

Hardware Handbook

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Safety information

The construction of the IBM Aptiva* Personal Computer provides extra protection against the risk of electrical shock. The IBM Aptiva PC 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.

FOR CONTINUED PROTECTION AGAINST THE RISK OF ELECTRICAL SHOCK:

- 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.

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.
- Discard used lithium batteries according to local country dispositions.

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| Intel | Intel Corporation |
| Microsoft | Microsoft Corporation |
| OverDrive | Intel Corporation |
| Pentium | Intel Corporation |
| Soundblaster | Creative Labs, Incorporated |
| PFS:WindowWorks | SoftKey International Incorporated |
| VESA | Video Electronics Standards Association |
| Windows | Microsoft Corporation |
| Windows NT | Microsoft Corporation |
| Works for Windows | Microsoft Corporation |

Hardware and software assistance

See your *Services and Support Guide* for information on getting hardware and software assistance.

About this book

The *Hardware Handbook* contains general information about using The IBM Aptiva* Personal Computer. It also provides hardware specifications and installation instructions for most options that you can add to your computer.

For example, this book can help you:

- Select software settings that let you get the best performance from your monitor
- Install a printer driver
- Control the volume on multimedia systems
- Send commands to your modem
- Determine the cause of many computer problems and fix them yourself
- Install and remove adapter cards
- Install and remove diskette drives, hard disk drives, tape drives, and CD-ROM drives
- Add memory
- Change your battery

How this book is organized

This book has two parts and an appendix.

“Part 1. Reference information” contains information about:

- Using monitors and modems
- Using Rapid Resume* Manager
- Installing printer drivers
- Controlling the volume on multimedia systems
- Troubleshooting problems
- Using the computer’s Configuration/Setup Utility.

“Part 2. Installing options” contains instructions for installing options in your system unit and on your system board.

“Appendix A. Reference tables” contains technical reference information that you may need when installing options.

Related information

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

Read me first. This booklet contains instructions to help you unpack, setup, and start using your computer.

Services and Support Guide. This folder contains important information about hardware service and software support for your computer. Here you will find information about using the 1-800-number (for hardware assistance) and IBM support services (for answers to questions about your new computer). This folder also contains your warranty and license agreement.

A Guide to All the Extras. This folder contains information about a wide selection of additional software offerings. Be sure to read this information to take full advantage of all The IBM Aptiva Personal Computer offerings.

Online documentation. The software that came preloaded on your computer includes online tutorials and exercises that can help you learn how to use your computer. We suggest you start exploring the online documentation by double-clicking on the Learning Library icon in Program Manager.

Reference information **Part 1**

In this part, you will find these chapters:

- “ Setting up and using a monitor” describes how the monitor controls work and explains how to set up the software that lets you get the best performance from your monitor.
- “ System performance” explains how your computer functions when you have Rapid Resume Manager features enabled, how to install a printer driver, and how to control the volume on multimedia models of the IBM Aptiva PC.
- “ Modem information” describes the modems that come on some models of the IBM Aptiva PC, their features, and how they work. This chapter also explains how to send modem commands and includes a table of frequently used commands.
- “ Troubleshooting” describes potential computer problems and their solutions.
- “ Working with the Configuration/Setup Utility” explains how to use the Utility to change your computer’s hardware information.

Setting up and using a monitor 1

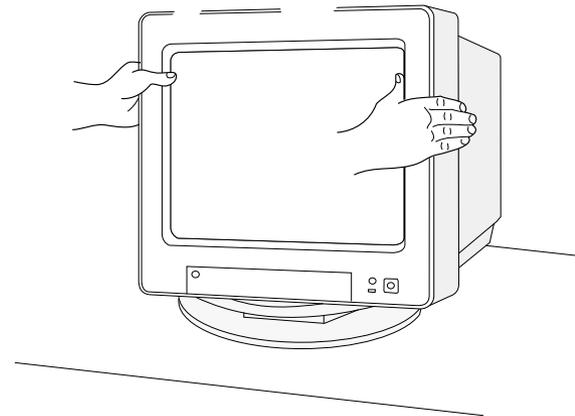
You should have already followed the setup instructions in the *Read Me First* booklet to connect the monitor to the system unit.

Using the tilt/swivel stand

Your monitor may come with a tilt/swivel stand that lets you adjust the screen to a comfortable viewing angle. (Your tilt/swivel stand may come preinstalled. If it is not preinstalled, see the installation instructions that came with your monitor.)

To use the tilt/swivel stand, grasp the monitor with both hands and:

- Pull downward to lower the monitor.
- Push upward to raise the monitor.
- Push side to side to turn the monitor.



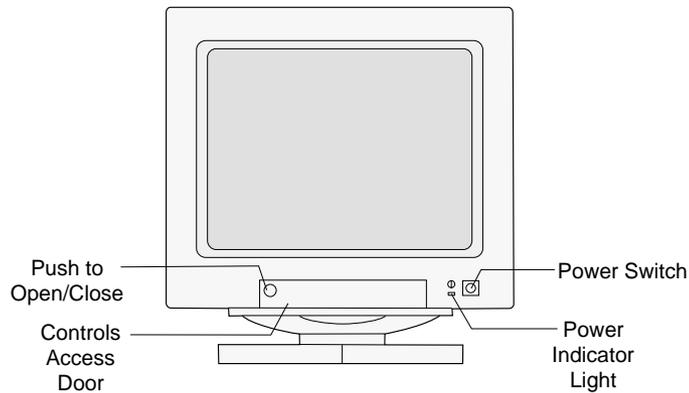
Adjustment tips:

- Tilt the monitor at an angle that gives you the least reflection from lights and windows. This usually means positioning the screen at a right angle to any windows.
- Position the monitor so that the top of the screen is slightly below your eye level.

Adjusting monitor controls

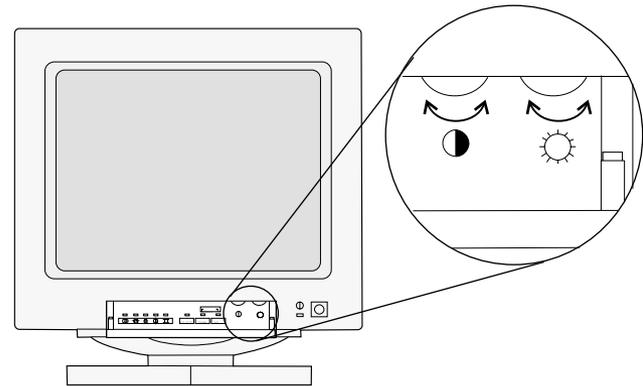
Your monitor has controls for adjusting the image that you see on the screen. The instructions on the next few pages will help you identify and adjust these controls.

The following picture shows a typical monitor. Your monitor may or may not have a controls access door. If it does, push in on the door to open it.



Contrast and brightness controls

Use the contrast and brightness controls to sharpen and change the intensity of the image on your screen. (The controls on your monitor may not be located behind a door as shown in the following picture.)



Most monitors have symbols next to the controls that identify the control function.



Contrast

Makes the image sharper.



Brightness

Makes the image lighter or darker.

To adjust the contrast and brightness controls:

1. Be sure the monitor and system unit are turned on. (The power indicator lights on the monitor and system unit are lit when they are on.)
2. Adjust the monitor controls until you get the effect you want.

Adjustment tips:

- Set the brightness level so that the background (the black visible area just outside the data/text area) just disappears.
- Set the contrast level so that text does not appear fuzzy. The edges of the characters should remain sharp.

Image controls

Some monitors have controls that let you adjust the shape and position of the images you see on the screen. These image controls are located on the front of the monitor underneath the screen, typically behind a door.

The following are symbols for common image controls. The symbols are located next to the controls. Your monitor may have some or all of these controls.



Centers the screen image horizontally.



Centers the screen image vertically.



Adjusts the horizontal size of the screen image.



Adjusts the vertical size of the screen image.



Adjusts the vertical sides of the image from appearing to bow in or out.

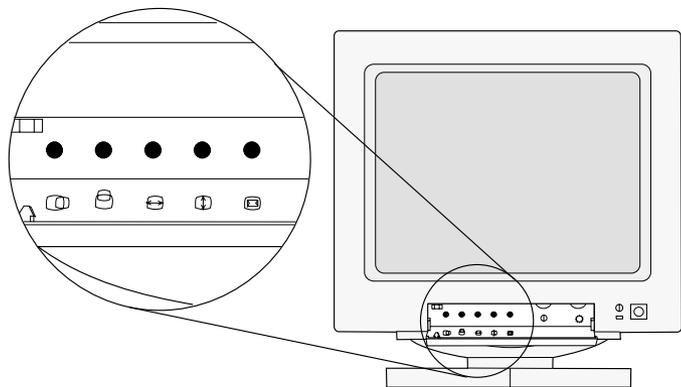


Adjusts the angles of the vertical sides of the image.

If your monitor has image controls, they could be either *rotary* or *push button* image controls.

Rotary image controls

You turn knobs to adjust rotary image controls. The knob for each control is located next to the symbol.



To adjust a rotary image control, turn the knob to the left or right until you get the effect you want.

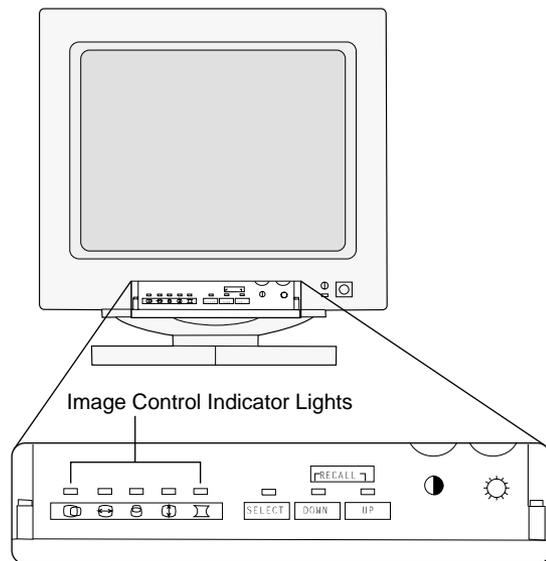
Push button image controls

You adjust some image controls with push buttons. The way that you adjust the push button image controls depends on whether you have a monitor *with* or *without* indicator lights.

Monitors with image control indicator lights

If your monitor has an indicator light next to each image control symbol, follow these steps to adjust the image controls:

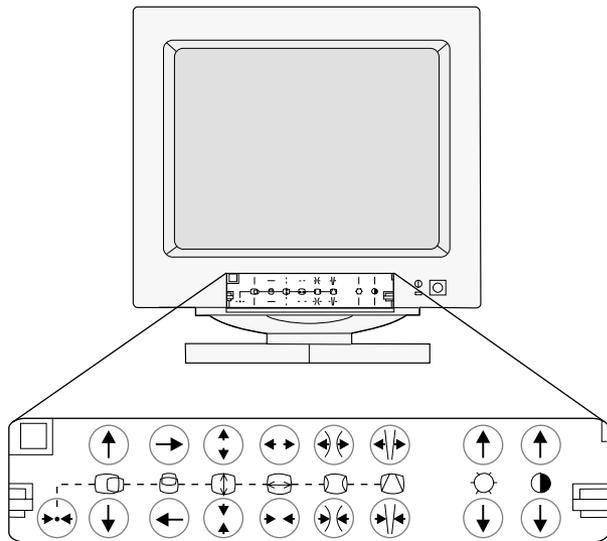
1. Press **SELECT** until the light next to the symbol for the image control you want to adjust is lit.
2. Press **DOWN** to decrease the selected effect or press **UP** to increase the selected effect.



note: If the monitor cable is disconnected from the system unit, the lights next to the symbols will flash consecutively.

Monitors without image control indicator lights

If your monitor has push buttons next to each image control symbol, adjust the image controls by pressing the arrows next to the symbols to increase or decrease the effect. *After you make all of your adjustments, you must wait 5 seconds for the monitor to save the new setting.*



Adjustment tip:

- Use push button image controls to minimize the black border around the data/text area on the screen by adjusting the image size out to the edges of the monitor casing.

Recall function

For monitors with push button image controls, the image control settings for common display modes have been preset at the factory. (A display mode is a resolution setting associated with a vertical frequency setting. For example, 720x400 at 70Hz.) For some display modes, you can return to (recall) the image control settings set at the factory. For monitors:

- With image control indicator lights, you press and together to recall factory settings.
- Without image control indicator lights, you press and hold the Reset button, , for about 4 seconds to recall factory settings.

Example:

If you have selected a display mode of 720x400 at 70Hz, common for DOS, and you change the image settings while you are in that mode, you can use the Recall function to return to the factory image control settings.

Power saver feature

Your monitor may have a power saver feature, which allows the monitor to save energy when it has not been used for a specified amount of time. Your IBM Aptiva Personal Computer comes with Rapid Resume*, which lets your monitor and computer use less power. The Aptiva Index describes the Rapid Resume features and gives you step-by-step instructions for setting it up. You can use the Aptiva Index by double-clicking on its icon in Program Manager.

note: *The monitor's power indicator light will begin to flash soon after the system unit turns off when Rapid Resume features are enabled.*

Monitor settings

The following definitions will help you 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 72 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. |
| 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 | Rate (in hertz [Hz]) at which the entire image is drawn on the screen. Also called "refresh rate". |

Selecting monitor settings

These are the monitor settings that you can select.

- **Monitor Horizontal Frequency.** Sets the computer's video output frequency to match the monitor's frequency.
- **Monitor Resolution.** Determines the amount of information that can appear on the screen.
- **Number of Colors.** Sets the number of colors that can be displayed on the screen.
- **Font Size.** Sets the size of the characters displayed on the screen.

The values you can choose for Monitor Resolution and Number of Colors depend on the:

- Monitor's horizontal frequency setting.
- Amount of video memory installed on the computer's system board. The amount of video memory installed on your system board is listed in the Configuration/Setup Utility. For instructions on using the Configuration/Setup Utility, see page 61.

Monitor Horizontal Frequency

If your monitor and system unit came:

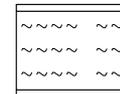
- *Packaged together,* your monitor horizontal frequency was set correctly at the factory to give you the best performance from your monitor. You do not need to complete the following steps unless you attach a different monitor to your system unit.
- *Separately,* complete the following steps to get the best performance from your monitor.

You select the Monitor Horizontal Frequency setting in the Configuration/Setup Utility. To select the Monitor Horizontal Frequency setting, follow these steps:

1. If your monitor and system unit are turned:
 - a. *On,* save all open files and close all software applications. Turn off the system unit, and then turn the system unit on again.
 - b. *Off,* turn on your monitor, and then turn on your system unit.
2. If you are using Rapid Resume (Rapid Resume is enabled), press Ctrl + Alt + Delete.

If you are not using Rapid Resume, do not press Ctrl + Alt + Delete.

3. Press the F1 key while the following symbol appears in the upper right corner of your screen:



The main menu of the Configuration/Setup Utility is displayed.

(Steps continued on the next page.)

4. Press the down arrow key until Devices and I/O Ports is highlighted, and then press Enter.
5. Press the down arrow key until Video Setup... is highlighted, and then press Enter.
Make the Video Display Type selection. The available selections include a list of IBM monitor types, User Defined, and Custom. Use the right arrow key to select a setting.
 - a. If the monitor you are adding is in the list of IBM monitor types, select that setting, and then go to step 8.
 - b. If the monitor you are adding is not in the list of IBM monitor types, select User Defined.
6. Look in the documentation that came with your monitor to find the highest *horizontal frequency* that your monitor can support. Horizontal frequency is also called *horizontal scanning frequency*.
7. Press the down arrow key until Monitor Horizontal Frequency is highlighted. Use the right arrow key to select the frequency range that contains your monitor's maximum horizontal frequency.

Warning!

Do not select a setting that exceeds the capabilities of your monitor. If you do, your monitor will not function properly. If this happens, turn off your system unit and repeat steps 1 through 7.

8. To save your selection and exit the Configuration/ Setup Utility:
 - a. Press Esc until you return to the main menu.
 - b. Press the down arrow key until Save Settings is highlighted.
 - c. Press Enter, and then press Esc.

Monitor Resolution, Number of Colors, and Font Size

Once you have selected the correct monitor type or monitor frequency, the computer knows which resolutions and colors your monitor can support. In Display Select (where you select Monitor Resolution, Number of Colors, and Font Size), you can only select those settings that are supported. Settings that are not supported are gray, and nothing happens when you click on them.

From the settings that your monitor supports, you should select the ones that are most comfortable for you to work with. You can determine this by selecting and trying each supported setting.

To set the Monitor Resolution, Number of Colors, and Font Size settings, follow these steps:

1. Double-click on the *Custom Tools* icon, then click on the *Display Select* button.
2. Click on one of the supported resolution settings (ones that are not grayed out).
3. Click on one of the supported color settings.
4. Click on the font size that you prefer.

note:

For additional information about these settings, see the Help topics in Display Select.

Tips:

The highest resolution and color settings are not always best. For example:

- Higher resolutions display more pels. 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 applications will slow down. Only choose as many colors as you need. A color setting of 256 typically provides the fastest performance.

Performance tips

Here are some general guidelines for working with your monitor:

- Place your monitor away from sources of magnetic interference, such as other monitors, unshielded speakers, and electric power lines. (The speakers that come with some models of the computer are shielded.)
- Keep the monitor screen clean by using a nonabrasive screen or glass cleaner. Do not spray the cleaner directly on the screen.
- Under some conditions, interference patterns, such as curved, shadowy lines can occur. If these patterns appear on your screen, change your software application's background color or design.
- To extend the life of your monitor, turn it off at the end of each day.
- Check the documentation that came with your software application to see if it will let you select combinations of resolution and color. This could make viewing the screen more comfortable.

System performance 2

This chapter covers a variety of topics that affect the performance of your system. It includes detailed information that will help you:

- Use the Rapid Resume Manager, an exclusive energy-saving feature found only on IBM PCs.
- Install a printer driver on your computer.
- Control the volume on multimedia models of the IBM Aptiva PC.

Using Rapid Resume Manager

Your IBM Aptiva Personal Computer comes with special software called Rapid Resume Manager that saves energy and makes using your computer easier. Rapid Resume Manager has the following features:

- **Rapid Resume***. If you are using Windows**, OS/2*, or DOS, Rapid Resume remembers the state of your computer when you turn it off. The next time you turn on your computer, your applications and files will be open just as you left them. The Automatic Power Off option saves energy by turning your computer off after it has not been used for a period of time that you set.
- **Standby**. Lets your computer use less energy after it has been inactive for a period of time that you set.
- **Scheduler**. Turns on the computer for an activity that you specify, such as starting a program, displaying a message, or sending a fax.

- **Wake Up on Ring**. Turns on the computer when the phone rings to let you receive a fax.

The following table describes the way your computer will normally operate when one of the Rapid Resume Manager features is turned on (enabled). See the Aptiva Index for step-by-step instructions for enabling Rapid Resume Manager features. You can use the Aptiva Index by double-clicking on its icon in Program Manager.

Table 2: Rapid Resume Manager normal operation

| What happens: | Explanation: |
|--|--|
| Task List appears after turning on the computer. | Use the Task List to return to an application, or you can keep the Task List from appearing by turning it off (disabling it) in the Rapid Resume Options window. |
| Delay before mouse works. | When your computer comes out of Standby, and the desktop reappears, it may take a few seconds for the mouse to become active. |
| Computer waits before turning off. | In some cases, it can take up to several seconds before Rapid Resume saves the desktop and turns off the computer. |
| Can't start the computer from diskette if Rapid Resume is enabled. | After you turn on the computer, press Ctrl + Alt + Delete when you see the Rapid Resume screen. There may be a slight delay before the computer restarts. |

Table 2: Rapid Resume Manager normal operation

| What happens: | Explanation: |
|---|---|
| Computer comes on when the phone rings. | This is a normal function of the Wake Up on Ring feature. You can turn Wake Up on Ring off in Rapid Resume Manager or in the Rapid Resume feature of the Configuration/Setup Utility. |
| Computer comes on when you haven't pushed the on/off button. | This is a normal function of the Scheduler feature. You can turn this feature off by disabling Scheduler in Rapid Resume Manager or Wake Up on Alarm in the Rapid Resume feature of the Configuration/Setup Utility. |
| System unit power indicator light is blinking, but system unit is turned off. | This is a normal function of Wake Up on Ring. It indicates a fax may be waiting. With Wake Up on Ring enabled, you can select the Indicator option in Rapid Resume Manager or in the Rapid Resume feature of the Configuration/Setup Utility. |
| System unit and monitor are on, but nothing is displayed on the screen. | This is a normal function of the Standby feature. Press a key or move the mouse to exit Standby. |

How Rapid Resume saves information

When you use Rapid Resume, the contents of memory are saved in a special file on your hard disk every time you turn off your computer. This is a hidden system file called "_PS1SAVE.DAT". With Rapid Resume enabled, it is created each time you start your computer by pressing Ctrl + Alt + Delete.

The size of this file depends on how much memory is installed on your computer. If you install additional memory, the size of the file increases when you press Ctrl + Alt + Delete to start your computer. If your hard disk does not have enough space for the _PS1SAVE.DAT file, Rapid Resume cannot be enabled until you create enough space for this file.

If you choose not to use Rapid Resume, you can delete the _PS1SAVE.DAT file to free some space on your hard disk. For more information about Rapid Resume and specific instructions on how to delete the _PS1SAVE.DAT file, see section 2.4 of the README.TXT file located in the PS1TOOLS directory of your computer.

