NetVista ™

IBM

User Guide
A40 Type 6830, 6831, 6840
A40p Type 6837, 6841, 6847
A40i Type 2251, 2271

NetVista™

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User Guide
A40 Type 6830, 6831, 6840
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A40i Type 2251, 2271

> **Note**
>
> Before using this information and the product it supports, be sure to read the "Safety Information" on page v and "Appendix F. Notices and trademarks" on page 83.

Contents

Safety Information

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.	

DANGER

Le courant électrique provenant de l'alimentation, du téléphone et des câbles de transmission peut présenter un danger.

Pour éviter tout risque de choc électrique :
- **Ne manipulez aucun câble et n'effectuez aucune opération d'installation, d'entretien ou de reconfiguration de ce produit au cours d'un orage.**
- **Branchez tous les cordons d'alimentation sur un socle de prise de courant correctement câblé et mis à la terre.**
- **Branchez sur des socles de prise de courant correctement câblés tout équipement connecté à ce produit.**
- **Lorsque cela est possible, n'utilisez qu'une seule main pour connecter ou déconnecter les câbles d'interface.;**
- **Ne mettez jamais un équipement sous tension en cas d'incendie ou d'inondation, ou en présence de dommages matériels.**
- **Avant de retirer les carters de l'unité, mettez celle-ci hors tension et déconnectez ses cordons d'alimentation, ainsi que les câbles qui la relient aux**

v

réseaux, aux systèmes de té lécommunication et aux modems (sauf instruction contraire mentionnée dans les procédures d'installation et de configuration).

- Lorsque vous installez, que vous déplacez, ou que vous manipulez le présent produit ou des périphériques qui lui sont raccordés, reportez-vous aux instructions ci-dessous pour connecter et déconnecter les différents cordons.

Connexion:	Déconnexion:
1. Mettez les unités hors tension.	1. Mettez les unités hors tension.
2. Commencez par brancher tous les cordons sur les unités.	2. Débranchez les cordons d'alimentation des prises.
3. Branchez les câbles d'interface sur des connecteurs.	3. Débranchez les câbles d'interface des connecteurs.
4. Branchez les cordons d'alimentation sur des prises.	4. Débranchez tous les câbles des unités.
5. Mettez les unités sous tension.	

Lithium battery notice

CAUTION:
Danger of explosion if battery is incorrectly replaced.

When replacing the battery, use only IBM Part Number 33F8354 or an equivalent type battery recommended by the 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.

ATTENTION

Danger d'explosion en cas de remplacement incorrect de la batterie.

Remplacer uniquement par une batterie IBM de type ou d'un type équivalent recommandé par le fabricant. La batterie contient du lithium et peut exploser en cas de mauvaise utilisation, de mauvaise manipulation ou de mise au rebut inappropriée.

Ne pas :
- **Lancer ou plonger dans l'eau**
- **Chauffer à plus de 100°C (212°F)**
- **Réparer ou désassembler**

Mettre au rebut les batteries usagées conformément aux règlements locaux.

Modem safety information

To reduce the risk of fire, electrical shock, or injury when using telephone equipment, always follow basic safety precautions, such as:

- Never install telephone wiring during a lightning storm.

- Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
- Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
- Use caution when installing or modifying telephone lines.
- Avoid using a telephone (other than a cordless type) during an electrical storm. There may be a remote risk of electric shock from lightning.
- Do not use the telephone to report a gas leak in the vicinity of the leak.

Consignes de sécurité relatives au modem

Lors de l'utilisation de votre matériel téléphonique, il est important de respecter les consignes ci-après afin de réduire les risques d'incendie, d'électrocution et d'autres blessures :
- N'installez jamais de cordons téléphoniques durant un orage.
- Les prises téléphoniques ne doivent pas être installées dans des endroits humides, excepté si le modèle a été conçu à cet effet.
- Ne touchez jamais un cordon téléphonique ou un terminal non isolé avant que la ligne ait été déconnectée du réseau téléphonique.
- Soyez toujours prudent lorsque vous procédez à l'installation ou à la modification de lignes téléphoniques.
- Si vous devez téléphoner pendant un orage, pour éviter tout risque de choc électrique, utilisez toujours un téléphone sans fil.
- En cas de fuite de gaz, n'utilisez jamais un téléphone situé à proximité de la fuite.

Laser compliance statement

Some IBM Personal Computer models are equipped from the factory with a CD-ROM drive or a DVD-ROM drive. CD-ROM drives and DVD-ROM drives are also sold separately as options. CD-ROM drives and DVD-ROM drives are laser products. These drives are certified in the U.S. to conform to the requirements of the Department of Health and Human Services 21 Code of Federal Regulations (DHHS 21 CFR) Subchapter J for Class 1 laser products. Elsewhere, these drives are certified to conform to the requirements of the International Electrotechnical Commission (IEC) 825 and CENELEC EN 60 825 for Class 1 laser products.

When a CD-ROM drive or a DVD-ROM drive is installed, note the following handling instructions.

CAUTION:
Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.

Removing the covers of the CD-ROM drive or DVD-ROM drive could result in exposure to hazardous laser radiation. There are no serviceable parts inside the CD-ROM drive or DVD-ROM drive. **Do not remove the drive covers.**

Some CD-ROM drives and DVD-ROM drives contain an embedded Class 3A or Class 3B laser diode. Note the following statement.

DANGER:

Certains modèles d'ordinateurs personnels sont équipés d'origine d'une unité de CD-ROM ou de DVD-ROM. Mais ces unités sont également vendues séparément en tant qu'options. L'unité de CD-ROM/DVD-ROM est un appareil à laser. Aux État-Unis, l'unité de CD-ROM/DVD-ROM est certifiée conforme aux normes indiquées dans le sous-chapitre J du DHHS 21 CFR relatif aux produits à laser de classe 1. Dans les autres pays, elle est certifiée être un produit à laser de classe 1 conforme aux normes CEI 825 et CENELEC EN 60 825.

Lorsqu'une unité de CD-ROM/DVD-ROM est installée, tenez compte des remarques suivantes:

ATTENTION: Pour éviter tout risque d'exposition au rayon laser, respectez les consignes de réglage et d'utilisation des commandes, ainsi que les procédures décrites.

L'ouverture de l'unité de CD-ROM/DVD-ROM peut entraîner un risque d'exposition au rayon laser. Pour toute intervention, faites appel à du personnel qualifié.

Certaines unités de CD-ROM/DVD-ROM peuvent contenir une diode à laser de classe 3A ou 3B. Tenez compte de la consigne qui suit:

About this book

This publication provides instructions for installing most options into your NetVista™ computer. It also contains information to help you decide which options to add to your computer.

How this book is organized

This book contains the following chapters and appendices:

- "Chapter 1. Overview" provides an introduction to the options available for your computer.
- "Chapter 2. Installing external options" provides information to orient you to the connectors on your computer and instructions for installing external options and peripheral devices.
- "Chapter 3. Installing internal options — desktop model" provides instructions for removing the cover and installing hard disk drives, memory, and adapters in the desktop model computer.
- "Chapter 4. Installing internal options — minitower model" provides instructions for removing the cover and installing hard disk drives, memory, and adapters in the minitower model computer.
- "Chapter 5. Installing internal options — microtower model" provides instructions for removing the cover and installing hard disk drives, memory, and adapters in the microtower model computer.
- "Chapter 6. Updating the computer configuration" provides instructions for updating the computer configuration.
- "Appendix A. Using Enhanced Security" provides information for A40p model computers that you should know before you remove the cover or components.
- "Appendix B. Changing the battery" provides instructions to help you change the battery if you need to.
- "Appendix C. Updating System Programs" provides instructions to help you if you ever experience a POST/BIOS update failure.
- "Appendix D. System address maps" provides information for programmers describing the address maps of the computer.
- "Appendix E. Interrupt request and direct memory access channel assignments" provides information about the interrupt and direct memory access channel assignments.
- "Appendix F. Notices and trademarks" contains notice and trademark information.

Information resources

This publication is intended to provide the necessary instructions for installing most options into your NetVista computer. This publication also includes an overview of computer features, locating connectors, and updating configuration settings.

Access IBM on your desktop provides a link to more information about your computer.

For those with Internet access, the most up-to-date manuals for your computer are available from the World Wide Web. To access this information, point your browser to:

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

Type your machine type and model number in the **Quick Path** field and click **Go**.

Chapter 1. Overview

Adding hardware options to your NetVista computer is an easy way to increase its capabilities. Instructions for installing external and internal options are included in this publication. When adding an option, use these instructions along with the instructions that come with the option.

This chapter provides a brief introduction to the options and features that are available for your computer. Also, important information about required tools, electrical safety, and static-sensitive devices is included.

> **Important**
>
> Before you install any option, read "Safety Information" on page v. These precautions and guidelines will help you work safely.

See Access IBM for general information about the use, operation, and maintenance of your computer. Access IBM also contains information to help you solve problems and get repair service or other technical assistance.

Identifying your computer

To properly install options, you will need to know the model of your computer. The best way to identify your computer is by the machine type/model number. The machine type/model number indicates the various features of the computer, such as the type of microprocessor or the number of drive bays. You can find this number on the small label on the front of your computer. An example of the machine type/model number is 6840-110.

The information in this publication is for the desktop, minitower, and microtower model computers.

- The desktop type is 6837.
- The minitower types are 2271, 6840, 6841, and 6847.
- The microtower types are 2251, 6830 and 6831.

When it is necessary to distinguish between the models you will see references to the model type. When the model is not specified, the information applies to all. See the following pages for descriptions of the three basic types.

1

Desktop model computer

Desktop models come with a diskette drive and a hard disk drive. Some models come with a CD-ROM drive. The power button is located on the left side of the computer as you are facing it.
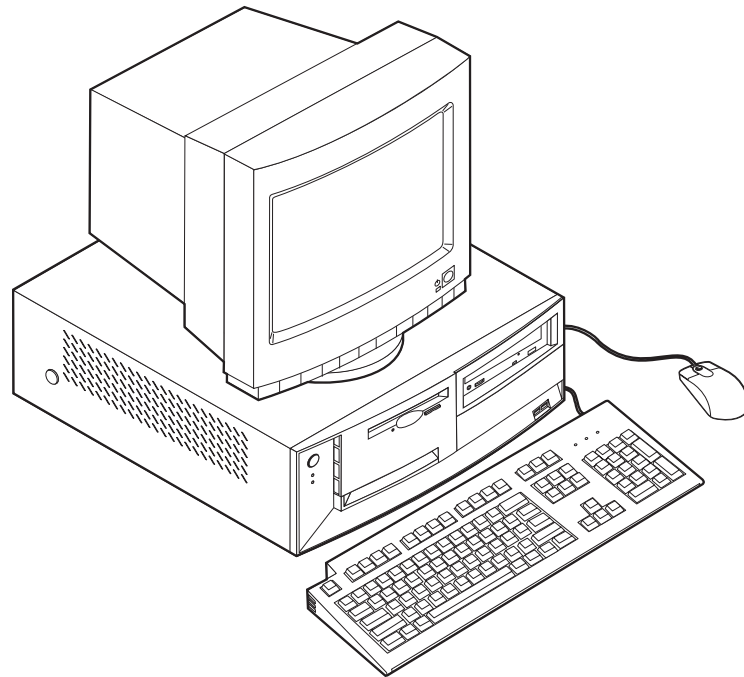
Minitower model computer

Minitower models come with a diskette drive and a hard disk drive. Some models come with a CD drive or DVD drive. The power button is located on the right side of the computer as you are facing it.
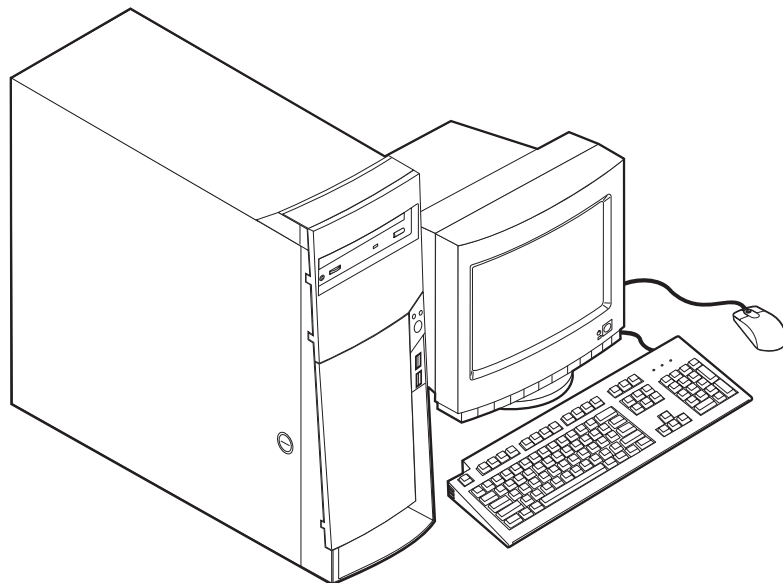
Microtower model computer

Microtower models come with a diskette drive and a hard disk drive. Some models come with a CD drive or DVD drive. The power button is located on the right side of the computer as you are facing it.
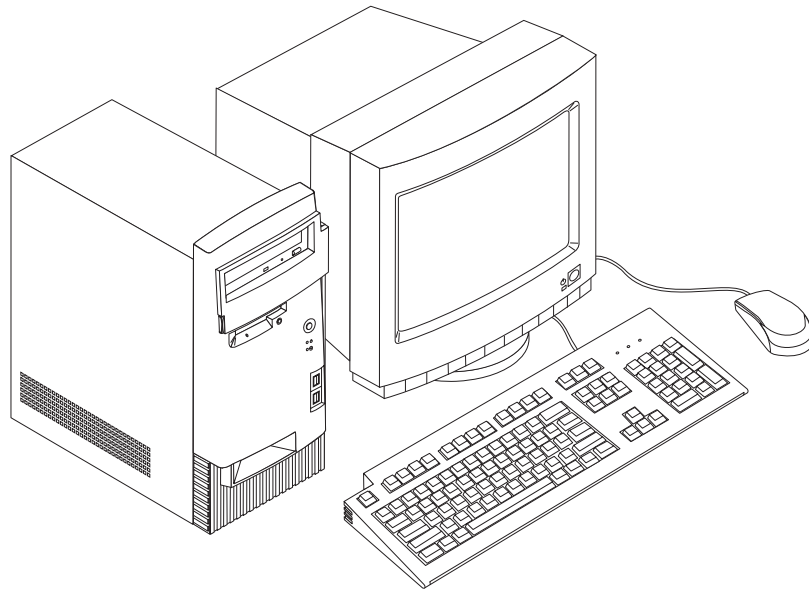
Features

This section provides an overview of the computer features, preinstalled software, and specifications.

Not all models come with all features summarized here.

Microprocessor
Intel® Pentium™ III microprocessor with 256 KB of internal L2 cache memory

Memory
- Support for Rambus inline memory modules (RIMMs) or dual inline memory modules (DIMMs), depending on the model
 - 3.3 V, synchronous, 168-pin, unbuffered, 133 MHz nonparity synchronous dynamic random access memory (SDRAM) or nonparity Rambus dynamic random access memory (RDRAM), depending on the model
  - 64 MB, 128 MB, and 256 MB unbuffered nonparity DIMMs or RIMMs for a maximum of 512 MB
  - DIMM or RIMM heights of 38.1 mm (1.5 inches)
- 512 KB flash memory for system programs

Internal drives
- 3.5-inch, 1.44 MB diskette drive
- Internal hard disk drive
- EIDE CD drive or DVD drive (some models)

Video controller
- Dynamic video memory technology

- Accelerated graphics port (AGP) adapter (some models)

Audio subsystem
16-integrated Sound Blaster Pro compatible audio subsystem

Connectivity
- 10/100 Mbps Ethernet adapter that supports Wake on LAN® (some models)
- Modem (some models)

System management features
- Remote Program Load (RPL) and Dynamic Host Configuration Protocol (DHCP)
- Wake on LAN (requires Wake on LAN-supported network adapter)
- Wake on Ring (in the Configuration/Setup Utility program, this feature is called Serial Port Ring Detect for an external modem and Modem Ring Detect for an internal modem)
- Wake on Alarm
- Remote Administration (the ability to update POST and BIOS over the network)
- Automatic power-on startup
- System Management (SM) BIOS and SM software
- Ability to store POST hardware test results

Input/output features
- 25-pin, ECP/EPP parallel port
- One or two 9-pin serial ports
- Four 4-pin, USB ports
- PS/2 mouse port
- PS/2 keyboard port
- 15-pin monitor port
- Three audio connectors (line/headphone out, line in, and microphone)
- Joystick/MIDI connectors (some models)

Expansion
- Drive bays:
  - Desktop model: 4
  - Minitower model: 7
  - Microtower model: 4
- PCI expansion slots
  - Desktop model: 3
  - Minitower model: 5
  - Microtower model: 3
- One AGP expansion slot

Power
- 155 W or 200 W power supply with manual voltage selection switch
- Automatic 50/60 Hz input frequency switching
- Advanced Power Management support
- Advance Configuration and Power Interface (ACPI) support

Security features
- Power-on and administrator passwords
- Cover keylock
- Support for the addition of a U-bolt and lockable cable
- Startup sequence control
- Startup without diskette drive, keyboard, or mouse
- Unattended start mode
- Diskette and hard disk I/O control
- Serial and parallel port I/O control
- Security profile by device

IBM preinstalled software
Your computer might come with preinstalled software. If so, an operating system, device drivers to support built-in features, and other support programs are included.

Operating systems (supported)
- Microsoft® Windows® 2000 Professional
- Microsoft Windows NT® Workstation Version 4.0 with Service Pack 6
- Microsoft Windows 98 SE
- Microsoft Windows Millennium Edition (Me)
- Novell NetWare Versions 3.2, 4.11, 5.0

Operating systems (tested for compatibility)[1]
- Microsoft Windows 95
- DOS 2000
- SCO OpenServer 5.0.2 and later
- IBM OS/2® Warp Connect 3.0
- IBM OS/2 Warp 4.0
- IBM OS/2 LAN Server 3.0 and 4.0
- Linux: Red hat, Caldera, S.U.S.E., and Pacific High Tech
- Sun Solaris 2.5.1 or later

Specifications

This section lists the physical specifications for the NetVista computer. The NetVista desktop and microtower models have three 32-bit PCI expansion slots, one AGP slot, and four drive bays. The NetVista minitower model computer has five 32-bit PCI expansion slots, one AGP slot, and seven drive bays.

Note: The computer is classified as a Class A or Class B digital device. See the *Quick Reference* for further information about this classification.

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1. The operating systems listed here are being tested for compatibility at the time this publication goes to press. Additional operating systems might be identified by IBM as compatible with your computer following the publication of this booklet. Corrections and additions to this list are subject to change. To determine if an operating system has been tested for compatibility, check the Web site of the operating system vendor.

Physical specifications — desktop model

Dimensions

  Height: 140 mm (5.5 in.)

  Width: 425 mm (16.7 in.)

  Depth: 425 mm (16.7 in.)

Weight

  Minimum configuration as shipped: 9.4 kg (20 lb)

  Maximum configuration: 11.3 kg (25.0 lb)

Environment

  Air temperature:

    System on: 10° to 35° C (50° to 95° F)
    System off: 10° to 43° C (50° to 110° F)

    Maximum altitude: 2134 m (7000 ft)

    Note: The maximum altitude, 2134 m (7000 ft), is the maximum altitude at which the specified air temperatures apply. At higher altitudes, the maximum air temperatures are lower than those specified.

  Humidity:

    System on: 8% to 80%

    System off: 8% to 80%

Electrical input

  Input voltage:

    Low range:

      Minimum: 90 V ac

      Maximum: 137 V ac

      Input frequency range: 57–63 Hz

      Voltage switch setting: 115 V ac

    High range:

      Minimum: 180 V ac

      Maximum: 265 V ac

      Input frequency range: 47–53 Hz

      Voltage switch setting: 230 V ac

  Input kilovolt-amperes (kVA) (approximate):

    Minimum configuration as shipped: 0.08 kVA

    Maximum configuration: 0.30 kVA

  Note: Power consumption and heat output vary depending on the number and type of optional features installed and the power-management optional features in use.

Heat output (approximate) in British thermal units (Btu) per hour:

  Minimum configuration: 240 Btu/hr. (75 watts)

  Maximum configuration: 705 Btu/hr. (207 watts)

Airflow

  Approximately 0.5 cubic meters per minute (18 cubic feet per minute) maximum

Acoustical noise-emission values

  Average sound-pressure levels:

    At operator position:

      Idle: 38 dBA

      Operating: 43 dBA

    At bystander position - 1 meter (3.3 ft):

      Idle: 33 dBA

      Operating: 37 dBA

  Declared (upper limit) sound-power levels:

    Idle: 4.8 bels

    Operating: 5.1 bels

  Note: These levels were measured in controlled acoustical environments according to the procedures specified by the American National Standards Institute (ANSI) S12.10 and ISO 7779 and are reported in accordance with ISO 9296. Actual sound-pressure levels in a given location might exceed the average values stated because of room reflections and other nearby noise sources. The declared sound-power levels indicate an upper limit, below which a large number of computers will operate.

