



Personal Computer

Types 6266, 6270, 6276, 6279, 6280 and 6286

User Guide

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Notices

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Safety information

Installation

The construction of the IBM Personal Computer provides extra protection against the risk of electrical shock. The IBM computer has a power cord with a three-prong plug that is required to ground metal parts. It is the responsibility of the person installing the computer to connect it to a properly grounded electrical outlet. Seek professional assistance before using an adapter or extension cord; these devices could interrupt the grounding circuit.

If the computer is connected to an electrical outlet that is incorrectly connected to the building wiring, serious electrical shock could result.

CONTINUED PROTECTION AGAINST THE RISK OF ELECTRICAL SHOCK:

For continued protection against the risk of electrical shock, follow these steps:

- Connect your computer only to an electrical outlet of the correct voltage. If you are unsure about the voltage of the electrical outlet you are using, contact your local power company.
- If your computer has cables other than the power cords, you must connect them before plugging the power cords into an electrical outlet. Before removing these cables, you must first unplug the power cords from the outlet.
- If your computer has a telephone connection, do not touch the telephone cords when there is lightning in the area.
- Do not use or store the computer in an area where it can become wet.
- Make sure all replacement parts have characteristics identical or equivalent to the original parts. Other parts may not have the same safety features.
- Personal injury or electrical shock may result if you undertake actions other than those specifically described in this book. This is particularly true if you try to service or repair the power supply, monitor, or built-in modem. Always refer service or repairs to qualified service personnel.

Safety while working with hardware

Each time you open your computer, you must follow specific safety procedures to ensure that you do not damage your computer. For your safety, and the safety of your equipment, follow the steps for “Disconnecting your computer” on page x before you remove the cover of the system unit (if included with the model you purchased).

Connecting your computer

To connect your computer:

1. Turn off the computer and any external devices (such as a monitor or printer) that have their own power switches.
2. Attach a signal cable to each external device (such as a monitor or printer), and then connect the other end of the signal cable to the computer.
3. Attach communication cables (such as modem cables or network cables) to the computer. Then, attach the other ends of the cables to properly wired communication outlets.
4. Attach the power cords to the computer and any external devices (such as a monitor or printer), and then connect the other ends of the power cords to properly grounded electrical outlets.
5. Turn on the computer and any attached devices that have their own power switches.

Danger!

To avoid shock hazard:

- Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.
- The power cord must be connected to a properly wired and grounded receptacle.
- Any equipment to which this product will be attached must also be connected to properly wired electrical outlets.
- Electrical current from power, telephone, and communications cables is hazardous. To avoid shock hazard, use the steps described in this section to connect and disconnect cables when installing, moving, or opening the cover of this product.
- Never install telephone wiring during a lightning storm

Disconnecting your computer

To disconnect your computer:

1. Turn off the computer and any attached devices that have their own power switches.
2. Unplug all power cables from electrical outlets.
3. Disconnect all communication cables (such as modem or network cables) from communication outlets.
4. Disconnect all cables and cords from the computer; this includes power cords, signal cables from external devices, communication cables, and any other cables attached to the computer.

Danger!

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

Caution!

Be sure to turn off the computer and monitor power switches before cleaning the computer and monitor screen.

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.

Lithium battery notice

Caution!

Your computer uses lithium batteries. There may be a risk of fire, explosion, or burns if the batteries are handled incorrectly.

To ensure safety:

- Do not recharge, disassemble, heat, or incinerate a lithium battery.
- Replace the battery with an identical or equivalent type lithium battery.
- Do not throw or immerse the battery in water.
- Discard used lithium batteries according to local country dispositions.

Regulatory safety notice for the CD-ROM and DVD-ROM drive

This notice contains required safety information about the CD-ROM/DVD-ROM drive in your computer (if included with the model you purchased). The CD-ROM/DVD-ROM drive is a Class 1 laser product, and Class 1 laser products are not considered to be hazardous. The design of the laser system and CD-ROM-DVD-ROM drive ensures that during normal operation, there is no exposure to laser radiation above Class 1 level.

Please note that the CD-ROM/DVD-ROM drive does not contain any user adjustable or serviceable parts. Service on this drive should only be performed by a trained service provider.

Laser compliance statement

Some IBM Personal Computer models are equipped from the factory with a CD-ROM or DVD-ROM drive. CD-ROM/DVD-ROM drives are also sold separately as options. The CD-ROM/DVD-ROM drive is a laser product. The CD-ROM/DVD-ROM drive is 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, the drive is 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/DVD-ROM drive is installed, note the following:

Caution!	Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.
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Removing the covers of the CD-ROM/DVD-ROM drive could result in exposure to hazardous laser radiation. There are no serviceable parts inside the CD-ROM/DVD-ROM drive covers. **Do not remove the CD-ROM/DVD-ROM drive covers.**

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

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.
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Consignes de sécurité

Installation

La conception de fabrication de l'ordinateur personnel IBM assure une protection accrue contre les risques d'électrocution. Le PC IBM possède un cordon d'alimentation équipé d'une fiche à trois broches qui permet une mise à la terre des principaux éléments métalliques de la machine. Il incombe au responsable de l'installation de vérifier le branchement. Si vous devez installer un adaptateur ou une rallonge, faites appel à un professionnel pour ne pas risquer de créer une rupture dans le circuit de mise à la terre. Un socle de prise de courant incorrectement relié à l'alimentation électrique du bâtiment peut être à l'origine d'une électrocution.

Danger!

Pour éviter tout risque de choc électrique:

Ne manipulez aucun cordon et n'effectuez aucune opération d'installation, de maintenance ou reconfiguration de ce produit au cours d'un orage.

Les cordons d'alimentation du présent produit et de tous les appareils qui lui sont connectés doivent être branchés sur des socles de prise de courant correctement câblés et mis à la terre.

Le courant électrique circulant dans les câblés de communication et les cordons téléphoniques et d'alimentation est dangereux. Pour éviter tout risque de choc électrique, respectez les consignes de la présente section pour connecter et déconnecter des câblés lors de l'installation, du retrait ou de l'ouverture du panneau de ce produit.

Protection contre les risques d'électrocution. Pour vous prémunir contre les risques d'électrocution, respectez les consignes ci-après:

- Ne branchez l'ordinateur que sur un socle de prise de courant présentant la tension adéquate.
- Ne branchez le cordon d'alimentation sur le socle de prise de courant qu'après avoir connecté tout autre cordon à la machine. Inversement, débranchez le cordon d'alimentation du socle de la prise de courant avant de déconnecter tout autre cordon.

- Si votre ordinateur est doté d'un cordon téléphonique, ne manipulez jamais ce cordon pendant un orage.
- Évitez d'utiliser et de placer votre ordinateur dans un endroit humide.
- Ne remplacez un élément que par un élément identique ou possédant des caractéristiques équivalentes et équipé des mêmes dispositifs de sécurité.
- Le non-respect de ces consignes peut être à l'origine de blessures ou d'une électrocution, en particulier si vous intervenez sur le bloc d'alimentation, l'écran ou le modem intégré. Confiez la maintenance et la réparation de l'ordinateur à une personne qualifiée.

Consignes de sécurité lors de la manipulation du matériel

Lorsque vous ouvrez l'unité centrale, il convient de suivre un certain nombre de consignes de sécurité afin de ne pas endommager l'ordinateur. Pour votre sécurité et celle de votre matériel, suivez les instructions de la section "Disconnecting your computer" on page x, avant d'ouvrir l'unité centrale (le cas échéant).

Branchement de l'ordinateur. Pour brancher l'ordinateur, procédez comme suit:

1. Mettez l'ordinateur hors tension ainsi que tout périphérique (écran ou imprimante) que vous allez connecter, qui dispose d'un interrupteur d'alimentation.
2. Connectez tous les câbles (de l'écran, par exemple) à l'ordinateur.
3. Branchez tous les câbles d'interface (par exemple, un câble téléphonique) sur des socles de prise de courant correctement mis à la terre.
4. Branchez les cordons d'alimentation sur des socles de prise de courant correctement mis à la terre.
5. Mettez l'ordinateur sous tension ainsi que tout périphérique connecté disposant d'un interrupteur d'alimentation.

Débranchement de l'ordinateur. Pour débrancher l'ordinateur, procédez comme suit:

1. Mettez l'ordinateur hors tension ainsi que tout périphérique connecté disposant d'un interrupteur d'alimentation.

2. Débranchez tous les cordons d'alimentation des prises de courant.
3. Débranchez tous les câbles (câble de téléphone, par exemple) de leurs prises.
4. Débranchez tous câbles de l'ordinateur (les cordons d'alimentation, les câbles d'entrée-sortie et tous les autres câbles qui pourraient y être connectés).

Attention!

Votre ordinateur est équipé de piles au lithium. Prenez garde aux risques d'incendie, d'explosion ou de brûlures liés à une mauvaise utilisation des piles. Respectez les consignes de sécurité suivantes:

Ne rechargez pas la pile, ne la démontez pas, ne l'exposez pas à la chaleur et ne la faites pas brûler.

Ne la remplacez que par une pile identique ou de type équivalent.

Ne la jetez pas à l'eau.

Pour le recyclage ou la mise au rebut des piles au lithium, reportez-vous à la réglementation en vigueur.

Danger!

No détachez pas le bloc d'alimentation de son support et ne retirez aucune vis du bloc d'alimentation.

Attention!

Veillez à mettre l'ordinateur et l'écran hors tension avant de procéder à leur nettoyage.

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.

Consignes relatives à la pile au lithium

Attention!

Votre ordinateur est équipé de piles au lithium. Prenez garde aux risques d'incendie, d'explosion ou de brûlures liés à une mauvaise utilisation des piles. Respectez les consignes de sécurité suivantes:

- Ne rechargez pas la pile, ne la démontez pas, ne l'exposez pas à la chaleur et ne la faites pas brûler.
- Ne la remplacez que par une pile identique ou de type équivalent.
- Ne la jetez pas à l'eau.
- Pour le recyclage ou la mise au rebut des piles au lithium, reportez-vous à la réglementation en vigueur.

Consignes de sécurité pour l'unité de CD-ROM et de DVD-ROM

La présente consigne contient les informations de sécurité relatives à l'unité de CD-ROM de votre ordinateur (le cas échéant). L'unité de CD-ROM est un produit à laser de classe 1. Les produits de classe 1 ne sont pas considérés comme dangereux. Le système à laser et l'unité de CD-ROM ont été conçus de façon telle qu'il n'existe aucun risque d'exposition à un rayonnement laser de niveau supérieur à la classe 1 dans des conditions normales d'utilisation.

Veillez noter qu'aucune pièce de l'unité de CD-ROM n'est réglable ni réparable. Ne confiez la réparation de cette unité qu'à une personne qualifiée.

Conformité aux normes relatives aux appareils laser.

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 CDI 825 et CENELEC EN 60 825.

Lorsqu'une unité de CD-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.

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. About this book

The *User Guide* contains general information for all users of an IBM Personal Computer. Once you have taken your computer out of the box and connected all the components, you can use this book as a guide to your computer's hardware and as a problem-solving tool.

The topics in this book range from an introduction of important hardware features to instructions for reconfiguring or upgrading your computer. In addition, if you experience a problem with your computer, this book can guide you to a solution.

This book may include information for several models. If the model you purchased did not come with some of the hardware or IBM-preinstalled software mentioned in this book, you will not be able to use those features. For more information, see the "About your software" that comes with your computer.

About this book

This book contains the following chapters:

- Chapter 1. "About this book" on page 1-1
This chapter contains information about the book's contents and organization. It also points you to other documents or online resources for more information.
- Chapter 2. "Getting started" on page 2-1
This chapter contains instructions for making adjustments to the monitor and the system volume settings on your computer. It also provides information to help you connect your computer to a printer or to the Internet.
- Chapter 3. "Power management features" on page 3-1
This chapter describes the software shutdown and suspend features of your computer for more efficient power management.
- Chapter 4. "BIOS Setup configuration" on page 4-1
This chapter provides instructions for using the Setup Utility, where you can view or change your system's configuration.

- Chapter 5. "Preparing to upgrade" on page 5-1
This chapter contains information to help you prepare to add or replace adapter cards, drives, and system board components in your system unit.
- Chapter 6. "Adding and removing adapter cards and drives" on page 6-1
This chapter contains instructions for adding and removing adapter cards and drives.
- Chapter 7. "Adding and replacing system board components" on page 7-1
This chapter contains instructions for adding and replacing hardware components on your system board.
- Chapter 8. "Diagnosing and recovering from problems" on page 8-1
This chapter provides troubleshooting information, including error code and message interpretations. It also includes information to help you recover factory-installed programs and files.
- "Appendix A. Specification tables" on page A-1
This appendix contains specific memory, address, interrupt, channel, and port specifications. It also includes connector information.
- "Appendix B. Modem information" on page B-1
This appendix contains information about modems, including AT command set information that you can use if you decide to operate your modem from a Windows DOS box prompt.
- "Appendix C. Monitor terminology" on page C-1
This appendix contains definitions of some of the terms generally used to describe monitor characteristics.

Where to find more information

The following publications and online documentation contain more information about your computer:

Quick Reference: Your computer comes with a *Quick Reference*. The *Quick Reference* provides safety, system setup, service and support information and some other basic information for the computer.

Online Information: The “online information” is available within Access IBM and also from IBM via the WWW. See your *Quick Reference* for more about accessing IBM information on the WWW. Your computer comes with different types of online documentation. The software that came preinstalled on your computer may include online tutorials and exercises that can help you learn how to use your computer. Help is also available as you use your software. In most software, you can press **F1** for help.

From the Windows desktop, you can search for specific help topics about your computer.

To start the Windows help system, follow these steps:

1. Click on the **Start** button on your desktop.
2. Move your mouse pointer to the **Help** option and click on it.

Chapter 2. Getting started

This chapter contains the following sections to help you make adjustments and connections to your computer.

- “Controlling monitor settings” on page 2-2
- “Controlling volume” on page 2-6
- “Setting up communications” on page 2-9
- “Configuring your computer for a connection to the Internet” on page 2-11
- “Using the Rapid Access II Keyboard” on page 2-12

Controlling monitor settings

When you connected your monitor to your system unit and turned your computer on for the first time, your computer automatically selected settings for monitor performance. Depending on the monitor you have, you might want to change some of these settings for optimal performance. Using Windows, you can customize the screen resolution, number of colors, the size of the screen, and other properties.

Refer to the documentation that came with your monitor for model-specific monitor information and configuration settings.

Note:

If the image on your monitor screen is scrolling, blinking, or flashing the first time you turn on your computer, read "Is anything displayed on the monitor?" on page 8-4 in the chapter "Diagnosing and recovering from problems".

