NetVista™

**IBM**

# User Guide
# A60 Type 6838
# A60i Type 6848

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# A60 Type 6838
# A60i Type 6848

IBM

> **Note**
>
> Before using this information and the product it supports, be sure to read the "Safety Information" on page v and "Appendix E. Notices and trademarks" on page 45.

# Contents

# Safety Information

**DANGER**

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

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

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

**DANGER**

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

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

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

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

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

# Lithium battery notice

CAUTION:
Danger of explosion if battery is incorrectly replaced.

When replacing the battery, use only IBM Part Number 33F8354 or an equivalent type battery recommended by the manufacturer. The battery contains lithium and can explode if not properly used, handled, or disposed of.

*Do not:*
- Throw or immerse into water
- Heat to more than 100°C (212°F)
- Repair or disassemble

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

ATTENTION

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

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

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

Mettre au rebut les batteries usagées conformément aux règlements locaux.

# Modem safety information

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

- Never install telephone wiring during a lightning storm.

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

**Consignes de sécurité relatives au modem**

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

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

# Laser compliance statement

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

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

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

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

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

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

**DANGER:**

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

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

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

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

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

> **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.**

# About this book

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

## How this book is organized

This book contains the following chapters and appendixes:

- "Chapter 1. Overview" provides an introduction to the computer specifications and the options that are available for your computer.
- "Chapter 2. Installing external options" provides information to orient you to the connectors on your computer and instructions for installing external options and peripheral devices.
- "Chapter 3. Installing internal options" provides instructions for removing the cover and installing hard disk drives, memory, and adapters in your computer.
- "Chapter 4. Updating the computer configuration" provides instructions for updating the computer configuration, installing device drivers, and erasing a lost or forgotten password.
- "Appendix A. Changing the battery" provides instructions to help you change the battery if you need to.
- "Appendix B. Updating System Programs" provides instructions to help you update your system programs.
- "Appendix C. System address maps" provides information for programmers describing the address maps of the computer.
- "Appendix D. Interrupt request and direct memory access channel assignments" provides information about the interrupt and direct memory access channel assignments.
- "Appendix E. Notices and trademarks" contains notice and trademark information.

# Information resources

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

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**.

# Chapter 1. Overview

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

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

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

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

## Identifying your computer

To properly install options, you will need to know the model of your computer. The best way to identify your computer is by the machine type/model number. The machine type/model number indicates the various features of the computer, such as the type of microprocessor and the number of drive bays. You can find this number on the small label on the front of your computer. An example of the machine type/model number is 6838-xxx.
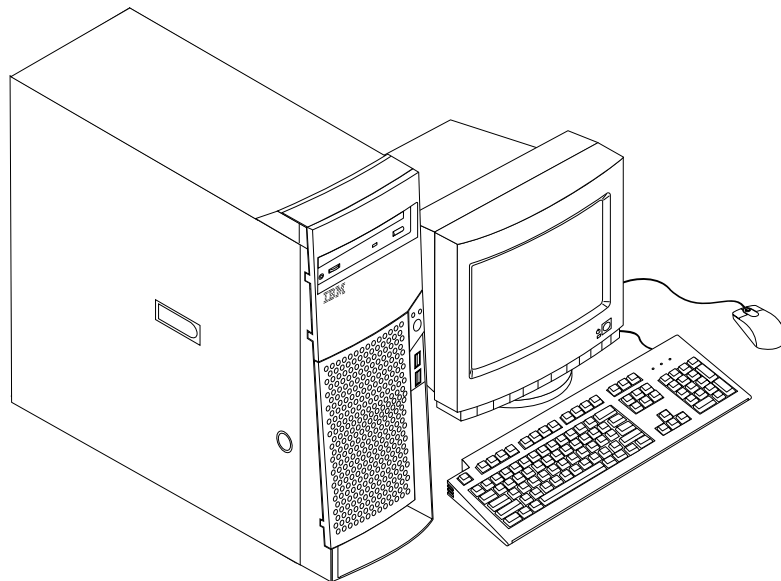
# Features

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

Not all models come with all features that are summarized here.

**Microprocessor**
Intel® Pentium™ 4 with 256 KB of internal L2 cache memory and MMX™ technology

**Memory**
- Support for Rambus in-line memory modules (RIMMs)
  - 2.5 V, synchronous, 184-pin, unbuffered, 133 MHz nonparity Rambus dynamic random access memory (RDRAM)
  - 64 MB, 128 MB, 256 MB, and 512 MB RIMMs (when available)
  - A maximum of 2 GB of memory
  - RIMM heights of 38.1 mm (1.5 inches)
- 512 KB flash memory for system programs

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

**Video controller**
- Dynamic video memory technology
- High-performance accelerated graphics port (AGP) adapter

**Audio subsystem**
16-bit integrated Sound Blaster Pro compatible audio subsystem

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

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

**Input/output features**
- 25-pin, Extended Capabilities Port (ECP)/Extended Parallel Port (EPP)

- Two 9-pin serial connectors
- Four 4-pin, USB connectors
- Mouse connector
- Keyboard connector
- Ethernet connector
- Monitor connector (on AGP adapter)
- Three audio connectors (line in, line out, and microphone)

**Expansion**
- Seven drive bays
- Five PCI expansion slots
- One AGP expansion slot

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

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

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

**Operating systems (supported)**
- Microsoft® Windows® Millennium Edition (Me)
- Microsoft Windows 2000 Professional

**Operating systems (tested for compatibility)[1]**
- Microsoft Windows 95
- Microsoft Windows 98 Second Edition
- Microsoft Windows NT® Version 3.51
- Microsoft Windows NT Workstation Version 4.0
- DOS 2000

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

- DOS Version 7.0
- IBM OS/2® Warp Connect 3.0
- IBM OS/2 Warp 4.0
- IBM OS/2 LAN Server 3.0 and 4.0
- Linux: Red Hat, Caldera, SuSE, and Turbo Linux

## Specifications

This section lists the physical specifications for the NetVista computer. Your computer has five 32-bit PCI expansion slots, one AGP slot, and seven drive bays.

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

**Dimensions**

Height: 165 mm (6.5 in.)

Width: 445 mm (17.5 in.)

Depth: 499 mm (19.6 in.)

**Weight**

Minimum configuration as shipped: 14.0 kg (30 lb)

Maximum configuration: 17.3 kg (38.0 lb)

**Environment**

Air temperature:

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

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

Humidity:

System on: 8% to 80%

System off: 8% to 80%

**Electrical input**

Input voltage:

Low range:

Minimum: 90 V ac

Maximum: 137 V ac

Input frequency range: 57–63 Hz

Voltage switch setting: 115 V ac

High range:

Minimum: 180 V ac

Maximum: 265 V ac

Input frequency range: 47–53 Hz

Voltage switch setting: 230 V ac

Input kilovolt-amperes (kVA) (approximate):

Minimum configuration as shipped: 0.08 kVA

Maximum configuration: 0.3 kVA

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

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

Minimum configuration: 240 Btu/hr (75 watts)

Maximum configuration: 940 Btu/hr (275 watts)

**Airflow**

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

**Acoustical noise-emission values**

Average sound-pressure levels:

At operator position:

Idle: 38 dBA

Operating: 43 dBA

At bystander position - 1 meter (3.3 ft):

Idle: 33 dBA

Operating: 37 dBA

Declared (upper limit) sound-power levels:

Idle: 4.8 bels

Operating: 5.1 bels

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

## Available options

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

For the latest information about available options, see the following World Wide Web pages:
- http://www.ibm.com/pc/us/options/
- http://www.ibm.com/pc/support/

You can also obtain information by calling the following telephone numbers:
- Within the United States, call 1-800-IBM-2YOU (1-800-426-2968), your IBM reseller, or IBM marketing representative.
- Within Canada, call 1-800-565-3344 or 1-800-465-7999.
- Outside the United States and Canada, contact your IBM reseller or IBM marketing representative.

