



## User Guide

Type 2292, 6343, 6349, 6350

Type 6790, 6791, 6792, 6793, 6794, 6795

Type 6823, 6825





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Type 2292, 6343, 6349, 6350

Type 6790, 6791, 6792, 6793, 6794, 6795

Type 6823, 6825

**Note**

Before using this information and the product it supports, be sure to read the "Safety Information" on page v and "Appendix E. Notices and trademarks" on page 69.

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# Contents

<b>Safety Information</b> . . . . .	<b>v</b>
Lithium battery notice . . . . .	vi
Modem safety information . . . . .	vi
Laser compliance statement . . . . .	vii

<b>About this book</b> . . . . .	<b>ix</b>
How this book is organized . . . . .	ix
Information resources . . . . .	x

<b>Chapter 1. Overview</b> . . . . .	<b>1</b>
Identifying your computer. . . . .	1
Small desktop model computer . . . . .	2
Desktop model computer . . . . .	2
Microtower model computer . . . . .	2
Features . . . . .	3
Specifications . . . . .	5
Physical specifications — small desktop model . . . . .	5
Physical specifications — desktop model . . . . .	6
Physical specifications — microtower model. . . . .	7
Available options . . . . .	8
Tools required . . . . .	8
Handling static-sensitive devices. . . . .	8

<b>Chapter 2. Installing external options</b> . . . . .	<b>11</b>
Locating the connectors on the front of your computer . . . . .	11
Locating the connectors on the rear of your computer . . . . .	13
Obtaining device drivers . . . . .	16

<b>Chapter 3. Installing internal options — small desktop model.</b> . . . . .	<b>17</b>
Removing the cover . . . . .	17
Locating components . . . . .	18
Identifying parts on the system board . . . . .	18
Installing memory . . . . .	19
Installing DIMMs . . . . .	19
Installing adapters . . . . .	20
Installing internal drives . . . . .	23
Drive specifications. . . . .	23
Installing a drive . . . . .	24
Installing a Rope Clip . . . . .	25
Replacing the cover and connecting the cables. . . . .	26

<b>Chapter 4. Installing internal options — desktop model</b> . . . . .	<b>29</b>
Removing the cover . . . . .	29
Locating components . . . . .	30
Identifying parts on the system board . . . . .	30
Installing memory . . . . .	31
Installing DIMMs . . . . .	31
Installing adapters . . . . .	32
Installing internal drives . . . . .	33
Drive specifications. . . . .	34

Installing a drive . . . . .	35
Installing a Rope Clip . . . . .	37
Replacing the cover and connecting the cables. . . . .	38

<b>Chapter 5. Installing internal options — microtower model</b> . . . . .	<b>41</b>
Removing the cover . . . . .	41
Locating components . . . . .	42
Moving the power supply . . . . .	42
Identifying parts on the system board . . . . .	43
Installing memory . . . . .	44
Installing DIMMs . . . . .	44
Installing adapters . . . . .	45
Installing internal drives . . . . .	47
Drive specifications. . . . .	47
Installing a drive . . . . .	48
Installing a Rope Clip . . . . .	51
Replacing the cover and connecting the cables. . . . .	52

<b>Chapter 6. Using the IBM Setup Utility program</b> . . . . .	<b>55</b>
Starting the IBM Setup Utility program . . . . .	55
Viewing and changing settings . . . . .	55
Exiting from the IBM Setup Utility program . . . . .	55
Using passwords . . . . .	55
User password . . . . .	55
Administrator password . . . . .	56
Setting, changing, and deleting a password. . . . .	56
Erasing a lost or forgotten password (clearing CMOS) . . . . .	56
Using Security Profile by Device . . . . .	57
Other settings in the IBM Setup Utility program . . . . .	57
The startup sequence . . . . .	57
Changing the startup sequence. . . . .	57

<b>Appendix A. Changing the battery</b> . . . . .	<b>59</b>
---	-----------

<b>Appendix B. Updating System Programs</b> . . . . .	<b>61</b>
System programs . . . . .	61
Recovering from a POST/BIOS update failure. . . . .	61

<b>Appendix C. System address maps</b> . . . . .	<b>63</b>
System memory map . . . . .	63
I/O address map . . . . .	63
DMA I/O address map . . . . .	65

<b>Appendix D. Interrupt request and direct memory access channel assignments</b> . . . . .	<b>67</b>
---	-----------

<b>Appendix E. Notices and trademarks</b> . . . . .	<b>69</b>
Television output notice . . . . .	69

Trademarks . . . . . 70

**Index . . . . . 71**

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## 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

réseaux, aux systèmes de télécommunication 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.	

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## 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.

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## 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.

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## 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**

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

**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 États-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:

**DANGER**

**Rayonnement laser lorsque le carter est ouvert. Évitez toute exposition directe des yeux au rayon laser. Évitez de regarder fixement le faisceau ou de l'observer à l'aide d'instruments optiques.**

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## About this book

This publication provides instructions for installing most options into your computer. This publication also includes an overview of computer features, locating connectors, and updating configuration settings.

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## How this book is organized

This book contains the following chapters and appendixes:

- “Chapter 1. Overview” provides an introduction to the computer specifications and the options that are 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 — small desktop model” provides instructions for removing the cover and installing hard disk drives, memory, and adapters in your computer.
- “Chapter 4. Installing internal options — desktop model” provides instructions for removing the cover and installing hard disk drives, memory, and adapters in your computer.
- “Chapter 5. Installing internal options — microtower model” provides instructions for removing the cover and installing hard disk drives, memory, and adapters in your computer.
- “Chapter 6. Using the IBM Setup Utility program” provides instructions for updating the computer configuration, using passwords, and changing the startup sequence.
- “Appendix A. Changing the battery” provides instructions to help you change the battery.
- “Appendix B. Updating System Programs” provides instructions to help you update your system programs.
- “Appendix C. System address maps” provides information for programmers describing the address maps of the computer.
- “Appendix D. Interrupt request and direct memory access channel assignments” provides information about the interrupt and direct memory access channel assignments.
- “Appendix E. Notices and trademarks” contains notice and trademark information.

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## Information resources

The *Quick Reference* that comes with your computer provides information for installing your computer and starting the operating system. It also includes basic troubleshooting information, software recovery procedures, help and service information, and warranty information.

Access IBM provides a link to more information about your computer. Click **Start** → **Access IBM**.

If you have 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.pc.ibm.com/support>

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

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## Chapter 1. Overview

Thank you for selecting an IBM® computer. Your computer incorporates many of the latest advances in computer technology and can be upgraded as your needs change.

Adding hardware options to your 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.

Go to 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.

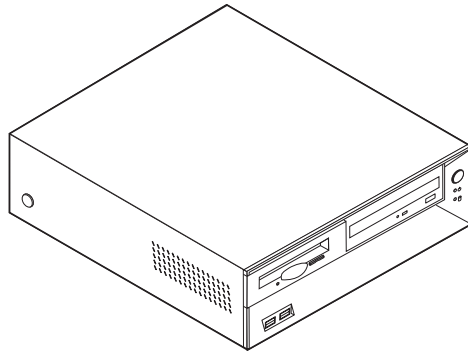
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### Identifying your computer

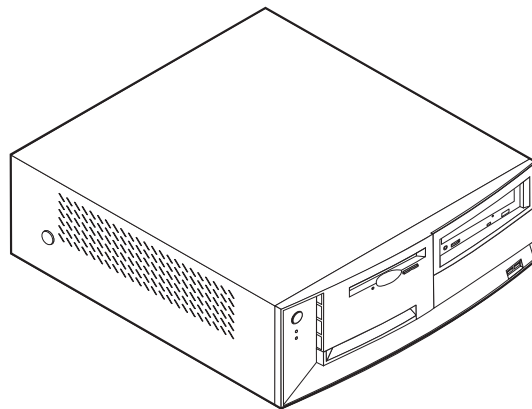
To properly install options, you will need to know the machine type/model of your computer. You can find this number on the small label on the front of your computer. An example of the machine type/model number is 6790xxx.

The information in this publication supports several computer types and models. The following illustrations will help you identify your computer.

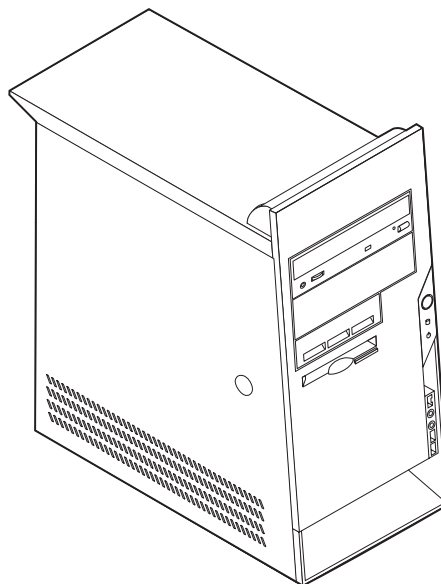
## Small desktop model computer



## Desktop model computer



## Microtower model computer



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## Features

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

### Microprocessor

Intel® Pentium™ 4 with 256 KB of internal L2 cache memory and Intel NetBurst™ micro-architecture

### Memory

- Support for three dual in-line memory modules (DIMMs) (some models)
- 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

### Video subsystem

AGP video adapter slot on the system board

### Audio subsystem

16-bit integrated Sound Blaster Pro compatible audio subsystem

### Connectivity

- 10/100 Mbps integrated Intel ethernet controller that supports the Wake on LAN® feature
- 56k V.90 data/fax PCI modem (some models)

### System management features (varies by model type)

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

### Input/output features

- 25-pin, Extended Capabilities Port (ECP)/Extended Parallel Port (EPP)
- Two 9-pin serial connectors
- Four 4-pin, USB connectors
- PS/2® mouse connector
- PS/2 keyboard connector
- RJ-45 Ethernet connector
- Monitor connector
- Three audio connectors (line in, line out, and microphone)
- IEEE 1394 connector (some models)

- Front connectors for microphone and headphone (some models)

### **Expansion**

- Drive bays
  - Small desktop model: Three
  - Desktop model: Four
  - Microtower model: Five
- 32-bit peripheral component interconnect (PCI) adapter slots
  - Small desktop model: Three (supports low profile adapters only)
  - Desktop model: Three
  - Microtower model: Three
- One accelerated graphics port (AGP) expansion slot (small desktop model supports low profile adapters)

### **Power**

- 160 W or 185 W power supply with manual voltage selection switch
- Automatic 50/60 Hz input frequency switching
- Advanced Power Management support
- Advanced Configuration and Power Interface (ACPI) support

### **Security features** (varies by model type)

- User and administrator passwords
- Support for the addition of a Rope Clip and lockable cable (varies by mechanical chassis)
- 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 it does, an operating system, device drivers to support built-in features, and other support programs are included.

### **Operating systems (supported)**

- Microsoft<sup>®</sup> Windows XP
- Microsoft Windows 2000
- Microsoft Windows NT<sup>®</sup> Workstation Version 4.0
- Microsoft Windows 98 Second Edition
- OS/2<sup>®</sup>

### **Operating systems (tested for compatibility)<sup>1</sup>**

- Linux

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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.



- PC DOS

## Specifications

This section lists the physical specifications for your computer.

### Physical specifications — small desktop model

<p><b>Dimensions</b></p> <p>Height: 104 mm (4.1 in.)  Width: 360 mm (14.2 in.)  Depth: 412 mm (16.2 in.)</p> <p><b>Weight</b></p> <p>Minimum configuration as shipped: 8.1 kg (18 lb)  Maximum configuration: 9.1 kg (20 lb)</p> <p><b>Environment</b></p> <p><b>Air temperature:</b></p> <p>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)  <b>Note:</b> 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.</p> <p><b>Humidity:</b></p> <p>System on: 8% to 80%  System off: 8% to 80%</p> <p><b>Electrical input</b></p> <p><b>Input voltage:</b></p> <p>Low range:</p> <p>Minimum: 90 V ac  Maximum: 137 V ac  Input frequency range: 57–63 Hz  Voltage switch setting: 115 V ac</p> <p>High range:</p> <p>Minimum: 180 V ac  Maximum: 265 V ac  Input frequency range: 47–53 Hz  Voltage switch setting: 230 V ac</p> <p><b>Input kilovolt-amperes (kVA) (approximate):</b></p> <p>Minimum configuration as shipped: 0.08 kVA  Maximum configuration: 0.30 kVA</p> <p><b>Note:</b> Power consumption and heat output vary depending on the number and type of optional features installed and the power-management optional features in use.</p>	<p><b>Heat output</b> (approximate) in British thermal units (Btu) per hour:</p> <p>Minimum configuration: 257 Btu/hr (75 watts)  Maximum configuration: 686 Btu/hr (200 watts)</p> <p><b>Airflow</b></p> <p>Approximately 0.45 cubic meters every three minutes (16 cubic feet every three minutes) maximum</p> <p><b>Acoustical noise-emission values</b></p> <p><b>Average sound-pressure levels:</b></p> <p>At operator position:</p> <p>Idle: 38 dBA  Operating: 43 dBA</p> <p>At bystander position - 1 meter (3.3 ft):</p> <p>Idle: 33 dBA  Operating: 37 dBA</p> <p><b>Declared (upper limit) sound-power levels:</b></p> <p>Idle: 3.75 bels  Operating: 4.99 bels</p> <p><b>Note:</b> 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.  <b>Note:</b> The computer is classified as a Class A or Class B digital device. See the <i>Quick Reference</i> for further information about this classification.</p>
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## Physical specifications — desktop model

<p><b>Dimensions</b></p> <p>Height: 140 mm (5.5 in.) Width: 425 mm (16.7 in.) Depth: 425 mm (16.7 in.)</p> <p><b>Weight</b></p> <p>Minimum configuration as shipped: 10.0 kg (22 lb) Maximum configuration: 11.4 kg (25.0 lb)</p> <p><b>Environment</b></p> <p>Air temperature:</p> <p>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) <b>Note:</b> 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.</p> <p>Humidity:</p> <p>System on: 8% to 80% System off: 8% to 80%</p> <p><b>Electrical input</b></p> <p>Input voltage:</p> <p>Low range:</p> <p>Minimum: 90 V ac Maximum: 137 V ac Input frequency range: 57–63 Hz Voltage switch setting: 115 V ac</p> <p>High range:</p> <p>Minimum: 180 V ac Maximum: 265 V ac Input frequency range: 47–53 Hz Voltage switch setting: 230 V ac</p> <p>Input kilovolt-amperes (kVA) (approximate):</p> <p>Minimum configuration as shipped: 0.08 kVA Maximum configuration: 0.3 kVA</p> <p><b>Note:</b> Power consumption and heat output vary depending on the number and type of optional features installed and the power-management optional features in use.</p>	<p><b>Heat output</b> (approximate) in British thermal units (Btu) per hour:</p> <p>Minimum configuration: 257 Btu/hr (75 watts) Maximum configuration: 789 Btu/hr (230 watts)</p> <p><b>Airflow</b></p> <p>Approximately 0.68 cubic meters every three minutes (24 cubic feet every three minutes) maximum</p> <p><b>Acoustical noise-emission values</b></p> <p>Average sound-pressure levels:</p> <p>At operator position:</p> <p>Idle: 38 dBA Operating: 43 dBA</p> <p>At bystander position - 1 meter (3.3 ft):</p> <p>Idle: 33 dBA Operating: 37 dBA</p> <p>Declared (upper limit) sound-power levels:</p> <p>Idle: 4.8 bels Operating: 5.1 bels</p> <p><b>Note:</b> 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. <b>Note:</b> The computer is classified as a Class A or Class B digital device. See the <i>Quick Reference</i> for further information about this classification.</p>
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## Physical specifications — microtower model