Getting the best performance from your monitor

Follow these guidelines to get the best performance from your monitor:

- Place your monitor away from sources of magnetic interference, such as other monitors, unshielded speakers, and electric power lines. (If your computer came with speakers, those speakers are shielded.)
- Keep the monitor screen clean by using a nonabrasive screen or glass cleaner. Do not spray the cleaner directly onto the screen.
- Under some conditions, interference patterns, such as curved, shadowy lines can occur. If these patterns appear on your screen, change your software program's background color or design.
- To extend the life of your monitor, turn it off at the end of each day.

Power saver feature

Your monitor documentation should indicate whether your monitor has a power saver feature. This feature may be called Display Power Management Signaling (DPMS). With DPMS, the monitor's display goes blank if you have not used your computer for a predetermined period of time. To redisplay the screen, press the **shift** key on your keyboard or move the mouse.

If your monitor has a power saver feature, you can set the energy saving features of the monitor in the Control Panel in Windows. "Automatic Power On" on page 4-15 for instructions on using this feature.

Changing display settings

The first time you turn on your computer, it automatically selects common settings for your monitor. If your monitor supports Display Data Channel (DDC), the computer automatically selects the best refresh rate your monitor can support. The refresh rate determines how quickly the screen image is drawn on the screen. This setting can be changed.

If you purchased a monitor that does not support DDC, you may want to change your monitor's refresh rate setting. With any monitor, you may want to customize one or more display properties.

Customizing display properties

In Windows, you can change display options such as screen resolution, number of colors, refresh rate, and the size of displayed characters.

If you need assistance while selecting display properties settings, click the question mark in the upper right corner of the window. Your mouse cursor will change into a question mark. Then click on the area you would like information about. If help information is available for the topic, it will be displayed at that time.

To customize your display properties:

1. Double-click on the **My Computer** icon on your desktop.
2. In the My Computer window, double-click on the **Control Panel** folder.
3. In the Control Panel window, double-click on the **Display** icon.
4. In the Display Properties window, click on the **Settings** tab.

In the Settings tab of the Display Properties window, you can set the display properties. Some of the properties you can set are:

- Colors

Lets you specify the number of colors that can be displayed on the screen.

- Font size

If you click on the **Advanced...** button, and then click on the **General** tab, you can specify the size of the characters displayed on the screen.

You should generally use the default setting for font size because some programs are not designed to work with large fonts.

- Screen area

Lets you specify the screen resolution. The resolution setting determines the amount of information that can be displayed on your screen. The larger the resolution setting numbers, the more you can see on your screen, but the smaller the images on the screen appear.

The values you can choose for screen area (resolution) and colors will be limited by:

- Your monitor's maximum horizontal and vertical frequencies.
- The amount of memory dedicated to video on the computer's system memory.

Your computer uses 4MB or more of system memory as video memory. You can select the amount of use as video memory through the Configuration/Setup utility program. See "BIOS Setup configuration" on page 4-1 for details.

Tips for choosing display properties

Of the settings that your monitor supports, you should select the ones that are most comfortable for you to work with. The highest resolution and color settings are not always best. For example:

- Higher resolutions display more pels (picture elements). While this allows more text and graphics to be displayed, it makes them appear smaller. For most

users, 640x480 or 800x600 is a comfortable resolution setting.

- When you select more colors, most software programs will slow down. Choose only as many colors as you need.
- You can determine which settings are most comfortable to work with by selecting and trying each one.
- While your monitor resolution may allow you to change the font size, some programs do not support large fonts. Large fonts may cause words to appear cut off or pushed together.
- If attaching a monitor other than an SVGA monitor, you may need to change the Screen area in Display Properties to 640 x 480 pixels and set the Palette to 16 colors to prevent the image from scrolling, blinking, or flashing. Read “Is anything displayed on the monitor?” on page 8-4 in the chapter “Diagnosing and recovering from problems” for the steps to restart your computer in Save mode and reconfigure your monitor.

Using the Windows Help function to select display properties

Windows Help provides instructions for choosing monitor settings. To select display properties, follow these steps:

1. From the Windows desktop, click on the **Start** button.
2. Click on **Help**.

The Windows Help folder appears.

3. Click on the **Index** tab.
4. In the first box, type:

monitor

5. The second box will automatically display a list of tasks related to the monitor. Click on the task you want; then, click on the **Display** button for instructions.

Controlling volume

Depending on your model, your computer might have more than one way of controlling volume:

- The volume-control software that came with your computer
This is the only control that will affect the volume of the speakers provided with your computer.
- On the CD-ROM drive at the front of the system unit
Your system may not have this volume control. If your system has this control, it will only control the headphones volume if the headphones are plugged into the CD-ROM drive front panel jack. This control has no effect on the speakers.

The control you use depends on whether you are listening to sound through the speakers or the headphones.


Adjusting the speaker volume

The volume of the speakers is controlled by a software volume-control program provided with your computer. You can access the volume control program using either of the following methods:

- Rotate front panel thumbwheel (models equipped with front audio connectors only)
- Click on the speaker icon on the Windows taskbar located at the bottom right corner of the Windows desktop. This method allows you to control the overall volume.
- Click on **Start**, select **Programs**, select **Accessories**, select **Entertainment**, and then click on **Volume Control**. This method starts the master Volume Control window, which allows you to adjust the volume of each audio device individually.

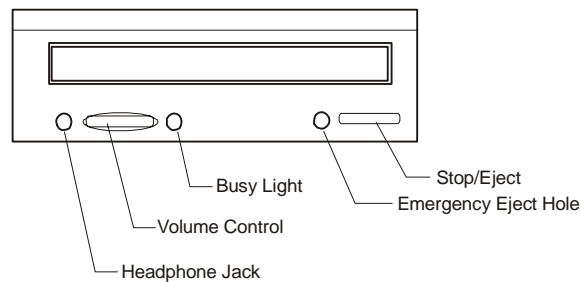
If no sound comes from your speakers, you might have the volume set too low or the mute function activated.

Adjusting the headphone volume

You may be able to plug headphones into the headphone jack on the CD-ROM drive (not available on all systems) or into the line-out jack on the back of the computer's system unit. The line-out jack is marked with the icon .

- On some IBM computers, a headphone jack and a volume control are located on the CD-ROM drive on the front of the computer's system unit.

Note: The CD-ROM drive in the computer that you purchased may not include all of the lights and controls shown in the following illustration.



When your headphones are plugged into the headphone jack on the CD-ROM drive, they will pick up only the sound coming from an ordinary audio CD in the CD-ROM drive. The headphones will not pick up other sounds generated from your computer or any external device connected to the computer, such as a MIDI (Musical Instrument Digital Interface) keyboard.

When your headphones are plugged into this jack, use the volume control on the CD-ROM drive to adjust the volume of the headphones. This volume control adjusts the volume of the headphones, but not the speakers. If you want to turn the speaker volume down while using the headphones, use the volume control program to do it.

- You can also plug headphones into the line-out jack on the back of the system unit. This is the same jack to which the external speakers connect. You must disconnect your speakers to use this jack with your headphones.

If you plug your headphones into the line-out jack on the back of the system unit, the headphones will pick up all sounds generated from your computer and any external devices connected to the computer, such as a MIDI (musical) keyboard. The headphones will also pick up sound coming from a CD in the CD-ROM drive.

Note: When your headphones are plugged into the line-out jack on the back of the system unit, you must control the headphone volume through the volume-control program on your computer. You cannot control the headphone volume from the volume control on the CD-ROM drive.

Setting up communications

If your computer has a fax/data modem, it can communicate with other computers and fax machines.

Some IBM personal computers have a modem already installed. However, if your computer package comes with a modem but it is not installed, open the system and install the modem first. Refer to sections "Opening the system unit" on page 5-5, "Adding and removing adapter cards for desktop model" on page 6-4 and "Adding and removing adapter cards for microtower model" on page 6-6 for instructions.

Before your computer can use its modem, you must complete the procedures in the following sections:

- Connecting your modem to the telephone network
- Configuring your communications software

Connecting your modem to the telephone network

Modems are designed to operate over the *public switched telephone network* (PSTN or PSN). This is an *analog network* commonly used by most households. Connect the modem to an analog network *only*. If you are not sure about your telephone line, contact your local telephone company.

Before you connect your modem to a telephone network, read the safety notices in "Safety information" on page viii.

Attention!

- Excessive voltages can occur on telephone lines, especially during lightning storms. To avoid any possible damage to sensitive electronic parts, unplug the computer and the telephone cords during such storms.
- Some businesses, schools, and buildings have digital telephone systems, known as digital private branch exchange (PBX) systems. These systems do not work with the modem. Connecting your modem to a digital telephone system might damage the modem.

The telephone line your modem uses cannot be used for any other purpose while the modem is operating. Any interruption on the line your computer is using will stop computer communications. Do not pick up a telephone on the same line your computer is using. You must also disable any Call Waiting features on your telephone service. Contact your local telephone company for information about how to disable Call Waiting. Your telephone company might have a dialing sequence procedure that lets you temporarily suspend Call Waiting.

If your computer's telephone line connection is interrupted during modem operation, you must clear the telephone line and restart the communication. If you were sending a fax, you must resent the fax. If you were dialed into a network (communicating with other computers), you must redial.

Configuring your communications software

Your computer can run software that allows you to use the system as a fax machine. To configure your computer to operate as a fax machine, see the Windows online help.

Your computer also comes with software that lets you connect to the Internet. Proceed to the next section "Configuring your computer for a connection to the Internet."

If you decide not to use a communications software program, you can still use your modem. See "Modem commands" on page B-5 for information about typing AT commands in a Windows Terminal program or a Windows DOS box. If you need more information about modems, see "Modems features" on page B-1.

Configuring your computer for a connection to the Internet

If your computer is equipped with a modem, you can connect to the Internet. Before you configure your Internet software, you must first connect your computer to a telephone network.

Your computer comes with a software selection CD. You can use Netscape Navigator by loading the software selection CD. To install Netscape Navigator, click on the Netscape icon on the desktop and follow the instructions on the screen.

For more information about using the many features of your operating system, select Help from the Windows Start bar or refer to the publication about using the operating system that comes with your computer.

The Microsoft Network

You can also use a Windows program to configure a dial-up connection to The Microsoft Network. Follow these steps if you want to become a member of The Microsoft Network.

1. From the Windows desktop, double-click on the **Setup MSN Internet Service** icon.
2. Follow the online instructions. If you need assistance, press the **F1** key to display the online help.

The Internet Connection Wizard

Your computer comes with a program that guides you through the steps for connecting to the Internet. You can use this program, called a wizard, to set up an Internet connection using The Microsoft Network or any other service provider.

Follow these steps to use the Internet Connection Wizard:

1. From the Windows desktop, click on the **Start** button.
2. Select **Programs**, select **Accessories**, and then select **Communications**.

3. Click on the **Internet Connection Wizard** option.

The wizard lists the information that you need to collect for your connection and then takes you through the steps required to connect. Follow the onscreen instructions. If you need assistance, press **F1** to display the online help.

Using the Rapid Access II Keyboard

For models featuring a Rapid Access Keyboard, the keyboard provides several special keybuttons that provide extra functions. For example, some buttons provide *shortcuts* to start a program, open a file, or perform a specific function when you press them. These keybuttons enable you to go straight to a file, program, or Internet address with the press of a button instead of having to click an icon, search for the program in the Start menu, or type an internet address in your browser.

Some of the Rapid Access buttons are preset to support important functions on your computer (Mute, Volume, and CD/DVD controls); these cannot be changed.

There are 104 keybuttons for Rapid Access Keyboard. Among the easy keybuttons, the Internet, Internet Shopping, IBM Web support, World Book, Option and Help keybuttons are preset to start certain programs on your computer. The preset functions are printed on the label above the keybuttons. You can keep these settings, or customize the keybuttons mentioned above except for the Help and Standby keybuttons. For example, if you enjoy playing Solitaire, you can customize a Rapid Access Keybutton to open the Solitaire program.

To customize a Rapid Access Button:

1. From the windows desktop, click **Start**.
2. Select **Settings**, and then click **Control Panel**.
3. Double-click **Keyboard (Rapid access)**. The Rapid Access Keyboard Customization program starts.
4. Follow the instructions on the screen.

To learn more about the Rapid Access keyboard, click **Help**.

Chapter 3. Power management features

Your computer is compliant to ACPI (Advance Control Power Interface) and the APM (Advance Power Management) functions. It will enter a power-saving mode according to the power management option you specify.

You can set up the power management option in the Configuration/Setup Utility. See “Power Management Setup” on page 4-14 for setting power management through the BIOS.

Your computer supports the following power management features:

- **ACPI BIOS Mode.** Your operating system is allowed to control the power management features of your computer when ACPI (automatic configuration and power interface). Not all operating systems support ACPI BIOS mode. Refer to your operating system documentation to determine if ACPI is supported.
- **APM.** This feature allows automatic power reduction through monitoring your computer’s hardware.
- **Automatic Power On.** This option lets you enable or disable features that automatically turn on your computer.

ACPI BIOS Mode

Using the ACPI BIOS Mode feature

Follow these steps to use the ACPI BIOS Mode feature:

1. Start the Configuration/Setup Utility (see "Configuration/Setup Utility overview" on page 4-2.)
2. Set **Power Management** from the Configuration/Setup Utility menu.
3. Set **ACPI BIOS Mode** to **Enabled** or **Disabled** using the Right or Left arrow key.
4. Press **Esc** to return to the Configuration/Setup Utility menu.
5. Before you exit from the program, select **Save Settings** from the Configuration/Setup Utility menu.
6. To exit from the Configuration/Setup Utility menu, press **Esc** and follow the instructions on the screen.

APM

This feature allows the computer to save power through monitoring your computer's hardware. Follow these steps to use the APM feature:

1. Start the Configuration/Setup Utility (see "Configuration/Setup Utility overview" on page 4-2.)
2. Select **Power Management** from the Configuration/Setup Utility menu
3. Select **APM**.
4. Set **APM BIOS Mode** to **Enabled**.
5. Select values for **Power Management** (time to low power, system power, processor speed, etc.), as necessary.
6. Set IDE Drives to Enabled or disabled.
7. Press Esc to return to the Configuration/Setup Utility menu.
8. Before you exit from the program, select **Save Settings** from the Configuration/Setup Utility menu.
9. To exit from the Configuration/Setup Utility menu, press **Esc** and follow the instructions on the screen.

Automatic Power On

This option allows you to enable or disable features that automatically turn on your computer. You must also select the startup sequence you want to use for the type of power-on event selected.

Follow these steps to use the Automatic Power On feature:

1. Start the Configuration/Setup Utility (see "Configuration/Setup Utility overview" on page 4-2.)
2. Select **Power Management** from the Configuration/Setup Utility menu.
3. Select **Automatic Power On**.
4. Select values for **Automatic Power On**. Use the Right or Left arrow key to select enable or disable.
5. Press Esc to return to the Configuration/Setup Utility menu.
6. Before you exit from the program, select **Save Settings** from the Configuration/Setup Utility menu.
7. To exit from the Configuration/Setup Utility menu, press **Esc** and follow the instructions on the screen.