## Tools required

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

## Handling static-sensitive devices

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

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

When you handle options and other computer components, take these precautions to avoid static electricity damage:
- Limit your movement. Movement can cause static electricity to build up around you.

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

# Chapter 2. Installing external options

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

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

## Locating the connectors on the front of your computer

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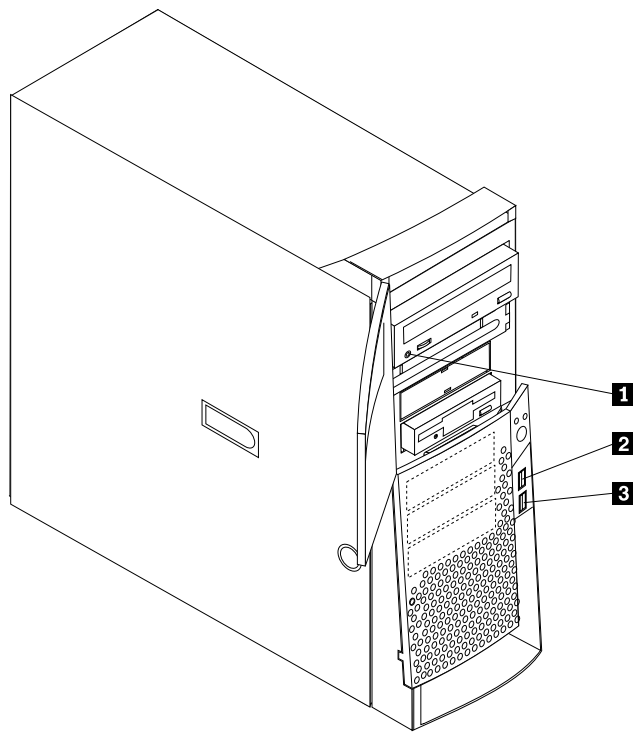


| | |
|---|---|
| **1** | CD-ROM headphone connector |
| **2** | Front USB connector 1 |
| **3** | Front USB connector 2 |

# Locating the connectors on the rear of your computer

The following illustration shows the location of the connectors on the rear of the computer. Your computer might not have all of the connectors shown here.
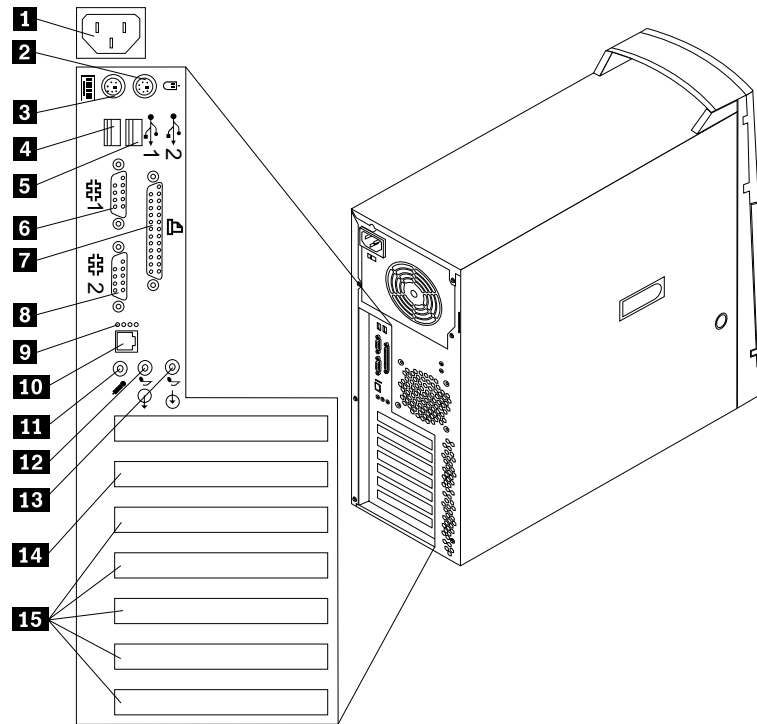
| | | | |
|---|---|---|---|
| **1** | Power connector | **9** | LEDs |
| **2** | Mouse connector | **10** | Ethernet connector |
| **3** | Keyboard connector | **11** | Microphone connector |
| **4** | USB connector 3 | **12** | Audio line out connector |
| **5** | USB connector 4 | **13** | Audio line in connector |
| **6** | Serial connector 1 | **14** | AGP slot |
| **7** | Parallel connector | **15** | PCI slots |
| **8** | Serial connector 2 | | |

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

| Connector | Description |
|---|---|
| Mouse connector | Used to attach a mouse, trackball, or other pointing device that uses a standard mouse connector. |
| Keyboard connector | Used to attach a keyboard that uses a standard keyboard connector. |
| USB connectors | Used to attach a device that requires a Universal Serial Bus (USB) connection, such as a USB scanner or USB printer. If you have more than four USB devices, you can purchase a USB hub, which you can use to connect additional USB devices. |
| Serial connectors | Used to attach an external modem, serial printer, or other device that uses a 9-pin serial connector. |
| Parallel connector | Used to attach a parallel printer, parallel scanner, or any other device that requires a 25-pin parallel connection. |

| Connector | Description |
|---|---|
| Ethernet connector | Used to attach an Ethernet cable that uses an Ethernet connector.<br>**Note:** To operate the computer within FCC Class A or Class B limits, use a category 5 Ethernet cable. |
| Microphone connector | Used to attach a microphone to your computer when you want to record voice or other sounds on the hard disk if you use speech-recognition software. |
| Audio line out connector | Used to send audio signals from the computer to external devices, such as powered stereo speakers (speakers with built-in amplifiers), headphones, multimedia keyboards, or the audio line in connector on a stereo system or other external recording device.<br>**Note:** The internal speaker in your computer is disabled when external speakers are connected to the audio line out connector on your computer. |
| Audio line in connector | Used to receive audio signals from an external audio device, such as a stereo system. When you attach an external audio device, a cable is connected between the audio line out connector of the device and the audio line in connector of the computer. |

## High-performance video adapter

Some models come with a high-performance AGP video adapter.
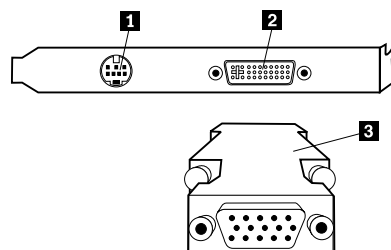


| Connector | Description |
|---|---|
| **1** S-Video connector | Used to attach a television set that has an S-Video connector. The S-Video cable (required to connect the television set to the adapter) is a separately purchased item. |
| **2** Digital video interface (DVI) connector | Used to attach a digital monitor. This connector provides the signals that are necessary to support the Display Power Management Signaling (DPMS) standard. |
| **3** Monitor converter | Used to attach an analog SVGA monitor to the AGP DVI connector. |