<p><b>Dimensions</b></p> <p>Height: 444.5 mm (17.5 in.)  Width: 165.1 mm (6.5 in.)  Depth: 497.8 mm (19.6 in.)</p> <p><b>Weight</b></p> <p>Minimum configuration as shipped: 9.1 kg (20 lb)  Maximum configuration: 10.2 kg (22.5 lb)</p> <p><b>Environment</b></p> <p>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)  <b>Note:</b> 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.</p> <p>Humidity:  System on: 8% to 80%  System off: 8% to 80%</p> <p><b>Electrical input</b></p> <p>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</p> <p>Input kilovolt-amperes (kVA) (approximate):  Minimum configuration as shipped: 0.08 kVA  Maximum configuration: 0.3 kVA</p> <p><b>Note:</b> Power consumption and heat output vary depending on the number and type of optional features installed and the power-management optional features in use.</p>	<p><b>Heat output</b> (approximate) in British thermal units (Btu) per hour:  Minimum configuration: 257 Btu/hr (75 watts)  Maximum configuration: 789 Btu/hr (230 watts)</p> <p><b>Airflow</b></p> <p>Approximately 0.79 cubic meters every three minutes (28 cubic feet every three minutes) maximum</p> <p><b>Acoustical noise-emission values</b></p> <p>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</p> <p>Declared (upper limit) sound-power levels:  Idle: 4.8 bels  Operating: 5.1 bels</p> <p><b>Note:</b> 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.  <b>Note:</b> The computer is classified as a Class A or Class B digital device. See the <i>Quick Reference</i> for further information about this classification.</p>
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## 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, joysticks, and scanners
  - Security device, such as a Rope Clip
  - Monitors
  - IEEE 1394 devices (requires an IEEE 1394 adapter)
  - SCSI devices (requires a SCSI adapter)
- Internal options
  - System memory, called dual in-line memory modules (DIMMs)
  - Adapters
    - Peripheral component interconnect (PCI) adapters
    - Accelerated graphics port (AGP) adapters
    - Small desktop models support low profile adapters only
  - Internal drives, such as:
    - CD drive or DVD drive
    - CD drive and 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.pc.ibm.com/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-IBM-4YOU.
- Outside the United States and Canada, contact your IBM reseller or IBM marketing representative.

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## Tools required

To install some options in your computer, you might need a flat-blade or a Phillips 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 device drivers that are required for the option.

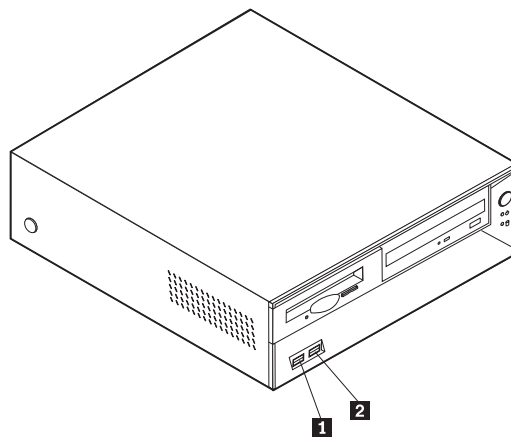
**Important**

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

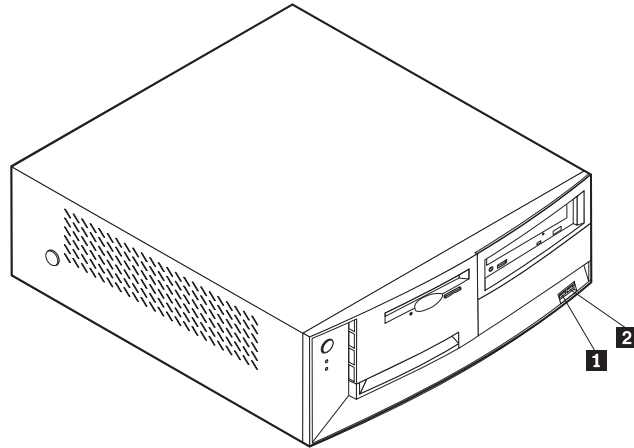
The following illustration shows the location of the connectors on the front of the small desktop computer.



**1** USB connector

**2** USB connector

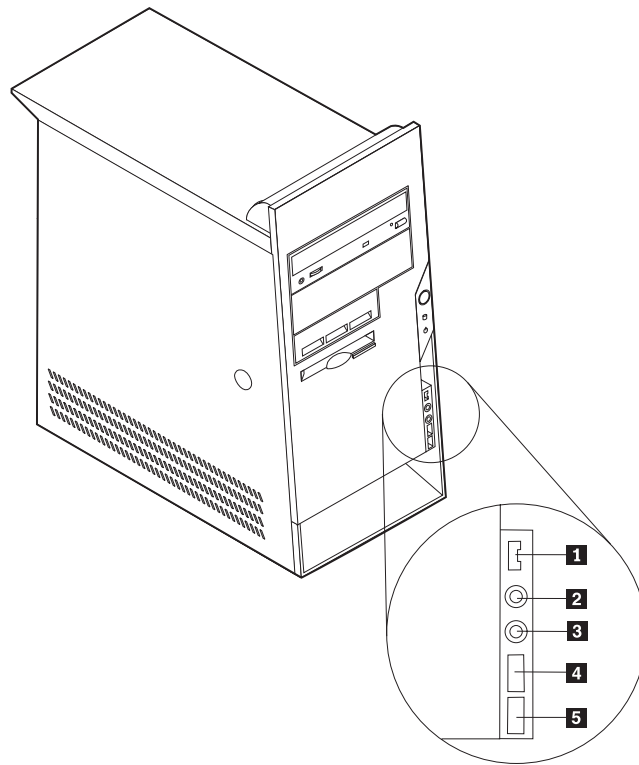
The following illustration shows the location of the connectors on the front of the desktop computer.



- 1** USB connector
- 2** USB connector

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

**Note:** Not all computer models will have the following connectors.



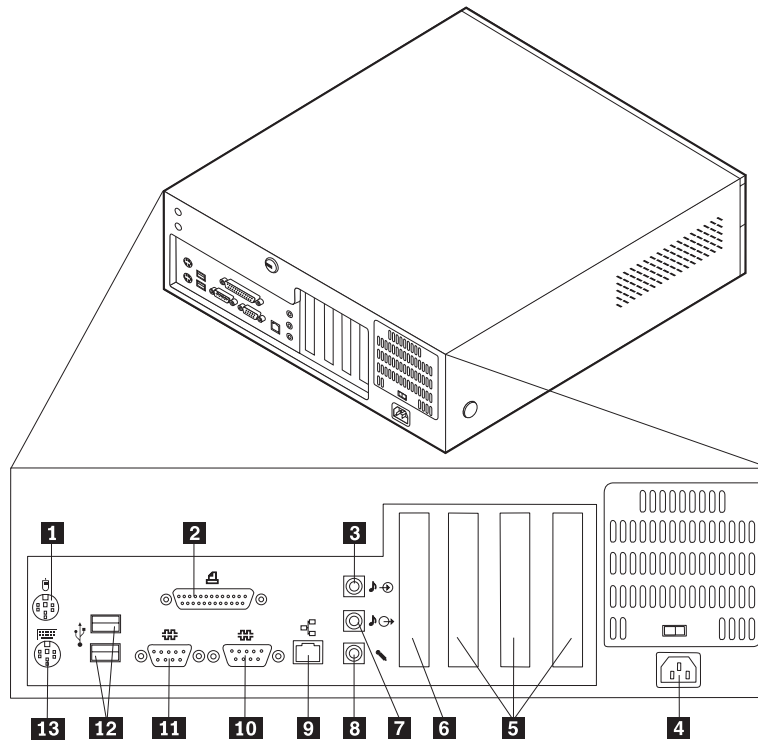
- 1** IEEE 1394 connector
- 2** Microphone connector
- 3** Headphone connector
- 4** USB connector
- 5** USB connector



---

## Locating the connectors on the rear of your computer

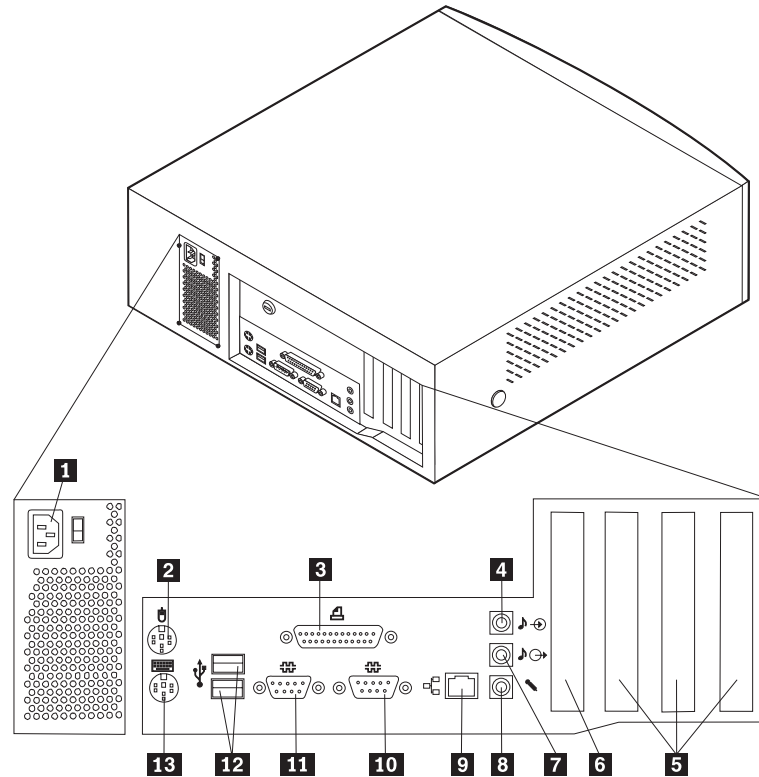
The following illustration shows the location of the connectors on the rear of the small desktop model computer. See page 16 for connector descriptions.



- |                                   |                               |
|-----------------------------------|-------------------------------|
| <b>1</b> Mouse connector          | <b>8</b> Microphone connector |
| <b>2</b> Parallel connector       | <b>9</b> Ethernet connector   |
| <b>3</b> Audio line in connector  | <b>10</b> Serial connector    |
| <b>4</b> Power connector          | <b>11</b> Serial connector    |
| <b>5</b> PCI slots                | <b>12</b> USB connectors      |
| <b>6</b> AGP slot                 | <b>13</b> Keyboard connector  |
| <b>7</b> Audio line out connector |                               |

**Note:** Some connectors on the rear of the computer are color-coded to help you to determine where to connect the cables on your computer.

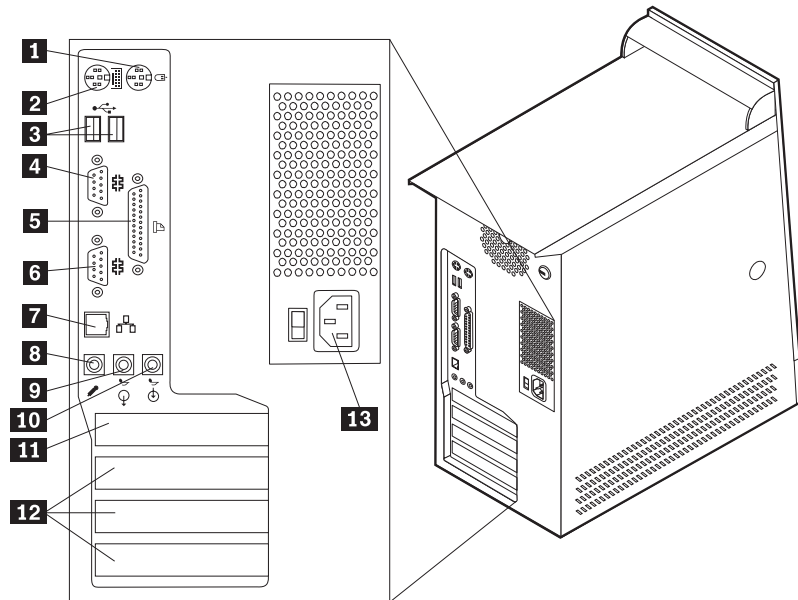
The following illustration shows the location of the connectors on the rear of the desktop model computer. See page 16 for connector descriptions.



- |                                   |                               |
|-----------------------------------|-------------------------------|
| <b>1</b> Power connector          | <b>8</b> Microphone connector |
| <b>2</b> Mouse connector          | <b>9</b> Ethernet connector   |
| <b>3</b> Parallel connector       | <b>10</b> Serial connector    |
| <b>4</b> Audio line in connector  | <b>11</b> Serial connector    |
| <b>5</b> PCI slots                | <b>12</b> USB connectors      |
| <b>6</b> AGP slot                 | <b>13</b> Keyboard connector  |
| <b>7</b> Audio line out connector |                               |

**Note:** Some connectors on the rear of the computer are color-coded to help you to determine where to connect the cables on your computer.

The following illustration shows the location of the connectors on the back of the microtower model computer. See page 16 for connector descriptions.



- |                             |                                   |
|-----------------------------|-----------------------------------|
| <b>1</b> Mouse connector    | <b>8</b> Microphone connector     |
| <b>2</b> Keyboard connector | <b>9</b> Audio line out connector |
| <b>3</b> USB connectors     | <b>10</b> Audio line in connector |
| <b>4</b> Serial connector   | <b>11</b> AGP slot                |
| <b>5</b> Parallel connector | <b>12</b> PCI slots               |
| <b>6</b> Serial connector   | <b>13</b> Power connector         |
| <b>7</b> Ethernet connector |                                   |

**Note:** Some connectors on the rear of the computer are color-coded to help you to determine where to connect the cables on your computer.