Chapter 4. BIOS Setup configuration

Your IBM Personal Computer is already configured for immediate use. You can view your computer's configuration settings using the Configuration/Setup Utility.

You can also use these configuration utilities to change some configuration settings. For example, if you add or replace hardware inside your system unit, you might need to verify or update specific settings. For information about working with your system unit's hardware, see "Preparing to upgrade" on page 5-1.

This chapter contains the following sections to help you reconfigure and optimize your computer:

- "Entering Setup" on page 4-4
- "Configuration/Setup Utility menu" on page 4-5
- "Working with the Setup menus" on page 4-5
- "Setup parameters" on page 4-9
- "Using other configuration utilities" on page 4-17

Configuration/Setup Utility overview

The Configuration/Setup Utility lets you view and change important information about your computer and its hardware. You might need to use it if you upgrade the hardware in your computer or if you get an error message while using your computer.

In most circumstances, when you add or replace hardware in your system unit, your computer's Basic Input/Output System (BIOS) detects the hardware changes and updates Setup parameters automatically. In some cases, however, you might need to manually change the configuration information in Setup. If you add or remove hardware, an online message may ask you to check Setup to verify that automatic detection made the correct configuration changes.

You can use the Setup menus to view information about your system's hardware configuration. In general, the Setup menus contain information on the following:

- Processor type and speed
- System memory
- Diskette, hard disk, and CD-ROM drives
- Serial and parallel ports
- Plug and Play options
- Startup options
- Model information
- Date and time settings
- Security options
- Power management options

Some of the parameters and related settings in Setup are for reference only, such as those items in the System Summary and Product Data menus. Refer to the section "Viewing system information and product data" on page 4-6 for details on these menus.

The configurable options allow you to control how your computer operates. For example, you can use Setup to:

- Configure hard disk, CD-ROM, or any other IDE drives
- Select and configure I/O devices, such as serial, parallel, USB, and video devices
- Enable, disable, or configure the power-management modes
- Customize startup options
- Set date and time
- Create or change a power-on password
- Enable or disable cache options and ROM shadowing
- Set resource assignments for PCI adapter cards and other system devices
- Load Setup default settings

Entering Setup

When the computer is on

Follow these steps to enter Setup when the computer is on:

1. Save all open files, close all applications, shut down the computer, then turn it off.
2. Turn on the computer and display.
3. When you see the IBM logo and the line message "Press F1 to enter Setup", press **F1** to enter Setup and display the Configuration/Setup Utility menu.

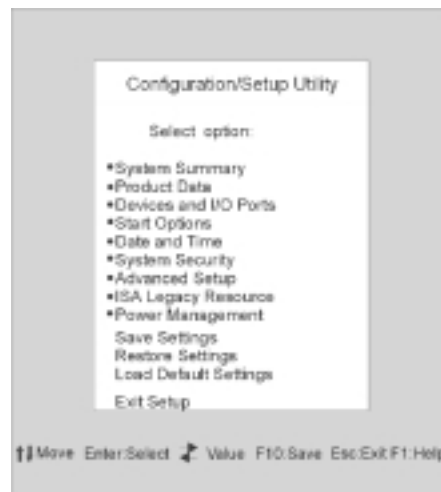
Note: You cannot enter Setup after the Power On Self Test (POST) is complete.

If you have previously set a power-on password, you are prompted to type in the password after you press the F1 key. Refer to "System Security" on page 4-15 for information on setting, changing, and removing the password.

Working with the Setup menus

The Configuration/Setup Utility menu appears immediately after you press **F1**.

Configuration/Setup Utility menu



Note: The Configuration/Setup Utility menu that you see on your computer may look slightly different from the menu shown here, but the options will operate just the same.

The Configuration/Setup Utility menu lists system configuration options. When you select one of these options, a menu for that option appears.

An option usually has only one menu, although some can have more than one. In options with multiple menus, use the **PgDn** and **PgUp** keys to move from one menu to another.

The following table lists specific keys on the keyboard that will help you move through the Setup menus.

Keys	Function
↑ ↓	Use these arrow keys to highlight an option in a menu. (Press the Enter key to choose the option.)
← →	Use these arrow keys to change the value of a setting. In some menus, you can use these keys to move from one field to another.
F10	Press this key to save your changes.
Enter	Press this key to select a highlighted option from a menu.
Esc	After viewing or making changes to the settings on a menu, press this key to exit from the menu.
F1	Press this key if you want help for a selected item in a menu.
+ -	Use the + and - keys to change the value in the Date and Time setting menu.

Note: Not all of the above keys are available on every menu. The available keys in a menu appear on the bottom of that menu.

Viewing system information and product data

To view general hardware information about your computer, select the **System Summary** option from the Configuration/Setup Utility menu. The items displayed in the System Information menu are not configurable.

Setup automatically updates this menu when you do either of the following:

- Add or change hardware on your computer
- Make changes to other menus in Setup and save those changes

To view other computer information such as the model number, serial number, and BIOS version and date, select the **Product Data** option from the Configuration/Setup Utility menu. Like in the System Information menu, the items displayed are not configurable.

Changing parameter settings

In the Setup menus, all configuration information that you can change is enclosed in brackets like these: []. You cannot change any information that is not enclosed in brackets. Use the up- or down-arrow keys to highlight options then press **Enter** to display a menu. When changing the setting of a particular parameter, highlight the setting then use the left- or right-arrow key to change the setting. Refer to the section “Setup parameters” on page 4-9 for details on the configurable parameters in each menu.

Loading the default settings

When you purchase an IBM personal computer, it is already configured for use. The original configuration settings, also called *factory or default settings*, are stored in the CMOS. Setup includes an option, Load Default Settings, that lets you reload the original configuration at any time.

If you have made changes in Setup but would like to restore the default settings, follow these steps:

1. From the Configuration/Setup Utility menu, highlight the option **Load Default Settings** then press **Enter**. A dialog box appears confirming if you want to load the default settings.
2. Type **Y** to select **Yes**, then press **Enter**.
3. Highlight the **Save & Exit** Setup option, then press **Enter**.

A dialog box appears saying “SAVE to CMOS and EXIT (Y/N)?”

4. Type **Y** to select **Yes**, then press **Enter** to save the changes in CMOS.

You must load the Setup default settings in the following instances:

- when you replace the system battery
- when you customize your system configuration settings and some resource assignments conflict causing the computer to stop responding

Canceling changes

You might make changes to the Setup parameter that you do not want to keep.

To cancel the changes that you have made, follow these steps:

1. Return to the Configuration/Setup Utility menu
2. Highlight the **Exit Without Saving** option then press **Enter** and **Y**. Then press **Enter** again.

The Setup program then clears all the changes that you made and resets the parameters to the previous settings. These settings are the settings that were in place when you started Setup.

Exiting Setup

When you have finished viewing the settings and making changes, press **Esc** to return to the Configuration/Setup Utility menu. From this location, you can exit Setup and save your changes or exit without saving your changes.

To exit Setup without saving the changes, follow these steps:

1. From the Configuration/Setup Utility menu, press the **Esc** key.
2. A dialog box appears saying "Quit without Saving (Y/N)?" Type **Y**, and then press **Enter**.

Note: You also can Exit the Setup by highlighting the **Save & Exit Setup** option or **Exit without Saving** option and follow the dialogue box directions.

To exit setup and save the changes, follow these steps:

1. From the Configuration/Setup Utility menu, select **Save and Exit Setup**. Then, press **Enter**.
2. A dialog box appears saying "Save to CMOS and EXIT (Y/N)?" Type **Y**, and then press **Enter**. The computer restarts using the new settings.

Setup parameters

Devices and I/O Ports

Use the options in this menu to configure the devices and I/O ports in this computer.

Mouse

This setting allows you to select whether or not a mouse is installed.

Diskette Drive A

Use this setting to define the type of drive installed as drive A.

None	No floppy drive installed
720K, 3.5 in	3-1/2 inch double-sided drive; 720 kilobyte capacity
1.44M, 3.5 in	3-1/2 inch double-sided drive; 1.44 megabyte capacity

Serial Port Setup

Use these settings to define the I/O port address and interrupt-request number to be used by the serial port.

Parallel Port Setup

Use these settings to define the I/O port address and interrupt-request number to be used by the parallel port. These settings also control the parallel port mode (EPP, ECP, ECP/EPP, or SPP, and the DMA setting for ECP, if used).

USB Setup

Use the settings for in this menu item to enable or disable the Universal Serial Bus (USB) functions.

USB Support

Select enabled if you will be using USB devices.

USB Keyboard/Mouse Support

Select Autodetect if you want this support to be enabled. The USB Support must also be set to enabled before you use USB/Keyboard Mouse Support. Select disabled if you will not be using a USB Keyboard/Mouse.

IDE Drives Setup

Use these settings to view the hard disk and CD-ROM drives that are installed in your computer.

Your computer will show the size and selectable performance of a hard disk when it is installed. To get better performance, run IDE hard disk and CD-ROM drives in High Performance Mode.

Video Setup

Select this menu item to configure the video settings.

Select Active Video

Select the active video mode when the computer is started. If the selected video is not available, the computer will select a default video.

Palette snooping

Select enabled if an ISA video multimedia adapter is installed in your computer and incorrect colors are displayed on the screen and your system has a PCI video adapter installed that supports Palette snooping.

Video Interrupt

Select enabled if you are using an application that requires this support.

Audio support

Use this setting to enable or disable the Audio function if your computer has the audio feature.

Network setup

Use this setting to enable or disable the Network function.

Start Options

The start options are settings that affect the way your computer acts when started.

Startup Sequence

Your computer can be started from several devices, including the hard disk drive, diskette drive, and CD-ROM drive. The startup program looks for these devices in a selected sequence.

Primary startup Sequence

Use this option to view or change the sequence.

Automatic Power On

Select enabled to use the startup sequence if your computer is started using automatic power on function.

Error Startup Sequence

Select Disabled if you want to automatically start Setup when a POST error occurs. Select another option if you want the system to bypass Setup and use a different startup sequence when a POST error occurs. You will still be able to enter setup using the **F1** key or on the POST error menu.

Virus Detection

This setting allows you to determine whether or not you want the virus checker that comes with your system's BIOS to check each time when you turn on your computer. Select enabled to use this function. The BIOS will halt the system and a message will appear to warn that your computer may have a virus.

If necessary, you need to run an anti-virus program to locate and remove the program before any damage is done.

Keyboard Numboard State

This setting determines the default state of the numeric keypad. By default, the system boots up on.

On	The numeric keypad provides numeric functions
Off	The numeric keypad provides cursor functions

Keyboard Speed

This setting determines whether or not the speed at which the keyboard responds when you hold down a key. The default typematic rate is 30 characters per second (Fast rate).

Disketteless Operation

The computer will startup and run without a diskette if you select enabled.

Keyboardless Operation Mode

The computer will startup and run without a keyboard if you select enabled.

Power On Self-Test

This setting allows you to set the level of power on self-test (Quick or Enhanced) that will be done during the power on sequence. If you select Quick, your computer will run a shortened power on self-test (POST) each time you turn on your computer.

Power On Logos

This setting allows you to determine whether or not logos are displayed during the power on sequence.

Network Boot F12 Option

This setting allows you to boot from Network after the system is turned on by pressing F12.

Date and Time

Use this setting to set the date and time of the internal clock in your computer.

Advanced Setup

You can use these features to configure advanced hardware features. Do not attempt to change these settings unless you have an advanced technical knowledge of computer hardware. If these settings are configured incorrectly, the computer might not function correctly.

ROM Shadowing

Video BIOS Shadow

Use this setting to determine whether or not video BIOS will be copied to RAM. Video performance improves when Video BIOS Shadow is enabled

Enabled	Video shadow is enabled
Disabled	Video shadow is disabled

PCI Control

Select enabled if you want your computer to have a PCI parity check of data across the PCI bus.

Plug and Play Control

Use the option to configure settings for Plug and Play devices.

Set Device Code

Most Plug and Play adapters use 16-bit address decoding. If you are experiencing problems with a Plug and Play adapter, changing address to decoding to 10-bit might fix the problem.

Address Decode

Select Yes if you are experiencing Post errors numbered 185X and your system will be booting from a Plug and Play complaint operating system. See your operating documentation if your operating system supports this function.

Plug and Play operation system

When this setting is enabled, the processor serial number is accessible to system and application software. By default, the setting is disabled. If you configure this selection, the machine must be powered off and back on for the change to take effect.

Processor Control

Use this option to set any features that are associated with your system processor.

ISA Legacy Resources

ISA legacy resources (DMA, Interrupts, Memory) are resources that are used by ISA adapters and legacy devices that are not Plug and Play adapters.

Power Management Setup

The Power Management Setup allows you to configure your system to use the most effective method of saving energy, while operating in a manner consistent with your own style of computer use.

ACPI BIOS Mode

Use this setting to enable or disable the Automatic Configuration and Power Interface (ACPI). If your operating system supports ACPI BIOS Mode, it is allowed to control the power management features of your computer when ACPI BIOS Mode is enabled.

APM

This setting allows automatic power saving through monitoring of your computer's hardware.

APM BIOS Mode

Enable this setting to reduce power consumption during periods of hardware inactivity.

Activity Monitor

Use this setting to set up the system activities that you want monitored for automatic power management

Automatic Power On

Use this setting to define automated methods of waking up the computer:

- Wake up when the modem senses an incoming ring
- Wake up at a preset time
- Wake up from PCI devices that support this function.

You can also define the power button override function. You can make the system power off instantly or after the power button is pressed for four seconds.

System Security

Use this setting to configure the system security settings for your computer.

Security Profile by Device

This setting enables you to control which devices require a password before they start up. You can set the below devices to request a password before they start up:

Removable Media Devices

Hard Disk Devices.

Network Devices.

You can select IDE Controller to enable or disable to control access to the hard disk. You can set Diskette Drive Access to enable or disable to control access to the diskette drive. You can also set Diskette write Protect to enable or disable to control writing to your diskette or removable media drives.

Remote Administration

Select enable to allow Remote Administration to be run from a remote system without requiring entry of your administrator password.

Power-on Password

This option allows you to set, change or delete a power-on password.

Administrator Password

This option allows you to set, change or delete an administrator password.

Adapter ROM Password

If Yes, the keyboard will be locked during adapter ROM initiation. this can be used in conjunction with an administrator password to prevent the use of adapter ROM based on utilities.

Refer to "System Security" on page 4-15 for details on setting a system password and setup password.

Using other configuration utilities

You can use Setup to view or change configuration settings for most of your factory-installed hardware. If you install new hardware, however, you might need to use other configuration utilities.