Installing a printer driver

After you have attached your printer to your computer as described in the *Read Me First* booklet, you need to install the correct printer driver in Microsoft** Windows.

A printer driver is a file that describes the characteristics of your printer to the software. The software then uses the file to convert your text and graphics into a form that your printer can understand.

To install the correct printer driver:

1. At the Microsoft Windows Program Manager screen, double-click on the First Steps icon.
2. Click on Set up your Printer.
3. Click on Start. The "Printers" window appears.
4. Click on Add>>.
5. Click on the name of your printer in the "List of Printers:" box. You may have to scroll through the list until you find the name of your printer.

If you do not see the name of your printer in the box, your printer may have an emulation mode that allows it to print like one of the printers in the list. Look in the documentation that came with your printer to find information on emulation modes. Then select the name of one of the printers it can emulate in this list.

If your printer came with a diskette, it may contain the printer driver your printer needs. Follow the instructions in the documentation that came with your printer to install this driver.

6. Click on Install... The name of your printer is now highlighted in the "Installed Printers:" box.
7. While the name of your printer is highlighted in the "Installed Printers" box, click on Set As Default Printer.

note:

Most fax software packages allow you to set the fax modem as the default printer. If your computer came with a fax modem and fax software installed, you must set the fax modem as the default printer while you are sending and receiving faxes. When you are finished using the fax modem, change the default printer back for printing. For more information, see the online Aptiva Index entries pertaining to your fax software.

8. Make sure the name of your printer appears in the "Default Printer" box. If it doesn't, repeat steps 4 through 7.
9. Click on Setup... to change the default settings for your printer. For example, you can select the paper source, paper size, and page orientation.

10. After you have made your selections, click on OK.

A port is a connection on the back of the system unit in which you plug a device, such as a printer. Most printers are parallel printers, and therefore should be attached to parallel ports.

note:

In the Connect window, you can assign your printer to a port. However, if you have a parallel printer and you attached it to your system unit as described in the Read Me First publication, Windows automatically selects the correct port (LPT1) for you.

11. Click on Close to save your selections and exit the "Printers" window.

Controlling the volume on multimedia systems

If you have a multimedia model of The IBM Aptiva Personal Computer, you can control the volume in three ways:

- With the volume control on one of the speakers
- With the volume controls in the multimedia software that came with your system
- With the volume control on the CD-ROM drive on the front of the system unit (your system may not have this volume control). This volume control is used solely to control headphone volume and has no effect on the speakers.

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

Adjusting the speaker volume

If you are listening to sound through the speakers, use the volume control on the front of the speaker to adjust the volume.

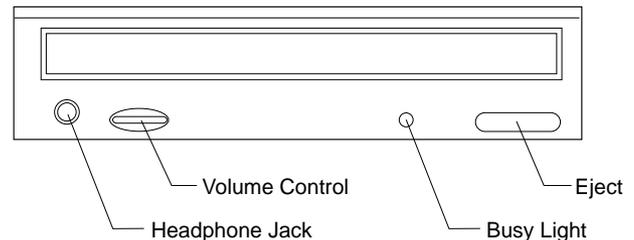
The volume control on the front of the speaker is affected by the volume control setting in the multimedia software that came with your computer. For example, if you turn the volume on the speaker all the way up, and no sound comes out of the speakers, the volume setting in your multimedia software is too low.

The multimedia software volume controls are located in either the Soundblaster** group or the Multimedia Utilities group in Windows Program Manager.

Adjusting the headphone volume

You can plug your headphones into the headphone jack on the CD-ROM drive (not available on all systems) or the Out jack on the sound card on the back of the computer's system unit.

- On some IBM Aptiva PCs, a headphone jack is located on the CD-ROM drive on the front of the computer's system unit.



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 on the speaker.

- On all multimedia models of the IBM Aptiva PC, the headphones can be plugged into the Out jack on the sound card on the back of the system unit. This is the same jack you plug your speakers into. You must disconnect your speakers to use this jack with your headphones.

If you plug your headphones into the jack on the sound card, 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 jack on the sound card, you must control the headphone volume through the volume control in the multimedia software on your computer. You cannot control the headphone volume from the volume control on the CD-ROM drive. To access the multimedia software, look in either the Soundblaster group or the Multimedia Utilities group in Windows Program Manager.

When using this jack, a few sounds may not be audible through the headphones, such as the beep when you turn on your computer.

About built-in modems

Some IBM Aptiva PCs have a built-in modem (modulator-demodulator). Using a telephone network, a modem allows your computer to communicate with other computers or fax machines.

This chapter includes important information about connecting your modem to the telephone network and operating your modem. You'll find useful tips that will help you:

- Use the Auto Answer feature with your modem communications software
- Use the telephone with your modem

We've also included a section about how modems work to help you understand the problems you may encounter as you use your modem.

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 and businesses. Connect the modem to an analog net-

work *only*. If you are not sure about your telephone line, contact your local telephone company.

Warning!

- *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 may damage the modem.*

Types of built-in modems

Most IBM Aptiva PCs purchased in the U.S. and Canada that have built-in modems use one of the modems listed below. The modem you have depends on your computer's model and is shown on the box your computer came in.

2400 bps data modem with 9600 bps send fax and 4800 receive fax capabilities: This modem is GVC F-9424H/R1; it supports Class 1 fax commands.

14,400 bps data modem with 14,400 bps send and receive fax capability: This modem is GVC F-1114HV/R1 or /R6; it supports Class 2 fax commands and V.42bis.

note: *Some IBM Aptiva PCs in the U.S. and Canada, and some models in other countries, may have built-in modems with more features than the modems listed here. If you have one of these models, refer to the modem documentation that came with your computer.*

Operating your modem

You can operate your modem either through a modem communications software application or from your DOS prompt.

Most people use a communications software application to operate their modem. Examples of these software applications include Windows Terminal, PFS:Window-Works** Terminal, and Microsoft Works for Windows** Terminal. These applications allow you to operate your modem without using the Hayes** AT command set—the commands that modems understand. With these software applications, you operate your modem by choosing menu items from a screen on your computer. If you use a communications software application, see the user's guide that came with the software for detailed instructions on operating your modem.

note: *Most modem communication software applications also allow you to send specific AT commands to the modem.*

You can also send commands to your modem from the DOS (C:>) prompt. Operating your modem with DOS is difficult and generally for experienced modem users

only. With DOS, you must type long AT command strings and you may need to send a variety of commands for each transmission. Also, you are not always sure if your commands have been received and executed by the modem.

To communicate with a modem from DOS, use the ECHO command. Direct these commands to the port your modem is connected to. For example:

```
C:\ > echo ATSO=0&W0&W1>COM1 and press Enter.
```

This is an AT command that:

- Stores a 0 into S register 0 to turn Auto Answer off (ATS0=0). S registers are storage areas inside the modem. The S registers hold values that the command set uses to control modem operations. For more information on S registers, see page 33.
- The &W0&W1 portion of the command stores ATS0=0 into memory (NVRAM locations 0 and 1) for future use.
- The command is directed to the modem's port (>COM1).

Whether you use DOS or a modem communications software application, you can send a wide variety of commands to your modem. For a detailed listing of modem commands see page 29.

Tips on using your modem

This section provides tips on:

- Using the Auto Answer feature with your modem communications software
- Using the telephone with your modem

Using the Auto Answer feature

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

To start the Auto Answer feature from your communications software, use the command: `ATSO=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.

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: `ATSO=0`.

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

Your modem communications software determines how the modem operates with Auto Answer. Some fax applications 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.

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

Using the telephone with your modem

When using the telephone line for modem communications, do not pick up any telephone receiver on that line. If you do, communications will be interrupted.

Disabling Call Waiting

You may want to disable the Call Waiting feature 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 might 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 page 33.

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 fax software already installed, the fax software documentation was included in the box your computer came in.

How modems work

If you are having problems connecting to other modems, or are interested in learning more about how modems work, the information in this section can help you. This section discusses the modem connection process, data modems, connecting to other data modems, fax modems, and choosing fax software applications.

Modem connection process

For two modems to connect, they must be of the *exact same* type and function. A data modem can only connect to a data modem and a fax modem can only connect to a fax modem. Many modern modems are designed with both data and fax capabilities. The data components of these data/fax modems can communicate with data modems, and the fax components can communicate with fax modems.

The connection process is controlled by software built into the modem. This connection process is called a *protocol*. The protocol of one modem communicates with the protocol of another and they “negotiate” to achieve a connection. These protocols must be compatible for the modems to connect.

The result of this negotiation determines the speed at which the two modems connect. Normally a 14,400 bits per second (bps) modem connects with a 9,600 bps modem at the lower speed of 9,600. But, because of phone line noise, they may connect at 2,400 bps. If you use a modem communications software application (such as Windows Terminal, PFS:WindowWorks, or

Microsoft Works for Windows), you should see the final connection speed on the screen. This rate remains constant throughout the session.

Data modems

Data modems send and receive data in the form of codes that represent letters, numbers, and spaces. Each letter of a word is represented by a code. These codes are sent in a series with a different code representing a space between words. Special applications, like word processors, use additional code sequences to indicate font type, bold, italic, and so on.

You use the *Attention* command set (sometimes called the *AT* or *Hayes* command set) to send commands to your data modem. The AT command set has evolved over the years, and some of its “standards” have also changed. Modem default settings and the more sophisticated modem commands, in particular, have changed over time.

Modem protocols govern the way a modem converts digital information from the computer into analog signals that can be transmitted over the telephone lines. Over time, standards have been created for these protocols. These standards are necessary so that modems made by different companies can exchange data.

Primarily, modem standards and recommendations in the United States have been set by two organizations:

- The International Telephone and Telegraph Corporation set the “Bell” standards.
- The International Consultative Committee on Telephony and Telegraphy (CCITT) set the “V.” (Vee Dot) recommendations.

Data modems use these standards for speeds up to 14,400 bps:

- Bell 103
- Bell 212A
- CCITT V.21, V.22, V.22bis, V.23, V.32, and V.32bis

Many modems support all of these standards. Older modems may support some but not all of these standards.

Connecting to other data modems

Phone line noise can cause loss of data and connection when modem speeds rise above 1200 bps. Over time, many different software transmission protocols, such as X-modem, MNP, and V.42bis, have been developed solely to detect and correct the errors caused by phone line noise. Not all of these protocols are compatible. This may be the reason you are unable to connect to another modem.

If your data modem uses any error detection and correction protocol, the modem on the other end must also have the same protocol. For example, if your data modem uses X-modem (one of the early protocols), the modem you’re connecting to must also use X-modem. This is why you are asked to choose a transfer type in

your software before downloading a file from a bulletin board.

Many different error detection and correction protocols are commonly used today. Examples of the earliest error detection and correction protocols include X-modem, Y-modem, and Kermit. These protocols are performed by software on your computer.

Recently developed protocols include the Microcom Network Protocol (MNP) and V.42bis. These protocols are performed by “firmware.” Firmware is software built into the modem. V.42bis is the newer of these two protocols. It has its own methods of error detection and correction, and also incorporates the MNP 4 and 5 protocols. As a result, modems with MNP 4 and 5 and modems with V.42bis can connect with each other.

If you cannot connect to another modem, it may be because the protocol you are using is not compatible with the protocol of the modem on the other end. If you’re having trouble connecting to other modems, try following these guidelines.

- If you know what protocols are available on the modem you are connecting to, enable a protocol on your modem that is supported by the other modem. Usually V.42bis works best if both modems support it.
- If you frequently connect to bulletin boards, you should buy a modem communications software application that includes many different software protocols. Different bulletin boards use different protocols.

- Many network services have their own proprietary protocols. To connect to these services, you often have to buy the protocol from the service. Other network services rely on V.42bis or MNP 4 and 5.

Important:

All error detection and correction protocols compress data to avoid slowing the transmission rate. However, combining protocols will not increase your transmission speed or significantly reduce transmission errors. For example, running V.42bis and X-modem together will not give you a greater compression rate or transmission speed than running V.42bis alone. Use only one protocol.

Fax modems

Fax modems send and receive facsimiles and generally transmit and receive pictures better than text or other data. In a fax machine, a page is “read” by a scanner and broken into a series of dots representing light and dark portions of the page. These dots compose the pictures, graphics, letters, and numbers printed by the fax machine.

Important:

The scan rate option in your fax software determines the size of a fax and how much time it takes to transmit the file.

The fax machine scans a page line-by-line and records the number and position of each dot in a scan line. This information is converted into a special code and transmitted to another computer or fax machine. This transmission uses a set of transfer and modulation specifications called protocols.

Fax machines and modems are connected in *Groups*. The Group a fax machine belongs to indicates its speed and level of technological advancement. The original fax machines were Group 1 machines. These are the slowest machines and are almost obsolete today. Faster Group 2 fax machines replaced the Group 1 machines. Most fax machines sold today are Group 3 machines.

Generally, a Group 3 fax machine can connect most efficiently to another Group 3 machine and may also be able to connect to many Group 2 machines. However, a Group 2 machine cannot connect to a Group 3 machine. The modem in your computer works with most Group 3 and Group 2 fax machines.

Choosing fax software applications

If your computer did not come with preinstalled fax software, you must buy a fax software application to operate your fax modem. Also, if you add a fax modem to your computer, you need to purchase fax software.

You send commands to a fax modem (or the fax portion of a data modem) using a revised version of the AT command set. This revised version includes two different sets of commands: *Class 1* and *Class 2*. Some modems support one class of command while others support both. When buying a fax software application, choose the highest class that your modem supports.

note:

CAS and SENDFAX are two other commonly used command sets. These command sets are not supported by the built-in modems in IBM Aptiva PCs.

- If your computer has a 2400 bps built-in modem with 9600 bps send fax and 4800 receive fax capabilities, your modem supports Class 1 fax commands.
- If your computer has a 14,400 bps built-in modem with 14,400 bps send and receive fax capabilities, your modem supports Class 2 fax commands.

Communications settings

The built-in modems in IBM Aptiva PCs are preset to COM1 SERIAL PORT 1. The addresses and interrupts supported by your computer are:

| | Address | Interrupt |
|------|---------|-----------|
| COM1 | 3F8 | IRQ 4 |
| COM2 | 2F8 | IRQ 3 |
| COM3 | 3E8 | IRQ 4 |
| COM4 | 2E8 | IRQ 3 |

The built-in external serial ports on the back of your computer support these addresses and interrupts.

| Port | Address | Interrupt |
|----------|---------|-----------|
| Serial A | 3F8 | IRQ 4 |
| | 3E8 | |
| Serial B | 2F8 | IRQ 3 |
| | 2E8 | |

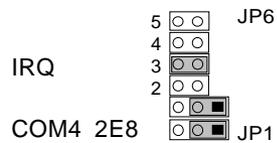
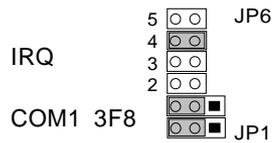
Conflicts may arise if you add adapter cards with serial ports or if you change the address settings on your modem. You can resolve most of these conflicts by using the Configuration/Setup Utility to change serial port addresses. See "Working with the Configuration/Setup Utility" on page 61 for more information.

Changing modem addresses

The modem address in your communications software must match the address setting on your modem. For example, if the modem address in the software is COM1 3F8, the DIP switches or jumpers on your modem must also be set for COM1 3F8. Help messages in your modem software will help you change your software address. The information below will help you set the DIP switches or jumpers on your modem correctly.

To change the hardware address settings on a built-in 14,400 bps data modem, locate the six DIP switches on the modem bracket on the back of the computer. Use the chart printed on the modem bracket to set the DIP switches for the correct address.

To change the hardware address settings on a built-in 2400 bps data modem, you must reset jumpers on the modem. To access the modem jumpers, remove the cover from the computer. To remove the cover, see page 79. The illustration shows how you should set the jumpers for each address.



Modem commands

Table 3 lists the modem commands you are likely to use most often. The built-in modems are compatible with the Hayes AT command set. All commands in this table must be preceded by the letters AT unless otherwise indicated. Not all of the AT commands are listed here.

For example, locate Ds in the Code/Command column of Table 3. To tell your modem to dial a telephone number using touch-tone dialing, type ATDT followed by the telephone number and then press Enter. The complete command might look like this: ATDT5554242. To dial the same telephone number using pulse dialing, you would type ATDP5554242. Spaces are not required in the commands unless otherwise indicated.

Table 3: Modem commands

| Code/Command | Function |
|--------------|---|
| AT | Begins the command line. The modem is ready to accept a command. |
| A/ | Repeats the last command given, if it is not preceded by AT or followed by a carriage return. |
| A | Answers the call immediately. |
| Ds | The modem automatically dials a telephone number "s" where "s" is a complete telephone number. The command may also include the following codes: s=P Pulse dialing s=R Dial an "originate-only" modem s=T Touch-tone dialing s=, Pause while dialing s=@ Wait 30 seconds for a valid ringback followed by 5 seconds silence before next symbol s=; Return to command state after dialing s=! Go off-hook 0.5 seconds s=W Wait for dial tone |
| Ds=n | Dials one of four stored telephone numbers. |
| En | Sets Echo on or off n=0 Echo off n=1 Echo on |
| Hn | On/Off hook n=0 On hook n=1 Off hook |

Table 3: Modem commands (Continued)

| Code/Command | Function |
|--------------|--|
| Ln | Sets the volume of the speaker on the modem n=0 Low volume n=1 Low volume n=2 Medium volume n=3 High volume |
| Mn | Controls when the modem speaker is in use n=0 Speaker off n=1 Speaker is on except when receiving n=2 Speaker on n=3 Speaker is off when dialing or receiving |
| On | Online n=0 Go online n=1 Retrain at 2400 bps |
| Qn | Sends result codes n=0 Result codes sent n=1 Result codes not sent |
| Vn | Determines whether the result code is sent as numbers or words. n=0 Result code is sent as numbers n=1 Result code is sent as words |
| Xn | Sets the type of result code sent n=0 Basic result code sent (0 to 4) n=1 Extended result code sent (0 to 5, and 10) n=2 Extended result code sent (0 to 6, and 10) n=3 Extended result code sent (0 to 7, and 10) n=4 Whole result code sent (0 to 10) |
| Z | Resets the modem to the defaults |
| Z0 | Recalls modem profile 1 |
| Z1 | Recalls modem profile 2 |
| &Zn= | Stores up to four telephone numbers in the modem's memory |

Table 3: Modem commands (Continued)

| Code/Command | Function |
|--------------|--|
| &V | The modem answers with the active profile and the phone numbers stored in NVRAM |
| &W0 | Saves the current register setting as profile 1 |
| &W1 | Saves the current register setting as profile 2 |
| &F&W0&W1 | Returns a modem profile to the original factory setting |
| +++ | Escape sequence Return to command state |
| +FCLASS=? | Shows which class of fax commands the modem supports. If the modem answers: 0,1 it supports Class 1 commands 0,1,2 it supports Class 1 or Class 2 commands 0,2 it supports Class 2 commands |

Modem return codes

The following table lists some codes that the modem sends to your computer in response to the commands you type. They are called return codes. Not all of the return codes are listed here.

Table 4: Return 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 | Ringing 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 |
| 5 | Connect 1200 | Connected at 1200 bps |
| 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 |
| 10 | Connect 2400 | Connected at 2400 bps |
| | WORD FORM | Preceded and terminated by CR LF |

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. Not all of the S registers are listed here.

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.