## High-performance audio adapter

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

The following illustration shows the connectors on the high-performance audio adapter that comes with some models.
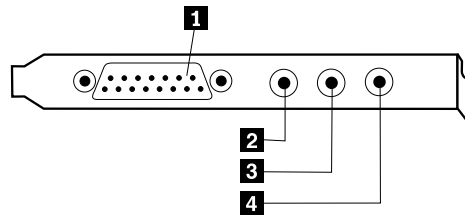


| Connector | Description |
| --- | --- |
| **1** MIDI/joystick connector | Used to attach a joystick, gamepad, or a musical instrument digital interface (MIDI) device such as a MIDI keyboard. |
| **2** Audio line out connector | Used to send audio signals from the computer to external devices, such as powered stereo speakers (speakers with built-in amplifiers), headphones, multimedia keyboards, or the audio line in connector on a stereo system or other external recording device. |
| **3** Microphone connector | Used to attach a microphone to your computer when you want to record voice or use other speech-recognition software. |
| **4** Audio line in connector | Used to receive audio signals from an external audio device, such as a stereo system. When you attach an external audio device, run the cable between the audio line out connector of the device and the audio line in connector of the computer. |

## ADSL modem

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

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

## Home PNA network adapter

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

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

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

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

## Obtaining device drivers

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

# Chapter 3. Installing internal options

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

## Removing the cover

> **Important:**
> Read "Safety Information" on page v and "Handling static-sensitive devices" on page 6 before removing the cover.

To remove the cover:

1. Shut down your operating system, remove any media (diskettes, CDs, or tapes) from the drives, and turn off all attached devices and the computer.

2. Unplug all power cords from electrical outlets.

3. Disconnect all cables attached to the computer. This includes power cords, input/output (I/O) cables, and any other cables that are connected to the computer.

4. Pull out on the cover-release latch and slide the cover panel toward the rear of the computer.
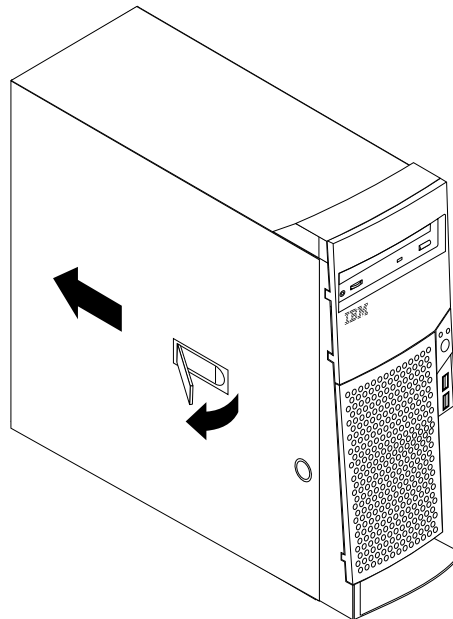
# Locating components

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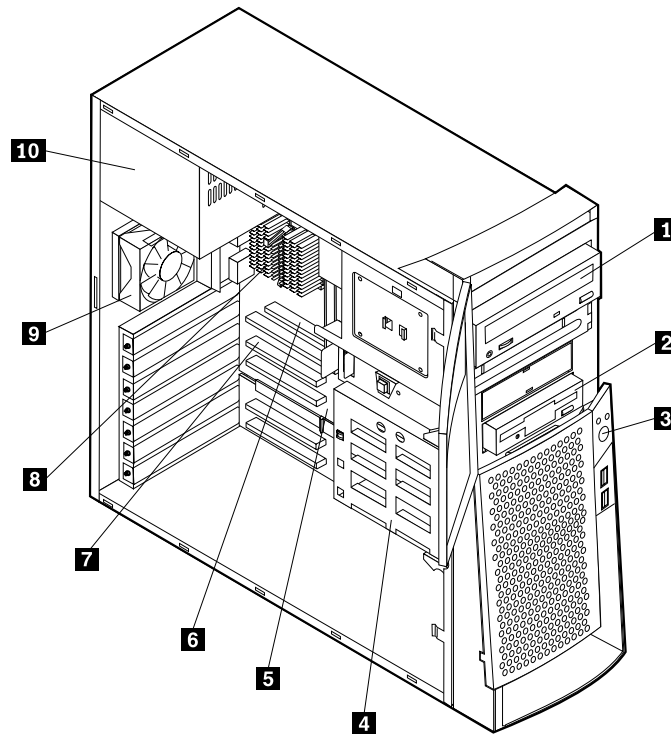


| | | | |
|---|---|---|---|
| **1** | CD drive or DVD drive | **6** | Accelerated graphics port (AGP) slot |
| **2** | Diskette drive | **7** | PCI slot |
| **3** | Power button | **8** | Heat sink |
| **4** | Lower drive-bay cage | **9** | Fan sink |
| **5** | System board | **10** | Power supply |

# Installing options on the system board

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

## Accessing the system board

To access the system board, you must remove the computer cover. For information on removing the computer cover, see "Removing the cover" on page 15. You might need to remove adapters to access some components on the system board. For information about adapters, see "Installing adapters" on page 19. When disconnecting cables, be sure to note where they are attached, so you can correctly reattach them later.

## Identifying parts on the system board

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

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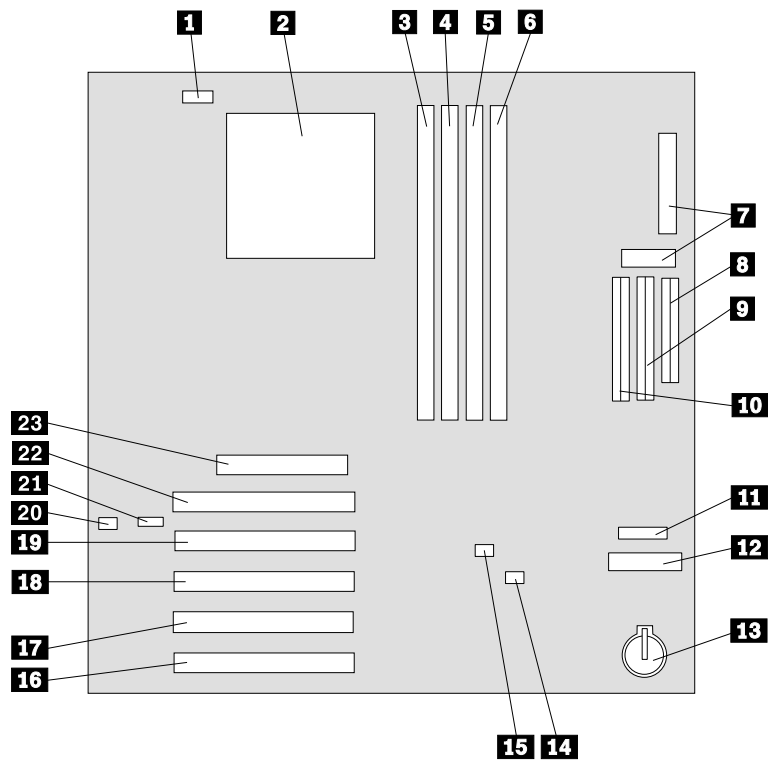