Connector	Description
Mouse connector	Used to attach a mouse, trackball, or other pointing device that uses a standard mouse connector.
Keyboard connector	Used to attach a keyboard that uses a standard 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 devices that use a 9-pin serial connector.
Parallel connector	Used to attach a parallel printer, parallel scanner, or other devices that use a 25-pin parallel connector.
Ethernet connector	Used to attach an Ethernet cable for a Local Area Network (LAN). <b>Note:</b> To operate the computer within FCC Class B limits, use a category 5 Ethernet cable.
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 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.
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.

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## Obtaining device drivers

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

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## Chapter 3. Installing internal options — small desktop model

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

---

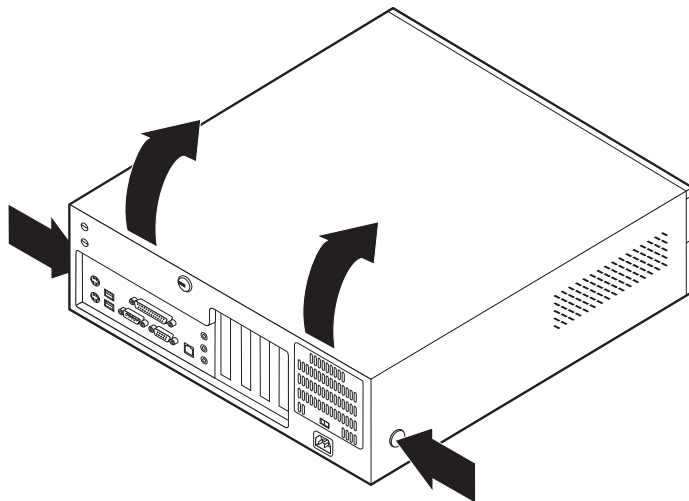
### Removing the cover

**Important**

Read before removing the cover “Safety Information” on page v and “Handling static-sensitive devices” on page 8.

To remove the cover:

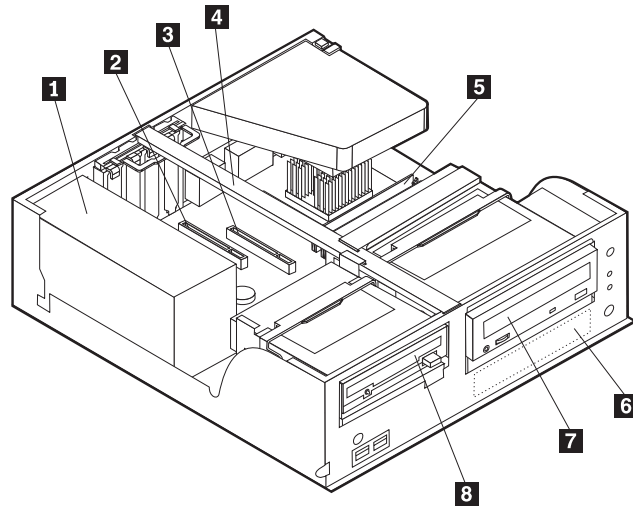
1. Shut down your operating system, remove any media (diskettes, CDs, or tapes) from the drives, and turn off all attached devices and the computer.
2. Unplug all power cords from electrical outlets.
3. Disconnect all cables attached to the computer. This includes power cords, input/output (I/O) cables, and any other cables that are 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.



---

## Locating components

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



- 1** Power supply
- 2** PCI slot
- 3** AGP slot
- 4** Support bar

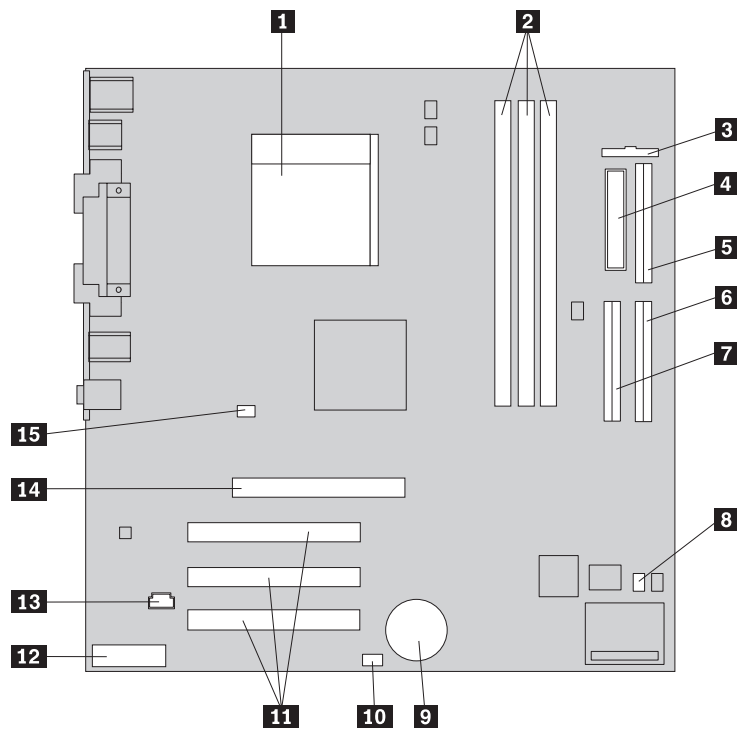
- 5** DIMM
- 6** Hard disk drive
- 7** CD drive or DVD drive
- 8** Diskette drive

---

## 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.



- |  |                                       |
|--|---------------------------------------|
| <b>1</b> Microprocessor                          | <b>9</b> Battery                      |
| <b>2</b> DIMM connectors (1, 2, 3 left to right) | <b>10</b> SCSI LED connector          |
| <b>3</b> Front panel connector                   | <b>11</b> PCI slots                   |
| <b>4</b> Power connector                         | <b>12</b> Front panel audio connector |
| <b>5</b> Diskette drive connector                | <b>13</b> CD-ROM audio connector      |
| <b>6</b> Primary IDE connector                   | <b>14</b> AGP slot                    |
| <b>7</b> Secondary IDE connector                 | <b>15</b> 12V Power connector         |
| <b>8</b> Clear CMOS/Recovery jumper              |                                       |

---

## Installing memory

Your computer has three connectors for installing dual in-line memory modules (DIMMs) that provide up to a maximum of 1 GB of system memory.

**Note:** Your computer will only support DIMM 1 and DIMM 2 (from left to right). DIMM 3 will not be used due to mechanical restrictions.

### Installing DIMMs

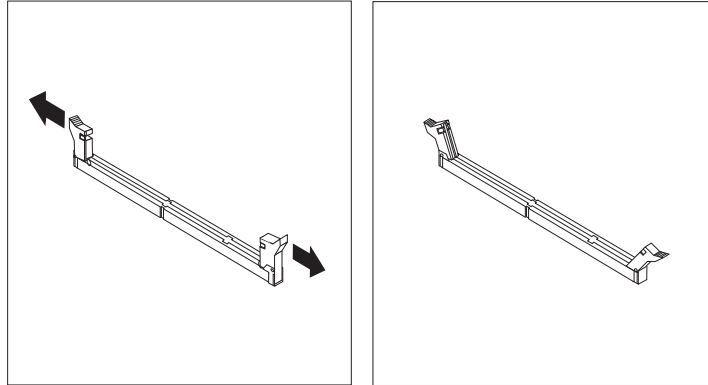
When installing DIMMs, the following rules apply:

- Fill each system memory connector sequentially, starting at DIMM 1
- Use 3.3 V, synchronous, 168-pin, unbuffered, 133 MHz, nonparity, synchronous dynamic random access memory (SDRAM)
- Use 64 MB, 128 MB, 256 MB, or 512 MB DIMMs in any combination
- DIMM heights of 38.1 mm (1.5 inches)

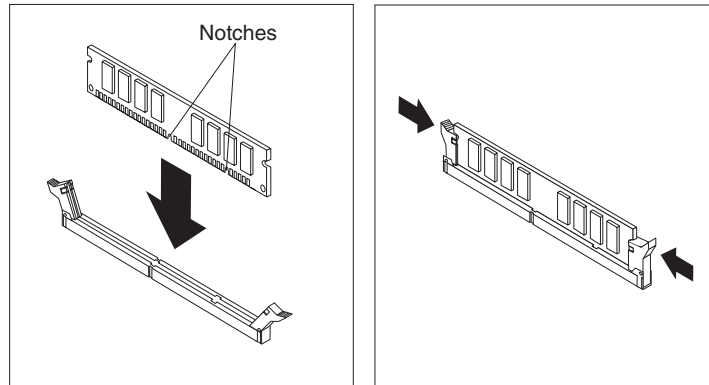
To install a DIMM:

1. Remove the cover. See “Removing the cover” on page 17.

2. To locate the DIMM connectors. See “Identifying parts on the system board” on page 18 .
3. Open the retaining clips.



4. Make sure the notches in the DIMM align with the tabs on the connector. Push or insert the DIMM straight down into the connector until the retaining clips close.



**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 26.

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## Installing adapters

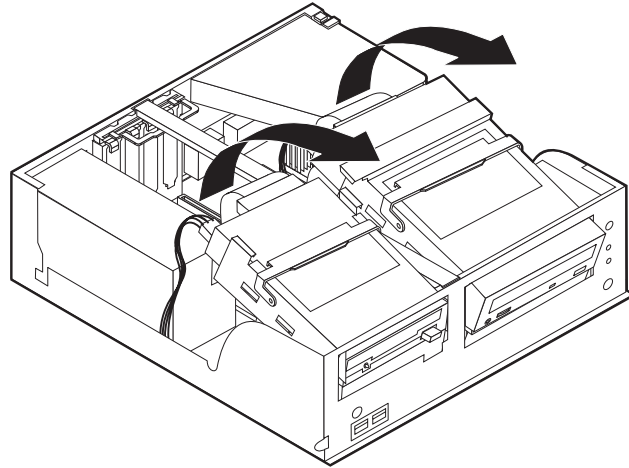
This section provides information and instructions for installing and removing adapters. Your computer has three expansion slots for PCI adapters and one slot used for an AGP adapter. Adapters must be low profile. Your computer supports adapters up to 168 mm (6.6 inches) long.

To install an adapter:

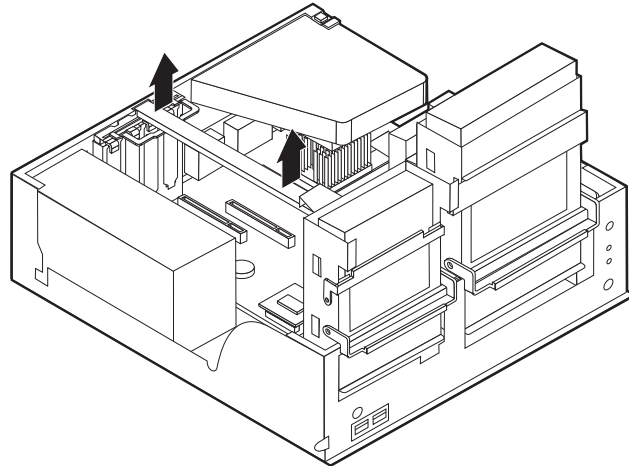
1. Remove the cover. See “Removing the cover” on page 17.



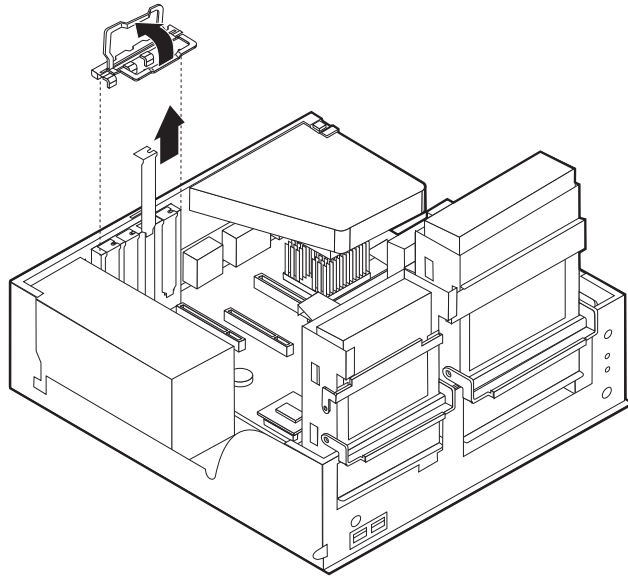
2. Pivot one of the drive bay latch handles toward the front of the computer and then pivot the drive bay cage upward, as shown, until it is latched in the up position. Repeat this procedure for the remaining drive bay.



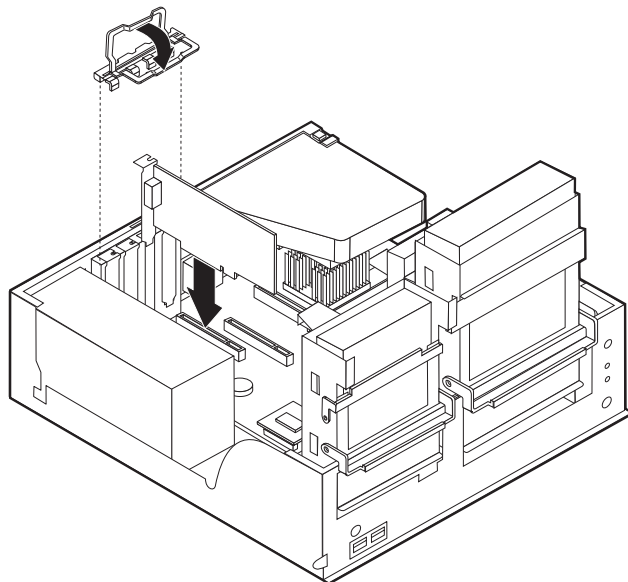
3. Remove the support bar by pulling it outward from the computer.



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



5. Remove the adapter from its static-protective package.
6. Install the adapter into the appropriate slot on the system board.
7. Install the adapter slot cover latch.



8. Replace the support bar and pivot the two drive bays back to their original positions.

**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 26.

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## 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 or replace drives to your computer to increase storage capacity and to enable your computer to read other types of media such as CD-ROM.

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 that you can install in each bay. Also, it is important to correctly connect the internal drive cables to the installed drive.

