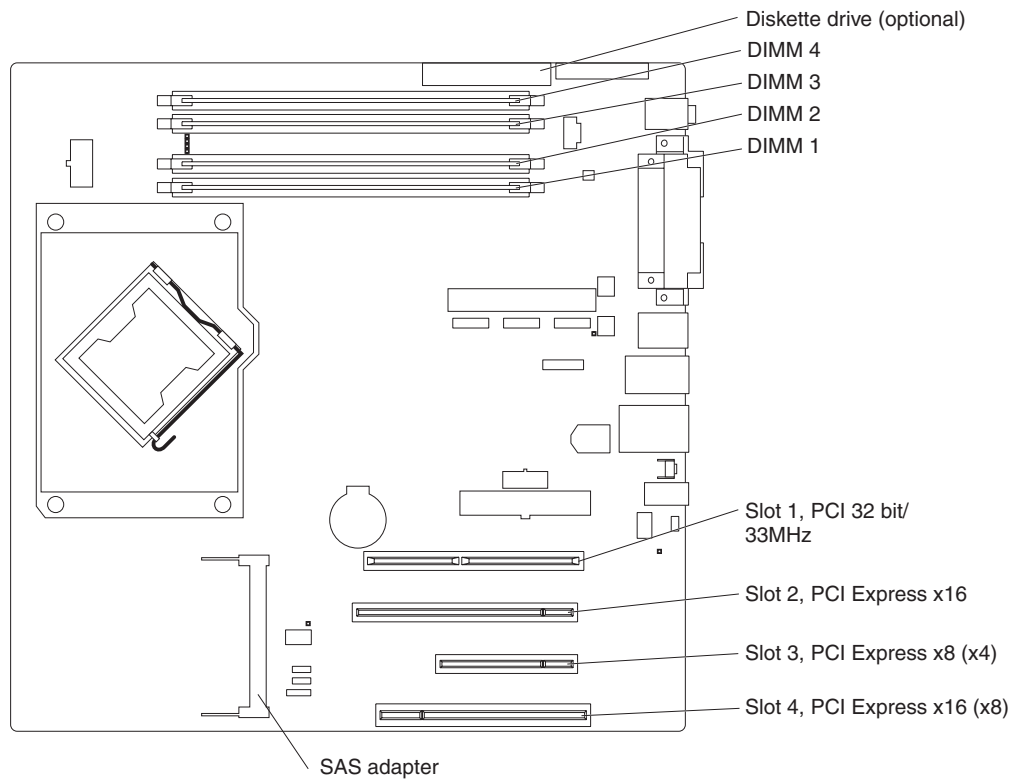
System-board internal connectors

The following illustration shows the internal connectors on the system board.
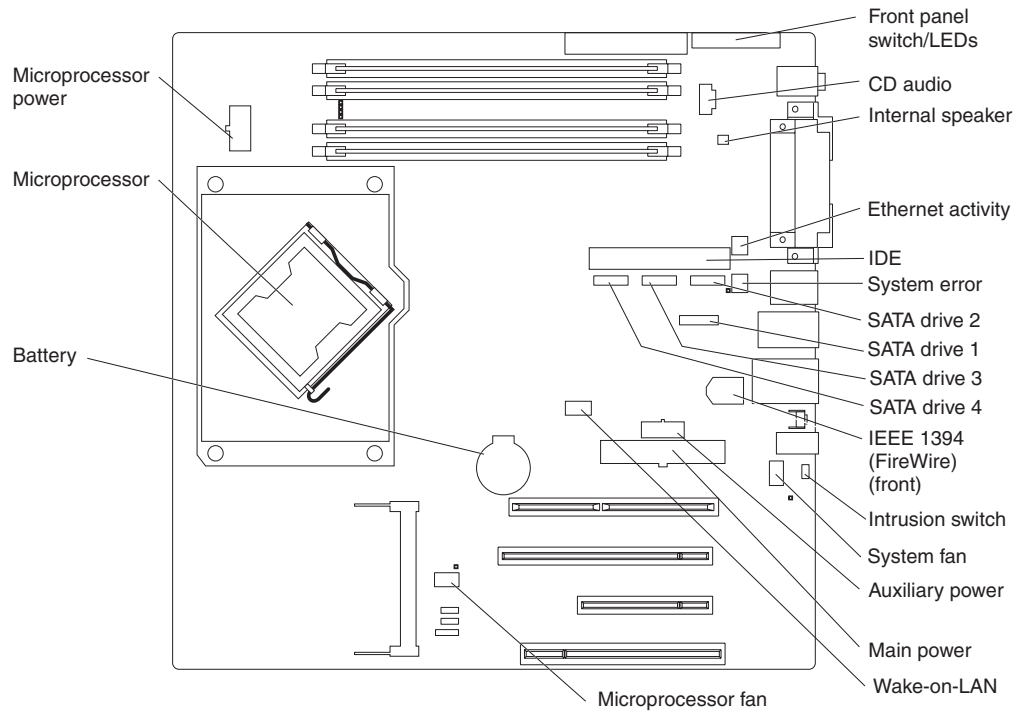
System-board external connectors

The following illustration shows the external input/output connectors on the system board.

Audio in/out

Serial 2

Parallel

Serial 1

Keyboard/mouse

USB 3-6

Ethernet/
USB 1 and 2

IEEE 1394
(FireWire)
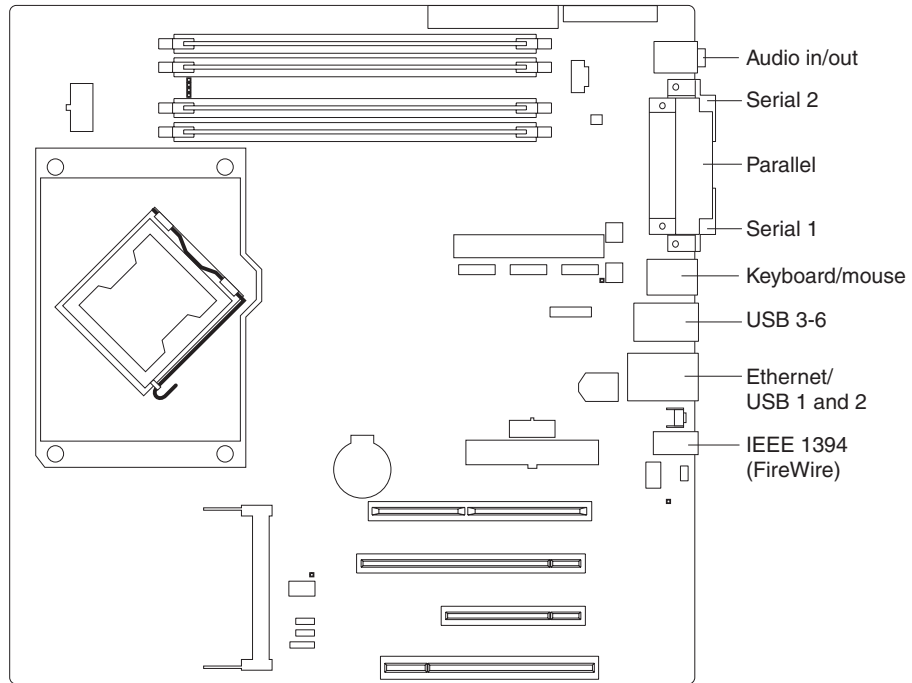
Removing the side cover

To remove the side cover of the computer, complete the following steps:

1. Read the safety information that begins on page v and "Installation guidelines" on page 29.

2. Turn off the computer and all attached devices (see "Turning off the computer" on page 19); then, disconnect all power cords and external cables.

3. Unlock the side cover, if it is locked.

4. Press the cover-release button on the side of the computer, and push the side cover toward the rear of the computer. Lift the side cover off the computer and set it aside.
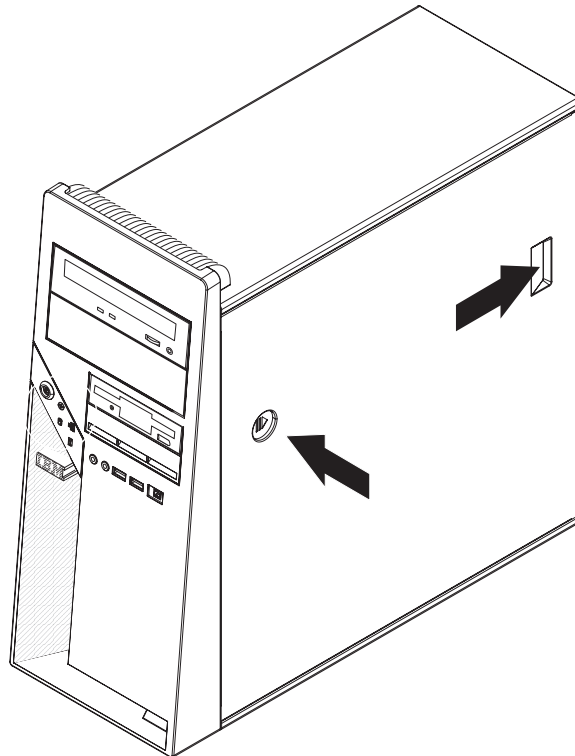
Attention: For proper cooling and airflow, replace the cover before you turn on the computer. Operating the computer with the cover removed might damage computer components.

Removing the bezel

When you work with some optional devices, such as a CD or DVD drive or diskette drive, you must first remove the bezel to access the device.

To remove the bezel, complete the following steps:

1. Read the safety information that begins on page v and the "Installation guidelines" on page 29.

2. Turn off the computer and all attached devices (see "Turning off the computer" on page 19); then, disconnect all power cords and external cables.

3. Remove the side cover (see "Removing the side cover" on page 35).

4. Press the bezel release button and pull the bottom of the bezel away from the chassis; then, pull downward on the handle. The top tabs of the bezel are disengaged from the matched holes in the chassis.