Table 5: 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 | 0-127 /ASCII | 43 |
| S3 | Carriage return character | 0-127 /ASCII | 13 |
| S4 | Line feed character | 0-127 /ASCII | 10 |
| S5 | Backspace character | 0-32, 127 /ASCII | 8 |
| S6 | Dial tone wait time | 0-255 /seconds | 2 |
| S7 | Remote carrier wait time | 1-255 /seconds | 45 |
| S8 | Comma pause time | 0-255 /seconds | 2 |

Table 5: S registers (Continued)

| Register | Function | Range/units | Default |
|----------|--|---------------------------|---------|
| S9 | Carrier detect response time | 0-255 /10ths of a second | 6 |
| S10 | Carrier loss time | 0-255 /10ths of a second | 14 |
| S11 | Touch-tone dialing speed | 50-255 /milliseconds | 95 |
| S12 | Escape character detect time | 0-25 /50ths of a second | 50 |
| S13 | Reserved (Do not use) | | None |
| S14 | Echo, response, dialing, originate/answer | Bit-mapped register | None |
| S15 | Reserved (Do not use) | | None |
| S16 | RDL, Clear-Down, Retrain Response | Bit-mapped register | None |
| S17 | Reserved (Do not use) | | None |
| S18 | Modem test timer | 0-255 /seconds | 0 |
| S19 | Reserved (Do not use) | | None |
| S20 | Reserved (Do not use) | | None |
| S21 | Originate-only, line, DTR, DCD, DSR, and Long Space Disconnect | Bit-mapped register | None |
| S22 | Speaker, M/B ratio and response | Bit-mapped register | None |
| S23 | DTE data rate, parity, and guard tone | Bit-mapped register | None |
| S24 | Reserved (Do not use) | | None |
| S25 | Data Terminal Ready delay | 0-100 seconds | 5 |
| S26 | RTS to CTS delay interval | 0-255 /100ths of a second | 1 |
| S27 | Async/Sync operation, clock source, DCE speed | Bit-mapped register | None |
| S28 | Power-on connect, call-back security, CCITT/Bell mode | | None |

Modem regulations

FCC and telephone company requirements

If your IBM Aptiva Personal Computer has a built-in modem, the following Federal Communications Commission (FCC) and telephone company requirements apply:

1. The modem adapter card is located in the back of the system unit. It complies with Part 68 of the FCC rules. A label is affixed to the built-in modem that contains, among other things, the FCC registration number, USOC, and Ringer Equivalency Number (REN) for this equipment. If these numbers are requested, slide the top cover forward to see the label, and provide this information to your telephone company.
2. The REN is useful to determine the quantity of devices you may connect to your telephone line and still have those devices ring when your number is called. In most, but not all areas, the sum of the RENs of all devices should not exceed five (5.0). To be certain of the number of devices you may connect to your line, as determined by the REN, you should call your local telephone company to determine the maximum REN for your calling area.
3. If the built-in modem causes harm to the telephone network, the telephone company may discontinue your service temporarily. If possible, they will notify you in advance; if advance notice isn't practical, you will be notified as soon as possible. You will be advised of your right to file a complaint with the FCC.
4. Your telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the proper operation of your equipment. If they do, you will be given advance notice so as to give you an opportunity to maintain uninterrupted service.
5. If you experience trouble with this built-in modem, contact your Authorized Seller, or the Product Support Center – Aptiva PC, IBM Corporation, Dept. BM3/Bldg. 201, Research Triangle Park, NC 27709-2195, 1-800-765-4747, Fax (919) 543-8716 for repair/warranty information. The telephone company may ask you to disconnect this equipment from the network until the problem has been corrected, or until you are sure the equipment is not malfunctioning.
6. No customer repairs are possible to the modem.
7. The modem may not be used on coin service provided by the telephone company. Connection to party lines is subject to state tariffs. Contact your state public utility commission or corporation commission for information.
8. When ordering network interface (NI) service from the Local Exchange Carrier, specify service arrangement USOC RJ11C.

Canadian Department of Communications compliance statement

This equipment does not exceed Class B limits per radio noise emissions for digital apparatus, set out in the Radio Interference Regulation of the Canadian Department of Communications.

Avis de conformité aux normes du Ministère des Communications du Canada

Cet équipement ne dépasse pas les limites de Classe B d'émission de bruits radioélectriques pour les appareils numériques, telles que prescrites par le Règlement sur le brouillage radioélectrique établi par le ministère des Communications du Canada.

Canadian Department of Communications certification label

Notice: The Canadian Department of Communications label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational and safety requirements. The Department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the company's inside wiring associated with a single line individual service may be extended by means of a certified connector assembly (telephone extension cord). The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

CAUTION:

Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

Étiquette d'homologation du Ministère des Communications du Canada

AVIS: L'étiquette du ministère des Communications du Canada identifie le matériel homologué. Cette étiquette certifie que le matériel est conforme à certaines normes de protection, d'exploitation et de sécurité des réseaux de télécommunications. Le ministère n'assure toutefois pas que le matériel fonctionnera à la satisfaction de l'utilisateur.

Avant d'installer ce matériel, l'utilisateur doit s'assurer qu'il est permis de le raccorder aux installations de l'entreprise locale de télécommunications. Le matériel doit également être installé en suivant une méthode acceptée de raccordement. L'abonné ne doit pas oublier qu'il est possible que la conformité aux conditions énoncées ci-dessus n'empêchent pas la dégradation du service dans certaines situations.

Les réparations de matériel homologué doivent être effectuées par un centre d'entretien canadien autorisé désigné par le fournisseur. La compagnie de télécommunications peut demander à l'utilisateur de débrancher un appareil à la suite de réparations ou de modifications effectuées par l'utilisateur ou à cause d'un mauvais fonctionnement.

Pour sa propre protection, l'utilisateur doit s'assurer que tous les fils de mise à la terre de la source d'énergie électrique, des lignes téléphoniques et des canalisations d'eau métalliques, s'il y en a, sont raccordés ensemble. Cette précaution est particulièrement importante dans les régions rurales.

CAUTION:

L'utilisateur ne doit pas tenter de faire ces raccordements lui-même, il doit avoir recours à un service d'inspection des installations électriques ou à un électricien, selon le cas.

LOAD NUMBER (LN)

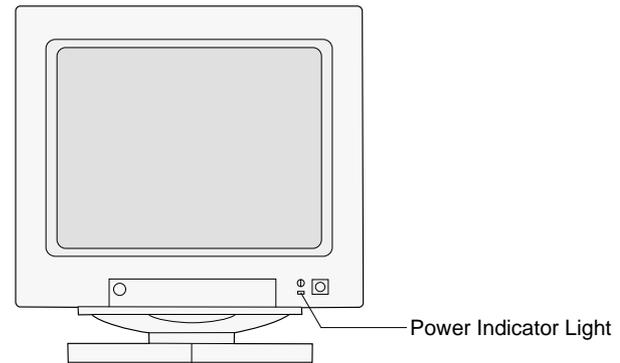
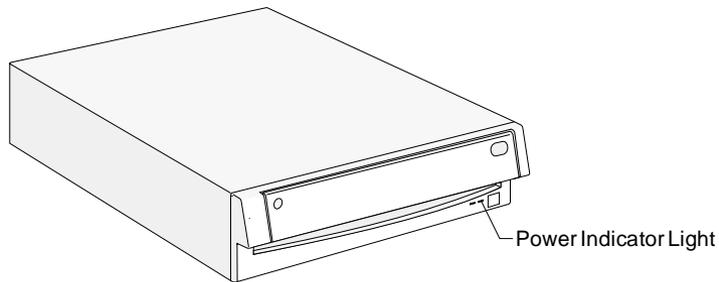
The load number (LN) assigned to each terminal device denotes the percentage of the total load to be connected to a telephone loop which is used by the device, to prevent overloading. The termination on a loop may consist of any combination of devices subject only to the requirement that the total of the load of all the devices does not exceed 100. The load number of the built-in modem is 10.

INDICE DE CHARGE (IC)

L'INDICE DE CHARGE (IC) assigné à chaque dispositif terminal indique, pour éviter toute surcharge, le pourcentage de la charge totale qui peut être raccordé à un circuit téléphonique bouclé utilisé par ce dispositif. L'extrémité du circuit bouclé peut consister en n'importe quelle combinaison de dispositifs pourvu que la somme des INDICES DE CHARGE de l'ensemble des dispositifs ne dépasse pas 100. L'indice de charge du modem intégré est de 10.

Problem solving steps

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



Note: The locations of the power indicator lights may be different than those shown in these pictures.

Yes

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

No

- Press the on/off buttons on the system unit and monitor to make sure they are turned on.
- 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. Your *Read Me First* booklet shows how the cables and cords should be connected.
- Make sure the electrical outlets you are using are not controlled by a wall or dimmer switch.
- 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, check your *Services and Support Guide* for information on obtaining service.

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

Yes, more than once

There is a problem with the system unit. If an error code:

- *Is displayed*, find the code in “Error codes, descriptions, and corrective actions” on page 52, and take the action listed.
 - *Is not displayed*, check your *Services and Support Guide* for information on obtaining service.
-

Yes, once

The system unit has passed the power-on self test (POST). Go to Step 3.

No

There is a problem with the system unit.

- a. If you added hardware, remove it and restart the computer to see if the problem is corrected. If the problem is corrected, you may have installed your hardware incorrectly. Reinstall your hardware. For instructions on installing hardware in your system unit, see “Working with your system unit” on page 79. For instructions on installing options on your system board, see “Working with your system board” on page 99.
- b. Check that memory modules are installed correctly. For instructions, see “Working with your system board” on page 99.

If the problem continues, check your *Services and Support Guide* for information on obtaining service.

Step 3 Is anything displayed on the monitor?

Yes

There is a problem with the system unit if:

- A three or four digit error code appears. Find the code in “Error codes, descriptions, and corrective actions” on page 52, and take the action listed.
- A box containing an error code and message appears. Follow the instructions in the message. For instructions on using the Configuration/Setup Utility, see page 61.
- A blinking cursor appears. Check your *Services and Support Guide* for information on obtaining service.
- The image on the screen is unreadable (the image is scrolling, blinking, or flashing). Follow these steps:
 - a. You may have selected a Monitor Horizontal Frequency setting that your monitor does not support. Follow the steps under “Monitor Horizontal Frequency” on page 9 to select another setting.
 - b. Complete these steps to reset your computer:
 1. Disable the Power-on Password option in the Security feature of the Configuration/Setup Utility.
 2. Record any Configuration settings that you have changed (customized) from the default settings (for example, Monitor Horizontal Frequency). You will have to re-enter these later. For instructions on using the Configuration/Setup Utility, see page 61.
 3. Turn off the system unit. Reset your computer by holding down both mouse buttons while you turn on the system unit. Release the mouse buttons when something appears on your screen.

Note: Resetting your computer changes all of the settings in the Configuration/Setup Utility to the factory defaults. After resetting your computer, re-enter any customized settings in the Configuration/Setup Utility.

- The colors displayed are wrong. Check to make sure the monitor cable is correctly and securely connected to the system unit. Your *Read Me First* booklet shows how the cable should be connected.
- Nothing happens when you use the mouse or keyboard.
 - 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 to help you: 

The mouse port has this symbol next to it to help you: 

- b. Turn the system unit off, and then turn it on again.

If the problem you are having does not appear in this list, look for a description of the problem in the troubleshooting tables that begin on page 42.

No

There is a problem with the monitor.

- a. Make sure your monitor cables are correctly and securely connected. Your *Read Me First* booklet shows how the cables should be connected.
- b. Adjust the brightness and contrast controls. For instructions, see “Adjusting monitor controls” on page 4.

If the problem continues, check your *Services and Support Guide* for information on obtaining service.

Troubleshooting tables

Table 6: Troubleshooting: Hardware problems

| If the problem is: | Here's what to do: |
|--|--|
| No beep during power-on self test (POST) | Make sure that the system unit is turned on. |
| Error code (and description), more than one beep in self-test, or continuous beep occurs | <p>If an error code:</p> <ul style="list-style-type: none"> • <i>Is displayed</i>, find the code in “Error codes, descriptions, and corrective actions” on page 52 and take the action listed. • <i>Is not displayed</i>, check your <i>Services and Support Guide</i> for information on obtaining service. |
| Computer turns off without warning | <ol style="list-style-type: none"> 1. If you have enabled the Standby feature, move the mouse to exit Standby. 2. If you have enabled the Rapid Resume feature and set up the Automatic Power Off option, or set the Scheduler feature to turn the system unit off, turn the system unit back on. 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 on/off button on the system unit. |
| 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. The keyboard port has this symbol next to it to help you:  3. If you have forgotten your password, check your <i>Services and Support Guide</i> for information on obtaining service. |
| <p>Note: If any of these problems continue after taking the actions listed, check your <i>Services and Support Guide</i> for information on obtaining service.</p> | |

Table 6: Troubleshooting: Hardware problems (Continued)

| If the problem is: | Here's what to do: |
|--|---|
| 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 page 79. |
| Can't send information (write) to diskette | <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 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 page 79. |
| 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 page 79. |
| 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. Make sure you are using a screen that allows typing. Some screens do not. 4. Turn the system unit off, wait 10 seconds, and then turn the system unit on again. |
| <p>Note: If any of these problems continue after taking the actions listed, check your <i>Services and Support Guide</i> for information on obtaining service.</p> | |

Table 6: Troubleshooting: Hardware problems (Continued)

| If the problem is: | Here's what to do: |
|--|---|
| <p>Mouse does not move the cursor</p> | <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. For instructions, select the Learning Library icon in Program Manager to see the <i>Computer Basics</i> tutorial that came on your system. 5. Turn the system unit off, wait 10 seconds, and then turn the system unit on again. |
| <p>Modem/communications errors</p> | <ol style="list-style-type: none"> 1. Make sure the telephone cord is securely plugged into the telephone outlet in the wall and into the system unit. Your <i>Read Me First</i> booklet shows how the cord should be 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 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. 4. Make sure no one is using the telephone while you are communicating with another computer. 5. 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. 6. Make sure your modem cord is connected to an analog telephone line. For additional help, see "Modem information" on page 19. 7. Make sure the modem adapter card is installed correctly. For instructions on installing adapter cards, see "Working with your system unit" on page 79. |
| <p>Note: If any of these problems continue after taking the actions listed, check your <i>Services and Support Guide</i> for information on obtaining service.</p> | |

Table 6: Troubleshooting: Hardware problems (Continued)

| If the problem is: | Here's what to do: |
|--|---|
| <p>When the computer is turned on, a picture appears indicating a diskette should be inserted into drive A</p> | <ol style="list-style-type: none"> 1. Choose Start Options from the Configuration/Setup Utility main menu, and make sure that Startup devices are 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 page 79. 3. Insert the Recovery diskette into drive A, and press F1. The Recovery diskette is the one that you were instructed to create in First Steps. Follow the instructions on your screen to restore the operating system files to your computer's hard disk. 4. If you are not able to restore the operating system files to your computer's hard disk or if you did not make a Recovery diskette, check your <i>Services and Support Guide</i> for information on obtaining service. |
| <p>Printer error</p> | <ol style="list-style-type: none"> 1. 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:  2. Make sure the printer power cord is securely connected to an electrical outlet. 3. Make sure the printer is ready for printing. (If the Ready light is on, but not flashing, the printer is ready.) 4. Make sure the correct printer driver is selected in the software, if required. For instructions on selecting a printer driver, see "Installing a printer driver" on page 15. 5. Make sure the paper and the cartridge containing the print material (ink, ribbon, or toner) are loaded correctly. 6. Turn the printer and system unit off, and wait 10 seconds. Now turn the printer on <i>first</i>, and then the system unit. 7. Make sure the Parallel Port option is not set to "Disabled" in the Devices and I/O Ports feature of the Configuration/Setup Utility. 8. Make sure the Parallel Port Mode option is set to "Standard" in the Devices and I/O Ports feature of the Configuration/Setup Utility. 9. For additional help, see the user's guide that came with the printer. |
| <p>Note: If any of these problems continue after taking the actions listed, check your <i>Services and Support Guide</i> for information on obtaining service.</p> | |

Table 7: Troubleshooting: Software problems

| If the problem is: | Here's what to do: |
|--|---|
| Computer automatically turns off instead of entering Standby. | Make sure the Standby timer is set to a shorter period of time than the Automatic Power Off timer. |
| You hear 3 beeps when you turn the computer off. | Sometimes installing new software changes your AUTOEXEC.BAT file. If you installed new software, make sure the following line is still in the AUTOEXEC.BAT file, and "REM" does not appear at the beginning of the line: C:\PS1TOOLS\PS1PFILE |
| You turn on the computer to resume where you left off. When the computer enters Windows, it restarts on its own. | EMM386 or an upper memory manager program may not be set up properly. Rename the CONFIG.SYS file in the Root (C:\) directory (do not delete it), and use the CONFIG.SYS file in the C:\ DOS directory by copying it to the Root (C:\) directory. Turn the system unit off, and then turn it on again. |
| 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 an application 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 Automatic Power Off option is enabled in Rapid Resume or on the Rapid Resume menu of the Configuration/Setup Utility. For instructions on using the Configuration/Setup Utility, see page 61. |
| POST error occurs when you turn on the computer to resume where you left off. | <ol style="list-style-type: none"> 1. Turn the system unit off, wait 10 seconds, and then turn the system unit on again. 2. If you have changed your hardware (installed or removed an option), return it to its previous configuration. Try starting the computer again. If the error is corrected, save any work that you want to keep and disable Rapid Resume. Reinstall your hardware. For instructions on installing options in your system unit, see "Working with your system unit" on page 79. For instructions on installing options on your system board, see "Working with your system board" on page 99. |
| <p>Note: If any of these problems continue after taking the actions listed, check your <i>Services and Support Guide</i> for information on obtaining service.</p> | |

Table 7: Troubleshooting: Software problems (Continued)

| If the problem is: | Here's what to do: |
|---|---|
| The Rapid Resume Features screen does not appear in the Configuration/Setup Utility and the Rapid Resume Manager icon does not appear in Windows. | Check your <i>Services and Support Guide</i> for information on obtaining service. |
| When you turn the computer on, the Windows desktop is not as you left it when you turned the computer off. | <ol style="list-style-type: none"> 1. Make sure another person hasn't used the computer and changed the Windows desktop. 2. Check that Rapid Resume is enabled. 3. If you are using Windows, choose Rapid Resume from the Configuration/ Setup Utility main menu, and make sure that the APM BIOS Mode option is set to "32 Bit Protected". If you are using OS/2 2.1 or a later version, make sure that the APM BIOS Mode option is set to "16 Bit Protected". 4. Check that "POWER.EXE" is in the CONFIG.SYS file (make sure "REM" does not appear in front of "POWER.EXE"). |
| Computer turns off without saving information. | <ol style="list-style-type: none"> 1. Check that Rapid Resume is enabled. 2. If you are using Windows, choose Rapid Resume from the Configuration/ Setup Utility main menu, and make sure that the APM BIOS Mode option is set to "32 Bit Protected". If you are using OS/2 2.1 or a later version, make sure that the APM BIOS Mode option is set to "16 Bit Protected". 3. Check that "POWER.EXE" is in the CONFIG.SYS file (make sure "REM" does not appear in front of "POWER.EXE"). 4. EMM386 or an upper memory manager program may not be set up properly. Rename the CONFIG.SYS file in the Root (C:\) directory (do not delete it), and use the CONFIG.SYS file in the C:\ DOS directory by copying it to the Root (C:\) directory. Turn the system unit off, and then turn it on again. |
| You pressed the on/off button on the system unit, but the computer has not turned off after 5 minutes. | Check your <i>Services and Support Guide</i> for information on obtaining service. |
| Application is not active when you turn the computer on to resume working. | Restart the application. Some applications will not operate correctly with Rapid Resume. |
| Note: If any of these problems continue after taking the actions listed, check your <i>Services and Support Guide</i> for information on obtaining service. | |

Table 7: Troubleshooting: Software problems (Continued)

| If the problem is: | Here's what to do: |
|--|--|
| Adapter cards don't work after you turn the computer on to resume working. | In the Rapid Resume menu of the Configuration/Setup Utility, make sure the Initialize Adapter Cards option is set to "Reload Device Drivers". Some adapter cards do not operate correctly with Rapid Resume. |
| Computer turns off or screen goes blank during activity (for example, when using a joystick or printing). | <ol style="list-style-type: none"> 1. Press the on/off button. 2. Increase the Automatic Power Off time. 3. Disable Rapid Resume and Standby during long periods of activity such as joystick use or printing. |
| You added hardware or installed new software and you want to cancel Rapid Resume and restart the computer. | Turn the monitor on, and then turn the system unit on. Press Ctrl + Alt + Delete when you see the Rapid Resume screen. There may be a slight delay before the computer restarts. |
| Problems using or connecting to networks after turning on the computer to resume working where you left off. | <ol style="list-style-type: none"> 1. Try reconnecting to your network drives. 2. Make sure network drivers, network start commands, and other network commands come before "RESUME.EXE" in the AUTOEXEC.BAT file. 3. Log off the network before turning off the computer. 4. Use the Standby feature for energy savings instead of Rapid Resume. |
| Computer shuts off without pressing the on/off button. | <ol style="list-style-type: none"> 1. In Rapid Resume Manager, check the Scheduler feature and the Automatic Power Off option of the Rapid Resume feature to see if either of them is set to turn the computer off. 2. Check to see if the Automatic Power Off feature is enabled on the Rapid Resume menu of the Configuration/Setup Utility. For instructions on using the Configuration/Setup Utility, see page 61. |
| You set the computer to start when the phone rings in order to receive a fax, but it receives a regular phone call instead. | <p>Either disable the Wake Up on Ring feature in Rapid Resume Manager or on the Rapid Resume menu of the Configuration/Setup Utility, or disable the Auto Answer feature in your fax software. Use Wake Up on Ring only when you know you will have incoming fax communications. For instructions on using the Configuration/Setup Utility, see page 61.</p> <p>You can also prevent this from occurring by installing a telephone line sharing device, which will direct calls where you specify (to either an answering machine or a fax modem).</p> |
| <p>Note: If any of these problems continue after taking the actions listed, check your <i>Services and Support Guide</i> for information on obtaining service.</p> | |

Table 7: Troubleshooting: Software problems (Continued)

| If the problem is: | Here's what to do: |
|--|---|
| Your computer turns on automatically when you dial out on a rotary or pulse telephone. | <p>Either disable the Wake Up on Ring feature in Rapid Resume Manager or on the Rapid Resume menu of the Configuration/Setup Utility, or disable the Auto Answer feature in your fax software. Use Wake Up on Ring only when you know you will have incoming fax communications. For instructions on using the Configuration/Setup Utility, see page 61.</p> <p>You can also prevent this from occurring by installing a telephone line sharing device, which will direct calls where you specify (to either an answering machine or a fax modem).</p> |
| The phone rings and the computer turns on, but a fax isn't received. | See the documentation that came with your fax software to make sure it is set up to answer the phone. |
| An error code appears after you turn your computer on using Rapid Resume. | <ol style="list-style-type: none"> 1. Turn the system unit off. 2. If you have: <ul style="list-style-type: none"> • <i>Not changed</i> your hardware (installed or removed an option), find the error code in "Error codes, descriptions, and corrective actions" on page 52 and take the action listed. • <i>Changed</i> your hardware (installed or removed an option), return the computer to its previous configuration. Then wait 10 seconds and turn the system unit on. If the error does not reoccur, you may have installed your hardware incorrectly. Save any work that you want to keep and reinstall your hardware. For instructions on installing hardware in your system unit, see "Working with your system unit" on page 79. For instructions on installing options on your system board, see "Working with your system board" on page 99. |
| <p>Note: If any of these problems continue after taking the actions listed, check your <i>Services and Support Guide</i> for information on obtaining service.</p> | |