Physical specifications — minitower model

Dimensions

    Height: 165 mm (6.5 in.)

    Width: 445 mm (17.5 in.)

    Depth: 499 mm (19.6 in.)

Weight

    Minimum configuration as shipped: 14.0 kg (30 lb)

    Maximum configuration: 17.3 kg (38.0 lb)

Environment

    Air temperature:

        System on: 10° to 35° C (50° to 95° F)
        System off: 10° to 43° C (50° to 110° F)

        Maximum altitude: 2134 m (7000 ft)
        Note: The maximum altitude, 2134 m (7000 ft), is the maximum altitude at which the specified air temperatures apply. At higher altitudes, the maximum air temperatures are lower than those specified.

    Humidity:

        System on: 8% to 80%

        System off: 8% to 80%

Electrical input

    Input voltage:

        Low range:

            Minimum: 90 V ac

            Maximum: 137 V ac

            Input frequency range: 57–63 Hz

            Voltage switch setting: 115 V ac

        High range:

            Minimum: 180 V ac

            Maximum: 265 V ac

            Input frequency range: 47–53 Hz

            Voltage switch setting: 230 V ac

    Input kilovolt-amperes (kVA) (approximate):

        Minimum configuration as shipped: 0.08 kVA

        Maximum configuration: 0.3 kVA

Note: Power consumption and heat output vary depending on the number and type of optional features installed and the power-management optional features in use.

Heat output (approximate) in British thermal units (Btu) per hour:

    Minimum configuration: 240 Btu/hr. (75 watts)

    Maximum configuration: 940 Btu/hr. (275 watts)

Airflow

    Approximately 0.34 cubic meters per minute (12 cubic feet per minute) maximum

Acoustical noise-emission values

    Average sound-pressure levels:

        At operator position:

            Idle: 38 dBA

            Operating: 43 dBA

        At bystander position - 1 meter (3.3 ft):

            Idle: 33 dBA

            Operating: 37 dBA

    Declared (upper limit) sound-power levels:

        Idle: 4.8 bels

        Operating: 5.1 bels

Note: These levels were measured in controlled acoustical environments according to the procedures specified by the American National Standards Institute (ANSI) S12.10 and ISO 7779 and are reported in accordance with ISO 9296. Actual sound-pressure levels in a given location might exceed the average values stated because of room reflections and other nearby noise sources. The declared sound-power levels indicate an upper limit, below which a large number of computers will operate.

Physical specifications — microtower model

Dimensions

    Height: 140 mm (5.5 in.)

    Width: 425 mm (16.7 in.)

    Depth: 425 mm (16.7 in.)

Weight

    Minimum configuration as shipped: 9.4 kg (20 lb)

    Maximum configuration: 11.3 kg (25.0 lb)

Environment

    Air temperature:

        System on: 10° to 35° C (50° to 95° F)
        System off: 10° to 43° C (50° to 110° F)

        Maximum altitude: 2134 m (7000 ft)
        Note: The maximum altitude, 2134 m (7000 ft), is the maximum altitude at which the specified air temperatures apply. At higher altitudes, the maximum air temperatures are lower than those specified.

    Humidity:

        System on: 8% to 80%

        System off: 8% to 80%

Electrical input

    Input voltage:

        Low range:

            Minimum: 90 V ac

            Maximum: 137 V ac

            Input frequency range: 57–63 Hz

            Voltage switch setting: 115 V ac

        High range:

            Minimum: 180 V ac

            Maximum: 265 V ac

            Input frequency range: 47–53 Hz

            Voltage switch setting: 230 V ac

    Input kilovolt-amperes (kVA) (approximate):

        Minimum configuration as shipped: 0.08 kVA

        Maximum configuration: 0.3 kVA

    Note: Power consumption and heat output vary depending on the number and type of optional features installed and the power-management optional features in use.

Heat output (approximate in British thermal units (Btu) per hour:

    Minimum configuration: 240 Btu/hr. (75 watts)

    Maximum configuration: 705 Btu/hr. (207 watts)

Airflow

    Approximately 0.5 cubic meters per minute (18 cubic feet per minute) maximum

Acoustical noise-emission values

    Average sound-pressure levels:

        At operator position:

            Idle: 38 dBA

            Operating: 43 dBA

        At bystander position - 1 meter (3.3 ft):

            Idle: 33 dBA

            Operating: 37 dBA

    Declared (upper limit) sound-power levels:

        Idle: 4.8 bels

        Operating: 5.1 bels

    Note: These levels were measured in controlled acoustical environments according to the procedures specified by the American National Standards Institute (ANSI) S12.10 and ISO 7779 and are reported in accordance with ISO 9296. Actual sound-pressure levels in a given location might exceed the average values stated because of room reflections and other nearby noise sources. The declared sound-power levels indicate an upper limit, below which a large number of computers will operate.

Available options

The following are some available options:

- External options
  - Parallel port devices, such as printers and external drives
  - Serial port devices, such as external modems and digital cameras
  - Audio devices, such as external speakers for the sound system
  - USB devices, such as printers and scanners
  - Security U-bolt
  - Monitor
- Internal options
  - System memory
    - Dual in-line memory modules (DIMMs)
    - Rambus in-line memory modules (RIMMs)
  - Adapters
    - Peripheral component interconnect (PCI) adapters
    - Accelerated graphics port (AGP) adapters
  - Internal drives
    - CD drive or DVD drive
    - Hard disk
    - Diskette drives and other removable media drives

For the latest information about available options, see the following World Wide Web pages:

- http://www.ibm.com/pc/us/options/
- http://www.ibm.com/pc/support/

You can also obtain information by calling the following telephone numbers:

- Within the United States, call 1-800-IBM-2YOU (1-800-426-2968), your IBM reseller, or IBM marketing representative.
- Within Canada, call 1-800-565-3344 or 1-800-465-7999.
- Outside the United States and Canada, contact your IBM reseller or IBM marketing representative.

Tools required

To install some options in your computer, you might need a flat-blade screwdriver. Additional tools might be needed for certain options. See the instructions that come with the option.

Handling static-sensitive devices

Static electricity, although harmless to you, can seriously damage computer components and options.

When you add an option, do *not* open the static-protective package containing the option until you are instructed to do so.

When you handle options and other computer components, take these precautions to avoid static electricity damage:

- Limit your movement. Movement can cause static electricity to build up around you.
- Always handle components carefully. Handle adapters and memory modules by the edges. Never touch any exposed circuitry.
- Prevent others from touching components.
- When you install a new option, touch the static-protective package containing the option to a metal expansion-slot cover or other unpainted metal surface on the computer for at least two seconds. This reduces static electricity in the package and your body.
- When possible, remove the option and install it directly in the computer without setting the option down. When this is not possible, place the static-protective package that the option came in on a smooth, level surface and place the option on it.
- Do not place the option on the computer cover or other metal surface.

Chapter 2. Installing external options

This chapter shows the various external connectors on your computer to which you can attach external options, such as external speakers, a printer, or a scanner. For some external options, you must install additional software in addition to making the physical connection. When adding an external option, use the information in this chapter to identify the required connector, and then use the instructions that come with the option to help you make the connection and install any software or drivers required for the option.

Important

Before you install or remove any option, read "Safety Information" on page v. These precautions and guidelines will help you work safely.
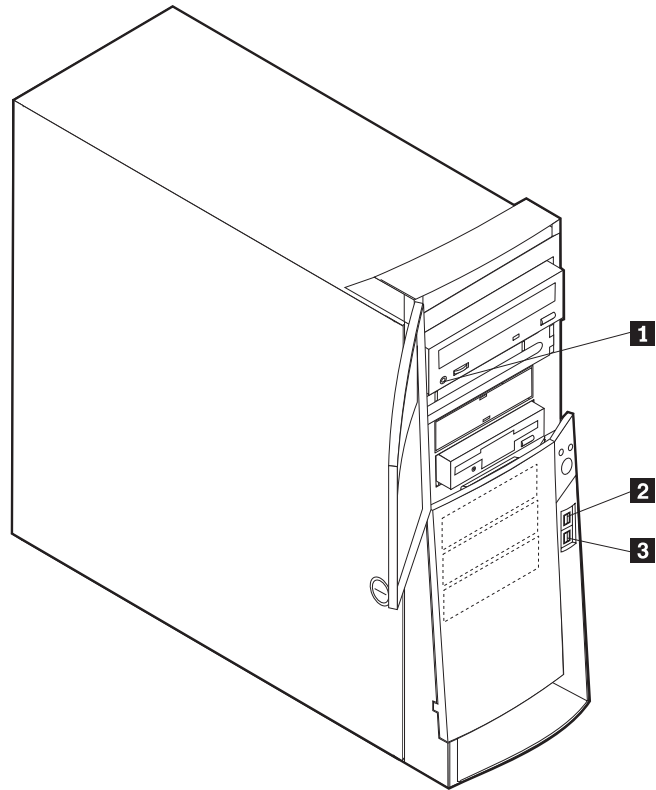

Locating the connectors on the front of your computer

The following illustration shows the location of the connectors on the front of the desktop computer.
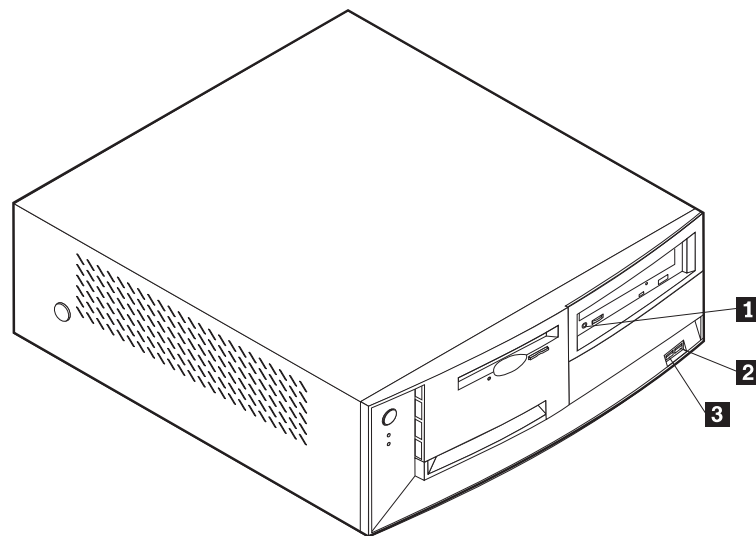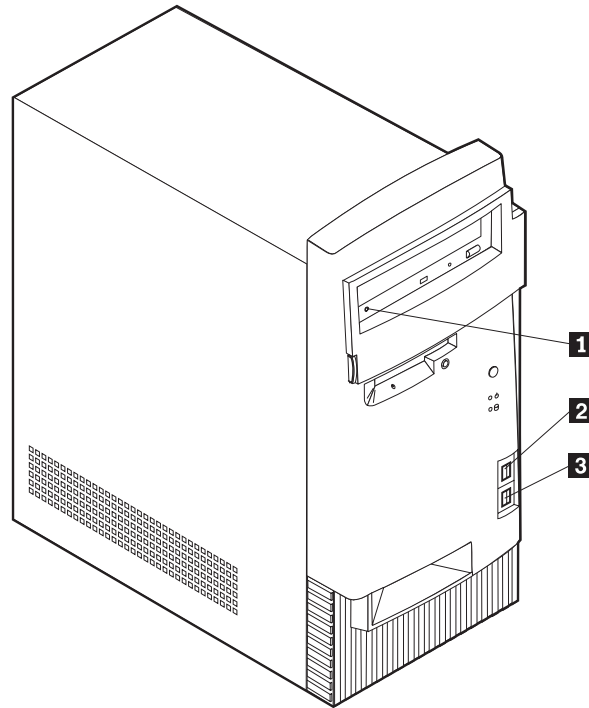


```
1   CD-ROM headphone connector
2   Front USB connector 1
3   Front USB connector 2
```

The following illustration shows the location of the connectors on the front of the minitower computer.

1 CD-ROM headphone connector
2 Front USB connector 1
3 Front USB connector 2

The following illustration shows the location of the connectors on the front of the microtower computer.

1 CD-ROM headphone connector
2 Front USB connector 1
3 Front USB connector 2

# Locating the connectors on the rear of your computer

The following illustration shows the location of the connectors on the back of the desktop model computer. You might not have all of the connectors shown here.
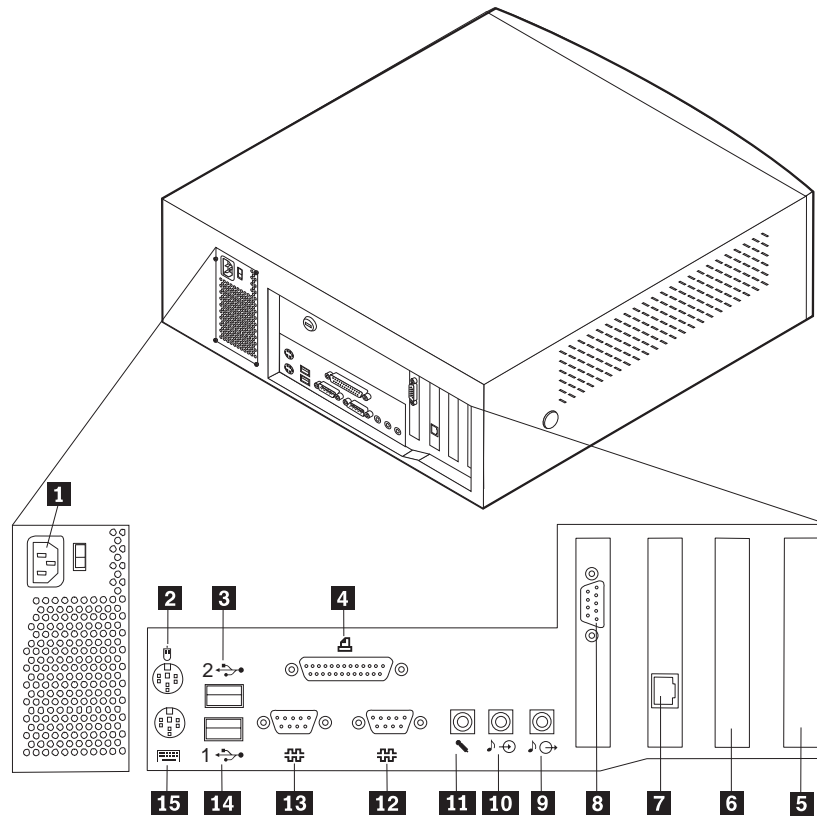
1	Power connector	**9**	Audio out connector
2	Mouse connector	**10**	Audio in connector
3	USB connector 2	**11**	Microphone connector
4	Parallel connector	**12**	Serial connector 2
5	PCI connector 1	**13**	Serial connector 1
6	PCI connector 2	**14**	USB connector 1
7	Ethernet connector	**15**	Keyboard connector
8	Monitor connector (AGP adapter)		

Note: The connectors on the rear of the computer have color-coded icons. Icons will help you to determine where to connect the proper cables on your computer.
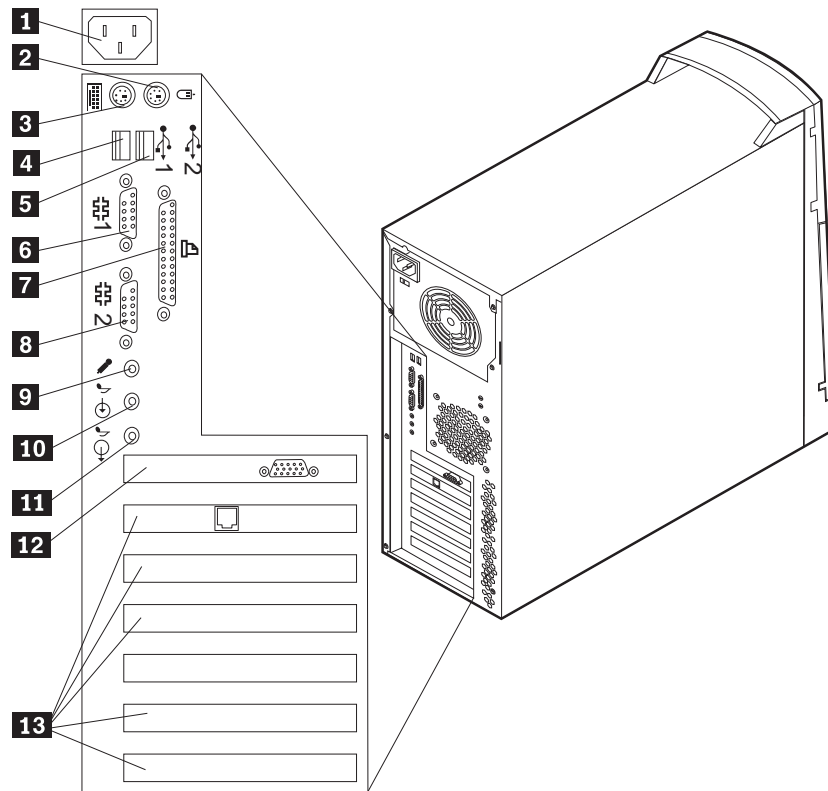
The following illustration shows the location of the connectors on the back of the minitower model types 2271, 6840, and 6841. You might not have all of the connectors shown here.
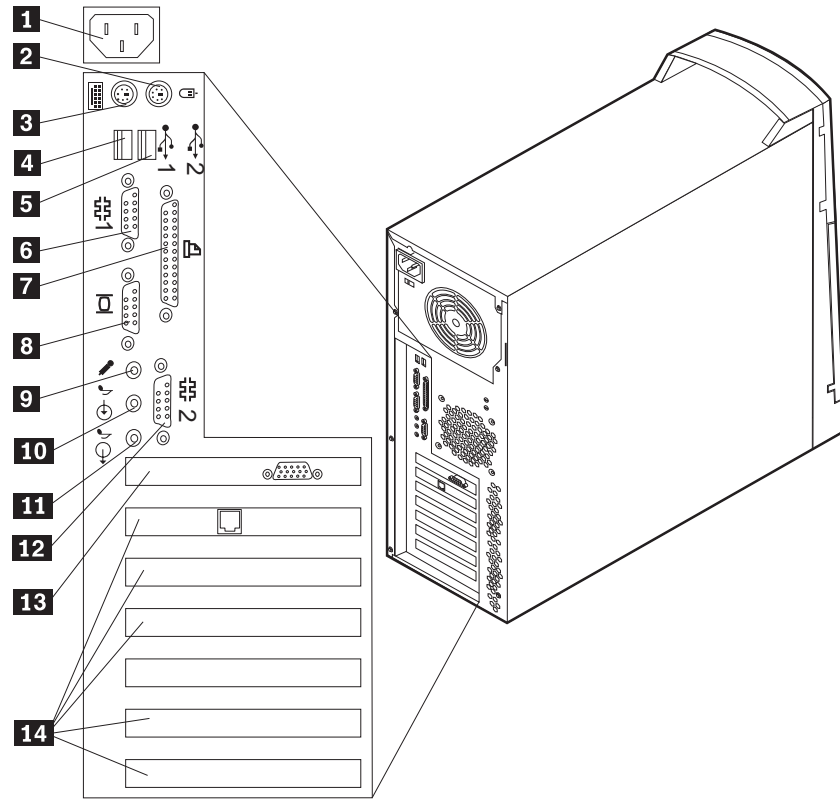
1	Power connector	8	Monitor connector
2	Mouse connector	9	Microphone connector
3	Keyboard connector	10	Audio in connector
4	USB connector 1	11	Audio out connector
5	USB connector 2	12	Serial connector 2
6	Serial connector 1	13	AGP monitor connector
7	Parallel connector	14	PCI slots

Note: The connectors on the rear of the computer have color-coded icons. Icons will help you to determine where to connect the proper cables on your computer.

The following illustration shows the location of the connectors on the back of the minitower model type 6847. You might not have all of the connectors shown here.

1 Power connector
2 Mouse connector
3 Keyboard connector
4 USB connector 1
5 USB connector 2
6 Serial connector 1
7 Parallel connector

8   Serial connector 2
9   Microphone connector
10 Audio in connector
11 Audio out connector
12 AGP monitor connector
13 PCI slots

Note: The connectors on the rear of the computer have color-coded icons. Icons will help you to determine where to connect the proper cables on your computer.

