

ThinkCentre™



User Guide

Types 8183, 8184, 8320, 8416

Types 8417, 8418, 8419, 8429

ThinkCentre™



User Guide

Types 8183, 8184, 8320, 8416

Types 8417, 8418, 8419, 8429

Note

Before using this information and the product it supports, be sure to read the "Important safety information" on page v and Appendix E, "Notices," on page 59.

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Contents

Important safety information v

Conditions that require immediate action	v
General safety guidelines	vi
Service	vi
Power cords and power adapters	vi
Extension cords and related devices	vii
Plugs and outlets	vii
Batteries	vii
Heat and product ventilation	viii
CD and DVD drive safety	viii
Additional safety information	viii
Lithium battery notice	x
Modem safety information	x
Laser compliance statement	xi

Chapter 1. Overview 1

Information resources	1
Features	2
Available options	4
Specifications	5
Supported operating positions	6

Chapter 2. Installing options 7

Handling static-sensitive devices	7
Installing external options	7
Locating controls and connectors on the front of your computer	8
Locating connectors on the rear of your computer	9
Obtaining device drivers	9
Opening the cover	10
Locating components	11
Accessing system board components and drives	12
Identifying parts on the system board	13
Installing memory	14
Installing PCI adapters	15
Installing internal drives	16
Removing and replacing a CD-ROM, CD-RW, or DVD optical drive	18
Removing and replacing a hard disk drive	19
Removing and replacing a diskette drive	20
Connecting a serial ATA hard disk drive	20
Connecting an IDE drive	21
Installing security features	21
Identifying security locks	22
Integrated security cable	22
Rope clip	24
Cover lock	24
Password protection	24
Erasing a lost or forgotten password (clearing CMOS)	25
Closing the cover and connecting the cables	25

Chapter 3. Using the IBM Setup Utility 27

Starting the IBM Setup Utility program	27
Viewing and changing settings	27
Exiting from the IBM Setup Utility program	28
Using passwords	28
User password	28
Administrator password	28
Setting, changing, and deleting a password	28
Using Security Profile by Device	29
Using IDE Drives Setup	29
Selecting a startup device	30
Selecting a temporary startup device	30
Changing the startup device sequence	30
Advanced settings	30

Appendix A. Replacing customer replaceable units (CRU) 31

CRU list	32
Removing and replacing the power supply assembly	33
Removing and replacing the system board assembly	36
Removing the microprocessor	38
Replacing the microprocessor	40
Removing and replacing the battery	41
Removing and replacing the speaker	42
Removing and replacing the power button and LED assembly	43
Removing and replacing the fan assembly	44
Completing the installation	46

Appendix B. Updating POST/BIOS 47

POST/BIOS	47
Updating (flashing) BIOS from a diskette	47
Updating (flashing) BIOS from your operating system	47
Recovering from a POST/BIOS update failure	48

Appendix C. Cleaning the mouse 49

Cleaning an optical mouse	49
Cleaning a mouse with a ball	49

Appendix D. Manual modem commands 51

Basic AT commands	51
Extended AT commands	53
MNP/V.42/V.42bis/V.44 commands	54
Fax Class 1 commands	55
Fax Class 2 commands	55
Voice commands	56

Appendix E. Notices 59

Trademarks	60
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Index 61

Important safety information

This information can help you safely use your IBM® personal computer. Follow and retain all information included with your IBM computer. The information in this document does not alter the terms of your purchase agreement or the IBM Statement of Limited Warranty.

Customer safety is important to IBM. Our products are developed to be safe and effective. However, personal computers are electronic devices. Power cords, power adapters, and other features can create potential safety risks that can result in physical injury or property damage, especially if misused. To reduce these risks, follow the instructions included with your product, observe all warnings on the product and in the operating instructions, and review the information included in this document carefully. By carefully following the information contained in this document and provided with your product, you can help protect yourself from hazards and create a safer computer work environment.

Note: This information includes references to power adapters and batteries. In addition to mobile personal computers, IBM ships some products (such as speakers or monitors) with external power adapters. If you have such a product, this information applies to your product. In addition, your computer product may contain a coin-sized internal battery that provides power to your system clock even when the machine is unplugged, so the battery safety information applies to all computers.

Conditions that require immediate action

Products can become damaged due to misuse or neglect. Some product damage is serious enough that the product should not be used again until it has been inspected and, if necessary, repaired by an authorized servicer.

As with any electronic device, pay close attention to the product when it is turned on. On very rare occasions, you might notice an odor or see a puff of smoke or sparks vent from your machine. Or you might hear sounds like popping, cracking or hissing. These conditions might merely mean that an internal electronic component has failed in a safe and controlled manner. Or, they might indicate a potential safety issue. However, do not take risks or attempt to diagnose the situation yourself.

Frequently inspect your computer and its components for damage or wear or signs of danger. If you have any question about the condition of a component, do not use the product. Contact the IBM HelpCenter® or the product manufacturer for instructions on how to inspect the product and have it repaired, if necessary.

In the unlikely event that you notice any of the conditions listed below, or if you have any safety concerns with your product, stop using the product and unplug it from the power source and telecommunication lines until you can speak to the IBM HelpCenter for further guidance.

- Power cords, plugs, power adapters, extension cords, surge protectors, or power supplies that are cracked, broken or damaged.
- Signs of overheating, smoke, sparks or fire.

- Damage to a battery (such as cracks, dents, creases), discharge from a battery, or a buildup of foreign substances on the battery.
- A cracking, hissing or popping sound, or strong odor that comes from the product.
- Signs that liquid has been spilled or an object has fallen onto the computer product, the power cord or power adapter.
- The computer product, the power cord or power adapter has been exposed to water.
- The product has been dropped or damaged in any way.
- The product does not operate normally when you follow the operating instructions.

Note: If you notice these conditions with a non-IBM product (such as an extension cord), stop using that product until you can contact the product manufacturer for further instructions, or until you get a suitable replacement.

General safety guidelines

Always observe the following precautions to reduce the risk of injury and property damage.

Service

Do not attempt to service a product yourself unless instructed to do so by the IBM HelpCenter. Use only an IBM authorized service provider who is approved to repair your particular product.

Note: Some parts can be upgraded or replaced by the customer. These parts are referred to as Customer Replaceable Units, or CRUs. IBM expressly identifies CRUs as such, and provides documentation with instructions when it is appropriate for customers to replace those parts. You must closely follow all instructions when performing such replacements. Always make sure that the power is turned off and that the product is unplugged from any power source before you attempt the replacement. If you have any questions or concerns, contact the IBM HelpCenter.

Power cords and power adapters

Use only the power cords and power adapters supplied by the product manufacturer.

Never wrap a power cord around the power adapter or other object. Doing so can stress the cord in ways that can cause the cord to fray, crack or crimp. This can present a safety hazard.

Always route power cords so that they will not be walked on, tripped over, or pinched by objects.

Protect the cord and power adapters from liquids. For instance, do not leave your cord or power adapter near sinks, tubs, toilets, or on floors that are cleaned with liquid cleansers. Liquids can cause a short circuit, particularly if the cord or power adapter has been stressed by misuse. Liquids can also cause gradual corrosion of the power cord terminals and/or the connector terminals on the adapter which can eventually result in overheating.

Always connect power cords and signal cables in the correct order and ensure that all power cord connectors are securely and completely plugged into receptacles.

Do not use any power adapter that shows corrosion at the ac input pins and/or shows signs of overheating (such as deformed plastic) at the ac input or anywhere on the power adapter.

Do not use any power cords where the electrical contacts on either end show signs of corrosion or overheating or where the power cord appears to have been damaged in any way.

Extension cords and related devices

Ensure that extension cords, surge protectors, uninterruptible power supplies, and power strips that you use are rated to handle the electrical requirements of the product. Never overload these devices. If power strips are used, the load should not exceed the power strip input rating. Consult an electrician for more information if you have questions about power loads, power requirements, and input ratings.

Plugs and outlets

If a receptacle (power outlet) that you intend to use with your computer equipment appears to be damaged or corroded, do not use the outlet until it is replaced by a qualified electrician.

Do not bend or modify the plug. If the plug is damaged, contact the manufacturer to obtain a replacement.

Some products are equipped with a three-pronged plug. This plug fits only into a grounded electrical outlet. This is a safety feature. Do not defeat this safety feature by trying to insert it into a non-grounded outlet. If you cannot insert the plug into the outlet, contact an electrician for an approved outlet adapter or to replace the outlet with one that enables this safety feature. Never overload an electrical outlet. The overall system load should not exceed 80 percent of the branch circuit rating. Consult an electrician for more information if you have questions about power loads and branch circuit ratings.

Be sure that the power outlet you are using is properly wired, easily accessible, and located close to the equipment. Do not fully extend power cords in a way that will stress the cords.

Connect and disconnect the equipment from the electrical outlet carefully

Batteries

All IBM personal computers contain a non-rechargeable coin cell battery to provide power to the system clock. In addition many mobile products such as Thinkpad notebook PCs utilize a rechargeable battery pack to provide system power when in portable mode. Batteries supplied by IBM for use with your product have been tested for compatibility and should only be replaced with IBM approved parts.

Never attempt to open or service any battery. Do not crush, puncture, or incinerate batteries or short circuit the metal contacts. Do not expose the battery to water or other liquids. Only recharge the battery pack strictly according to instructions included in the product documentation.

Battery abuse or mishandling can cause the battery to overheat, which can cause gasses or flame to “vent” from the battery pack or coin cell. If your battery is damaged, or if you notice any discharge from your battery or the buildup of

foreign materials on the battery leads, stop using the battery and obtain a replacement from the battery manufacturer.

Batteries can degrade when they are left unused for long periods of time. For some rechargeable batteries (particularly Lithium Ion batteries), leaving a battery unused in a discharged state could increase the risk of a battery short circuit, which could shorten the life of the battery and can also pose a safety hazard. Do not let rechargeable Lithium-Ion batteries completely discharge or store these batteries in a discharged state.

Heat and product ventilation

Computers generate heat when turned on and when batteries are charging. Notebook PCs can generate a significant amount of heat due to their compact size. Always follow these basic precautions:

- Do not leave the base of your computer in contact with your lap or any part of your body for an extended period when the computer is functioning or when the battery is charging. Your computer produces some heat during normal operation. Extended contact with the body could cause discomfort or, potentially, a skin burn.
- Do not operate your computer or charge the battery near flammable materials or in explosive environments.
- Ventilation slots, fans and/or heat sinks are provided with the product for safety, comfort, and reliable operation. These features might inadvertently become blocked by placing the product on a bed, sofa, carpet, or other flexible surface. Never block, cover or disable these features.

CD and DVD drive safety

CD and DVD drives spin discs at a high speed. If a CD or DVD is cracked or otherwise physically damaged, it is possible for the disc to break apart or even shatter when the CD drive is in use. To protect against possible injury due to this situation, and to reduce the risk of damage to your machine, do the following:

- Always store CD/DVD discs in their original packaging
- Always store CD/DVD discs out of direct sunlight and away from direct heat sources
- Remove CD/DVD discs from the computer when not in use
- Do not bend or flex CD/DVD discs, or force them into the computer or their packaging
- Check CD/DVD discs for cracks before each use. Do not use cracked or damaged discs

Additional 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: <ol style="list-style-type: none"> 1. Turn everything OFF. 2. First, attach all cables to devices. 3. Attach signal cables to connectors. 4. Attach power cords to outlet. 5. Turn device ON. 	To disconnect: <ol style="list-style-type: none"> 1. Turn everything OFF. 2. First, remove power cords from outlet. 3. Remove signal cables from connectors. 4. Remove all cables from devices.
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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: <ol style="list-style-type: none"> 1. Mettez les unités hors tension. 2. Commencez par brancher tous les cordons sur les unités. 3. Branchez les câbles d'interface sur des connecteurs. 4. Branchez les cordons d'alimentation sur des prises. 5. Mettez les unités sous tension. 	Déconnexion: <ol style="list-style-type: none"> 1. Mettez les unités hors tension. 2. Débranchez les cordons d'alimentation des prises. 3. Débranchez les câbles d'interface des connecteurs. 4. Débranchez tous les câbles des unités.
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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.

Modem safety information

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

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

Consignes de sécurité relatives au modem

Lors de l'utilisation de votre matériel téléphonique, il est important de respecter les consignes ci-après afin de réduire les risques d'incendie, d'électrocution et d'autres blessures :

- N'installez jamais de cordons téléphoniques durant un orage.

- Les prises téléphoniques ne doivent pas être installées dans des endroits humides, excepté si le modèle a été conçu à cet effet.
- Ne touchez jamais un cordon téléphonique ou un terminal non isolé avant que la ligne ait été déconnectée du réseau téléphonique.
- Soyez toujours prudent lorsque vous procédez à l'installation ou à la modification de lignes téléphoniques.
- Si vous devez téléphoner pendant un orage, pour éviter tout risque de choc électrique, utilisez toujours un téléphone sans fil.
- En cas de fuite de gaz, n'utilisez jamais un téléphone situé à proximité de la fuite.

Laser compliance statement

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

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

CAUTION:

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

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

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

<p>DANGER</p>

<p>Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.</p>
--

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.

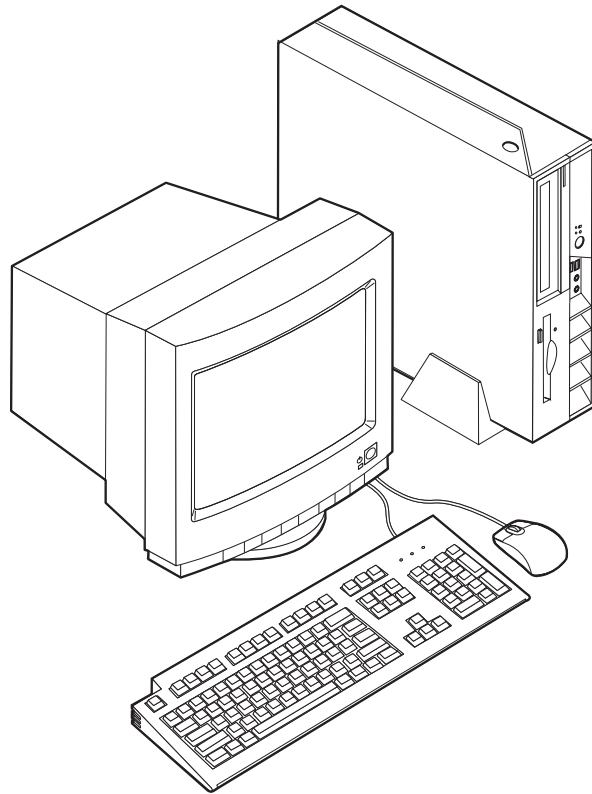
Certaines unités de CD-ROM/DVD-ROM peuvent contenir une diode à laser de classe 3A ou 3B. Tenez compte de la consigne qui suit:

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.