Table 8: Troubleshooting: Monitor problems

| If the problem is: | Here's what to do: |
|---|---|
| Discolored screen | <ol style="list-style-type: none"> 1. Move the monitor away from any equipment that might cause magnetic interference; for example, other monitors, audio speakers, or microphones. (Some models of the computer come with microphones and speakers, which are shielded to prevent magnetic interference.) Turn the monitor off, wait 30 minutes, and then turn the monitor on again. 2. Select a new video device driver. |
| Picture shape on monitor screen is poor | Adjust the monitor controls. For instructions, see "Adjusting monitor controls" on page 4 if you are using a monitor that came packaged with your system unit. If you are using a monitor that you purchased separately, see the documentation that came with the monitor. |
| White screen | <ol style="list-style-type: none"> 1. Make sure the monitor cable is correctly and securely connected to the system unit. 2. Make sure the system unit and monitor power cords are securely plugged into electrical outlets. 3. Make sure the system unit and monitor are turned on. 4. If available, connect another monitor to your system unit. If the problem is corrected, something may be wrong with your monitor. |
| Flickering or unsteady picture on monitor screen | <ol style="list-style-type: none"> 1. Select lower resolution and color settings in Display Select. 2. If your monitor is located close to another monitor, move them farther apart. 3. Change the video device driver in your software application. |
| Screen is an intense yellow, magenta (purple or red-blue), or cyan (blue-green) color | Check your <i>Services and Support Guide</i> for information on obtaining service. |
| Adjustments from earlier use were not saved | You may have selected more user definable modes than the monitor can save. When this occurs, the newest mode replaces the oldest mode. Use the monitor controls to adjust the image for the display mode you are using. |
| Image control indicator lights on the monitor flash consecutively | Make sure the monitor cable is correctly and securely connected to the system unit. |
| Note: If any of these problems continue after taking the actions listed, check your <i>Services and Support Guide</i> for information on obtaining service. | |

Table 8: Troubleshooting: Monitor problems (Continued)

| If the problem is: | Here's what to do: |
|--|---|
| <p>Any of the following:</p> <ul style="list-style-type: none"> • Totally blank screen • No cursor displayed • Only the cursor is displayed • Screen is unreadable • Other monitor problems | <ol style="list-style-type: none"> 1. If you have enabled the Standby feature, press any key or move the mouse to exit Standby. 2. If you have enabled the Rapid Resume feature and set up the Automatic Power Off option, turn the system unit back on. 3. Make sure the monitor cable is correctly and securely connected to the system unit. 4. Make sure the system unit and monitor power cords are securely plugged into electrical outlets. 5. Make sure the system unit and monitor are turned on. (The power indicator lights on the system unit and the monitor are lit when they are on.) 6. Adjust the monitor controls. 7. Change the background colors in your software application or try using a different software application. 8. 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 on/off button on the system unit. |
| <p>Note: If any of these problems continue after taking the actions listed, check your <i>Services and Support Guide</i> for information on obtaining service.</p> | |

Error codes, descriptions, and corrective actions

Table 9: Error codes, descriptions, and corrective actions

| Error Code | Description | Here's what to do: |
|---|---|--|
| 10X 129 15X 17X 18X | System Board Error | Turn the system unit off, wait 10 seconds, and then turn the system unit on again. |
| 110 | System Board Parity Error | <ol style="list-style-type: none">1. A memory module (SIMM) has failed. Make sure SIMMs are inserted correctly. For instructions on inserting SIMMs, see "Installing and removing memory modules" on page 102.2. Turn the system unit off, wait 10 seconds, and then turn the system unit on again. |
| 111 114 | I/O Channel Parity Error Adapter ROM Error | <ol style="list-style-type: none">1. Make sure all adapter cards are installed correctly. For instructions on installing adapter cards, see "Working with your system unit" on page 79.2. Turn the system unit off, wait 10 seconds, and then turn the system unit on again. |
| 161 | Bad CMOS Battery | Make sure the battery is installed correctly. If the error continues, install a new battery. For instructions on installing the battery, see "Replacing the battery" on page 106. |
| Notes: <ol style="list-style-type: none">1. An X shown as part of the error code in this table represents any number between 0 and 9.2. If any of these errors continue after taking the actions listed, check your <i>Services and Support Guide</i> for information on obtaining service. | | |

Table 9: Error codes, descriptions, and corrective actions (Continued)

| Error Code | Description | Here's what to do: |
|--|--|--|
| 162 | Configuration Error Configuration Change Has Occurred | <p>Here's what to do:</p> <ul style="list-style-type: none"> • If you are using Rapid Resume, complete the following steps: <ul style="list-style-type: none"> - If you <i>have not changed</i> your hardware (installed or removed an option), check your <i>Services and Support Guide</i> for information on obtaining service. <i>Note: Any work that you did not save before the computer was turned off cannot be retrieved.</i> - If you <i>have changed</i> your hardware (installed or removed an option), press the on/off button on the system unit to turn it off. Return the hardware to its previous configuration, wait 10 seconds, and then turn the system unit on again. If the error does not reoccur, save any work that you want to keep and reinstall your hardware. If the error occurs again, check your <i>Services and Support Guide</i> for information on obtaining service. • If you are <i>not</i> using Rapid Resume: <ul style="list-style-type: none"> - Press Enter while the error message is displayed to start the Configuration/Setup Utility. Look through the Configuration/Setup Utility and verify that the options with ► next to them were supposed to change. If so, choose Save Settings at the bottom of the Configuration/Setup Utility main menu and press Enter. Then exit the Configuration/Setup Utility. For more information on using the Configuration/Setup Utility, see page 61. If options changed that were not supposed to, check your <i>Services and Support Guide</i> for information on obtaining service. |
| 163 | Date and Time Incorrect | The clock module on the system board may not be set correctly. To set the correct date and time, press Enter while the error message is displayed to enter the Configuration/Setup Utility. For instructions on using the Configuration/Setup Utility, see page 61. |
| <p>Notes:</p> <ol style="list-style-type: none"> 1. An X shown as part of the error code in this table represents any number between 0 and 9. 2. If any of these errors continue after taking the actions listed, check your <i>Services and Support Guide</i> for information on obtaining service. | | |

Table 9: Error codes, descriptions, and corrective actions (Continued)

| Error Code | Description | Here's what to do: |
|--|------------------------------------|--|
| 164 | Memory Size Error | <p>1. If you added memory after Rapid Resume turned the computer off, press Enter while the error message is displayed to enter the Configuration/Setup Utility. Choose Save Settings at the bottom of the Configuration/Setup Utility main menu and press Enter. Then exit the Configuration/Setup Utility. You will lose any data that you did not save before the computer turned off.</p> <p>2. If you have removed memory from your computer, press Enter while the error message is displayed to enter the Configuration/Setup Utility. Choose System Summary View from the Configuration/Setup Utility main menu to verify that the new memory size is correct. For instructions on using the Configuration/Setup Utility, see page 61. If you have not removed memory from your computer, check your <i>Services and Support Guide</i> for information on obtaining service.</p> |
| 20X | Memory Error | <p>Make sure memory modules (SIMMs) are inserted correctly and completely. For instructions on inserting SIMMs, see "Installing and removing memory modules" on page 102.</p> |
| 30X | Keyboard Error | <p>1. Make sure the keyboard and mouse cables are correctly and securely connected to the ports on the back of the system unit.</p> <p>The keyboard port has this symbol next to it to help you: </p> <p>The mouse port has this symbol next to it to help you: </p> <p>2. Make sure that a keyboard key or a mouse button is not being held down.</p> |
| 60X, 662 | Diskette Drive Configuration Error | <p>If you removed a diskette drive, press Enter while the error message is displayed to enter the Configuration/Setup Utility. Choose Devices and I/O Ports from the Configuration/Setup Utility main menu and verify that the Diskette Drive settings are correct. If the settings are not correct, change the settings. For instructions on using the Configuration/Setup Utility, see page 61.</p> |
| <p>Notes:</p> <ol style="list-style-type: none"> 1. An X shown as part of the error code in this table represents any number between 0 and 9. 2. If any of these errors continue after taking the actions listed, check your <i>Services and Support Guide</i> for information on obtaining service. | | |

Table 9: Error codes, descriptions, and corrective actions (Continued)

| Error Code | Description | Here's what to do: |
|--|--------------------------------------|---|
| 762 | Math Coprocessor Configuration Error | Check your <i>Services and Support Guide</i> for information on obtaining service. |
| 962 | Parallel Port Configuration Error | If you changed a hardware option, press Enter while the error message is displayed to enter the Configuration/Setup Utility. Choose Devices and I/O Ports from the Configuration/Setup Utility main menu and verify that the Parallel Port setting is correct. If the setting is not correct, change the setting. For instructions on using the Configuration/Setup Utility, see page 61. |
| 1162 | Serial Port Configuration Error | If you changed a hardware option, press Enter while the error message is displayed to enter the Configuration/Setup Utility. Choose Devices and I/O Ports from the Configuration/Setup Utility main menu and verify that the Serial Port settings are correct. If the settings are not correct, change the settings. For instructions on using the Configuration/Setup Utility, see page 61. |
| 1762 | Hard Disk Configuration Error | <ol style="list-style-type: none"> 1. Make sure the cables to all drives are securely attached. 2. Press Enter while the error message is displayed to enter the Configuration/Setup Utility. Choose Devices and I/O Ports from the Configuration/Setup Utility main menu. Then choose IDE Drives Setup and make sure the settings for the drive options are correct. If the settings are not correct, change the settings. For instructions on using the Configuration/Setup Utility, see page 61. |
| <p>Notes:</p> <ol style="list-style-type: none"> 1. An X shown as part of the error code in this table represents any number between 0 and 9. 2. If any of these errors continue after taking the actions listed, check your <i>Services and Support Guide</i> for information on obtaining service. | | |

Table 9: Error codes, descriptions, and corrective actions (Continued)

| Error Code | Description | Here's what to do: |
|--|--|--|
| 1780 1781 1782 1783 | Drive 0 (Hard Disk) Error Drive 1 (Hard Disk) Error Drive 2 (Hard Disk) Error Drive 3 (Hard Disk) Error | Here's what to do: <ol style="list-style-type: none"> 1. Make sure the cables to all drives are securely attached. 2. Press Enter while the error message is displayed to enter the Configuration/Setup Utility. Choose System Summary View from the Configuration/Setup Utility main menu and verify that the Processor option's speed setting is correct. (Find the processor speed [in MHz] on the label attached to the front of your system unit.) If the setting is not correct, check your <i>Services and Support Guide</i> for information on obtaining service. 3. Make sure the hard disk signal cable is attached to the correct connector on the system board and the jumper settings on the hard disk are correct. For information about drive connectors and settings, see "Installing additional drives" on page 87. |
| 1800 | PCI Error (IRQ not available) | A PCI adapter card has requested a hardware interrupt that is not available. <ol style="list-style-type: none"> 1. Choose ISA Legacy Resources from the Configuration/Setup Utility main menu, and make sure the interrupt resources (IRQ) settings for ISA legacy adapter cards are correct. If the interrupt resources settings are not correct, change the settings. For instructions on using the Configuration/Setup Utility, see page 61. 2. If all interrupts are being used by ISA legacy adapter cards, you may need to remove an ISA card to make memory available to the PCI adapter card. For instructions on removing an adapter card, see page 84. |
| 1801 | PCI Error (ROM not available) | A PCI adapter card has requested memory resources that are not available. <ol style="list-style-type: none"> 1. Choose ISA Legacy Resources from the Configuration/Setup Utility main menu, and make sure the memory resources settings for ISA legacy adapter cards are correct. If the memory resources settings are not correct, change the settings. For instructions on using the Configuration/Setup Utility, see page 61. 2. If all memory resources are being used by ISA legacy adapter cards, you may need to remove an ISA card to make memory available to the PCI adapter card. For instructions on removing an adapter card, see page 84. |
| Notes: <ol style="list-style-type: none"> 1. An X shown as part of the error code in this table represents any number between 0 and 9. 2. If any of these errors continue after taking the actions listed, check your <i>Services and Support Guide</i> for information on obtaining service. | | |

Table 9: Error codes, descriptions, and corrective actions (Continued)

| Error Code | Description | Here's what to do: |
|--|--|--|
| 1802 | PCI Error (I/O address not available) | <p>A PCI adapter card has requested an I/O address that is not available, or the PCI adapter card may be defective.</p> <p>Choose ISA Legacy Resources from the Configuration/Setup Utility main menu, and make sure the I/O port resources settings for ISA legacy adapter cards are correct. If the I/O port resources settings are not correct, change the settings. For instructions on using the Configuration/Setup Utility, see page 61. If the I/O port resources settings are correct, the PCI adapter card may be defective.</p> |
| 1803 | PCI Error (memory above 1MB not available) | <p>A PCI adapter card has requested a memory address that is not available, or the PCI adapter card may be defective.</p> <p>Choose ISA Legacy Resources from the Configuration/Setup Utility main menu, and make sure the memory resources settings for ISA legacy adapter cards are correct. If the memory resources settings are not correct, change them. For instructions on using the Configuration/Setup Utility, see page 61. If the memory resources settings are correct, the PCI adapter card may be defective.</p> |
| 1804 | PCI Error (memory below 1MB not available) | <p>A PCI adapter card has requested a memory address that is not available.</p> <ol style="list-style-type: none"> 1. Choose ISA Legacy Resources from the Configuration/Setup Utility main menu, and make sure the memory resources settings for ISA legacy adapter cards are correct. If the settings are not correct, change the settings. For instructions on using the Configuration/Setup Utility, see page 61. 2. If all memory resources are being used by ISA legacy adapter cards, you may need to remove an ISA card to make memory available to the PCI adapter card. For instructions on removing an adapter card, see page 84. |
| 1805 | PCI Error (ROM error) | <ol style="list-style-type: none"> 1. Remove the PCI adapter card. For instructions on removing an adapter card, see page 84. 2. Restart the computer without the card installed. If the computer restarts without an error, reinstall the card and restart the computer again. For instructions on installing an adapter card, see page 84. If the error reoccurs, the adapter card may be defective. |
| <p>Notes:</p> <ol style="list-style-type: none"> 1. An X shown as part of the error code in this table represents any number between 0 and 9. 2. If any of these errors continue after taking the actions listed, check your <i>Services and Support Guide</i> for information on obtaining service. | | |

Table 9: Error codes, descriptions, and corrective actions (Continued)

| Error Code | Description | Here's what to do: |
|--|---------------------------|---|
| 1962 | Boot Sequence Error | <ol style="list-style-type: none"> 1. Choose Start Options from the Configuration/Setup Utility main menu, and make sure that Startup devices are set correctly. 2. Insert the Recovery diskette into drive A, and press F1. The Recovery diskette is the one that you were instructed to create in First Steps. Follow the instructions on your screen to restore the operating system files to your computer's hard disk. 3. If you are not able to restore the operating system files to your computer's hard disk or if you did not make a Recovery diskette, check your <i>Services and Support Guide</i> for information on obtaining service. |
| 24XX | Video Error | <ol style="list-style-type: none"> 1. Make sure the monitor cables are correctly and securely connected to the system unit. 2. If a video adapter card is installed, make sure it is installed correctly. For instructions, see the documentation that came with the adapter card. 3. If the error continues, remove the video adapter card. If removing the card corrects the error, replace the card with a new one. |
| 2462 | Video Configuration Error | <ol style="list-style-type: none"> 1. Make sure the monitor cables are correctly and securely connected to the system unit. 2. If a video adapter card is installed, press Enter while the error message is displayed to enter the Configuration/Setup Utility. Choose Save Settings at the bottom of the Configuration/Setup Utility main menu and press Enter. Then exit the Configuration/Setup Utility main menu. 3. Press Enter while the error message is displayed to enter the Configuration/Setup Utility. Choose System Summary View and Devices and I/O Ports from the Configuration/Setup Utility main menu to verify that the settings for the Video Controller, Video Memory, and Monitor Horizontal Frequency options are correct in the Configuration/Setup Utility. For instructions on using the Configuration/Setup Utility, see page 61. |
| <p>Notes:</p> <ol style="list-style-type: none"> 1. An X shown as part of the error code in this table represents any number between 0 and 9. 2. If any of these errors continue after taking the actions listed, check your <i>Services and Support Guide</i> for information on obtaining service. | | |

Table 9: Error codes, descriptions, and corrective actions (Continued)

| Error Code | Description | Here's what to do: |
|---|----------------------------|--|
| 5962 | CD-ROM Configuration Error | <p>1. Check that all CD-ROM drive cables are correctly and securely connected.</p> <p>2. If you added, removed, or moved any drives in your system unit, press Enter while the error message is displayed to enter the Configuration/Setup Utility. Choose the System Summary View feature from the Configuration/Setup Utility main menu to verify that only the options for the drives you changed have ► next to them. Return to the main menu, choose Save Settings and press Enter. Then exit the Configuration/Setup Utility and save the new configuration.</p> <p>If options changed that were not supposed to, check your <i>Services and Support Guide</i> for information on obtaining service.</p> |
| 86XX | Pointing Device Error | <p>1. Make sure the keyboard and mouse cables are correctly and securely connected to the ports on the back of the system unit.</p> <p>The keyboard port has this symbol next to it to help you: </p> <p>The mouse port has this symbol next to it to help you: </p> <p>2. Make sure that a keyboard key or a mouse button is not being held down.</p> |
| <p>Notes:</p> <p>1. An X shown as part of the error code in this table represents any number between 0 and 9.</p> <p>2. If any of these errors continue after taking the actions listed, check your <i>Services and Support Guide</i> for information on obtaining service.</p> | | |

Working with the Configuration/Setup Utility **5**

Using the Configuration/Setup Utility

The Configuration/Setup Utility lets you view and change important information about your computer and its hardware. You may need to use the Configuration/Setup Utility in these situations:

- If you add or replace a hardware option (such as a diskette drive, memory module, monitor, or adapter card), and you want to verify or make a change.
- To verify a change after removing a hardware option.
- If you get an error code and message.

You can also use the Configuration/Setup Utility to:

- Check the computer's hardware features. For example, you can use this program to check the amount of memory or the size of the hard disk in your computer.
- Change the computer's serial and parallel port settings, and the parallel port mode.
- Set up or change Power-on or Administrator passwords on your computer.
- Change the date and time on your computer.
- Reduce the amount of energy your computer uses by setting up the computer's Rapid Resume features.

Starting the Configuration/Setup Utility

The Configuration/Setup Utility opens with a main menu that lists the features of the utility. When you choose a feature from the main menu, the Configuration/Setup Utility displays screens that let you view information about how your computer is set up (called the *configuration*), or change certain information on your computer.

If Rapid Resume is enabled, you start the Configuration/Setup Utility with a different method than if Rapid Resume is not enabled. You can also start the utility any time you get an error code and description on your computer screen. The methods for starting the Configuration/Setup Utility are described in the following paragraphs.

When you get an error, your computer shows a *popup window* with an error code and description. Press Enter to get the Configuration/Setup Utility main menu.

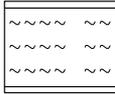
You can also start the Utility with this method:

1. If your monitor and system unit are turned:
 - a. *On*, save all open files and close all software applications. Turn off the system unit, and then turn the system unit on again.
 - b. *Off*, turn on your monitor, and then turn on your system unit. (*Steps continued on the next page.*)

2. If you are using Rapid Resume (Rapid Resume is enabled), press Ctrl + Alt + Delete.

If you are not using Rapid Resume, skip Step 2.

3. This symbol will appear on the screen.



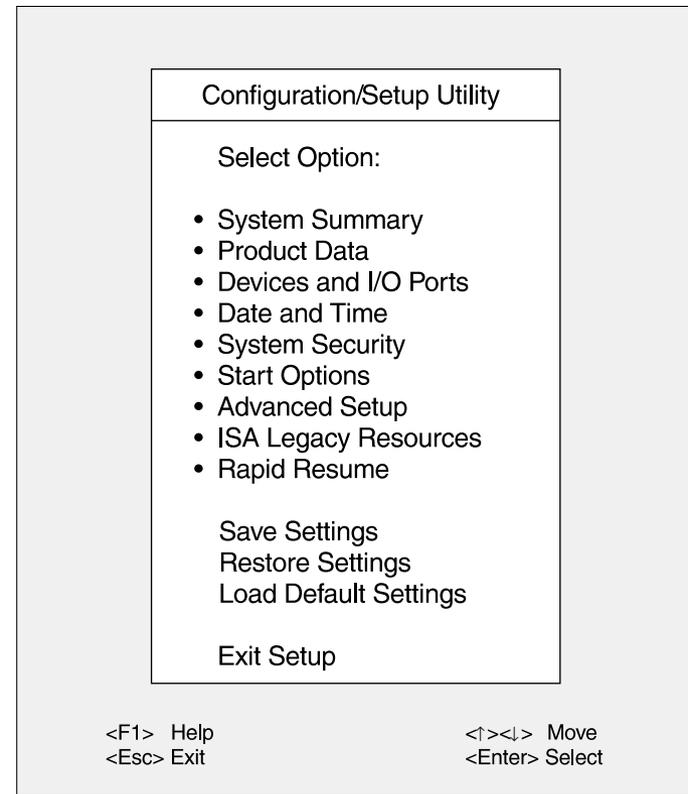
Press F1 while the symbol is displayed to get the Configuration/Setup Utility.