**Note:** An illustration of the system board and additional information is provided on a label located on the inside of the computer chassis.

| | | | |
|---|---|---|---|
| **1** | Fan connector | **13** | Battery |
| **2** | Microprocessor | **14** | Clear CMOS/Recovery jumper |
| **3** | RIMM 1 | **15** | Wake on LAN connector |
| **4** | RIMM 2 | **16** | PCI slot |
| **5** | RIMM 3 | **17** | PCI slot |
| **6** | RIMM 4 | **18** | PCI slot |
| **7** | Power connectors | **19** | PCI slot |
| **8** | Diskette connector | **20** | Speaker connector |
| **9** | Primary IDE connector | **21** | CD-ROM audio connector |
| **10** | Secondary IDE connector | **22** | PCI slot |
| **11** | Front USB connector | **23** | AGP slot |
| **12** | Front panel connector | | |

## Installing memory

Your computer has four connectors for Rambus in-line memory modules (RIMMs) that provide up to a maximum of 2 GB of system memory.

The IBM-installed RIMMs that come with your computer are ECC (error checking and correction) Rambus dynamic random access memory (RDRAM) modules.

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

- Rambus memory is divided into two channels (channel A and B). RIMM connectors 1 and 3 are channel A, and RIMM connectors 2 and 4 are channel B.
- Each channel must contain the same amount of memory.

- Each RIMM connector supports a maximum of 512 MB of memory.
- Any connector that does not have a RIMM installed must have a continuity RIMM (C-RIMM), a module that looks like a RIMM but has no memory on it. A C-RIMM is used to continue the connection on a RIMM connector that does not have memory installed in it.
- Install only ECC RIMMs to enable ECC. If you use ECC and non-ECC memory together, it will function as non-ECC memory.
- RIMM connectors do not support dual in-line memory modules (DIMMs).
- Use only PC600 or PC800 RIMMs.

> **Note:** If you use PC600 and PC800 RIMMs together, all memory will function at the speed of the slowest RIMM.

### Removing a RIMM or C-RIMM
To remove a RIMM or C-RIMM:

1. To locate the RIMM connectors inside your computer, see "Identifying parts on the system board" on page 16.
2. At both ends of the RIMM connector on the system board, push outward on the retaining clips until the module is loosened. Lift the RIMM or C-RIMM out of the connector.
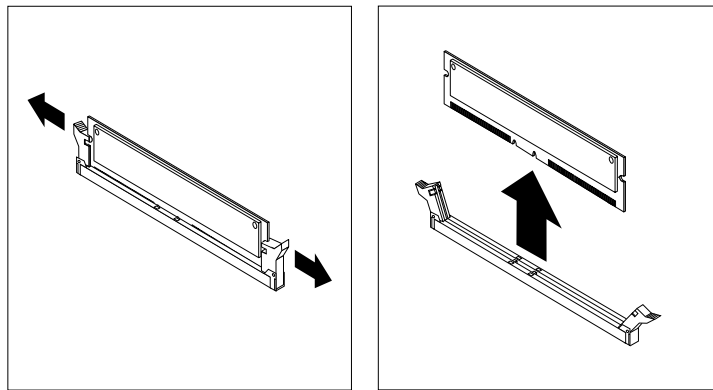


> **Note:** Be careful not to push too hard on the retaining clips, because the RIMM or C-RIMM might eject too quickly.

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

### Installing a RIMM or C-RIMM
To install a RIMM or C-RIMM:

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

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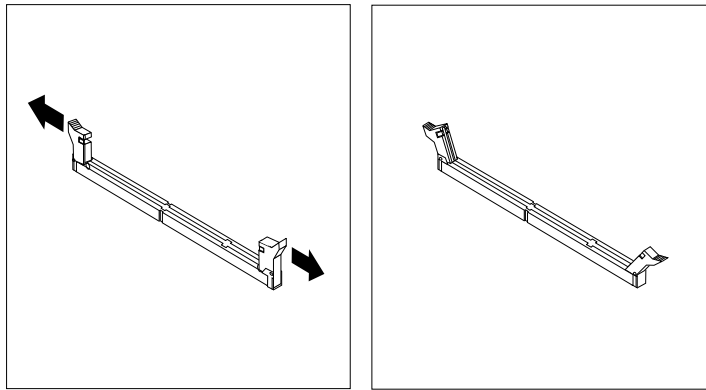


3. Position the RIMM or C-RIMM above the connector so that the two notches on the bottom edge of the module align properly with the empty connector.
4. Firmly push the module straight down into the connector until the retaining clips pop up and fit snugly around both ends of the module.
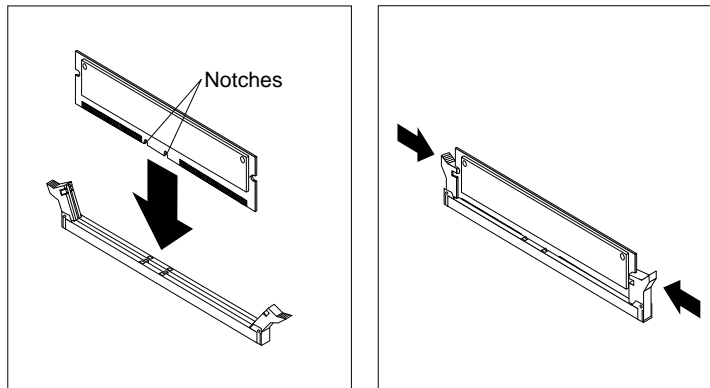


---

**What to do next:**

- To work with another option, go to the appropriate section.
- To complete the installation, go to "Replacing the cover and connecting the cables" on page 29.

---

## Installing adapters

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

### Adapter slots

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

### Installing adapters

To install an adapter:

1. Remove the cover. See "Removing the cover" on page 15.

2. Remove the adapter slot cover latch and the slot cover for the appropriate expansion slot.
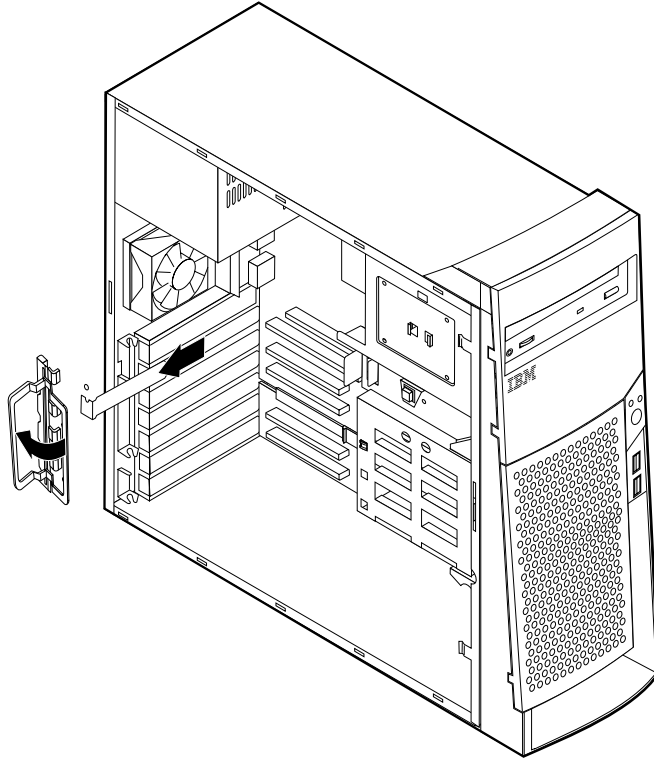
3. Remove the adapter from its static-protective package.
4. Install the adapter into the appropriate slot on the system board.
5. Install the adapter slot cover latch.