The following illustration shows the location of the connectors on the back of the microtower model computer. You might not have all of the connectors shown here.
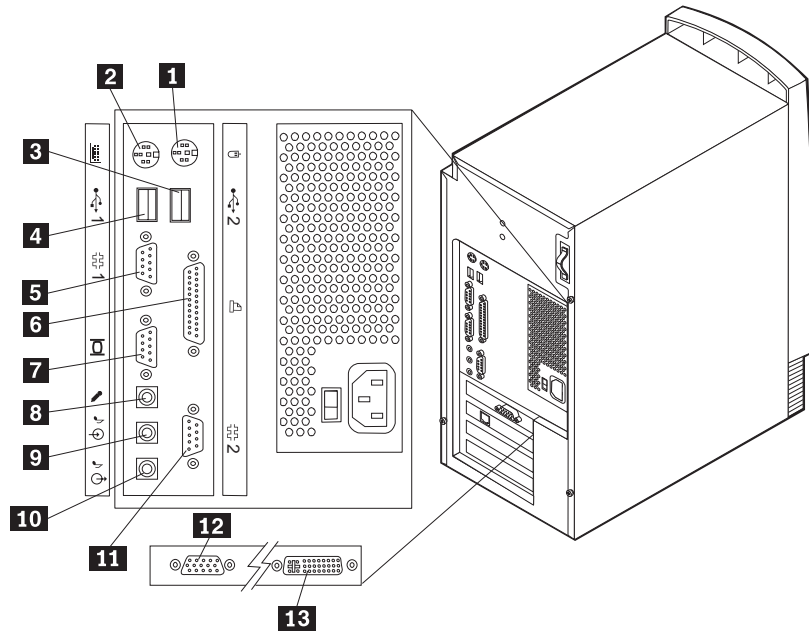
1	Mouse connector	8	Microphone connector
2	Keyboard connector	9	Audio in connector
3	USB connector 2	10	Audio out connector
4	USB connector 1	11	Serial connector 2
5	Serial connector 1	12	SVGA Monitor connector (AGP adapter) (some models only)
6	Parallel connector	13	DVI Monitor connector (AGP adapter) (some models only)
7	Monitor connector		

Note: The connectors on the rear of the computer have color-coded icons. Icons will help you to determine where to connect the proper cables on your computer.

Connector	Description
Mouse connector	Used to attach a mouse, trackball, or other pointing device that uses a mouse connector.
Keyboard connector	Used to attach a keyboard that uses a keyboard connector.
USB connectors	Used to attach a device that requires a Universal Serial Bus (USB) connection, such as a USB scanner or USB printer. If you have more than four USB devices, you can purchase a USB hub, which you can use to connect additional USB devices.
Serial connectors	Used to attach an external modem, serial printer, or other device that uses a 9-pin serial connector.
Parallel connector	Used to attach a parallel printer, parallel scanner, or any other device that requires a 25-pin parallel connection.
Monitor connector	Used to attach a monitor. Some models might have two monitor connectors. There is one on the system board and some models have an AGP adapter that provides a monitor connection. The AGP adapter might support a DVI monitor, a SVGA, or both.
Microphone connector	Used to attach a microphone to your computer when you want to record voice or other sounds on the hard disk if you use speech-recognition software.
Audio line-in connector	Used to receive audio signals from an external audio device, such as a stereo system. When you attach an external audio device, a cable is connected between the audio line-out connector of the device and the audio line-in connector of the computer.
Audio line-out connector	Used to send audio signals from the computer to external devices, such as powered stereo speakers (speakers with built-in amplifiers), headphones, multimedia keyboards, or the audio line-in connector on a stereo system or other external recording device. **Note:** The internal speaker in your computer is disabled when external speakers are connected to the audio line-out connector on your computer.

High-performance video adapter

Some models come with a high-performance AGP video adapter.
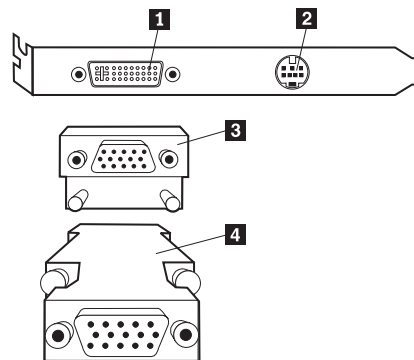
Connector	Description
1 Digital video interface (DVI) connector	Used to attach a digital monitor. This connector provides the signals necessary to support the Display Power Management Signaling (DPMS) standard.
2 S-Video connector	Used to attach a television set that has a S-Video connector. The S-Video cable (required to connect the television set to the adapter) is a separately purchased item.
3 SVGA monitor converter	Used to attach an analog SVGA monitor to the AGP DVI connector. This SVGA converter is used for desktop models.
4 SVGA monitor converter	Used to attach an analog SVGA monitor to the AGP DVI connector. This SVGA converter is used for minitower and microtower models.

High-performance audio adapter

If this adapter is installed, the MIDI/joystick, audio line out, microphone, and audio line in connectors on the system board are disabled. This disablement feature applies to this audio adapter only. The internal speaker of the computer is also disabled during normal operation. You must use external speakers or headphones for audio.

The following illustration shows the connectors on the high-performance audio adapter that comes with some models.
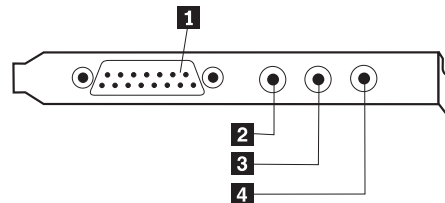
Connector	Description
1 MIDI/joystick connector	Used to attach a joystick, gamepad, or a Musical Instrument Digital Interface (MIDI) device such as a MIDI keyboard.
2 Audio line-out connector	Used to send audio signals from the computer to external devices, such as powered stereo speakers (speakers with built-in amplifiers), headphones, multimedia keyboards, or the audio line-in connector on a stereo system or other external recording device.
2 Microphone connector	Used to attach a microphone to your computer when you want to record voice or other speech-recognition software.
4 Audio line-in connector	Used to receive audio signals from an external audio device, such as a stereo system. When you attach an external audio device, run the cable between the audio line-out connector of the device and the audio line-in connector of the computer.

ADSL modem

Some models have an Asymmetric Digital Subscriber Line (ADSL) modem for high-speed communication. To use an ADSL modem, you must have the correct telephone wiring in your home or office and you must be enrolled with an ADSL service provider.

Depending on how your home or office is wired, the ADSL modem uses either wires 2 and 5 or wires 3 and 4 of the telephone-line wall connector. Refer to the label on the back of the ADSL modem and set the switch on the back of the ADSL modem to match the wiring scheme. If you do not know which wiring scheme to use, contact your ADSL service provider.

Home PNA network adapter

Some models have a Home Phoneline Network Alliance network adapter with an integrated V.90 modem. In addition to its modem function, this adapter enables you to use the telephone wiring in your home for peer-to-peer networking. To use the Home PNA Network adapter, you must install the Intel AnyPoint™ software from the *Software Selections CD*. Each computer on the home PNA network must have a PNA network adapter and the associated software installed. For information about using the PNA network adapter or the AnyPoint software, refer to the AnyPoint documentation (provided with models that come with PNA network adapters only).

Connect each computer on a home PNA network directly to a telephone-line wall connector. If you have more computers than telephone-line wall connectors in a room, use a telephone splitter at the wall connector.

Actual network transfer speeds depend on many factors, such as home wiring configuration, and are often less then the maximum possible.

Some Internet Service Provider (ISP) accounts do not allow or charge extra for Internet sharing. Your ISP access agreement might require you to have more than one account. Check your ISP access agreement for more information.

Obtaining device drivers

You can obtain device drivers for operating systems that are not preinstalled at http://www.ibm.com/pc/support/ on the World Wide Web. Installation instructions are provided in README files with the device driver files.

Chapter 3. Installing internal options — desktop model

You can expand the capabilities of your computer by adding memory, drives, or adapters. When adding an option, use these instructions along with the instructions that come with the option.
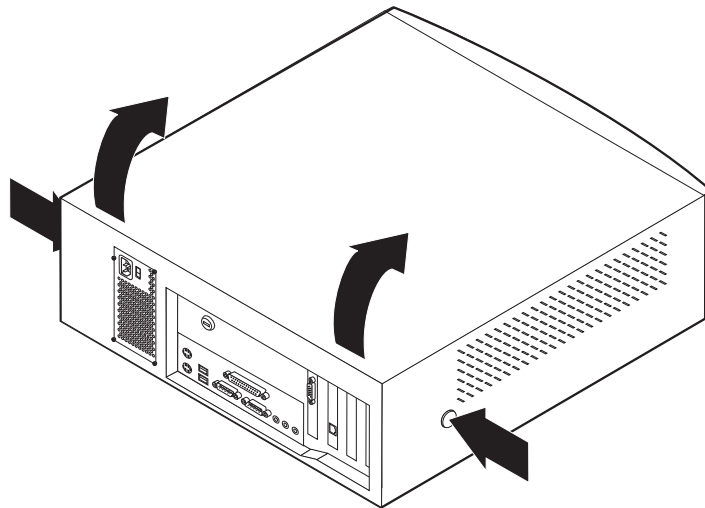
Removing the cover

> **Important:**
> Read "Safety Information" on page v and "Handling static-sensitive devices" on page 9 before removing the cover.

To remove the cover:

1. Shut down your operating system, remove any media (diskettes, CDs, or tapes) from the drives, and turn off all attached devices and the computer.
2. Unplug all power cords from electrical outlets.
3. Disconnect all cables attached to the computer. This includes power cords, input/output (I/O) cables, and any other cables connected to the computer.
4. Press the buttons on the sides of the computer and pivot the rear end of the cover up toward the front of the computer.

Note: For additional information on removing the cover, see "Appendix A. Using Enhanced Security" on page 71.

Locating components

The following illustration will help you locate the various components in your computer.
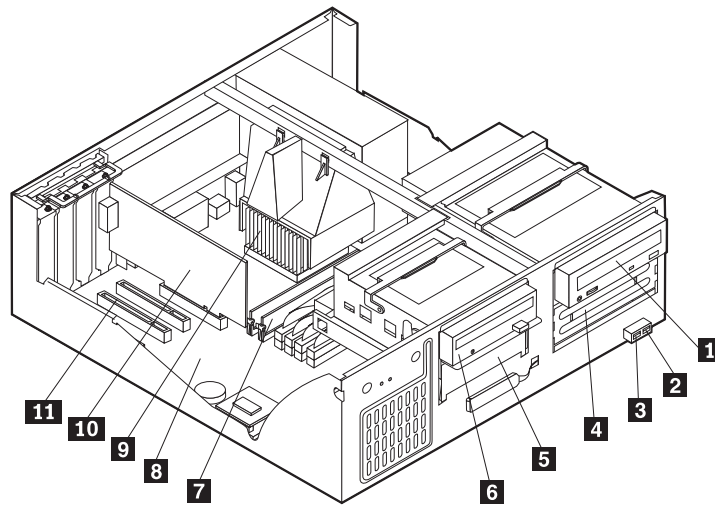
1	CD-ROM drive	**7**	RIMM connector
2	Front USB connector 1	**8**	System board
3	Front USB connector 2	**9**	Microprocessor
4	Optional drive bay	**10**	Accelerated graphic port (AGP) adapter
5	Hard disk drive	**11**	PCI slot
6	Diskette drive		

Installing options on the system board

This section provides instructions for installing options, such as system memory and adapters, on the system board.
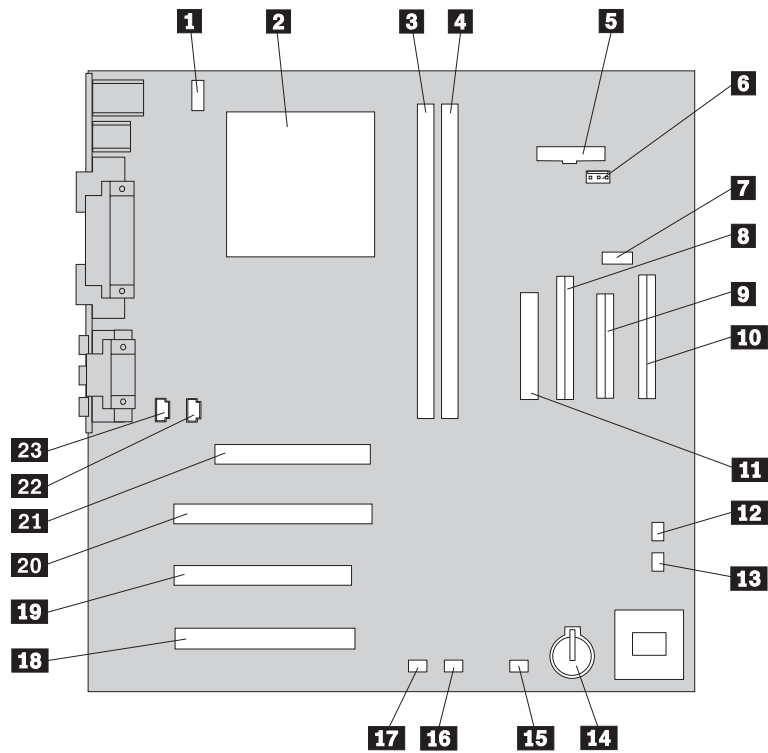
Accessing the system board

To access the system board, you must remove the computer cover. For information on removing the computer cover, see "Removing the cover" on page 21. You might need to remove adapters in order to access some components on the system board. For information about adapters, see "Installing adapters" on page 26. When disconnecting cables, be sure to note where they attach, so you can correctly reattach them later.

Identifying parts on the system board

The system board, also called the *planar* or *motherboard*, is the main circuit board in your computer. It provides basic computer functions and supports a variety of devices that are IBM-installed or that you can install later.

See the following illustration for the location of parts on the system board.

Note: An illustration of the system board and additional information is provided on a label located on the inside of the computer chassis.

1	CPU fan connector	13	Front fan connector
2	Microprocessor	14	Battery
3	RIMM 1	15	SCSI adapter LED connector
4	RIMM 2	16	Alert on LAN connector
5	Power LED connector	17	Wake on LAN connector
6	RFID connector	18	PCI slot
7	Front USB connector	19	PCI slot
8	Secondary IDE connector	20	PCI slot
9	Diskette connector	21	AGP slot
10	Primary IDE connector	22	CD-ROM audio connector
11	Power connector	23	Speaker connector
12	CMOS clear/recovery jumper		

Installing memory

Your computer has two connectors for installing Rambus inline memory modules (RIMMs) that provide up to a maximum of 512 MB of system memory.

When installing or replacing RIMMs, take the following information into consideration:

- Any connector that does not have a RIMM installed must have a continuity RIMM (C-RIMM), a module that looks like a RIMM but has no memory on it. A C-RIMM is used to continue the connection on a RIMM connector that does not have memory installed in it.
- Install only ECC RIMMs to enable ECC. If you use ECC and non-ECC memory together, it will function as non-ECC memory.
- RIMM connectors do not support dual inline memory modules (DIMMs).
- Use only PC700 or PC800 RIMMs.

   Note: If you use PC700 and PC800 RIMMs together, all memory will function at the speed of the slowest RIMM.

Removing a RIMM or C-RIMM

To remove a C-RIMM or RIMM:

1. Remove the fan duct.
2. Remove the AGP adapter. See "Installing adapters" on page 26.
3. Locate the RIMM connectors. See "Identifying parts on the system board" on page 22.
4. At both ends of the RIMM connector on the system board, push outward on the retaining clips until the module is loosened. Lift the RIMM or C-RIMM out of the connector.
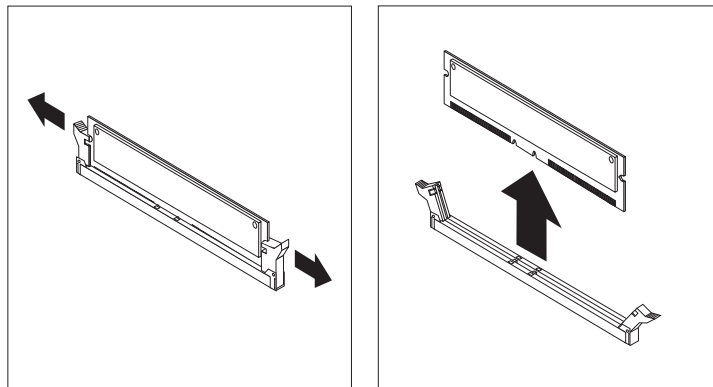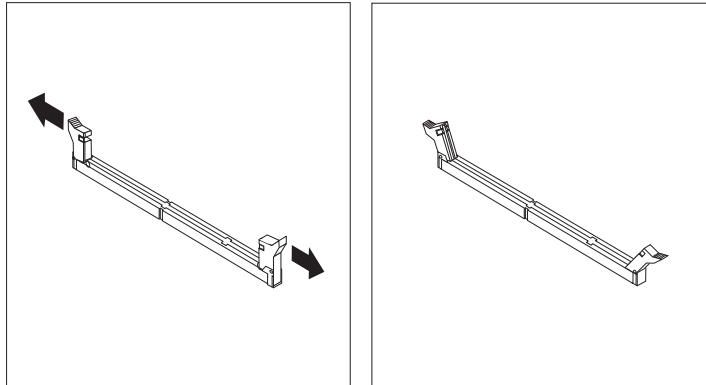

   Note: Be careful not to push too hard on the retaining clips, because the RIMM or C-RIMM might eject too quickly.

5. Store the RIMM or C-RIMM in a static-protective package. Do not discard or lose this part. It might be needed later if you change your memory configuration.
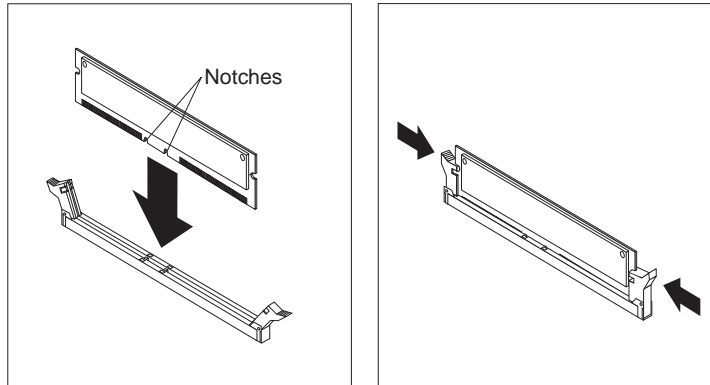
Installing a RIMM or C-RIMM

To install a RIMM or C-RIMM:

1. Touch the static-protective package containing the RIMM to any unpainted metal surface in the computer, and then remove the RIMM or C-RIMM.

2. If the retaining clips are not already open, open them.

3. Position the RIMM or C-RIMM above the connector so that the two notches on the bottom edge of the module align properly with the empty connector.

4. Firmly push the module straight down into the connector until the retaining clips pop up and fit snugly around both ends of the module.

What to do next:

- Replace the AGP adapter and adapter slot cover latch.
- To work with another option, go to the appropriate section.
- To complete the installation, go to "Replacing the cover and connecting the cables" on page 32.

Installing adapters

This section provides information and instructions for installing and removing adapters.
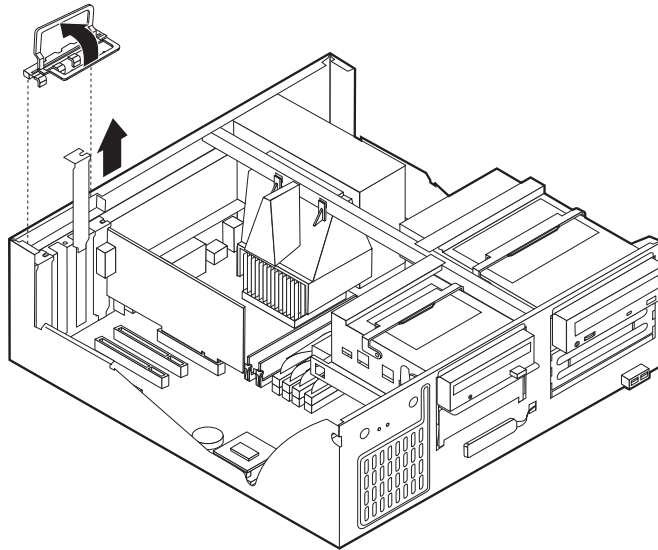
Adapter slots

Your computer has three expansion slots for peripheral component interconnect (PCI) adapter and one slot for an accelerated graphics port (AGP) adapter. You can install an adapter up to 330 mm (13 inches) long.
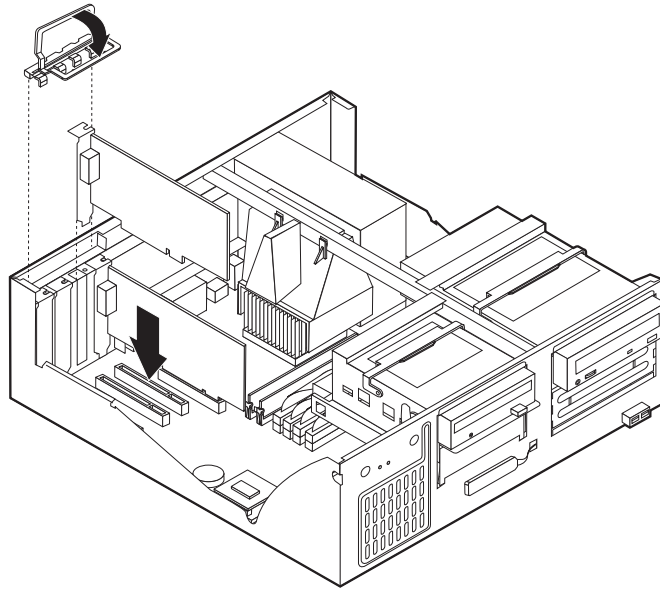
Installing adapters

To install an adapter:

1. Remove the cover. See "Removing the cover" on page 21.

2. Remove the adapter slot cover latch and the slot cover for the appropriate expansion slot.

3. Remove the adapter from its static-protective package.

4. Install the adapter into the appropriate slot on the system board.

5. Install the adapter slot cover latch.

Note: If you are installing a Wake on LAN-supported network adapter, attach the Wake on LAN cable that comes with the adapter to the Wake on LAN connector on the system board. See "Identifying parts on the system board" on page 22.