Bezel release button
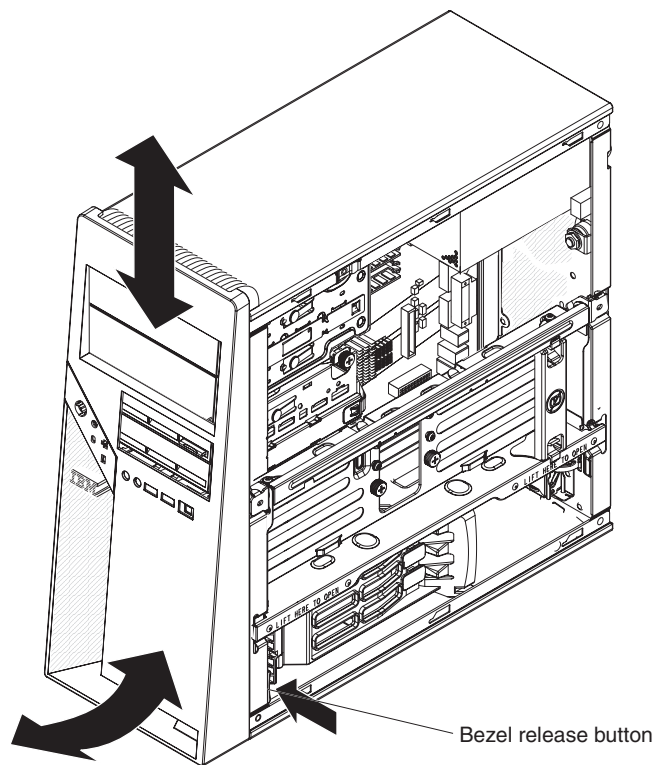
5. Carefully remove the bezel from the computer; then, set the bezel aside.

Removing the internal drive-bay bracket

To remove the internal drive-bay bracket, complete the following steps:

1. Read the safety information that begins on page v and "Installation guidelines" on page 29.
2. Turn off the computer and all attached devices (see "Turning off the computer" on page 19).
3. Remove the side cover (see "Removing the side cover" on page 35).
4. If a hard disk drive is installed in the bracket, disconnect the signal and power cables from the hard disk drive.
5. Remove the two screws that fasten the top edge of the drive-bay bracket to the chassis.
6. Grasp the lower edge of the drive-bay bracket, and disengage it from the chassis.
7. Lift the top edge of the drive-bay bracket from the chassis and remove the drive-bay bracket from the computer.
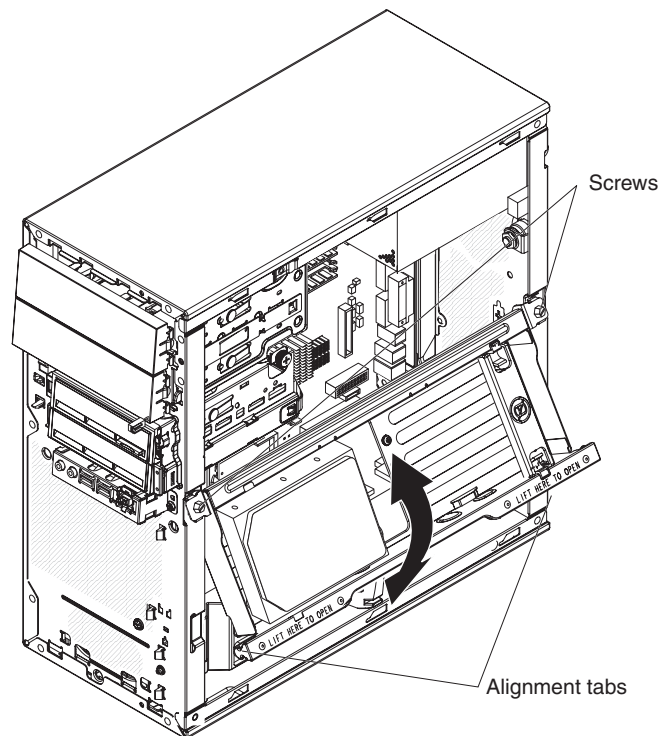
Removing the air baffle

The computer might come with an air baffle that directs airflow to the microprocessor. When you install optional devices, you might have to remove the air baffle to access some components.

To remove the air baffle, complete the following steps:

1. Press in on the tabs on each side of the air baffle.
2. Lift the air baffle out of the computer and set it aside.

Release tab

Handle
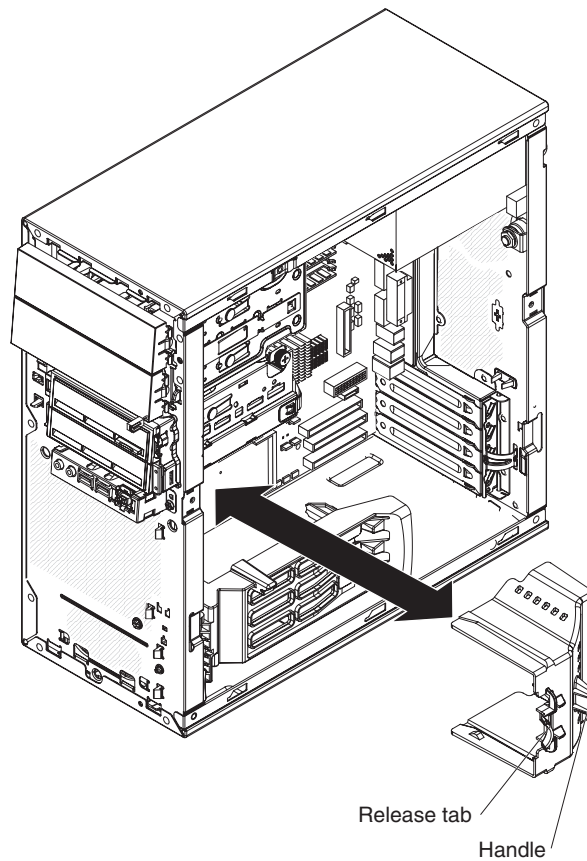
Installing an adapter

The following notes describe the types of adapters that the computer supports and other information that you might consider when you install an adapter. See "System-board optional-device connectors" on page 32 for an illustration of the adapter slot locations.

Important: When you install the NVIDIA Quadro FX 3500 video adapter in the computer, do not set the analog resolution above 1600 x 1200 @ 60 Hz. This is the highest resolution supported for the NVIDIA Quadro FX 3500 video adapter. In addition, when you use a cathode ray tube (CRT) type monitor, the monitor cable must come with a ferrite suppression on both ends of the monitor cable.

- Read the documentation that comes with the operating system.
- Locate the documentation that comes with the adapter and follow those instructions in addition to the instructions in this chapter. If you have to change the switch or jumper settings on the adapter, follow the instructions that come with the adapter.
- The computer comes with the following adapter connectors, or *slots*:

    Important: The slot designation information describes the adapter that is supported in that slot and the bandwidth for that slot. For example, the *x8 (x4)* designation for slot 3 identifies an x8 slot that is designed to support x4 adapters and x8 adapters that can downshift to operate at the x4 bandwidth. If you install an x8 adapter in slot 3 that can downshift to the x4 bandwidth, it will run at the x4 bandwidth. The x8 connector is used for x4 and x8 adapters.

    – Slot 1, PCI 32-bit, 33 MHz
    – Slot 2, PCI Express x16

      Note: In some models, the video adapter in slot 2 overlaps slot 1. Therefore, you will have one less PCI slot in which you can install an adapter.
    – Slot 3, PCI Express x8 (x4)
    – Slot 4, PCI Express x16 (x8)

    The computer comes with the video (graphics) adapter installed in slot 2. You can install up to three additional optional adapters in the computer. The computer supports dual-graphic adapters in slots 2 and 4. If a single-graphic configuration is used, slot 2 is configured to run at the x16 bandwidth. If the dual-graphic configuration is used, slots 2 and 4 are configured to run at the x8 bandwidth.

    Notes:

    1. If you are using the dual-graphic configuration, connect the video auxiliary power cable to the system board. Make sure each video adapter is 65 watts or less.
    2. If you are using the single-graphic configuration and the power consumption of the video adapter is more than 65 watts, connect the video auxiliary power cable to the video adapter.

Slot	Dual graphics	Single graphic
1	Available	Available
2	x8 single slot (65 watts maximum)	x16
3	Available	Available
4	x8 single slot (65 watts maximum)	Must be empty

- You can install a full-length 32-bit, 5 V PCI adapter in slot 1.
- You can install full-length adapters in slots 3 and 4. None of the expansion slots are hot-plug slots.
- For slot 1, the computer supports 5.0 V signaling and universal PCI adapters; it does not support 3.3 V signaling adapters.
- To assign system resources, the computer scans the adapters in the following sequence:
  - Slot 2, PCI Express x16
  - Slot 4, PCI Express x16 (x8)
  - Slot 3, PCI Express x8 (x4)
  - The SAS adapter slot
  - Slot 1, PCI 32-bit/33 MHz

  The computer starts the PCI devices in the following order, if you have not changed the default startup sequence: slot 2, slot 4, slot 3, the SAS adapter slot, slot 1, and then IDE or Serial ATA devices.
- The computer comes with integrated IEEE 1394 (FireWire) support.
- For a list of supported options for the computer, see http://www.ibm.com/servers/eserver/serverproven/compat/us/.