Making changes with the Configuration/Setup Utility

Read this section to learn how to choose a feature from the main menu. We also describe the keys you use to move through and make changes to the Configuration/Setup Utility screens and provide a step-by-step example of how to use the Configuration/Setup Utility.

The Configuration/Setup Utility main menu

The main menu appears when you start the Configuration/Setup Utility. The main menu lists all of the features of the Configuration/Setup Utility. (The main menu you see on your computer may look slightly different than the menu shown here, but will operate the same way.)



To choose a feature from the Configuration/Setup Utility main menu:

1. Press the down (↓) or up (↑) arrow key on the keyboard until the feature you want is highlighted.
2. Press Enter. One of the following will occur:
 - a. A screen will appear that allows you to view or change information.
 - b. Another menu will appear. Repeat steps 1 and 2 to view or change information.

You can only change some of the information that appears on the Configuration/Setup Utility screens. The information you can change is enclosed in brackets like this: []. You cannot change items that do not have brackets around them.

Working with Configuration/Setup Utility screens

You use keys on the keyboard to move through and make changes to the Configuration/Setup Utility screens. Here are the keys you can use.

| Keys | Function |
|-------|---|
| ↑ ↓ | Use these arrow keys to highlight a feature or option on the screen. (Press the Enter key to choose the feature or option.) |
| ← → | Use these arrow keys to make a selection and change an option. On some screens, you can use these keys to move from one field to another. |
| + | Use this key on some screens to increase the numerical value of a setting. |

| Keys | Function |
|-------|---|
| – | Use this key (the minus or hyphen key) on some screens to decrease the numerical value of a setting. |
| F1 | Press this key once if you want help for a selected menu item. Press this key twice for general information on using the Configuration/Setup Utility. |
| F9 | After you change a setting on a screen, press this key to change the setting back to its previous value. |
| F10 | Press this key to restore the settings on a screen to the factory defaults. |
| Esc | After viewing or making changes to a screen, press this key to exit the screen. |
| Enter | Press this key to choose a feature or option from a menu. |

The ► symbol on the screen shows you that an option has been changed.

Note: Not all of these keys are available on every screen. The keys that are available on each screen are displayed on the bottom of the screen.

Saving and restoring settings

After you make changes to a Configuration/Setup Utility screen, you will return to the main menu.

The main menu includes three options at the bottom of the screen: Save Settings, Restore Settings, and Load Default Settings.

If you choose:

- *Save Settings*, your changes will be saved
- *Restore Settings*, any options that were changed will revert to their previous values
- *Load Default Settings*, the Configuration/Setup Utility returns to the factory defaults (the original settings that were made at the factory)

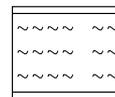
Example of using the Configuration/Setup Utility

To give you an idea of how to work with the Configuration/Setup Utility, the following example walks you step-by-step through the process of changing the time on the computer.

1. If your monitor and system unit are turned:
 - a. *On*, save all open files and close all software applications. Turn off the system unit, and then turn the system unit on again.
 - b. *Off*, turn on your monitor, and then turn on your system unit.
2. If you are using Rapid Resume (Rapid Resume is enabled), press Ctrl + Alt + Delete.

If you are not using Rapid Resume, skip Step 2.

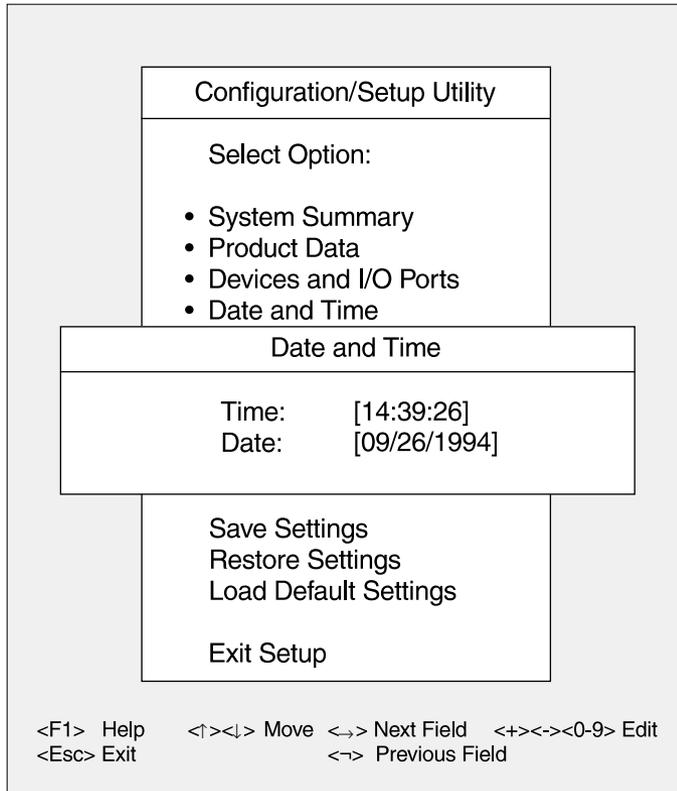
3. This symbol will appear on the screen.



Press F1 while the symbol is displayed to get the Configuration/Setup Utility.

4. When the main menu appears, press the down (↓) arrow key until Date and Time is highlighted. Then press Enter to display the Date and Time screen.

5. The Date and Time screen looks like this:



note:

When you enter the time in the Configuration/Setup Utility, use the 24-hour format. For example:

- 12 midnight is 00:00:00
- 12 noon is 12:00:00
- 1:30 p.m. is 13:30:00

The hour setting of the Time option should be highlighted when the Date and Time screen appears (the hour setting is 14 in the picture). If the

hour setting is not highlighted, use the arrow keys on the keyboard to highlight it.

To change the hours, press the + key to increase the hour setting, or the - (minus) key to decrease it.

6. Press the right arrow key (→) to move from the hour setting to the minute setting. Press the + key to increase the minute setting, or the - key to decrease it. (If necessary, use the same method to change the seconds.)

note:

On the Date and Time screen, you use the right and left arrow keys to move from one field to another. On other screens, you use these arrow keys to select a new setting. To determine which keys to use on each Configuration/Setup Utility screen, look at the bottom of each screen.

7. After you have entered the correct time, press the Esc key to exit the Date and Time screen.
8. The main menu will reappear. Press the down (↓) arrow key until Save Settings is highlighted. Then press Enter.
9. From the main menu, press the Esc key to exit the Configuration/Setup Utility.
10. When the Exit Setup menu appears, choose Yes, exit Setup and press Enter.

Now that you understand how to work with the Configuration/Setup Utility, read the rest of this chapter to learn about each of its features.

Features of the Configuration/Setup Utility

The Configuration/Setup Utility contains the following features, which you select from the main menu:

- System Summary
- Product Data
- Devices and I/O Ports
- Date and Time
- System Security
- Start Options
- Advanced Setup
- ISA Legacy Resources
- Rapid Resume

Each feature is described in the following pages.

System Summary

Use the System Summary feature to view information about the hardware installed on your computer. You cannot use this screen to change information. The Configuration/Setup Utility will automatically update this screen when you:

- Add or change an option on your computer
- Make changes to other screens in the Configuration/Setup Utility.

The System Summary screen contains information about the processor, system memory, video controller, cache memory, and the diskette and hard drives

installed on your system. This screen also shows if the mouse is installed.

Product Data

The Product Data feature shows information about your computer, including model and serial number, the flash EEPROM (electrically erasable, programmable read-only memory) revision level, and the BIOS (Basic Input/Output System) date. You cannot change any information that appears on this screen.

Devices and I/O Ports

The Devices and I/O Ports feature contains options relating to serial and parallel ports, the mouse, diskette drives, video (monitor) setup, and hard disks. The following paragraphs describe each of these options.

Serial Port Addresses (A or B). Your computer has two serial ports: Serial Port A and Serial Port B. Each serial port has a special address (identifying location) assigned to it. If you add adapter cards to your computer that have additional serial ports, you must make sure that each serial port has a different address.

If you change serial port addresses on the Devices and I/O Ports screen, you may also need to make changes to your software. For instructions on changing your software, see the user's guide or online information that came with the software.

Parallel Port. This option lets you change the parallel port address. Your computer has one parallel port with a special address (identifying location). If you add adapter cards to your computer that have additional parallel ports, you must make sure that each parallel port has a different address assigned to it.

If you change parallel ports on the Devices and I/O Ports screen, you may also need to make changes to your software. For instructions on changing your software, see the user's guide or online information that came with your software.

Parallel Port Mode. This option lets you choose either the Standard or Extended mode for a parallel port. You can increase the efficiency of your parallel port by using Extended modes with supporting hardware.

If you change the mode of a parallel port, you may need to make changes to the supported hardware and its software.

Parallel Port Extended Mode. This option is only available when you choose Extended as the parallel port mode. The Extended modes use recent technology and are only supported by newer hardware (such as a printer). The available Extended modes are:

- *Bidirectional*: This mode is used for data transfer to other PC systems and supported devices.
- *EPP*: The enhanced parallel port (EPP) mode is a high performance bidirectional mode.

- *ECP*: The extended capabilities port mode (ECP) provides higher speed data transfers than the Compatible mode. It is used for high-speed printers and other devices.
- *EPP and ECP*: This mode combines the capabilities of the ECP and EPP modes.

Mouse. This option allows you to enable or disable the mouse.

Diskette Drive (A: or B:). This option shows you an entry for each diskette drive on your computer. If you add or change a diskette drive, you must select the correct diskette drive type on the Devices and I/O Ports screen.

Video Setup

Choosing the Video Setup option on the Devices and I/O Ports screen displays the Video Setup screen. The Video Setup screen shows the amount of video memory installed on your computer and allows you to change your monitor's *refresh rates*. The refresh rate is the rate in hertz (Hz) at which the entire image is drawn on the screen.

You should change the refresh rates only if you attach a monitor to your computer that is different from the monitor that came with your computer. The options you can choose to change the monitor's refresh rates are Video Display Type, Monitor Horizontal Frequency, and Refresh Rate.

note:

Super VGA (SVGA) and multifrequency monitors can refresh the screen faster than other types of monitors. You must make sure the refresh rate is set correctly for your monitor.

Video Display Type. With this option, you can choose a predefined IBM monitor type (IBM 2110, IBM 2111, and so on), User Defined, or Custom.

If you have attached an IBM monitor that is in the list of predefined types, select that setting. This is the only setting you need to make. The refresh rates are set automatically by your computer.

If you attach a monitor that is not in the list of predefined types, choose User Defined as the Video Display Type. Then go to the Monitor Horizontal Frequency option and select your monitor's maximum horizontal frequency. These are the only settings you need to make.

You can also choose Custom as the Video Display Type when you attach a monitor that is not in the list of predefined types. Choosing Custom provides more flexibility than the User Defined setting because it allows you to choose a refresh rate for each resolution supported by your monitor.

Monitor Horizontal Frequency. This option is available only if you choose User Defined as the Video Display Type. This option automatically sets the refresh rates when you specify your monitor's *horizontal frequency*. Horizontal frequency is the rate in kilohertz (kHz) at which each line is drawn on the screen.

Select the frequency range that includes your monitor's maximum horizontal frequency. See the documentation that came with your monitor to determine your monitor's maximum horizontal frequency.

Refresh Rate (resolution). This option is available only if you choose Custom as the Video Display Type. When you select Custom as the Video Display Type, you can select a refresh rate for each *resolution* supported by your monitor.

The resolution is the size of the image on the screen expressed in picture elements or *pels* (for example, 800 x 600).

Before you select refresh rates, read the documentation that came with your monitor. The documentation should include the horizontal frequency and refresh rates that work best with your monitor. You can also experiment with different settings to find which settings produce the best image.

Warning!

Do not select a setting that exceeds the capabilities of your monitor. If you do, your monitor will not function properly. If this happens, turn off your system unit and restart the Configuration/Setup Utility.

IDE Drives Setup

Choosing the the IDE Drives Setup option on the Devices and I/O Ports screen displays the IDE Drives Setup screen. The IDE Drives Setup screen shows the size of the hard disks installed in your computer and allows you to choose the IDE Performance mode for your hard disks.

Your computer comes with one hard disk (Hard Disk 0) and a CD-ROM drive preinstalled. You can have a maximum of four IDE drives installed on your system.

The IDE Drives Setup screen lists four IDE drive selections:

- *Hard Disk 0* is attached to Local Bus connector 1 on the system board and set as the Master device. This is the hard disk that comes preinstalled with your computer.
- *Hard Disk 1* (if installed) is attached to Local Bus connector 1 on the system board and set as the Slave device.
- *Hard Disk 2* or *CD-ROM* is attached to Local Bus connector 2 on the system board and set as the Master device.
- *Hard Disk 3* (if installed) is attached to Local Bus connector 2 on the system board and set as the Slave device.

When you choose one of the four IDE drive selections from the IDE Drives Setup screen, the Hard Disk screen appears. This screen shows the size of the hard disk installed and allows you to choose the IDE Performance mode for each drive.

IDE Performance. This option lets you choose either the High Performance or Compatible mode for a hard disk. To get the best disk performance, it is recommended that you run IDE hard drives in High Performance mode.

Date and Time

The Date and Time feature lets you change the date and time on your computer.

Time and Date. Enter the time in 24-hour format (hours, minutes, seconds). For example:

- 12 midnight is 00:00:00
- 12 noon is 12:00:00
- 1 p.m. is 13:00:00

Enter the date in the format shown on the screen.

System Security

The System Security feature allows you to control access to disk drives and set or delete an *Administrator* and *Power-on* password. This feature includes the following options.

Secure Hard Disk Drives and Diskette Drives. This option lets you enable or disable the access to hard disks and diskette drives.

Power-on Password. This option lets you set a Power-on password to restrict the use of your computer. If you set a Power-on password, you must type this password each time your computer is turned on. If you do not type the correct password, you cannot use the computer. You can also choose to display or not display a password prompt.

Follow the instructions on the screen to set or delete a Power-on password. The Power-on password can be up to seven characters long (letters, numbers, or both). *Once you create your password, be sure to write it down and put it in a secure place.*

note: *The Power-on password does not appear on the screen when you type it.*

Administrator Password. This option lets you set an Administrator password to restrict the use of the Configuration/Setup Utility. If you set an Administrator password, you must enter this password each time you press the F1 (or Enter) key to start the Configuration/Setup utility. Entering the Administrator password allows you to view and change all features of the Configuration/Setup utility. You can also choose to display or not display a password prompt.

Follow the instructions on the screen to set or delete an Administrator password. The Administrator password can be up to seven characters long (letters, numbers, or both). *Once you create your password, be sure to write it down and put it in a secure place.*

note: *The Administrator password does not appear on the screen when you type it.*

When you set an Administrator password, you can also choose to have the Power-on password changeable by the user. This option is useful only when you set both an Administrator and a Power-on Password.

If you set an Administrator and a Power-on password, you can also start the Configuration/Setup utility by entering the Power-on password after you press the F1

(or Enter) key. However, the Power-on password will not grant you full access to the Configuration/Setup utility; only two or three features will appear in the main menu. These features are:

- System Summary (view only screen)
- Product Data (view only screen)
- Security (may not appear in main menu)

If you choose to have the Power-on password changeable by the user, the Security feature will be available to anyone starting the Configuration Utility with the Power-on password. The user will be able to change the Power-on password, but will not be able to change any other Security options.

note: *If you choose not to have the Power-on password changeable by the user, the Security feature will not appear in the main menu when the Power-on password is entered to start the utility.*

Start Options

The Start Options feature controls a variety of events that occur each time you turn your computer on. This feature allows you to:

- Determine the keyboard speed
- Determine whether your keyboard's Num Lock function is turned on or off when you start your computer
- Enable your computer to operate without a diskette drive, display, or keyboard

- Tell the computer where to find the operating system files
- Enable Virus Detection when the computer is turned on

The following paragraphs describe each of these options.

Keyboard NumLock. This option lets you set the Num Lock function on the keyboard to turn on automatically each time you turn the computer on.

Keyboard Speed. This option lets you choose either the Normal or Fast keyboard speed. The keyboard speed is the rate at which the keyboard responds when you hold down a key. The Normal rate is 10 characters per second. The Fast rate is 30 characters per second.

Disketteless Operation. This option lets you avoid a power-on self test (POST) error when a diskette drive is disconnected. This option is useful if your computer will be used as a network server.

Displayless Operation. This option lets you avoid a power-on self test (POST) error when the monitor is disconnected. This option is useful if your computer will be used as a network server.

Keyboardless Operation. This option lets you avoid a power-on self test (POST) error when the keyboard is disconnected. This option is useful if your computer will be used as a network server.

Startup Devices (First – Fourth). When you turn your computer on, it searches for the operating system files. The computer can search for these files on a hard disk, a diskette, an adapter card, or a network.

Use the Startup Devices options to tell the computer the devices to search for the operating system files and the order in which it should search them. For example, if you select diskette drive A (also called Diskette Drive 0) as the First Startup Device, and Hard Disk 0 as the Second Startup Device, the computer will search for the operating system files on diskette drive A first and hard disk 0 second.

note: *Hard disk 0 is the hard disk that came preinstalled in your computer. For more information, see “IDE Drives Setup” on page 68.*

Power On Self Test. Each time you turn on the computer, it performs a series of tests to make sure it is operating properly. This series of tests is called the power-on self test (POST).

This option lets you tell the computer to run the Quick or Enhanced version of POST. If you choose Enhanced, the computer performs the complete POST and it takes longer for your operating system or application to become available. If you choose Quick, the computer does not perform the complete POST.

Virus Detection. This option lets you have your computer search for computer viruses each time you turn on the computer.

Advanced Setup

The Advanced Setup feature allows you to enable or disable cache memory and the ROM (read-only memory) shadowing of a memory region.

The following paragraphs describe each of these options.

Cache Control. The Cache Control option allows you to enable or disable Cache memory and shows you the amount of Cache memory installed in your computer. Your computer comes with the maximum of 256K of cache memory installed.

Cache memory is special buffer storage that holds frequently used instructions and data, and works faster than main storage. With cache memory enabled, your applications and programs run faster. You can disable cache memory to slow down your computer.

ROM Shadowing. The Basic Input/Output System (BIOS) is the machine language that runs your computer. The BIOS in your computer is stored in read-only memory called *ROM*.

The ROM Shadowing option allows you to store BIOS in random access memory (RAM). Because RAM works faster than ROM, your programs will run faster. To store BIOS in RAM, you must enable the appropriate memory region.

ISA Legacy Resources

If you are installing an ISA legacy (non-Plug and Play or non-PCI) adapter card, you can use the ISA Legacy Resources feature to manually configure the card. This feature lets you set the following legacy resources typically required by these adapter cards:

- Memory resources
- I/O port resources

- DMA resources
- Interrupt resources

The following paragraphs describe each of these options.

Memory Resources. This option lets you allocate system memory regions for a legacy adapter card. It lists the hexadecimal addresses of the available memory regions. You allocate memory to an adapter card by choosing the Not Available setting for a particular hexadecimal address.

Be sure to read the documentation that came with the adapter card. You may need to make changes to the card that match the selections you make for Memory Resources. For example, you may have to move jumpers or switches on the adapter card, or make changes to the software that came with the adapter card.

I/O Port Resources. This option lets you allocate I/O ports for a legacy adapter card. It lists the hexadecimal addresses of the available I/O ports. You allocate I/O Ports to an adapter card by choosing the Not Available setting for a particular hexadecimal address.

Be sure to read the documentation that came with the adapter card. You may need to make changes to the card that match the selections you make for I/O Port Resources. For example, you may have to move jumpers or switches on the adapter card, or make changes to the software that came with the adapter card.

DMA Resources. This option lists the channel assignments for direct memory access (DMA). DMA allows I/O devices to transfer data to and from memory. You allocate DMA channels to ISA legacy adapter cards by choosing the Not Available setting for a particular channel.

Be sure to read the documentation that came with the adapter card. You may need to make changes to the card that match the selections you make for DMA Resources. For example, you may have to move jumpers or switches on the adapter card, or make changes to the software that came with the adapter card.

Interrupt Resources. This option lists the system interrupt requests (IRQs) and their functions. You allocate IRQs to an ISA legacy adapter card by choosing the Not Available setting for a particular IRQ.

Be sure to read the documentation that came with the adapter card. You may need to make changes to the card that match the selections you make for Interrupt Resources. For example, you may have to move jumpers or switches on the adapter card, or make changes to the software that came with the adapter card.

Rapid Resume

Rapid Resume is an exclusive IBM energy-saving feature with many useful options. Rapid Resume can:

- Save the current state of your computer when you turn it off. Any applications or programs open when the computer is turned off will be open when the computer is turned back on.