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.



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 along with the option.

Information resources

The *Quick Reference* that comes with your computer provides information for setting up your computer, starting the operating system, troubleshooting, and notices.

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.ibm.com/pc/support>

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

Features

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

System summary

The following information covers a variety of models. For a listing of features for your specific model, go to Chapter 3, "Using the IBM Setup Utility," on page 27.

Microprocessor

- Intel Pentium® 4 processor with HyperThreading
- Intel Pentium 4 processor
- Intel® Celeron™ processor
- Internal cache (size varies by model type)

Memory

Support for two 184-pin dual inline memory modules (DIMMs). Each DIMM socket can support up to 1 GB of PC2700 double data rate (DDR) synchronous dynamic random access memory (SDRAM) for a system maximum of 2 GB.

Internal drives

- 3.5-inch, half-inch (slim) diskette drive (some models)
- Hard disk drive
- CD-ROM, DVD-ROM, DVD-ROM/CD-RW Combo, CD-RW, or IBM Multi-Burner optical drive (some models)

Video subsystem

An integrated Intel Extreme Graphics 2 controller for a Video Graphics Array (VGA) monitor

Audio subsystem

The integrated AC'97 audio controller provides four audio connectors.

- Microphone and headphone connectors on the front panel
- Line-in and line-out connectors on the rear panel

Connectivity

- 10/100 Mbps integrated Intel Ethernet controller that supports the Wake on LAN® feature (some models)
- 10/100/1000 Mbps integrated Intel Ethernet controller that supports the Wake on LAN feature (some models)
- Peripheral Component Interconnect (PCI) V.90 Data/Fax modem (some models)

System management features

- 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 PCI 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
- Eight USB 2.0 connectors (two on front panel and six on rear panel)
- PS/2[®] mouse connector
- PS/2 keyboard connector
- Ethernet connector
- VGA monitor connector
- Two audio connectors (line-in and line-out) on rear panel
- Two audio connectors (microphone and headphone) on front panel

Expansion

- Two 32-bit PCI full height adapter slots
- Two DIMM memory connectors

Power

- 200 Watt 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

- User and administrator passwords
- Support for the addition of a cable lock such as a Kensington lock
- Knockout holes for installing a rope clip (U-bolt)
- Optional keylock on top cover
- Startup sequence control
- Startup without diskette drive, keyboard, or mouse
- Diskette and hard disk I/O control
- Serial and parallel port I/O control
- Security profile by device

IBM preinstalled software

Your computer comes with preinstalled software. An operating system, device drivers to support built-in features, and other support programs are included.

Operating systems (preinstalled) (varies by model)

Note: Not all countries or regions will have these operating systems.

- Microsoft® Windows® XP Home
- Microsoft Windows XP Professional
- Microsoft Windows 2000

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 devices, such as a cable lock
 - Monitors
- Internal options
 - System memory, called dual inline memory modules (DIMMs)
 - Peripheral component interconnect (PCI) adapters
 - CD-ROM, DVD-ROM, or CD-RW drive, hard disk drive, diskette drive, and other removable media drives

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

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

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

- Within the United States, call 1-800-IBM-2YOU (1-800-426-2968), your IBM reseller, or IBM marketing representative.
- Within Canada, call 1-800-565-3344 or 1-800-IBM-4YOU.
- Outside the United States and Canada, contact your IBM reseller or IBM marketing representative.

Specifications

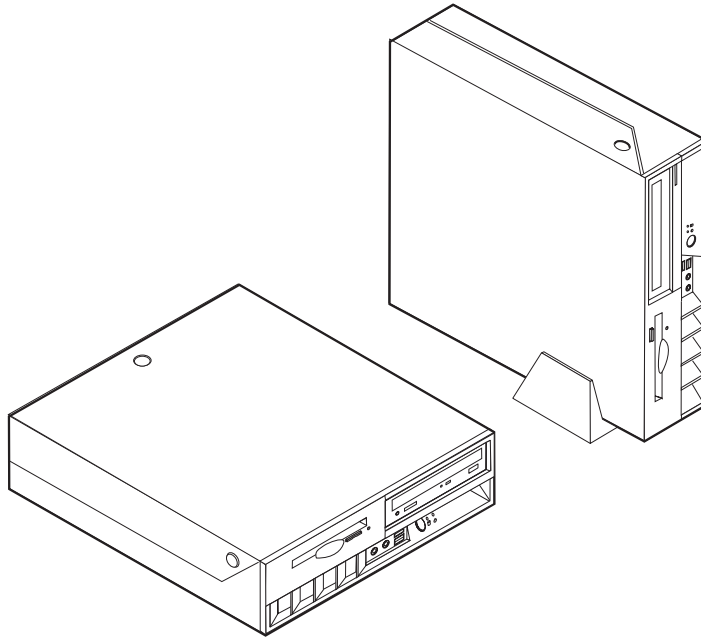
This section lists certain specifications for your computer. For the latest specification information, see the *User Guide* for your computer model and type at:

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

<p>Dimensions</p> <p>Width: 12.2 inches (310 mm) Height: 3.35 inches (85 mm) Depth: 14.1 inches (358 mm)</p> <p>Weight</p> <p>Minimum configuration as shipped: 8.2 kg (18 lbs)</p> <p>Environment</p> <p>Air temperature:</p> <p>Operating at 0 - 3000 ft (914.4 m): 10° to 35°C (50° to 95°F) Operating at 3000 ft - 7000 ft (2134 m): 10° to 32°C (50° to 89.6°F) Non-operating: 10° to 43°C (50° to 110°F)</p> <p>Humidity:</p> <p>Operating: 8% to 80% Non-operating: 8% to 80% Transit: 8% to 90%</p> <p>Maximum altitude: 7000 ft (2133.6 m)</p> <p>Electrical input</p> <p>Input voltage:</p> <p>Low range:</p> <p>Minimum: 100 V ac Maximum: 127 V ac Input frequency range: 50–60 Hz Voltage switch setting: 115 V ac</p> <p>High range:</p> <p>Minimum: 200 V ac Maximum: 240V ac Input frequency range: 50–60 Hz Voltage switch setting: 230 V ac</p> <p>Input kilovolt-amperes (kVA) (approximate):</p> <p>Minimum configuration as shipped: 0.09 kVA Maximum configuration: 0.23 kVA</p> <p>Heat output (approximate) in British thermal units (Btu) per hour:</p> <p>Minimum configuration: 205.8 Btu/hr (60 watts) Maximum configuration: 548.8 Btu/hr (160 watts)</p>	<p>Airflow for computers with a microprocessor that runs at or below 2.8 GHz</p> <p>Approximately 13 cubic feet (0.37 cubic meters) per minute</p> <p>Airflow for computers with a microprocessor that runs above 2.8 GHz</p> <p>Approximately 14 cubic feet (0.40 cubic meters) per minute</p> <p>Acoustical noise-emission values</p> <p>Note: In this computer, fan speed is controlled by temperature, configuration, and software. Actual noise-emission values might be different from the stated values depending on the number of fans and the speed of the fans.</p> <p>Average sound-pressure levels for computers with a microprocessor that runs at or below 2.8 GHz:</p> <p>At operator position - 0.5 meters:</p> <p>Idle: 30 dBA Operating: 34 dBA</p> <p>At bystander position - 1 meter (3.3 ft):</p> <p>Idle: 25 dBA Operating: 29 dBA</p> <p>Declared (upper limit) sound-power levels:</p> <p>Idle: 3.9 bels Operating: 4.3 bels</p> <p>Average sound-pressure levels for computers with a microprocessor that runs at greater than 2.8 GHz:</p> <p>At operator position - 0.5 meters:</p> <p>Idle: 31 dBA Operating: 34 dBA</p> <p>At bystander position - 1 meter (3.3 ft):</p> <p>Idle: 26 dBA Operating: 29 dBA</p> <p>Declared (upper limit) sound-power levels:</p> <p>Idle: 4.0 bels Operating: 4.3 bels</p> <p>Note: These levels were measured in controlled acoustical environments according to the procedures specified by the American National Standards Institute (ANSI) S12.10 and ISO 7779 and are reported in accordance with ISO 9296. Actual sound-pressure levels in a given location might exceed the average values stated because of room reflections and other nearby noise sources. The declared sound-power levels indicate an upper limit, below which a large number of computers will operate.</p>
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Supported operating positions

To provide proper air flow to internal components, you must position your computer in one of the positions as illustrated below.



Chapter 2. Installing options

This chapter provides instructions for installing optional memory, PCI adapters, drives, and security features. When installing an option, use these instructions along with the instructions that come with the option. Use these procedures also if you are replacing any of these options as a customer replaceable unit (CRU). See Appendix A, “Replacing customer replaceable units (CRU),” on page 31 for other CRUs.

Important

Before you install or remove any option, read “Important safety information” on page v. These precautions and guidelines will help you work safely.

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:

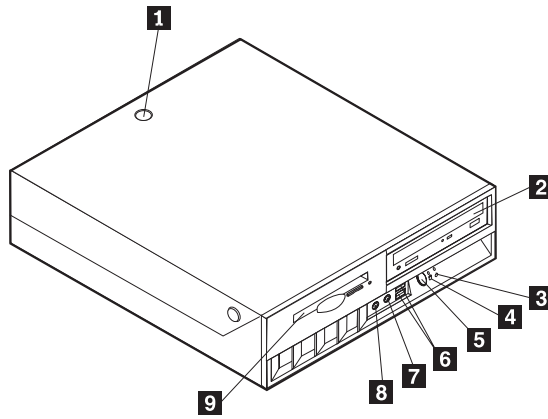
- Limit your movement. Movement can cause static electricity to build up around you.
- Always handle components carefully. Handle adapters and memory modules by the edges. Never touch any exposed circuitry.
- Prevent others from touching components.
- When you install a new option, touch the static-protective 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.

Installing external options

This section 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 section 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.

Locating controls and connectors on the front of your computer

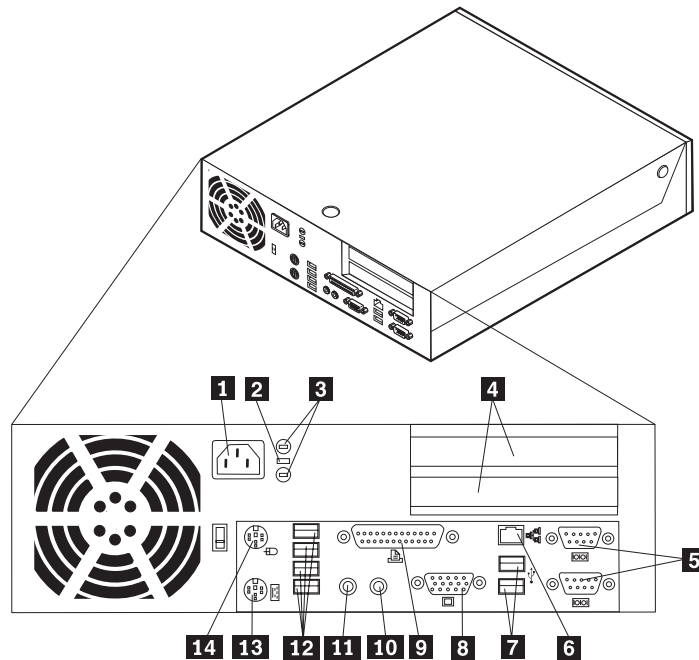
The following illustration shows locations of the controls and connectors on the front of your computer.



- | | | | |
|----------|------------------------------------|----------|--------------------------------|
| 1 | Cover keylock (some models) | 6 | USB connectors (2) |
| 2 | CD or DVD drive | 7 | Microphone connector (line in) |
| 3 | Hard disk drive activity indicator | 8 | Headphone connector (line out) |
| 4 | Power-on indicator | 9 | Diskette drive |
| 5 | Power button | | |

Locating connectors on the rear of your computer

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



- | | | | |
|----------|--------------------------|-----------|--------------------------|
| 1 | Power cord connector | 8 | VGA monitor connector |
| 2 | Cable lock latch | 9 | Parallel connector |
| 3 | Rope clip (U-bolt) holes | 10 | Audio line-in connector |
| 4 | PCI adapter slots | 11 | Audio line-out connector |
| 5 | Serial connectors (2) | 12 | USB connectors (4) |
| 6 | Ethernet connector | 13 | PS/2 keyboard connector |
| 7 | USB connectors (2) | 14 | PS/2 mouse connector |

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

Obtaining device drivers

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

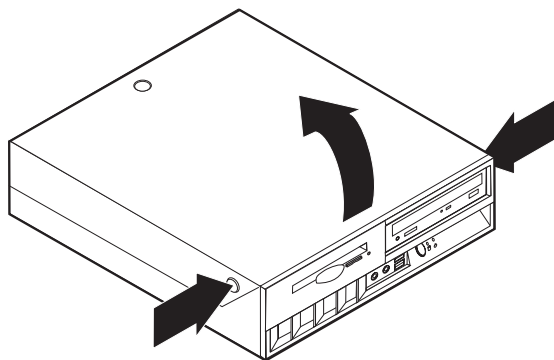
Opening the cover

Important

Read “Important safety information” on page v and “Handling static-sensitive devices” on page 7 before opening the cover.