To install an adapter, complete the following steps:

1. Read the safety information that begins on page v and "Installation guidelines" on page 29.
2. Turn off the computer and all attached devices (see "Turning off the computer" on page 19); then, disconnect all external cables and power cords.
3. Remove the side cover (see "Removing the side cover" on page 35).
4. Lift up on the bottom edge of the internal drive-bay bracket and rotate the bracket out of the computer.
5. Determine which PCI slot you will use for the adapter. Review the instructions that come with the adapter for any requirements, restrictions, or cabling instructions. It might be easier to route cables before you install the adapter.
6. Prepare the slot:
   - If the slot contains a full-length adapter, rotate the rear adapter-retention bracket and then the front adapter-retention bracket to the open (unlocked) position. Grasp the adapter and pull it out of the slot.
   - If the slot contains a smaller adapter, rotate only the rear adapter-retention bracket to the open (unlocked) position. Grasp the adapter and pull it out of the slot.
   - If the slot is empty, remove the expansion-slot cover. From the rear of the computer, press on the slot cover. Grasp it and pull it out of the expansion slot. Store it in a safe place for future use.

   Attention: Expansion-slot covers must be installed in all empty slots. This maintains the electronic emissions standards of the computer and ensures proper ventilation of computer components.
7. Follow the instructions that come with the adapter to set jumpers or switches, if there are any.

   Attention: Avoid touching the components and gold-edge connectors on the adapter.
8. If you are installing a full-length adapter, remove the blue adapter guide (if any) from the end of the adapter.

Adapter guide
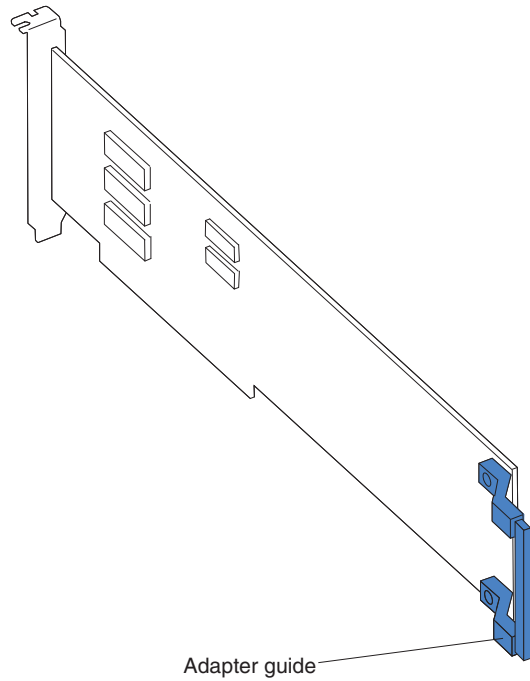
> **Attention:** Make sure that the adapter is correctly seated in the expansion slot before you turn on the computer. Incomplete installation of an adapter might damage the computer or the adapter.

9. Carefully grasp the adapter by the top edge or upper corner and move the adapter directly from the static-protective package to the adapter slot. Align the adapter with the expansion slot guides; then, press the adapter *firmly* into the expansion slot.

Rear adapter-retention bracket

Front adapter-retention bracket
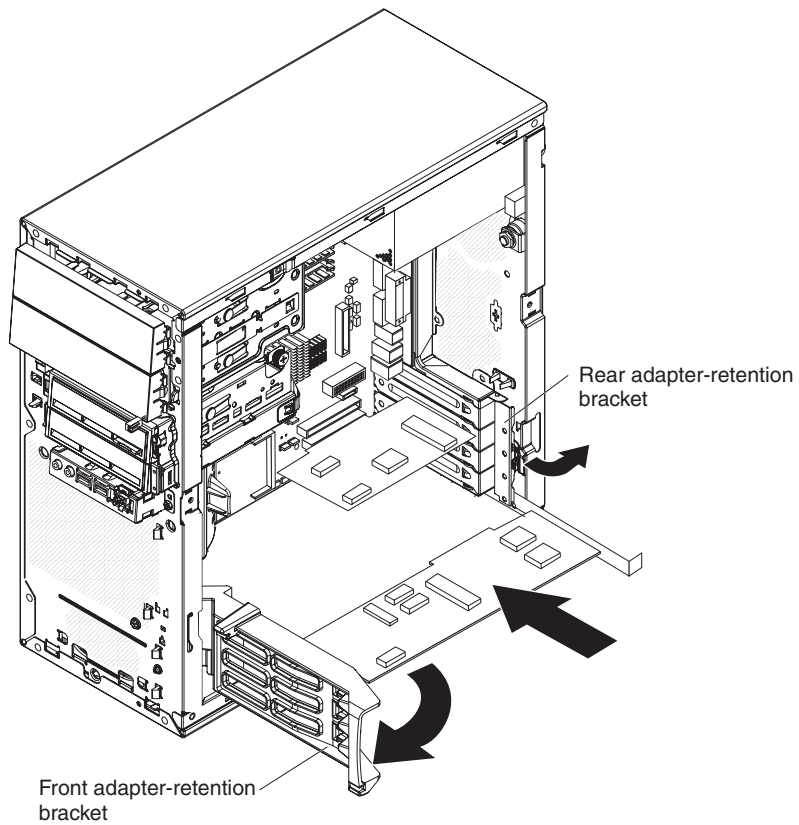
10. Rotate the rear adapter-retention bracket to the closed (locked) position.

11. Connect required cables to the adapter. Route cables so that they do not block the flow of air from the fans.

12. If you have another adapter to install, repeat steps 5 through 11.

13. If you have installed a full-length adapter, press down on the top tab of the front adapter-retention bracket to lock it in place; then, rotate the front adapter-retention bracket to the closed (locked) position.

14. Rotate the internal drive-bay bracket back into the computer and press down on the bracket to lock it into place.

If you have other devices to install, do so now; otherwise, go to "Completing the installation" on page 53.

Installing internal drives

Depending on the computer model, one or more of the following drives might be installed in the computer:

- Diskette (optional)
- Hard disk
- CD-RW, or DVD/CD-RW combo
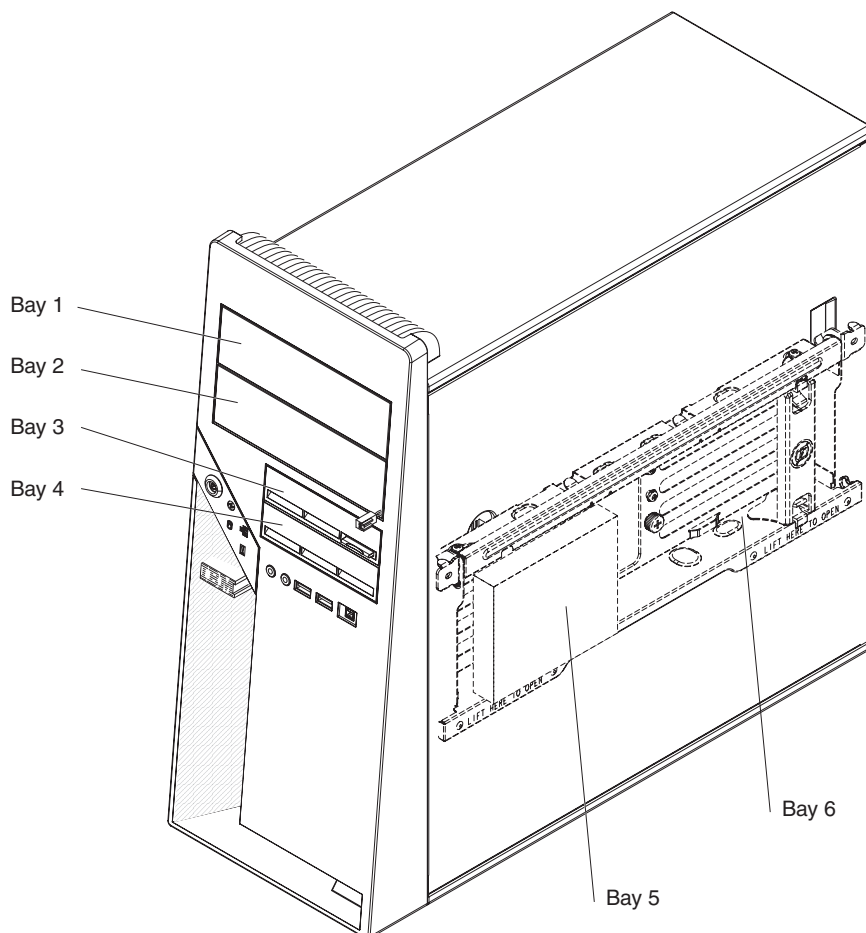
The following notes describe the types of drives that the computer supports and other information that you must consider when you install drives:

- The computer comes with an IDE optical drive in bay 1 and one hard disk drive in bay 4.

- Diskette drives, tape drives, CD-RW, DVD/CD-RW, and DVD-ROM drives are examples of removable-media drives. You can install removable-media drives in bays 1, 2, and 3 only.
- You can install all SATA hard disk drives or all SAS hard disk drives. Do not mix SATA and SAS drives.
- You can install a 3.5-in. slim-high (requires conversion kit), or 5.25-in. half-high removable-media drive, such as a tape backup drive, in bay 2.
- The computer supports an optional diskette drive in bay 3 or a Universal Serial Bus (USB) drive that is connected to the USB connector on the front of the computer.
- The internal drive-bay bracket provides two additional drive bays for the installation of a fifth drive (bay 5) and sixth drive (bay 6).
- Three SAS hard disk drives can be installed in the computer, in bays 2, 4 and 5. Install the SAS hard disk drives in this sequence: bay 4, 5, and 2.
- Four SATA hard disk drives can be installed in the computer, in bays 2, 4, 5 and 6. Install the SATA hard disk drives in this sequence: bay 4, 5, 6, and 2.
- Install the SATA hard disk drives in the following sequence.

Number of SATA hard disk drives	SATA connector
One	1
Two	1, 2
Three	1, 2, 3
Four	1, 2, 3, 4

- When the SAS adapter is installed, use the 4-drop cable to connect the drives to the SAS adapter.
- The electromagnetic interference (EMI) integrity and cooling of the computer are protected by having all bays and PCI slots covered or occupied. When you install a drive or PCI adapter, save the EMC shield and filler panel from the bay or the PCI adapter slot cover in the event that you later remove the drive or adapter.
- For a complete list of supported optional devices for the computer, see http://www.ibm.com/servers/eserver/serverproven/compat/us/.