What to do next:
- To work with another option, go to the appropriate section.
- To complete the installation, go to "Replacing the cover and connecting the cables" on page 32.

Installing internal drives

This section provides information and instructions for installing and removing internal drives.

Internal drives are devices that your computer uses to read and store data. You can add drives to your computer to increase storage capacity and to enable your computer to read other types of media. Some of the different drives available for your computer are:
- Hard disk drives
- Tape drives
- CD-ROM drives
- Removable media drives

Internal drives are installed in *bays*. Within this book, the bays are referred to as bay 1, bay 2, and so on.

When you install an internal drive, it is important to note what type and size of drive you can install in each bay. Also, it is important to correctly connect the internal drive cables to the installed drive.
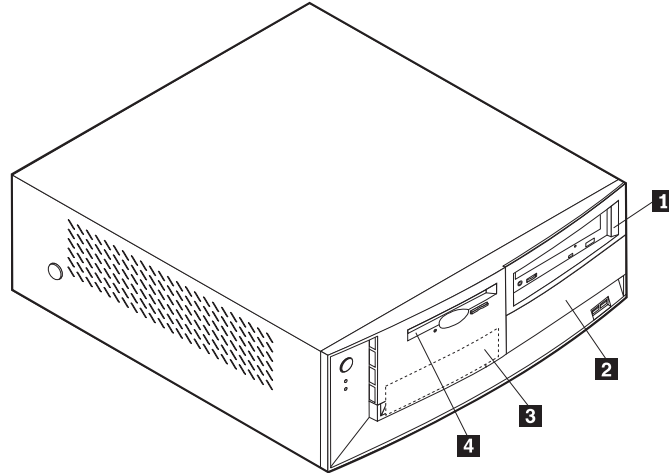
Drive specifications

Your computer comes with the following IBM-installed drives:
- A CD-ROM drive in bay 1 (some models).
- A 3.5-inch hard disk drive in bay 3.
- A 3.5-inch diskette drive in bay 4.

Models that do not have drives installed in bays 1 and 2 have a static shield and bay panel installed.

The following illustration shows the locations of the drive bays.

The following table describes some of the drives you can install in each bay and their height requirements.

1 Bay 1 - **Max Height: 41.3 mm (1.6 in.)**	CD-ROM drive (standard in some models) 5.25-inch hard disk drive
2 Bay 2 - **Max Height: 41.3 mm (1.6 in.)**	5.25-inch hard disk drive 3.5-inch hard disk drive (requires a mounting bracket) CD-ROM drive DVD-ROM drive
3 Bay 3 - **Max Height: 25.4 mm (1.0 in.)**	3.5-inch hard disk drive (preinstalled)
4 Bay 4 - **Max Height: 25.4 mm (1.0 in.)**	3.5-inch diskette drive (preinstalled)

Notes:
1. Drives that are greater than 41.3 mm (1.6 in.) high cannot be installed.
2. Install removable media (tape or CD) drives in the accessible bays: bay 1 or 2.

Power and signal cables for internal drives

Your computer uses cables to connect integrated drive electronics (IDE) drives to the power supply and to the system board. The following cables are provided:
- Four-wire *power cables* connect most drives to the power supply. At the end of these cables are plastic connectors that attach to different drives; these connectors vary in size. Also, certain power cables attach to the system board.
- Flat *signal cables*, also called *ribbon cables*, connect IDE and diskette drives to the system board. There are two sizes of ribbon signal cables that come with your computer:
  - The wider signal cable has two or three connectors.

- If the cable has three connectors, one of these connectors is attached to the drive, one is a spare, and the third attaches to the primary or secondary IDE connector on the system board.
- If the cable has two connectors, one of these connectors is attached to the hard disk drive, and the other attaches to the primary or secondary IDE connector on the system board.

Note: If you want to add another device, and your computer does not come with a CD-ROM preinstalled, you will need a second signal cable with three connectors. You will need an 80-conductor ATA 100 signal cable if you are replacing the existing signal cable or adding a second hard disk. ATA 100 signal cables are color-coded. The blue connector attaches to the system board, the black connector attaches to the master device, and the gray middle connector attaches to the secondary (or slave) device.

If your computer comes with a CD-ROM drive, it will have an ATA 100 signal cable. However, if you are installing a hard disk drive, you must change the switch or jumper setting on the CD-ROM drive to secondary and change the connector used for the CD-ROM drive to the gray middle connector.

– The narrower signal cable has two connectors for attaching the diskette drive to the diskette-drive connector on the system board.

Note: To locate connectors on the system board, see "Identifying parts on the system board" on page 22.

The following are some important points to remember when connecting power and signal cables to internal drives:

- The drives that are preinstalled in your computer come with power and signal cables attached. If you replace any drives, it is important to remember which cable is attached to which drive.
- When you install a drive, ensure that the drive connector at the *end* of the signal cable is always connected to a drive; also, ensure that the drive connector at the other end is connected to the system board. This reduces electronic noise from the computer.
- If two IDE devices are used on a single cable, one must be designated as the primary or master device and the other as the secondary or slave device; otherwise, some of the IDE devices might not be recognized by the system. The primary or secondary designation is determined by switch or jumper settings on each IDE device.
- If two IDE devices are on a single cable, and only one is a hard disk drive, the hard disk drive must be set as the master device.
- If you have only one IDE device on a cable, it must be set as master.

For help in selecting drives, cables, and other options for your computer, see "Available options" on page 9.

Installing internal drives

To install an internal drive, following these steps.

Note: If your computer has a CD-ROM drive, you might need to remove the signal and power cables from the drive.

1. Remove the cover (see "Removing the cover" on page 21).

2. Pivot the drive bay latch handle toward the front of the computer and pivot the drive bay cage toward the front of the computer until the drive cage latch catches to the chassis.
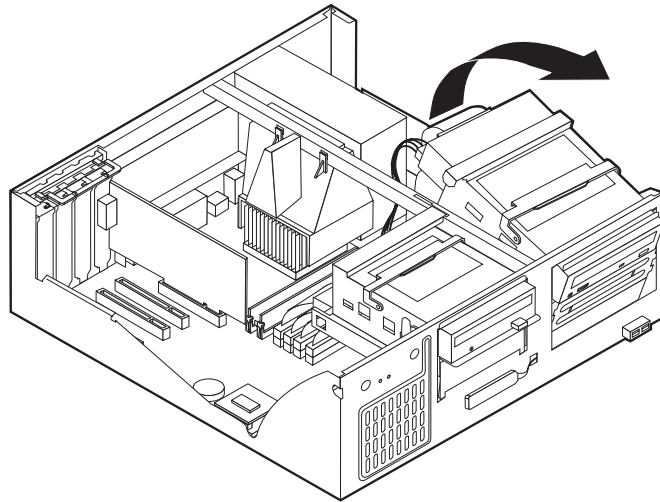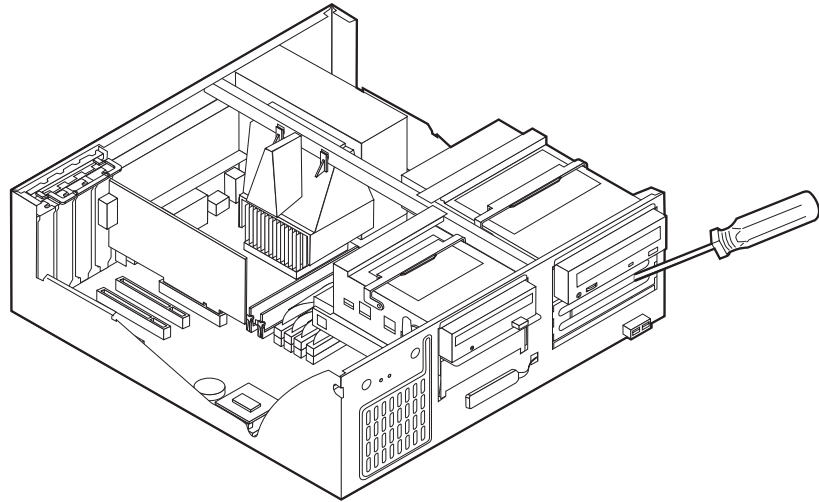
3. Install the drive into the bay. Align the screw holes and insert the two screws.
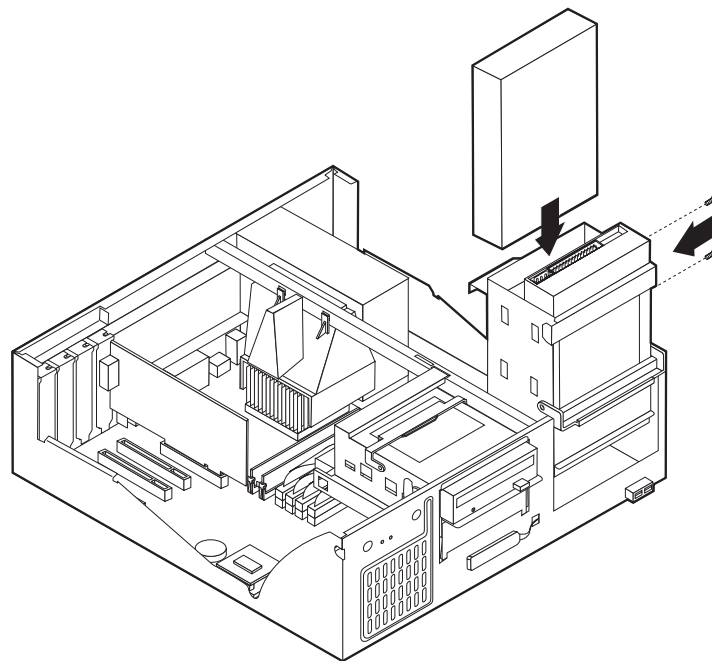
4. Pivot the drive bay cage back into place.
5. If you are installing a drive with removable media, insert a flat–blade screwdriver into one of the slots on the static shield in the drive bay into which

you installed the drive and gently pry the static shield loose from the drive bay.

6. If the drive you installed is a removable-media drive, remove the bay panel from the front bezel and place the bezel frame that comes with your computer over the drive bay.

7. Connect the power and signal cables to the drive.
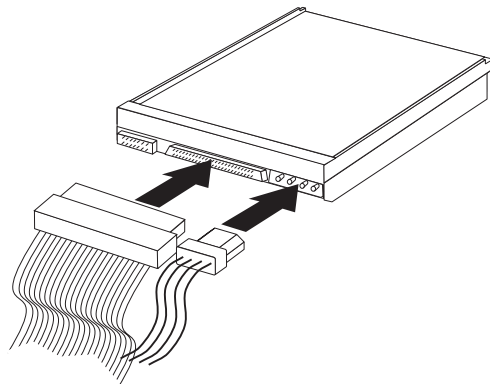
What to do next

- To work with another option, go to the appropriate section.
- To complete the installation, go to "Replacing the cover and connecting the cables" on page 32.
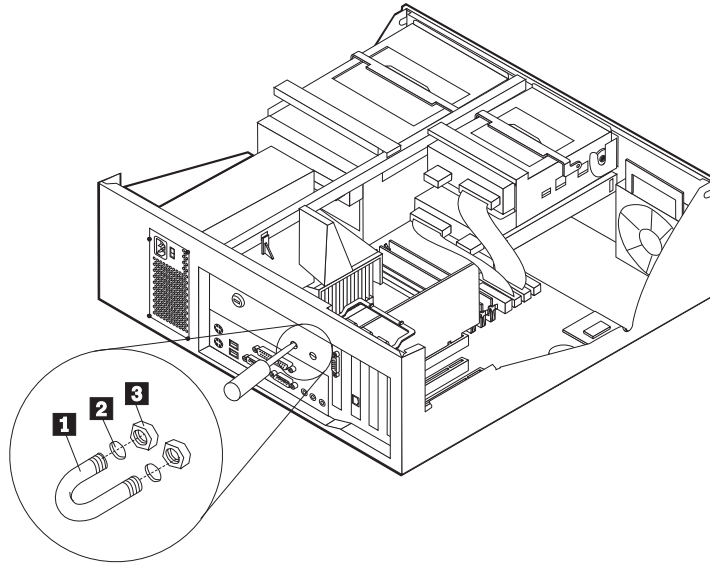

Installing a security U-bolt

To help prevent hardware theft, you can add a security U-bolt and cable to your computer. After you add the security cable, make sure that it does not interfere with other cables that are connected to the computer.

To install a U-bolt:

1. Remove the cover (see "Removing the cover" on page 21).
2. Use a tool, such as a screwdriver, to remove the two metal knockouts.
3. Insert the U-bolt through the rear panel; then attach and tighten the nuts with an appropriately sized or adjustable wrench.

4. Replace the computer cover. For more information, see "Replacing the cover and connecting the cables".

5. Thread the cable through the U-bolt and around an object that is not a part of or permanently secured to the building structure or foundation, and from which it cannot be removed; then fasten the cable ends together with a lock.

1 U-bolt
2 Bolt holes
3 Nuts

What to do next:
- To work with another option, go to the appropriate section.

Replacing the cover and connecting the cables

After working with options, you need to install any removed parts, replace the cover, and reconnect any cables, including power cords and telephone lines. Also, depending on the option installed, you might need to confirm the updated information in the Configuration/Setup Utility program.

To replace the cover and connect cables to your computer:

1. Ensure that all components have been reassembled correctly and that no tools or loose screws are left inside your computer.

2. Clear any cables that might impede the replacement of the cover.

3. Position the cover over the chassis and pivot the cover down over the computer until the cover snaps into place.
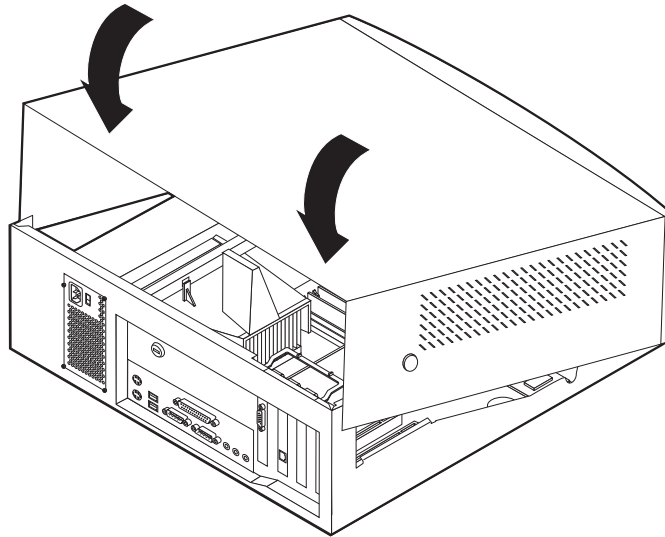
4. Reconnect the external cables and cords to the computer. See "Chapter 2. Installing external options" on page 11.
5. To update the configuration, see "Chapter 6. Updating the computer configuration" on page 67.

Chapter 4. Installing internal options — minitower model

You can expand the capabilities of your computer by adding memory, drives, or adapters. When adding an option, use these instructions along with the instructions that come with the option.
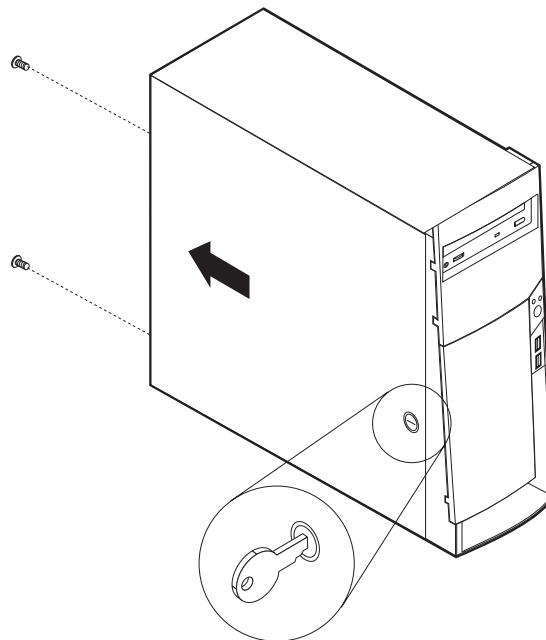
Removing the cover

> **Important:**
> Read "Safety Information" on page v and "Handling static-sensitive devices" on page 9 before removing the cover.

To remove the cover:

1. Shut down your operating system, remove any media (diskettes, CDs, or tapes) from the drives, and turn off all attached devices and the computer.
2. Unplug all power cords from electrical outlets.
3. Disconnect all cables attached to the computer. This includes power cords, input/output (I/O) cables, and any other cables connected to the computer.
4. Remove the screws from the rear of the computer.
5. If the keylock button is locked, unlock it and slide the cover panel toward the rear of the computer.
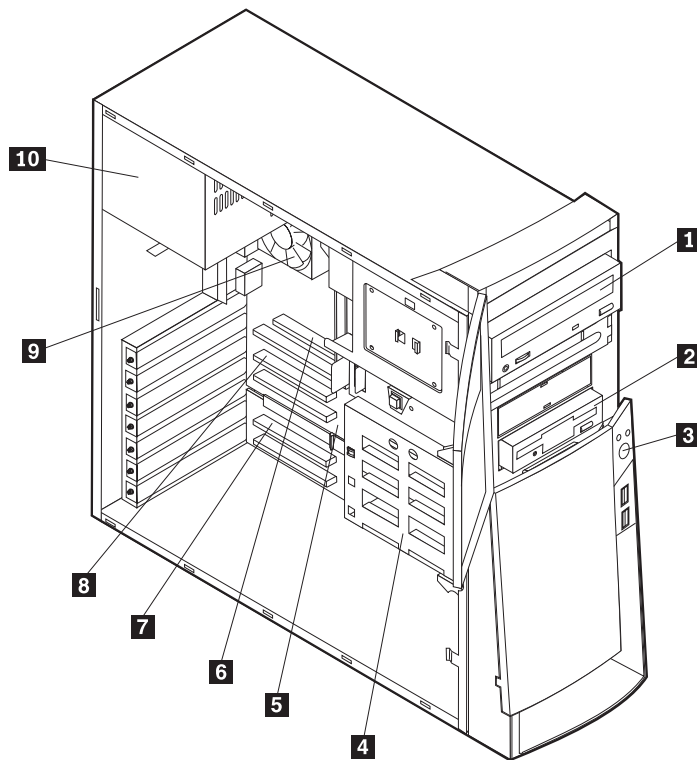

Note: The keylock might be replaced by a plastic plug, in some models.

For additional information on removing the cover, see "Appendix A. Using Enhanced Security" on page 71.

Locating components

The following illustration will help you locate the various components in your computer.