> **Note:** If you are installing a Wake on LAN-supported network adapter, attach the Wake on LAN cable that comes with the adapter to the Wake on LAN connector on the system board. See "Identifying parts on the system board" on page 16.

---

**What to do next**

- To work with another option, go to the appropriate section.
- To complete the installation, go to "Replacing the cover and connecting the cables" on page 29.

---

## Installing internal drives

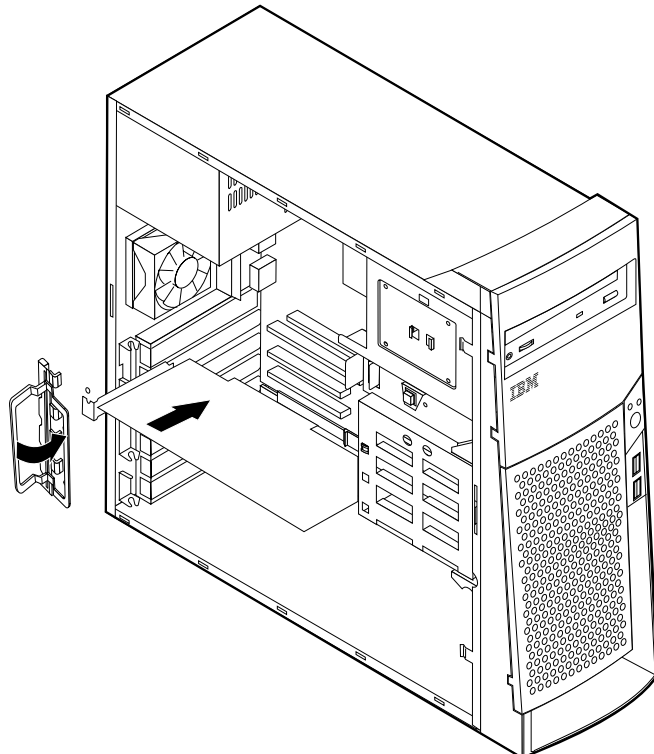This section provides information and instructions for installing and removing internal drives.

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

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

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

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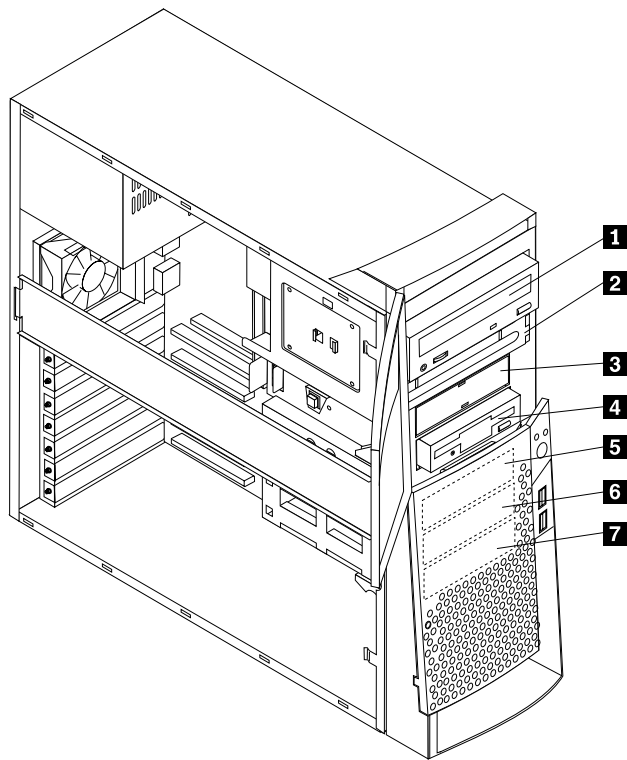
### Drive specifications

Your computer comes with the following IBM-installed drives:

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

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

The following illustration shows the locations of the drive bays.



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

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

**Notes:**

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

## Power and signal cables for internal drives

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

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

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

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

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

**Note:** To locate connectors on the system board, see "Identifying parts on the system board" on page 16.

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

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

For help in selecting drives, cables, and other options for your computer, see page 6.

## Installing internal drives in bays 1, 2, and 3

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

1. Remove the cover (see "Removing the cover" on page 15).

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

2. Remove the bay panel, and insert a flat-blade screwdriver into one of the slots on the static shield in the drive bay into which you are installing the drive. Gently pry the static shield loose from the drive bay.

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



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

---

**What to do next**

- To work with another option, go to the appropriate section.
- To complete the installation, go to "Replacing the cover and connecting the cables" on page 29.
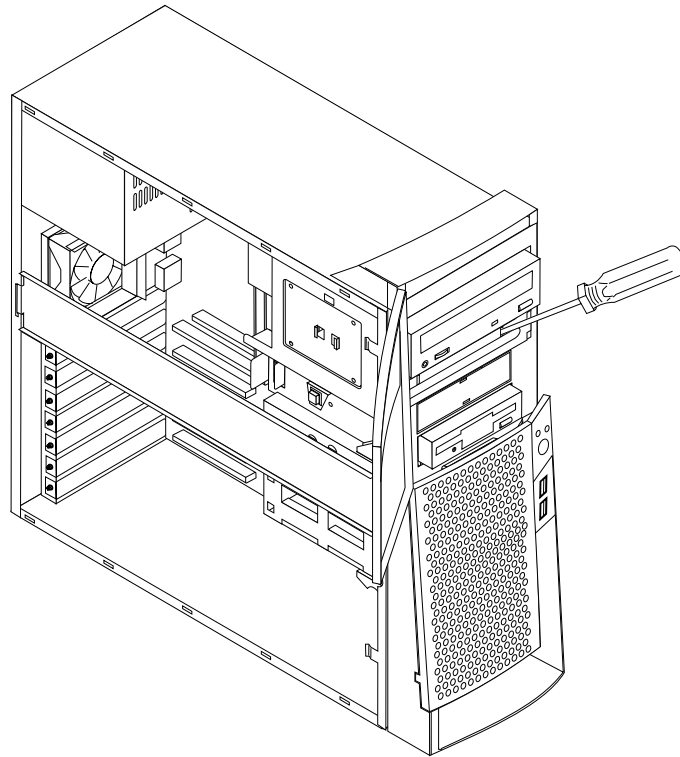
---