- Automatically turn off your computer when you have not used the mouse, keyboard, or hard disk for an amount of time you select. If you have an energy-saving monitor, it will also turn off.
- Put your computer in a Standby mode to conserve energy when you have not used the mouse, keyboard, or hard disk for an amount of time you select.
- Reduce the time your computer takes to start up.
- Automatically turn on your computer when the phone rings so that your computer can receive a fax.
- Automatically turn on your computer at a date and time you specify.

The following paragraphs describe each of these options.

APM BIOS Mode. The Basic Input/Output System (BIOS) is the machine language that runs your computer. The APM BIOS Mode option shows you the advanced power mode (APM) that your operating system's APM driver should use when it communicates with BIOS.

Rapid Resume. This option lets you turn Rapid Resume on (enabled) or off (disabled).

Automatic Power Off. If Rapid Resume is enabled, this option lets you set the amount of time that will pass before your computer turns off automatically. For example: 30 minutes means that if the mouse, keyboard, or hard disk are not used for 30 minutes, the computer turns off automatically.

note: *Only energy-saving monitors will turn off automatically with Rapid Resume.*

The current state of the computer is saved before the computer turns off. Any applications or programs open when the computer turns off will be open when you turn the computer back on.

Initialize Adapter Cards. If you are using the Rapid Resume feature, this option indicates whether your adapter cards will be restarted (initialized) when you turn on your computer.

Standby Timeout. This option lets you set the amount of time that will pass before your computer starts conserving energy. For example: 20 minutes means that if the mouse, keyboard, and hard disk are not used for 20 minutes, your display goes blank and the hard disk in your computer starts using less power.

note: *Only energy-saving monitors power down during Standby.*

If you are using the Automatic Power Off feature, the time you set for Standby must be less than the time you set for Automatic Power Off. Otherwise, your computer will turn off before it enters Standby.

Monitor Mode. This option lets you change the power mode used to blank the monitor during Standby. If you have an energy-saving monitor, the VESA DPMS setting turns the monitor back on the fastest.

note: *Only energy-saving monitors will power down during Standby.*

Halt CPU When Idle. This option lets you halt the central processing unit (CPU) during Standby. This conserves power without affecting the operation of your computer.

Wake Up on Ring. This option lets you have the computer turn on automatically when the phone rings. This is useful if you have a fax modem and use your computer to receive faxes. To use this feature, you must have an internal modem that supports Wake Up on Ring.

Indicator. If you are using the Wake Up on Ring feature, and you enable the Indicator option, the power light will blink to indicate the computer answered the phone. The Indicator resets when you turn the computer on.

note: *With Wake Up on Ring, your computer may turn on automatically when you dial out on a rotary or pulse telephone. If this occurs, disable the Wake Up on Ring feature and use it only when you know you will have incoming fax communications.*

Wake Up on Alarm. This option lets you have the computer turn on automatically at a date and time you specify. Choose the date and time in the Alarm Date and Alarm Time fields. If you select Daily Event, you can set the Alarm Time but not the Date.

Alarm Date and Time. If you are using the Wake Up on Alarm feature, these options let you set the date and time you want the computer to turn on automatically. Enter the date in the format shown on the screen.

Enter the time in 24-hour format (hours, minutes, seconds). For example:

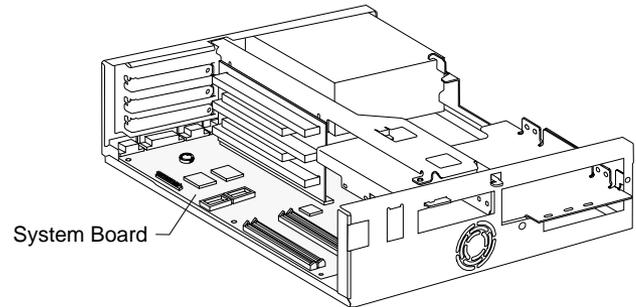
- 12 midnight is 00:00:00
- 12 noon is 12:00:00
- 1 p.m. is 13:00:00

Installing options **Part 2**

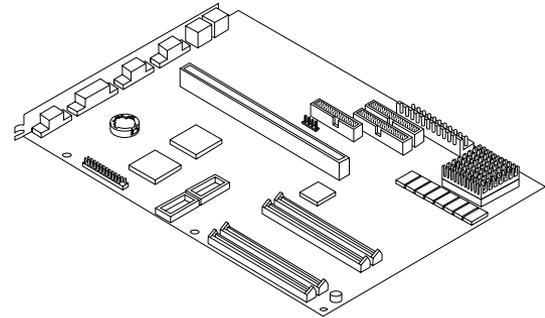
In this part, you will find these chapters:

- “Working with your system unit” explains how to install adapter cards and drives in your system unit.
- “Working with your system board” explains how to install the following options on your system board:
 - Single inline memory modules (SIMMs)
 - Video memory module
 - Replacement batteries

This is how the system board looks when installed in your system unit:



This is how the system board is shown in “Working with your system board” in order to make the parts of the system board easier to see.

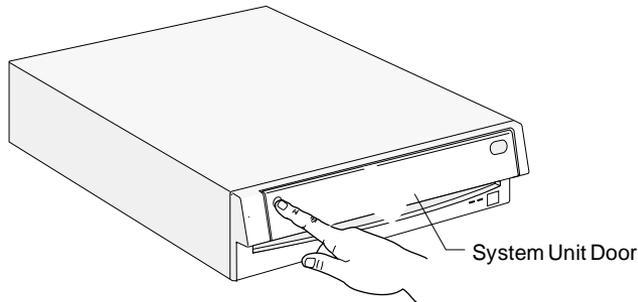


Working with your system unit 6

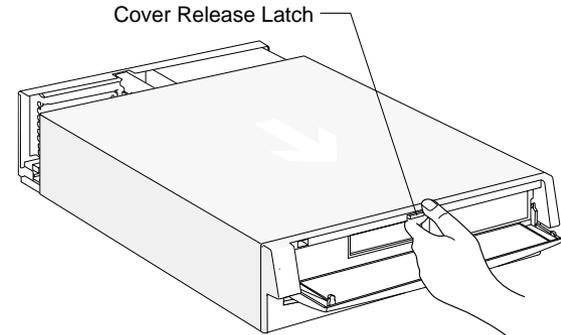
How to begin

FOR YOUR SAFETY, follow these simple precautions:

1. Turn off the system unit, monitor, and any external options (such as a printer).
2. Disconnect the telephone cord from the system unit. Also disconnect any other cords and cables that may be attached to the system unit.
3. Remove the system unit cover:
 - a. Remove the monitor from the system unit. Press on the corner of the door to open it.



- b. Press up on the release latch. Slide the cover off completely.

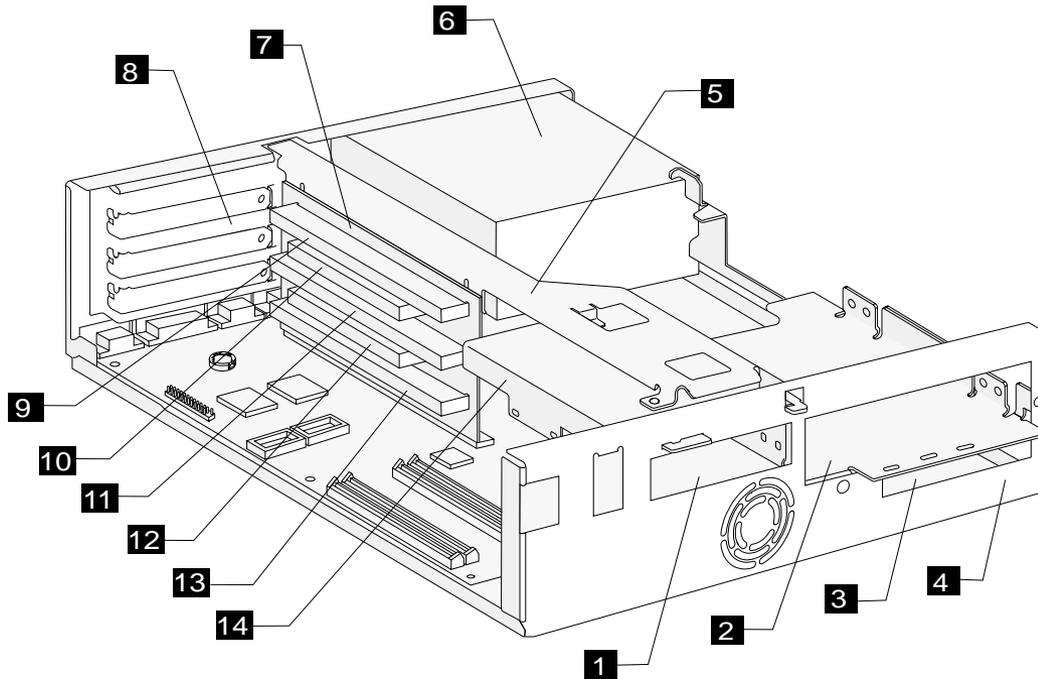


Important:

To prevent an electrostatic charge from damaging any part of your computer, touch the computer's bare metal frame before you unplug the system unit, or wear an antistatic wrist strap while making hardware changes.

4. Unplug the system unit and monitor from the electrical outlets.
5. Unplug the power cords of any external options from the electrical outlets.

Identifying parts of the system unit



Specifications of the system unit

The system unit of your computer has four bays (bays are locations for drives) and three adapter card slots. On most models, three bays come with drives installed and two card slots come with adapter cards installed. Later, you may want to purchase a drive to install in the empty bay or an adapter card to install in the empty slot.

You can install industry standard architecture (ISA) advanced technology (AT*) adapter cards, and peripheral component interconnect (PCI) adapter cards.

Diskette drives use the standard diskette AT interface. Hard disks use an integrated drive electronics (IDE) AT interface. This computer supports the American National Standards Institute (ANSI) standard for AT attachment disk drives.

- 1** Bay 1. Holds a 3.5-inch slim drive, such as a diskette or tape drive.
- 2** Bay 2. Holds up to a 5.25-inch half high drive, such as a diskette, tape, or CD-ROM drive.
- 3** Bay 3. Located under bay 2. Holds a 3.5-inch slim hard disk.
- 4** Bay 4. Located under bay 3. Holds a 3.5-inch slim hard disk.
- 5** Right bracket. Holds drives in bays 2, 3, and 4.
- 6** Power supply. Capable of providing 145 watts of power to the system unit.

- 7** Riser card. Holds the adapter card connectors.
- 8** Adapter card slots. Three openings for adapter cards.
- 9** Adapter card connector 1. Holds AT adapter cards.
- 10** Adapter card connector 2a. Holds PCI adapter cards.
- 11** Adapter card connector 2b. Holds AT adapter cards.
- 12** Adapter card connector 3a. Holds PCI adapter cards.
- 13** Adapter card connector 3b. Holds AT adapter cards.
- 14** Left bracket. Holds a drive in bay 1.

Preparing to install adapter cards

The system unit has three slots and five connectors for adapter cards. A maximum of three adapter cards can be installed in the system unit at one time. You can install ISA-AT or PCI adapter cards.

Adapter card specifications

Use the following table to help you determine what type and size of adapter card to install in each adapter card connector.

| Adapter card connector | Specifications |
|------------------------|--|
| 1 | Can hold a half-length or three-quarter-length ISA-AT adapter card. Can hold a full-length ISA-AT adapter card if the left bracket is removed. |
| 2a | Can hold a half-length or full-length PCI adapter card. |
| 2b | Can hold a half-length, three-quarter-length, or full-length ISA-AT adapter card. |
| 3a | Can hold a half-length or full-length PCI adapter card. |
| 3b | Can hold a half-length, three-quarter-length, or full-length ISA-AT adapter card. |

You can install an adapter card in connector 2a or 2b. However, you cannot have adapter cards installed in connectors 2a and 2b at the same time. Likewise, you

can install an adapter card in connector 3a or 3b, but you cannot have adapter cards installed in connectors 3a and 3b at the same time.

Adapter card settings

When you install an adapter card, you may have to set switches or move jumpers to make the card work properly with any cards that may be already installed. If you install a Plug and Play adapter card, however, you typically do not have to change any switch or jumper settings after you install it. The computer and the card automatically work together to make sure the settings are correct.

If you install non-Plug and Play adapter cards, *you* must make sure the settings are correct. The documentation that came with the card contains instructions on changing system settings. If the documentation refers you to information about your computer's I/O addresses, system board interrupt requests (IRQs), or DMA channel assignments, you can find this information in "Appendix A" on page 107.

Before installing an adapter card, see Table 10 on page 83 to determine whether you need to change any settings.

note: *If your computer came with any preinstalled adapter cards, they are non-Plug and Play adapter cards.*

The following table can help you when installing adapter cards.

Table 10: Adapter card configurations

| Adapter card or cards currently installed: | Adapter card you are installing: | Action: |
|--|----------------------------------|---|
| None | Plug and Play | Do not change any settings. |
| | Non-Plug and Play | Do not change any settings. |
| Plug and Play | Plug and Play | Do not change any settings. |
| | Non-Plug and Play | Change settings in the Plug and Play Setup Utility <i>before</i> installing the card. For instructions on changing the Plug and Play Setup Utility, see the Aptiva Index. |
| Non-Plug and Play | Plug and Play | Change settings in the Plug and Play Setup Utility <i>before</i> installing the card. For instructions on changing the Plug and Play Setup Utility, see the Aptiva Index. |
| | Non-Plug and Play | Do not change any settings. |
| Both Plug and Play and Non-Plug and Play | Plug and Play | Do not change any settings. |
| | Non-Plug and Play | Change settings in the Plug and Play Setup Utility <i>before</i> installing the card. For instructions on changing the Plug and Play Setup Utility, see the Aptiva Index. |

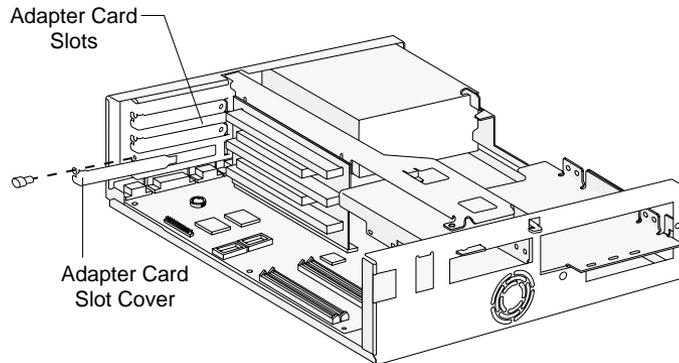
Installing adapter cards

Before you install an adapter card, you must remove the system unit cover. For instructions, see page 79.

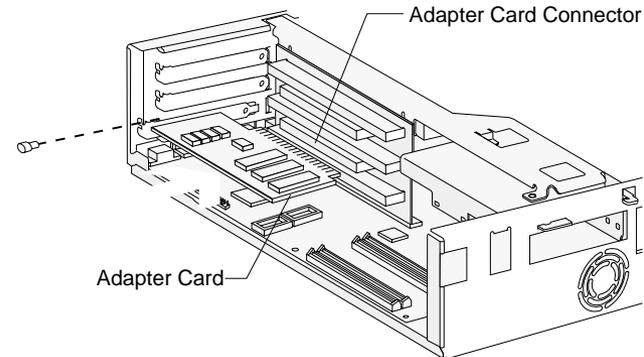
For some hardware changes, you may need to remove preinstalled adapter cards. If these adapter cards have cables attached, disconnect them. (Be sure to notice where the cables connect to the cards. You will need to reattach the cables when you reinstall the adapter cards.)

To install an adapter card:

1. Remove the screw and then the adapter card slot cover.



2. Align and insert the adapter card into the adapter card connector. Insert the screw. (Reverse this step for card removal.)



note: *After making hardware changes, reinstall any adapter cards you removed and all necessary screws. Reconnect the cables, if necessary.*

Preparing to install drives

Before you install an additional:

- Drive (of any type), you may need to purchase power and signal cables.
- Hard disk, see “Installing additional drives” on page 87.
- Diskette, tape, or CD-ROM drive, you may need to remove a bay panel from the system unit cover before you replace the cover. (Bay panels are attached to the front of the system unit cover.) Removing the panel allows you to access the drive from the front of the system unit, once it is installed and the system unit cover has been replaced.

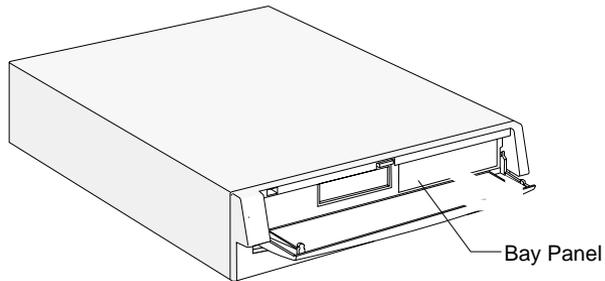
Before removing a bay panel, use the following table to help you determine where to install your drive. *You can install a drive in any empty bay in which the drive fits.*

| Bay | Drive Specifications | Bay Capacity |
|-----|---|------------------------------------|
| 1 | Holds a 3.5-inch slim drive, such as a diskette or tape drive. | 101.6 x 25.4 mm (4.0 x 1.0 in.) |
| 2 | Holds up to a 5.25-inch half high drive, such as a diskette, tape, or CD-ROM drive. | 149.0 x 41.3 mm (5.87 x 1.625 in.) |
| 3 | Holds a 3.5-inch slim hard disk. | 101.6 x 25.4 mm (4.0 x 1.0 in.) |
| 4 | Holds a 3.5-inch slim hard disk. | 101.6 x 25.4 mm (4.0 x 1.0 in.) |

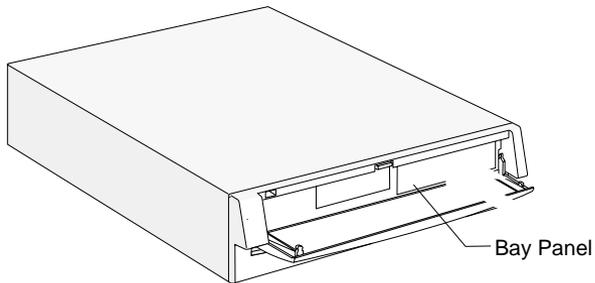
Note: *Using the appropriate installation hardware, you can install smaller drives than those listed here.*

Before you install a drive:

1. Check to see if the system unit cover has a panel covering the bay you want to use.
2. If a panel covers the bay, remove the system unit cover. For cover removal instructions, see page 79.
3. Locate the panel latches on the inside of the cover. Then squeeze the latches and push the panel out.



If you ever want to replace the panel, push it onto the opening until you hear the latches *click*.



Installing additional drives

When you install additional drives, you have to use signal (also called data) cables that are attached to the correct connectors on the system board. The system board has three connectors for drive signal cables:

- Local Bus connector 1 (labeled J12 on your system board)
- Local Bus connector 2 (labeled J13 on your system board)
- Diskette connector (labeled J34 on your system board)

See pages 100 and 101 to identify the connectors.

note:

To install additional drives, you may have to purchase power and signal cables.

The following table shows the types of drives that can be attached to each connector on the system board.

| Connector | Interface type | Description |
|-----------------------------|-------------------------|---|
| Local Bus connector 1 (J12) | IDE/AT Local Bus | Preferred location for first or second hard disk drives. A CD-ROM drive can also be attached here. |
| Local Bus connector 2 (J13) | IDE/AT Local Bus | Preferred location for a third or fourth hard disk drive. A CD-ROM drive can also be attached here. |
| Diskette connector (J34) | Standard diskette AT | Should be used for diskette drives or diskette AT interface tape drives. |

IDE/AT interface drives

Two drives can be attached to each IDE/AT connector with 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. If you are installing an additional drive, see page 89 for information on the connectors and settings you should use.

The hard disk that came preinstalled in your computer is attached to Local Bus connector 1 and is set as a Master device.

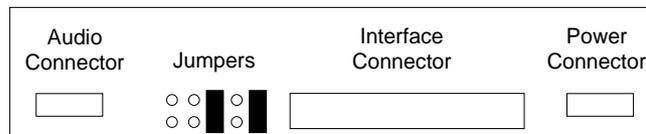
If your computer came with a CD-ROM drive, it is attached to Local Bus connector 2 and is set as a Master device.

Guidelines for attaching additional IDE/AT interface drives

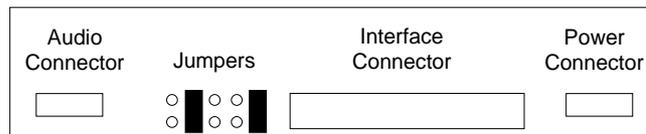
- If only one drive is attached to a connector, it must be set as a Master device.
- On each connector, there can be only one drive set as the Master device and one drive set as the Slave device.
- A maximum of four IDE drives can be attached to your computer, two on Local Bus connector 1, and two on Local Bus connector 2.
- 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 should be set as the Master device.

If a CD-ROM drive came with your computer, the following pictures show how to set the CD-ROM jumper on the back of the drive to make it a Master or Slave device. If you have attached another type of drive to Local Bus connector 2, see the documentation that came with that drive to find the jumper location and instructions for setting it.

Jumper setting for CD-ROM drive as a Master device:



Jumper setting for CD-ROM drive as a Slave device:



See “Connectors and settings for additional drives” on page 89 for information on setting and attaching IDE/AT interface drives.

Diskette interface drives

Two drives can be attached to the Diskette connector with the proper cables. All drives attached to the Diskette connector should be set to the Drive 0 address. You set this address with a switch on the drive.