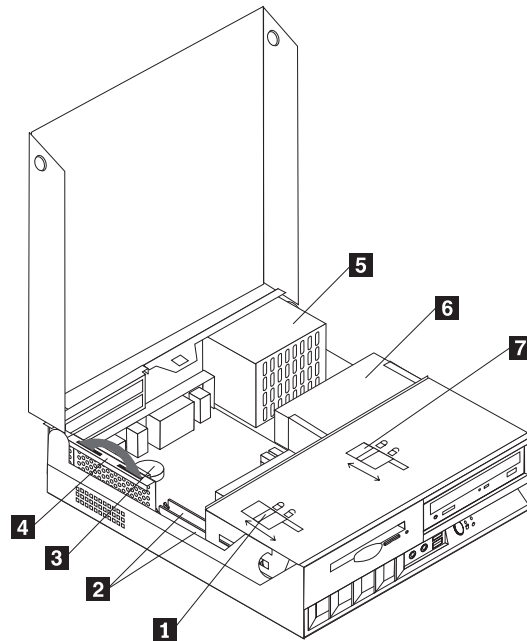
To open the cover:

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. Remove the floor stand, if attached.
5. If a cover lock is installed, unlock the cover.
6. Press inward on the two buttons and rotate the top cover upward as illustrated.



Locating components

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



- | | | | |
|----------|------------------------------|----------|---|
| 1 | Diskette drive lock | 5 | Power supply assembly |
| 2 | DIMM (memory) connectors (2) | 6 | CD or DVD drive (hard disk drive is under the CD drive) |
| 3 | Battery | 7 | CD or DVD drive lock |
| 4 | PCI riser | | |

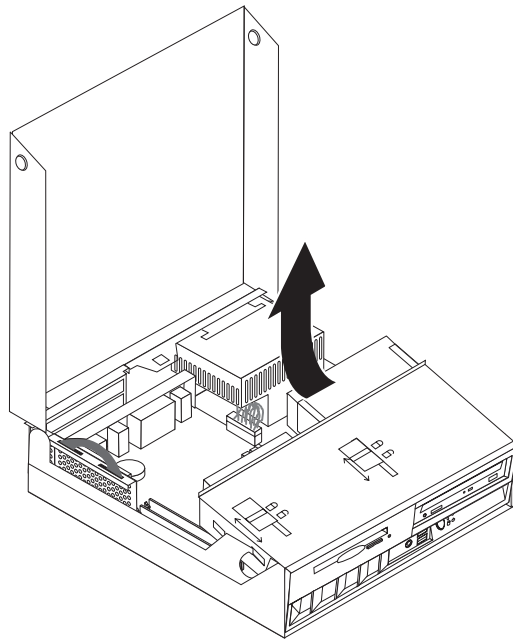
Accessing system board components and drives

You might need to rotate the drive bay assembly upward and remove the PCI riser and adapters to access system board components such as memory, the battery, the Clear CMOS/BIOS recovery jumper and to access the drives.

To access system board components and the drives:

1. Turn off the computer.
2. Open the cover. See “Opening the cover” on page 10.
3. Rotate the drive bay assembly upward as illustrated.

Note: Make sure you note the location of any cables that you disconnect from the drives or the system board.

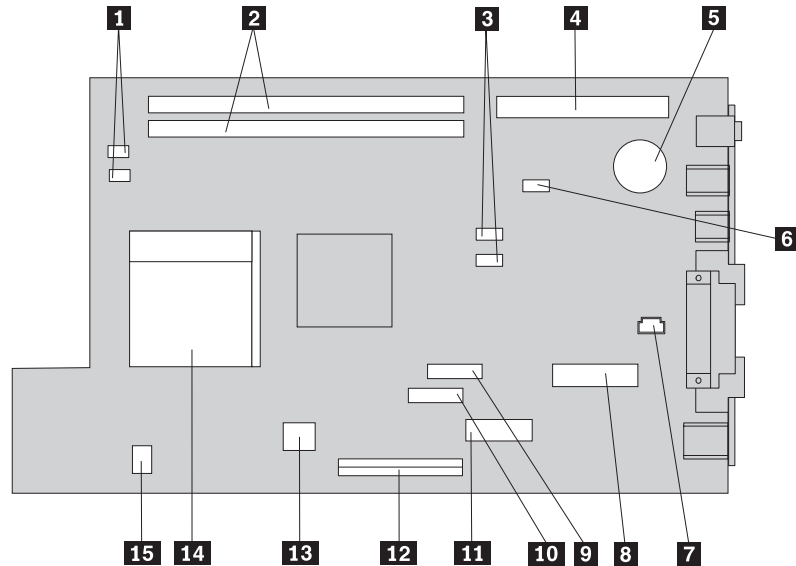


4. If any PCI adapters are installed, remove the PCI riser and adapter cards. Do not remove any adapters from the riser card. See “Installing PCI adapters” on page 15.

Identifying parts on the system board

The system board (sometimes 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.

The following illustration shows the locations of parts on the system board.



- | | | | |
|----------|--|-----------|---|
| 1 | Fan connectors (2) | 8 | Promise of value (POV) daughter card (some models) |
| 2 | Memory DIMM connectors (2) | 9 | Diskette drive connector |
| 3 | SATA 1 IDE and SATA 2 IDE hard disk drive connectors (2) | 10 | Power button and front LED assembly connector |
| 4 | PCI riser connector | 11 | Power supply connector |
| 5 | CMOS Battery | 12 | PATA Primary IDE connector (hard disk drive and CD-ROM drive) |
| 6 | Clear CMOS/BIOS recovery jumper | 13 | Power supply connector |
| 7 | Internal speaker connector | 14 | Microprocessor |
| | | 15 | CD audio connector |

Installing memory

Your computer has two connectors for installing dual inline memory modules (DIMMs) that provide up to a maximum of 2 GB of system memory.

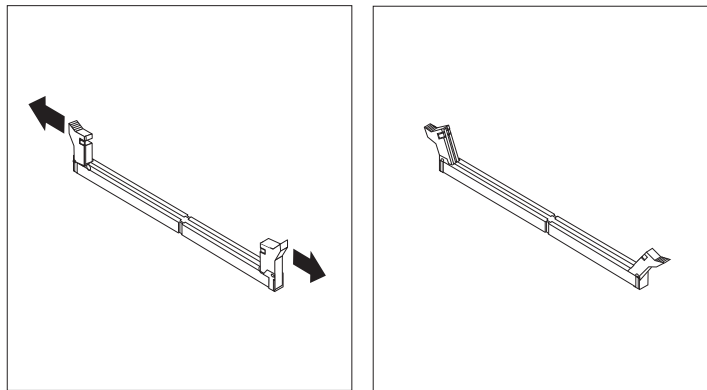
When installing memory, the following rules apply:

- Use 2.5 V, 184-pin, double data rate synchronous dynamic random access memory (DDR SDRAM), non-ECC DIMMs.
- Use 128 MB, 256 MB, 512 MB, or 1 GB DIMMs (when available) in any combination.

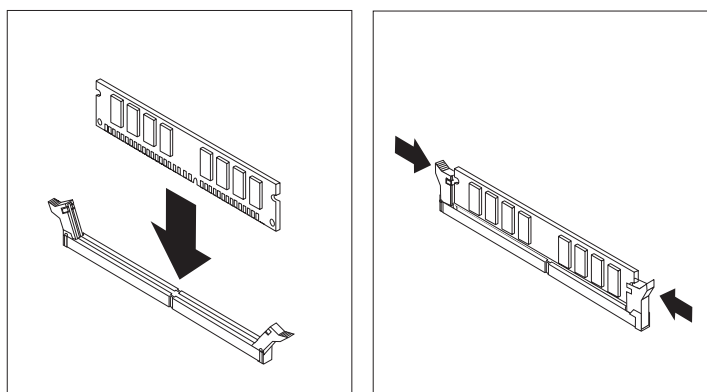
Note: Only DDR SDRAM DIMMs can be used.

To install DIMMs:

1. Access the system board. See “Accessing system board components and drives” on page 12.
2. Locate the DIMM connectors. See “Identifying parts on the system board” on page 13.
3. Open the retaining clips.



4. Make sure the notch in the DIMM aligns with the tab on the connector. Push or insert the memory module straight down into the connector until the retaining clips close.



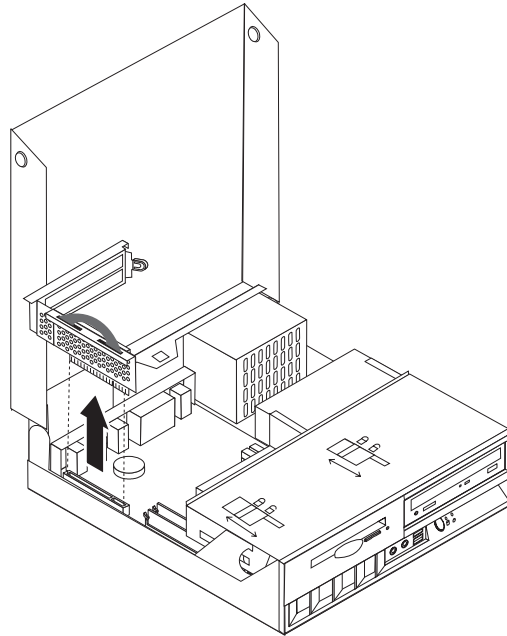
5. Replace the PCI riser and adapters if it was removed.
6. Place the drives back to the original position.
7. Replace the cover. See “Closing the cover and connecting the cables” on page 25.

Installing PCI adapters

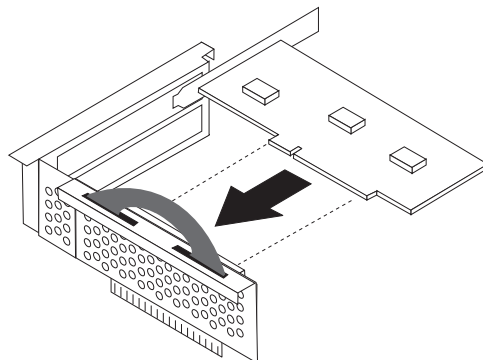
This section provides information and instructions for installing and removing PCI adapters. Your computer has a riser card with two PCI expansion slots.

To install a PCI adapter:

1. Open the cover. See “Opening the cover” on page 10.
2. While holding the left rear of the computer chassis down, pull upward on the handle provided, to remove the PCI riser and any adapters that are currently installed.



3. Release the slot cover latch and remove the slot cover for the appropriate expansion slot.
4. Remove the adapter from its static-protective package.
5. Install the adapter into the appropriate slot in the PCI riser.



6. Position the adapter-slot-cover latch to retain the adapters.
7. Reinstall the PCI riser and adapters.
8. Close the cover. See “Closing the cover and connecting the cables” on page 25.

What to do next:

- To work with another option, go to the appropriate section.
- To complete the installation, go to “Closing the cover and connecting the cables” on page 25.

Installing internal drives

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

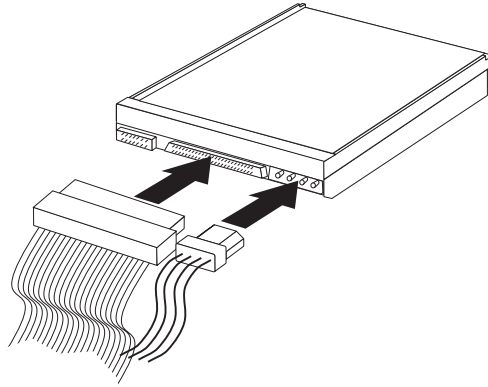
Internal drives are devices that your computer uses to read and store data. Your computer does not have the capacity to install additional drives but you might want to install higher capacity drives or a different type of drive to enable your computer to read other types of media. Some of the different drives available for your computer are:

- Parallel Advanced Technology Attachment (ATA) Integrated Drive Electronics (IDE) hard disk drive
- Serial ATA IDE hard disk drive
- Tape drives
- CD-ROM, CD-RW, or DVD-ROM optical drives
- Diskette and other removable media drives

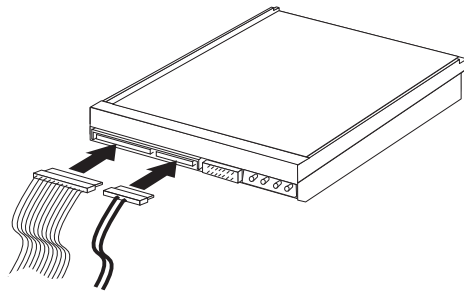
When you install an internal drive, it is important to note the type of drive that you are installing.

The following illustrations show a parallel ATA IDE hard disk drive and a serial ATA IDE hard disk drive.

Parallel ATA IDE drive



Serial ATA IDE drive



Listed below are the various types of drives and the connector used to connect them to the system board. Each drive also requires the connection of a power cable from the power supply.

Serial ATA IDE hard disk drive

Connect to an SATA 1 IDE or SATA 2 IDE connector

Parallel ATA IDE hard disk drive

Connect to the PATA Primary IDE connector

CD-ROM, CD-RW, or DVD optical drives

Connect to the PATA Primary IDE connector

Diskette drive

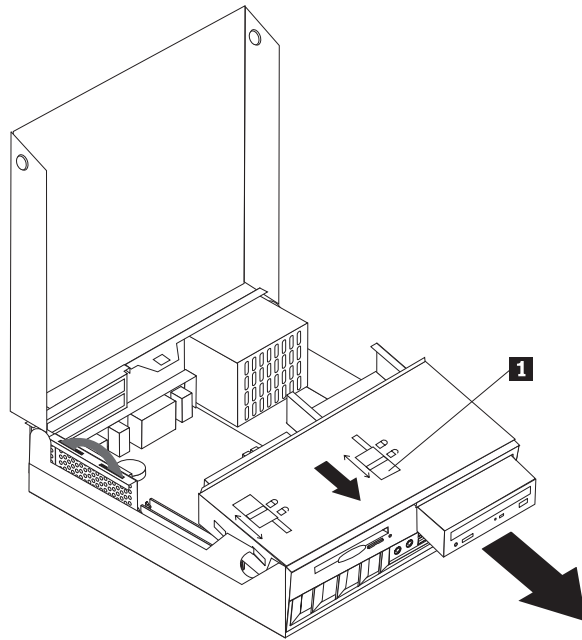
Connect to the diskette drive connector

Removing and replacing a CD-ROM, CD-RW, or DVD optical drive

1. Open the cover. See “Opening the cover” on page 10.
2. Rotate the drive bay assembly upward to gain access to the cable connections. See “Accessing system board components and drives” on page 12 and “Locating components” on page 11.
3. Disconnect the signal and power cables from the drive.