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

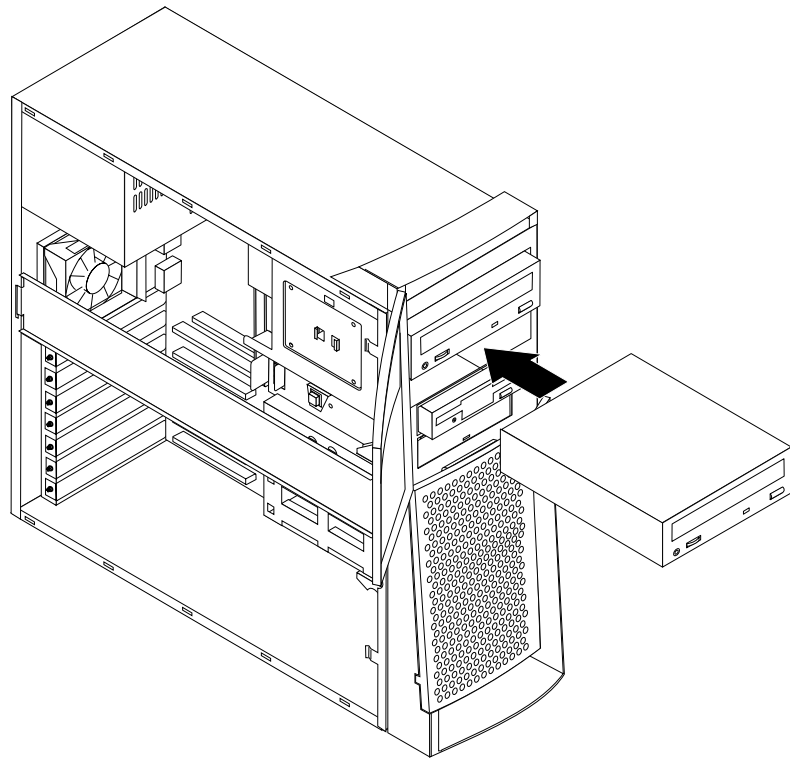To install an internal drive in bay 4, 5, 6, or 7:

1. Remove the cover (see "Removing the cover" on page 15).

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

2. Remove the support bar by pulling it outward from the computer as shown.



3. Pull and pivot the lower drive-bay cage outward from the computer.
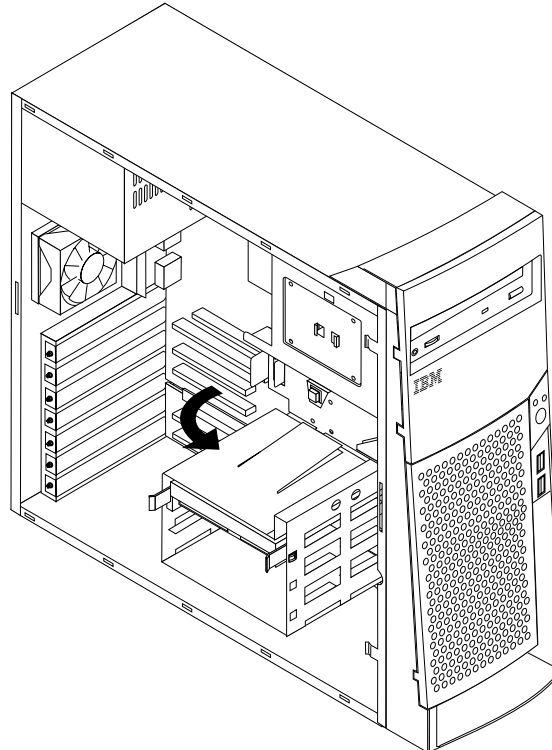
4. Mount sliding rails on the drive that you want to install, and slide the drive along the rail guides into the unoccupied drive bay.
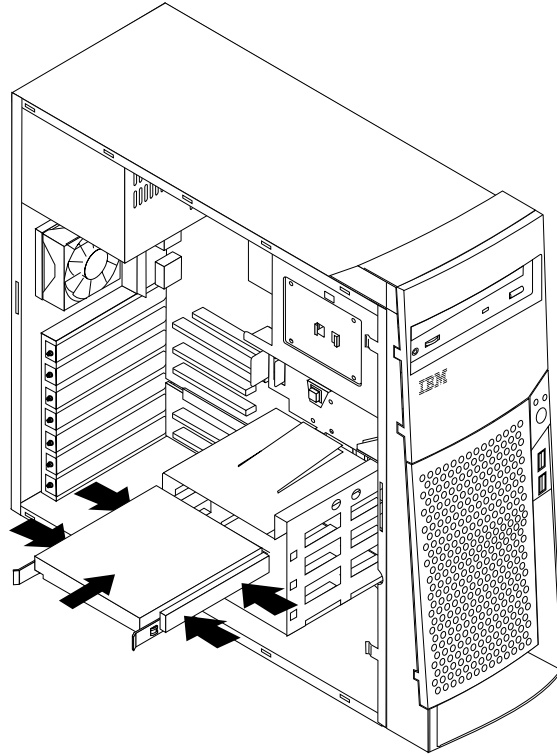


5. Pivot the drive bay cage back into place.
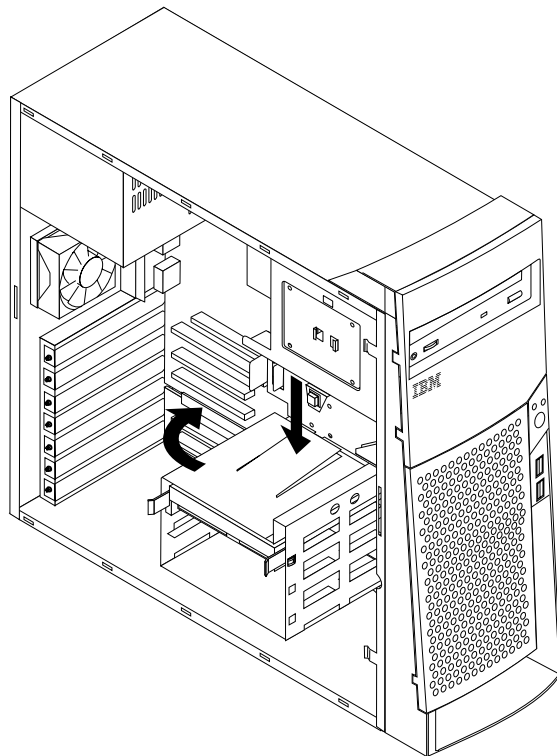
6. Connect the power and signal cables to the drive.
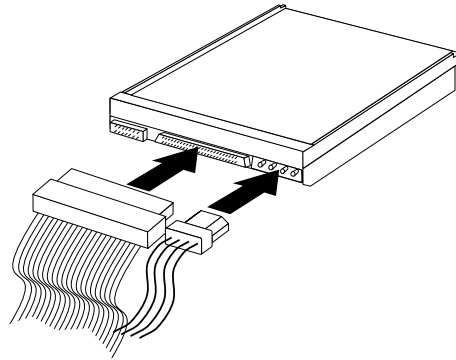