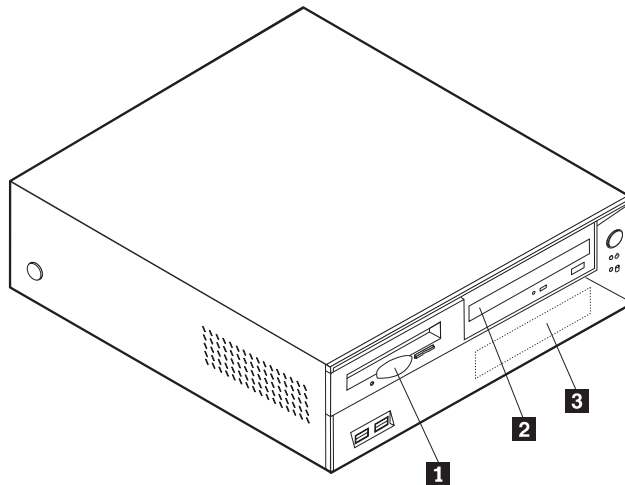
### Drive specifications

Your computer might come with the following IBM-installed drives:

- A 3.5-inch diskette drive in bay 1
- A CD drive or DVD drive in bay 2
- A 3.5-inch hard disk drive in bay 3

Bays that do not have drives installed 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 that you can install in each bay and their height requirements.

<b>1</b> Bay 1 - Max Height: 25.8 mm (1.0 in.)	3.5-inch diskette drive (preinstalled)
<b>2</b> Bay 2 - Max Height: 41.3 mm (1.6 in.)	CD-ROM drive (standard in some models)
<b>3</b> Bay 3 - Max Height: 25.8 mm (1.0 in.)	3.5-inch hard disk drive (preinstalled)

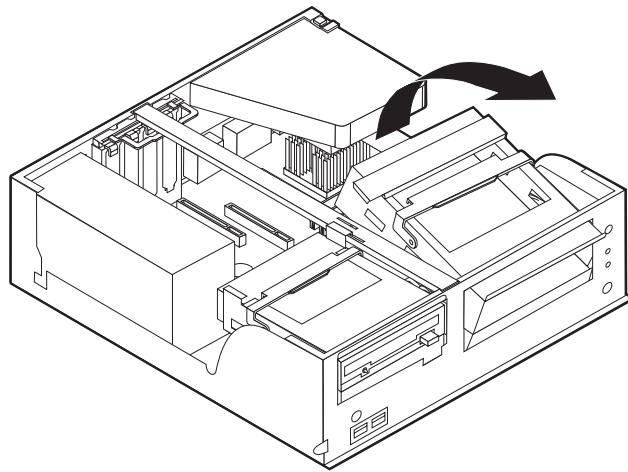
#### Notes:

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 bay: bay 2.

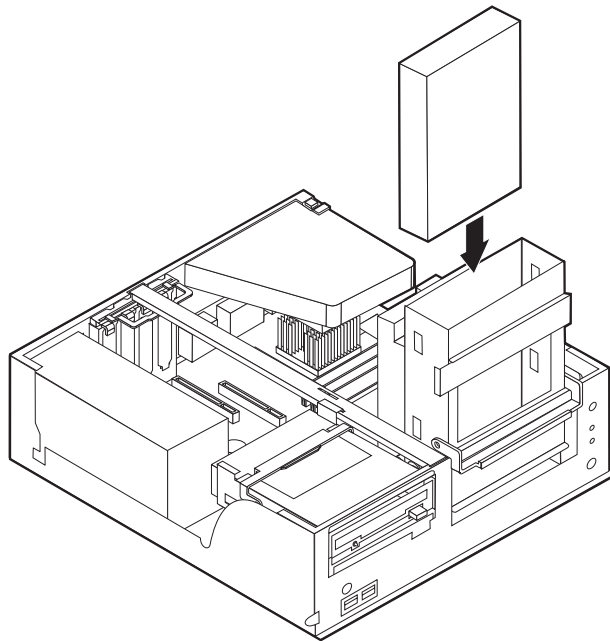
## Installing a drive

To install a CD drive or DVD drive in bay 2, follow these steps.

1. Remove the cover (see “Removing the cover” on page 17).
2. If the drive you are installing is a removable-media drive, remove the bay panel from the front bezel.
3. Remove the metal shield from the drive bay by inserting a flat-blade screwdriver into one of the slots and gently prying it loose.
4. Make sure the drive is set correctly as the master device. Refer to the documentation that comes with your CD drive or DVD drive for master/slave jumper information.
5. Pivot the drive bay latch handle toward the front of the computer and then pivot the drive bay cage upward, as shown, until it is latched in the up position.



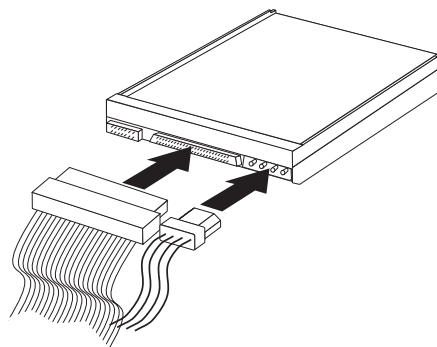
6. Install the drive into the bay. Align the screw holes and insert the two screws.



7. Each integrated drive electronics (IDE) drive requires two cables; a four-wire power cable that connects to the power supply, and a signal cable that connects to the system board.

To connect a CD drive or DVD drive to your computer, follow these steps.

- a. Locate the signal cable that came with your computer or with the new drive.
- b. Locate the secondary IDE connector on the system board. See “Identifying parts on the system board” on page 18.
- c. Connect one end of the signal cable to the secondary IDE connector on the system board and the other to the CD drive or DVD drive.
- d. Your computer has extra power connectors for connecting additional drives. Connect the power cable to the drive.



8. Pivot the drive bay cage back into place.

**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 26.

---

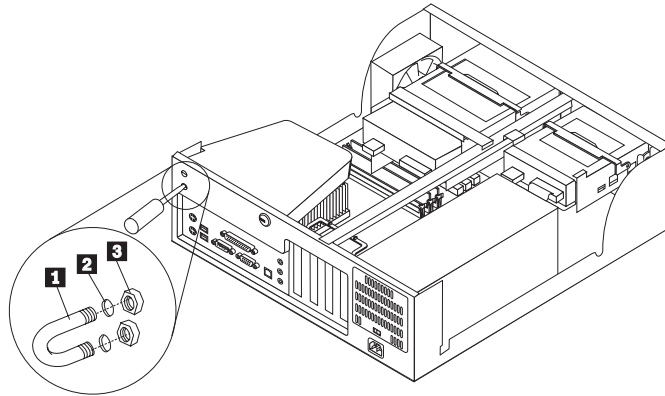
## Installing a Rope Clip

To help prevent hardware theft, you can add a 3/16 inch or 5 mm Rope Clip 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 Rope Clip:

1. Remove the cover (see “Removing the cover” on page 17).
2. Use a tool, such as a screwdriver, to remove the two metal knockouts.
3. Insert the Rope Clip 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 26.

5. Thread the cable through the Rope Clip 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** Rope Clip
- 2** Bolt holes
- 3** Nuts

**What to do next:**

To work with another option, go to the appropriate section.

---

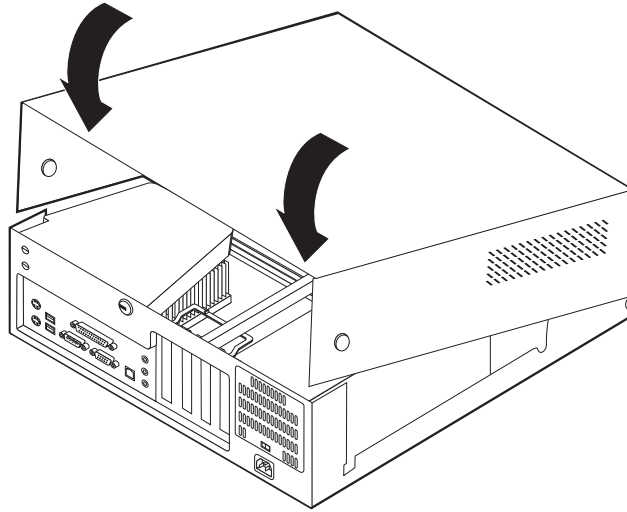
## Replacing the cover and connecting the cables

After working with options, you need to install any removed parts, replace the cover, and reconnect cables, including telephone lines and power cords. Also, depending on the option that is installed, you might need to confirm the updated information in the IBM 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 it down over the computer until it snaps into place.



4. Reconnect the external cables and power cords to the computer. See “Chapter 2. Installing external options” on page 11.
5. To update the configuration, see “Chapter 6. Using the IBM Setup Utility program” on page 55.





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## Chapter 4. Installing internal options — desktop model

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

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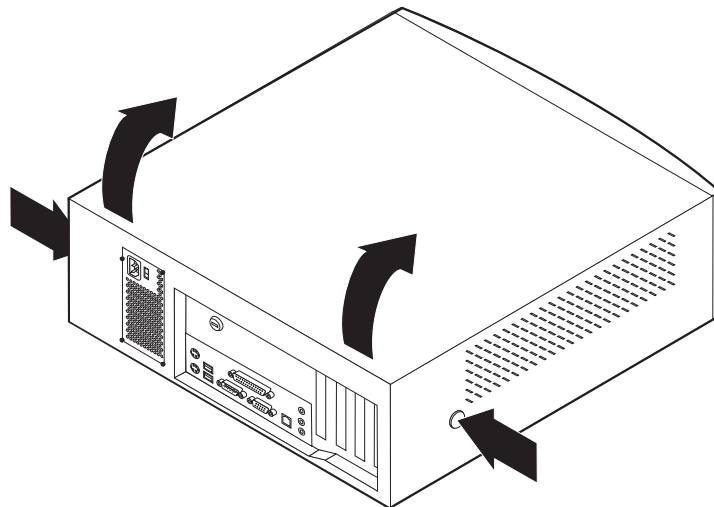
### Removing the cover

**Important:**

Read “Safety Information” on page v and “Handling static-sensitive devices” on page 8 before removing the cover.

To remove the cover:

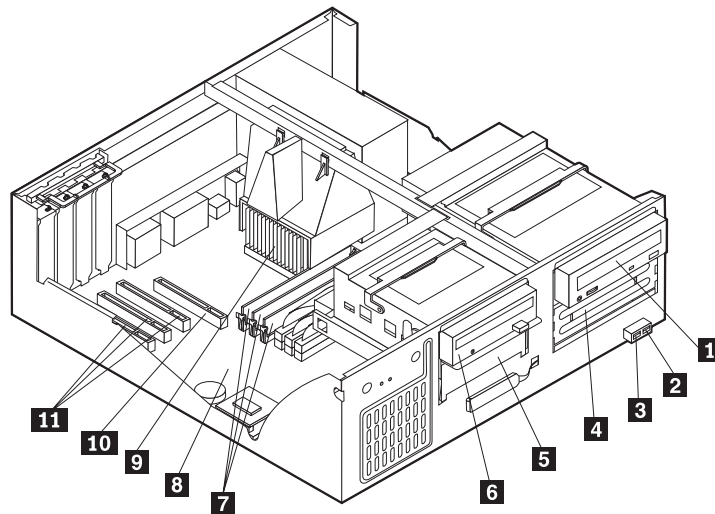
1. Shut down your operating system, remove any media (diskettes, CDs, or tapes) from the drives, and turn off all attached devices and the computer.
2. Unplug all power cords from electrical outlets.
3. Disconnect all cables attached to the computer. This includes power cords, input/output (I/O) cables, and any other cables that are 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.



---

## Locating components

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



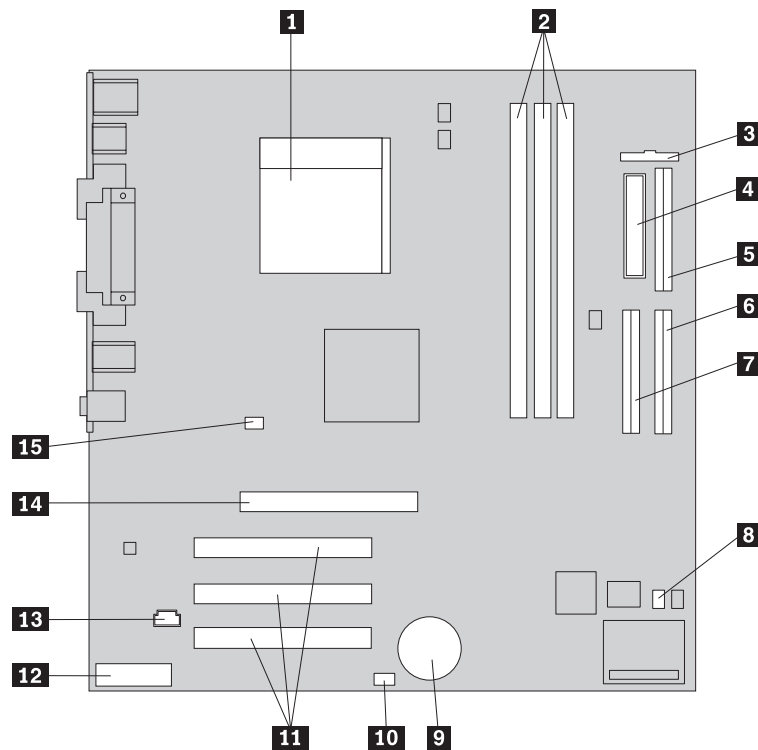
- |                              |                                       |
|------------------------------|---------------------------------------|
| <b>1</b> CD-ROM drive        | <b>7</b> DIMMs                        |
| <b>2</b> Front USB connector | <b>8</b> System board                 |
| <b>3</b> Front USB connector | <b>9</b> Microprocessor and heat sink |
| <b>4</b> Optional drive bay  | <b>10</b> AGP slot                    |
| <b>5</b> Hard disk drive     | <b>11</b> PCI slots                   |
| <b>6</b> Diskette drive      |                                       |

---

## 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.



- |  |                                       |
|--|---------------------------------------|
| <b>1</b> Microprocessor                          | <b>9</b> Battery                      |
| <b>2</b> DIMM connectors (1, 2, 3 left to right) | <b>10</b> SCSI LED connector          |
| <b>3</b> Front panel connector                   | <b>11</b> PCI slots                   |
| <b>4</b> Power connector                         | <b>12</b> Front panel audio connector |
| <b>5</b> Diskette drive connector                | <b>13</b> CD-ROM audio connector      |
| <b>6</b> Primary IDE connector                   | <b>14</b> AGP slot                    |
| <b>7</b> Secondary IDE connector                 | <b>15</b> 12V Power connector         |
| <b>8</b> Clear CMOS/Recovery jumper              |                                       |

---

## Installing memory

Your computer has three connectors for installing dual in-line memory modules (DIMMs) that provide up to a maximum of 1.5 GB of system memory.