Installing a drive in bay 2 or 3

To install a drive in bay 2 or bay 3, complete the following steps.

Note: When you install optional devices, you might find it easier to work with the computer lying on its side.

1. Read the safety information that begins on page v, "Installation guidelines" on page 29, and the documentation that comes with the drive.
2. Turn off the computer and all attached devices; then, disconnect all external cables and power cords.
3. Remove the side cover (see "Removing the side cover" on page 35).
4. Remove the bezel (see "Removing the bezel" on page 36).

5. Use a screwdriver to pry the filler panel and EMC shield away from the computer.

EMC shield

Filler panel

Drive retainer clip
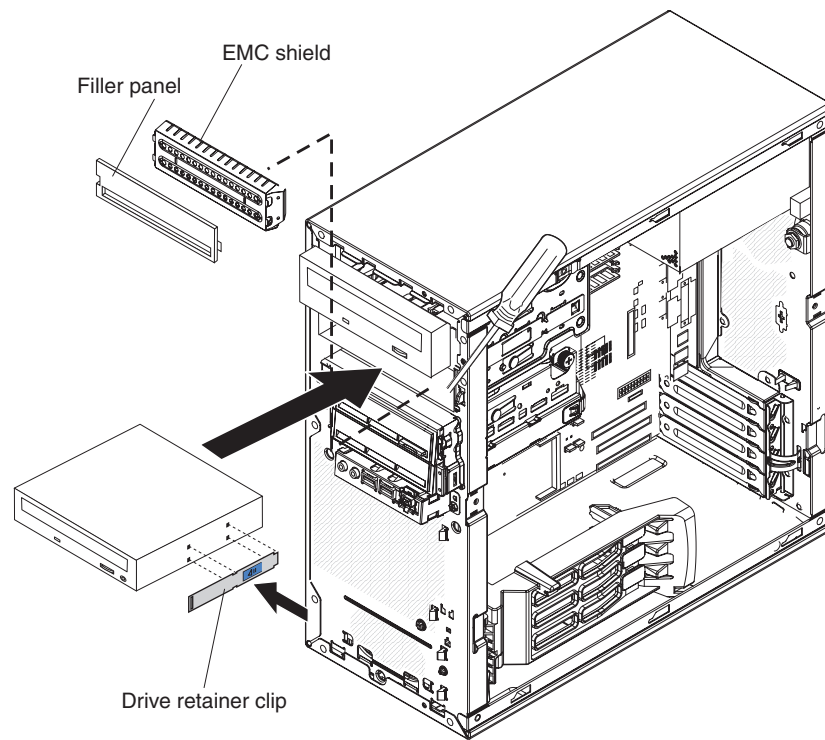
Note: If you are installing a drive that contains a laser, observe the following safety precaution.

Statement 3:

CAUTION:
When laser products (such as CD-ROMs, DVD drives, fiber optic devices, or transmitters) are installed, note the following:
• **Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.**
• **Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.**

DANGER

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

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

6. Touch the static-protective package that contains the drive to any unpainted metal surface on the computer; then, remove the drive from the package and place it on a static-protective surface.

7. Set any jumpers or switches on the drive according to the documentation that comes with the drive.

   Note: You might find it easier to install the new drive into the opening in the front and then attach the cables.

8. Install the drive in bay 2 or bay 3.

   To install the drive in bay 2, complete the following steps. To install the optional diskette drive in bay 3, go to page 47.

   a. Remove the large drive retainer clip that is attached to the inside of the top portion of the bezel door. Pull outward (to the left) on the drive retainer clip release tab to release the drive retainer clip, and lift it off the bezel.

Drive retainer clip

Drive retainer clip release tab
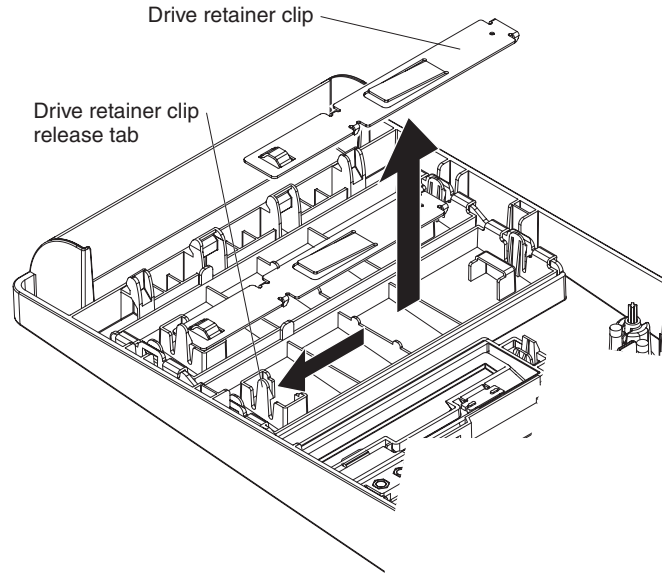
b. Install the blue drive retainer clip into the screw holes on the side of the drive (with the blue side of the clip facing outward).

Drive retainer clip
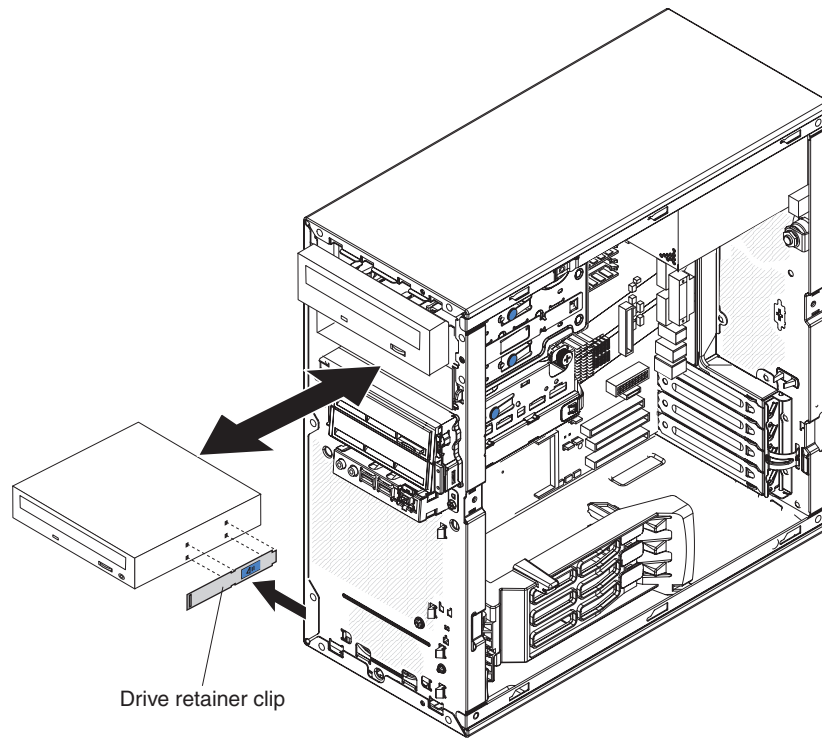
c. If you are installing a 5.25 in. drive in bay 2, slide the drive into the front of the bay until it snaps in place. If you are installing a 3.5 in. drive in bay 2, attach the 5.25 in. conversion kit and push the drive into the drive bay until it snaps in place.

d. Determine whether the drive is a IDE, SATA, or SAS device; then, connect one end of the applicable signal cable into the back of the drive and make sure that the other end of this cable is connected into the applicable IDE, SATA, or SAS connector.

e. Route the signal cable so that it does not block the airflow to the rear of the drives or over the microprocessor and dual inline memory modules (DIMM).

f. Connect the power cable to the back of the drive. The connectors are keyed and can be inserted only one way.

If you have other devices to install do so now; otherwise, go to "Completing the installation" on page 53.

To install an optional diskette drive in bay 3, complete the following steps:

a. Lift up on the bottom edge of the internal drive-bay bracket and rotate the bracket out of the computer.

b. Remove the small drive retainer clip that is attached to the bottom of the drive cage. Slide the drive retainer clip to disengage it from the drive cage; then, snap the drive retainer clip into the screw holes on the side of the drive.

c. Slide the drive into the front of the bay until it snaps in place.
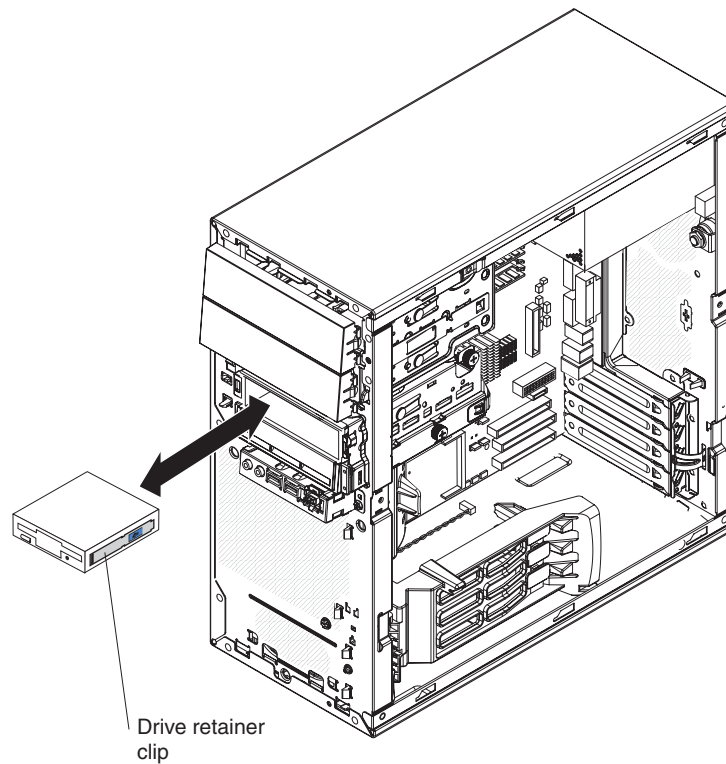
Drive retainer clip

d. Determine whether the drive is a IDE, SATA, or SAS device; then, connect one end of the applicable signal cable into the back of the drive and make sure that the other end of this cable is connected into the applicable IDE, SATA, or SAS connector.

e. Route the signal cable so that it does not block the airflow to the rear of the drives or over the microprocessor and dual inline memory modules (DIMM)

f. Connect the power cable to the back of the drive. The connectors are keyed and can be inserted only one way.