When you purchase new hardware to install in your computer, a configuration utility or new drivers may come with the new hardware. See the documentation that comes with the new hardware for instructions.

Chapter 5. Preparing to upgrade

To upgrade your computer's hardware, you can add or replace cards, drives, or some system board components. If you take the time to evaluate your new hardware and plan your hardware changes, you can reduce the effort required to make the changes.

For instance, the type of hardware you plan to add or replace determines whether you begin with your computer turned on or off.

As you prepare to add or replace hardware in your system unit, follow the instructions in these sections:

- "Evaluating your new hardware" on page 5-2
- "Planning your hardware changes" on page 5-3
- "Resolving resource conflicts" on page 5-4
- "Opening the system unit" on page 5-5
- "Looking inside the system unit for desktop model" on page 5-9
- "Looking inside the system unit for microtower model" on page 5-11

Evaluating your new hardware

The documentation that came with your new hardware should contain information about required settings and the instructions on how to install the hardware. Study the documentation carefully.

If the documentation refers you to information about your computer's I/O addresses, system interrupt requests (IRQs), or DMA channel assignments, see "Appendix A. Specification tables" on page A-1.

For conflicts with system resources used by adapter cards

If you install new hardware in your system, it might attempt to use a system resource that is already assigned.

If you install a PCI adapter card, the system BIOS automatically detects it, assigns an available system resource to it, and configures your computer to use the card.

Follow the procedure in the section "Resolving resource conflicts" on page 5-4.

For conflicts with other system resources

If you install hardware that creates conflicts with other system resources, you may receive an error message the first time you turn on your computer after you have installed the new hardware. If you receive an error message, use the Windows Device Manager to reassign system resources. See the section "Using the Windows Device Manager" on page 5-4 for instructions.

Refer also to "Appendix A. Specification tables" on page A-1.

Planning your hardware changes

You should understand how your new hardware will work with your existing hardware before you unplug your system unit, pull the cover off, and start removing or adding hardware. You should also record your changes as you work.

Make sure that you have read the preceding section “Evaluating your new hardware” on page 5-2 before you proceed.

Recording your changes

When you add or replace hardware, you should record the changes you make. The information you need to record as you work includes, but is not limited to:

- Changes to jumper positions
- Connection of drive and adapter card cables to the system board
- Changes to CMOS settings in Setup
- Changes to settings in other online configuration utilities, such as the Windows Device Manager or a configuration utility that might come with your new hardware.

Resolving resource conflicts

Using Setup

Your computer's Basic Input/Output System (BIOS) automatically detects most hardware changes and then updates the related CMOS configuration settings in Setup. In cases when the CMOS settings are not automatically updated, you receive a message reminding you to manually update the settings.

To resolve resource conflicts between system devices in Setup, follow these steps:

1. Enter Setup. See "Entering Setup" on page 4-4 for instructions.
2. From the Configuration/Setup Utility menu, select **PnP/PCI Option**.
3. Highlight the **Reset configuration Data** parameter and set it to **Enabled** to clear the resource assignments of all installed cards.

After the above steps, proceed to the next section on how to use the Windows Device Manager to assign system resources to your hardware devices.

Using the Windows Device Manager

Use the Windows Device Manager to verify system device settings or to resolve system resource conflicts, such as those that might occur with Interrupt Requests (IRQ) and Direct Memory Access (DMA) resources.

Follow these steps to start the Device Manager and change device settings:

1. From the Windows desktop, double-click on the **My Computer** icon.
2. In the My Computer window, double-click on the **Control Panel** icon.
3. In the Control Panel window, double-click on the **System** icon.
4. In the System Properties window, click on the **Device Manager** tab.
5. Select a device item, then click on the **Properties** button. A display box appears showing the properties of the device.
6. Make the necessary changes in the settings that will not conflict with other devices.
7. Click on **OK**.

Opening the system unit

Each time you open your system unit, you must follow specific safety procedures to ensure that you do not damage your computer.

Taking safety precautions

Before you open the system unit, review "Safety information" on page viii.

For your safety and the safety of your equipment, follow these steps before you remove the system unit cover:

1. If your computer is on or in any of the power-saving modes, shut down the computer.
2. Turn off the computer and any attached devices that have their own power switches.
3. Unplug all power cables from electrical outlets.
4. Disconnect all communication cables (such as modem or network cables) from communication outlets.
5. Disconnect all cables and cords from the computer; this includes power cords, signal cables from external devices, communication cables, and any other cables attached to the computer.
6. Proceed to the next section for instructions on removing the cover.

Removing the top cover for desktop model

Follow these steps to remove the system unit top cover:

1. Remove the screw that secures the top cover at the back of the system unit.



2. Hold both sides of the system unit top cover and push it forward about 0.25 inch. Lift the top cover up to remove it completely.
3. Touch the bare metal frame of your system unit to dissipate the static electricity from your body. Do not touch any of the components inside the frame before you touch the frame. Do not touch any of the components that have a voltage warning label.

Removing the top cover for microtower model

Follow these steps to remove the system unit top cover:

Note: See "Taking safety precautions" on page 5-5 to disconnect the cables before you perform the following steps.

1. Remove the three screws that secure the top cover at the back of the system unit.



2. Hold both sides of the system unit cover and push it backward about 25 mm (1 in.). Lift the top cover up to remove it completely.

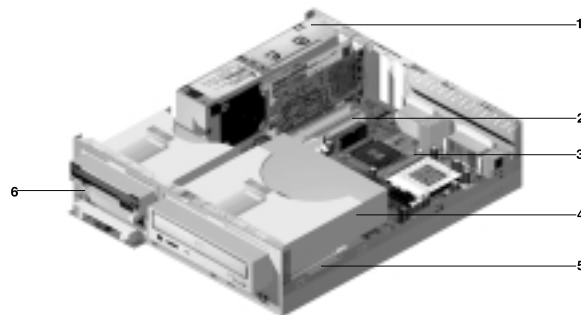


3. Touch the bare metal frame of your system unit to dissipate the static electricity from your body. Do not touch any of the components inside the frame before you touch the frame. Do not touch any of the components that have a voltage warning label.

Looking inside the system unit for desktop model

After you remove the system unit top, the system unit looks like the following figure.

Note: See the next page for a description of the hardware components inside the system unit.



Your computer has three bays. One bay is for 5.25-inch drive and two bays are for 3.5-inch drives.

Diskette drives use the standard diskette Advanced Technology (AT) interface. Hard disks use an Integrated Drive Electronics (IDE) AT interface. Your computer supports the American National Standards Institute (ANSI) standard for AT attachment disk drives.

Your computer has adapter card slots for installation of additional expansion cards. You can install Peripheral Component Interconnect (PCI) adapter cards into the system.

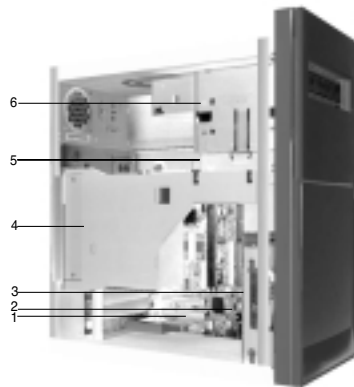
The components inside your system unit are depicted in a graphic in the previous figure. The following list describes each hardware component:

- 1** **Switching power supply.** The system comes with a switching power supply.
- 2** **Expansion slots.** On the system boards are three expansion slots for installation of the adapter cards that conform to Peripheral Component Interconnect (PCI) specifications. These cards are commonly referred to as PCI adapter cards (only the low-profile PCI cards will fit).
- 3** **System board.**
- 4** **Bay 3.** This drive can accommodate a 5.25-inch half-high drive such as a hard disk, tape, or CD-ROM. In many models, this bay holds a factory-installed CD-ROM drive or DVD-ROM drive.
- 5** **Bay 2.** This drive can accommodate a 3.5-inch device. In many models, this bay holds a factory-installed hard disk drive.
- 6** **Bay 1.** This drive bay can accommodate a 3.5-inch slim IDE hard disk. In many models, this bay holds a factory-installed diskette drive.

Looking inside the system unit for microtower model

After you remove the system unit top, the system unit looks like the following figure.

Note: See the next page for a description of the hardware components inside the system unit.



Your computer has four bays that can hold up to two 5.25-inch drives and two 3.5-inch drives.

Diskette drives use the standard diskette Advanced Technology (AT) interface. Hard disks use an Integrated Drive Electronics (IDE) AT interface. Your computer supports the American National Standards Institute (ANSI) standard for AT attachment disk drives.

Your computer has adapter card slots for installation of additional expansion cards. You can install Peripheral Component Interconnect (PCI) adapter cards into the system.

The components inside your system unit are depicted in a graphic in the previous figure. The following list describes each hardware component:

- 1** **Expansion slots.** There are three expansion slots on the system board for the installation of adapter cards that conform to Peripheral Component Interconnect (PCI) specifications. These cards are commonly referred to as PCI adapter cards.
- 2** **System board.**
- 3** **Bay 3.** This drive bay can accommodate a 3.5-inch slim IDE hard disk. In many models, this bay holds a factory-installed hard disk drive.
- 4** **Switching power supply.** The system comes with a switching power supply
- 5** **Bay 2.** This drive bay can accommodate a 5.25-inch device, such as a 5.25-inch diskette drive, CD-ROM drive, or DVD-ROM drive. You can also install a 3.5-inch to 5.25-inch installation kit.
- 6** **Bay 1.** This drive bay can accommodate a 5.25-inch half-high drive such as a diskette, hard disk, tape, or CD-ROM. In many models, this bay holds a factory-installed CD-ROM drive.

Chapter 6. Adding and removing adapter cards and drives

Before you begin working with the hardware inside your system unit, read the following sections:

- “Evaluating your new hardware” on page 5-2

This section contains the information you need to understand about potential system resource conflicts. Your new hardware might attempt to use a resource that is already assigned to other hardware.

- “Planning your hardware changes” on page 5-3

This section contains important information about planning for hardware changes and recording changed hardware settings. You can avoid repeated steps if you follow the recommendations in this section.

- “Resolving resource conflicts” on page 5-4

This section will help you prevent potential system resource conflicts when you install additional adapter cards or drives.

Resolving conflicts with installed adapter cards

If you purchased a computer with an installed modem card, this section can help you resolve some potential conflicts between your new hardware and the modem card.

If after installing a new hardware option, the modem or new hardware option does not work, use the Windows Device Manager to compare the resources used by the installed modem card and the new hardware option. If both devices attempt to use the same resource, refer to the new hardware's documentation to change the resource used by the new hardware.

If the resource for the new hardware cannot be changed, change the resource for the modem card in the Device Manager.

Setting modem card configurations

If your computer is equipped with a modem, follow these steps to view the interrupt request resources or change the I/O addresses and memory range for the installed modem card.

1. Right click on the My Computer icon and select **Properties**.
2. In the System Properties window, click on the **Device Manager** tab.
3. Click on **View devices by type**.
4. Do one of the following:
 - To change or view the I/O addresses or view the interrupt request assignment, double-click on the modem list item to expand the list. Then, continue with step 5.
 - To change or view the memory addresses or view the interrupt request assignment, double-click on the HCFMODEM list item to expand the list. Then, continue with step 5.
5. Double-click on the **Modem** item appearing in the expanded list.
6. In the Modem **Properties** window, click on the **Resources** tab.

If you need help in using the Device Manager, press the **F1** key to view the online help.

You must restart your computer before any Device Manager changes can take effect.

Working with the hardware in the system unit

If you have not removed the cover from your system unit, review “Safety information” on page viii, and then see “Opening the system unit” on page 5-5.

If you plan to add both an adapter card and a drive, install or replace the drive before you install or replace the adapter card. If you also plan to make hardware changes on the system board, see Chapter 7 and finish your work with the system board before continuing to work with the drives and adapter cards.

To add or remove adapter cards or drives in the system unit, complete the instructions in the following sections:

- “Adding and removing adapter cards for desktop model” on page 6-4
- “Adding and removing adapter cards for microtower model” on page 6-6
- “Removing and adding drives” on page 6-7

Adding and removing adapter cards for desktop model

The system board includes three PCI adapter card connectors (only the low-profile PCI cards will fit).

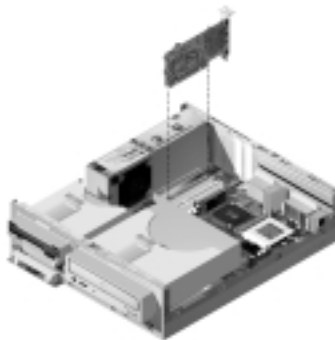
Note: Make sure that you have followed the proper procedure in "Opening the system unit" on page 5-5. This ensures that you discharge the static electricity that you may have accumulated.

Installing adapter cards

Your computer provides expansion slots for PCI adapter cards only.

Follow these steps to install an adapter card:

1. Align and insert the adapter card into the adapter card connector.
2. Secure the card with the screw to the system chassis
3. If your card has cables, connect the cable or cables from the adapter card to the correct connection on the system board or CD-ROM drive.



4. Reinstall all hardware that you removed prior to the installation of the adapter card.

If you disconnected any cables to gain access to the adapter card connector on the system board, reconnect the cables.

Adding and removing adapter cards for microtower model

The system board includes three PCI adapter card connectors.

Note: Make sure that you have followed the proper procedure in "Opening the system unit" on page 5-5. This ensures that you discharge the static electricity that you may have accumulated.

Installing adapter cards

Your computer provides expansion slots for PCI adapter cards only.

Follow these steps to install an adapter card:

1. Align and insert the adapter card into the adapter card connector.
2. Secure the card with the screw to the system chassis.



3. If your card has cables, connect the cable or cables from the adapter card to the correct connection on the system board or CD-ROM drive.
4. Reinstall all hardware and screws that you removed prior to the installation of the adapter card.

If you disconnected any cables to gain access to the adapter card connector on the system board, reconnect the cables.

Removing and adding drives

Your computer has four drive bays to accommodate various types of drives.

See the section “Looking inside the system unit for desktop model” on page 5-9 and “Looking inside the system unit for microtower model” on page 5-11 for the location and description of the drive bays.

Identifying signal cable connectors

When you install a drive of any type, you must attach the signal cable (also called the data cable) from the drive to a connector on the system board. The following table identifies each connector on the system and the type of drive that uses the connection. Note that the first two connectors are for IDE/ATA ATAPI drives (such as hard disk drives and CD-ROM drives), while the third connector is for diskette interface drives (such as diskette drives or tape drives).

The following illustration identifies the signal cable connectors on your system board:

System board connector	Interface type	Type of drive using the connector
Primary IDE	IDE/ATA ATAPI	Preferred location for the hard disk drives.
Secondary IDE	IDE/ATA ATAPI	Preferred location for a CD-ROM drive.
FDD	Standard diskette	Diskette and tape drives

When attaching a drive signal cable to any of these connectors, take note of the pin 1 indicator (usually marked by coloured stripes or dots) on the edge of the cable to ensure it aligns with pin 1 on the connector.