---
**What to do next**
- To work with another option, go to the appropriate section.
- To complete the installation, go to "Replacing the cover and connecting the cables" on page 29.
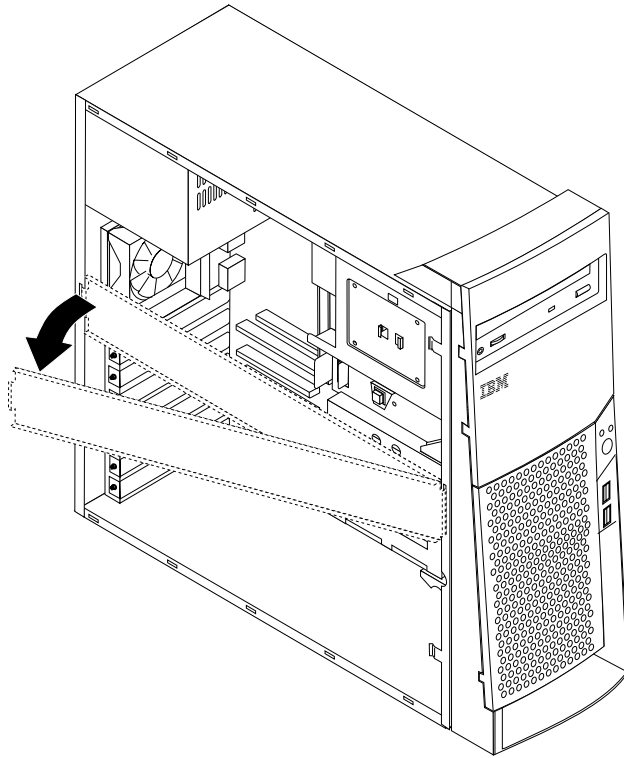---

## Installing a security U-bolt

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

To install a U-bolt:

1. Remove cover (see "Removing the cover" on page 15).
2. Use a tool, such as a screwdriver, to remove the two metal knockouts.
3. Insert the U-bolt through the rear panel; then attach and tighten the nuts with an appropriately sized or adjustable wrench.
4. Replace the computer cover. For more information, see "Replacing the cover and connecting the cables" on page 29.
5. Thread the cable through the U-bolt and around an object that is not a part of or permanently secured to the building structure or foundation, and from which it cannot be removed; then fasten the cable ends together with a lock.
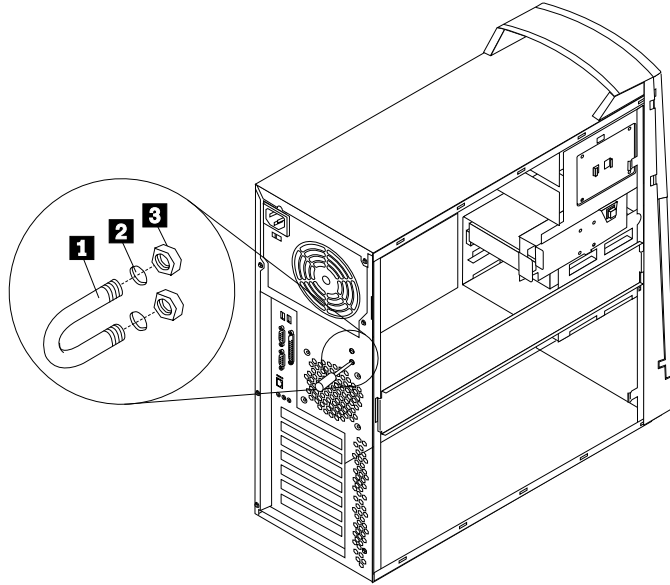
1 U-bolt
2 Bolt holes
3 Nuts

---

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

---

## Replacing the cover and connecting the cables

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

To replace the cover and connect cables to your computer:

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

3. Position the cover on the chassis and slide the cover toward the front bezel of the computer. Make sure to align the tabs on the computer with the cover.
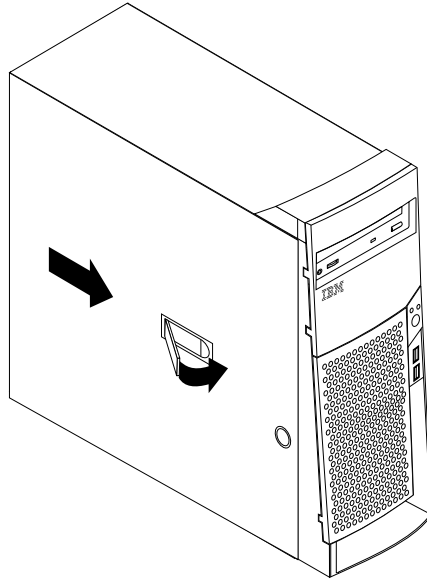
4. Close the cover-release latch to secure the cover in place.
5. Reconnect the external cables and cords to the computer. See "Chapter 2. Installing external options" on page 9 and the *Quick Reference*.
6. To update the configuration, see "Chapter 4. Updating the computer configuration" on page 31.

# Chapter 4. Updating the computer configuration

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

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

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

```
                    POST Startup Error(s)

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

    162 Configuration Change Has Occurred

    Select one of the following:

    Continue
    Exit Setup
```

If this message is displayed, select **Continue** and press Enter. The BIOS Setup Utility program automatically starts. From the BIOS Setup Utility program menu, do the following:

1. Select **Exit** and press Enter.
2. Select **Exit Saving Changes** and press Enter.

The computer will restart.

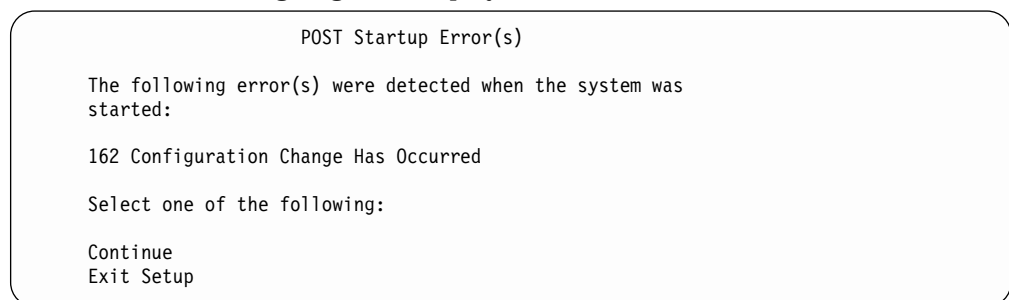The Windows operating system will usually detect the new option, update the configuration information, and prompt you for device drivers, if required. Before installing any device drivers, always check the documentation that is provided with your option for specific instructions. Not all device drivers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

## Verifying that an option is installed correctly

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

1. From the Windows desktop, use the right mouse button to click **My Computer**; then, click **Properties**.
2. In the System Properties window, click the **Device Manager** tab.

   **Note:** If you are running Windows 2000, in the System Properties window, click the **Hardware** tab first; then click the **Device Manager** tab.

3. Click **View devices by type**.
4. Click the plus sign next to each of the device types to expand the list.
   - If neither an X nor a circled exclamation point appears over any of the icons, all devices are working properly.

- An X over an icon indicates that the device is disabled. A circled exclamation point over an icon indicates a resource conflict. If an X or a circled exclamation point appears over an icon, click **Properties** to learn more about the source of the problem.
- If the device is not listed, it might not be physically installed correctly. Make sure that the option is installed according to instructions, all cables and connections are secure, and any jumper or switch settings are correct.
- If the device is listed under ″Other devices,″ a required device driver is either missing or installed incorrectly, or the operating system was not restarted after the device driver was installed. Restart the computer and check the device again. If it is still listed under ″Other devices,″ refer to the documentation that comes with the option, and reinstall the device driver.