### Installing DIMMs

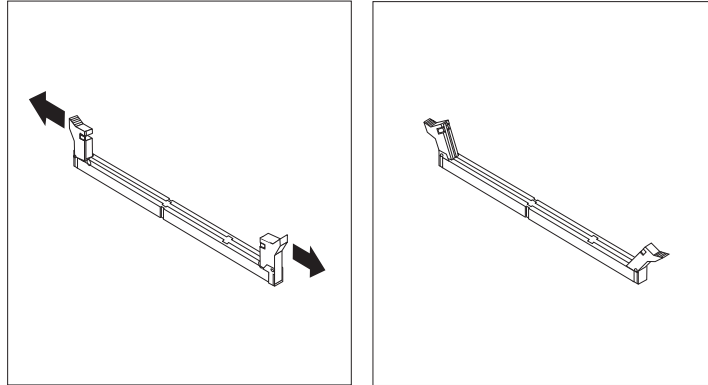
When installing DIMMs, the following rules apply:

- Fill each system memory connector sequentially, starting at DIMM 1
- Use 3.3 V, synchronous, 168-pin, unbuffered, 133 MHz nonparity synchronous dynamic random access memory (SDRAM)
- Use 64 MB, 128 MB, 256 MB, or 512 MB DIMMs in any combination
- DIMM heights of 38.1 mm (1.5 inches)

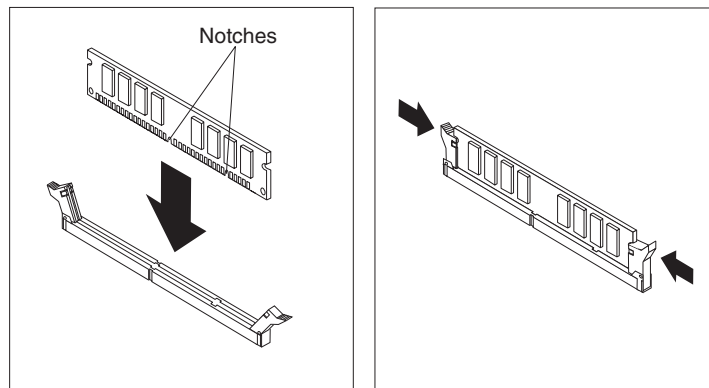
To install a DIMM:

1. Remove the cover. See “Removing the cover” on page 29.
2. You might have to remove an adapter to gain access to the DIMM slots. See “Installing adapters” on page 32.

3. To locate the DIMM connectors. See “Identifying parts on the system board” on page 30 .
4. Open the retaining clips.



5. Make sure the notches in the DIMM align with the tabs on the connector. Push or insert the DIMM straight down into the connector until the retaining clips close.



**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 38.

---

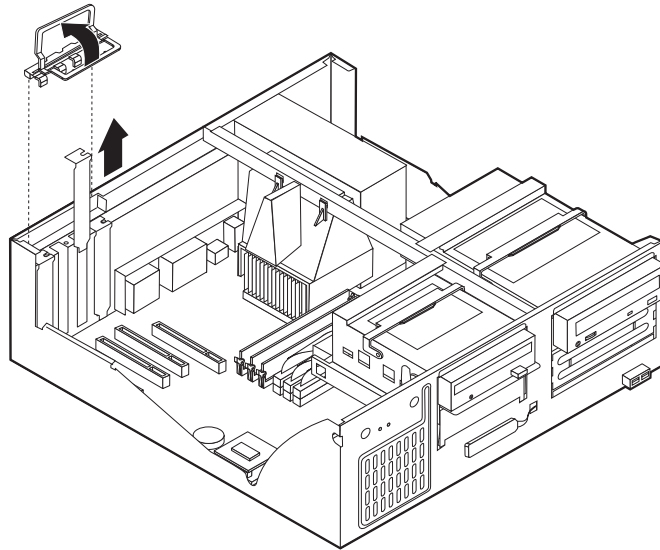
## Installing adapters

This section provides information and instructions for installing and removing adapters. Your computer has three expansion slots for PCI adapters and one slot used for an AGP adapter. You can install an adapter up to 340 mm (13.4 inches) long.

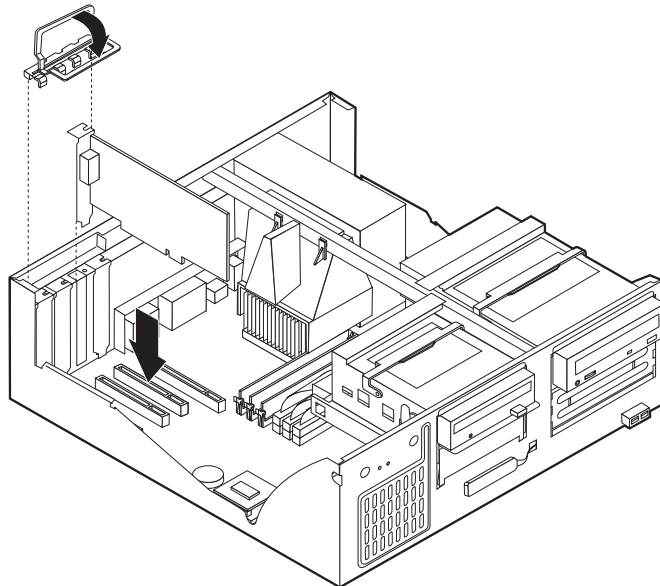
To install an adapter:

1. Remove the cover. See “Removing the cover” on page 29.

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.



**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 38.

---

## 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 that are 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 that you can install in each bay. Also, it is important to correctly connect the internal drive cables to the installed drive.

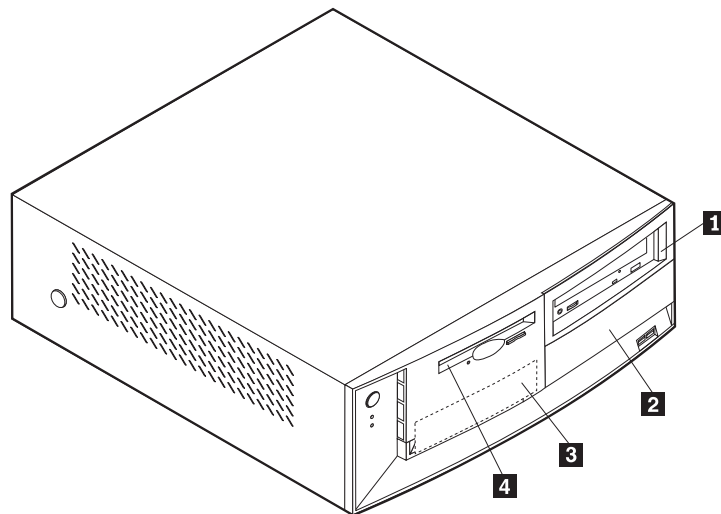
## Drive specifications

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 that you can install in each bay and their height requirements.

<b>1</b> Bay 1 - Max Height: 41.3 mm (1.6 in.)	CD-ROM drive (standard in some models) 5.25-inch hard disk drive
<b>2</b> 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
<b>3</b> Bay 3 - Max Height: 25.8 mm (1.0 in.)	3.5-inch hard disk drive (preinstalled)
<b>4</b> Bay 4 - Max Height: 25.8 mm (1.0 in.)	3.5-inch diskette drive (preinstalled)

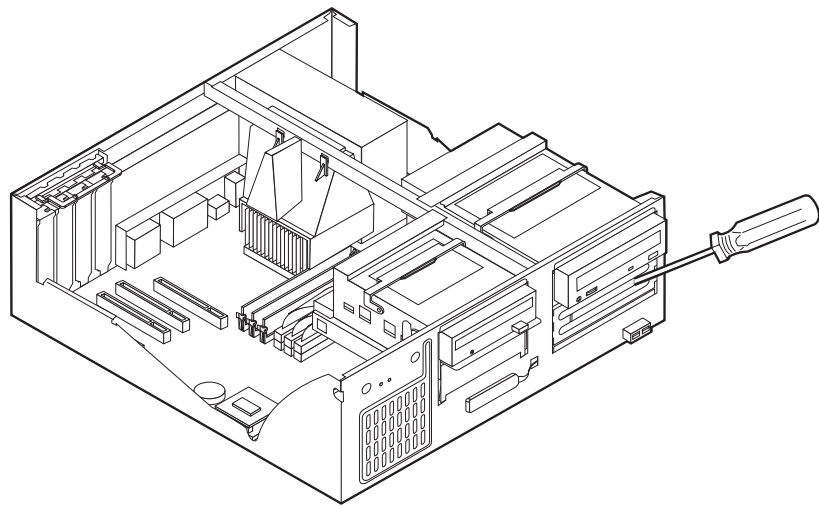
**Notes:**

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 bay: bay 1 or 2.

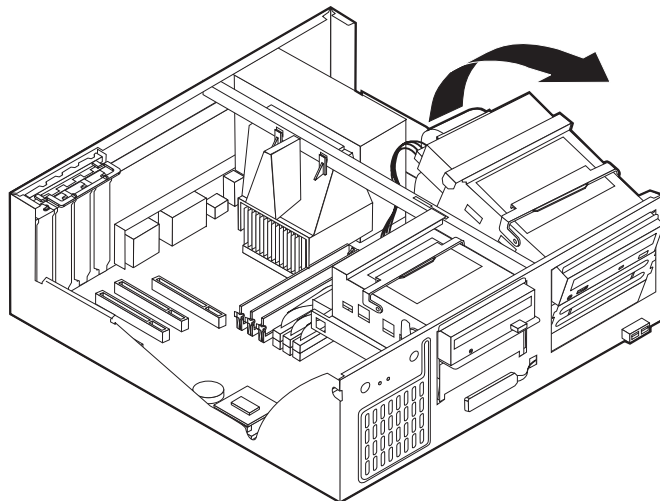
## Installing a drive

To install an internal drive, follow these steps.

1. Remove the cover. See “Removing the cover” on page 29.
2. If your computer has a CD drive or DVD drive, you might need to remove the signal and power cables from the drive.
3. If the drive you are installing is a removable-media drive, remove the bay panel from the front bezel.
4. Remove the metal shield from the drive bay by inserting a flat-blade screwdriver into one of the slots and gently prying it loose.



5. Pivot the drive bay latch handle toward the front of the computer and then pivot the drive bay cage upward, as shown, until it is latched in the up right position.

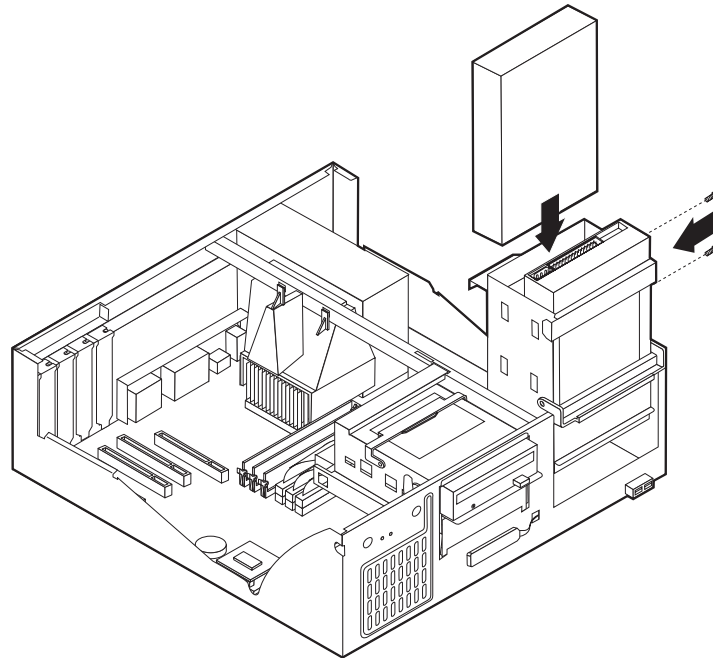


6. Make sure the drive that you are installing is set correctly as either a master or a slave device.
  - If it is a hard disk drive, set as a slave device.

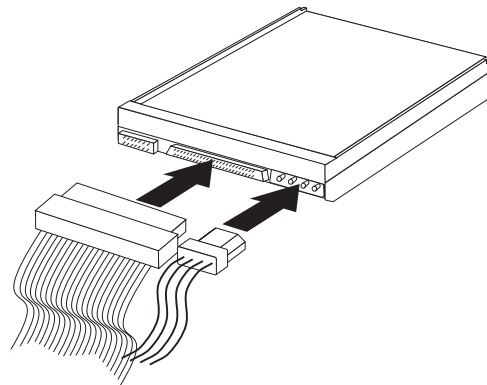
- If it is the first CD drive or DVD drive, set as a master device.
- If it is an additional CD drive or DVD drive, set as a slave device.

Refer to the documentation that comes with your drive for master/slave jumper information.

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



8. Pivot the drive bay cage back into place.
9. Each integrated drive electronics (IDE) drive requires two cables; a four-wire power cable that connects to the power supply and a signal cable that connects to the system board.



The steps to connect an IDE drive are different depending on the type of drive you are connecting. Locate the procedure below for your drive connection.

### To connect the first IDE CD drive or DVD drive

1. Locate the three-connector signal cable that came with your computer or with the new drive.
2. Locate the secondary IDE connector on the system board. See "Identifying parts on the system board" on page 30.



3. Connect one end of the signal cable to the drive and the other to the secondary IDE connector on the system board. To reduce electronic noise, use the connectors at the end of the cable only.
4. Your computer has extra power connectors for additional drives. Connect a power connector to the drive.
5. If you have a CD-ROM audio cable, connect it to the drive and to the system board. See “Identifying parts on the system board” on page 30.

### **To connect an additional IDE CD drive or DVD drive**

1. Locate the secondary IDE connector on the system board and the three-connector signal cable. See “Identifying parts on the system board” on page 30.
2. Connect the extra connector in the signal cable to the new CD drive or DVD drive.
3. Your computer has extra power connectors for additional drives. Connect a power connector to the drive.

### **To connect an additional IDE hard disk drive**

1. Locate the primary IDE connector on the system board. One end of the three-connector cable connects to the hard disk drive and the other connects to the system board. See “Identifying parts on the system board” on page 30.
2. Connect the extra connector in the signal cable to the new hard disk drive.
3. Your computer has extra power connectors for additional drives. Connect a power connector 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 38.