If you have other devices to install, do so now; otherwise, go to "Completing the installation" on page 53.

Installing a drive in bay 4, 5, or 6

To install a hard disk drive in bay 4, 5, or 6 complete the following steps:

1. Read the safety information that begins on page v, "Installation guidelines" on page 29, and the documentation that comes with the drive.
2. Turn off the computer and all attached devices; then, disconnect all external cables and power cords.
3. Remove the side cover (see "Removing the side cover" on page 35).
4. Remove the bezel (see "Removing the bezel" on page 36).
5. Touch the static-protective package that contains the drive to any unpainted metal surface on the computer; then, remove the drive from the package and place it on a static-protective surface.
6. Set any jumpers or switches on the new drive according to the documentation that comes with the drive.
7. To install the drive in bay 4, complete the following steps. To install a drive in bay 5 or 6 go to step 8.
   a. Lift up on the bottom edge of the internal drive-bay bracket and rotate the bracket out of the computer.
   b. Install the hard disk drive onto the hard disk drive tray, with the screws that come with the drive. Slide the drive into the bay until it snaps into place. If you are replacing the drive in bay 4, use the captured thumbscrew that you received earlier, to attach the drive to the chassis.
   c. Determine whether the drive is a SATA or SAS device; then, connect one end of the applicable signal cable into the back of the drive and make sure that the other end of this cable is connected into the applicable SATA or SAS connector.
   d. Route the signal cable so that it does not block the airflow to the rear of the drives or over the microprocessor and DIMMs.
   e. Connect the power cable to the back of the drive. The connectors are keyed and can be inserted only one way.

   If you have other devices to install, do so now; otherwise, go to "Completing the installation" on page 53.
8. To install the drive in bay 5 or bay 6, complete the following steps.

   Note: Before you can install a drive in bay 6, you must remove the plastic block from bay 6.
   a. Install the two shoulder screws, one on each side, at the front of the new drive.
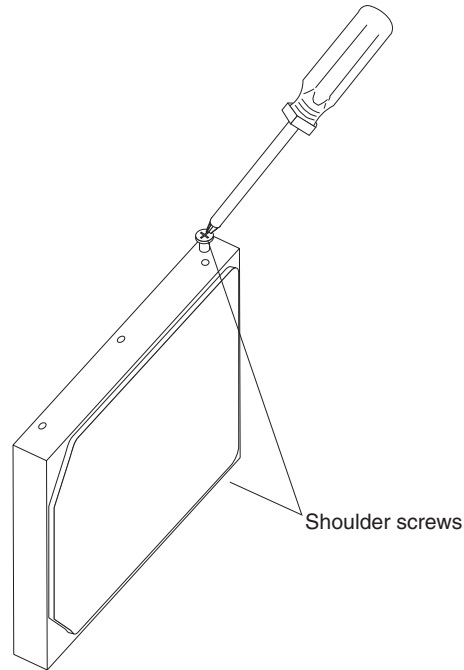
Shoulder screws

b. Position the hard disk drive so that the shoulder screws are aligned with the slots in the internal drive-bay bracket.

c. Slide the front of the drive into the slots of the internal drive-bay bracket.

Plastic block

Guide slots
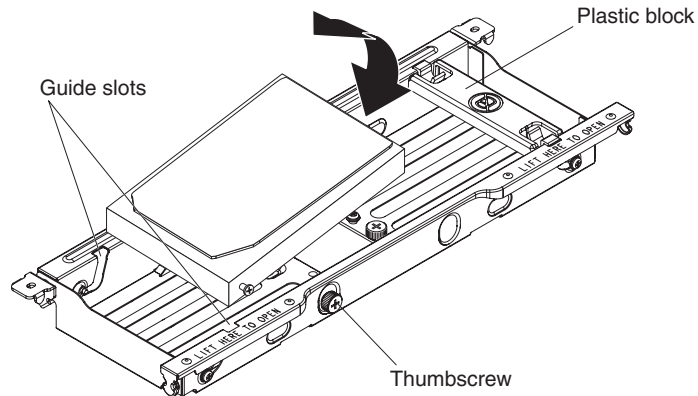
Thumbscrew

d. Lower the rear of the drive into position in the bracket, and install the thumbscrew at the rear of the drive.

e. Reconnect the signal and power cables to the hard disk drive in the bracket.

If you have other devices to install, do so now; otherwise, go to "Completing the installation" on page 53.

Power and signal cables for internal drives

Important: This computer is suitable for use on an IT power distribution system whose maximum phase to phase voltage is 240 V under any distribution fault condition.

The computer uses cables to connect IDE, SATA, and SAS devices to the power supply and to the system board. (See "System-board internal connectors" on page 33 for the location of system-board connectors.) Review the following information before you connect power and signal cables to internal drives:

- The drives that are preinstalled in the computer come with power and signal cables attached. If you replace any drives, remember which cable is attached to which drive.
- When you install a drive, make sure that one of the drive connectors of the signal cable is connected to the drive and that the connector at the other end of the signal cable is connected to the system board.
- If you have only one IDE device on a cable, it must be set as a primary device.
- If two IDE devices are used on a single cable, one must be designated as the primary device and the other as the secondary device; otherwise, the computer might not recognize some of the IDE devices. The primary and secondary designation is determined by switch or jumper settings on each IDE device.
- When the SAS adapter is installed, use the four-drop cable to connect the drives to the SAS adapter.

The following cables are provided:

- **Power cables:** Four-wire power cables connect the drives to the power supply. At the ends of these cables are plastic connectors that can be attached to different drives; these connectors vary in size. You can use either a four-wire power cable or Serial ATA power cable with Serial ATA drives, but do not use both at the same time (use one or the other).
- **Signal cables:** Signal cables are typically flat cables, also called ribbon cables, that connect parallel IDE, SATA, SAS and diskette drives to the system board. Two or three types of signal cables come with the computer:
  - **IDE:** The wider IDE signal cable has three connectors. One of these connectors is attached to the drive, one is a spare, and the third is attached to the primary IDE connector on the system board.

    The optical drive is attached to an ATA 100 signal cable. ATA 100 signal cables are color-coded. The blue connector is attached to the system board. The black connector is attached to the primary IDE device. The gray middle connector is attached to the secondary IDE device.
  - **Diskette drive (optional):** The narrower signal cable has two connectors. One is attached to the diskette drive, and the other is attached to the diskette drive connector on the system board.
  - **Serial ATA:** The narrower, black signal cable has two connectors. One is attached to the SATA drive, and the other is attached to the connector on the system board. Each SATA drive comes with a cable. If you install an additional SATA drive, you will need an additional cable. Connect SATA signal cables to the system board connectors (SATA 1 through SATA 4) in numerical order, starting with SATA 1.
  - **SAS:** The SAS flat three-drop cable connects the internal SAS hard disk drive to the SAS adapter connector. This cable has three connectors for attaching three internal SAS devices.

Installing memory modules

The following notes describe the types of DIMMs that the computer supports and other information that you must consider when you install DIMMs:

- When you restart the computer after you add or remove a DIMM, the computer displays a message that the memory configuration has changed.
- The computer uses industry-standard PC2-5300 double-data-rate 2 (DDR2) DIMMs.
- The system board contains four DIMM connectors and supports two-way memory interleaving.
- The optional DIMMs that are available for the computer are 512 MB, 1 GB, and 2 GB memory modules. When you order 1 GB and 2 GB DIMM options, they come in pairs. The computer supports a minimum of 512 MB of memory and a maximum of 8 GB of memory.
- The computer comes with either two 512 MB or two 1 GB DIMMs installed in the DIMM 1 and DIMM 3 connectors. The second pair of DIMMs must be installed in the DIMM 2 and DIMM 4 connectors.
- DIMMs must be installed in matched pairs. The DIMMs in each pair must be the same size, speed, type, and technology as each other but do not have to match the other pairs. You can mix compatible DIMMs from various manufacturers.
- Install only 1.8 V, 240-pin, DDR2, PC2-5300, 667 MHz, unbuffered synchronous dynamic random-access memory (SDRAM) with error correcting code (ECC) DIMMs. These DIMMs must be compatible with the latest PC2-5300 SDRAM, unbuffered DIMM specification. For a list of supported optional devices for the computer, see http://www.ibm.com/servers/eserver/serverproven/compat/us/.
- The amount of usable memory will be reduced depending on the system configuration. A certain amount of memory must be reserved for system resources. The system summary in the Configuration/Setup Utility program displays the total amount of installed memory and the amount of configured memory.

To install a DIMM, complete the following steps:

1. Read the safety information that begins on page v, and the"Installation guidelines" on page 29.
2. Turn off the computer and all attached devices (see "Turning off the computer" on page 19); then, disconnect all power cords and external cables.
3. Remove the side cover (see "Removing the side cover" on page 35).
4. Remove the bezel (see "Removing the bezel" on page 36).
5. For easier access, place the computer on its side.
6. Remove the internal drive-bay bracket (see "Removing the internal drive-bay bracket" on page 37).
7. Locate the DIMM connectors on the system board. Determine the connectors into which you will install the DIMMs. Remember that DIMM 1 and DIMM 3 must be paired together (and must be the first installed pair) and DIMM 2 and DIMM 4 must be paired together. The following table shows the DIMM installation sequence.