Note: Blue straps are provided to help when disconnecting cables.

4. Slide the lock **1** to the unlocked position.
5. Open the door at the front of the drive and slide it out the front of the computer.



6. Install the new drive into the bay.
7. Slide the lock **1** to the locked position and close the door at the front of the drive.
8. If you are replacing an existing drive, place the master/slave jumper on the drive in the same position as on the drive being replaced. If you are installing an additional drive, place the master/slave jumper on the drive so that it is a slave. Also refer to any instructions that come with the drive.
9. To connect the drive, go to “Connecting an IDE drive” on page 21.

What to do next:

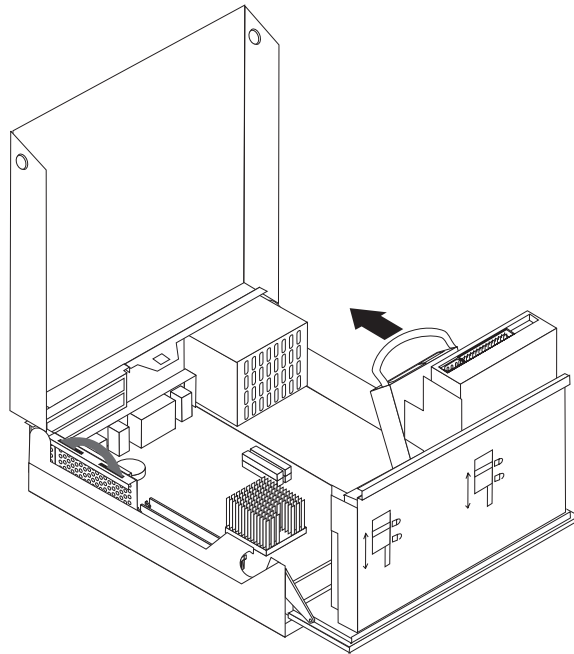
- To work with another option, go to the appropriate section.
- To complete the installation, go to “Closing the cover and connecting the cables” on page 25.

Removing and replacing a hard disk drive

1. Open the cover. See “Opening the cover” on page 10..
2. Rotate the drive bay assembly upward to gain access to the cable connections. See “Accessing system board components and drives” on page 12 and “Locating components” on page 11.
3. If a CD drive is installed, it helps to disconnect the signal cable from the drive to access the hard disk drive cables.

Note: Blue straps are provided to help when disconnecting cables.

4. Disconnect the signal and power cables from the hard disk drive.
5. Rotate the hard disk drive and bracket to the rear by pulling on the blue handle provided.



6. Lift the hard disk drive and bracket up to remove. The drive is removed from the bracket by flexing the bracket.
7. Install the new drive into the bracket and place the bracket into the slot.
8. Rotate the drive and bracket towards the front of the computer and snap it into position.
9. If you are replacing an existing drive, place the master/slave jumper on the drive in the same position as on the drive being replaced. If you are installing an additional drive, place the master/slave jumper on the drive so that it is a slave. Also refer to any instructions that come with the drive.
10. Depending on the type of drive you are installing, go to “Connecting a serial ATA hard disk drive” on page 20 or “Connecting an IDE drive” on page 21.

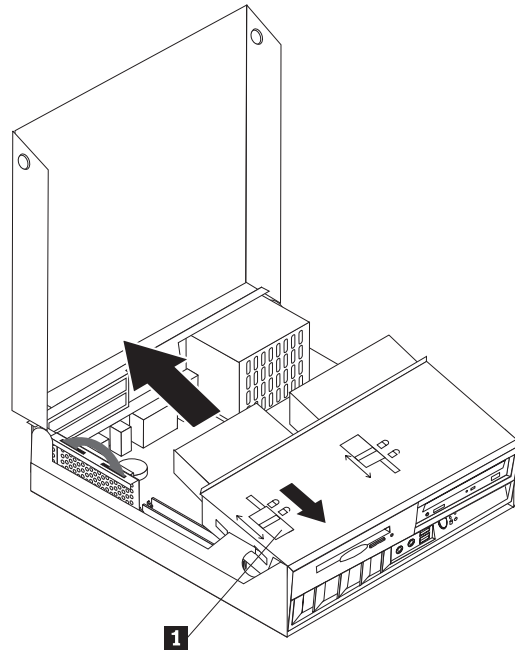
Note: Do not forget to reconnect the CD drive signal cable if it was disconnected.

What to do next:

- To work with another option, go to the appropriate section.
- To complete the installation, go to “Closing the cover and connecting the cables” on page 25.

Removing and replacing a diskette drive

1. Open the cover. See “Opening the cover” on page 10.
2. Slide the lock **1** to the unlocked position.



3. Slide the drive towards the rear of the computer far enough to gain access to the flat cable connector on the drive and disconnect the flat cable from the drive.
4. Rotate the drive bay assembly upward and remove the diskette drive.

To install a new diskette drive:

1. Slide the new drive partially into the bay from the rear.
2. Connect the flat cable to the new drive.
3. Slide the new drive completely into the bay and slide the lock **1** to the locked position.

What to do next:

- To work with another option, go to the appropriate section.
- To complete the installation, go to “Closing the cover and connecting the cables” on page 25.

Connecting a serial ATA hard disk drive

1. Locate the signal cable that came with your computer or with the new drive.

Note: When replacing a parallel ATA with a serial ATA hard disk drive, you must obtain the signal cable. It is not included with your computer.

2. Locate the SATA connectors on the system board. See “Identifying parts on the system board” on page 13.
3. Connect one end of the signal cable to the drive and the other to either the SATA 1 IDE or the SATA 2 IDE connector on the system board.

Note: It makes no difference which SATA connector you use.

4. Connect a power connector to the drive.
5. Lower the drive bay assembly into the normal position.

What to do next:

- To work with another option, go to the appropriate section.
- To complete the installation, go to “Closing the cover and connecting the cables” on page 25.

Connecting an IDE drive

1. Locate the three-connector signal cable that came with your computer. One end of the cable is connected to the system board IDE connector. The other two connectors allow you to connect two drives.
2. Make sure one end of the signal cable is connected to the PATA Primary IDE connector on the system board. See “Identifying parts on the system board” on page 13.
3. Connect an unused signal cable connector to the drive being installed.

Note: When connecting a hard disk drive make sure you connect it to the connector on the end of the cable. Use the other connector for the optical drive.

4. Connect a power connector to the drive.
5. If you have a CD-ROM drive audio cable (not included with computer), connect it to the drive and the system board. For the location of the CD audio connector, see “Identifying parts on the system board” on page 13.
6. Lower the drive bay assembly into the normal position.

What to do next:

- To work with another option, go to the appropriate section.
- To complete the installation, go to “Closing the cover and connecting the cables” on page 25.

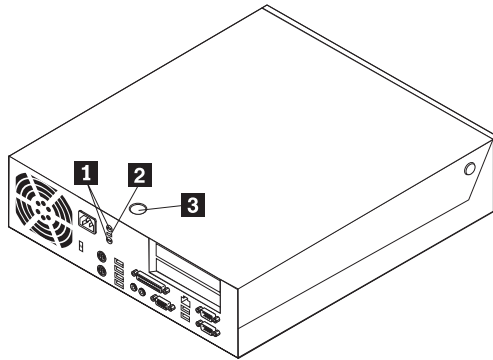
Installing security features

To help prevent hardware theft and unauthorized access to your computer, several security lock options are available. The following sections help you identify and install the various types of locks that might be available for your computer. In addition to physical locks, unauthorized use of your computer can be prevented by a software lock that locks the keyboard until a correct password is typed in.

Make sure that any security cables you install do not interfere with other computer cables.

Identifying security locks

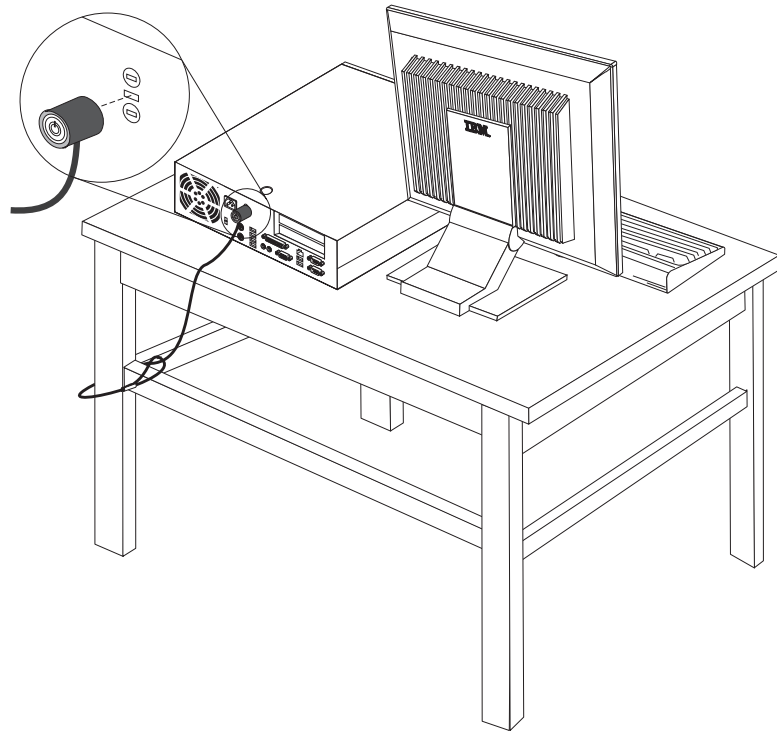
The following illustration will help you to identify the various types of security locks that your computer might have.



- 1** Holes for Rope clip (U-bolt)
- 2** Slot for integrated cable lock (Kensington lock)
- 3** Cover lock

Integrated security cable

With an integrated cable lock (sometimes referred to as the Kensington lock), you can secure your computer to a desk, table, or other non-permanent fixture. The cable lock attaches to a security slot at the rear of your computer and is operated with a key. This is the same type of lock used with many laptop computers. You can order a security cable directly from IBM. Go to <http://www.pc.ibm.com/support> and search on *Kensington*.

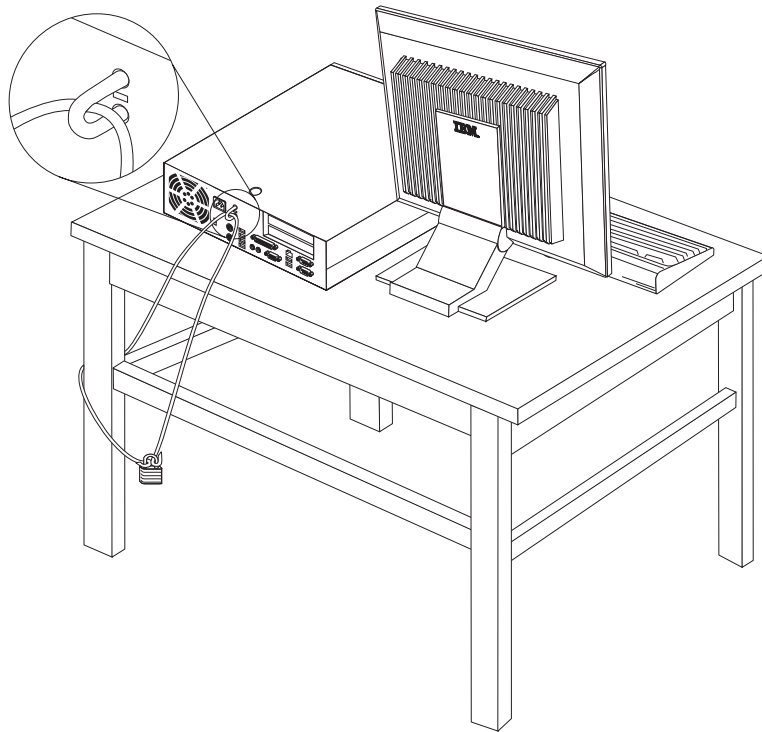


Rope clip

Using a 3/16 in (5 mm) security rope clip (sometimes referred to as a U-bolt), a steel security cable, and a padlock you can secure your computer to a desk, table, or other non-permanent fixture. For computers designed to accommodate the rope clip, knockouts at the rear of the chassis are provided.

To install a rope clip:

1. Remove the cover. See "Opening the cover" on page 10.
2. Use a tool, such as a screwdriver, to remove the two metal knockouts.
3. Insert the rope clip through the rear of the chassis and install the nuts using either an adjustable or an appropriate sized wrench.
4. Replace the cover.
5. Thread the security cable through the rope clip and around an object that is not part of or permanently attached to the building structure or foundation, and from which it cannot be removed; then fasten the cable together with a lock.



Cover lock

Your computer comes with a built-in key lock or a provision to install a key lock such as those provided by the Illinois Lock Company. The mailing address is:
Illinois Lock Company
301 W. Hintz Road
Wheeling, IL 60090-5754 USA

Password protection

To deter unauthorized use of your computer, you can use the IBM Setup Utility program to set a password. When you turn on your computer you are prompted to type the password to unlock the keyboard for normal use.

Erasing a lost or forgotten password (clearing CMOS)

This section applies to lost or forgotten passwords. For more information about lost or forgotten passwords, go to Access IBM.

Note: Some models have a POV daughter card installed on the system board. In these models, the password is stored in the EEPROM on the POV card and cannot be erased. See “Identifying parts on the system board” on page 13 for the location of the POV card.