1	CD drive or DVD drive	**6**	Accelerated graphics port (AGP) slot
2	Diskette drive	**7**	Extender card
3	Power button	**8**	PCI slot
4	Lower drive bay cage	**9**	Microprocessor
5	System board	**10**	Power supply

Installing options on the system board

This section provides instructions for installing options, such as system memory and adapters, on the system board.
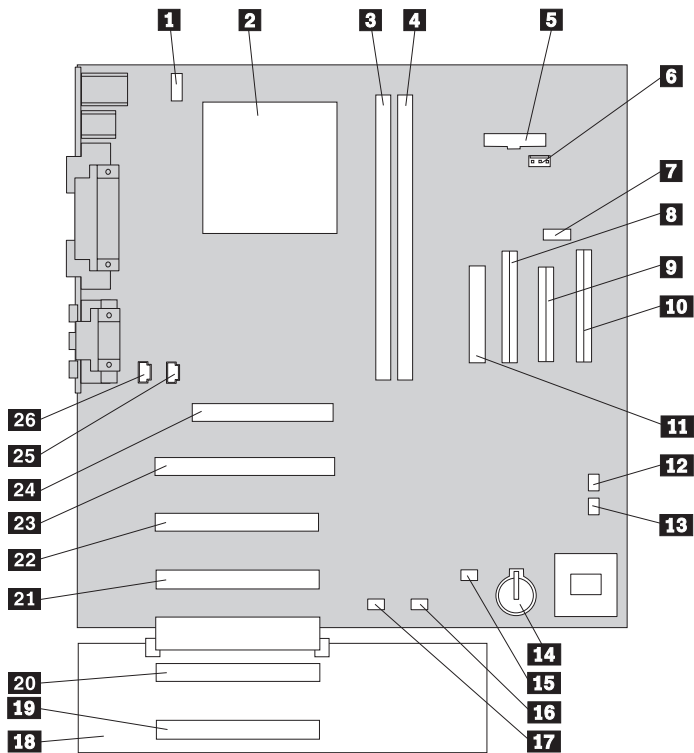
Accessing the system board

To access the system board, you must remove the computer cover. For information on removing the computer cover, see "Removing the cover" on page 35. You might need to remove adapters in order to access some components on the system board. For information about adapters, see "Installing adapters" on page 41. When disconnecting cables, be sure to note where they attach, so you can correctly reattach them later.

Identifying parts on the system board

The system board, also called the *planar* or *motherboard*, is the main circuit board in your computer. It provides basic computer functions and supports a variety of devices that are IBM-installed or that you can install later.

See the following illustration for the location of parts on the system board.

Note: An illustration of the system board and additional information is provided on a label located on the inside of the computer chassis.

1	CPU fan connector	14	Battery
2	Microprocessor and fan sink	15	SCSI adapter LED connector
3	DIMM 1 or RIMM 1	16	Alert on LAN connector
4	DIMM 2 or RIMM 2	17	Wake on LAN connector
5	Power LED connector	18	Bus extender
6	RFID connector	19	PCI slot
7	Front USB connector	20	PCI slot
8	Secondary IDE connector	21	PCI slot
9	Diskette connector	22	PCI slot
10	Primary IDE connector	23	PCI slot
11	Power connector	24	AGP slot
12	CMOS clear/recovery jumper	25	CD-ROM audio connector
13	Front fan connector	26	Speaker connector

Installing memory

Your computer has two connectors for installing memory modules that provide up to a maximum of 512 MB of system memory.

Your computer uses either dual inline memory modules (DIMMs) or Rambus inline memory modules (RIMMs), depending on the model. To tell which type of memory your computer uses, use the Configuration/Setup Utility program to view system information.

Installing DIMMs

When installing DIMMs, the following rules apply:

- Fill each system memory connector sequentially, starting at DIMM 1.
- Use 3.3 V, 133 MHz, unbuffered, SDRAM DIMMs.
- Use only 64, 128, or 256 MB DIMMs in any combination.

To install a DIMM:

1. Remove the AGP adapter. See "Installing adapters" on page 41.
2. Locate the DIMM connectors. See "Identifying parts on the system board" on page 36.
3. If the retaining clips are not already open, open them.
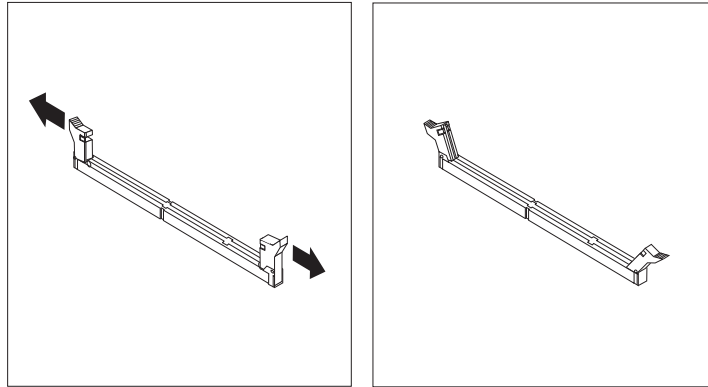
4. Install the DIMM straight down into the connector until the retaining clips close. Make sure the notches in the DIMM align with the tabs on the connector.
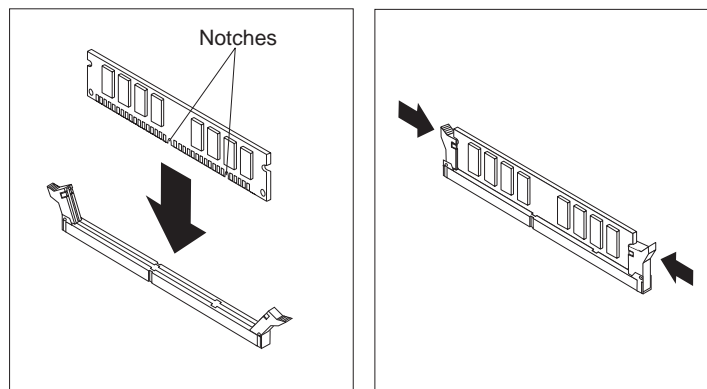
What to do next:

- Replace the AGP adapter and adapter slot cover latch.
- To work with another option, go to the appropriate section.
- To complete the installation, go to "Replacing the cover and connecting the cables" on page 51.

Removing and Installing RIMMs

The IBM-installed RIMMs that come with some models are ECC (error checking and correction) RDRAM modules.

When installing or replacing RIMMs, take the following information into consideration:

- Any connector that does not have a RIMM installed must have a continuity RIMM (C-RIMM), a module that looks like a RIMM but has no memory on it. A C-RIMM is used to continue the connection on a RIMM connector that does not have memory installed in it.
- Install only ECC RIMMs to enable ECC. If you use ECC and non-ECC memory together, it will function as non-ECC memory.
- RIMM connectors do not support dual inline memory modules (DIMMs).
- Use only PC700 or PC800 RIMMs.

> **Note:** If you use PC700 and PC800 RIMMs together, all memory will function at the speed of the slowest RIMM.

To remove a C-RIMM or RIMM:

1. To locate the RIMM connectors inside your computer, see "Identifying parts on the system board" on page 36.
2. At both ends of the RIMM connector on the system board, push outward on the retaining clips until the module is loosened. Lift the RIMM or C-RIMM out of the connector.
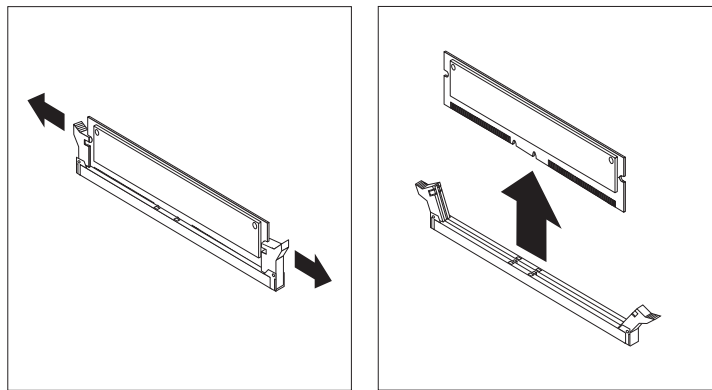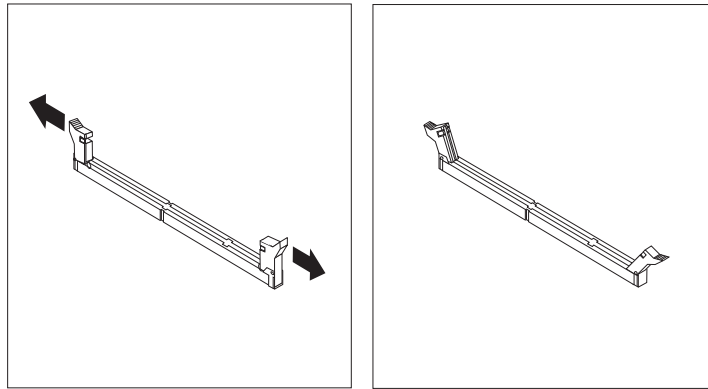

> **Note:** Be careful not to push too hard on the retaining clips, because the RIMM or C-RIMM might eject too quickly.
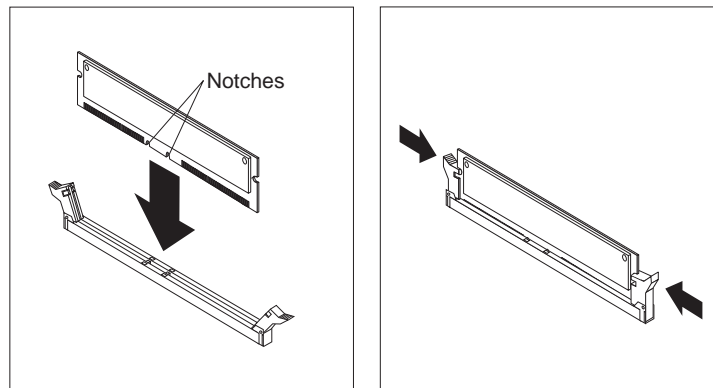
3. Store the RIMM or C-RIMM in a static-protective package. Do not discard or lose this part. It might be needed later if you change your memory configuration.

To install a RIMM or C-RIMM:

1. Touch the static-protective package containing the RIMM to any unpainted metal surface in the computer, and then remove the RIMM or C-RIMM.
2. If the retaining clips are not already open, open them.

3. Position the RIMM or C-RIMM above the connector so that the two notches on the bottom edge of the module align properly with the empty connector.
4. Firmly push the module straight down into the connector until the retaining clips pop up and fit snugly around both ends of the module.

What to do next:

- Replace the AGP adapter and adapter slot cover latch.
- To work with another option, go to the appropriate section.
- To complete the installation, go to "Replacing the cover and connecting the cables" on page 51.

Installing adapters

This section provides information and instructions for installing and removing adapters.
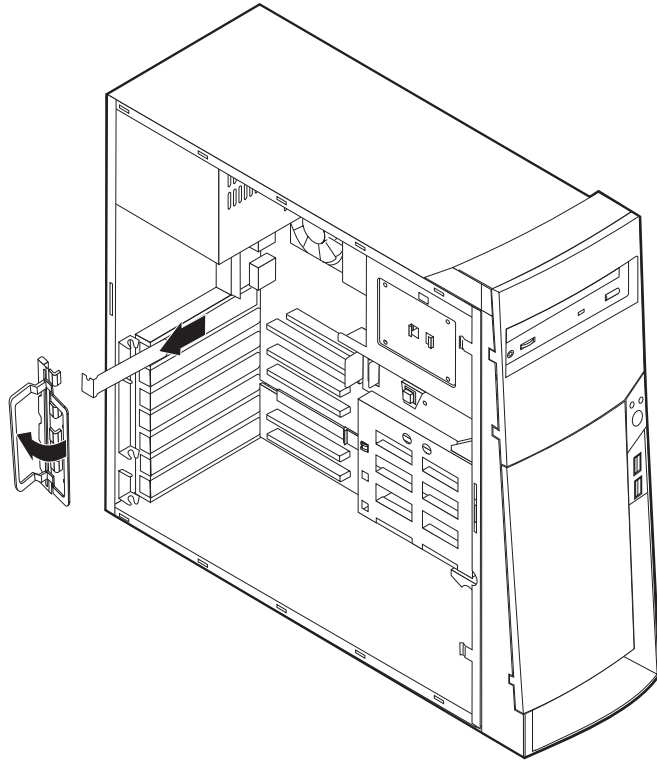
Adapter slots

Your computer has five expansion slots for peripheral component interconnect (PCI) adapters and one slot for an accelerated graphics port (AGP) adapter. You can install an adapter up to 330 mm (13 inches) long.
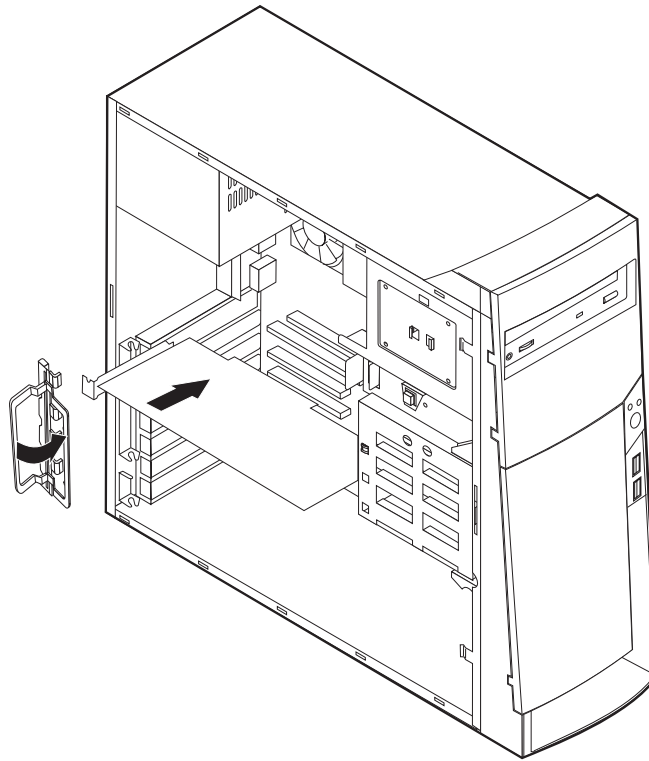
Installing adapters

To install an adapter:

1. Remove the cover. See "Removing the cover" on page 35.

2. Remove the adapter slot cover latch and the slot cover for the appropriate expansion slot.

3. Remove the adapter from its static-protective package.
4. Install the adapter into the appropriate slot on the system board.

5. Install the adapter slot cover latch.

Note: If you are installing a Wake on LAN-supported network adapter, attach the Wake on LAN cable that comes with the adapter to the Wake on LAN connector on the system board. See "Identifying parts on the system board" on page 36.

What to do next

- To work with another option, go to the appropriate section.
- To complete the installation, go to "Replacing the cover and connecting the cables" on page 51.

Installing internal drives

This section provides information and instructions for installing and removing internal drives.

Internal drives are devices that your computer uses to read and store data. You can add drives to your computer to increase storage capacity and to enable your computer to read other types of media. Some of the different drives available for your computer are:

- Hard disk drives
- Tape drives
- CD drives or DVD drives
- Removable media drives

Internal drives are installed in *bays*. Within this book, the bays are referred to as bay 1, bay 2, and so on.

When you install an internal drive, it is important to note what type and size of drive you can install in each bay. Also, it is important to correctly connect the internal drive cables to the installed drive.
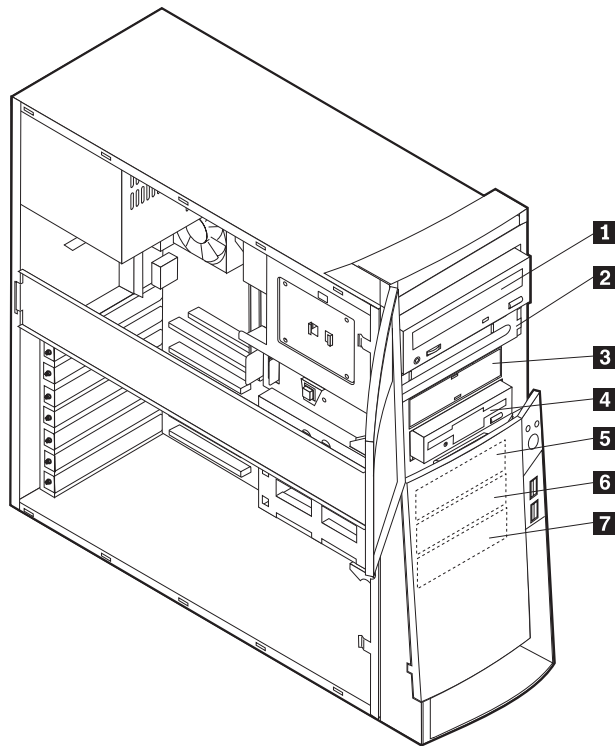
Drive specifications

Your computer comes with the following IBM-installed drives:

- A CD drive or DVD drive in bay 1 (some models).
- A 3.5-inch hard disk drive in bay 3.
- A 3.5-inch diskette drive in bay 4.

Models that do not have drives installed in bays 1 and 2 have a static shield and bay panel installed.

The following illustration shows the locations of the drive bays.

The following table describes some of the drives you can install in each bay and their height requirements.

1	**Bay 1 - Max Height: 41.3 mm (1.6 in.)**	CD-ROM drive (standard in some models)
		5.25-inch hard disk drive
2	**Bay 2 - Max Height: 41.3 mm (1.6 in.)**	5.25-inch hard disk drive
		3.5-inch hard disk drive (requires a mounting bracket)
		CD-ROM drive
		DVD-ROM drive
3	**Bay 3 - Max Height: 25.4 mm (1.0 in.)**	3.5-inch diskette drive (preinstalled)
4	**Bay 4 - Max Height: 25.4 mm (1.0 in.)**	Hard disk drive
		3.5-inch removable drive
5	**Bay 5 - Max Height: 25.4 mm (1.0 in.)**	Hard disk drive
6	**Bay 6 - Max Height: 25.4 mm (1.0 in.)**	Hard disk drive
7	**Bay 7 - Max Height: 25.4 mm (1.0 in.)**	Hard disk drive

Notes:

1. Drives that are greater than 41.3 mm (1.6 in.) high cannot be installed.

2. Install removable media (tape or CD) drives in the accessible bays: bays 1 or 2.

Power and signal cables for internal drives

Your computer uses cables to connect integrated drive electronics (IDE) drives to the power supply and to the system board. The following cables are provided:

- Four-wire *power cables* connect most drives to the power supply. At the end of these cables are plastic connectors that attach to different drives; these connectors vary in size. Also, certain power cables attach to the system board.

- Flat *signal cables*, also called *ribbon cables*, connect IDE and diskette drives to the system board. There are two sizes of ribbon signal cables that come with your computer:
  – The wider signal cable has two or three connectors.
    - If the cable has three connectors, one of these connectors is attached to the drive, one is a spare, and the third attaches to the primary or secondary IDE connector on the system board.
    - If the cable has two connectors, one of these connectors is attached to the hard disk drive, and the other attaches to the primary or secondary IDE connector on the system board.

      Note: If you want to add another device, and your computer does not come with a CD drive or DVD drive preinstalled, you will need a second signal cable with three connectors. You will need an 80-conductor ATA 100 signal cable if you are replacing the existing signal cable or adding a second hard disk. ATA 100 signal cables are color-coded. The blue connector attaches to the system board, the black connector attaches to the master device, and the gray middle connector attaches to the secondary (or slave) device.

      If your computer comes with a CD drive or DVD drive, it will have an ATA 100 signal cable. However, if you are installing a hard disk drive, you must change the switch or jumper setting on the CD drive or DVD drive to secondary and change the connector used for the CD drive or DVD drive to the gray middle connector.
  – The narrower signal cable has two connectors for attaching the diskette drive to the diskette-drive connector on the system board.

Note: To locate connectors on the system board, see "Identifying parts on the system board" on page 36.

The following are some important points to remember when connecting power and signal cables to internal drives:

- The drives that are preinstalled in your computer come with power and signal cables attached. If you replace any drives, it is important to remember which cable is attached to which drive.
- When you install a drive, ensure that the drive connector at the *end* of the signal cable is always connected to a drive; also, ensure that the drive connector at the other end is connected to the system board. This reduces electronic noise from the computer.
- If two IDE devices are used on a single cable, one must be designated as the primary or master device and the other as the secondary or slave device; otherwise, some of the IDE devices might not be recognized by the system. The primary or secondary designation is determined by switch or jumper settings on each IDE device.
- If two IDE devices are on a single cable, and only one is a hard disk drive, the hard disk drive must be set as the master device.
- If you have only one IDE device on a cable, it must be set as master.