Memory installation sequence	
DIMMs	Connectors
2 DIMMs	1, 3
4 DIMMs	1, 3, 2, 4

8. Gently open the retaining clips and, if necessary, remove any existing DIMM.

    Attention: To avoid breaking the retaining clips or damaging the DIMM connectors, open and close the clips gently

9. Touch the static-protective package that contains the DIMM to any unpainted metal surface on the computer. Then, remove the new DIMM from the package.

10. Gently open the retaining clip on each end of the DIMM connector. Turn the DIMM so that the pins align correctly with the connector.
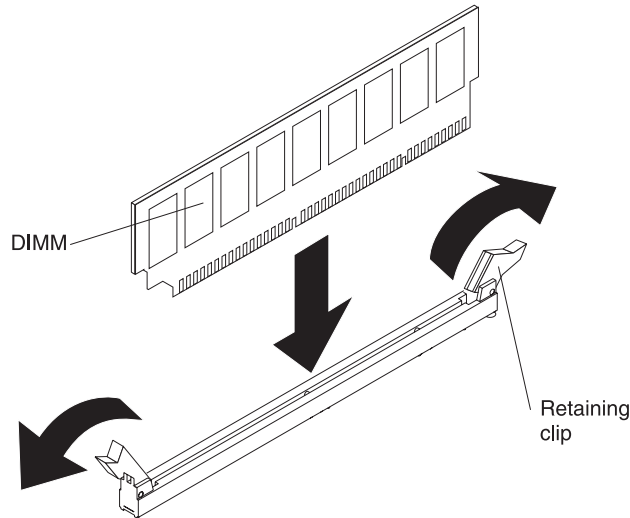
11. Insert the DIMM into the connector. Firmly press the DIMM straight down into the connector by applying pressure on both ends of the DIMM simultaneously. The retaining clips snap into the locked position when the DIMM is firmly seated in the connector. If there is a gap between the DIMM and the retaining clips, the DIMM has not been correctly installed. Open the retaining clips and remove the DIMM; then, reinsert it.

12. If you have other options to install do so now.

13. Return the computer to the upright position, go to "Completing the installation" on page 53.

Installing a security cable

To help prevent hardware theft, you can thread a security cable through the cable loop on the rear of the computer. After you add the security cable, make sure that it does not interfere with other cables that are connected to the computer.

Before you begin, obtain the following items:
- A security cable
- A lock, such as a combination lock or padlock

To install a security cable, complete the following steps:

1. Thread the cable through the cable loop and around an object that is not part of or permanently secured to the building structure or foundation and from which the cable cannot be removed.
2. Fasten the cable ends together with a lock. Make sure that the cable does not interfere with other cables that are connected to the computer.

Cable loop
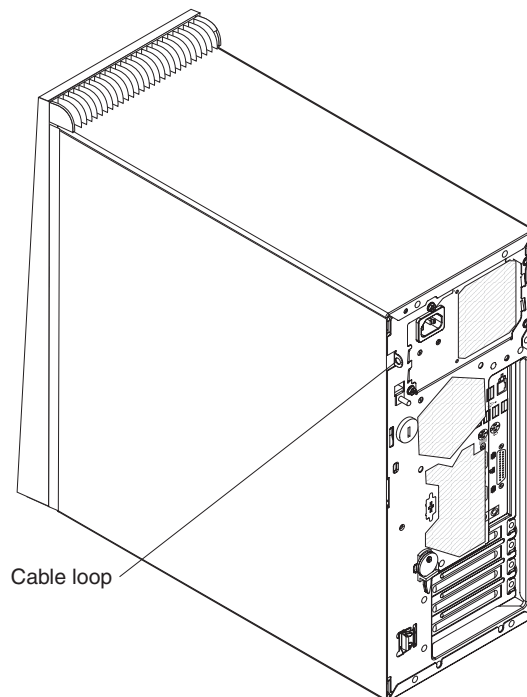
Completing the installation

To complete the installation, reinstall the bezel, reinstall the side cover, and reconnect all the external cables.

Replacing the air baffle

To replace the air baffle, complete the following steps:

1. Place the air baffle directly over the front fan unit.
2. Press the air baffle down until it snaps in place over the front fan unit. When the air baffle is correctly seated, the right edge of the air baffle rests on the left edge of the heat sink.

Release tab

Handle
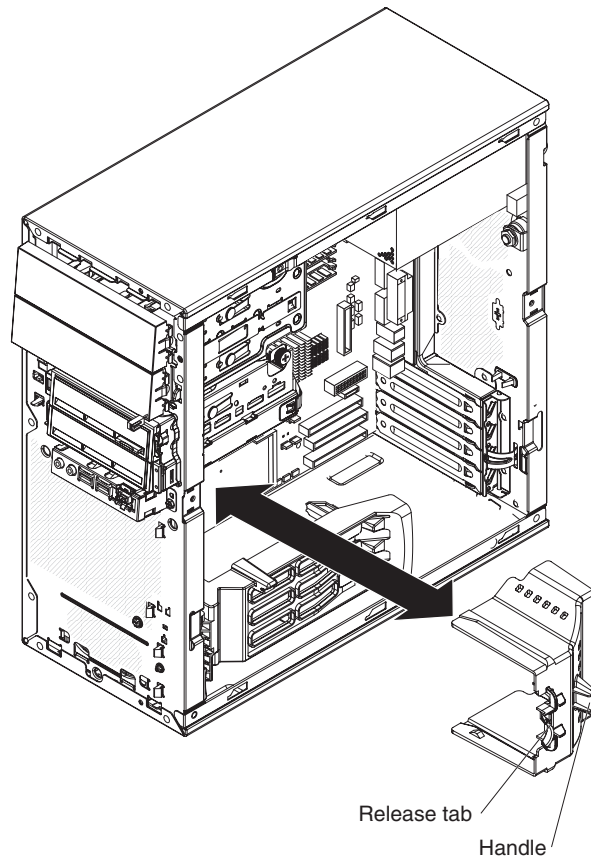
Replacing the internal drive-bay bracket

To install the internal drive-bay bracket, complete the following steps:

1. Place the top edge of the internal drive-bay bracket into place on the chassis. Rotate the drive-bay bracket downward until it engages in the chassis.

2. Install the two screws that fasten the top edge of the drive-bay bracket to the chassis.

3. If you removed the hard disk drive while you removed the drive-bay bracket, install the hard disk drive now (see "Installing a drive in bay 4, 5, or 6" on page 47).

4. Reconnect the signal and power cables to the hard disk drive in the drive-bay bracket.

Screws

Alignment tabs
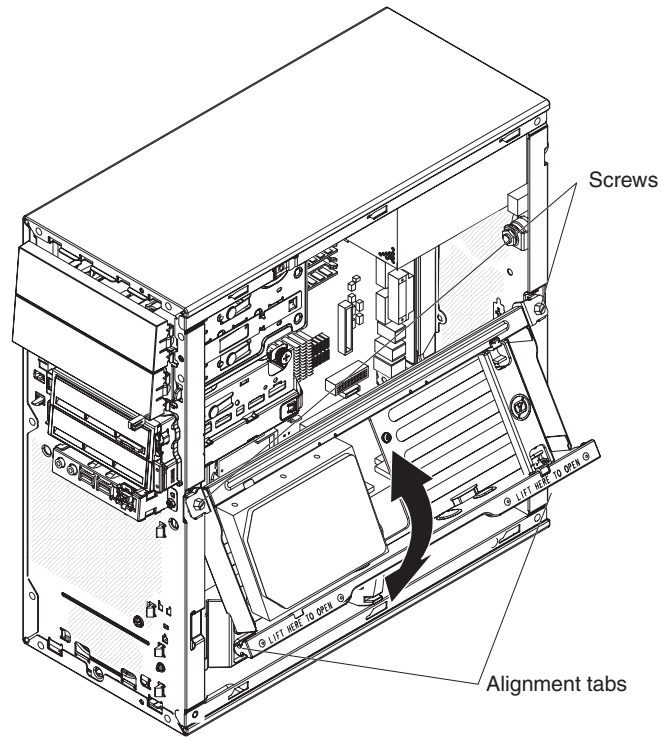
Replacing the bezel

To replace the bezel, complete the following steps:

1. Insert the four tabs on the top back of the bezel into the matching holes on the computer chassis above bay 1.

2. Push the bottom of the bezel toward the computer until the two tabs at the bottom of the bezel snap into place.

Bezel release button
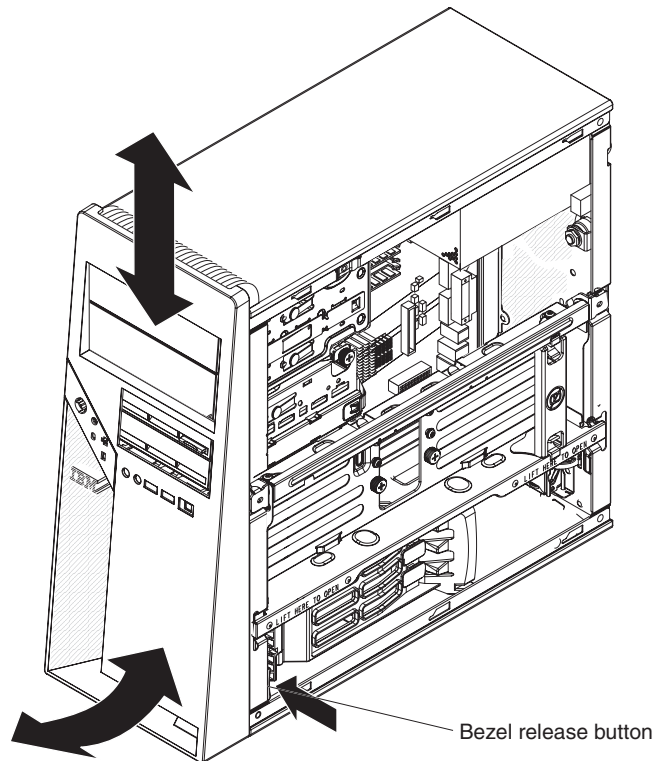
Replacing the side cover

To replace the side cover, complete the following steps:

1. Make sure that all cables, adapters, and other components are installed and seated correctly and that you have removed all work tools or parts from inside the computer.