To erase a forgotten password:

1. Refer to “Accessing system board components and drives” on page 12.
2. Locate the Clear CMOS/BIOS recovery jumper on the system board. See “Identifying parts on the system board” on page 13.
3. Move the jumper from the standard position (pins 1 and 2) to the maintenance or configure position (pins 2 and 3).
4. Install the PCI riser and adapters if removed.
5. Lower the drive bay assembly and reconnect any cables that were disconnected.
6. Close the cover and connect the power cable. See “Closing the cover and connecting the cables.”
7. Restart the computer, leave it on for approximately 10 seconds, and then turn off the computer.
8. Repeat step 1.
9. Move the CMOS/BIOS recovery jumper back to the standard position (pins 1 and 2).
10. Reassemble the computer and close the cover. See “Closing the cover and connecting the cables.”

Closing the cover and connecting the cables

After working with options, you need to install any removed parts, close 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 close 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. Make sure the drive bay assembly is lowered and that the drive locks are both in the **locked position**. Otherwise, you cannot close the cover.
4. Close the cover.
5. If a cover lock is installed, lock the cover.
6. If your computer is being placed in the vertical position, attach the floor stand.
Attention: To prevent overheating and possible component damage, always attach the floor stand when placing the computer in the vertical position.
7. Reconnect the external cables and power cords to the computer. See “Locating connectors on the rear of your computer” on page 9.
8. To update the configuration, see Chapter 3, “Using the IBM Setup Utility,” on page 27.

Chapter 3. Using the IBM Setup Utility

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. Shut down the operating system and turn off your computer.
2. Hold the Enter key pressed and turn on the computer.
3. When you hear a series of beeps, release the enter key.
4. When the **Startup Interrupt Menu** displays, press F1.

Note: If an administrator password has been set, the IBM Setup Utility program menu is not display until you type your password.

The IBM Setup Utility might start automatically when POST detects that hardware has been removed or new hardware has been installed in your computer. A sample of the first IBM Setup Utility screen is shown here.

IBM Setup Utility	
Main	Devices Startup Advanced Security Power Exit
▶ System Summary	Item Specific Help
Product Data:	
Machine Type/Model	818311x
Flash EEPROM Revision Lev	28KTxxAUS
Boot Block Revision Level	28xxA
System Board Identifier	IBM
System Serial Number	1234567
BIOS Date (MM/DD/YY)	02/06/03
▶ System UUID	
System Time (HH:MM:SS) :	[13:34:25]
System Date (MM:DD:YYYY) :	[02/27/2003]
F1 Help ↑↓ Select Item -/+ Change Values F9 Setup Defaults	
Esc Exit ↔ Select Menu Enter Select ▶ Sub-Menu F10 Save and Exit	

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 perform 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** or **Save and exit the Setup Utility**. 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 27).
2. From the IBM Setup Utility program menu, select **Security** → **Set Passwords**. Read the information displayed on the right side of the screen.

Using Security Profile by Device

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

IDE controller	When this feature is set to Disable , 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.
Diskette Drive Access	When this feature is set to Disable , the diskette drive cannot be accessed.
Diskette Write Protect	When this feature is set to Enable , 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 27).
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** or **Save and exit the Setup Utility**.

Note: If you do not want to save the settings, select **Exit the Setup Utility without saving**.

Using IDE Drives Setup

In addition to listing the different IDE devices, there are options for configuring the serial and parallel IDE controllers.

Parallel ATA	This setting allows the user to disable one or both of the parallel IDE controllers.
Serial ATA	This setting allows the user to disable the serial ATA controllers.
Native Mode Operation	This setting is only available when the serial ATA controller is enabled. This allows the user to specify whether the parallel and serial ATA controllers will operate in “legacy” or “native” mode. By default, they will operate in native mode unless both parallel ATA controllers are populated and a serial ATA drive is present. Then the serial ATA drive will become “native” mode. The user can select Automatic or the serial ATA controller to run in “native” mode. However, running in “native” mode might not work with older operating systems.

To configure IDE Drives Setup, do the following:

1. Start the IBM Setup Utility program (see “Starting the IBM Setup Utility program” on page 27).
2. From the IBM Setup Utility program menu, select **Devices**.
3. Select **IDE Drives Setup**.
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**.

Selecting a startup device

If your computer does not start up (boot) from a device such as the CD-ROM, diskette, or hard disk as expected, use one of the following procedures to select a startup device.

Selecting a temporary startup device

Use this procedure to startup from any boot device.

Note: Not all CDs, hard disks, and diskettes are startable (bootable).

1. Turn off your computer.
2. Turn on your computer and look for the following prompt on the logo screen:
(To interrupt normal startup, press Enter)

Press Enter when you see the prompt.

3. When the Startup Interrupt Menu displays, press F12.
4. Select the desired startup device from the Startup Device menu and press Enter to begin.

Note: Selecting a startup device from the Startup Device menu does not permanently change the startup sequence.

Changing the startup device sequence

To view or permanently change the configured startup device sequence, do the following:

1. Start the IBM Setup Utility program (see “Starting the IBM Setup Utility program” on page 27).
2. Select **Startup**.
3. Select **Startup Sequence**. See the information displayed on the right side of the screen.
4. Select the 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** or **Save and exit the Setup Utility**.

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

Advanced settings

On some computer models the Advanced settings menu includes a setting to Enable/Disable HyperThreading. This feature works only with HyperThreading-aware operating systems such as Microsoft Windows XP. The default setting for HyperThreading is Enabled. However, if you select **Set Defaults** and are using an operating system other than Windows XP, your computer performance might be degraded. Therefore, you should always set HyperThreading to Disabled unless you are sure your operating system supports HyperThreading.

Appendix A. Replacing customer replaceable units (CRU)

Some computer models are designed to be serviced with customer replaceable units (CRU). The CRUs for your computer vary by machine type. These procedures are provided to guide you when replacing the following CRUs:

- power supply
- microprocessor
- system board
- battery
- speaker
- fan
- power button and LED assembly

For memory DIMMs, PCI adapters, diskette drive, CD-ROM drive, and hard disk drive procedures, see Chapter 2, "Installing options," on page 7.

If you have Internet access, the most up-to-date *User Guide* and *Hardware Maintenance manual* (HMM) for your computer are available from the World Wide Web. To access this information, go to:

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

To replace some CRUs in your computer, you will need a flat-blade screwdriver.

See "Handling static-sensitive devices" on page 7 before replacing CRUs.

Although there are no moving parts in your computer after the power cord has been disconnected, the following warning is required for proper UL certification.

Warning

**Hazardous moving parts
Keep fingers and other body parts away**

Caution:



Turn off the computer and wait 3 to 5 minutes to let the computer cool before opening the cover.

Attention

Before disconnecting any cables, take note where the cables are connected. This is important when installing new CRUs.

CRU list

Battery, CMOS
Bezel, front plastic Kit
Cables, all
Cover
Cover lock assembly
Diskette drive
Fan assembly
Floor stand
Hard disk drives
Hard disk drive bracket
Keyboard
Memory DIMMs
Microprocessor
Microprocessor heat sink
Mouse
Optical drives
Phone line cord
Power button and LED assembly
Power supply, 200 Watt Power supply model: API3PC24
Riser card assembly
RJ11 connector adapter
Rotating drive bay assembly
Shield, 5.25 EMC (DR9)
Speaker assembly, internal
Speakers, external
Speaker power converter
System board assembly
V.90 Data/Fax Soft Modem Modem model: RD01-D270

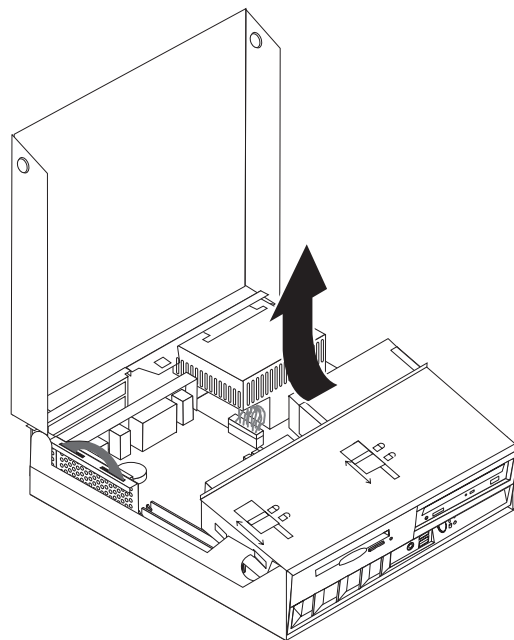
Removing and replacing the power supply assembly

Important

Before you install or remove any component, read “Important safety information” on page v. These precautions and guidelines will help you work safely.

To remove and replace the power supply assembly, do the following:

1. Turn off the computer and disconnect the power cord from the electrical outlet and from the computer.
2. Open the cover (see “Opening the cover” on page 10).
3. Rotate the drive bay assembly upward to gain access to the cable connections.

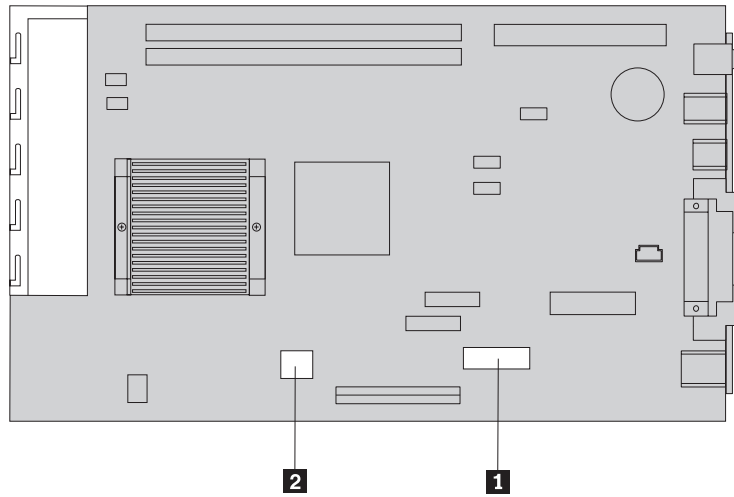


4. Locate the power supply assembly. See “Locating components” on page 11.

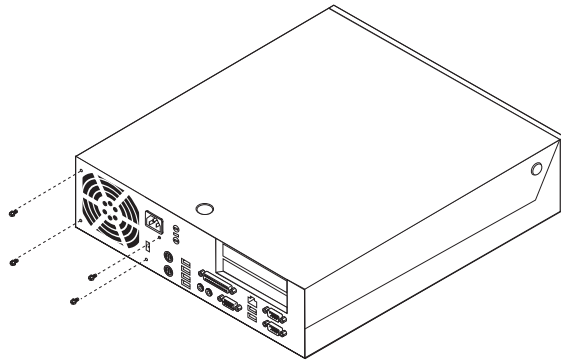
Note: Take note of the routing of the power supply cables. It is important to route the cables the same way when installing a new power supply assembly.

5. Disconnect the power cables (P3 and P4) from the hard disk drive and the CD-ROM drive.

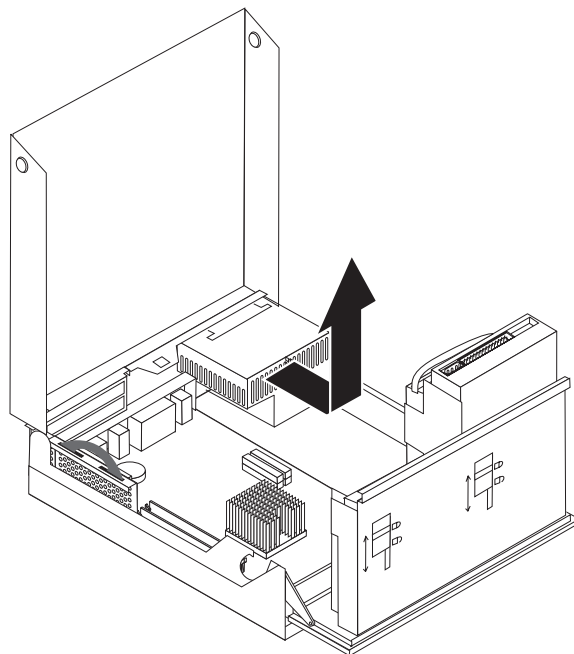
6. Disconnect the power cables P1 **1** and P2 **2** from the system board.



7. Remove the four power supply assembly screws from the rear of the chassis.



8. Remove the power supply assembly from the computer.



9. Install the new power supply assembly into the chassis so that the screw holes in the power supply assembly align with those in the chassis.

Note: Use only the screws provided by IBM.

10. Install and tighten the four power supply assembly screws into the rear of the chassis.
11. Reconnect power supply connectors P1 and P2 to the system board.
12. Reconnect power supply connectors P3 and P4 to the hard disk drive and CD-ROM drive, as required.
13. Correctly route all power supply cables to avoid interference with the drive bay assembly.
14. Go to “Completing the installation” on page 46.

Removing and replacing the system board assembly

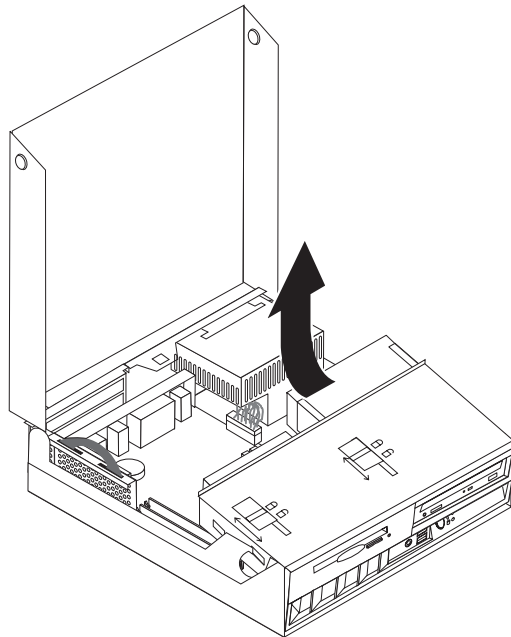
Important

Before you install or remove any component, read “Important safety information” on page v. These precautions and guidelines will help you work safely.

Attention: If your computer has been turned off for a long period of time, the thermal grease between the microprocessor heat sink and the microprocessor might not allow them to be separated easily. In this case turn on your computer for a few minutes to soften the grease.