See “Connectors and settings for additional drives” on page 89 for information on setting and attaching diskette interface drives.

Connectors and settings for additional drives

After you have installed a drive in your system unit, use these instructions to attach the drive to the correct system board connector and make the appropriate drive settings.

note: | *For instructions on changing a drive's setting, see the documentation that came with the new drive.*

- If you are installing a first or second hard disk drive, attach it to Local Bus connector 1.

Set the newly installed drive as a Master device if:

- It is the only drive attached to the connector.
- Another drive that is not a hard disk drive (such as a CD-ROM) is already attached to the connector.

Set the drive that is already attached to the connector as the Slave device.

Set the newly installed hard disk as a Slave device if another hard disk is already attached to the connector.

- If you are installing a third or fourth hard disk drive, attach it to Local Bus connector 2.

Set the newly installed drive as a Master device if:

- It is the only drive attached to the connector.
- Another drive that is not a hard disk drive is already attached to the connector. Set the drive that is already attached to the connector as the Slave device. (If your computer came with a CD-ROM drive preinstalled, see page 88 to set the CD-ROM as a Slave device.)

Set the newly installed hard disk as a Slave device if another hard disk is already attached to the connector.

- If you are installing a CD-ROM drive (or any drive that requires a software device driver), you can attach it to Local Bus connector 1 or 2.

Set the newly installed drive as a Master device if it is the only drive attached to the connector. Otherwise, set the new drive as a Slave device.

- If you are installing a Diskette drive, attach the drive to the Diskette connector. Set the newly installed drive to the Drive 0 address.

If the new drive is a:

- 5.25-inch device, you must purchase a signal cable with a "card edge" connector. Attach the card edge connector to the 5.25" drive.
- 3.5-inch device, you may have to purchase a signal cable.

note: | *You do not have to change any settings on a diskette drive that is already installed.*

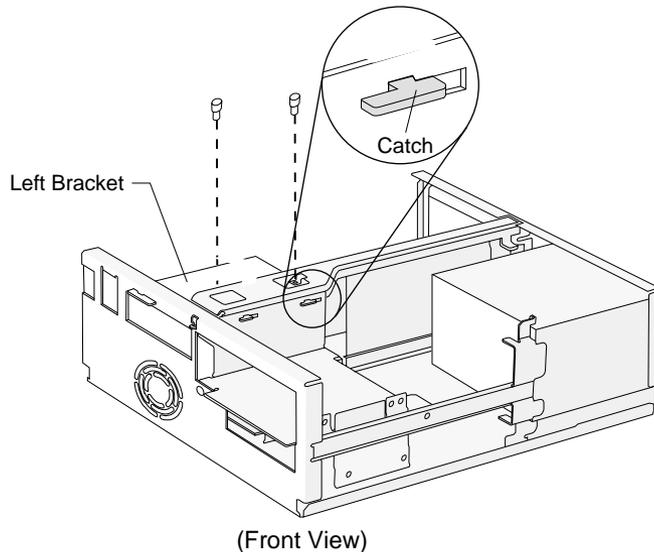
Installing and removing a drive in bay 1

Bay 1 holds a 3.5-inch slim drive, such as a diskette or tape drive.

Before beginning these steps, you may need to remove any installed adapter cards. For instructions on removing adapter cards, see page 84.

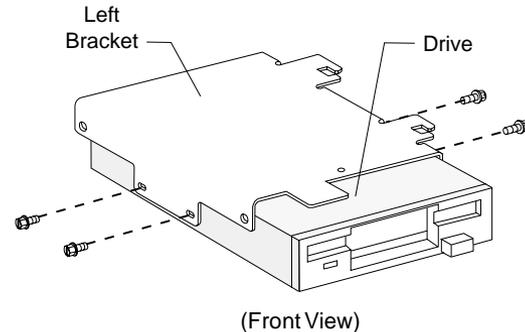
1. Left bracket removal

Remove the screws and disconnect any drive cables. (Notice how the cables are attached. You may need to attach these cables when you are finished.) Slide the left bracket back to release the catches, and then remove the bracket (with any attached drive, if present).



2. Drive attachment/removal

For drive attachment, lay the drive upright on a flat surface. Place the bracket on top of the drive. Align the screw holes and insert the screws. (Reverse this step for drive removal.)

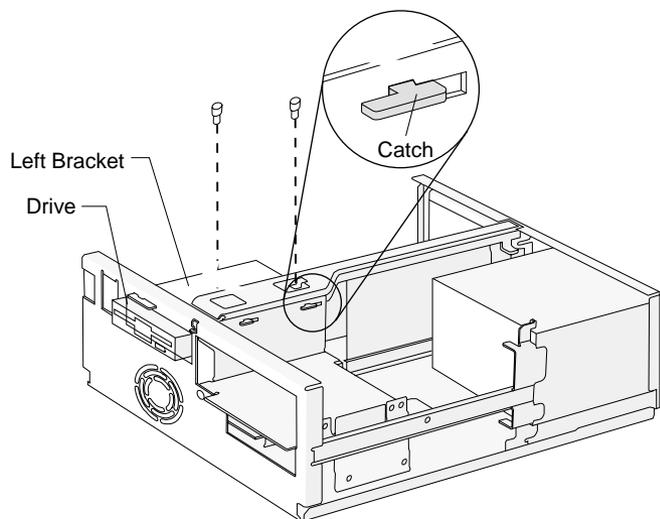


note: | Screw locations may differ.

Installing and removing a drive in bay 1 (continued)

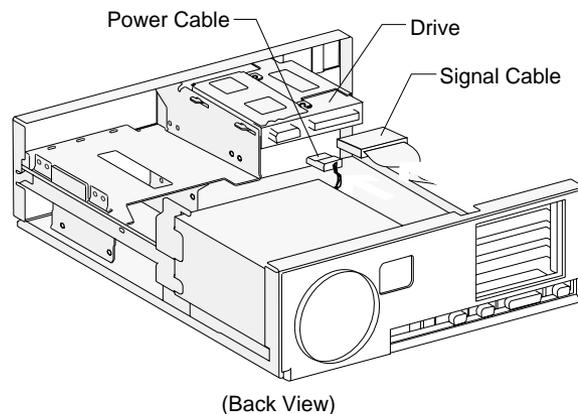
3. Left bracket replacement

Insert the left bracket catches into the slots and slide the bracket forward until it locks into place. Align the screw holes and insert the screws



4. Drive cable connection

Connect all drive cables.



note:

If you are adding a diskette or tape drive that attaches to the Diskette connector, make sure the signal cable you plug into the drive is attached to the Diskette connector on the system board. To identify the Diskette connector, see "Identifying parts of the system board" on page 100.

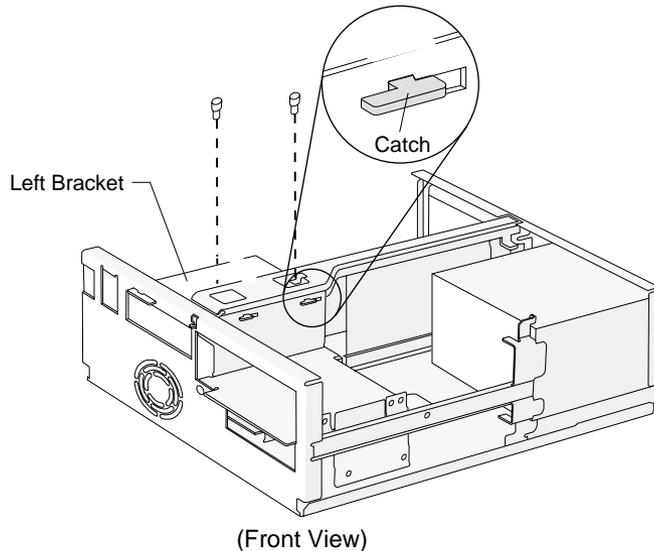
Installing and removing a drive in bay 2

Bay 2 holds up to a 5.25-inch half high drive, such as a diskette, tape, or CD-ROM drive.

Before beginning these steps, you may need to remove any installed adapter cards. For instructions on removing adapter cards, see page 84.

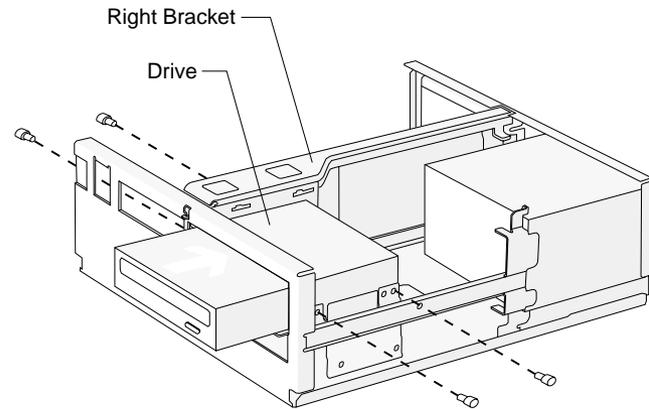
1. Left bracket removal

Remove the screws and disconnect any drive cables. (Notice how the cables are attached. You may need to attach these cables when you are finished.) Slide the left bracket back to release the catches, and then remove the bracket (with any attached drive, if present).



2. Drive attachment/removal

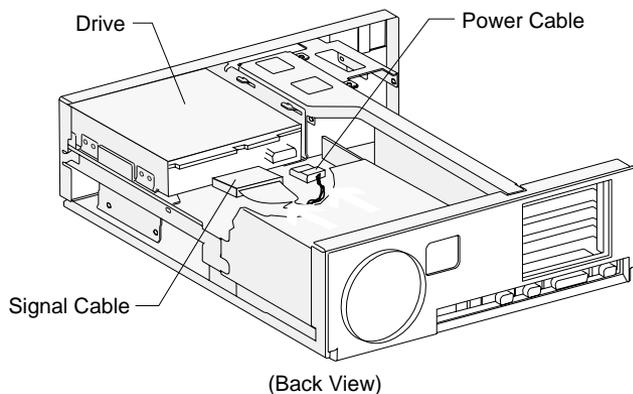
For drive attachment, slide the drive into the bracket. To insert each screw, align the screw hole on the drive with the rearmost of the two screw holes on the bracket. Insert the screws. (Reverse this step for drive removal.)



Installing and removing a drive in bay 2 (continued)

3. Drive cable connections

Connect all drive cables.



note:

If you are adding a diskette, tape, or CD-ROM drive that attaches to the Diskette connector, make sure the signal cable you plug into the drive is attached to the Diskette connector on the system board. To identify the Diskette connector, see "Identifying parts of the system board" on page 100.

4. Left bracket replacement and drive cable connections

For instructions on replacing the left bracket and connecting the drive cables for any drive that may be attached to the left bracket, see page 91.

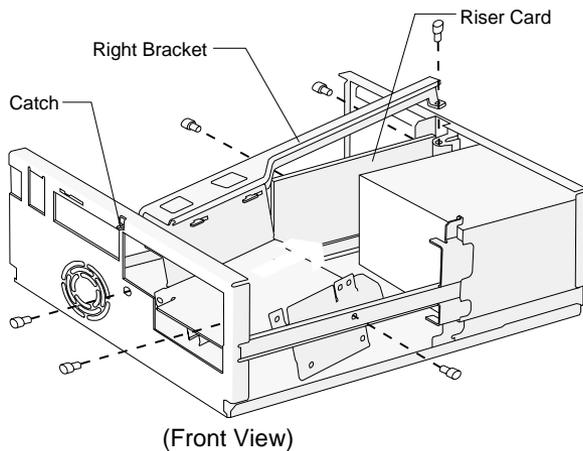
Installing and removing a hard disk in bay 3

Bay 3 holds a 3.5-inch slim hard disk.

Before beginning these steps, you must remove any drives installed in bays 1 and 2. For instructions on removing a drive from bay 1, see page 90. For instructions on removing a drive from bay 2, see page 92.

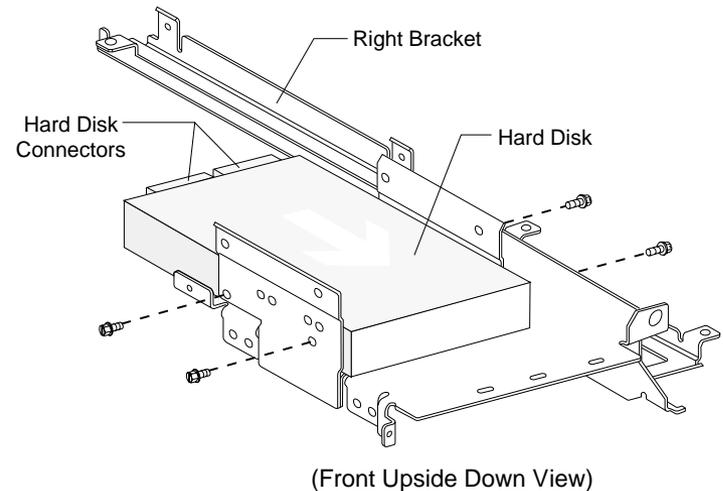
1. Right bracket removal

Remove the screws and disconnect any drive cables. (Notice how the cables are attached. You may need to attach these cables when you are finished.) Slide the right bracket back to release the catch, then lift and remove the bracket.



2. Drive attachment/removal

For drive attachment, turn the bracket upside down and slide the drive into the bracket with the component side down. Align the screw holes on the drive with the screw holes on the bracket. Insert the screws. (Reverse this step for drive removal.)



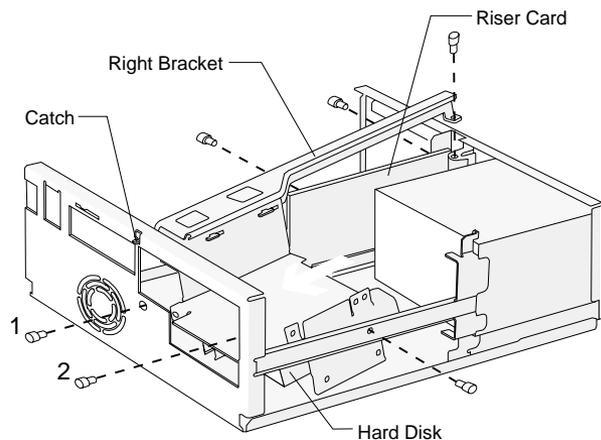
note: | Screw locations may differ.

Installing and removing a hard disk in bay 3 (continued)

3. Right bracket replacement

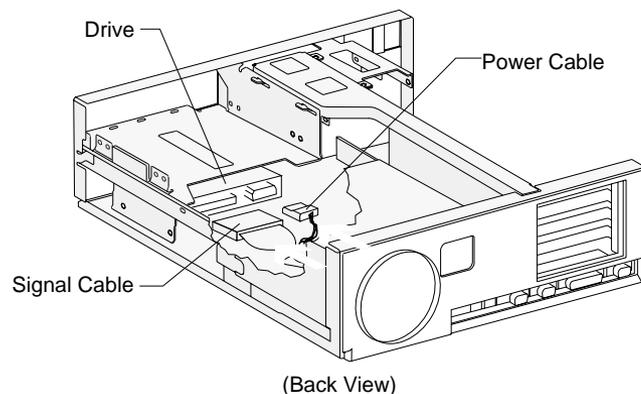
Slide the right bracket into the bay, making sure to insert the catch into its slot. Also make sure the riser card is located to the left of the bracket.

Align the screw holes. Insert the two front screws *first*, then insert the remaining screws. (The riser card should be located to the left of the bracket so that the screws go through the riser card first.)



4. Hard disk cable connections

Connect all drive cables. Reinstall any drives you removed in bays 1 and 2. For instructions on installing a drive in bay 1, see page 90. For instructions on installing a drive in bay 2, see page 92.



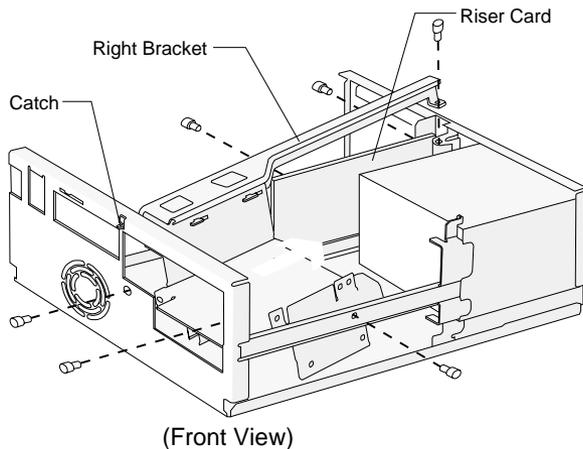
Installing and removing a hard disk in bay 4

Bay 4 holds 3.5-inch slim hard disk.

Before beginning these steps, you must remove any drives installed in bays 1 and 2. For instructions on removing a drive from bay 1, see page 90. For instructions on removing a drive from bay 2, see page 92.

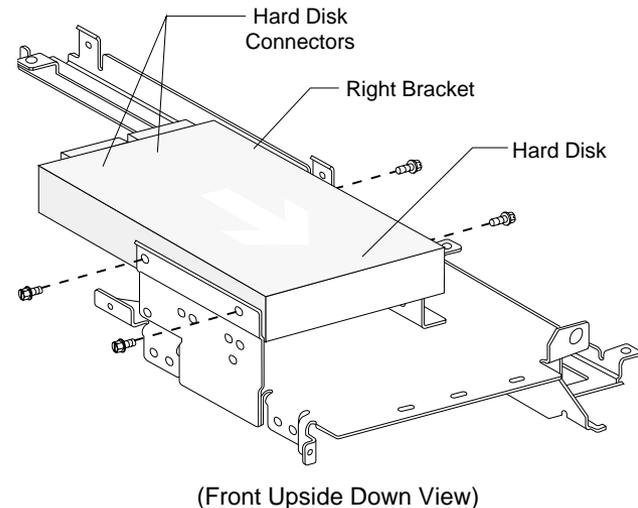
1. Right bracket removal

Remove the screws and disconnect any drive cables. (Notice how the cables are attached. You may need to attach these cables when you are finished.) Slide the right bracket back to release the catch, then lift and remove the bracket.



2. Drive attachment/removal

For drive attachment, turn the bracket upside down and slide the drive into the bracket with the component side down. Align the screw holes on the drive with the screw holes on the bracket. Insert the screws. (Reverse this step for drive removal.)



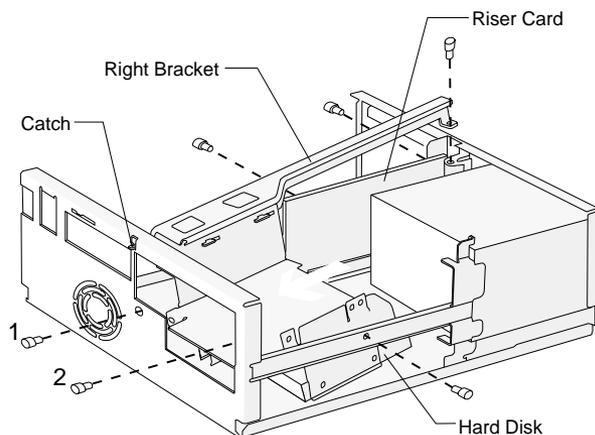
note: | Screw locations may differ.

Installing and removing a hard disk in bay 4 (continued)

3. Right bracket replacement

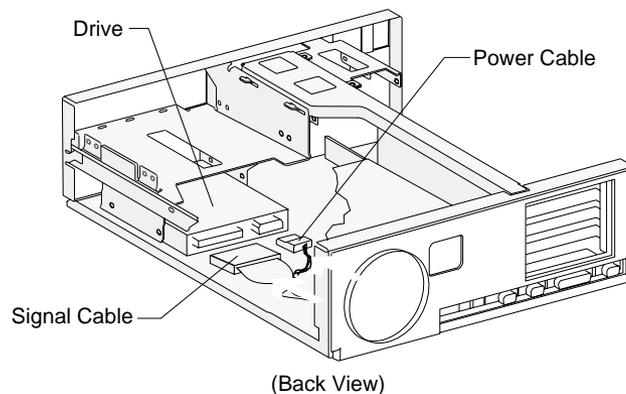
Slide the right bracket into the bay, making sure to insert the catch into its slot. Also make sure the riser card is located to the left of the bracket.

Align the screw holes. Insert the two front screws *first*, then insert the remaining screws. (The riser card should be located to the left of the bracket so that the screws go through the riser card first.)



4. Hard disk cable connections

Connect all drive cables. Reinstall any drives you removed in bays 1 and 2. For instructions on installing a drive in bay 1, see page 90. For instructions on installing a drive in bay 2, see page 92.