---

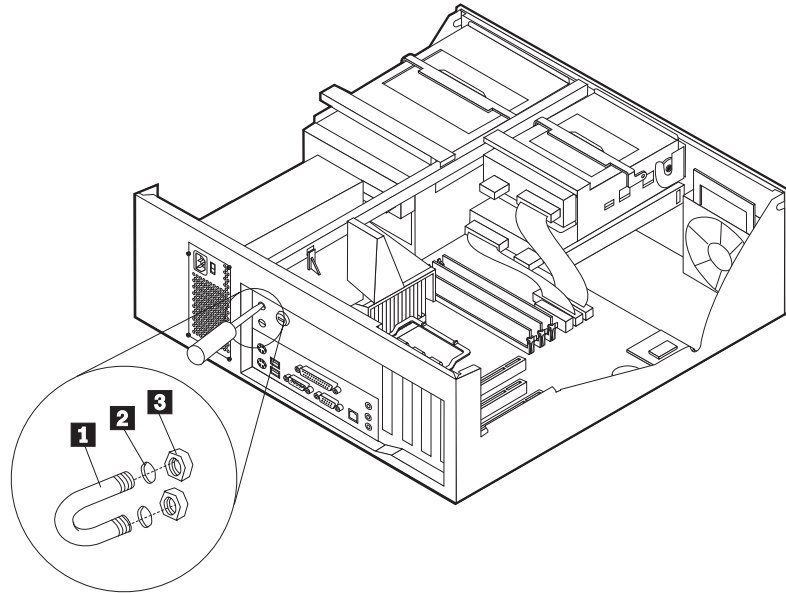
## **Installing a Rope Clip**

To help prevent hardware theft, you can add a 3/16 inch or 5 mm Rope Clip 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 Rope Clip:

1. Remove the cover. See “Removing the cover” on page 29.
2. Use a tool, such as a screwdriver, to remove the two metal knockouts.
3. Insert the Rope Clip 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 38.

5. Thread the cable through the Rope Clip 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** Rope Clip
- 2** Bolt holes
- 3** Nuts

**What to do next:**

To work with another option, go to the appropriate section.

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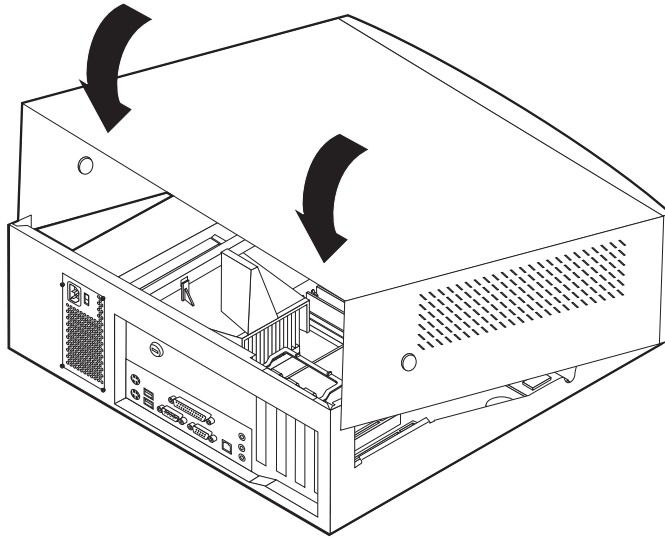
## Replacing the cover and connecting the cables

After working with options, you need to install any removed parts, replace the cover, and reconnect any cables, including telephone lines and power cords. Also, depending on the option that is installed, you might need to confirm the updated information in the IBM 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 it down over the computer until it snaps into place.



4. Reconnect the external cables and power cords to the computer. See “Chapter 2. Installing external options” on page 11.
5. To update the configuration, see “Chapter 6. Using the IBM Setup Utility program” on page 55.



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## Chapter 5. Installing internal options — microtower model

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

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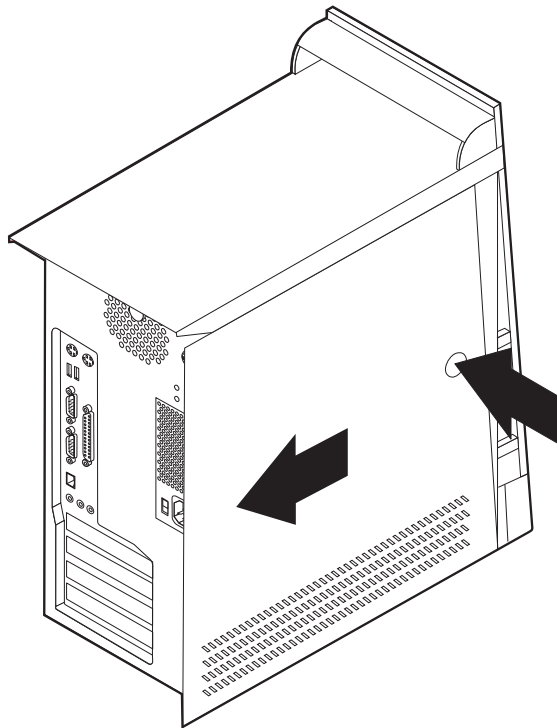
### Removing the cover

**Important:**

Read “Safety Information” on page v and “Handling static-sensitive devices” on page 8 before removing the cover.

To remove the cover:

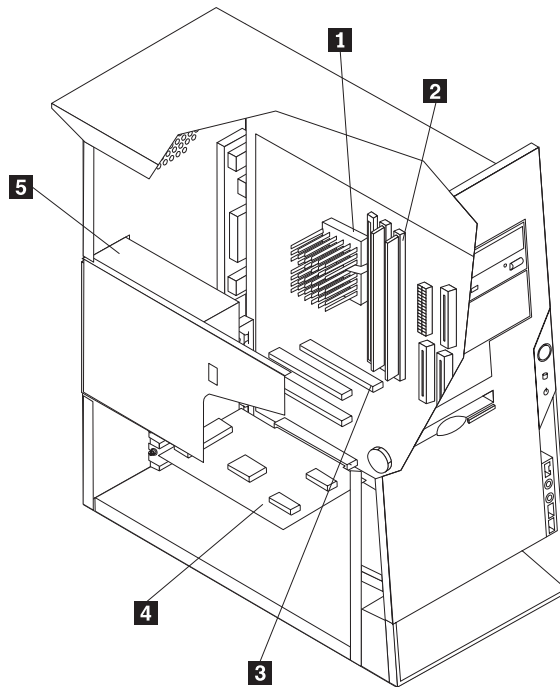
1. Shut down your operating system, remove any media (diskettes, CDs, or tapes) from the drives, and turn off all attached devices and the computer.
2. Unplug all power cords from electrical outlets.
3. Disconnect all cables attached to the computer. This includes power cords, input/output (I/O) cables, and any other cables that are connected to the computer.
4. Press the cover release button on the left side cover and remove the cover.



---

## Locating components

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



**1** Microprocessor and heat sink

**2** DIMM

**3** AGP slot

**4** PCI adapter

**5** Power supply

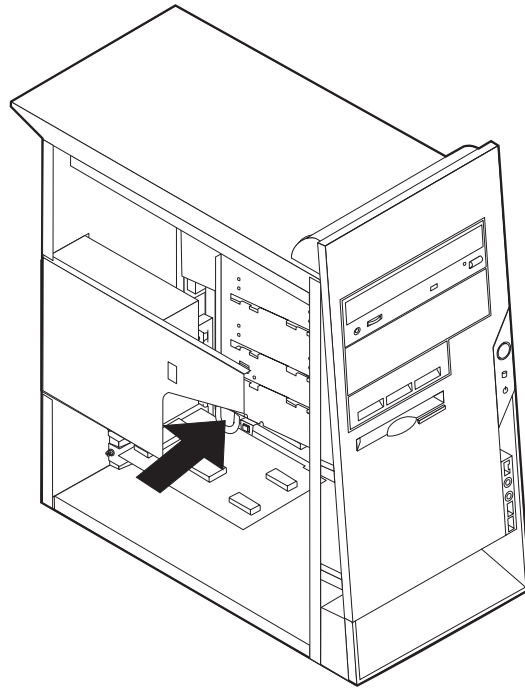
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## Moving the power supply

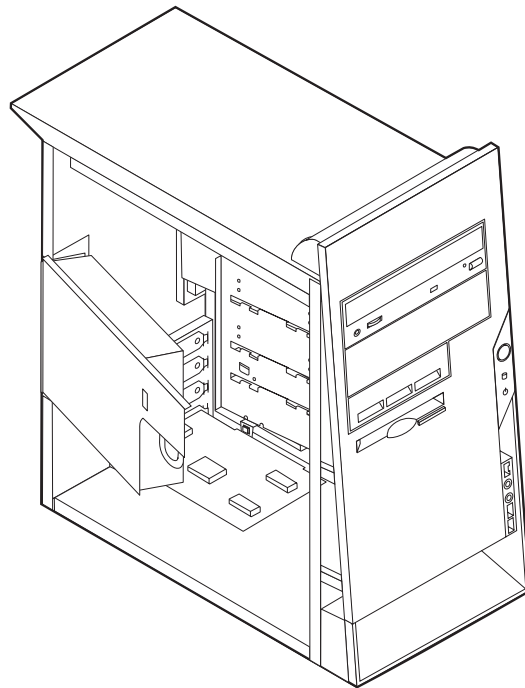
To perform some operations inside the computer, you might need to move the power supply to access parts of the system board that are difficult to see or hard to reach. Use the following procedure to provide easier access to the system board.

1. Locate the power supply. See “Locating components” on page 42.

2. Push the plastic tab to release the power supply.



3. Move the power supply outward from the computer.



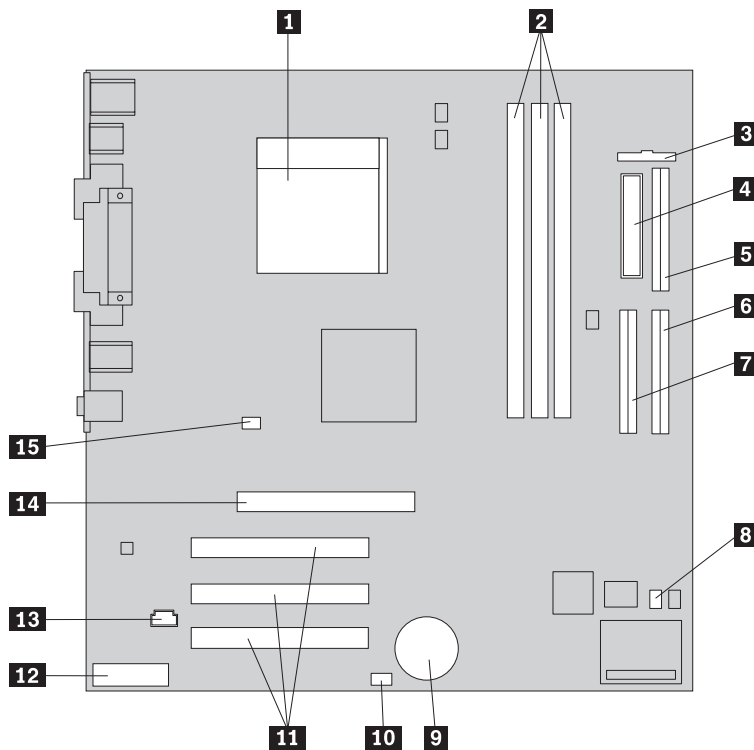
4. To replace the power supply, reverse these steps.

---

## 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.



- |  |                                       |
|--|---------------------------------------|
| <b>1</b> Microprocessor                          | <b>9</b> Battery                      |
| <b>2</b> DIMM connectors (1, 2, 3 left to right) | <b>10</b> SCSI LED connector          |
| <b>3</b> Front panel connector                   | <b>11</b> PCI slots                   |
| <b>4</b> Power connector                         | <b>12</b> Front panel audio connector |
| <b>5</b> Diskette drive connector                | <b>13</b> CD-ROM audio connector      |
| <b>6</b> Primary IDE connector                   | <b>14</b> AGP slot                    |
| <b>7</b> Secondary IDE connector                 | <b>15</b> 12V Power connector         |
| <b>8</b> Clear CMOS/Recovery jumper              |                                       |

---

## Installing memory

Your computer has three connectors for installing dual in-line memory modules (DIMMs) that provide up to a maximum of 1.5 GB of system memory.

### Installing DIMMs

When installing DIMMs, the following rules apply:

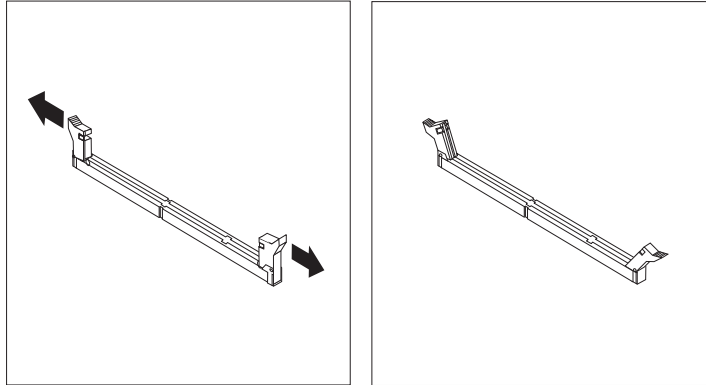
- Fill each system memory connector sequentially, starting at DIMM 1
- Use 3.3 V, synchronous, 168-pin, unbuffered, 133 MHz nonparity synchronous dynamic random access memory (SDRAM)
- Use 64 MB, 128 MB, 256 MB, or 512 MB DIMMs in any combination
- DIMM heights of 38.1 mm (1.5 inches)

To install a DIMM:

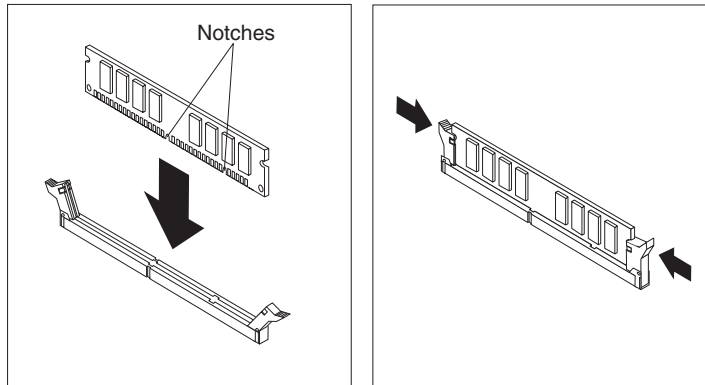
1. Remove the cover. See “Removing the cover” on page 41.
2. You might have to remove an adapter to gain access to the DIMM slots. See “Installing adapters” on page 45.