2. Install the side cover by placing it into position on the computer. Make sure that the lip on the bottom of the cover rests on the ledge on the bottom of the chassis. Slide the side cover forward to secure the side cover in place.
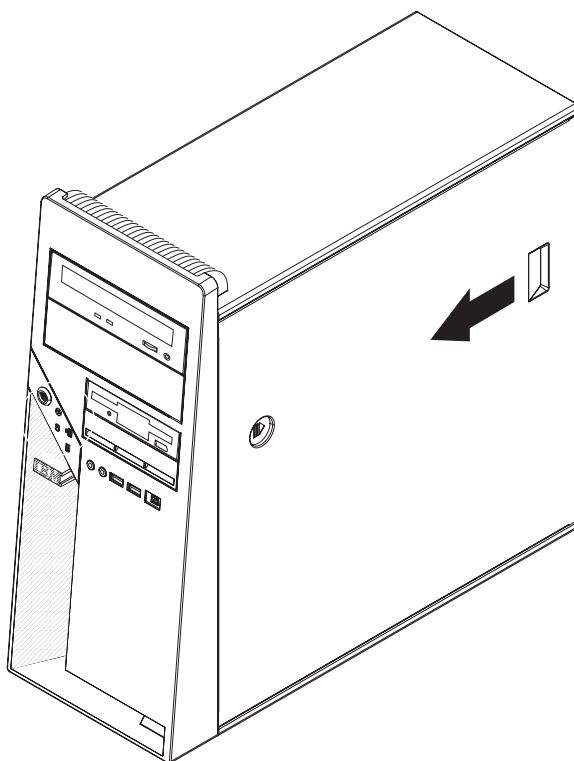
3. Lock the side cover, if you unlocked it during removal.
4. Reconnect the external cables and power cords to the computer; then, connect the power cords to electrical outlets.
5. Turn on the attached devices; then, turn on the computer.

Connecting external devices

You can connect a number of optional external devices to the connectors on the rear and front of the computer.

To connect an external device, complete the following steps:
1. Read the safety information that begins on page v, "Installation guidelines" on page 29, and the documentation that comes with the device.
2. Turn off the computer and all attached devices (see "Turning off the computer" on page 19).
3. Follow the instructions that come with the device to prepare it for installation and to connect it to the computer.

Input/output connectors

Connect optional external devices to the connectors on the front and rear of the computer.

The computer has the following input/output (I/O) connectors on the front and rear of the computer:
• One audio line in
• Two audio line out (front and rear of the computer)
• One audio microphone
• One Ethernet

- Two IEEE 1394 (FireWire) (front and rear of the computer)
- One keyboard
- One mouse
- One parallel
- Two serial
- Eight Universal Serial Bus (USB) 2.0 (front and rear of the computer)
- One video

The following illustration shows the locations of the connectors on the rear of the computer.

Power cord

Line in
Line out
Serial

Parallel
Keyboard
Mouse
USBs
NMI
Ethernet
IEEE 1394
(FireWire)
Video
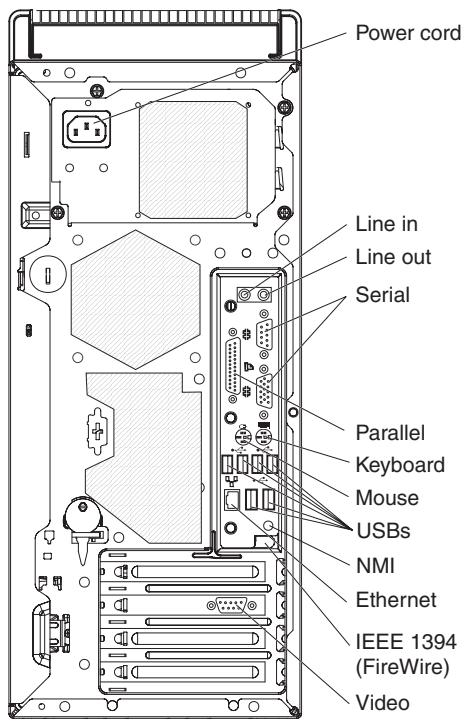
The following sections describe these connectors.

Audio connectors

Use the audio connectors to connect external audio equipment to the computer. The following illustration shows the front and rear audio connectors.

Line in
(blue)
Line out
(green)
Mic
(pink)
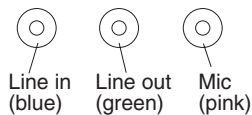
Line in

There is one line-in connector on the rear of the computer. The computer receives audio signals through this connector from an external audio device.

Line out

There are two line-out connectors, one on the front and one on the rear of the computer. The computer sends audio signals through this connector to powered speakers with built-in amplifiers, headphones, a multimedia keyboard, or the audio line-in connector on a stereo system. The internal speaker in the computer is disabled when a device is attached to this connector.

Mic

There is one microphone connector on the front of the computer. Connect a microphone to this connector to record sounds onto the hard disk or to use speech-recognition software.

Auxiliary-device (pointing-device) connector

There is one auxiliary-device connector on the rear of the computer. Use this connector to connect a mouse or other pointing device. The following illustration shows an auxiliary-device connector.

```
    6  ○  ▯  ○  5
    4  ○      ○  3
      ○      ○
        2      1
```
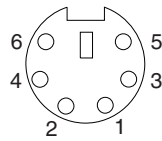
Ethernet (RJ-45) connector

There is one Ethernet connector on the rear of the computer. Use this connector to connect the computer to a 10 Mbps, 100 Mbps, or 1000 Mbps network. The following illustration shows an Ethernet connector.

```
Activity LED                      Link LED
(green)                           (green)

              8          1
```
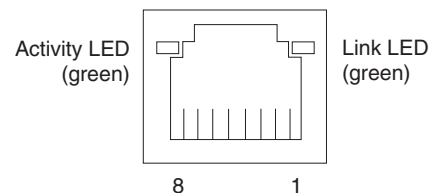
Connect a Category 3, 4, or 5 unshielded twisted-pair (UTP) cable to this connector. The 100BASE-TX and 1000BASE-T Fast Ethernet standards require Category 5 or higher cabling.

The Ethernet connector has one LED that indicates Ethernet-link status. When this LED is lit, it indicates that there is an active connection on the Ethernet port. Activity between the computer and the network is indicated by the Ethernet transmit/receive activity LEDs on the front and rear of the computer (see "Controls, LEDs, and connectors" on page 9).

IEEE 1394 (FireWire) connector (some models)

There is one 4-pin Institute of Electrical and Electronics Engineers (IEEE) 1394 (FireWire) connector on the front of the computer and one 6-pin IEEE 1394 (FireWire) connector on the rear of the computer. Use these connectors to connect IEEE 1394 (FireWire) devices. The following illustrations show the IEEE 1394 (FireWire) connectors.

4-pin IEEE 1394 (FireWire) connector (front)

```
    4   3   2   1
```
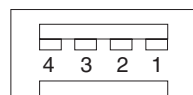
6-pin IEEE 1394 (FireWire) connector (rear)

```
 2   4   6
┌─────────────┐
│ ▭   ▭   ▭   │
│ ▭   ▭   ▭   │
└─────────────┘
 1   3   5
```
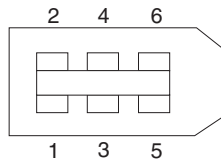
Keyboard connector

There is one keyboard connector on the rear of the computer. Use this connector to connect a PS/2 (non-USB) keyboard. The following illustration shows a keyboard connector.

```
   ┌─┐
 6 ○ ▯ ○ 5
 4 ○   ○ 3
   ○   ○
   2   1
```
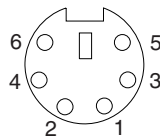
If you attach a keyboard to this connector, Universal Serial Bus (USB) ports and devices are disabled during the power-on self-test (POST).

Parallel connector

There is one parallel connector on the rear of the computer. Use this connector to connect a parallel device. The following illustration shows a parallel connector.

```
 13                        1
┌──────────────────────────┐
│ ○○○○○○○○○○○○○ │
│  ○○○○○○○○○○○○  │
└──────────────────────────┘
 25                       14
```
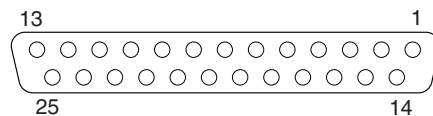
The parallel connector supports two standard IEEE 1284 modes of operation: enhanced parallel port (EPP) and extended capability port (ECP). If you configure the parallel port to operate in bidirectional mode, it supports the ECP and EPP modes. When the parallel connector is configured as bidirectional, use an IEEE 1284-compliant cable that does not exceed 3 meters (9.8 ft). Use the **Devices and I/O Ports** options in the IBM Configuration/Setup Utility program to configure the parallel connector as bidirectional.

Serial connectors

There are two serial connectors on the rear of the computer. Use these connectors to connect serial devices. The following illustration shows a serial connector.

```
 1       5
┌─────────┐
│ ○○○○○ │
│  ○○○○  │
└─────────┘
 6     9
```
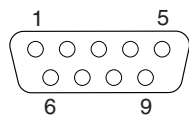
Universal Serial Bus connectors

There are eight USB 2.0 connectors, two on the front and six on the rear of the computer. Use the USB connectors to connect optional telephony and multimedia devices. USB 2.0 technology transfers data at up to 480 Mbps (megabits per second) with a maximum of 127 external devices and a maximum signal distance of 5 meters (16 ft) per segment (if the device that is attached to the computer is a USB 2.0 device). If multiple USB devices are attached to the computer, the USB hub must be USB 2.0; otherwise, all USB 2.0 devices will transfer data at 12 Mbps.