To remove and replace the system board assembly, do the following:

1. Turn off the computer and disconnect the power cord from the electrical outlet and from the computer.
2. Open the cover. See “Opening the cover” on page 10.
3. Rotate the drive bay assembly upward to gain access to the system board.

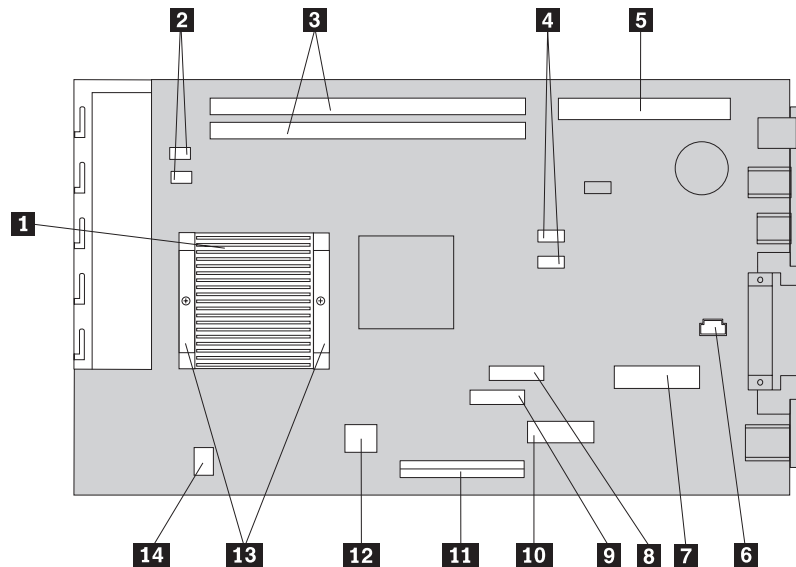


4. Remove the PCI riser card assembly along with any adapters. See “Installing PCI adapters” on page 15.
5. Remove the microprocessor from the system board. Go to “Removing the microprocessor” on page 38. Return here after removing the microprocessor.
6. Carefully take note of the location of all cable connections on the system board. It will be necessary to reconnect them properly when installing a new system board assembly.

Note: Take note of the cable routing. It is important to route the cables the same way when installing a new system board.

7. Disconnect the diskette drive cable from the system board by sliding the plastic cable retainer upward to release the cable.

- Disconnect all other cables connected to the system board.



- | | | | |
|----------|--|-----------|---|
| 1 | Microprocessor heat sink | 8 | Diskette drive connector |
| 2 | Fan connectors (2) | 9 | Front panel connector |
| 3 | DIMM connectors (2) | 10 | Power connector (P1) |
| 4 | SATA 1 IDE and SATA 2 IDE hard disk drive connectors (2) | 11 | PATA Primary IDE connector (hard disk drive and CD-ROM drive) |
| 5 | PCI riser connector | 12 | Power connector (P2) |
| 6 | Speaker connector | 13 | Microprocessor heat sink clamps |
| 7 | POV connector | 14 | CD audio connector |

- Using the two blue handles provided, lift the system board assembly out of the computer.

Note: You will have to tilt the system board assembly and move it around the edge of the power supply assembly to remove it from the computer.

- Take note of the location of the memory DIMMs and remove them from the system board. See “Installing memory” on page 14.
- Install the DIMMs on the new system board in the same location as they were on the system board being replaced.
- Install the new system board assembly into the computer chassis by aligning the two tabs on the rear of the system board assembly with the slots in the rear of the computer chassis. Slide the system board assembly to the rear until the front edge of the system board assembly fits behind the flange in the front and is seated flush to the bottom of the chassis.
- Reconnect all cables that were disconnected from the system board. Make sure all cables are routed correctly.
- Install the microprocessor on the new system board. See “Replacing the microprocessor” on page 40. Return here after replacing the microprocessor.
- Lower the drive bay assembly into the normal position.
- Go to “Completing the installation” on page 46.

Removing the microprocessor

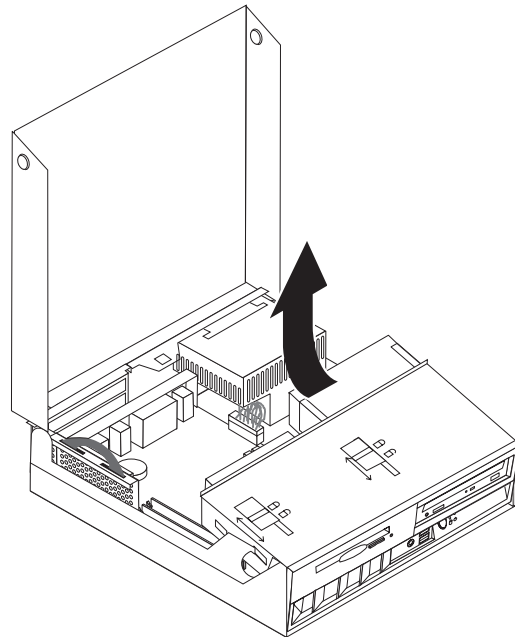
Important

Before you install or remove any component, read “Important safety information” on page v. These precautions and guidelines will help you work safely.

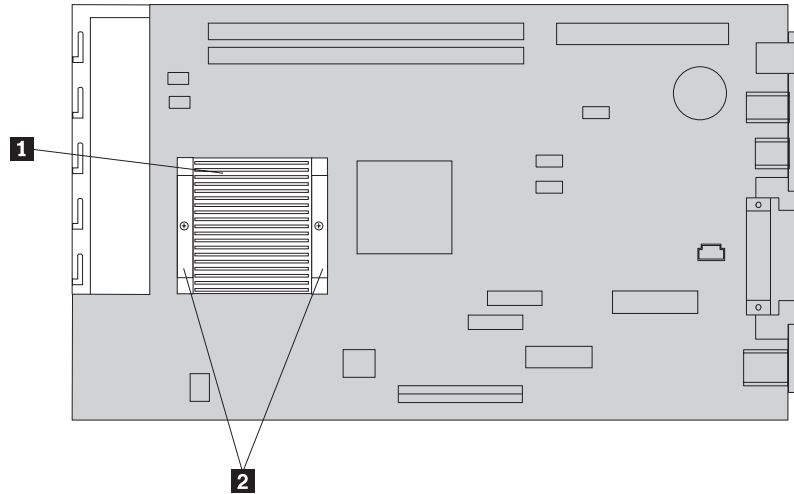
Attention: If your computer has been turned off for a long period of time the thermal grease between the microprocessor heat sink and the microprocessor might not allow them to be separated easily. In this case turn on your computer for a few minutes to soften the grease.

To remove the microprocessor, do the following:

1. Turn off the computer and disconnect the power cord from the electrical outlet and from the computer.
2. Open the cover. See “Opening the cover” on page 10.
3. Rotate the drive bay assembly upward to gain access to the microprocessor.



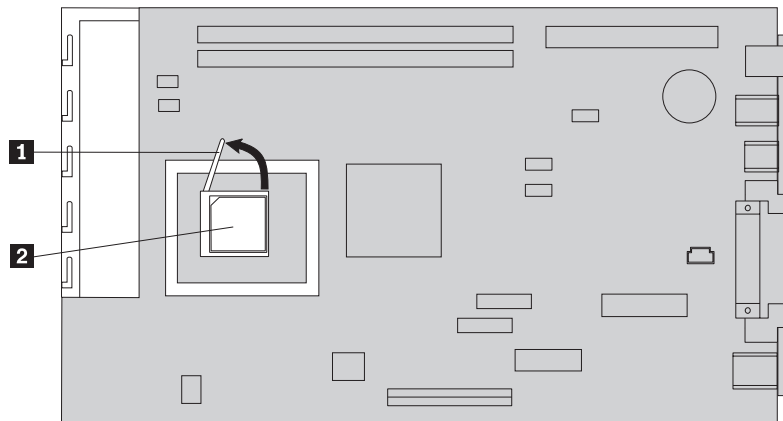
4. Remove the air baffle from the microprocessor heat sink **1**.
5. Completely loosen the screw in each of the two clamps **2** that secure the microprocessor heat sink.



6. Carefully twist the heat sink to break the grease seal to the microprocessor, then remove the heat sink.

Attention: If your computer has been turned off for a long period of time the thermal grease between the microprocessor heat sink and the microprocessor might not allow them to be separated easily. In this case, turn on your computer for a few minutes and allow the heat from the microprocessor to soften the grease.

7. Take notice of the orientation of the beveled corner on the microprocessor **2**. This is important when reinstalling the microprocessor on the system board.



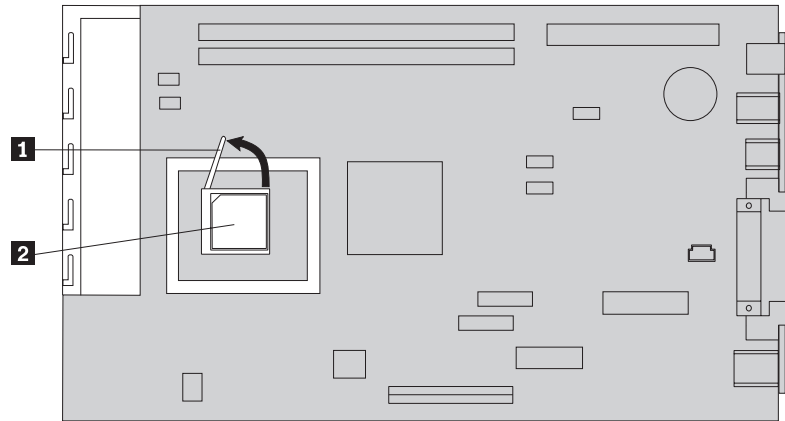
8. Remove the microprocessor from the system board by lifting the small handle **1** on the microprocessor.
 - If you are installing a new system board assembly, return to the system board procedure.
 - If you are replacing only the microprocessor, continue to “Replacing the microprocessor” on page 40.

Replacing the microprocessor

Important

Before you install or remove any component, read “Important safety information” on page v. These precautions and guidelines will help you work safely.

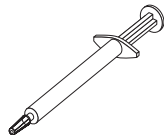
1. Take notice of the orientation of the beveled corner on the microprocessor **2**. This is important when reinstalling the microprocessor on the system board.

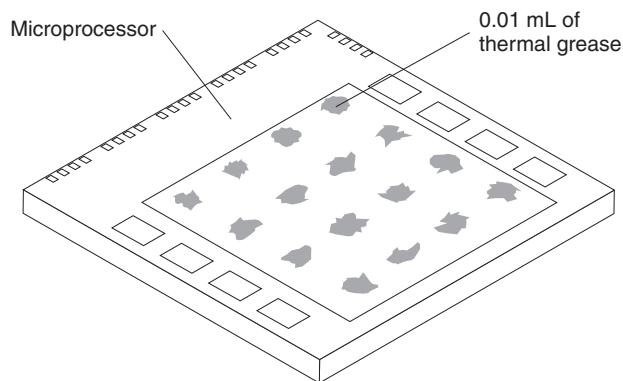


2. Make sure that the handle used to remove the microprocessor is fully in the up position. Otherwise the microprocessor pins might be damaged when installing the microprocessor.
3. Position the microprocessor so that the pins are aligned with the socket and with the beveled corner in the orientation as shown.
4. Lower the handle until it is fully in the down position. This locks the microprocessor in place.
5. Place the heat sink on a clean work surface.
6. Remove the cleaning pad from its package and use the cleaning pad to wipe the thermal grease from the bottom of the heat sink.

Notes:

1. Be sure that all of the thermal grease is removed.
2. The cleaning pad and thermal grease are separate FRUs and are not included with the system board or microprocessor FRUs. These must be ordered separately and shipped along with the FRUs being replaced.
7. Use the thermal grease syringe to place 16 uniformly spaced dots of 0.01ML each on the top of the microprocessor.





Note: 0.01ML is one tick mark on the syringe. If the grease is properly applied, approximately half (0.22ML) of the grease will remain in the syringe.

8. Place the heat sink into position on the microprocessor and replace the air baffle over the heat sink.
9. When tightening the screws that clamp the heat sink, do not overtighten. Tighten the clamp screws evenly by tightening one side some and then the other until they are both snug.
 - If you are replacing only the microprocessor, go to “Completing the installation” on page 46.
 - If you are installing a new system board assembly, return to the system board procedure.

Removing and replacing 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, sometimes called the CMOS 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 x for information about replacing and disposing of the battery.

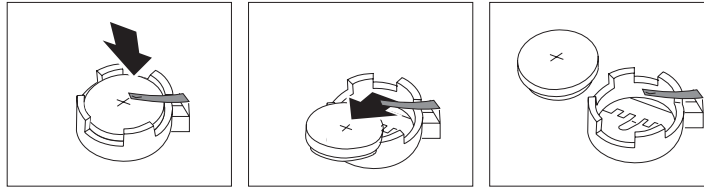
Important

Before you install or remove any component, read “Important safety information” on page v. These precautions and guidelines will help you work safely.

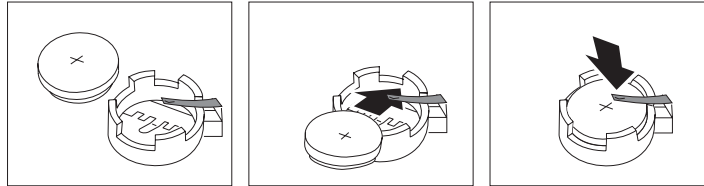
To change the battery:

1. Turn off the computer and disconnect the power cord from the electrical outlet and from the computer.
2. Open the cover. See “Opening the cover” on page 10.
3. Refer to “Identifying parts on the system board” on page 13 and locate the battery.

4. Remove the PCI riser and PCI adapters that impede access to the battery.
5. Remove the old battery.



6. Install the new battery.



7. Install the PCI riser and adapters if removed.
8. Replace the cover, and connect the cables. See “Closing the cover and connecting the cables” on page 25.

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.

Removing and replacing the speaker

Important

Before you install or remove any component, read “Important safety information” on page v. These precautions and guidelines will help you work safely.