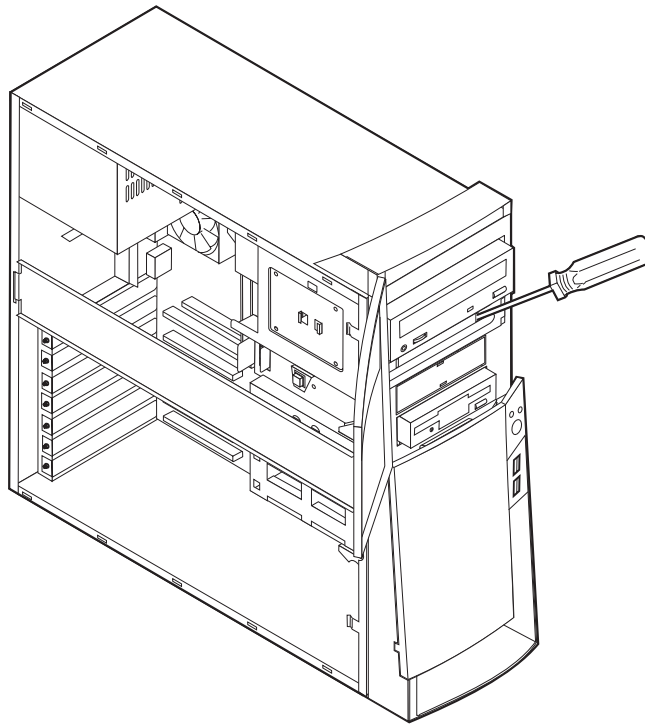For help in selecting drives, cables, and other options for your computer, see page 9.

Installing internal drives in bays 1, 2, and 3

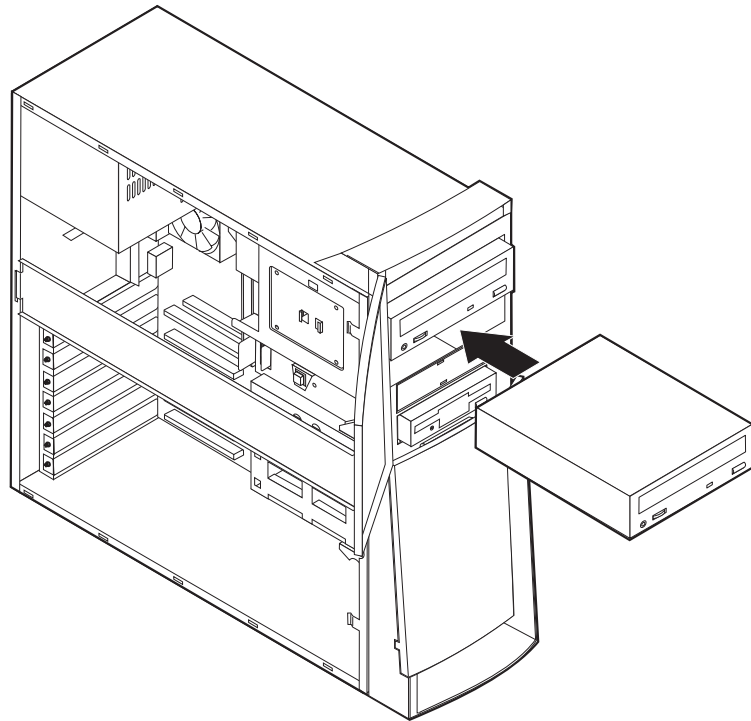To install an internal drive in bay 1, 2, or 3:

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

   Note: If your computer has a CD drive or DVD drive, you might need to remove the signal and power cables from the drive.

2. Remove the bay panel and insert a flat–bladed screwdriver into one of the slots on the static shield in the drive bay into which you are installing the drive and gently pry the static shield loose from the drive bay.

3. Install the drive into the bay. Align the screw holes and insert the two screws.

4. If the drive you installed is a removable-media drive, place the bezel frame that comes with your computer over the drive bay.
5. Connect the power and signal cables to the drive.

What to do next

- To work with another option, go to the appropriate section.
- To complete the installation, go to "Replacing the cover and connecting the cables" on page 51.
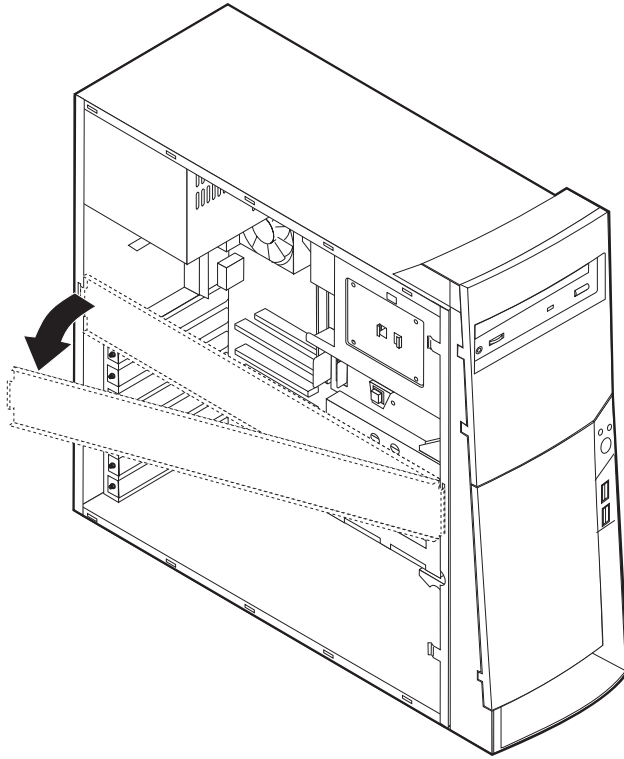

Installing internal drives in bays 4, 5, 6, and 7

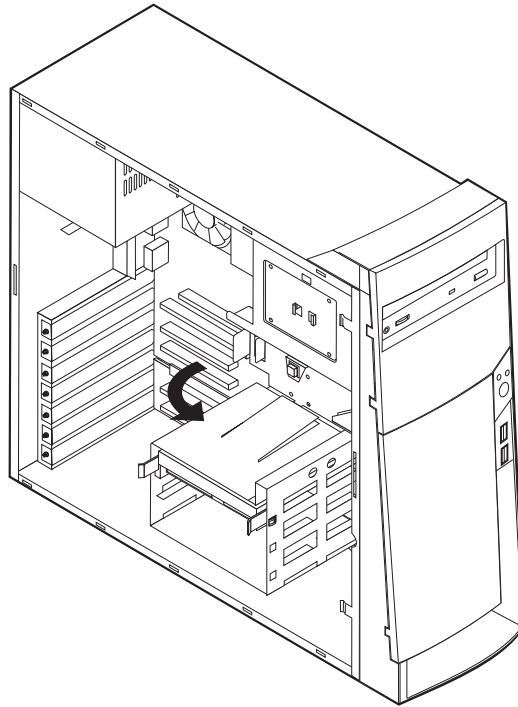To install an internal drive in bay 4, 5, 6, or 7:

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

   Note: If your computer has a CD drive or DVD drive, you might need to remove the signal and power cables from the drive.
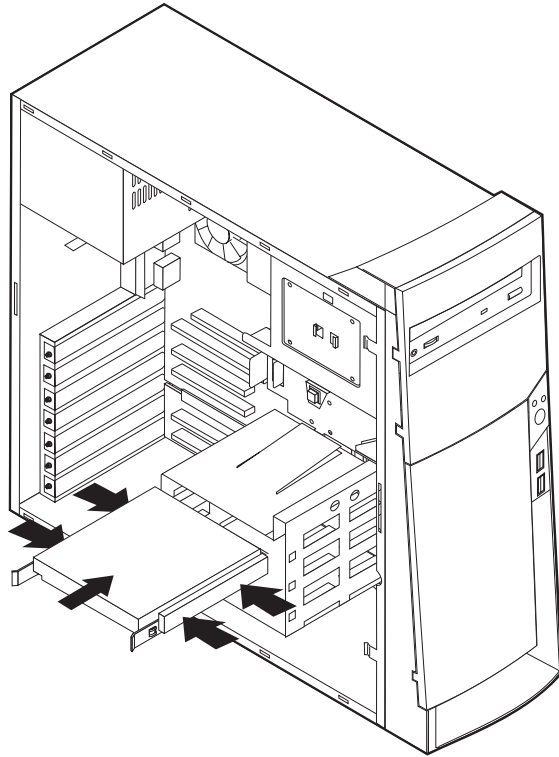
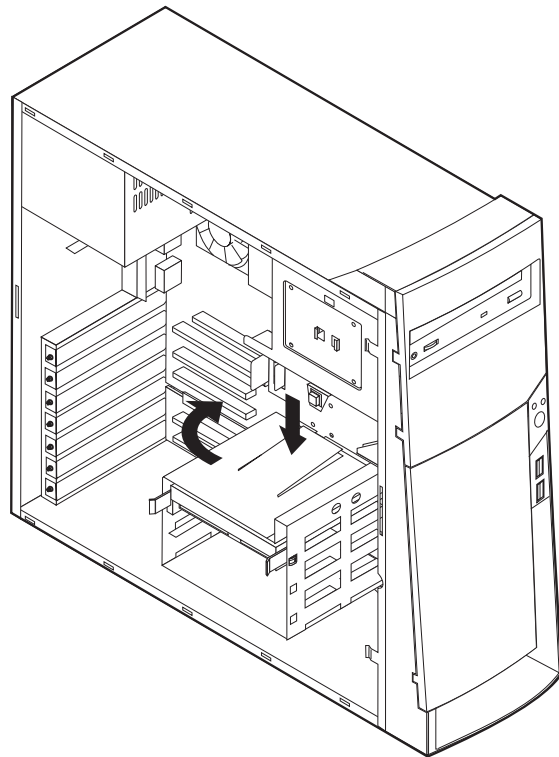2. Remove the support bar by pulling outward from the computer as shown.

3. Remove the metal cover and pivot the lower drive bay cage outward from the computer.
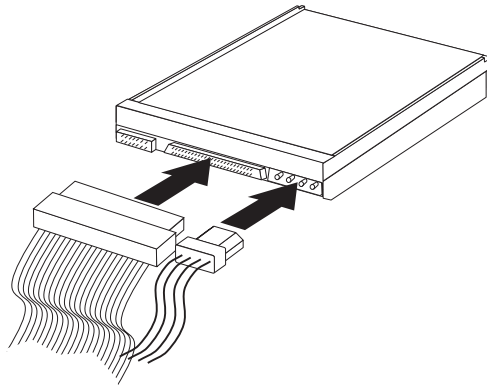
4. Mount sliding rails on the drive you wish to install and slide the drive along the rail guides into the unoccupied drive bay.

5. Pivot the drive bay cage back into place.

6. Connect the power and signal cables to the drive.

What to do next
- To work with another option, go to the appropriate section.
- To complete the installation, go to "Replacing the cover and connecting the cables" on page 51.

Installing a security U-bolt

To help prevent hardware theft, you can add a security U-bolt and cable to your computer. After you add the security cable, make sure that it does not interfere with other cables that are connected to the computer.

To install a U-bolt:

1. Remove the cover (see "Removing the cover" on page 35).
2. Use a tool, such as a screwdriver, to remove the two metal knockouts.
3. Insert the U-bolt through the rear panel; then attach and tighten the nuts with an appropriately sized or adjustable wrench.
4. Replace the computer cover. For more information, see "Replacing the cover and connecting the cables" on page 51.

5. Thread the cable through the U-bolt and around an object that is not a part of or permanently secured to the building structure or foundation, and from which it cannot be removed; then fasten the cable ends together with a lock.

1 U-bolt
2 Bolt holes
3 Nuts

What to do next:
- To work with another option, go to the appropriate section.

Replacing the cover and connecting the cables

After working with options, you need to install any removed parts, replace the cover, and reconnect any cables, including power cords and telephone lines. Also, depending on the option installed, you might need to confirm the updated information in the Configuration/Setup Utility program.

To replace the cover and connect cables to your computer:

1. Ensure that all components have been reassembled correctly and that no tools or loose screws are left inside your computer.
2. Clear any cables that might impede the replacement of the cover.

3. Position the cover on the chassis and slide the cover toward the front bezel of the computer. Make sure to align the tabs on the computer with the cover and snap the cover into place.
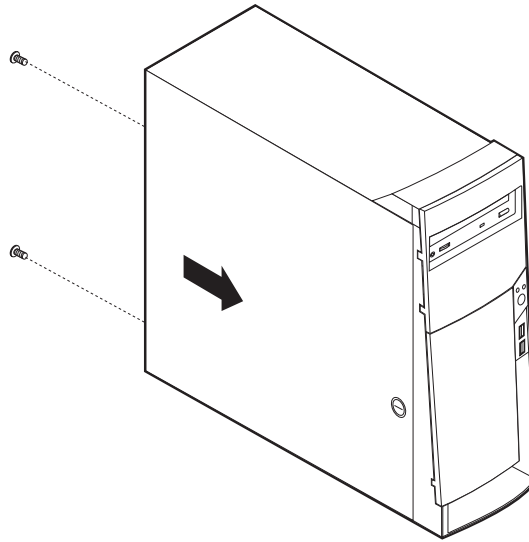
4. Insert the screws into the holes in the rear of the computer and tighten.
5. Lock the cover, if necessary.
6. Reconnect the external cables and cords to the computer. See "Chapter 2. Installing external options" on page 11 and the *Quick Reference*.
7. To update the configuration, see "Chapter 6. Updating the computer configuration" on page 67.

Chapter 5. Installing internal options — microtower model

You can expand the capabilities of your computer by adding memory, drives, or adapters. When adding an option, use these instructions along with the instructions that come with the option.

Removing the cover

> **Important:**
>
> Read "Safety Information" on page v and "Handling static-sensitive devices" on page 9 before removing the cover.

To remove the cover:

1. Shut down your operating system, remove any media (diskettes, CDs, or tapes) from the drives, and turn off all attached devices and the computer.
2. Unplug all power cords from electrical outlets.
3. Disconnect all cables attached to the computer. This includes power cords, input/output (I/O) cables, and any other cables connected to the computer.
4. Remove the thumbscrews from the rear of the computer and slide the cover toward the rear of the computer.
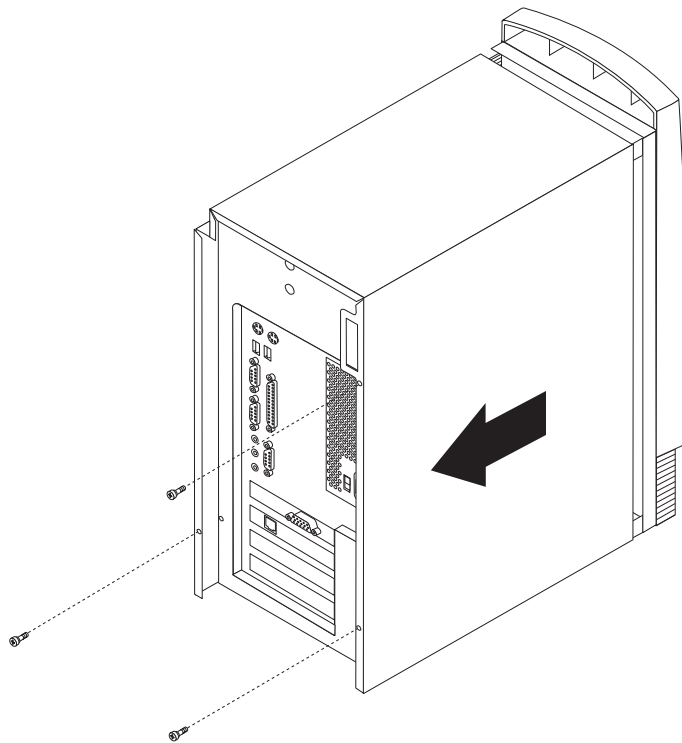
Locating components

The following illustration will help you locate the various components in your computer.
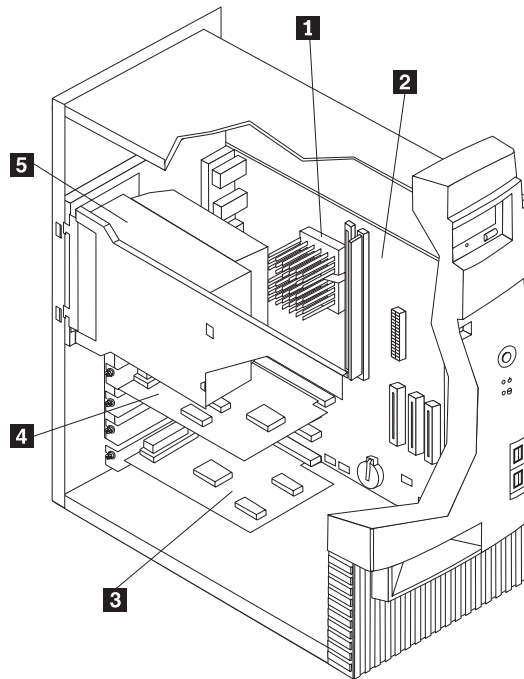
1	Microprocessor	**4**	Accelerated graphics port (AGP) adapter
2	System board	**5**	Power supply
3	PCI adapter		

Moving the power supply

To perform some operations inside the computer, you might need to move the power supply to access parts of the system board that are difficult to see or hard to reach. Use the following procedure to provide easier access to the system board.

DANGER

Do not detach the power supply bracket from the power supply or remove any of the power supply screws.

1. Remove the screw securing the power supply to the rear of the chassis.
2. Push the metal tab securing the power supply to the chassis to release the power supply.

3. Slide the power supply unit up toward the top of the chassis.
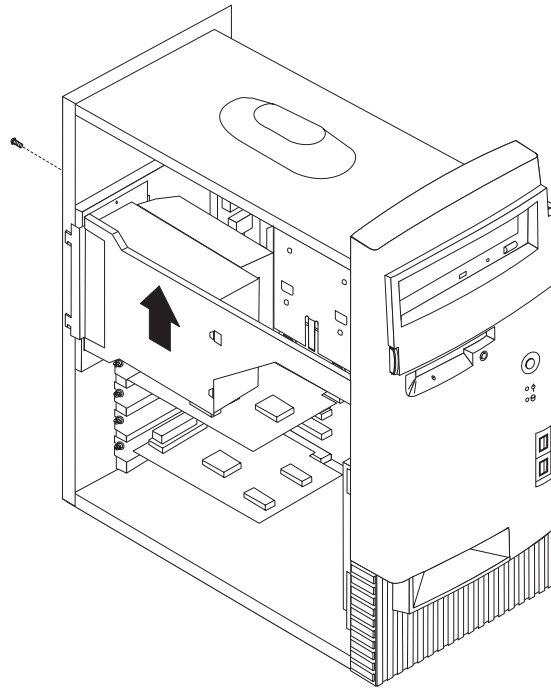
4. Rotate the power supply outward as shown.

5. Pull the power supply forward and carefully rotate it toward the front of the chassis. Lay it to the side.

6. To replace the power supply, reverse these steps.

Installing options on the system board

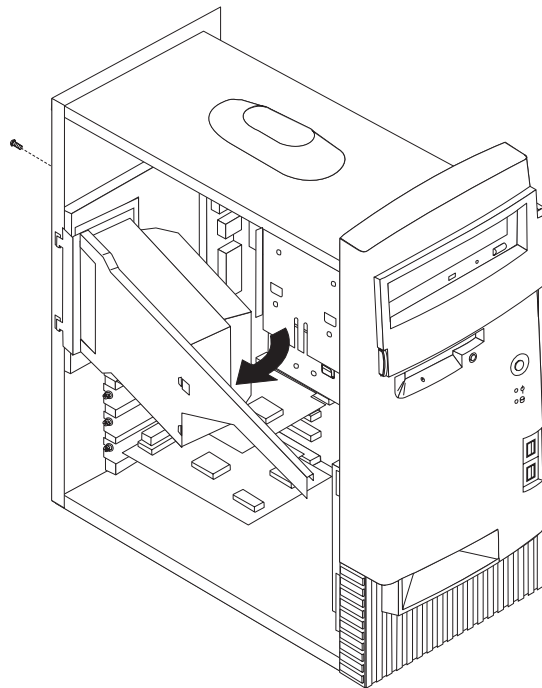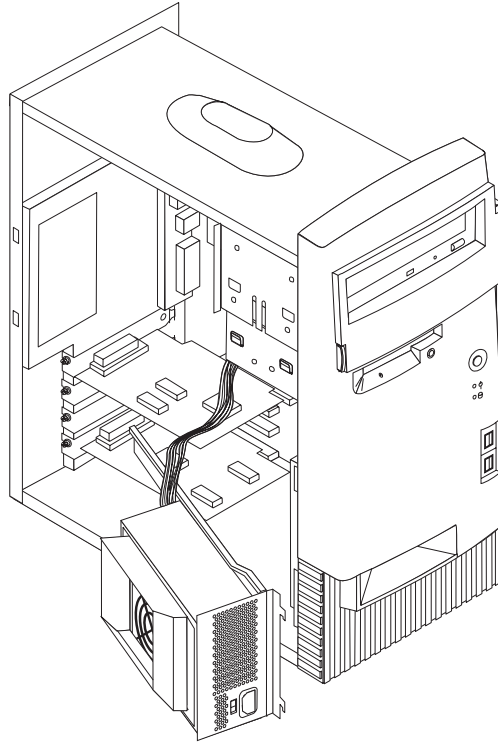This section provides instructions for installing options, such as system memory and adapters, on the system board.