In your computer, the IDE and diskette connectors on the system board and cables have guides that allow the cable to be inserted one way only.

Guidelines for connecting IDE/ATA signal cables

Your system board has two connectors for attaching IDE/ATA signal cables. You can install two IDE/ATA drives to each of these connectors, if you have the proper cables. When two drives are attached to one connector, one drive must be the master device, and the other the slave device. Jumper settings on the drives determine which drive is the master and which is the slave.

The hard disk that came installed in your computer is attached to IDE connector 1 and is set as a master device. If your computer came with a CD-ROM drive, it is attached to IDE connector 2 and is set as a master device.

These are the general guidelines for IDE/ATA signal cable connections:

- If only one drive is attached to a connector, it must be set as a master device.
- On each connector, there can be only one drive set as the master device and one drive set as the slave device.
- If a hard disk shares the same connector with a drive that requires a software device driver (such as a CD-ROM drive), the hard disk must be set as the master device and the CD-ROM must be set as the slave device.

If you are installing a second drive to the primary IDE connector, follow these guidelines:

1. Set the new drive as the slave device. See the instructions that were provided with the new drive.
2. Install the new drive and connect the new drive to the spare connector on the cable attached to the primary IDE connector. If you are installing a second drive to the secondary IDE connector, follow these guidelines:
 1. Replace the IDE signal cable attached to the secondary IDE connector with an IDE cable that has two drive connectors.
 2. Set the jumper on the new drive to master or slave, depending on the following conditions:
 - If the factory-installed drive is a CD-ROM drive (or any drive type other than a hard disk drive), and the drive you are installing is a hard disk drive, set the new drive as the master device. Then, set the factory-installed drive as a slave device. Jumpers for setting drives as master or slave devices are typically located at the back of the drive.
 - If the factory-installed drive is a hard disk drive, set the new drive as a slave drive.
 3. Install the new drive.

Guidelines for connecting diskette interface signal cables

Your system board has one connector for attaching diskette interface signal cables, but you can install two diskette interface drives to this connector if you have the proper cables.

If you are installing a second diskette drive or a tape drive, follow these guidelines:

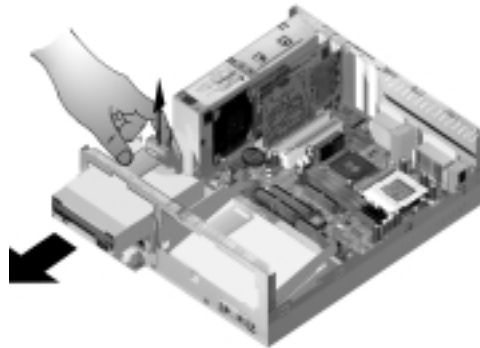
1. Replace the diskette-drive signal cable attached to the diskette drive connector with a diskette-drive signal cable that has two connectors. Remember to reconnect the factory-installed drive to the new cable.
2. Do not change any settings on the factory-installed diskette drive.
3. Install the new drive.
4. After completing the installation of the drive, start the Setup utility and verify that the drive parameter settings in the Devices and I/O Ports menu are correct. See "BIOS Setup configuration" on page 4-1 for details.

When you have finished installing the diskette drive, enter Setup to make sure that the drive parameter setting is correct. See "Loading the default settings" on page 4-7.

Removing the diskette drive for desktop model

If you want to replace or remove the diskette drive, do the following:

1. Disconnect the power and signal cables from the rear of the diskette drive.
2. Pull up the latch that secures the drive mounting tray.



3. Slide the drive mounting tray toward from the front of the computer and remove it.
4. Remove the four screws (two on each side) that secure the mounting tray.
5. Pull the diskette drive from the mounting tray to remove it.
6. Reverse the procedure to install a new drive.

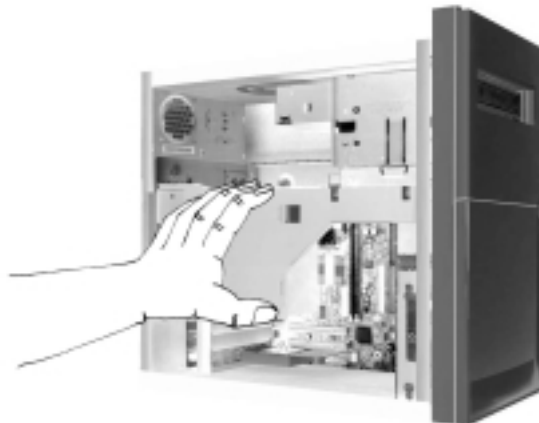
Removing the diskette drive for microtower model

If you want to replace the diskette drive, you must follow these steps:

1. On the back of the system, remove the screw that secures the power supply.



2. Pull the latch on the drive mounting tray and the power supply upward to remove it completely.



3. Disconnect the power and signal cables from the back of the diskette drive.
4. Remove the two screws that hold the diskette drive to the mounting tray.

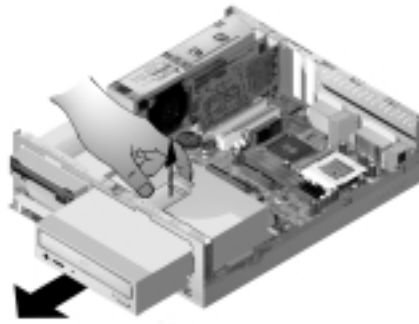


5. Open the door on the front of the computer.
6. Pull the diskette drive toward the front of the computer to remove it.
7. Reverse the procedure to install a new drive.

Removing the CD-ROM drive for desktop model

To replace the CD-ROM, do as follows:

1. Disconnect the power, sound and signal cables from the CD-ROM.
2. Pull up the latch that secures the CD-ROM drive mounting tray.



3. Slide the CD-ROM drive mounting tray to the front of the computer and remove the tray.
4. To remove the CD-ROM drive from the mounting tray, remove the four screws that secure it to the tray.
5. Reverse the procedure to install a new drive.

Removing the CD-ROM drive for microtower model

To replace the CD-ROM:

1. Disconnect the power, sound and signal cables from the CD-ROM.
2. Remove the screws that secure the CD-ROM drive.
3. Open the door on the front of the computer.

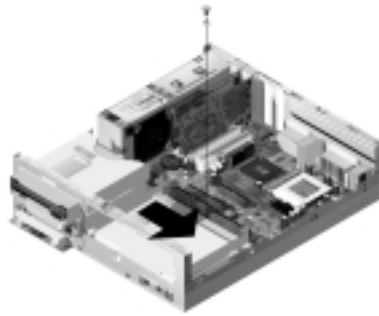


4. Slide the CD-ROM drive forward through the front opening and remove it.
5. Reverse the procedure to install a new drive.

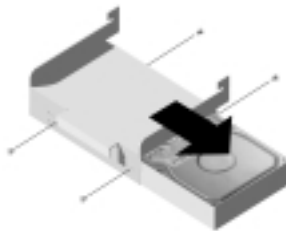
Removing the hard disk drive for desktop model

To replace or remove the hard disk drive, follow these steps:

1. Follow the above steps to remove the CD-ROM.
2. Make sure to disconnect the power cord and signal cables from the hard disk drive and the diskette drive.
3. Remove the screw that secures the mounting tray holding the hard disk drive
4. Push the mounting tray to the right to separate it from the chassis, then lift the tray out of chassis.



5. To remove the hard disk drive from the mounting tray, remove the four screws securing it to the tray.



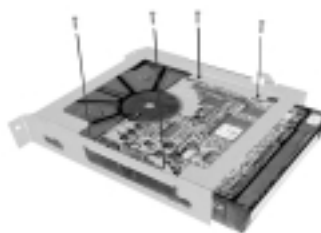
Removing the hard disk drive for microtower model

To replace or remove the hard disk drive, do the following:

1. Disconnect the power and signal cables from the diskette drive.
2. Lay the computer on the side to access the screws on the bottom. Remove the two screws that secure the mounting tray at the bottom of the system unit.



3. Pull the drive mounting tray upward and remove it.
4. Remove the four screws (two on each side) that secure the hard disk drive to the mounting tray.



5. Pull the hard disk drive from the mounting tray to remove it.
6. Reverse the procedure to install a drive.

Updating the CMOS settings in Setup

When you add PCI adapter cards, memory, and IDE drives, your system's Basic Input/Output System (BIOS) detects the hardware changes and updates the CMOS settings automatically.

When you add other types of devices, such as a diskette drive, you have to enter Setup to manually assign resources (IRQs) to the devices.

For adapter cards

PCI adapter cards do not have jumpers and switches; and therefore, do not require any configuration prior to installation. After the adapter card is installed, it is recognized by the system and, in a vast majority of cases, automatically configured. You can use the Windows Device Manager to view the assigned resources and change the resource settings, if needed.

Although rare, there are some unique circumstances when you must use Setup to resolve a conflict. See "BIOS Setup configuration" on page 4-1 for details.

For Drives

When you install a diskette drive, you should check the size and storage capacity of the drive and make any required changes in Setup. To specify the diskette drive size and capacity, select **Devices and I/O Ports** option in the Configuration/Setup Utility menu. See "Diskette Drive A" on page 4-9 for information about this option.

If you remove a diskette drive, hard disk drive, or CD-ROM drive, the POST generates an error message. In Setup, verify that the information the BIOS automatically recorded is correct. Use this opportunity to verify that the remaining drives are installed as intended.

Select **Devices and I/O Ports** option in the Configuration/Setup Utility menu to verify drive settings.

Normally, BIOS will auto-detect the HDD and CD-ROM drive at the POST stage and show them on the screen.

Chapter 7. Adding and replacing system board components

To work with the hardware components on the system board, you must first unplug the system and remove the system unit cover. Before removing the cover or working with internal components, review “Safety information” on page viii. If you have not removed the cover from your system unit, see “Opening the system unit” on page 5-5.

To access the section of the system board that you need to work with, you may have to remove adapter cards and drives. With the system board exposed, you can work with the connectors, system memory modules, and the system battery.

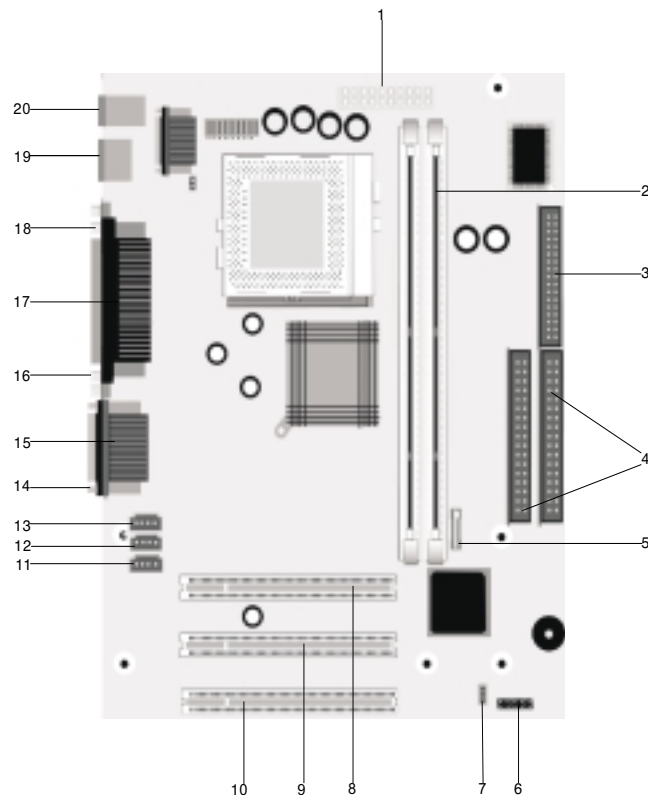
Once you have completed your hardware changes and put the cover back on your system unit, you might need to enter the BIOS Configuration/Setup Utility to update the settings. The system board varies with the type. Please comprehend the type before you want to identify the parts and connector of the system board.

The following sections contain instructions for working with the hardware components on your system board:

- “Identifying system board parts” on page 7-2
- “PCI Card connector and jumper information” on page 7-4
- “Upgrading the system memory” on page 7-5
- “Replacing the system battery” on page 7-7
- “Updating the CMOS settings in Setup” on page 7-9

Identifying system board parts

If you plan to add or replace hardware in your computer, you need to know the layout of the system board. The items on the next page correspond to the numbered locations on the figure.



The system board, sometimes called the planar or motherboard, is the main circuit board in the system unit. It supports a variety of devices and provides other basic computer functions that are preinstalled or that you can install later. The system board shown on the previous page has the following parts:

- 1** **Power connector.**
- 2** **Memory module sockets (for DIMMs).** Your system board has two 168-pin sockets for Dual Inline Memory Modules (DIMMs). The DIMM sockets support 3.3V single-or double-sided Synchronous DRAM (SDRAM). The maximum system memory is 256MB (64 megabit technology) or 512MB (128 megabit technology) SDRAM.
- 3** **Floppy Disk connector.**
- 4** **Hard Disk Connector (IDE1 & IDE2).**
- 5** **Battery.**
- 6** **Case connector.** Power Switch, Power LED, Speaker and HDD LED are all connected to this connector block.
- 7** **Clear CMOS jumper.**
- 8** **PCI adapter card connector.** This is the first PCI adapter card connector.
- 9** **PCI adapter card connector.** This is the second PCI adapter card connector.
- 10** **PCI adapter card connector.** This is the third PCI adapter card connector.
- 11** **Modem-In connector.**
- 12** **Aux Line In connector.**
- 13** **CD-In connector.**
- 14** **Audio Port connector.**
- 15** **Serial Port connector 1.**
- 16** **VGA Port Connector.**
- 17** **Parallel Port Connector.**
- 18** **Serial Port connector 2 (Optional).**
- 19** **Universal Serial Bus Port.**
- 20** **Mouse and Keyboard connector.**

PCI Card connector and jumper information

Identifying adapter card connectors

You can install low-profile PCI adapter cards into the card connectors on the system board. Use the following table to help you determine the type and length of adapter cards that you can install in the card connectors.

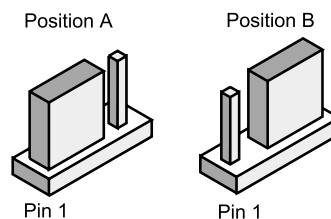
Adapter card connector	Type of adapter card you can install
PCI Slot 1	PCI adapter card measuring 169 mm in length (or less)
PCI Slot 2	PCI adapter card measuring 169 mm in length (or less)
PCI Slot 3	PCI adapter card measuring 120 mm in length (or less)

Refer to the section “Adding and removing adapter cards for desktop model” on page 6-4 and “Adding and removing adapter cards for microtower model” on page 6-6 for instructions on adding or removing cards.