To replace the speaker:

1. Turn off the computer and disconnect the power cord from the electrical outlet and from the computer.
2. Open the cover. See “Opening the cover” on page 10.
3. Rotate the drive bay assembly upward to gain access to the speaker.
4. Locate the speaker **1**. See Figure 1 on page 43.
5. Disconnect the speaker cable from the system board. See “Identifying parts on the system board” on page 13.

Note: Make sure you note the location of the cable that you disconnect from the system board.

6. Remove the speaker by sliding it upward and out of the retaining bracket.

Note: You may need to slightly flex the side of the computer to aid in removing the speaker.

7. Install the new speaker and reconnect the speaker cable.
8. Lower the drive bay assembly.
9. Replace the cover, and connect the cables. See “Closing the cover and connecting the cables” on page 25.

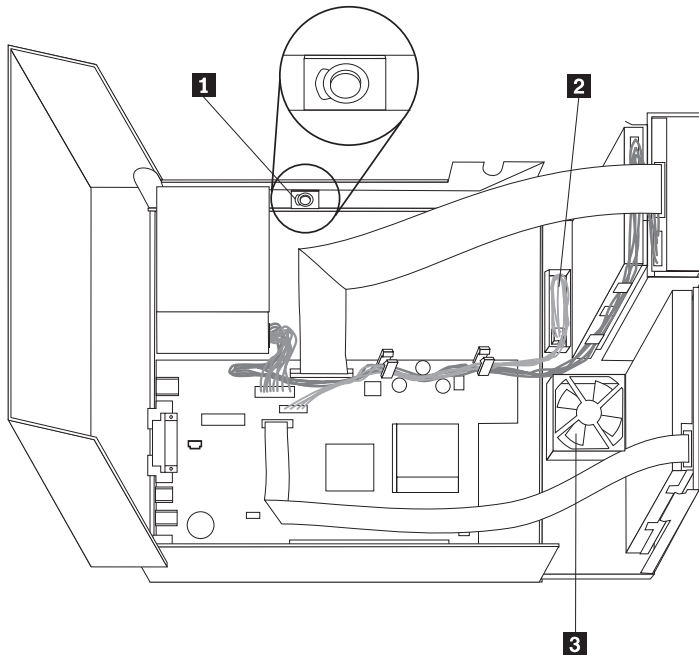


Figure 1. Speaker, fan, power button and LED assembly

- | | |
|----------|-------------------------------|
| 1 | speaker |
| 2 | power button and LED assembly |
| 3 | fan |

Removing and replacing the power button and LED assembly

Important

Before you install or remove any component, read “Important safety information” on page v. These precautions and guidelines will help you work safely.

To replace the power button and LED assembly:

1. Turn off the computer and disconnect the power cord from the electrical outlet and from the computer.
2. Open the cover. See “Opening the cover” on page 10.
3. Rotate the drive bay assembly upward to gain access to the power button and LED assembly.
4. Disconnect the power button and LED assembly cable from the system board. See “Identifying parts on the system board” on page 13.

Note: Make sure you note the location of the cable that you disconnect from the system board.

5. Lift the tab and slide the power button and LED assembly **2** out. See Figure 1 on page 43.
6. Install the new power button and LED assembly and reconnect the power button and LED assembly cable.
7. Lower the drive bay assembly.
8. Replace the cover, and connect the cables. See “Closing the cover and connecting the cables” on page 25.

Removing and replacing the fan assembly

Important

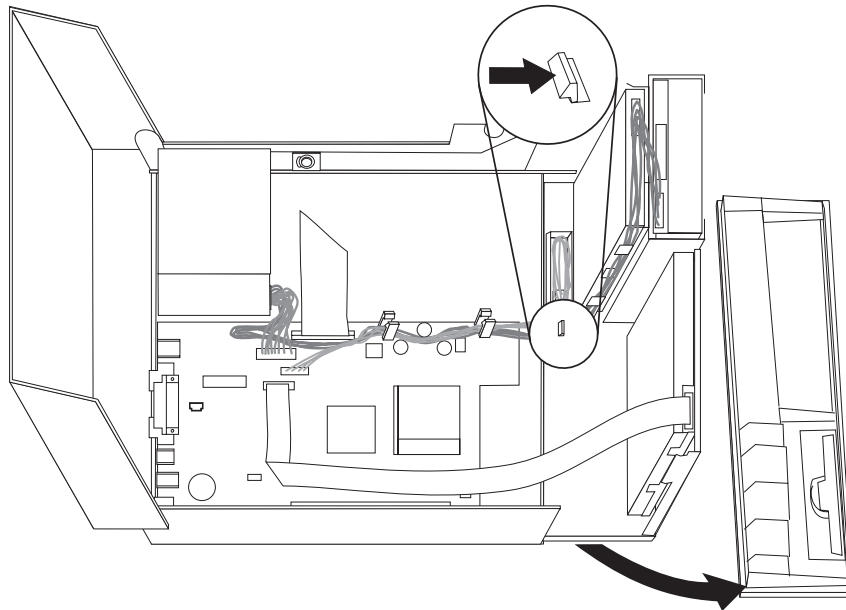
Before you install or remove any component, read “Important safety information” on page v. These precautions and guidelines will help you work safely.

To replace the fan assembly:

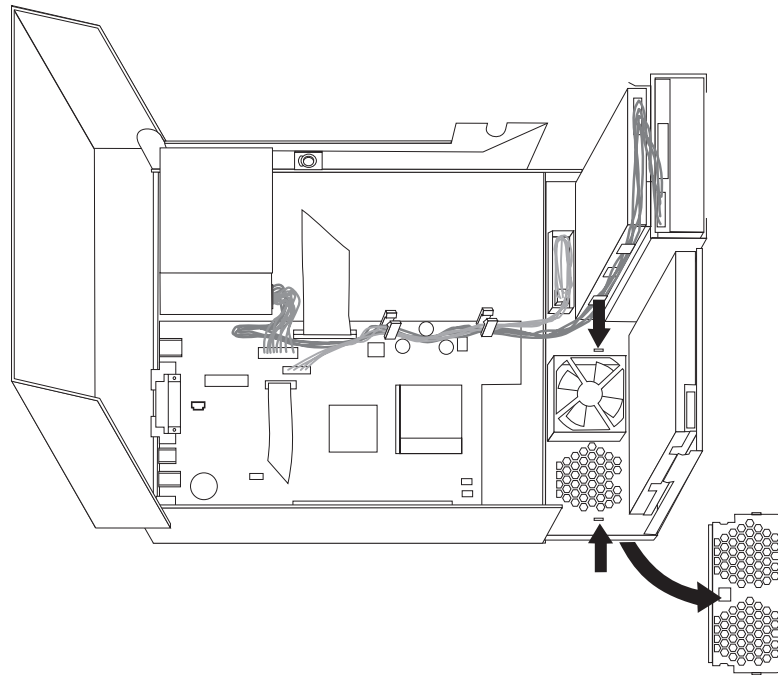
1. Turn off the computer and disconnect the power cord from the electrical outlet and from the computer.
2. Rotate the drive bay assembly upward to gain access to the fan assembly **3**. See Figure 1 on page 43.
3. Disconnect fan assembly cable from the system board. See “Identifying parts on the system board” on page 13.

Note: Make sure you note the location of the cable that you disconnect from the system board.

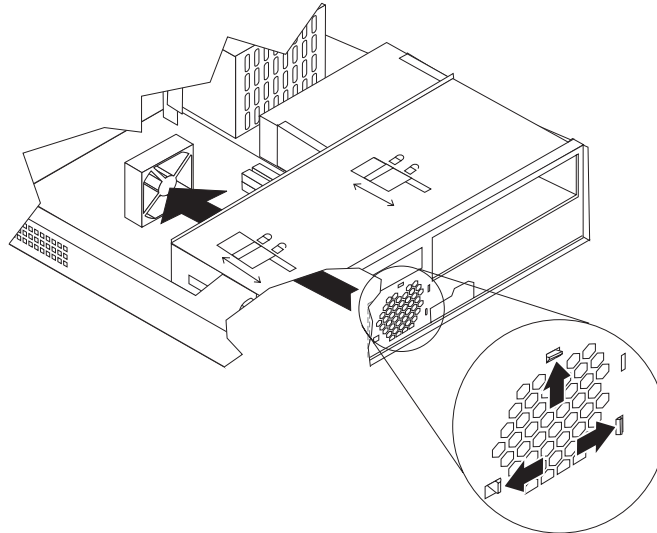
4. Remove the front bezel by releasing the tab as shown.



5. Remove the plastic insert behind the bezel by releasing the tabs as shown:



6. Remove the fan assembly by releasing the tabs out as shown.



7. Install the new fan assembly and connect the fan cable to the system board.
8. Reinstall the plastic insert.
9. Reinstall the front bezel.
10. Lower the drive bay assembly.
11. Replace the cover, and connect the cables. See "Closing the cover and connecting the cables" on page 25.

Completing the installation

After replacing the CRUs, you need to close the cover and reconnect cables, including telephone lines and power cords. Also, depending on the CRU that was replaced, you might need to confirm the updated information in the IBM Setup Utility program.

To complete the CRU installation:

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. Make sure that the drive locks on the drive bay assembly are both in the **locked position**. Otherwise, you cannot close the cover.
4. Close the cover.
5. If a cover lock is installed, lock the cover.
6. If your computer is being placed in the vertical position, attach the floor stand.
Attention: To prevent overheating and possible component damage, always attach the floor stand when placing the computer in the vertical position.
7. Reconnect the external cables and power cords to the computer. See “Locating connectors on the rear of your computer” on page 9.
8. Turn on the computer. If you need to update the configuration, see Chapter 3, “Using the IBM Setup Utility,” on page 27.
9. Return the CRU that was replaced to IBM as per instructions from the IBM HelpCenter.

Appendix B. Updating POST/BIOS

This appendix contains information about updating POST/BIOS and how to recover from a POST/BIOS update failure.

POST/BIOS

POST and *BIOS* 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 or by running a special update program from your operating system.

IBM might make changes and enhancements to the POST/BIOS. When updates are released, they are available as downloadable files on the World Wide Web (see the *Quick Reference*). Instructions for using the POST/BIOS updates are available in a .txt file that is included with the update files. For most models, you can download either an update program to create a system-program-update (flash) diskette or an update program that can be run from the operating system.

Note: You can download a self starting bootable CD image (known as an .iso image) of the diagnostics program from <http://www.ibm.com/pc/support> to support systems without a diskette drive.

Updating (flashing) BIOS from a diskette

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

Updating (flashing) BIOS from your operating system

Note: Due to constant improvements being made to the IBM Web site, Web page content (including the links referenced in the following procedure) is subject to change.

1. From your browser, type <http://www.pc.ibm.com/support> in the address field and press Enter.
2. Locate Downloadable files for your type of computer.
3. Under Select your product, choose your machine type and click **Go**.
4. In Downloadable file by category, click **BIOS**.
5. Under Download files - BIOS by date, click your machine type.

6. Scroll down and look for a .txt file that has instructions for Flash BIOS update from the operating system. Click the .txt file.
7. Print these instructions. This is very important since they are not on the screen after the download begins.
8. From your browser, Click **Back** to return to the list of files. Carefully follow the printed instructions to download, extract, and install the update.

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 commonly called Boot-block Recovery.

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 open the cover. See "Opening the cover" on page 10.
3. Locate the Clear CMOS/BIOS Recovery jumper on the system board. See "Identifying parts on the system board" on page 13.
4. If necessary, refer to "Accessing system board components and drives" on page 12 to gain access to the Clear CMOS/BIOS Recovery jumper.
5. Remove any cables or adapters that impede access to the Clear CMOS/BIOS Recovery jumper.
6. Move the jumper from the standard position (pins 1 and 2) to pins 2 and 3.
7. Replace any cables or adapters that were removed.
8. Close the cover. See "Closing the cover and connecting the cables" on page 25.
9. Reconnect the power cords for the computer and monitor to electrical outlets.
10. Insert the POST/BIOS update (flash) diskette into drive A, and turn on the computer and the monitor.
11. During the update session there will be no video. You will hear a long beep when recovery is completed. Remove the diskette from the diskette drive, and turn off the computer and monitor.
12. Unplug the power cords from electrical outlets.
13. Open the cover. See "Opening the cover" on page 10.
14. Remove any cables or adapters that impede access to the Clear CMOS/BIOS Recovery jumper.
15. Replace the Clear CMOS/BIOS Recovery jumper to its original position.
16. Replace any cables or adapters that were removed.
17. Close the cover and reconnect any cables that were disconnected.
18. Turn on the computer to restart the operating system.

Appendix C. Cleaning the mouse

This appendix provides instructions on how to clean your mouse. The procedure will be different depending on which type of mouse you have.

Cleaning an optical mouse

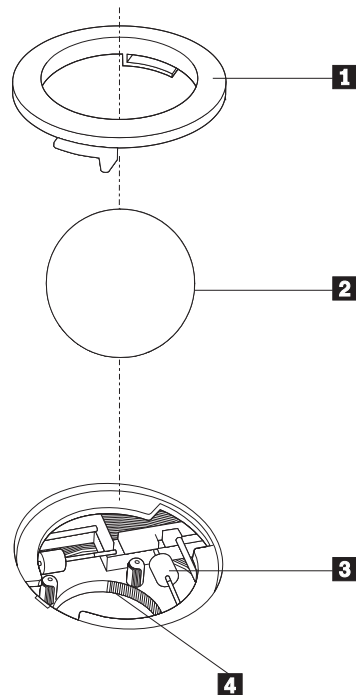
If you experience some problems with your optical mouse, check the following:

1. Turn the mouse over and look carefully at the lens area.
 - a. If there is a smudge on the lens, gently clean the area with a plain cotton swab or plain q-tip.
 - b. If there is some debris in the lens, gently blow the debris away from the area.
2. Check the surface you are using the mouse on. If you have a very intricate picture or pattern beneath the mouse it is difficult for the digital signal processor (DSP) to determine changes in the mouse position.