3. To locate the DIMM connectors. See “Identifying parts on the system board” on page 43 .
4. Open the retaining clips.



5. Make sure the notches in the DIMM align with the tabs on the connector. Push or insert the DIMM straight down into the connector until the retaining clips close.



**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 52.

---

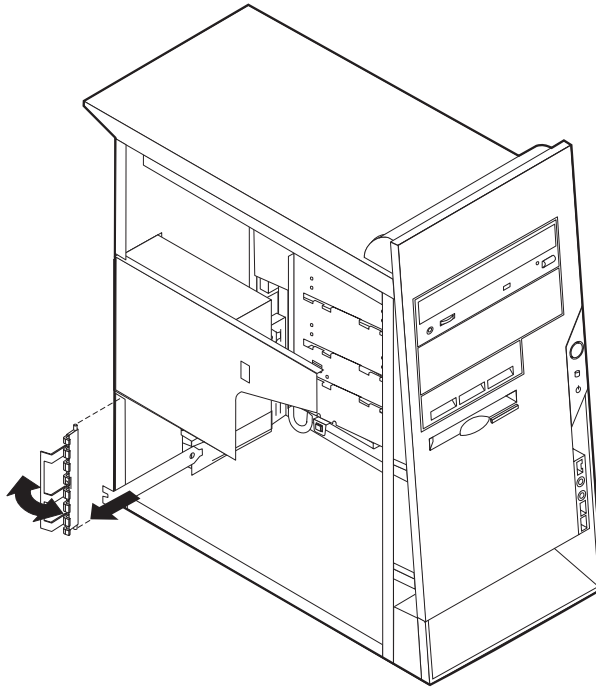
## Installing adapters

This section provides information and instructions for installing and removing adapters. Your computer has three expansion slots for PCI adapters and one slot used for an AGP adapter. You can install an adapter up to 228 mm (9 inches) long.

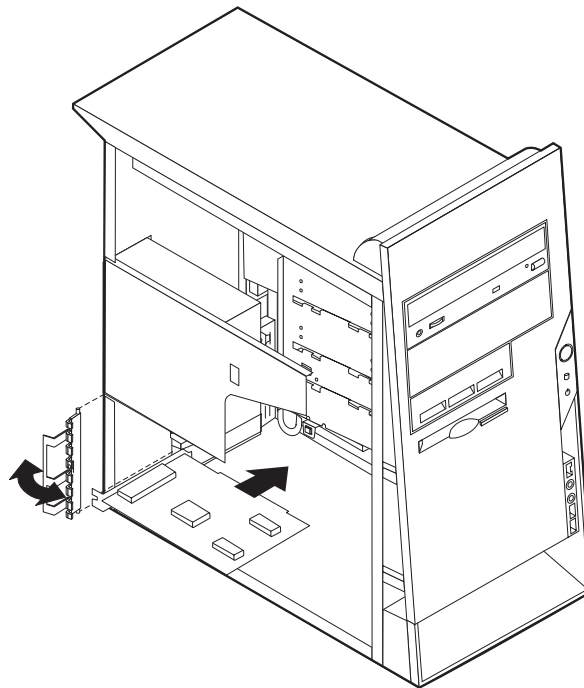
To install an adapter:

1. Remove the cover. See “Removing the cover” on page 41.

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.



**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 52.

---

## 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 that are available for your computer are:

- Hard disk 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 that you can install in each bay. Also, it is important to correctly connect the internal drive cables to the installed drive.

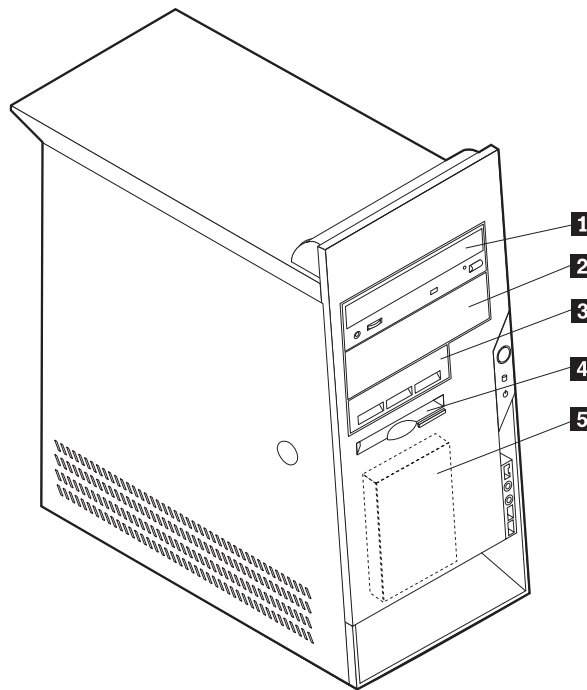
### Drive specifications

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 disk drive in bay 3
- A 3.5-inch hard 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.

<b>1</b> Bay 1 - Maximum Height: 41.3 mm (1.6 in.)	CD-ROM drive (standard in some models) 5.25-inch hard disk drive
<b>2</b> Bay 2 - Maximum 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
<b>3</b> Bay 3 - Maximum Height: 25.8 mm (1.0 in.)	3.5-inch hard disk drive
<b>4</b> Bay 4 - Maximum Height: 25.8 mm (1.0 in.)	3.5-inch diskette drive (preinstalled)
<b>5</b> Bay 5 - Maximum Height: 25.8 mm (1.0 in.)	Hard disk drive (preinstalled)

**Notes:**

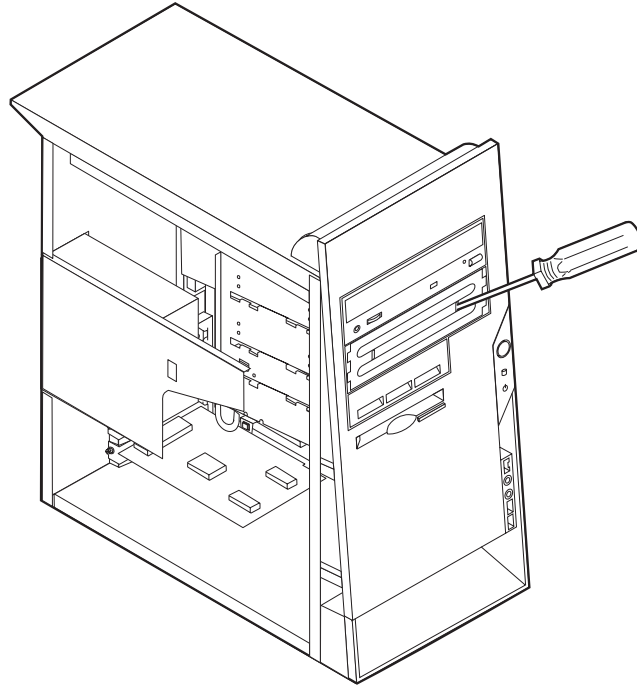
1. Drives that are greater than 41.3 mm (1.6 in.) high cannot be installed.
2. Install removable media (tape or CD) drives in the accessible bays: bay 1 or 2.

## Installing a drive

To install an internal drive, follow these steps.

1. Remove the cover. See "Removing the cover" on page 41.
2. If your computer has a CD drive or DVD drive, you might need to remove the signal and power cables from the drive.
3. Remove the bay panel from the drive bay by inserting a flat-blade screwdriver at the end and gently prying it loose.

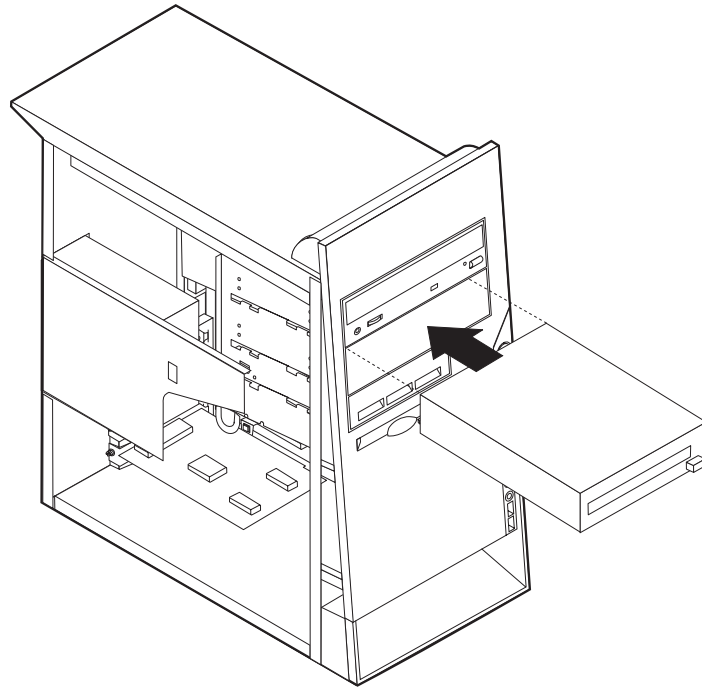
4. Remove the metal shield from the drive bay by inserting a flat-blade screwdriver into one of the slots and gently prying it loose.



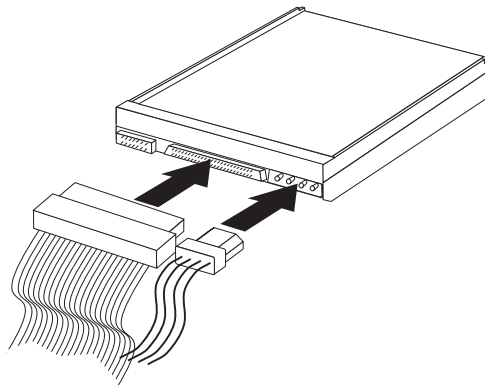
5. Make sure the drive that you are installing is set correctly as either a master or a slave device.
  - If it is the first CD drive or DVD drive, set as a master device.
  - If it is an additional CD drive or DVD drive, set as a slave device.
  - If it is a hard disk drive, set as a slave device.

Refer to the documentation that comes with your drive for master/slave jumper information.

6. Install the drive into the bay. Align the screw holes, and insert the screws that secure the drive to the bay.



7. Each integrated drive electronics (IDE) drive requires two cables; a four-wire power cable that connects to the power supply and a signal cable that connects to the system board. For a CD-ROM drive, you might also have an audio cable.



The steps to connect an IDE drive are different depending on the type of drive you are connecting. Locate the procedure below for your drive connection.

### **To connect the first IDE CD drive or DVD drive**

1. Locate the three-connector signal cable that came with your computer or with the new drive.
2. Locate the secondary IDE connector on the system board. See "Identifying parts on the system board" on page 43.
3. Connect one end of the signal cable to the drive and the other to the secondary IDE connector on the system board. To reduce electronic noise, use the connectors at the end of the cable only.
4. Your computer has extra power connectors for additional drives. Connect a power connector to the drive.

5. If you have a CD-ROM audio cable, connect it to the drive and to the system board. See “Identifying parts on the system board” on page 43.

### **To connect an additional IDE CD drive or DVD drive**

1. Locate the secondary IDE connector on the system board and the three-connector signal cable. See “Identifying parts on the system board” on page 43.
2. Connect the extra connector in the signal cable to the new CD drive or DVD drive.
3. Your computer has extra power connectors for additional drives. Connect a power connector to the drive.

### **To connect an additional IDE hard disk drive**

1. Locate the primary IDE connector on the system board. One end of the three-connector cable connects to the hard disk drive and the other connects to the system board. See “Identifying parts on the system board” on page 43.
2. Connect the extra connector in the signal cable to the new hard disk drive.
3. Your computer has extra power connectors for additional drives. Connect a power connector 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 52.

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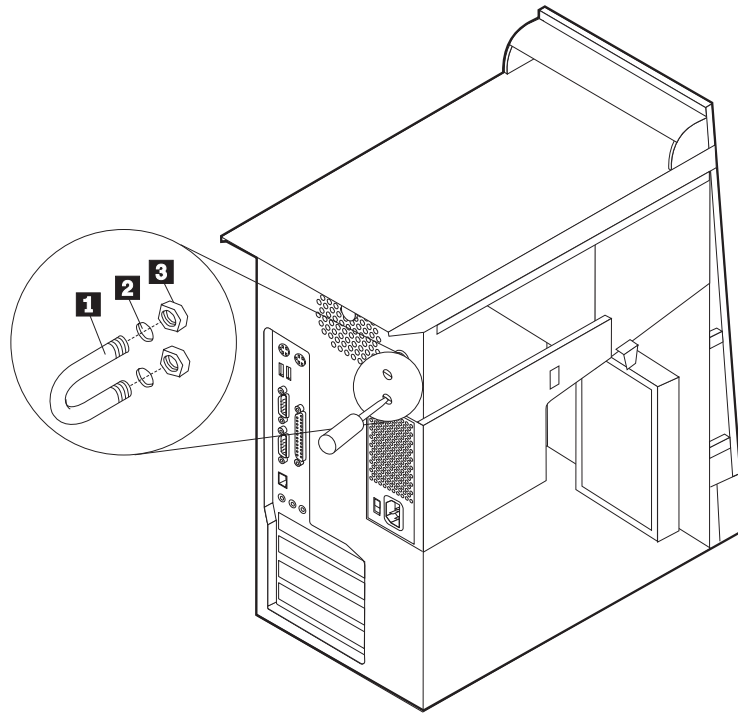
## **Installing a Rope Clip**

To help prevent hardware theft, you can add a 3/16 inch or 5 mm Rope Clip 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 Rope Clip:

1. Remove cover (see “Removing the cover” on page 41).
2. Use a tool, such as a screwdriver, to remove the two metal knockouts.
3. Insert the Rope Clip 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 52.

5. Thread the cable through the Rope Clip 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 Rope Clip
- 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

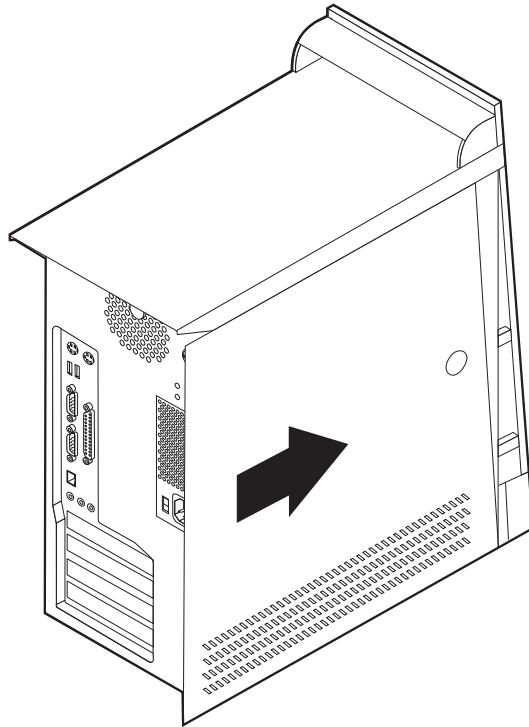
After working with options, you need to install any removed parts, replace the cover, and reconnect any cables, including telephone lines and power cords. Also, depending on the option that is installed, you might need to confirm the updated information in the IBM Setup Utility program.