Setting a jumper

When you install an adapter card, you may have to set switches or move jumpers to make the card work properly. Plug and Play cards normally require no changes, but other cards might. Refer to the documentation that came with the new hardware to determine if changes to jumper or switch settings are required.

The following figures show how to set a jumper. Position A shows closing pins 1-2 while position B shows closing pins 2-3. Pin 1 of a jumper is usually marked by a solid white line beside the pin.



Upgrading the system memory

Your system board has two system memory module sockets: DIMM 0, and DIMM 1. These sockets hold Dual Inline Memory Modules (DIMMs) that contain 3.3V single- or double-sided synchronous DRAM (SDRAM). You can install up to a maximum of 256 MB of system memory into these sockets. For information about supported memory configurations, see "Memory module placement" on page A-1.

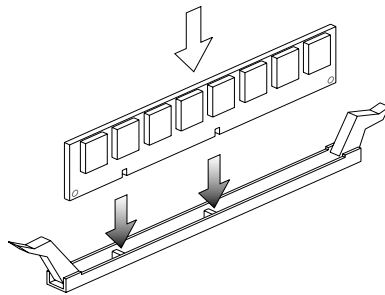
Installing memory modules

To install a DIMM:

1. Locate the memory retaining clips at both ends of the socket. Pivot the memory retaining clips outward.
2. Locate the two notches on the DIMM and the two tabs on the socket. Align the DIMM with the socket. Make sure the notches and tabs align.
3. Press the DIMM into the socket until the clips lock into the DIMM.

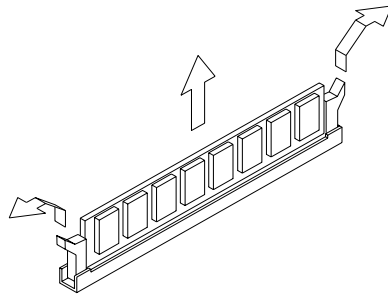
Note:

The DIMM socket is slotted to ensure proper installation. If you insert a DIMM but it does not fit easily into the socket, you may have inserted it incorrectly. Turn the DIMM around and try to insert it again.



Removing memory modules

To remove a DIMM, pivot the retaining clips on both sides of the socket outward to release the DIMM.



Verifying the system memory

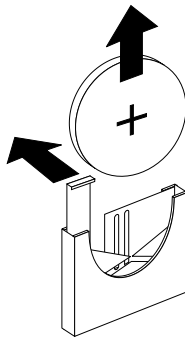
To view the system memory settings in Setup, select **System Summary** from the Configuration/Setup Utility menu.

Replacing the system battery

Follow these steps to replace the battery:

Note: Before replacing the lithium battery review the lithium battery notice on “Lithium battery notice” on page xi.

1. Note the orientation of the battery in the bracket.
2. Press outward on the metal latch and lift the battery out.



3. Insert a new 3V lithium battery (CR2032) into the bracket and press it down until the securing clip clicks and locks the battery in if you replace the system battery, you need to reset the system date and time in Setup.

Important: Make sure you insert the battery with the positive side on top. A plus (+) sign indicates the positive side.

Follow these steps:

1. Enter Setup. See "Entering Setup" on page 4-4.
2. From the Configuration/Setup Utility menu, select "**Standard CMOS Setup**".
3. Set the date and the time.
4. Exit Setup and save the change.
5. Use the left arrow key to select **Yes**, then press **Enter** to save the settings in CMOS.

You can also change the time and date from the Windows desktop.

1. Double-click on the **My Computer** icon.
2. Double-click on the **Control Panel** icon.
3. From the Control Panel, double-click on the **Date/Time** icon to display the items for changing the date and time.
4. Make the necessary changes then click on the **OK** button.

Updating the CMOS settings in Setup

When you add system board components, such as system memory modules, your system's Basic Input/Output System (BIOS) detects the hardware changes and updates the CMOS settings automatically. However, if you replace or remove components, you might receive a message that asks you to verify if the automatic detection changed the configuration correctly.

To verify or correct the system configuration settings, enter Setup. See the section "Entering Setup" on page 4-4.

Chapter 8. Diagnosing and recovering from problems

This chapter can help you if your computer stops operating or displays error messages. It covers the following major topics:

- “Before you panic: some simple fixes” on page 8-2

This section lists some common problems that you might encounter while operating your computer.

- “Quick problem solving chart” on page 8-6

This flow chart will help you diagnose system problems that you may have with your computer.

- “Solving hardware and software problems” on page 8-7

The tables in this section list some common hardware and software problems. It includes corrective actions for each problem.

- “Error codes and messages” on page 8-17

This section lists the BIOS error codes and messages and their respective corrective actions.

- “IBM Diagnostic Programs” on page 8-20

This section tells you how to recover your computer if your computer is damaged.

Before you panic: some simple fixes

Step 1 Are the power indicator lights on the system unit and monitor lit?

Yes

Power is reaching the system unit and monitor. Go to Step 2.

No

- a. Press the power button on the system unit and monitor to make sure they are turned on.
 - b. Make sure your system unit and monitor cables are correctly and securely connected. Make sure the system unit and monitor power cords are plugged into electrical outlets.
 - c. Make sure the electrical outlets you are using are not controlled by a wall or dimmer switch.
 - d. If you are using a multiple outlet device (for example, a power surge protector or power strip), make sure it is plugged in and turned on.
- If the problem continues, refer to the "Quick problem solving chart" on page 8-6.

Step 2 Did the system unit beep after it was turned on?

<p>Yes, more than once</p>	<p>There is a problem with the system unit. Find the error code or message in the section “Error codes and messages” on page 8-17 and take the action listed.</p> <p>Note: If the beep is a single long beep followed by two short beeps, a video error has occurred and the BIOS cannot initialize the video screen to display additional information.</p> <p>If the beep is a repeating single long beep, there’s a problem with the dynamic random access memory (DRAM).</p>
<p>No</p>	<ul style="list-style-type: none">– If you just added hardware and the computer will not start, you might have a hardware problem. Remove the new hardware and restart the computer to see if the problem is corrected. If the problem is corrected, you might have installed the new hardware incorrectly. Reinstall your hardware. <p>For instructions on installing hardware in the system unit, see “Working with the hardware in the system unit” on page 6-3. For instructions on installing options on the system board, see “Adding and replacing system board components” on page 7-1. If you did not just install new hardware or the computer appears to start normally, go to Step 3.</p>

Step 3



Is anything displayed on the monitor?

Yes

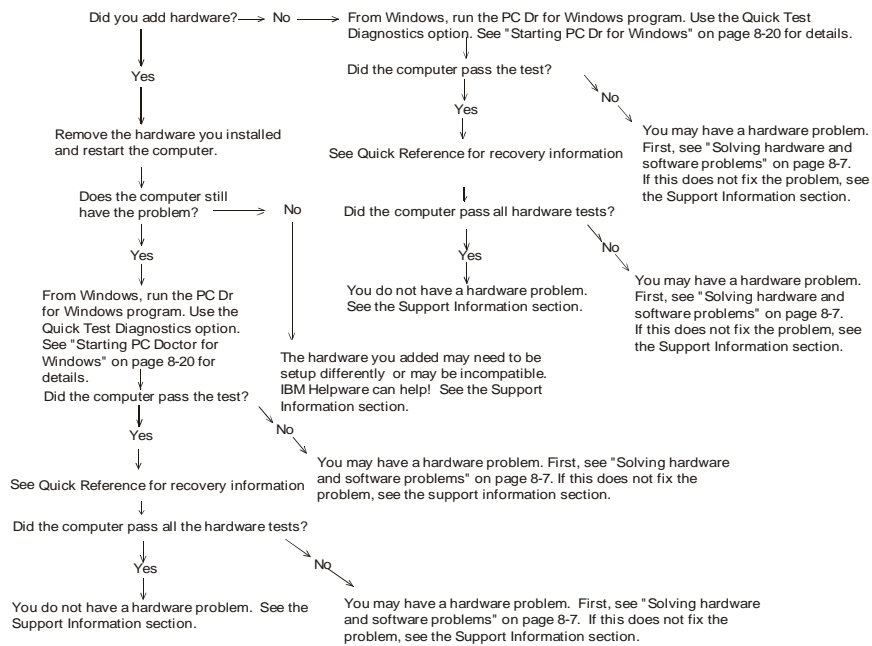
There may be a problem with the system unit if:

- An error message appears. Find the error message in the section “Error codes and messages” on page 8-17 and take the action listed.
- A box containing an error code and message appears. Follow the instructions in the message. For instructions on using Setup, see “Entering Setup” on page 4-4.
- The image on the screen is unreadable (the image is scrolling, blinking, or flashing).
 1. The monitor you attached may not be an SVGA monitor or you may have selected a monitor setting that your monitor does not support. Follow these steps to reconfigure your monitor:
 - a. Restart the computer. If necessary, turn the system unit off, pause for 15 seconds, and then turn the system unit back on.
 - b. When you see “Starting Windows” appear on the screen during startup, press **F8**. This opens the Microsoft Windows Startup Menu.
 - c. Select Choice 3 for Safe Mode and press **Enter**. This starts your computer using the factory configuration settings.
 - d. When your computer has completed startup, double-click on the **My Computer** desktop icon.
 - e. In the My Computer window, double-click on the **Control Panel** icon.
 - f. In the Control Panel window, double-click on the **Display** icon.
 - g. In the Display Properties window, click on the **Settings** tab.
 - h. See “Customizing display properties” on page 2-3 for instructions on selecting new monitor settings. If using a VGA monitor, select 640 x 480 pixels in the Screen area and 16 colors in the palette.
 - i. Restart the computer. Your computer may take a little longer than usual to restart.
 2. If the monitor you attached is a VGA monitor and not an SVGA monitor (older monitors may be VGA), detach the VGA monitor and attach an SVGA monitor. Using an SVGA monitor allows your computer system to take full advantage of Windows video function.

Step 3 Is anything displayed on the monitor? (Continued)

	<ul style="list-style-type: none">• The colors displayed are wrong. Make sure the monitor cable is correctly and securely connected to the system unit. If the problem continues, refer to “Solving hardware and software problems” on page 8-7 and take the action listed.• Nothing happens when you use the mouse or keyboard.<ul style="list-style-type: none">a. Make sure the keyboard and mouse cables are correctly and securely connected to the ports on the back of the system unit. The keyboard port has this symbol next to it:  The mouse port has this symbol next to it: b. Turn the system unit off, and then turn it on again. If the problem continues, refer to the “Quick problem solving chart” on page 8-6.
<div style="border: 1px solid black; padding: 2px; display: inline-block;">No</div>	<p>There may be a problem with the monitor.</p> <ul style="list-style-type: none">a. Make sure your monitor cables are correctly and securely connected.b. Adjust the brightness and contrast controls. For more information, refer to the documentation that came with your monitor. <p>If the problem continues, refer to the “Quick problem solving chart” on page 8-6.</p>

Quick problem solving chart



Solving hardware and software problems

Solving hardware problems

Table 1: Hardware problems

If the problem is:	Here's what to do:
Screen is black (no error code); beep during power on self-test (POST).	If you installed memory modules or adapter cards, make sure you installed them correctly. For instructions on installing memory modules on your system board, see "Installing memory modules" on page 7-5. For instructions on installing adapter cards in your system unit, see "Adding and removing adapter cards for desktop model" on page 6-4 and "Adding and removing adapter cards for microtower model" on page 6-6.
Error code (and description), more than one beep in self-test, or continuous beep occurs	If an error code or message appears, refer to the section "Error codes and messages" on page 8-17.
Computer turns off without warning	<ol style="list-style-type: none">1. If mouse movement wakes the monitor, your monitor was in standby.2. If computer power on light is blinking, your system is in Standby mode. Press the power on button to take the system out of Standby mode.3. Make sure that the system unit and monitor power cords are securely plugged into electrical outlets.4. Make sure that the cables are correctly and securely connected to the system unit.5. Check for a blown fuse, tripped circuit breaker, or power failure.6. Unplug the system unit power cord from the electrical outlet, wait 10 seconds, and then plug the power cord back into the electrical outlet. If the computer does not start immediately, push the power button on the system unit.7. If you have added hardware inside the system unit, make sure the power cable connectors are securely attached.

Table 1: Hardware problems (Continued)


If the problem is:	Here's what to do:
Can't enter password	<ol style="list-style-type: none"> 1. Make sure you are typing the correct password. 2. Make sure the keyboard cable is correctly and securely connected to the keyboard port (not the mouse port) on the back of the system unit. <p>The keyboard port has this symbol next to it:  .</p>
Can't read information on diskette or CD	<ol style="list-style-type: none"> 1. Make sure you are using the correct type of diskette. Make sure the diskette is formatted correctly. 2. Make sure the diskette or CD is inserted into the drive correctly. 3. Make sure the CD is clean and not scratched. 4. Try to read a diskette or CD that you know is good. If it works, the first diskette or CD is damaged. If you can't read the information on the good diskette or CD, there may be a problem with your diskette or CD-ROM drive. 5. Make sure the drive power and signal cables are securely attached to the back of the drive. For instructions on working in the system unit, see "Working with the hardware in the system unit" on page 6-3.
Audio CD does not play when inserted into CD-ROM drive	<p>Make sure you have enabled AutoPlay. To enable AutoPlay:</p> <ol style="list-style-type: none"> 1. Click on Start. 2. Select Settings and click on Control Panel. 3. Double click on the System icon. 4. Click on the Device Manager tab. 5. Double click on CD-ROM and select the listed CD-ROM option. 6. Click on the Settings tab. 7. Under Options, click on Auto insert notification (a check appears in the box). 8. Click on OK.

Table 1: Hardware problems (Continued)


If the problem is:	Here's what to do:
Can't write to diskette	<ol style="list-style-type: none"> 1. Make sure you are using the correct type of diskette. Make sure that the diskette is correctly formatted. 2. Make sure the diskette is not write-protected. 3. Make sure you are sending information to the correct drive. 4. Make sure there is space on the diskette for the information. (Try using a blank, formatted diskette.) 5. Make sure the drive power and signal cables are securely attached to the back of the drive. For instructions on working in the system unit, see "Working with the hardware in the system unit" on page 6-3. 6. Make sure that the Diskette Drive parameter is enabled in Setup under Advanced Options, Security Options.
Can't format diskette	<ol style="list-style-type: none"> 1. Make sure the diskette is not write-protected. 2. Make sure you are using the correct type of diskette. 3. Make sure the drive power and signal cables are securely attached to the back of the drive. For instructions on working in the system unit, see "Working with the hardware in the system unit" on page 6-3. 4. Make sure Diskette Drive is not disabled in the BIOS STANDARD CMOS Menu.
Keyboard doesn't work or only some keys work	<ol style="list-style-type: none"> 1. Make sure the keyboard cable is correctly and securely connected to the keyboard port (not the mouse port) on the back of the system unit. The keyboard port has this symbol next to it to help you:  2. Move your fingers across the keys. Make sure no keys are stuck. 3. If you have a protector over your keyboard, make sure that it allows typing. Some do not. 4. Turn the system unit off, wait 10 seconds, and then turn the system unit on again.