Cleaning a mouse with a ball

If the pointer on the screen does not move smoothly with the mouse, you might need to clean the mouse.

Note: The following illustration might be slightly different from your mouse.



- 1** Retainer ring
- 2** Ball
- 3** Plastic rollers
- 4** Ball cage

To clean a mouse with a ball:

1. Turn off your computer.
2. Turn the mouse over, with the top side down, and look carefully at the bottom. Twist the retainer ring **1** to the unlocked position to remove the ball.
3. Place your hand over the retainer ring and ball **2**, and then turn the mouse over, top side up, so that the retainer ring and ball fall out into your hand.
4. Wash the ball in warm, soapy water then dry it with a clean cloth. Blow air carefully into the ball cage **4** to dislodge dust and lint.
5. Look for a build up of dirt on the plastic rollers **3** inside the ball cage. This build up usually appears as a stripe running across the middle of the rollers.
6. If the rollers are dirty, clean them by using a cotton swab soaked in isopropyl (rubbing) alcohol. Turn the rollers with your finger and continue swabbing them until all the dirt is removed. Be sure the rollers are still centered in their channels after you clean them.
7. Remove any fibers from the swab that might be remaining on the rollers.
8. Replace the ball and the retainer ring.
9. Turn your computer back on.

Appendix D. Manual modem commands

The following section lists commands for manually programming your modem.

Commands are accepted by the modem while it is in Command Mode. Your modem is automatically in Command Mode until you dial a number and establish a connection. Commands may be sent to your modem from a PC running communication software or any other terminal devices.

All commands sent to the modem must begin with **AT** and end with **ENTER**. All commands may be typed in either upper or lower case, but not mixed. To make the command line more readable, spaces may be inserted between commands. If you omit a parameter from a command that requires one, it is just like specifying a parameter of **0**.

Example:

ATH [ENTER]

Basic AT commands

In the following listings, all default settings are printed in **bold text**.

Command		Function
A		Manually answer incoming call.
A/		Repeat last command executed. Do not precede A/ with AT or follow with ENTER .
D_		0 - 9, A-D, # and *
	L	last number redial
	P	pulse dialing
		Note: Pulse dialing is not supported for Australia, New Zealand, Norway, and South Africa.
	T	touch-tone dialing
	W	wait for second dial tone
	,	pause
	@	wait for five seconds of silence
	!	flash
	;	return to Command Mode after dialing
DS=n		Dial one of the four telephone numbers (n=0-3) stored in the modem non-volatile memory.
E_	E0	Commands are not echoed
	E1	Commands are echoed
+++		Escape Characters - Switch from Data Mode to Command Mode (T.I.E.S. Command)
H_	H0	Force modem on-hook (hang up)

Command		Function
	H1	Force modem off-hook (make busy) Note: H1 command is not supported for Italy
I_	I0	Display product-identification code
	I1	Factory ROM checksum test
	I2	Internal memory test
	I3	Firmware ID
	I4	Reserved ID
L_	L0	Low speaker volume
	L1	Low speaker volume
	L2	Medium speaker volume
	L3	High speaker volume
M_	M0	Internal speaker off
	M1	Internal speaker on until carrier detected
	M2	Internal speaker always on
	M3	Internal speaker on until carrier detected and off while dialing
N_		Included for compatibility only, provides no effect
O_	O0	Return to Data Mode
	O1	Return to Data Mode and initiate an equalizer retrain
P		Set Pulse dial as default
Q_	Q0	Modem sends responses
Sr?		Read and display value in register r.
Sr=n		Set register r to value n (n = 0-255).
T		Set Tone Dial as default
V_	V0	Numeric responses
	V1	Word responses
W_	W0	Report DTE speed only
	W1	Report line speed, error correction protocol, and DTE speed.
	W2	Report DCE speed only
X_	X0	Hayes Smartmodem 300 compatible responses/blind dialing.
	X1	Same as X0 plus all CONNECT responses/blind dialing
	X2	Same as X1 plus dial tone detection
	X3	Same as X1 plus busy detection/blind dialing
	X4	All responses and dial tone and busy signal detection
Z_	Z0	Reset and retrieve active profile 0
	Z1	Reset and retrieve active profile 1

Extended AT commands

Command		Function
&C_	&C0	Force Carrier Detect Signal High (ON)
	&C1	Turn on CD when remote carrier is present
&D_	&D0	Modem ignores the DTR signal
	&D1	Modem returns to Command Mode after DTR toggle
	&D2	Modem hangs up, returns to the Command Mode after DTR toggle
	&D3	Resets modem after DTR toggle
&F_	&F	Recall factory default configuration
&G_	&G0	Guard tone disabled
	&G1	Guard tone disabled
	&G2	1800 Hz guard tone
&K_	&K0	Disable flow control
	&K3	Enable RTS/CTS hardware flow control
	&K4	Enable XON/XOFF software flow control
	&K5	Enable transparent XON/XOFF flow control
	&K6	Enable both RTS/CTS and XON/XOFF flow control
&M_	&M0	Asynchronous operation
&P_	&P0	US setting for off-hook-to-on-hook ratio
	&P1	UK and Hong Kong off-hook-to-on-hook ratio
	&P2	Same as &P0 setting but at 20 pulses per minute
	&P3	Same as &P1 setting but at 20 pulses per minute
&R_	&R0	Reserved
	&R1	CTS operates per flow control requirements
&S_	&S0	Force DSR Signal High (ON)
	&S1	DSR off in command mode, on in on-line mode
&T_	&T0	Ends test in progress
	&T1	Perform Local Analog Loopback Test
	&T3	Perform Local Digital Loopback Test
	&T4	Grant Remote Digital Loopback Test request by remote modem
	&T5	Deny Remote Digital Loopback Test request
	&T6	Perform a Remote Digital Loopback Test
	&T7	Perform a Remote Digital Loopback Test and Self-Test
	&T8	Perform Local Analog Loopback Test and Self-Test
&V	&V0	Displays Active and Stored Profiles

Command		Function
	&V1	Display Last Connection Statistics
&W_	&W0	Stores the active profile as Profile 0
	&W1	Stores the active profile as Profile 1
%E_	%E0	Disable auto-retrain
	%E1	Enable auto-retrain
+MS?		Displays the current Select Modulation settings
+MS=?		Displays a list of supported Select Modulation options
+MS=a,b,c,e,f		Select modulation where: a =0, 1, 2, 3, 9, 10, 11, 12, 56, 64, 69; b =0-1; c =300-56000; d =300-56000; e =0-1; and f =0-1. A, b, c, d, e, f default= 12, 1, 300, 56000, 0, 0 . Parameter " a " specifies the modulation protocol desired where: 0=V.21, 1=V.22, 2=V.22bis, 3=V.23, 9=V.32, 10=V.32bis, 11=V.34, 12=V.90,K56Flex,V.34.....,56=K 56Flex, V.90,V.34....., 64=Bell 103, and 69=Bell 212. Parameter " b " specifies automode operations where: 0=automode disabled, 1= automode enabled with V.8/V.32 Annex A. Parameter " c " specifies the minimum connection data rate (300- 56000). Parameter " d " specifies the maximum connection rate (300-56000); Parameter " e " specifies the codec type (0= Law, and 1=A-Law). Parameter " f " specifies "robbed bit" signaling detection (0=detection disabled 1=detection enabled)

MNP/V.42/V.42bis/V.44 commands

Command		Function
%C_	%C0	Disable MNP Class 5 and V.42bis data compression
	%C1	Enable MNP Class 5 data compression only
	%C2	Enable V.42bis data compression only
	%C3	Enable MNP Class 5 and V.42bis data compression
&Q_	&Q0	Direct data link only (same as \N1)
	&Q5	V.42 data link with fallback options
	&Q6	Normal data link only (same as \N0)
+DS44=0, 0		Disable V.44
+DS44=3, 0		Enable V.44
+DS44?		Current values
+DS44=?		List of support values

Fax Class 1 commands

+FAE=n	Data/Fax Auto Answer
+FCLASS=n	Service Class
+FRH=n	Receive data with HDLC framing
+FRM=n	Receive data
+FRS=n	Receive silence
+FTH=n	Transmit data with HDLC framing
+FTM=n	Transmit data
+FTS=n	Stop transmission and wait

Fax Class 2 commands

+FCLASS=n	Services class.
+FAA=n	Adaptive answer.
+FAXERR	Fax error value.
+FBOR	Phase C data bit order.
+FBUF?	Buffer size (read only).
+FCFR	Indicate confirmation to receive.
+FCLASS=	Service class.
+FCON	Facsimile connection response.
+FCIG	Set the polled station identification.
+FCIG:	Report the polled station identification.
+FCR	Capability to receive.
+FCR=	Capability to receive.
+FCSI:	Report the called station ID.
+FDCC=	DCE capabilities parameters.
+FDCS:	Report current session.
+FDCS=	Current session results.
+FDIS:	Report remote capabilities.
+FDIS=	Current sessions parameters.
+FDR	Begin or continue phase C receive data.
+FDT=	Data transmission.
+FDTC:	Report the polled station capabilities.
+FET:	Post page message response.
+FET=N	Transmit page punctuation.
+FHNG	Call termination with status.
+FK	Session termination.
+FLID=	Local ID string.
+FLPL	Document for polling.
+FMDL?	Identify model.
+FMFR?	Identify manufacturer.

+FPHCTO	Phase C time out.
+FPOLL	Indicates polling request.
+FPTS:	Page transfer status.
+FPTS=	Page transfer status.
+FRECV?	Identify revision.
+FSPT	Enable polling.
+FTSI:	Report the transmit station ID.

Voice commands

#BDR	Select Baud Rate
#CID	Enable Caller ID detection and reporting format
#CLS	Select Data, Fax or Voice/Audio
#MDL?	Identify Model
#MFR?	Identify Manufacturer
#REV?	Identify Revision Level
#TL	Audio output transmit level
#VBQ?	Query Buffer Size
#VBS	Bits per sample (ADPCM or PCM)
#VBT	Beep Tone Timer
#VCI?	Identify Compression Method
#VLS	Voice line select
#VRA	Ringback goes away timer
#VRN	Ringback never came timer
#VRX	Voice Receive Mode
#VSDB	Silence deletion tuner
#VSK	Buffer skid setting
#VSP	Silence detection period
#VSR	Sampling rate selection
#VSS	Silence deletion tuner
#VTD	DTMF tone reporting capability
#VTM	Enable timing mark placement
#VTS	Generate tone signals
#VTX	Voice transmit mode

Attention Switzerland User:

If your Swisscom phone line does not have Taxsignal switched OFF, modem function may be impaired. The impairment may be resolved by a filter with the following specifications:

Telekom PTT SCR-BE
Taximpulssperrfilter-12kHz
PTT Art. 444.112.7
Bakom 93.0291.Z.N

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Index

Special characters

.iso image 47

A

Access IBM 1
adapter
 installing 15
 peripheral component interconnect (PCI) 4
 removing and replacing 15
 slots 15
administrator password 27, 28
audio subsystem 2
automatic startup sequence 30

B

battery, changing 41
bezel replacement 44
BIOS settings 27
BIOS updating 47
Boot-block recovery 48
bootable CD image 47

C

cable lock 21
cables, connecting 25
CD drive, removing and replacing 18
changing
 battery 41
 startup device sequence 30
cleaning
 mouse 49
closing the cover 25
components, internal 11, 12
connectors
 front 8
 rear 9
cover
 closing 25
 lock 21
 opening 10
CRU
 completing the installation 46
 list 32
 removing and replacing 7, 31
CRU replacement 31

D

device drivers 9
DIMMs 14
diskette drive, removing and replacing 20
double data rate (DDR) memory 14
drives
 installing 12
 internal 16
 optical 16

drives (*continued*)

 parallel ATA drive 16
 removable media 16
 removing and replacing 16
 serial ATA hard disk drive 16
 tape 16

E

environment, operating 5
error startup sequence 30
Ethernet 2
exiting Setup Utility 28
expansion adapters 3
external options 7

F

fan replacement 44
features 2

H

hard disk drive, removing and replacing 19
hyper threading 30

I

IBM Setup Utility 27
IDE drive setup 29
IDE drive, connecting 21
information resources 1
input/output (I/O) features 3
installing options
 adapters 15
 cable lock 21
 drives 12
 memory 14
internal drives 2

L

locating components 11

M

memory
 installing 14
 removing and replacing 14
 type 2
microprocessor
 removing and replacing 38, 40
 type 2
microprocessor replacement 40
modem commands
 Basic AT 51
 Extended AT 53
 Fax Class 1 55

modem commands (*continued*)
Fax Class 2 55
MNP/V.42/V.42bis/V.44 54
Voice 56
mouse cleaning 49

N

noise level 5

O

opening the cover 10
optical drive, removing and replacing 18
options 4
available 4
external 4
internal 4

P

parallel ATA drive 16, 17
password
administrator 27, 28
erasing 25
lost or forgotten 25
setting, changing, deleting 28
user 28
PCI adapter 15
POST/BIOS 47
power
Advanced Configuration and Power Interface (ACPI)
support 3
Advanced Power Management support 3
features 3
power button and LED assembly replacement 43
power supply, removing and replacing 33
primary startup sequence 30

R

recovering from a POST/BIOS update failure 48
removing and replacing
adapters 15
battery 41
bezel 44
diskette drive 20
fan 44
hard disk drive 19
memory 14
microprocessor 38
optical drive 18
power button and LED assembly 43
power supply assembly 33
speaker 42
system board assembly 36
removing drives 12
riser card 15

S

security
cable lock 21
features 3
profile by device 29

selecting
startup device 30
temporary startup device 30
serial ATA drive 16, 17
serial ATA hard disk drive, connecting 20
software 3
speaker replacement 42
specifications 5
starting setup utility 27
startup sequence 30
system board
components, accessing 12
connectors 13
identifying parts 13
location 13
memory 4, 14
removing and replacing 36
system management 2

U

updating BIOS
diskette 47
OS 47
updating POST/BIOS 47
user password 28
using
IBM Setup Utility 27
IDE drive setup 29
passwords 28
security profile by device 29

V

video subsystem 2



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