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 so that the rail guides on the bottom of the cover engage the rails and push the cover closed until it latches.



4. Reconnect the external cables and power cords to the computer. See “Chapter 2. Installing external options” on page 11.
5. To update the configuration, see “Chapter 6. Using the IBM Setup Utility program” on page 55.

**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 initialize.



---

## Chapter 6. Using the IBM Setup Utility program

The IBM Setup Utility program is stored in the electrically erasable programmable read-only memory (EEPROM) of your computer. The IBM Setup Utility program is used to view and change the configuration settings of your computer, regardless of which operating system you are using. However, the operating system settings might override any similar settings in the IBM Setup Utility program.

---

### Starting the IBM Setup Utility program

To start the IBM Setup Utility program, do the following:

1. If your computer is already on when you start this procedure, you must shut down the operating system and turn off the computer.
2. Turn on the computer and look for the F1 prompt in the lower left corner of the screen.
3. When the prompt displays, press F1. (This prompt is displayed for only a few seconds. You must press F1 quickly.) If an administrator password has been set, the IBM Setup Utility program menu is not displayed until you type your password. See "Using passwords" for more information.

The IBM Setup Utility might start automatically when POST detects that hardware has been removed or new hardware has been installed in your computer.

---

### Viewing and changing settings

The IBM Setup Utility program menu lists items that identify system configuration topics.

When working with the IBM Setup Utility program menu, you must use the keyboard. The keys used to accomplish various tasks are displayed at the bottom of each screen.

---

### Exiting from the IBM Setup Utility program

When you finish viewing or changing settings, press Esc to return to the IBM Setup Utility program menu (you might have to press Esc several times). If you want to save the new settings, select Save Settings before you exit. Otherwise, your changes will not be saved.

---

### Using passwords

You can use passwords to provide security for your computer and data. There are two kinds of passwords: a user password and an administrator password. You do not have to set a password of either type to use your computer. However, if you decide to set either one, read the following sections.

#### User password

The user password feature deters unauthorized persons from gaining access to your computer.

## Administrator password

Setting an administrator password deters unauthorized persons from changing configuration settings. If you are responsible for maintaining the settings of several computers, you might want to set an administrator password.

After you set an administrator password, a password prompt is displayed each time you try to access the IBM Setup Utility program. If you type the wrong password, you will see an error message. If you type the wrong password three times, you must turn the computer off and start again.

If both the user and administrator passwords are set, you can type either password. However, to change any configuration settings, you must use your administrator password.

## Setting, changing, and deleting a password

To set, change, or delete a password, do the following:

**Note:** A password can be any combination of up to seven characters (A- Z, a-z, and 0-9).

1. Start the IBM Setup Utility program (see “Starting the IBM Setup Utility program” on page 55).
2. From the IBM Setup Utility program menu, select **Security**. Read the information displayed at the right side of the screen.

## Erasing a lost or forgotten password (clearing CMOS)

This section applies to lost or forgotten passwords. This procedure might not apply to all computer models. For more information about lost or forgotten passwords, go to Access IBM.

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 17 (small desktop model), “Removing the cover” on page 29 (desktop model), or “Removing the cover” on page 41 (microtower model).
4. Locate the Clear CMOS/Recovery jumper on the system board. See “Identifying parts on the system board” on page 18 (small desktop model), “Identifying parts on the system board” on page 30 (desktop model), or “Identifying parts on the system board” on page 43 (microtower model).
5. If necessary, refer to Installing adapters to remove any adapters that impede access to the Clear CMOS/Recovery jumper.
6. Move the jumper from the standard position (pins 1 and 2) to the maintenance or configure position (pins 2 and 3).
7. Replace the cover and connect the power cord. See “Replacing the cover and connecting the cables” on page 26 (small desktop model), “Replacing the cover and connecting the cables” on page 38 (desktop model), or “Replacing the cover and connecting the cables” on page 52 (microtower model).
8. Restart the computer, leave it on for about ten seconds, and then turn off the computer. Hold the power switch for approximately five seconds, the computer will power off.
9. Repeat steps 2 through 4 on page 56.

10. Move the jumper back to the standard (pins 1 and 2).
11. Replace the cover and connect the power cord. See “Replacing the cover and connecting the cables” on page 26 (small desktop model), “Replacing the cover and connecting the cables” on page 38 (desktop model), or “Replacing the cover and connecting the cables” on page 52 (microtower model).
12. When you restart the computer, a 0162 error message will be displayed. This is normal. Choose an option and following the instructions that are displayed on the screen.

---

## Using Security Profile by Device

Security Profile by Device is used to enable or disable user access to the following devices:

<b>IDE controller</b>	When this feature is set to <b>Disable</b> , all devices connected to the IDE controller (such as hard disk drives or the CD-ROM drive) are disabled and will not be displayed in the system configuration.
<b>Diskette Drive Access</b>	When this feature is set to <b>Disable</b> , the diskette drive cannot be accessed.
<b>Diskette Write Protect</b>	When this feature is set to <b>Enable</b> , all diskettes are treated as if they are write-protected.

To set Security Profile by Device, do the following:

1. Start the IBM Setup Utility program (see “Starting the IBM Setup Utility program” on page 55).
2. From the IBM Setup Utility program menu, select **Security**.
3. Select **Security Profile by Device**.
4. Select the desired devices and settings and press Enter.
5. Return to the IBM Setup Utility program menu and select **Exit** and then **Save Settings**.

---

## Other settings in the IBM Setup Utility program

The information in this section contains instructions for changing the startup sequence.

### The startup sequence

Your computer can be started from several devices including the hard disk drive, diskette drive, and CD drive or DVD drive, or from the network. The startup program looks for these devices in a specified sequence and starts the computer from the first device in the sequence that contains startable media or code. You can specify a different startup sequence for when your computer is turned on from the power button than for when it is turned on automatically, such as over a network or by a timer.

When you turn on your computer, you are prompted to press F12 to change the startup sequence temporarily for the current startup. No permanent changes are made to the computer configuration.

### Changing the startup sequence

To view or change the primary or automatic power-on startup sequence, do the following:

1. Start the IBM Setup Utility program (see “Starting the IBM Setup Utility program” on page 55).
2. Select **Startup**.
3. Select **Startup Sequence**. See the information displayed at the right side of the screen.
4. Select the sequence of devices for the Primary Startup Sequence, the Automatic Startup Sequence, and the Error Startup Sequence.
5. Select **Exit** from the IBM Setup Utility menu and then **Save Settings**.

If you have changed these settings and want to return to the default settings, select **Load Default Settings** on the Exit menu.

---

## Appendix A. Changing the battery

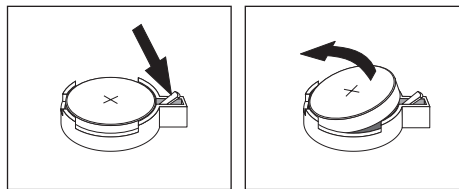
Your computer has a special type of memory that maintains the date, time, and settings for built-in features, such as parallel-port assignments (configuration). A battery keeps this information active when you turn off the computer.

The battery normally 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.

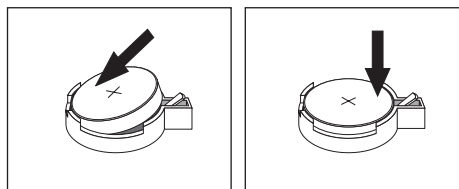
Refer to “Lithium battery notice” on page vi for information about replacing and disposing of the battery.

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 17 (small desktop model), “Removing the cover” on page 29 (desktop model), or “Removing the cover” on page 41 (microtower model).
3. Locate the battery. See “Identifying parts on the system board” on page 18 (small desktop model), “Identifying parts on the system board” on page 30 (desktop model), or “Identifying parts on the system board” on page 43 (microtower).
4. If necessary, remove any adapters that impede access to the battery. See “Installing adapters” on page 20 (small desktop model), “Installing adapters” on page 32 (desktop model), or “Installing adapters” on page 45 (microtower model) 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 20 (small desktop model), “Installing adapters” on page 32 (desktop model), or “Installing adapters” on page 45 (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 26 (small desktop model), “Replacing the cover and connecting the cables” on page 38 (desktop model), or “Replacing the cover and connecting the cables” on page 52 (microtower model).

**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 IBM Setup Utility program to set the date and time and any passwords.



---

## Appendix B. 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 that is built into your computer. They include the power-on self-test (POST), the basic input/output system (BIOS) code, and the IBM 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 IBM 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 IBM Setup Utility program by starting your computer using a flash update diskette.

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 *the Quick Reference*). Instructions for using the system program updates are available in a README file that is included in the update files.

To update system programs (flash the EEPROM):

1. Insert a system program update (flash) diskette into the diskette drive (drive A) in your computer. System program updates are available at <http://www.pc.ibm.com/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 17 (small desktop model), "Removing the cover" on page 29 (desktop model), or "Removing the cover" on page 41 (microtower model).
3. Locate the Clear CMOS/Recovery jumper on the system board. See "Identifying parts on the system board" on page 18 (small desktop model), "Identifying parts on the system board" on page 30 (desktop model), or "Identifying parts on the system board" on page 43 (microtower model).
4. If necessary, refer to Installing adapters to remove any adapters that impede access to the Clear CMOS/Recovery jumper.
5. Move the jumper from the standard position (pins 1 and 2) to pins 2 and 3.

6. Replace the cover. See "Replacing the cover and connecting the cables" on page 26 (small desktop model), "Replacing the cover and connecting the cables" on page 38 (desktop model), or "Replacing the cover and connecting the cables" on page 52 (microtower model).
7. Reconnect the power cords for the computer and monitor to electrical outlets.
8. Insert the POST/BIOS update (flash) diskette into drive A, and turn on the computer and the monitor.
9. After the update session is completed, there will be no video and the series of beeps will end. Remove the diskette from the diskette drive, and turn off the computer and monitor.
10. Unplug the power cords from electrical outlets.
11. Remove the cover. See "Removing the cover" on page 17 (small desktop model), "Removing the cover" on page 29 (desktop model), or "Removing the cover" on page 41 (microtower model).
12. Remove any adapters that impede access to the BIOS Configuration jumper.
13. Replace the Clear CMOS/Recovery jumper to its original position.
14. Replace any adapters that were removed.
15. Replace the cover and reconnect any cables that were disconnected.
16. Turn on the computer to restart the operating system.

---

## Appendix C. 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 – FFFFFFF	15 MB	PCI space
16 MB – 4096 MB	10000000 – FFDFFFFFF	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 range (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/O 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 range (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 range (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)	N/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	
0089	Channel 6, page table address register	00 – 07	

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

Address (hex)	Description	Bits	Byte pointer
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)	N/A	
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 D. 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	Available to user
6	Diskette controller
7	LPT1
8	Real-time clock
9	Video, ACPI
10	Available to user
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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# Index

## A

- adapters
  - accelerated graphics port (AGP) 8
  - installing
    - desktop model 32
    - microtower model 45
    - small desktop model 20
  - peripheral component interconnect (PCI) 8
  - slots 20, 32, 45
- address map
  - DMA input/output (I/O) 65
  - input/output (I/O) 63
  - system memory 63
- audio, subsystem 3
- audio line in connector 13, 14, 15, 16
- audio line out connector 13, 14, 15, 16

## C

- cables, connecting 26, 38, 52
- changing the battery 59
- channel assignments
  - DMA 67
  - IRQ 67
- connectors
  - description 16
  - front 11
  - rear 13
- cover
  - removing
    - desktop model 29
    - microtower model 41
    - small desktop model 17
  - replacing
    - desktop model 38
    - microtower model 52
    - small desktop model 26

## D

- device, drivers 16
- DIMMs, installing 19, 31, 44
- DMA channel assignments 67
- DMA I/O address map 65
- drives
  - bays 4, 23, 33, 47
  - CD 8, 34, 47
  - diskette 8
  - DVD 8, 34, 47
  - hard disk 8, 34, 47
  - installing 23, 24, 33, 35, 47, 48
  - internal 3, 8, 47, 48
  - removable media 8, 34, 47
  - specifications 23, 34, 47
  - tape 34

## E

- environment, operating 5, 6, 7
- Ethernet connector 13, 14, 15, 16

## I

- IBM Setup Utility 55
- input/output (I/O)
  - address map 63, 65
  - DMA address map 65
  - features 3
- installing options
  - desktop model
    - adapters 32
    - DIMMs 31
    - internal drives 35
    - memory 31
    - Rope Clip 37
  - microtower model
    - adapters 45
    - DIMMs 44
    - internal drives 48
    - memory 44
    - Rope Clip 51
  - small desktop model
    - adapters 20
    - DIMMs 19
    - internal drives 24
    - memory 19
    - Rope Clip 25
- interrupt request (IRQ) channel assignments 67

## K

- keyboard connector 13, 14, 15, 16

## L

- locating components
  - desktop model 30
  - microtower model 42
  - small desktop model 18

## M

- memory
  - dual in-line memory-modules (DIMMs) 19, 31, 44
  - installing 19, 31, 44
  - map 63
  - system 8, 19, 44
- microphone connector 13, 14, 15, 16
- mouse connector 13, 14, 15, 16
- moving the power supply 42

## N

- noise level 5, 6, 7

## O

### options

- available 8
- external 8, 11
- installing
  - desktop model 29
  - microtower model 41
  - small desktop model 17
- internal 8, 17, 29, 41

## P

parallel connector 13, 14, 15, 16

### password

- erasing 56
- lost or forgotten 56
- setting, changing, deleting 56

### power

- Advanced Configuration and Power Interface (ACPI) support 4
- Advanced Power Management support 4

## R

recovering from a POST/BIOS update failure 61

### removing the cover

- desktop model 29
- microtower model 41
- small desktop model 17

### replacing the cover

- desktop model 38
- microtower model 52
- small desktop model 26

## S

### security

- features 4
  - Rope Clip 25, 37, 51
- security profile by device 57
- serial connectors 13, 14, 15, 16
- system address maps 63
- system board
  - connectors 19, 31, 44
  - identifying parts 18, 30, 43
  - location 19, 31, 44
  - memory 8, 18, 31, 43
- system programs, updating 61

## U

updating system programs 61

USB connectors 13, 14, 15, 16

using, security profile by device 57

## V

video, subsystem 3





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