Table 1: Hardware problems (Continued)



If the problem is:	Here's what to do:
Mouse does not work	<ol style="list-style-type: none">1. Move the mouse onto a mouse pad and try using it.2. Make sure you are using a screen that allows the use of a mouse. Some screens do not.3. Make sure the mouse cable is correctly and securely connected to the mouse port (not the keyboard port) on the back of the system unit. The mouse port has this symbol next to it to help you 4. Clean the mouse.<ol style="list-style-type: none">a. Turn the computer off.b. Disconnect the mouse cable from the system unit.c. Turn the mouse upside down. Unlock the retainer on the bottom of the mouse by turning it counterclockwise. Now turn the mouse right-side up, and the retainer and the ball will drop out.d. Using a damp cloth, wipe the outside of the mouse and the retainer. Be sure to wipe the rollers inside the mouse.e. Insert the ball and retainer. Lock the retainer by turning it clockwise.f. Reconnect the mouse cable to the system unit.g. Turn on the computer.8. Turn the system unit off, wait 10 seconds, and then turn the system unit on again.

Table 1: Hardware problems (Continued)

If the problem is:	Here's what to do:
Modem/communications errors	<ol style="list-style-type: none"> 1. Make sure the telephone cord is securely connected. 2. Make sure the telephone line works by plugging a working telephone into the same telephone outlet that the computer was plugged into. Then make sure you can place a call. 3. Make sure your modem cord is connected to an analog telephone line. For additional help, see "Setting up communications" on page 2-9. 4. Make sure you are calling the correct number, and that you are using the correct communications settings. For additional help, see the user's guide for your communications software. 5. Make sure no one is using the telephone while you are communicating with another computer. 6. If some communications programs work but others do not, there may be a configuration problem. For additional help, see the user's guide for your communications software. 7. Make sure the modem adapter card is installed correctly. For instructions on installing adapter cards in the system unit, see "Adding and removing adapter cards for desktop model" on page 6-4 and "Adding and removing adapter cards for microtower model" on page 6-6. 8. If you have Call Waiting feature on your phone, make sure it is disabled.
When the computer is turned on, the message "Insert a system diskette and press Enter to reboot" appears	<ol style="list-style-type: none"> 1. Choose BIOS Features Setup from the Configuration/ Setup Utility menu, and make sure that the Boot Sequence is set correctly. 2. Make sure the drive power and signal cables are securely attached to the back of the hard disk drive. For instructions on working in the system unit, see "Removing and adding drives" on page 6-7. 3. See "<i>Quick Reference</i>" for recovery information.

Table 1: Hardware problems (Continued)

If the problem is:	Here's what to do:
Printer error	<ol style="list-style-type: none">1. Make sure the printer is turned on.2. Make sure the printer cable is correctly and securely connected to the printer and to the parallel (printer) port on the back of the system unit. The printer port has this symbol next to it to help you: 3. Make sure the printer power cord is securely connected to an electrical outlet.4. Make sure the printer is ready for printing. (If the Ready light is on, but not flashing, the printer is ready.)5. Make sure the correct printer driver is selected in the software, if required.6. Make sure the paper and the cartridge containing the print material (ink, ribbon, or toner) are loaded correctly.7. Turn the printer and system unit off, and wait 10 seconds. Now turn the printer on, and then the system unit.8. Make sure the On board Parallel Mode option is set properly in the Integrated Peripherals menu in Setup.9. Make sure the parallel port Operation Mode parameter is set to a mode that matches your printer.10. For additional help, see the user's guide that came with the printer.

Solving software problems

Table 2: Software problems

If the problem is:	Here's what to do:
Clock loses time	<p>The most common cause for the clock losing time is related to application programs, not a hardware failure. If you experience this problem, do the following:</p> <ol style="list-style-type: none">1. From the Windows desktop, click on the IBM Update Connector icon to obtain the latest software updates for your computer.2. If you have the Norton AntiVirus program installed, click on the LiveUpdate icon to obtain the latest version of the Norton AntiVirus program.3. For assistance with updating application programs that were not included with your personal computer, contact the software manufacturer.
Computer doesn't go into standby or automatically power off when the set time has elapsed.	<ol style="list-style-type: none">1. Make sure you don't touch the mouse or keyboard, and don't start a program that involves using the hard disk, such as File Manager or a Windows screen saver. These activities make the timer start over.2. If the computer does not automatically turn off, make sure the Power Management mode is enabled, then check the set time parameter. For instructions on using Setup, see "Entering Setup" on page 4-4.3. Allow a few minutes more than the specified time. Windows periodically accesses the hard disk for memory swapping and this activity resets the Standby timer. Windows might access the hard disk for a short time after you last touched your computer.4. Close any open communications programs. Programs which are running may not allow the system to enter standby.

Table 2: Software problems

If the problem is:	Here's what to do:
When the parameter Power Switch < 4 sec. under the Setup Power Management menu is set to Power Off, and the system does not turn off when you press the power button.	See "About your software" that comes with your computer.
When the parameter Power Button Override < 4 sec. under the Setup Power Management menu and the system does not turn off when you press the power button for more than four seconds.	See "About your software" that comes with your computer.

Solving modem problems

Your modem is designed to provide reliable and trouble-free service. However, should you experience any difficulty, the information in this section can help you determine and resolve the source of the problem. If you cannot resolve the problem after reading this section, contact your IBM PC HelpCenter for assistance.

Table 3: Modem problems

If the problem is:	Here's what to do:
Modem does not respond to commands	<ol style="list-style-type: none">1. Make sure the modem is not configured with a conflicting COM port and IRQ setting.2. Make sure the communications software is configured with the correct COM and IRQ settings (same COM port and IRQ line as the modem). Your communications software will not be able to send and receive data if it does not have the correct COM and IRQ settings of the modem.3. Make sure the modem is properly initialized by the communications software. The modem can be improperly initialized if you have selected an incorrect modem type. Select "Hayes Compatible" modem type and "Rockwell" in your data communications software. Select "Generic class 1" and "Rockwell" in your fax and voice software, respectively. You may also be prompted by the software to enter an initialization string. Use AT&F as your initialization string.
Modem dials but does not connect	<ol style="list-style-type: none">1. Make sure the phone line is working properly. A noisy line will prevent proper modem operation.2. Check for busy signal, ringback, or a remote answering system.

Table 3: Modem problems (Continued)

If the problem is:	Here's what to do:
Modem makes a connection but no data appears on the screen	<ol style="list-style-type: none"><li data-bbox="683 636 1222 763">1. Make sure all communication parameters (baud rate, data, stop, and parity bits) are properly configured and identical on both sides. Also make sure the hardware control flow (RTS/CTS) is enabled in both the modem and the communications software.<li data-bbox="683 770 1222 819">2. Press the Enter key several times. The remote system may be waiting to receive your data before it begins.<li data-bbox="683 826 1222 898">3. Make sure the correct terminal emulation mode is used in the software. Refer to the information that came with the software.
You are not able to verify whether the correct terminal emulation mode is being used by your software	<ol style="list-style-type: none"><li data-bbox="683 927 1158 947">1. Make sure the Call Waiting feature is turned off.<li data-bbox="683 954 1222 1003">2. Make sure the RTS/CTS hardware flow control is enabled (do not use XON/XOFF software flow control).<li data-bbox="683 1010 1222 1059">3. Make sure the data speed is not faster than your computer's capability.

Error codes and messages

When you see error codes and messages on your screen, find the error code or message in the following table, then take the applicable corrective action or actions.

Table 4: Error codes and messages

Error codes	Error messages	Corrective actions
161	CMOS battery failed	1. Load the default setting in Setup and reboot the system.
162	CMOS checksum error	1. Make sure the equipment (diskette drive, hard disk drive, keyboard, mouse, etc.) are connected properly and are defined correctly in BIOS Setup. 2. Load default settings in setup. 3. Replace the CMOS battery.
164	Memory size error	1. Determine if memory has been added or removed since the last boot.
201	Memory test fail	1. Determine if the memory modules are properly seated in the DIMM sockets, then reboot the system. 2. Replace the memory module.
301	Keyboard error or no Keyboard present	1. Determine if the keyboard cable is connected properly and is defined correctly in BIOS Setup. 2. If the error still shows after doing option 1, change your keyboard. It may be defective.
662	Floppy disk fail (80)	1. Unable to reset floppy subsystem. Load the default Setup setting.
662	Floppy disk(s) fail (40)	1. Floppy Type mismatch. Check the BIOS Setting.

Table 4: Error codes and messages (Continued)

Error codes	Error messages	Corrective actions
1701	Hard disk(s) diagnostics fail	<ol style="list-style-type: none">1. Determine if the hard disk is defined correctly in BIOS Setup.2. Check the hard disk drive cable/connection.3. Check the hard disk drive.
1762	Primary master IDE has changed Primary slave IDE has changed Secondary master IDE has changed Secondary slave IDE has changed	<ol style="list-style-type: none">1. Make sure the System Boot Drive parameter in the Startup Options of BIOS Setup is not set to (Drive A only).2. Load the default settings in Setup.3. Insert a system diskette into the diskette drive and reboot the system.4. Ensure the diskette drive configuration setting in BIOS Setup is correct.5. Check the power to the hard disk drive.6. Check the Diskette Drive.
1780	Primary master hard disk fail	<ol style="list-style-type: none">1. Load the default settings in Setup.2. Check the IDE drive jumper.3. Check the power to the IDE drive.4. Check the IDE cable/connection.5. Check the IDE drive.
1781	Primary slave hard disk fail	<ol style="list-style-type: none">1. Load the default settings in Setup.2. Check the IDE drive jumper.3. Check the power to the IDE drive.4. Check the IDE cable/connection.5. Check the IDE drive.
1782	Secondary master hard disk fail	<ol style="list-style-type: none">1. Load the default settings in Setup.2. Check the IDE drive jumper.3. Check the power to the IDE drive.4. Check the IDE cable/connection.5. Check the IDE drive.
1783	Secondary slave hard disk fail	<ol style="list-style-type: none">1. Load the default settings in Setup.2. Check the IDE drive jumper.3. Check the power to the IDE drive.4. Check the IDE cable/connection.5. Check the IDE drive.

Table 4: Error codes and messages (Continued)

Error codes	Error messages	Corrective actions
8602	PS/2 Mouse error OR no PS/2 mouse present	1. Determine if the mouse is connected properly and is defined correctly in BIOS Setup.

IBM Diagnostic Programs

Your computer comes with two diagnostic programs:

- **PC-Doctor for Windows:** This Windows-based diagnostic program is preinstalled on your computer, PC-Doctor for Windows can diagnose some hardware problems, but it is most effective at diagnosing software problems. For instructions on using PC-Doctor for Windows, see “Starting PC-Doctor for Windows” on page 8-20.
- **Product Recovery Program:** Your computer comes with a product recovery program, see *Quick Reference* for overview of the recovery program if you want or need to know how that will work.

Starting PC-Doctor for Windows

To start PC-Doctor for Windows, do the following:

1. Click **Start**.
2. Select **Programs**.
3. Select **PC-Doctor for Windows**.
4. Click **PC-Doctor for Windows**.

For additional information about running PC-Doctor for Windows, refer to the PC-Doctor for Windows help system.

Product Recovery Program

Your IBM computer has a Product Recovery Program, which is a recovery image on the hard disk drive accessed by pressing F11 during startup. For more information about the Product Recovery Program, see the *Quick Reference* that comes with your computer.

Appendix A. Specification tables

Memory module placement

This memory module placement table shows you how to place dual inline Memory modules (DIMMs) into the sockets labelled DIMM1 Bank 0 and DIMM Bank 1. Refer to the section “Identifying system board parts” on page 7-2 for the location of the DIMM sockets.

Table 1: Memory module placement

DIMM Bank 0	DIMM Bank 1	TOTAL Memory
64M	NONE	64M
128M	NONE	128M
256M	NONE	256M
64M	64M	128M
64M	128M	192M
64M	256M	320M
128M	64M	192M
128M	128M	256M
128M	256M	384M
256M	64M	320M
256M	128M	384M
256M	256M	512M

Memory map

This table shows the hexadecimal addresses for the system memory regions. You may use this information for adapter cards that require you to set up memory regions.

Table 2: Memory map

Address range	Description
0~640 KB (000000 ~ 09FFFF)	Main memory
640~768 KB (0A0000 ~ 0BFFFF)	VGA memory
768~816 KB (0C0000 ~ 0CBFFF)	Video BIOS Memory
816~896 KB (0CC000 ~ 0DFFFF)	ISA Card BIOS & Buffer Memory
896~960 KB (0E0000 ~ 0EFFFF)	BIOS Extension Memory Setup and Post Memory PCI Development BIOS
960~1024 KB (0F0000 ~ 0FFFFF)	System BIOS memory
(100000 ~ Upper Limit)	Main memory
(Upper Limit ~ 4 GB)	PCI memory

Note: Upper Limit means the maximum size of installed memory.
The Main Memory Maximum size is 512 MB.

System input/output addresses

This table shows the hexadecimal addresses for each of the system board Input/Output (I/O) functions. You may want to use this information if you install an adapter card that requires you to set I/O addresses.

Table 3: System input/output addresses

Address range (hexadecimal)	Function
000-00F	DMA controller-1
020-021	Interrupt controller-1
040-043	System timer
060-060	Keyboard controller 8742
061-061	System Speaker
070-071	CMOS RAM Address and Real Time Clock
081-08F	DMA controller-2
0A0-0A1	Interrupt controller-2
0C0-0DF	DMA controller-2
0F0-0FF	Math Co-Processor
170-177	Secondary IDE
1F0-1F7	Primary IDE
200-207	Game Port
278-27F	Parallel Printer Port 2
2F8-2FF	Serial Asynchronous Port 2
378-37F	Parallel Printer Port 1
3F0-3F5	Floppy Disk Controller
3F6-3F6	Secondary EIDE

Table 3: System input/output addresses (Continued)

Address range (hexadecimal)	Function
3F7-3F7	Primary EIDE
3F8-3FF	Serial Asynchronous Port 1
0CF8	Configuration Address Register
0CFC	Configuration Data Register
778-77A	Parallel Printer Port 1

System interrupts

This table shows the system Interrupt Requests (IRQs) and their functions. You may use this information if you install an adapter card that requires you to set IRQs. In some cases, the device listed uses the IRQ.