Accessing the system board

To access the system board, you must remove the computer cover. For information on removing the computer cover, see "Removing the cover" on page 53. You might need to move the power supply aside or remove adapters in order to access some components on the system board. For information about adapters, see "Installing adapters" on page 59. When disconnecting cables, be sure to note where they attach, so you can correctly reattach them later.

Identifying parts on the system board

The system board, also called the *planar* or *motherboard*, is the main circuit board in your computer. It provides basic computer functions and supports a variety of devices that are IBM-installed or that you can install later.

See the following illustration for the location of parts on the system board.

Note: An illustration of the system board and additional information is provided on a label located on the inside of the computer chassis.

1	CPU fan connector	**13**	Front fan connector
2	Microprocessor	**14**	Battery
3	DIMM 1	**15**	SCSI adapter LED connector
4	DIMM 2	**16**	Alert on LAN connector
5	Power LED connector	**17**	Wake on LAN connector
6	RFID connector	**18**	PCI slot
7	Front USB connector	**19**	PCI slot
8	Secondary IDE connector	**20**	PCI slot
9	Diskette connector	**21**	AGP slot
10	Primary IDE connector	**22**	CD-ROM audio connector
11	Power connector	**23**	Speaker connector
12	CMOS clear/recovery jumper		

Installing memory

Your computer has two connectors for installing dual inline memory modules (DIMMs) that provide up to a maximum of 512 MB of system memory.

Installing DIMMs

When installing DIMMs, the following rules apply:

- Fill each system memory connector sequentially, starting at DIMM 1.
- Use 3.3 V, 133 MHz, unbuffered, SDRAM DIMMs.
- Use only 64, 128, or 256 MB DIMMs in any combination.

To install a DIMM:

1. Remove the adapter. See "Installing adapters" on page 59.
2. To locate the DIMM connectors. See "Identifying parts on the system board" on page 56.
3. If the retaining clips are not already open, open them.
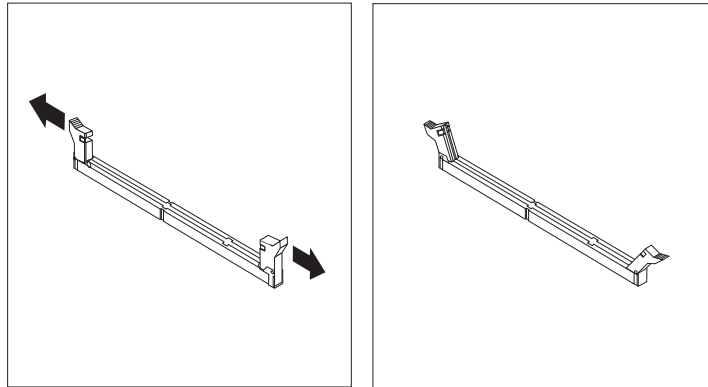
4. Install the DIMM straight down into the connector until the retaining clips close. Make sure the notches in the DIMM align with the tabs on the connector.
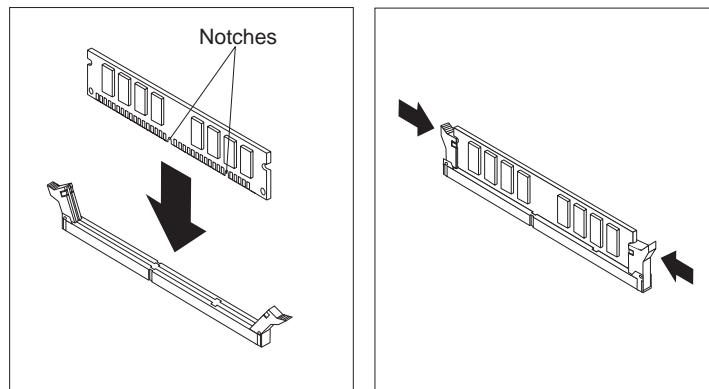
What to do next:

- Replace any adapters that were removed.
- Replace the power supply.
- To work with another option, go to the appropriate section.
- To complete the installation, go to "Replacing the cover and connecting the cables" on page 65.

Installing adapters

This section provides information and instructions for installing and removing adapters.

Adapter slots

Your computer has three expansion slots for peripheral component interconnect (PCI) adapters and one slot used for an accelerated graphics port (AGP) adapter. You can install an adapter up to 330 mm (13 inches) long.

Installing adapters

To install an adapter:

1. Remove the cover. See "Removing the cover" on page 53.

2. Remove the slot cover for the appropriate expansion slot.
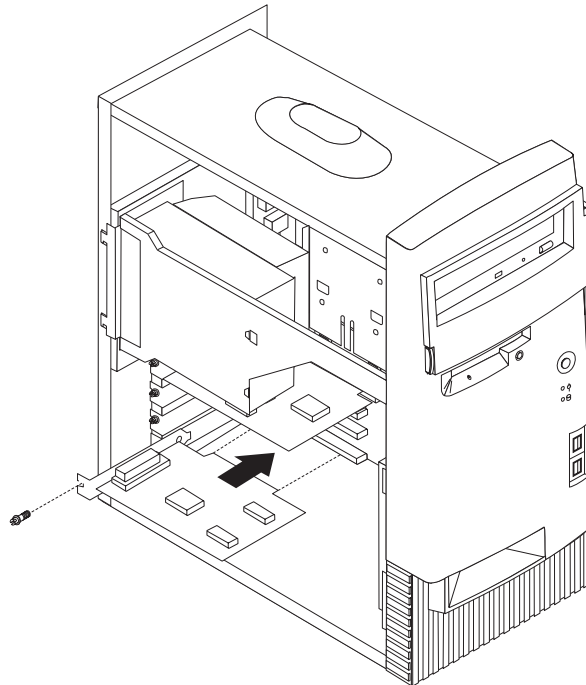
3. Remove the adapter from its static-protective package.

4. Install the adapter into the appropriate slot on the system board.

5. Install the screw that secures the adapter.

   Note: If you are installing a Wake on LAN-supported network adapter, attach the Wake on LAN cable that comes with the adapter to the Wake on LAN connector on the system board. See "Identifying parts on the system board" on page 56.

What to do next:
- To work with another option, go to the appropriate section.
- To complete the installation, go to "Replacing the cover and connecting the cables" on page 65.

Installing internal drives

This section provides information and instructions for installing and removing internal drives.

Internal drives are devices that your computer uses to read and store data. You can add drives to your computer to increase storage capacity and to enable your computer to read other types of media. Some of the different drives available for your computer are:

- Hard disk drives
- Tape drives
- CD drives or DVD drives
- Removable media drives

Internal drives are installed in *bays*. Within this book, the bays are referred to as bay 1, bay 2, and so on.

When you install an internal drive, it is important to note what type and size of drive you can install in each bay. Also, it is important to correctly connect the internal drive cables to the installed drive.
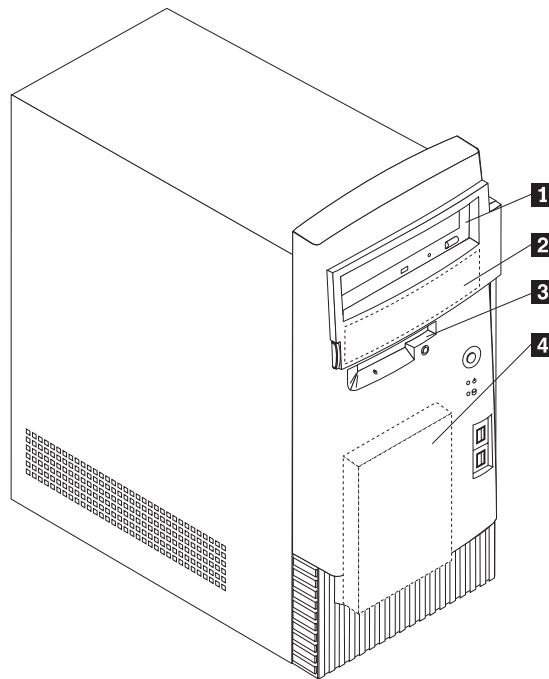
Drive specifications

Your computer comes with the following IBM-installed drives:

- A CD drive or DVD drive in bay 1 (some models).
- A 3.5-inch diskette drive in bay 3.
- A 3.5-inch hard disk drive in bay 4.

Models that do not have drives installed in bays 1 and 2 have a static shield and bay panel installed.

The following illustration shows the locations of the drive bays.

The following table describes some of the drives you can install in each bay and their height requirements.

1	**Bay 1** - **Max Height: 41.3 mm (1.6 in.)**	CD-ROM drive (standard in some models) 5.25-inch hard disk drive
2	**Bay 2** - **Max Height: 41.3 mm (1.6 in.)**	5.25-inch hard disk drive 3.5-inch hard disk drive (requires a mounting bracket) CD-ROM drive DVD-ROM drive
3	**Bay 3** - **Max Height: 25.4 mm (1.0 in.)**	3.5-inch diskette drive (preinstalled)
4	**Bay 4** - **Max Height: 25.4 mm (1.0 in.)**	Hard disk drive (preinstalled)

Notes:

1. Drives that are greater than 41.3 mm (1.6 in.) high cannot be installed.
2. Install removable media (tape or CD) drives in the accessible bays: bays 1 or 2.

Power and signal cables for internal drives

Your computer uses cables to connect integrated drive electronics (IDE) drives to the power supply and to the system board. The following cables are provided:

- Four-wire *power cables* connect most drives to the power supply. At the end of these cables are plastic connectors that attach to different drives; these connectors vary in size. Also, certain power cables attach to the system board.
- Flat *signal cables*, also called *ribbon cables*, connect IDE and diskette drives to the system board. There are two sizes of ribbon signal cables that come with your computer:
  - The wider signal cable has two or three connectors.
    - If the cable has three connectors, one of these connectors is attached to the drive, one is a spare, and the third attaches to the primary or secondary IDE connector on the system board.

- If the cable has two connectors, one of these connectors is attached to the hard disk drive, and the other attaches to the primary or secondary IDE connector on the system board.

  Note: If you want to add another device, and your computer does not come with a CD drive or DVD drive preinstalled, you will need a second signal cable with three connectors. You will need an 80-conductor ATA 100 signal cable if you are replacing the existing signal cable or adding a second hard disk. ATA 100 signal cables are color-coded. The blue connector attaches to the system board, the black connector attaches to the master device, and the gray middle connector attaches to the secondary (or slave) device.

  If your computer comes with a CD drive or DVD drive, it will have an ATA 100 signal cable. However, if you are installing a hard disk drive, you must change the switch or jumper setting on the CD drive or DVD drive to secondary and change the connector used for the CD drive or DVD drive to the gray middle connector.

  – The narrower signal cable has two connectors for attaching the diskette drive to the diskette-drive connector on the system board.

Note: To locate connectors on the system board, see "Identifying parts on the system board" on page 56.

The following are some important points to remember when connecting power and signal cables to internal drives:

- The drives that are preinstalled in your computer come with power and signal cables attached. If you replace any drives, it is important to remember which cable is attached to which drive.
- When you install a drive, ensure that the drive connector at the *end* of the signal cable is always connected to a drive; also, ensure that the drive connector at the other end is connected to the system board. This reduces electronic noise from the computer.
- If two IDE devices are used on a single cable, one must be designated as the primary or master device and the other as the secondary or slave device; otherwise, some of the IDE devices might not be recognized by the system. The primary or secondary designation is determined by switch or jumper settings on each IDE device.
- If two IDE devices are on a single cable, and only one is a hard disk drive, the hard disk drive must be set as the master device.
- If you have only one IDE device on a cable, it must be set as master.

For help in selecting drives, cables, and other options for your computer, see page 9.

Installing internal drives

To install an internal drive:

1. Remove the cover (see "Removing the cover" on page 53).

   Note: If your computer has a CD drive or DVD drive, you might need to remove the signal and power cables from the drive.

2. Remove the bay panel and insert a flat–bladed screwdriver into one of the slots on the static shield in the drive bay into which you are installing the drive and

gently pry the static shield loose from the drive bay.

3. Install the drive into the bay. Align the screw holes and insert the two screws.

4. If the drive you installed is a removable-media drive, place the bezel frame that comes with your computer over the drive bay.

5. Connect the power and signal cables to the drive.

> **What to do next**
>
> - To work with another option, go to the appropriate section.
> - To complete the installation, go to "Replacing the cover and connecting the cables" on page 65.

Installing a security U-bolt

To help prevent hardware theft, you can add a security U-bolt and cable to your computer. After you add the security cable, make sure that it does not interfere with other cables that are connected to the computer.
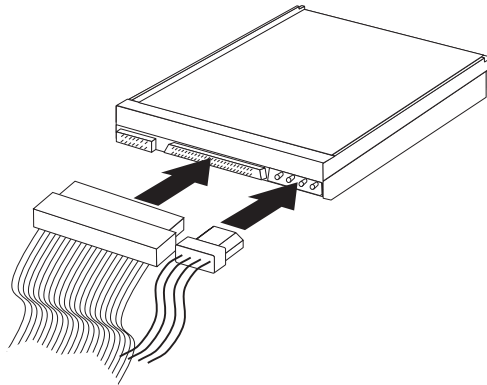
To install a U-bolt:

1. Remove the cover (see "Removing the cover" on page 53).
2. Use a tool, such as a screwdriver, to remove the two metal knockouts.
3. Insert the U-bolt through the rear panel; then attach and tighten the nuts with an appropriately sized or adjustable wrench.
4. Replace the computer cover. For more information, see "Replacing the cover and connecting the cables" on page 65.

5. Thread the cable through the U-bolt and around an object that is not a part of or permanently secured to the building structure or foundation, and from which it cannot be removed; then fasten the cable ends together with a lock.
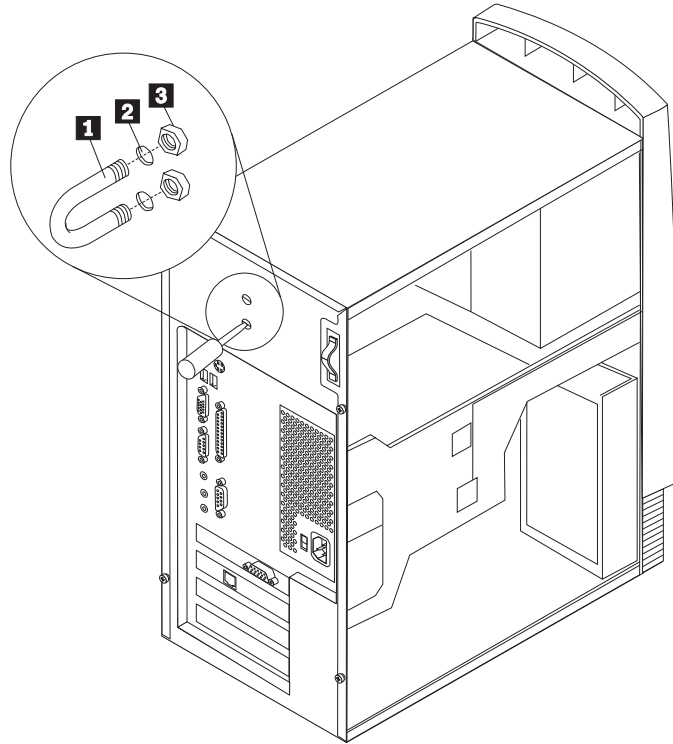
1 U-bolt
2 Bolt holes
3 Nuts

Replacing the cover and connecting the cables

After working with options, you need to install any removed parts, replace the cover, and reconnect any cables, including power cords and telephone lines. Also, depending on the option installed, you might need to confirm the updated information in the Configuration/Setup Utility program.

To replace the cover and connect cables to your computer:
1. Ensure that all components have been reassembled correctly and that no tools or loose screws are left inside your computer.
2. Clear any cables that might impede the replacement of the cover.

3. Position the cover over the chassis so that the front edge is approximately one inch away from the front bezel.
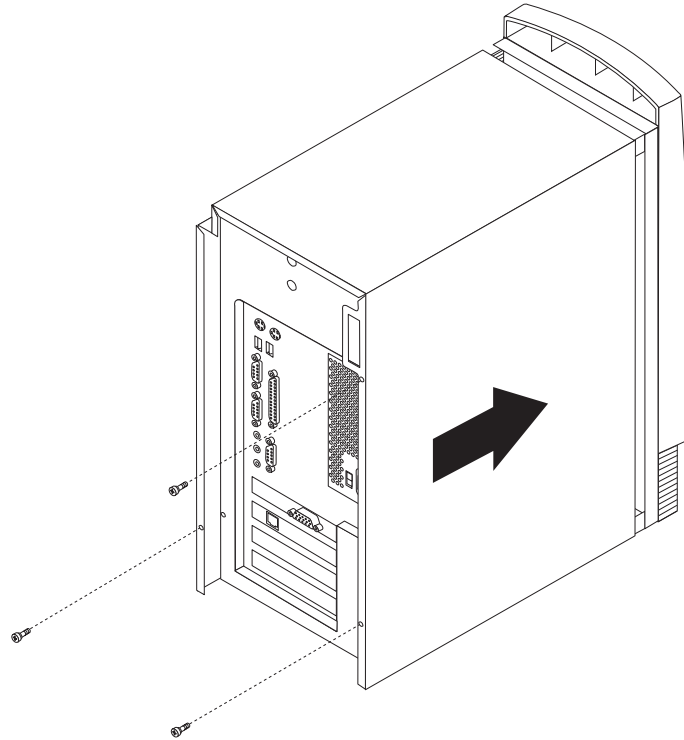
4. Lower the cover down over the chassis so that the rail guides engage the rails.
5. Slide the cover forward. You might need to lift the front of the cover slightly to align it properly.
6. Insert the three thumbscrews into the holes in the cover and the chassis and tighten.
7. Reconnect the external cables and cords to the computer. See "Chapter 2. Installing external options" on page 11.
8. To update the configuration, see "Chapter 6. Updating the computer configuration" on page 67.
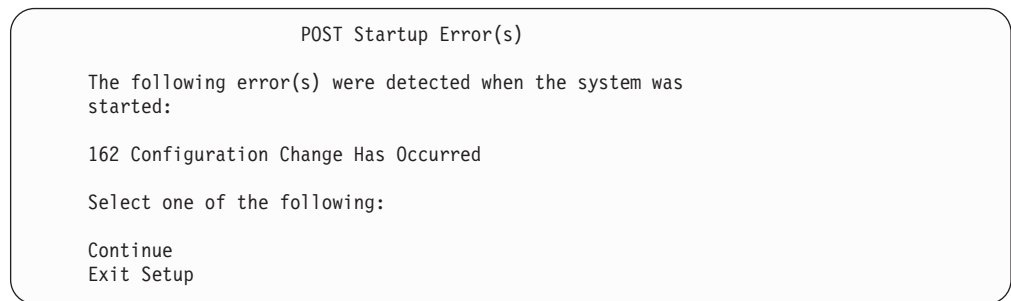
> **Important:**
> When the power cord is first plugged in, the computer might appear to power on for a few seconds, then power off. This is a normal sequence to enable the computer to self-initialize.

Chapter 6. Updating the computer configuration

This chapter includes information about updating configuration settings, installing device drivers (if required, after a new option has been installed), and erasing a lost or forgotten password. For more information about using the Configuration/Setup Utility Program, see Access IBM.

After adding options, the configuration settings must be updated. In most cases, this configuration update is performed automatically.

In some cases, when you start your computer after installing an option, a message similar to the following might be displayed.

```
                      POST Startup Error(s)

    The following error(s) were detected when the system was
    started:

    162 Configuration Change Has Occurred

    Select one of the following:

    Continue
    Exit Setup
```

If this message is displayed, select **Continue** and press Enter. The Configuration/Setup Utility program automatically starts. From the Configuration/Setup Utility program menu, do the following:
1. Select **Save Settings** and press Enter.
2. Select **Exit Setup** and press Enter.

The computer will restart.

The Windows operating system will usually detect the new option, update the configuration information, and prompt you for device drivers, if required. Before installing any device drivers, always check the documentation provided with your option for specific instructions. Not all device drivers install in the same way. Some options might also require you to install other software.

Verifying that an option is installed correctly

To verify if a new adapter or drive is correctly installed and configured, do the following:

1. From the Windows desktop, use the right mouse button to click **My Computer**; then, click **Properties**.
2. In the System Properties window, click the **Device Manager** tab.
3. Click **View devices by type**.
4. Click the plus sign next to each of the device types to expand the list.
   - If neither an X nor a circled exclamation point appears over any of the icons, all devices are working properly.
   - An X over an icon indicates that the device is disabled. A circled exclamation point over an icon indicates a resource conflict. If an X or a circled exclamation point appears over an icon, click **Properties** to learn more about the source of the problem.
   - If the device is not listed, it might not be physically installed correctly. Make sure the option is installed according to instructions, all cables and connections are secure, and any jumper or switch settings are correct.
   - If the device is listed under Other devices, a required device driver is either missing or installed incorrectly, or the operating system was not restarted after the device driver was installed. Restart the computer and recheck the device again. If it is still listed under Other devices, refer to the documentation that comes with the option and reinstall the device driver.