**Note:** For further information, refer to the manual for operating system.

# Configuring PCI adapters

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

PCI adapters generally require no user configuration. The computer and operating system work together to automatically manage the resources that are required by each device that is installed in the computer and to assign resources to new devices in a manner that avoids system conflicts.

# Configuring startup devices

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

# Erasing a lost or forgotten password (clearing CMOS)

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

To erase a forgotten password:
1. Turn off the computer and all attached devices.
2. Unplug the power cord.
3. Remove the cover. See "Removing the cover" on page 15.
4. Refer to the system board label inside the computer to locate the CMOS jumper on the system board.
5. Move the jumper from the standard position (pins 1 and 2) to the maintenance or configure position (pins 2 and 3).
6. Replace the cover and connect the power cord. See "Replacing the cover and connecting the cables" on page 29.
7. Once you restart the computer, the BIOS Setup Utility screen is displayed.
8. In the maintenance screen, you can clear CMOS settings.
9. Press Esc.
10. Select **Exit** from the menu.

11. Select **Exit Saving Changes**.
12. Follow the directions on the screen.

> **Note:** You must remove the cover again to place the jumper to the normal setting.

# Appendix A. Changing the battery

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

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

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

To change the battery:

1. Turn off the computer and all attached devices.
2. Unplug the power cord and remove the cover. See "Removing the cover" on page 15.
3. Locate the battery. Refer to the system board label inside your computer or see "Identifying parts on the system board" on page 16.
4. If necessary, remove any adapters that impede access to the battery. See "Installing adapters" on page 19 for more information.
5. Remove the old battery.
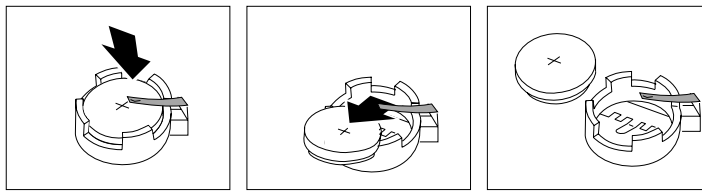
6. Install the new battery.
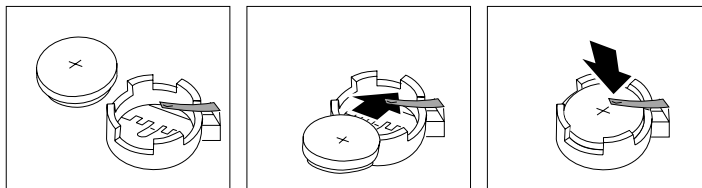
7. Replace any adapters that were removed to gain access to the battery. See "Installing adapters" on page 19 for instructions for replacing adapters.
8. Replace the cover, and plug in the power cord. See "Replacing the cover and connecting the cables" on page 29.

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

# Appendix B. Updating System Programs

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

## System programs

*System programs* are the basic layer of software that is built into your computer. They include the power-on self-test (POST), the basic input/output system (BIOS) code, and the BIOS 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 BIOS 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 BIOS Setup Utility program by starting your computer using a flash update diskette.

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

To update system programs (flash the EEPROM):

1. Insert a system program update (flash) diskette into the diskette drive (drive A) in your computer. System program updates are available at http://www.ibm.com/pc/support/ on the World Wide Web.

2. Turn on the computer. If it is on already, you must turn it off and back on again. The update begins.

## Recovering from a POST/BIOS update failure

If power to your computer is interrupted while POST/BIOS is being updated (flash update), your computer might not restart correctly. If this happens, perform the following procedure to recover:

1. Using another computer and a text editor, open the config.sys file on the BIOS flash diskette.

2. Find line:

   ```
   shell = flash2.exe
   ```

3. Change this line to:

   ```
   shell = flash2.exe /U
   ```

4. Save this file to the diskette. Now you can use this BIOS flash diskette to update your computer.

5. Turn off the computer and any attached devices, such as printers, monitors, and external drives.

6. Unplug all power cords from electrical outlets, and remove the cover. See "Removing the cover" on page 15.

7. Locate the Clear CMOS/Recovery jumper on the system board, removing any adapters that impede access to the jumper. See the system board label inside your computer for the location of the jumper. See also "Identifying parts on the system board" on page 16.

8. Remove the jumper from the system board.

9. Replace the cover. See "Replacing the cover and connecting the cables" on page 29.

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

11. Insert the BIOS update (flash) diskette into drive A, and turn on the computer and the monitor.

12. After the update session is completed, remove the diskette from the diskette drive, and turn off the computer and monitor.

13. Unplug the power cords from electrical outlets.

14. Remove the cover. See "Removing the cover" on page 15.

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

16. Replace the Clear CMOS/Recovery jumper to its original position.

17. Replace any adapters that were removed.

18. Replace the cover and reconnect any cables that were disconnected.

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

20. Restore the config.sys file on the diskette back to:

```
shell = flash2.exe
```

# Appendix C. System address maps

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

## System memory map

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

*Table 1. System memory map*

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

## I/O address map

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

*Table 2. I/O address map*

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

*Table 2. I/O address map  (continued)*

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

*Table 2. I/O address map  (continued)*

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

# DMA I/O address map

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

*Table 3. DMA I/O address map*

| Address (hex) | Description | Bits | Byte pointer |
|---|---|---|---|
| 0000 | Channel 0, memory address register | 00 – 15 | Yes |
| 0001 | Channel 0, transfer count register | 00 – 15 | Yes |
| 0002 | Channel 1, memory address register | 00 – 15 | Yes |
| 0003 | Channel 1, transfer count register | 00 – 15 | Yes |
| 0004 | Channel 2, memory address register | 00 – 15 | Yes |
| 0005 | Channel 2, transfer count register | 00 – 15 | Yes |
| 0006 | Channel 3, memory address register | 00 – 15 | Yes |
| 0007 | Channel 3, transfer count register | 00 – 15 | Yes |
| 0008 | Channels 0–3, read status/write command register | 00 – 07 | |
| 0009 | Channels 0–3, write request register | 00 – 02 | |
| 000A | Channels 0–3, write single mas register bits | 00 – 02 | |
| 000B | Channels 0–3, mode register (write) | 00 – 07 | |
| 000C | Channels 0–3, clear byte pointer (write) | A | |
| 000D | Channels 0–3, master clear (write)/temp (read) | 00 – 07 | |
| 000E | Channels 0-3, clear mask register (write) | 00 – 03 | |
| 000F | Channels 0-3, write all mask register bits | 00 – 03 | |
| 0081 | Channel 2, page table address register | 00 – 07 | |
| 0082 | Channel 3, page table address register | 00 – 07 | |
| 0083 | Channel 1, page table address register | 00 – 07 | |
| 0087 | Channel 0, page table address register | 00 – 07 | |
| 0089 | Channel 6, page table address register | 00 – 07 | |

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

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

# Appendix D. Interrupt request and direct memory access channel assignments

The following tables list the IRQ and DMA channel assignments.

*Table 4. IRQ channel assignments*

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

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

*Table 5. DMA channel assignment*

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

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