Table 4: System interrupts

Interrupt request (IRQ)	Function
0	Timer
1	Keyboard
2	Programmable Interrupt Controller
3	Serial Port, Communications port
5	Modem/Audio
6	Diskette
7	Parallel, Printer port
8	Real Time Clock/System CMOS
9	ACPI SCI
10	Audio
11	Ethernet, LAN
12	PS/2 Mouse
13	Numeric Data Processor
14	Primary IDE
15	Secondary IDE

DMA channel assignments

This table shows the channel assignments for Direct Memory Access (DMA). DMA allows I/O devices to transfer data directly to and from memory. You may need to select an available DMA channel if you add an I/O device that uses DMA.

Table 5: DMA channel assignments

DMA channel	Assignment
0	Available
1	Audio
2	Floppy Diskette
3	Printer Port
4	Cascade
5	Available
6	Available
7	Available

Serial port addresses

IBM computers have a built-in external serial port already installed in the computer. The connector for this port is located at the back of your computer. This port can be used to connect a serial mouse, serial printer, or other serial device and to transfer data between computers.

The built-in serial port supports the following addresses and interrupts.

Table 6: Serial port addresses

Address	COM#	Interrupt	Default
2F8	COM2	IRQ 3	Serial port

Conflicts may arise if you add adapter cards with serial ports or if you change the address settings on your modem if you are using an operating system other than Windows. You can resolve most of these conflicts by using Setup or the Windows Device Manager to change serial port addresses. See "Serial Port Setup" on page 4-9 or "Resolving resource conflicts" on page 5-4 for more information.

Connector functions

The following table includes the specific functions of the connectors. Refer to the section "Identifying system board parts" on page 7-2 for an illustration of the connector locations.

Table 7: Connector functions

Connector	Function
BATT	Battery socket
FDD1	Floppy connector
PCI Slot1	First PCI adapter card connector
PCI Slot2	Second PCI adapter card connector
PCI Slot3	Third PCI adapter card connector
JBAT	Clear CMOS jumper
JFP1	HDD LED, Power LED, speaker, Power Switch and Reset Switch
IDE 1	Primary IDE
IDE 2	Secondary IDE
JWR1	ATX Power Connector
COMA	Serial Port connector 1
COMB	Serial Port connector 2
LPT1	Parallel Port Connector
JKBMS1	Keyboard/Mouse Connector
J5	CD-In Connector
J6	Aux Line Connector
J7	Modem-In Connector

Appendix B. Modem information

Modem features

Using a telephone network, a modem allows your computer to communicate with other computers, fax machines, or telephones. For information about connecting your modem to a telephone network. "Connecting your modem to the telephone network" on page 2-9

Attention!

Before you plug your modem into a telecommunications system outside the country in which it was purchased, make sure your modem is designed to work with that telecommunications system. Otherwise, you could damage your computer. Read the guidelines in "Safety information" on page viii before you plug your modem into any telecommunications system.

Some IBM computers have a modem already installed. If your computer came with a modem, all you have to do is connect the modem to a telephone line. (You may also connect a telephone to the modem if it has two RJ11C jacks). The system firmware is already configured to load the modem drivers and software once you have made the connections.

If your computer does not have a modem but you intend to install one, see the documentation that came with the modem for installation instructions and reference information.

If present, the modem that came with your computer is a V.90 bps modem. It serves as a communications peripheral capable of high-speed data transfer and fax. Your modem is compatible with the following standards:

- V.90
- K56 Flex
- V.34 (33600 bps)
- V.32bis (14400 bps)
- V.32 (9600 bps)
- V.22bis (2400 bps)
- V.22 (1200 bps)
- Bell 212A (1200 bps)
- V.23 (1200/75 bps)
- V.21 (300 bps)
- Bell 103 (300 bps)
- V.17 (14400 bps FAX)
- V.29 (9600 bps FAX)
- V.27ter (4800 bps FAX)
- V.21 channel-2 (300 bps FAX)
- TIA/EIA 578 Class 1 fax command set
- IS-101 voice command set
- V.42bis (data compression)
- V.42 (error correction)
- MNP5 (data compression)
- TIA/EIA 602 AT command set
- V.8 start-up sequence
- MNP2-4 error correction
- Personal Computer 99 logo

Operating your modem

You can perform common modem functions such as dialing, file transfer, and faxing using the modem communications software that came with your computer. For information about configuring communications software, "Configuring your communications software" on page 2-10

It is still possible for you to perform the basic modem functions using the AT commands from the Windows DOS box prompt. A list and description of all the AT commands appear in the section "AT commands".

We strongly recommend, however, that you perform all modem operations through the modem communications software since it is designed to eliminate the inconvenience of using the AT commands. Modem software allows you to operate the modem by simply selecting command items from onscreen menus.

Note: Most modem communications software programs also allow you to send specific AT commands to the modem.

Using the Auto Answer feature

If you use a modem communications software program, it may require your modem to be set for *Auto Answer*. The Auto Answer feature lets your computer answer calls from another computer automatically.

Your modem communications software determines how the modem operates with Auto Answer. Some fax programs do not require you to type an AT command to turn Auto Answer on or off. For specific instructions, see the user's guide that came with the communications software.

To start the Auto Answer feature from your communications software, use the command: **ATS0=n**. This command tells the modem to answer a call after a certain number of rings. To set the number of rings, replace **n** with any number from 1 to 255.

If you do not have a voice modem, turn Auto Answer off when you are not using your modem. Otherwise, callers will be greeted with the modem tone. To turn Auto Answer off, use the command: **ATS0=0**.

In some communications software programs, you may need to select the "Auto Answer On" or "Auto Answer Off" option to turn off the auto answer feature.

Note: If you are using Auto Answer with a fax software program, setting a high number of rings will allow you to answer the telephone before the fax modem does.

If your computer came with fax software already installed, use the fax software documentation included in the fax software online Help for additional information.

Disabling Call Waiting

If you use the Call Waiting feature on your telephone, you may want to disable it while using your modem. With Call Waiting, communications can be interrupted when a second call is waiting to be answered.

To disable Call Waiting, contact your telephone company. Different telephone companies have different procedures for disabling this feature. Also, some telephone companies cannot disable Call Waiting. Your telephone company business office should be able to tell you the procedures and *dialing sequence* required to disable Call Waiting.

A dialing sequence is similar to a command you type on your computer. For example, in some areas the following dialing sequence disables Call Waiting:

(# or *)70,,,(complete telephone number)

The dialing sequence you type on your computer may look like this: ***70,,,5554343**. The commas (,,,) pause the modem until the command is carried out, then the telephone number is dialed automatically.

Call Waiting will be disabled **only** for the duration of your modem's current call and only from the calling end. For incoming calls, you may find it helpful to change the value of register S10 to a higher number. For more information on S registers, see "S registers" on page B-13.

Your modem communications software determines how your modem operates with Call Waiting. For specific instructions, see the user's guide or online Help that came with the communications software.

If your computer came with a fax software already installed, use the fax software documentation included in your computer package or the fax software online help for additional information.

Modem commands

This section provides information on the modem commands if you operate your modem from the DOS prompt using the AT command strings.

Executing commands

Your modem is in the Command Mode when powered-on and is ready to receive and execute AT commands. The modem remains in the Command Mode until it makes a connection with a remote modem. Commands may be sent to the modem from an attached terminal or a computer running a communication program.

The modem is designed to operate at common DTE speeds ranging from 300 bps to 115.2K bps. All commands and data must be issued to the modem using one of the valid DTE speeds.

Command format

All commands must begin with the **AT** prefix, followed by the command letter and ended with the **Enter** key. Spaces are allowed in the command string to increase command readability but are ignored by the modem during command execution. All commands may be typed in either upper or lower case, but not mixed. A command issued without any parameters is considered as specifying the same command with a parameter "0".

Example:

ATL [Enter]

This command causes your modem to lower its speaker volume.

AT commands

Table 1: AT commands

Command	Function
A	Answers incoming call
A/	Repeats the last command given. Note: Do not precede by AT or follow by Enter
D	0-9, A-D, # and * L = last number redial P = pulse dial T = tone dial W = wait for second dial tone V = switch to speakerphone mode , = pause @ = wait for five seconds of silence ! = flash := return to command mode after dialing
E0	Commands echo disabled
E1	Commands echo enabled
+++	Escape characters - switch from data mode to command mode
H0	Modem on-hook (hang-up)
H1	Modem off-hook (make busy)
I0	Firmware and device ID
I1	Checksum code

Table1: AT commands (Continued)

Command	Function
I2	ROM test
I3	Firmware and device ID
L0	Low speaker volume
L1	Low speaker volume
L2	Medium speaker volume
L3	High speaker volume
M0	Speaker always off
M1	Speaker on until carrier detected
M2	Speaker always on
O0	Return to data mode
O1	Initiate an equalizer retrain and return to data mode
P	Pulse dial
Q0	Result codes enabled
Q1	Result codes disabled
Sr?	Read S register r, where r=0-95
Sr=n	Set S register r to value n (r=0-95; n=0-255)
T	Tone dial
V0	Numeric responses
V1	Text responses
X0	Hayes Smartmodem 300 compatible responses/blind dialing

Table1: AT commands (Continued)

Command	Function
X1	Same as X0 plus all CONNECT responses/blind dialing
X2	Same as X1 plus dial tone detection
X3	Same as X1 plus busy signal detection/blind dialing
X4	All responses and dial tone and busy signal detection
Z	Reset and recall user profile

Detail for +MS Controls

Table 2: Detail for +MS Controls

<code>+MS=<carrier>,<automode>,<min transmit rate>,<max transmit rate>,<min receive rate>,<max receive rate></code>	
<code><carrier>=</code>	B103 for Bell 103 (300 bps) B212 for Bell 212 (1200 bps) V21 for V.21 (300 bps) V22 for V.22 (1200 bps) V22B for V.22bis (1200-2400 bps) V23C for V.23 V32 for V.32 (4800 & 9600 bps) V32B for V.32bis (7200, 12000, 14400 bps) V34 for V.34 (2400-33600 bps) K56 for K56flex (28000-56000 bps) V90 for V.90 (28000-56000 bps)
<code><automode></code>	= 0 (for automode OFF) = 1 (for automode ON)
<code><min transmit rate></code> = 300 bps to 33600 bps <code><max transmit rate></code> = 300 bps to 33600 bps <code><min receive rate></code> = 300 bps to 33600 bps <code><max receive rate></code> = 300 bps to 56000 bps	

An example of a command is **AT+MS = V90, 1, 24000, 33600, 28000, 56000**

Extended AT commands

Table 3: Extended AT commands

Command	Function
&C0	Carrier Detect (CD) always on
&C1	Turn on CD when remote carrier is present
&D0	DTR signal ignored
&D1	Modem returns to Command Mode after DTR toggle
&D2	Modem hangs up and returns to the command mode after DTR toggle
&F	Load factory default configuration
&G0	Guard tone disabled
&G1	550 Hz guard tone enabled
&G2	1800 Hz guard tone enabled
&V	View active profiles

V.42bis commands

Table 4: V.42bis commands

Command	Function
+IFC = 0,0	Disable flow control
+IFC = 2,2	Enable RTS/CTS hardware flow control (data mode default)
+IFC = 1,1	Enable XON/OFF software flow control
+DS = 0,0,2048,32	Data compression disable
+DS = 3,0,2048,32	V.42bis/MNP5 data compression enabled
+ES = 0,0,1	Normal mode (speed buffering) only
+ES = 4,4,6	MNP mode only
+ES = 3,3,5	V.42/MNP/Normal auto-mode
+ES = 3,0,2	V.42 mode only
+ILRR = 0	Disable protocol result code appended to DCE speed
+ILRR = 1	Enable protocol result code appended to DCE speed

Modem response codes

The following table lists the basic codes that the modem sends to your computer in response to the commands you type. They are called response codes.

Table 5: Basic Response codes

Digit code	Word code	Meaning
0	OK	Command was carried out without error
1	Connect	Connected at 300 bits per second (bps)
2	Ring	Ringling signal detected
3	No carrier	Carrier is lost or not heard
4	Error	Error in the command line Invalid command Command line exceeds buffer Invalid character format
6	No dial tone	No dial tone during the time-out period
7	Busy	The line being called is busy
8	No answer	The line being called did not answer within the time-out period
11	Connect xxxx	Connected at 2400 bps
24	Delayed	Dialing delayed
32	Blacklisted	Number is blacklisted
33	Fax	Fax connection
35	Data	Data connection
+F4	+FC error	Fax error

S registers

S registers are information storage areas inside the modem. The AT command set uses the S registers to configure modem options. Some S registers have default settings. For normal modem operations, the default settings are usually adequate. However, special circumstances may require you to change some defaults. To change or read the value of an S register, begin the command with the letters **AT**.

To read the value of an S register:

- Use the **ATSr?** command (**r**=register number 0-28).

For example, to read the value of S register 0, type **ATS0?** and press **Enter**.

To change the value of an S register:

- Use the **ATSr=n** command (**r**=register number 0-28, **n**=the new value you want to assign).

For example, to change the value of S register 0 to 20 rings, type **ATS0=20** and press **Enter**.

The following table lists the S Registers summary.

Table 6: S registers

Register	Function	Range/units	Default
S0	Auto-answer ring	0-255 /rings	0
S1	Ring counter	0-255 /rings	0
S2	Escape code character	0-255 /ASCII	43
S3	Carriage return character	0-127 /ASCII	13
S4	Line feed character	0-127 /ASCII	10
S5	Backspace character	0-32 /ASCII	8
S6	Dial tone wait time	2-255 /seconds	2
S7	Remote carrier wait time	1-255 /seconds	50
S8	Comma pause time	0-255 /seconds	2
S10	Carrier loss time	1-255 /10ths of a second	14
S11	Touch-tone dialing speed	50-255 /milliseconds	95
S12	Escape character detect time	0-255 /50ths of a second	50
S29	Flash dial modifier time	0-255 /10 milliseconds	70

Appendix C. Monitor terminology

As you read the documentation that came with your monitor and the monitor information provided in this chapter, you might find a few technical terms. If you change your monitor settings, refer to the following table to understand some of the terms used to describe monitor characteristics.

Table 1: Monitor terms and definitions

Term	Definition
display mode	A resolution setting associated with a vertical frequency setting (and sometimes a color setting). For example, 640x480 at 75 Hz, 256 colors.
horizontal frequency	Rate (in kilohertz [kHz]) at which each line on the screen is drawn.
interlaced	Method of producing an image by drawing only alternating lines until the entire image is completed.
noninterlaced	Method of producing an image by drawing each line, one after the other, until the entire image is completed. This method produces less flicker than the interlaced method.
pel (or pixel)	A picture element. A small rectangle or portion of an image that together with other pels make up the entire image.
resolution	The number of pels required to display an image horizontally and vertically. For example, 640x480 means 640 pels horizontally and 480 pels vertically.
SVGA	Super video graphics array. A video standard that provides some of the higher text and graphics resolutions.
vertical frequency/ refresh rate	Rate (in hertz [Hz]) at which the entire image is drawn on the screen. Also called "refresh rate."

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