Note: For further information, refer to your *Microsoft Operating System's* manual.

Configuring PCI adapters

Along with the documentation that comes with your adapter, use the following information to help with adapter configuration.

PCI adapters generally require no user configuration. The computer and operating system work together to automatically manage the resources required by each device installed in the computer and to assign resources to new devices in a manner that avoids system conflicts. However, two conditions might require you to change some settings in the Configuration/Setup Utility program:

- Parity checking
  Some PCI adapters do not support parity checking (check the documentation that comes with your adapter). If you install a PCI adapter that does not support parity checking, you might need to disable parity checking on the PCI bus. To disable parity checking:
  1. Start the Configuration/Setup Utility program (see Access IBM).
  2. From the Configuration/Setup Utility program menu, select **Advanced Setup** and press Enter.
  3. Select **PCI Control** and press Enter.
  4. Use the arrow keys to set the PCI Parity setting to **Disabled**.
  5. Press Esc until you return to the Configuration/Setup Utility program menu.
  6. Before you exit from the program, select **Save Settings** from the Configuration/Setup Utility program menu and press Enter.
  7. To exit from the Configuration/Setup Utility program, press Esc and follow the instructions on the screen.

- Automatic power on
  If you install a PCI adapter that supports an automatic power-on function, you can enable the power-on function through the Configuration/Setup Utility program. When the automatic power-on function is enabled, the computer can be started remotely through a network or through the telephone lines, depending on the type of adapter installed. An example of this type of adapter is a modem that supports the ring-detection function. To enable the PCI Wakeup function:

  1. Start the Configuration/Setup Utility program (see Access IBM).

  2. From the Configuration/Setup Utility program menu, select **Power Management**and press Enter.

  3. Select **Automatic Power On** and press Enter.

  4. In the PCI Wakeup line or the PCI MODEM Ring detect line (depending on the type of device), use the arrow keys to set the setting to **Enabled**. Then, in the corresponding Startup Sequence line, select either **Primary** (for primary power-on sequence) or **Automatic** (for automatic power-on sequence). For an explanation of the power-on sequence, see Access IBM.

  5. Press Esc until you return to the Configuration/Setup Utility program menu.

  6. Before you exit from the program, select **Save Settings** from the Configuration/SetupUtility program menu and press Enter.

  7. To exit from the Configuration/Setup Utility program, press Esc and follow the instructions on the screen.

Configuring startup devices

When your computer is turned on, it looks for an operating system. The order in which it searches devices for the operating system is the *startup sequence*. After adding new devices to the computer, you might want to change the startup sequence. You can use the Configuration/Setup Utility program to configure startup devices. For more information, see Access IBM.

Erasing a lost or forgotten password (clearing CMOS)

This section applies to lost or forgotten passwords that are not protected by Enhanced Security. For information about lost or forgotten passwords that are protected by Enhanced Security, see "Appendix A. Using Enhanced Security" on page 71.

To erase a forgotten password:

1. Turn off the computer and all attached devices.

2. Unplug the power cord.

3. Remove the cover. See "Removing the cover" on page 21 (desktop model), "Removing the cover" on page 35 (minitower model), or "Removing the cover" on page 53 (microtower model).

4. Refer to the system board label inside the computer to locate the clear CMOS jumper on the system board.

5. Set the jumper from the standard position (pins 1 and 2) to pins 2 and 3.

6. Replace the cover and plug in the power cord. See "Replacing the cover and connecting the cables" on page 32 (desktop model), "Replacing the cover and connecting the cables" on page 51 (minitower model), or "Replacing the cover and connecting the cables" on page 65 (microtower model).

7. Restart the computer, leave it on for about ten seconds, and then turn off the computer.

8. Repeat steps 2 through 4 on page 69.

9. Set the jumper back to the standard position (pins 1 and 2).

10. Replace the cover and plug in the power cord. See "Replacing the cover and connecting the cables" on page 32 desktop model), "Replacing the cover and connecting the cables" on page 51 (minitower model), or "Replacing the cover and connecting the cables" on page 65 (microtower model).

Appendix A. Using Enhanced Security

Note: The following Enhanced Security information is for the A40p model only.

Enhanced Security can be enabled or disabled only when you update system programs.

If Enhanced Security is enabled and you have not set an administrator password, your computer will operate as though enhanced security is disabled.

If Enhanced Security is enabled and you have set an administrator password, your computer will operate as follows:

- The contents of the security EEPROM (your administrator password and startup sequence) will be protected from failure of the battery and CMOS memory.
- The security EEPROM will be protected from unauthorized access because it locks after your computer is turned on and the system programs have completed their startup routine. Once it is locked, the security EEPROM cannot be read from or written to by any software application or system software until the computer is turned off and back on again. On a network, this might prevent certain functions from being performed remotely on your computer.

  Enhanced Security adds a *hard lock* for an extra measure of protection for the system programs in your computer. Normally, the entire contents of the system programs EEPROM is write protected with a *soft lock*. A soft lock enables the Remote Administration program to function in a network environment. With a hard lock, when your computer is turned on and the system programs startup routine is completed, Remote Administration is locked and cannot be unlocked until the computer is restarted and the administrator password is entered. Note that, in a networking environment, this prevents the system programs in your computer from being updated remotely. Someone must be present at your computer to turn it on and off and enter the administrator password.

- Some models have a chassis-intrusion feature that will alert you if the cover of your computer has been opened. This feature will work if your computer is on or off. If the cover has been opened, a prompt for your administrator password will appear on your screen, and your computer will remain in a suspended state until your administrator password is entered.
- Configuration settings cannot be changed in the Configuration/Setup Utility program until you enter the administrator password. This means that any changes to the computer hardware that the system programs detect will generate a configuration error until you enter the administrator password.

To enable or disable Enhanced Security:

1. Update the system programs. See "Appendix C. Updating System Programs" on page 75.
2. When updating system programs, you are given the option of enabling or disabling Enhanced Security. Your choice is automatically recorded in the System Security menu of the Configuration/Setup Utility program.

> **Important**
>
> When enhanced security is enabled, it is vital that you keep a record of your administrator password in a secure place. If you forget or lose the administrator password, the system board in your computer must be replaced in order to regain access to the Configuration/Setup Utility program.
>
> For more information about Enhanced Security and the other security features of your computer, see Access IBM.

Appendix B. Changing the battery

Your computer has a special type of memory that maintains the date, time, and settings for built-in features, such as serial- and parallel-port assignments (configuration). A battery keeps this information active when you turn off the computer.

The battery requires no charging or maintenance throughout its life; however, no battery lasts forever. If the battery fails, the date, time, and configuration information (including passwords) are lost. An error message is displayed when you turn on the computer.

Refer to "Lithium battery notice" on page vi"Lithium battery notice" on page vii for information about replacing and disposing of the battery.

To change the battery:
1. Turn off the computer and all attached devices.
2. Unplug the power cord and remove the cover. See "Removing the cover" on page 21 (desktop model), "Removing the cover" on page 35 (minitower model), or "Removing the cover" on page 53 (microtower model).
3. Locate the battery. Refer to the system board label inside your computer or see "Identifying parts on the system board" on page 22 (desktop model),"Identifying parts on the system board" on page 22 (minitower model), or "Identifying parts on the system board" on page 56 (microtower model).
4. If necessary, remove any adapters that impede access to the battery. See "Installing adapters" on page 26 (desktop model), "Installing adapters" on page 41 (minitower model), or "Installing adapters" on page 59 (microtower) for more information.
5. Remove the old battery.
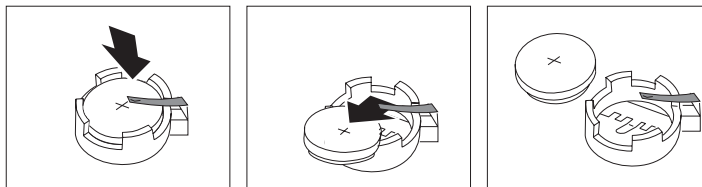
6. Install the new battery.
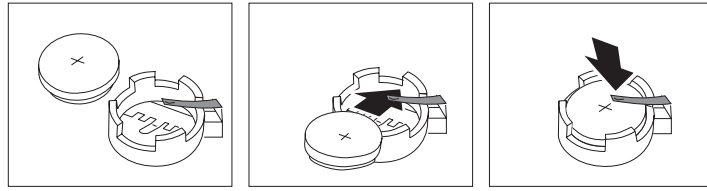
7. Replace any adapters that were removed to gain access to the battery. See "Installing adapters" on page 26 (desktop model), "Installing adapters" on page 41 (minitower model), or "Installing adapters" on page 59 (microtower model) for instructions for replacing adapters.

8. Replace the cover and plug in the power cord. See "Replacing the cover and connecting the cables" on page 32 (desktop model), "Replacing the cover and connecting the cables" on page 51 (minitower model), or "Replacing the cover and connecting the cables" on page 65 (microtower model) and the *Quick Reference*.

   Note: When the computer is turned on for the first time after battery replacement, an error message might be displayed. This is normal after replacing the battery.

9. Turn on the computer and all attached devices.

10. Use the Configuration/Setup Utility program to set the date and time and any passwords.

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

Appendix C. Updating System Programs

The following contains information about updating system programs (POST/BIOS) and how to recover from a POST/BIOS update failure.

System programs

System programs are the basic layer of software built into your computer. They include the power-on self-test (POST), the basic input/output system (BIOS) code, and the Configuration/Setup Utility program. POST is a set of tests and procedures that is performed each time you turn on your computer. BIOS is a layer of software that translates instructions from other layers of software into electrical signals that the computer hardware can understand. You can use the Configuration/Setup Utility program to view and change the configuration and setup of your computer.

Your computer system board has a module called *electrically erasable programmable read-only memory* (EEPROM, also referred to as *flash memory*). You can easily update POST, BIOS, and the Configuration/Setup Utility program by starting your computer using a flash update diskette or by using the Remote Administration feature, if it is enabled.

IBM might make changes and enhancements to the system programs. When updates are released, they are available as downloadable files on the World Wide Web (see *Quick Reference*). Instructions for using the system programs updates are available in a README file included in the update files.

To update system programs (flash the EEPROM):
1. Insert a system programs update (flash) diskette into the diskette drive (drive A) in your computer. System programs updates are available at http://www.ibm.com/pc/support/ on the World Wide Web.
2. Turn on the computer. If it is on already, you must turn it off and back on again. The update begins.

Recovering from a POST/BIOS update failure

If power to your computer is interrupted while POST/BIOS is being updated (flash update), your computer might not restart correctly. If this happens, perform the following procedure to recover:
1. Turn off the computer and any attached devices, such as printers, monitors, and external drives.
2. Unplug all power cords from electrical outlets and remove the cover. See "Removing the cover" on page 21 (desktop model), "Removing the cover" on page 35 (minitower model), or "Removing the cover" on page 53 (microtower model).
3. Locate the Clear CMOS/recovery jumper on the system board, removing any adapters that impede access to the jumper. See the system board label inside your computer for the location of the jumper. See also "Identifying parts on the system board" on page 22 (desktop model), "Identifying parts on the system board" on page 36 (minitower model), or "Identifying parts on the system board" on page 56 (microtower model).

4. Move the jumper to the adjacent pair of jumper pins.

5. Replace any adapters that were removed and replace the cover. See "Replacing the cover and connecting the cables" on page 32 (desktop model), "Replacing the cover and connecting the cables" on page 51 (minitower model), or "Replacing the cover and connecting the cables" on page 65 (microtower model).

6. Reconnect the power cords for the computer and monitor to electrical outlets.

7. Insert the POST/BIOS update (flash) diskette into drive A: and turn on the computer and the monitor.

8. After the update session completes, remove the diskette from the diskette drive and turn off the computer and monitor.

9. Unplug the power cords from electrical outlets.

10. Remove the cover. See "Removing the cover" on page 21 (desktop model), "Removing the cover" on page 35 (minitower model), or "Removing the cover" on page 53 (microtower model).

11. Remove any adapters that impede access to the BIOS Configuration jumper.

12. Move the Clear CMOS/recovery jumper to its original position.

13. Replace any adapters that were removed.

14. Install the cover and reconnect any cables that were disconnected.

15. Turn on the computer to restart the operating system.

Appendix D. System address maps

The following charts represent how the hard disk stores different types of information. Address ranges and byte sizes are approximate.

System memory map

The first 640 KB of system board RAM is mapped starting at address hex 00000000. A 256 byte area and a 1 KB area of this RAM are reserved for BIOS data. Memory can be mapped differently if POST detects an error.

Table 1. System memory map

Address range (decimal)	Address range (hex)	Size	Description
0 K – 512 KB	00000 – 7FFFF	512 KB	Conventional
512 K – 639 KB	80000 – 9FBFF	127 KB	Extended conventional
639 K – 640 KB	9FC00 – 9FFFF	1 KB	Extended BIOS data
640 K – 767 KB	A0000 – BFFFF	128 KB	Dynamic video memory display cache
768 K – 800 KB	C0000 – C7FFF	32 KB	Video ROM BIOS (shadowed)
800 K – 896 KB	C8000 – DFFFF	96 KB	PCI space, available to adapter ROMs
896 K – 1 MB	E0000 – FFFFF	128 KB	System ROM BIOS (main memory shadowed)
1 MB – 16 MB	1000000 – FFFFFF	15 MB	PCI space
16 MB – 4096 MB	10000000 – FFDFFFFF	4080 MB	PCI space (positive decode)
	FFFE0000 – FFFFFFFF	128 KB	System ROM BIOS

I/O address map

The following table lists resource assignments for the I/O address map. Any addresses that are not shown are reserved.

Table 2. I/O address map

Address (hex)	Size (bytes)	Description
0000 – 000F	16	DMA 1
0010 – 001F	16	General I/O locations, available to PCI bus
0020 – 0021	2	Interrupt controller 1
0022 – 003F	30	General I/0 locations, available to PCI bus
0040 – 0043	4	Counter/timer 1
0044 – 00FF	28	General I/O locations, available to PCI bus
0060	1	Keyboard controller byte, reset IRQ
0061	1	System port B
0064	1	Keyboard controller, CMD/ATAT byte
0070, bit 7	1 bit	Enable NMI
0070, bits 6:0	6 bits	Real-time clock, address
0071	1	Real-time clock, data

Table 2. I/O address map (continued)

Address (hex)	Size (bytes)	Description
0072	1 bit	Enable NMI
0072, bits 6:0	6 bits	RTC address
0073	1	RTC data
0080	1	POST checkpoint register during POST only
008F	1	Refresh page register
0080 – 008F	16	DMA page registers
0090 – 0091	15	General I/O locations, available to PCI bus
0092	1	PS/2 keyboard controller registers
0093 – 009F	15	General I/O locations
00A0 – 00A1	2	Interrupt controller 2
00A2 – 00BF	30	APM control
00C0 – 00DF	31	DMA 2
00E0 – 00EF	16	General I/O locations, available to PCI bus
00F0	1	Coprocessor error register
00F1 – 016F	127	General I/O locations, available to PCI bus
0170 – 0177	8	Secondary IDE channel
01F0 – 01F7	8	Primary IDE channel
0200 – 0207	8	MIDI/joystick port
0220 – 0227	8	Serial port 3 or 4
0228 – 0277	80	General I/O locations, available to PCI bus
0278 – 027F	8	LPT3
0280 – 02E7	102	Available
02E8 – 02EF	8	Serial port 3 or 4
02F8 – 02FF	8	COM2
0338 – 033F	8	Serial port 3 or 4
0340 – 036F	48	Available
0370 – 0371	2	IDE channel 1 command
0378 – 037F	8	LPT2
0380 – 03B3	52	Available
03B4 – 03B7	4	Video
03BA	1	Video
03BC – 03BE	16	LPT1
03C0 – 03CF	52	Video
03D4 – 03D7	16	Video
03DA	1	Video
03D0 – 03DF	11	Available
03E0 – 03E7	8	Available
03E8 – 03EF	8	COM3 or COM4
03F0 – 03F5	6	Diskette channel 1
03F6	1	Primary IDE channel command port

Table 2. I/O address map (continued)

Address (hex)	Size (bytes)	Description
03F7 (Write)	1	Diskette channel 1 command
03F7, bit 7	1 bit	Diskette disk change channel
03F7, bits 6:0	7 bits	Primary IDE channel status port
03F8 – 03FF	8	COM1
0400 – 047F	128	Available
0480 – 048F	16	DMA channel high page registers
0490 – 0CF7	1912	Available
0CF8 – 0CFB	4	PCI configuration address register
0CFC – 0CFF	4	PCI configuration data register
LPTn + 400h	8	ECP port, LPTn base address + hex 400
OCF9	1	Turbo and reset control register
0D00 – FFFF	62207	Available

DMA I/O address map

The following table lists resource assignments for the DMA address map. Any addresses that are not shown are reserved.

Table 3. DMA I/O address map

Address (hex)	Description	Bits	Byte pointer
0000	Channel 0, memory address register	00 – 15	Yes
0001	Channel 0, transfer count register	00 – 15	Yes
0002	Channel 1, memory address register	00 – 15	Yes
0003	Channel 1, transfer count register	00 – 15	Yes
0004	Channel 2, memory address register	00 – 15	Yes
0005	Channel 2, transfer count register	00 – 15	Yes
0006	Channel 3, memory address register	00 – 15	Yes
0007	Channel 3, transfer count register	00 – 15	Yes
0008	Channels 0–3, read status/write command register	00 – 07	
0009	Channels 0–3, write request register	00 – 02	
000A	Channels 0–3, write single mas register bits	00 – 02	
000B	Channels 0–3, mode register (write)	00 – 07	
000C	Channels 0–3, clear byte pointer (write)	A	
000D	Channels 0–3, master clear (write)/temp (read)	00 – 07	
000E	Channels 0-3, clear mask register (write)	00 – 03	
000F	Channels 0-3, write all mask register bits	00 – 03	
0081	Channel 2, page table address register	00 – 07	
0082	Channel 3, page table address register	00 – 07	
0083	Channel 1, page table address register	00 – 07	
0087	Channel 0, page table address register	00 – 07	

Table 3. DMA I/O address map (continued)

Address (hex)	Description	Bits	Byte pointer
0089	Channel 6, page table address register	00 – 07	
008A	Channel 7, page table address register	00 – 07	
008B	Channel 5, page table address register	00 – 07	
008F	Channel 4, page table address/refresh register	00 – 07	
00C0	Channel 4, memory address register	00 – 15	Yes
00C2	Channel 4, transfer count register	00 – 15	Yes
00C4	Channel 5, memory address register	00 – 15	Yes
00C6	Channel 5, transfer count register	00 – 15	Yes
00C8	Channel 6, memory address register	00 – 15	Yes
00CA	Channel 6, transfer count register	00 – 15	Yes
00CC	Channel 7, memory address register	00 – 15	Yes
00CE	Channel 7, transfer count register	00 – 15	Yes
00D0	Channels 4–7, read status/write command register	00 – 07	
00D2	Channels 4–7, write request register	00 – 02	
00D4	Channels 4–7, write single mask register bit	00 – 02	
00D6	Channels 4–7, mode register (write)	00 – 07	
00D8	Channels 4–7, clear byte pointer (write)		
00DA	Channels 4–7, master clear (write)/temp (read)	00 – 07	
00DC	Channels 4–7, clear mask register (write)	00 – 03	
00DE	Channels 4–7, write all mask register bits	00 – 03	
00DF	Channels 5–7, 8- or 16-bit mode select	00 – 07	

Appendix E. Interrupt request and direct memory access channel assignments

The following tables list the IRQ and DMA channel assignments.

Table 4. IRQ channel assignments

IRQ	System resource
NMI	Critical system error
SMI	System-management interrupt for power management
0	Timer
1	Keyboard
2	Cascade interrupt from slave PIC
3	COM2 (some models only)
4	COM1
5	LPT2/audio (if present)
6	Diskette controller
7	LPT1
8	Real-time clock
9	Video, ACPI
10	MIDI/joystick (some models only)
11	Available to user
12	Mouse port
13	Math coprocessor
14	Primary IDE (if present)
15	Secondary IDE (if present)

Note: The default settings for COM 1 (IRQ 4), COM 2 (IRQ 3), and LPT 1 (IRQ 7) can be changed to another IRQ.

Table 5. DMA channel assignments

DMA channel	Data width	System resource
0	8 bits	Open
1	8 bits	Open
2	8 bits	Diskette drive
3	8 bits	Parallel port (for ECP or EPP)
4		Reserved (cascade channel)
5	16 bits	Open
6	16 bits	Open
7	16 bits	Open

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