Using Plug and Play technology, USB devices are configured automatically. The following illustration shows a USB connector.
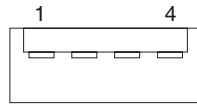
Use a 4-pin USB cable to connect an external device to a USB connector.

Video connector

The PCI Express x16 adapter (slot 2) provides the video connector. This connector is on the rear of the computer. Use the video connector to connect a monitor or other display device. The following illustrations show examples of different video connectors.

Important: When you install the NVIDIA Quadro FX 3500 video adapter in the computer, do not set the analog resolution above 1600 x 1200 @ 60 Hz. This is the highest resolution supported for the NVIDIA Quadro FX 3500 video adapter. In addition, when you use a CRT type monitor, the monitor cable must come with a ferrite suppression on both ends of the monitor cable.

Analog video connector
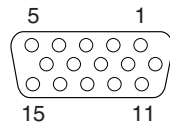
Digital (DVI-I) video connector
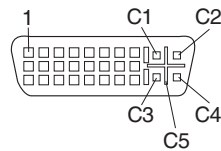
Dual monitor system-59 (DMS-59) video connector
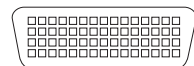
Some models come with a digital video interface (DVI) connector for connecting a digital monitor. If you have problems viewing information with a second monitor, see "Changing monitor settings" on page 15.

Models with the NVIDIA Quadro FX 550, NVIDIA Quadro FX 1500, NVIDIA Quadro FX 3500 video adapter come with a DVI-I to VGA style analog converter for each DVI-I connector.

Important: To get the best performance from the NVIDIA Quadro FX 3500 video adapter, you must connect the video adapter to the computer power supply. Otherwise, the video adapter will be operating with very limited

power, resulting in a decrease in performance for some applications. Use the PCI Express x16 external power drop to connect the video adapter to the computer power supply.

The following illustration is an example of the NVIDIA Quadro FX 3500 video adapter.

Power connector

Fan power connector
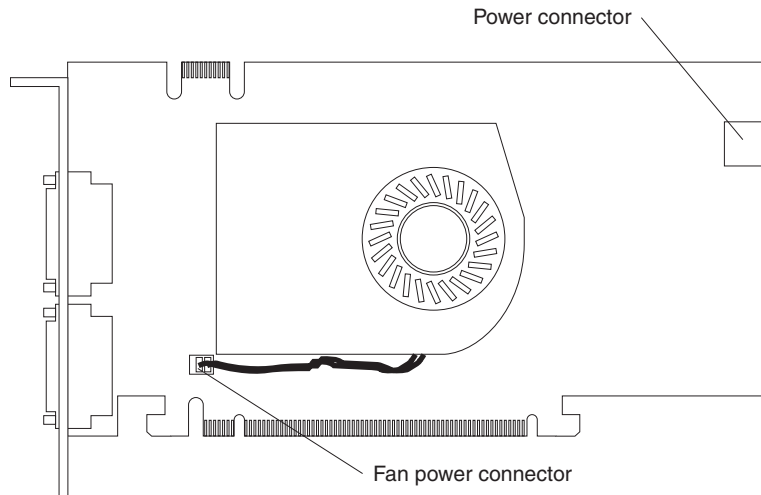
Models with the NVIDIA Quadro NVS 285 video adapter come with a dual monitor system-59 (DMS-59) to dual-analog monitor pigtail cable. If you want to set up two digital monitors, you must purchase a separate dual-digital monitor cable.

Appendix. Notices

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

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

IBM may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to:

> IBM Director of Licensing
> IBM Corporation
> North Castle Drive
> Armonk, NY 10504-1785
> U.S.A.

INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some jurisdictions do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

Any references in this publication to non-IBM Web sites are provided for convenience only and do not in any manner serve as an endorsement of those Web sites. The materials at those Web sites are not part of the materials for this IBM product, and use of those Web sites is at your own risk.

IBM may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you.

Trademarks

The following terms are trademarks of International Business Machines Corporation in the United States, other countries, or both:

Active Memory	IBM	TechConnect
Active PCI	IBM (logo)	Tivoli
Active PCI-X	IntelliStation	Tivoli Enterprise
AIX	NetBAY	Update Connector
Alert on LAN	Netfinity	Wake on LAN
BladeCenter	Predictive Failure Analysis	XA-32
Chipkill	ServeRAID	XA-64
e-business logo	ServerGuide	X-Architecture
@server	ServerProven	XpandOnDemand
FlashCopy	System x	xSeries
i5/OS		

Intel, Intel Xeon, Itanium, and Pentium are trademarks or registered trademarks of Intel Corporation or its subsidiaries in the United States and other countries.

Microsoft, Windows, Windows NT, and Windows Vista are trademarks of Microsoft Corporation in the United States, other countries, or both.

UNIX is a registered trademark of The Open Group in the United States and other countries.

Java and all Java-based trademarks and logos are trademarks of Sun Microsystems, Inc. in the United States, other countries, or both.

Adaptec and HostRAID are trademarks of Adaptec, Inc., in the United States, other countries, or both.

Linux is a trademark of Linus Torvalds in the United States, other countries, or both.

Red Hat, the Red Hat "Shadow Man" logo, and all Red Hat-based trademarks and logos are trademarks or registered trademarks of Red Hat, Inc., in the United States and other countries.

Other company, product, or service names may be trademarks or service marks of others.

Important notes

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

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

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

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

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

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

IBM makes no representation or warranties regarding non-IBM products and services that are ServerProven®, including but not limited to the implied warranties of merchantability and fitness for a particular purpose. These products are offered and warranted solely by third parties.

IBM makes no representations or warranties with respect to non-IBM products. Support (if any) for the non-IBM products is provided by the third party, not IBM.

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

Product recycling and disposal

This unit must be recycled or discarded according to applicable local and national regulations. IBM encourages owners of information technology (IT) equipment to responsibly recycle their equipment when it is no longer needed. IBM offers a variety of product return programs and services in several countries to assist equipment owners in recycling their IT products. Information on IBM product recycling offerings can be found on IBM's Internet site at http://www.ibm.com/ibm/environment/products/prp.shtml.

Esta unidad debe reciclarse o desecharse de acuerdo con lo establecido en la normativa nacional o local aplicable. IBM recomienda a los propietarios de equipos de tecnología de la información (TI) que reciclen responsablemente sus equipos cuando éstos ya no les sean útiles. IBM dispone de una serie de programas y servicios de devolución de productos en varios países, a fin de ayudar a los propietarios de equipos a reciclar sus productos de TI. Se puede encontrar información sobre las ofertas de reciclado de productos de IBM en el sitio web de IBM http://www.ibm.com/ibm/environment/products/prp.shtml.
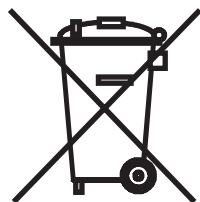
Notice: This mark applies only to countries within the European Union (EU) and Norway.

This appliance is labeled in accordance with European Directive 2002/96/EC concerning waste electrical and electronic equipment (WEEE). The Directive determines the framework for the return and recycling of used appliances as

applicable throughout the European Union. This label is applied to various products to indicate that the product is not to be thrown away, but rather reclaimed upon end of life per this Directive.

注意: このマークは EU 諸国およびノルウェーにおいてのみ適用されます。

この機器には、EU 諸国に対する廃電気電子機器指令 2002/96/EC(WEEE) のラベルが貼られています。この指令は、EU 諸国に適用する使用済み機器の回収とリサイクルの骨子を定めています。このラベルは、使用済みになった時に指令に従って適正な処理をする必要があることを知らせるために種々の製品に貼られています。

Remarque: Cette marque s'applique uniquement aux pays de l'Union Européenne et à la Norvège.

L'etiquette du système respecte la Directive européenne 2002/96/EC en matière de Déchets des Equipements Electriques et Electroniques (DEEE), qui détermine les dispositions de retour et de recyclage applicables aux systèmes utilisés à travers l'Union européenne. Conformément à la directive, ladite étiquette précise que le produit sur lequel elle est apposée ne doit pas être jeté mais être récupéré en fin de vie.

In accordance with the European WEEE Directive, electrical and electronic equipment (EEE) is to be collected separately and to be reused, recycled, or recovered at end of life. Users of EEE with the WEEE marking per Annex IV of the WEEE Directive, as shown above, must not dispose of end of life EEE as unsorted municipal waste, but use the collection framework available to customers for the return, recycling, and recovery of WEEE. Customer participation is important to minimize any potential effects of EEE on the environment and human health due to the potential presence of hazardous substances in EEE. For proper collection and treatment, contact your local IBM representative.

Battery return program

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

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

For Taiwan: Please recycle batteries.

For the European Union:

For California: Perchlorate material – special handling may apply. See
http://www.dtsc.ca.gov/hazardouswaste/perchlorate/.

The foregoing notice is provided in accordance with California
Code of Regulations Title 22, Division 4.5 Chapter 33. Best
Management Practices for Perchlorate Materials. This product/part
may include a lithium manganese dioxide battery which contains a
perchlorate substance.

Index

U

universal serial bus (USB)
    cables   61
    connectors   60
    ports   60
updating
    system programs   17
using
    Boot Menu program   24
    Configuration/Setup Utility program   21
    IBM Configuration/Setup Utility program   21
    LSI Logic Configuration Utility program   25
    passwords   23, 24

V

video
    connector   61
    device drivers   15
    DVI connector   61
    DVI connector pin-assignments   61
    features   15
    monitor settings   15
video controller   3
    specifications   3

W

Wake on LAN   18
weight   3
Windows Vista
    accessing the diagnostics programs   15
    shutting down the computer   18
Windows XP
    creating an emergency recovery diskette   13
    shutting down the computer   18

IBM ®

Part Number: 43W7002

Printed in USA