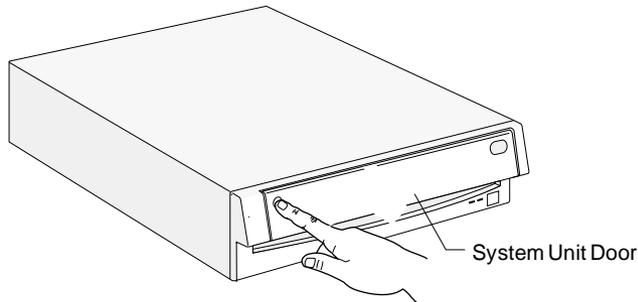


Working with your system board 7

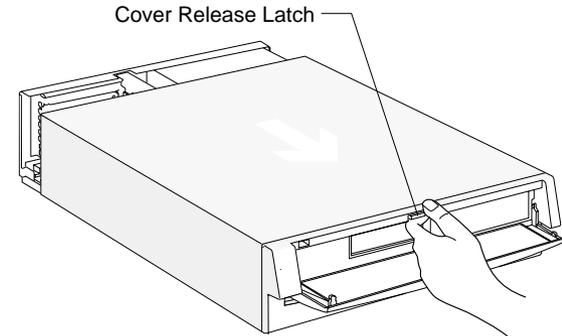
How to begin

FOR YOUR SAFETY, follow these simple precautions:

1. Turn off the system unit, monitor, and any external options (such as a printer).
2. Disconnect the telephone cord from the system unit. Also disconnect any other cords and cables that may be attached to the system unit.
3. Remove the system unit cover:
 - a. Remove the monitor from the system unit. Press on the corner of the door to open it.



- b. Press up on the release latch. Slide the cover off completely.



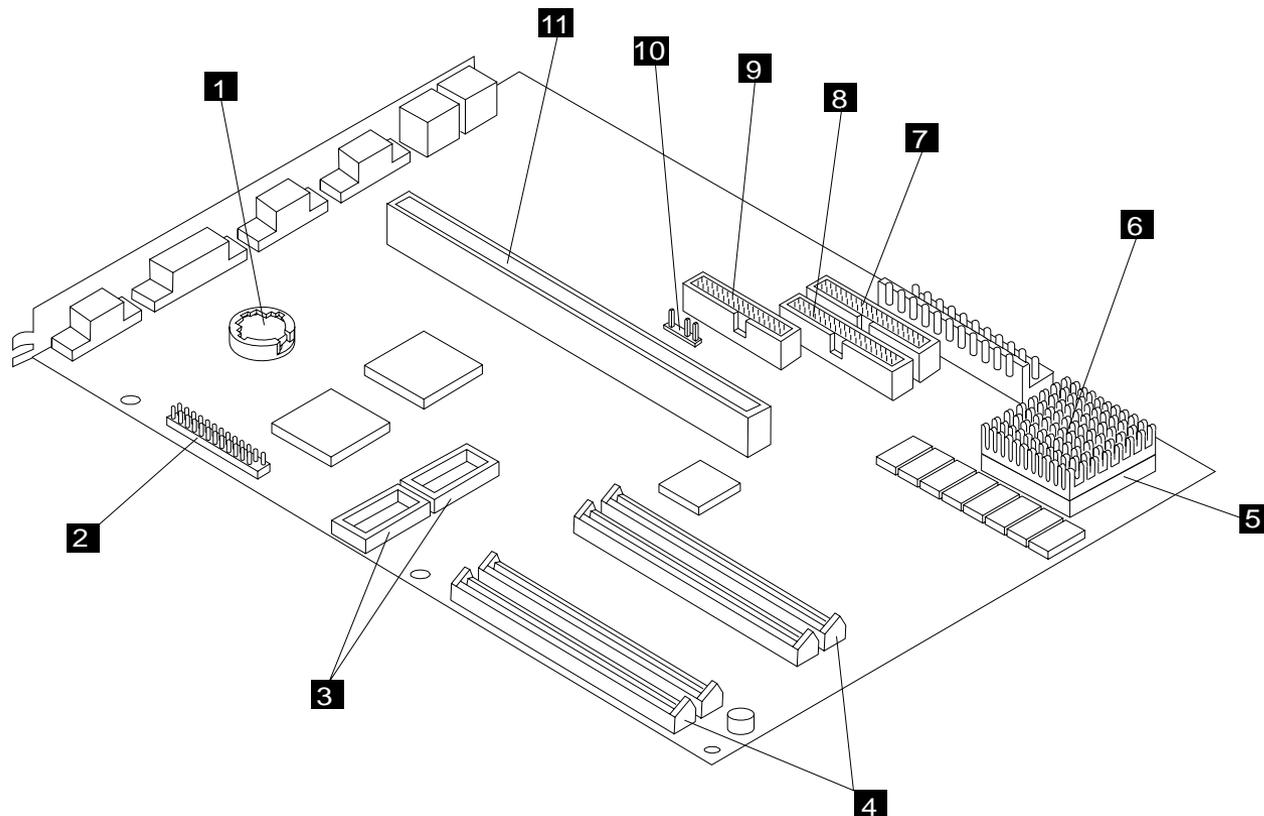
Important:

To prevent an electrostatic charge from damaging any part of your computer, touch the computer's bare metal frame before you unplug the system unit, or wear an antistatic wrist strap while making hardware changes.

4. Unplug the system unit and monitor from the electrical outlets.
5. Unplug the power cords of any external options from the electrical outlets.

Identifying parts of the system board

If you plan to add or replace hardware in your computer, you will need to know the layout of the *system board*. This picture shows an example of the system board in your computer. Simply match the system board in your computer to this example to identify the parts of the system board. The items on the next page correspond to the numbered locations on the picture.



Specifications for the system board

The system board is the main circuit board in the system unit. It supports a variety of devices, such as the mouse and keyboard, and provides other basic computer functions. The system board is sometimes called the *planar* or *motherboard*. The system board shown on page 100 has the following parts:

- 1** Battery. Replace the battery with a 3-volt (CR2032) lithium battery only.
- 2** VESA feature connector. Used for video and graphics adapter cards.
- 3** Video memory module sockets. You can upgrade the video memory to a maximum of 2MB. Your system board comes with 1MB of video memory.

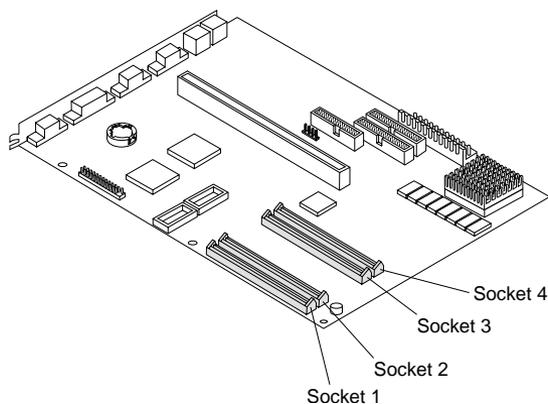
Specifications: 40-pin, surface mount package (SOJ), 256K x 16, 60 nanoseconds (ns), dynamic random access memory (DRAM).
- 4** Memory module sockets (for SIMMs). Memory modules are also called *single inline memory modules* or *SIMMs*. You can upgrade the memory on your system board to a maximum of 128MB. Your system board comes with 8MB already installed.

Specifications: 72-pin; 32-bit or 36-bit; 2MB, 4MB, 8MB, 16MB, or 32MB; 70 ns; gold contacts; DRAM.
- 5** Processor socket. Holds the processor.
- 6** Processor. Your computer has an Intel** Pentium** processor.
- 7** Local Bus connector 2. Holds signal cables that attach to drives.
- 8** Local Bus connector 1. Holds signal cables that attach to drives.
- 9** Diskette connector. Holds signal cables that attach to drives.
- 10** Wake Up on Ring connector. Holds the Wake Up on Ring cable attached to the internal modem.
- 11** Riser card connector. Holds the riser card.

Installing and removing memory modules

Before beginning these steps, you may have to remove installed adapter cards. For instructions on removing adapter cards, see page 84.

Your system board has four memory module sockets (labeled Socket 1, Socket 2, Socket 3, and Socket 4 in the picture). Your computer comes with 8MB of memory, a 4MB memory module installed in Socket 1 and a 4MB memory module installed in Socket 2. You can install additional memory modules in Sockets 3 and 4. You can also replace the existing memory modules with modules that have higher memory capacity. The maximum amount of memory you can install is 128MB.



Socket 1 and Socket 2 work together as a set. Socket 3 and Socket 4 also work together as a set. When adding or replacing memory modules, you must fill both

sockets in the set. Also, you must use two memory modules of the same size.

For example, if you install a 2MB memory module in Socket 3, you must also install a 2MB memory module in Socket 4. Use these guidelines when adding memory modules:

- If you install a memory module in one socket, you must also install a memory module in the other socket in the set.
- The memory modules you install in the two sockets must be the same size. For example, you cannot install a 2MB memory module in Socket 3 and a 4MB memory module in Socket 4.
- You can use two sets of different size memory modules. For example, you can have two 4MB memory modules installed in Socket 1 and Socket 2, and two 2MB memory modules installed in Socket 3 and Socket 4.

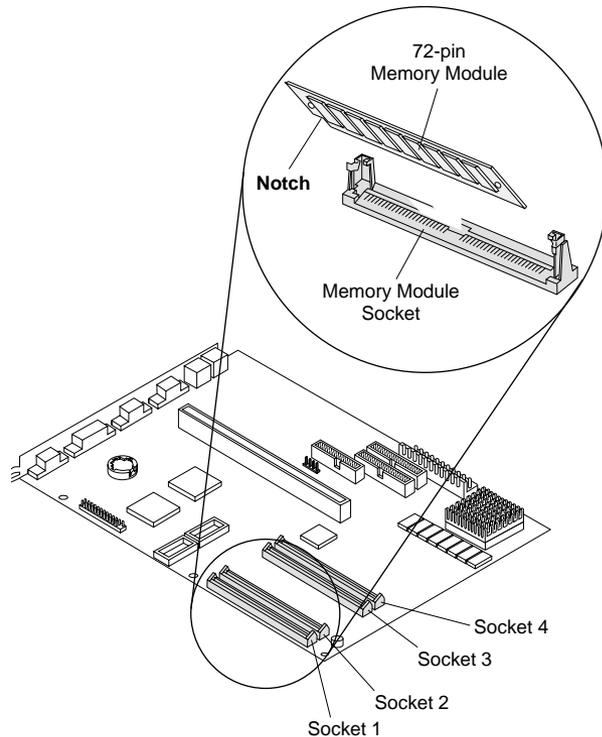
For more information on adding memory, see “Memory module placement” on page 107.

note: *Each memory module you install must have these specifications: 72-pin; 32-bit or 36-bit; 2MB, 4MB, 8MB, 16MB, or 32MB; 70 ns; gold contacts; DRAM.*

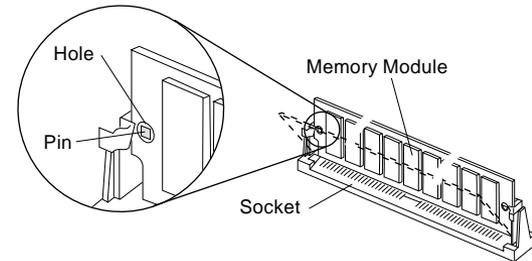
Installing memory modules

To install an additional memory module in an empty socket:

1. Find the notched edge of the module, and position it as shown.
2. Insert the module into the socket at a *45-degree angle* as shown. Make sure the connectors line up and the module is *firmly* held in the socket at approximately a 45-degree angle.



3. Press forward *firmly* on the memory module to move it into a vertical position. Both sides of the module will *click* when the module locks into place. The newly installed memory module will be locked into the socket in a vertical position with pins showing through the holes on each side.

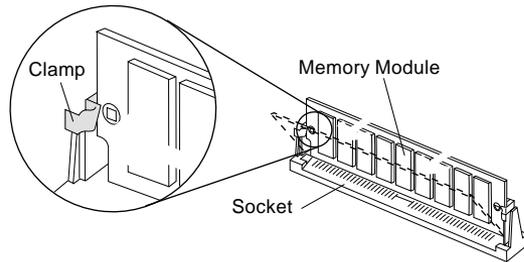


note: Remember to reinstall all hardware you removed to access the memory module sockets.

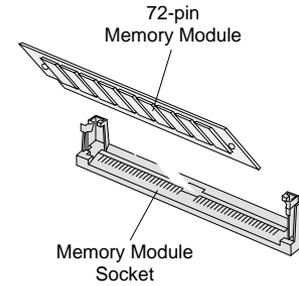
Removing memory modules

To remove a memory module from its socket:

1. Locate the two clamps that hold the memory module in place. One clamp holds the left edge of the module and the other clamp holds the right edge.
2. At the same time, push both clamps outward (away from the edges of the module). The module will release and move forward.



3. Lift the module out of the socket.



note: *Remember to reinstall all hardware you removed to access the memory module sockets.*

Upgrading video memory

Before beginning these steps, you may have to remove installed adapter cards. For instructions on removing adapter cards, see page 84.

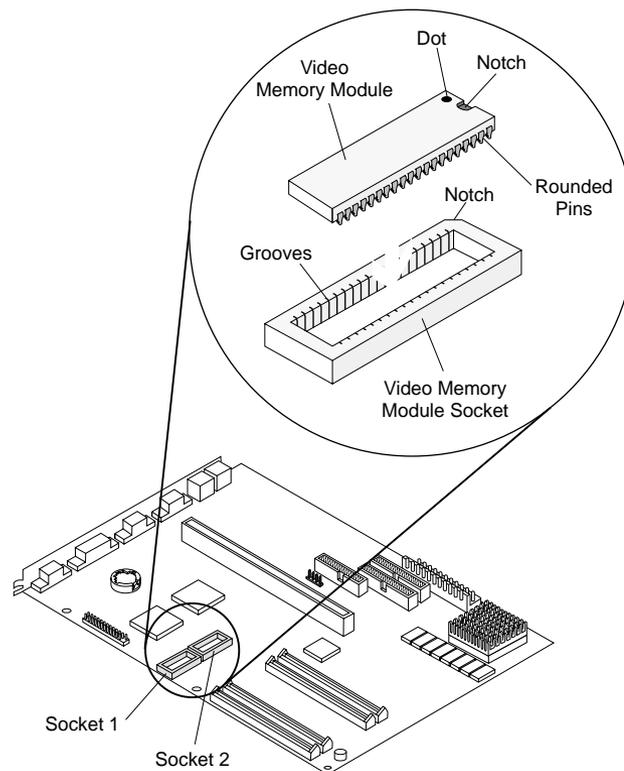
Your system board comes with 1MB of video memory installed and two empty video memory module sockets (Socket 1 and Socket 2 in the picture). You can upgrade the video memory to a maximum of 2MB. To upgrade video memory, you must install two video memory modules. You cannot install a video memory module in one socket and leave the other socket empty.

Each video memory module you install must have these specifications: *40-pin, surface mount package (SOJ), 256K x 16, 60 ns, DRAM.*

To upgrade video memory:

1. One end of the video memory module will have a dot, a notch, or both. Locate the dot or notch on the video memory module.
2. Position the end of the memory module with the dot or notch as shown.
3. Align the rounded pins on the sides of the memory module with the grooves in the memory module socket.
4. Press straight down *firmly* on the module to insert it into the socket. A properly inserted module will sit completely inside the socket

5. Repeat these steps to install the second video memory module.



note: Remember to reinstall all hardware you removed to access the video memory module sockets.

Replacing the battery

Before beginning these steps, you may have to remove installed adapter cards. For instructions on removing adapter cards, see page 84.

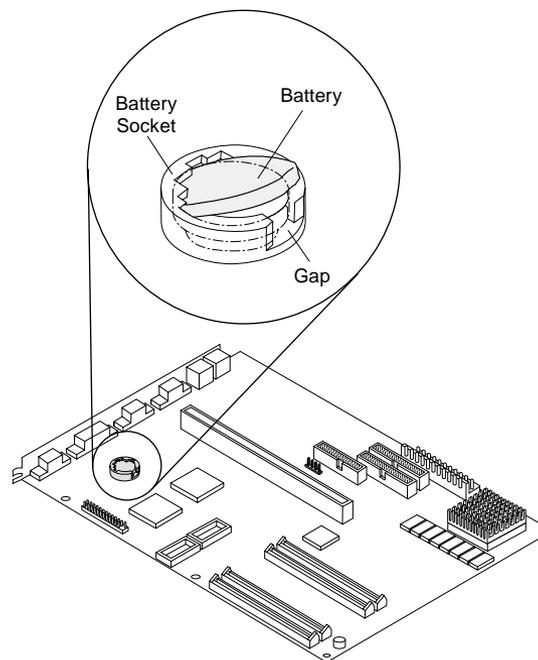
To replace the battery:

1. Locate the edge of the battery that is visible through the gap in the battery socket.
2. Using your finger, press on the edge of the battery until the battery is as far into the socket as it will go. Lift up gently on the battery to remove it.
3. Place a new 3-volt (CR2032) lithium battery into the battery socket at an angle so that the battery is half in and half out of the socket and tilted upward. (See the picture.)

note: *Make sure the positive side of the battery (the side with a + symbol printed on it) is facing up when you insert the battery into the socket.*

4. Press on the edge of the battery until the battery slides down and into the battery socket.

note: *Remember to reinstall all hardware you removed to access the battery.*



Memory module placement

This table shows how to place the single inline memory modules (SIMMs) on your system board. Use this information when adding or removing system memory.

Table 11: Memory module placement

| Total memory | Socket 1 | Socket 2 | Socket 3 | Socket 4 |
|--------------|----------|----------|----------|----------|
| 4MB | 2MB | 2MB | | |
| 4MB | | | 2MB | 2MB |
| 8MB | 2MB | 2MB | 2MB | 2MB |
| 8MB | 4MB | 4MB | | |
| 8MB | | | 4MB | 4MB |
| 12MB | 2MB | 2MB | 4MB | 4MB |
| 12MB | 4MB | 4MB | 2MB | 2MB |
| 16MB | 4MB | 4MB | 4MB | 4MB |
| 16MB | 8MB | 8MB | | |
| 16MB | | | 8MB | 8MB |
| 20MB | 2MB | 2MB | 8MB | 8MB |
| 20MB | 8MB | 8MB | 2MB | 2MB |
| 24MB | 4MB | 4MB | 8MB | 8MB |
| 24MB | 8MB | 8MB | 4MB | 4MB |
| 32MB | 8MB | 8MB | 8MB | 8MB |

Table 11: Memory module placement (Continued)

| Total memory | Socket 1 | Socket 2 | Socket 3 | Socket 4 |
|--------------|----------|----------|----------|----------|
| 32MB | 16MB | 16MB | | |
| 32MB | | | 16MB | 16MB |
| 36MB | 2MB | 2MB | 16MB | 16MB |
| 36MB | 16MB | 16MB | 2MB | 2MB |
| 40MB | 4MB | 4MB | 16MB | 16MB |
| 40MB | 16MB | 16MB | 4MB | 4MB |
| 48MB | 8MB | 8MB | 16MB | 16MB |
| 48MB | 16MB | 16MB | 8MB | 8MB |
| 64MB | 16MB | 16MB | 16MB | 16MB |
| 64MB | 32MB | 32MB | | |
| 64MB | | | 32MB | 32MB |
| 68MB | 2MB | 2MB | 32MB | 32MB |
| 68MB | 32MB | 32MB | 2MB | 2MB |
| 72MB | 4MB | 4MB | 32MB | 32MB |
| 72MB | 32MB | 32MB | 4MB | 4MB |
| 80MB | 8MB | 8MB | 32MB | 32MB |
| 80MB | 32MB | 32MB | 8MB | 8MB |
| 96MB | 16MB | 16MB | 32MB | 32MB |
| 96MB | 32MB | 32MB | 16MB | 16MB |
| 128MB | 32MB | 32MB | 32MB | 32MB |

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 12: Memory map

| Address range | Description |
|--------------------------------|--|
| 0-640KB (0-9FFFFH) | Base memory |
| 640-768KB (A0000-BFFFFH) | VGA mode video memory |
| 768-800KB (C0000-C7FFFFH) | Video BIOS |
| 800-896KB (C8000-DFFFFH) | Adapter card memory or upper memory |
| 896-960KB (E0000-EFFFF) | Available for upper memory |
| 960-1024KB (F0000-FFFFFFH) | System BIOS (some may be available for upper memory) |
| 1024KB-128MB (100000-7FFFFFFH) | Extended memory |

System Input/Output (I/O) addresses

This table shows the hexadecimal addresses for each of the system board 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 13: System I/O addresses

| Address range (hexadecimal) | Function |
|-----------------------------|---------------------------|
| 0000-001F | DMA controller |
| 0020-0021 | Interrupt controller 1 |
| 0040-0043 | System timers |
| 0060 | Keyboard/mouse controller |
| 0061 | System control port B |
| 0064 | Keyboard/mouse controller |
| 0070-0071 | RTC/CMOS and NMI mask |
| 0080-008F | DMA controller |
| 0092 | System control port A |
| 00A0-00A1 | Interrupt controller 2 |
| 00C0-00DF | DMA controller |
| 00EC-00ED | Reserved |
| 00F0-00FF | Math coprocessor |
| 0102 | SVGA controller |
| 0108-0109 | Reserved |
| 0170-0177, 0376 | Secondary IDE controller |

Table 13: System I/O addresses (Continued)

| Address range (hexadecimal) | Function |
|--------------------------------|------------------------|
| 01F0-01F7, 03F6 | Primary IDE controller |
| 0278-027F | Parallel port 3 |
| 02E8-02EF | Serial port 4 |
| 02F8-02FF | Serial port 2 |
| 0378-037F | Parallel port 2 |
| 03C0-03CF, 3D4, 3D5, 03DA | SVGA controller |
| 03E8-03EF | Serial port 3 |
| 03F0-03F5, 03F7 | Diskette controller |
| 03F8-03FF | Serial port 1 |
| CF8, CFC | Reserved |
| 46E8 | SVGA controller |

System board 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.

Table 14: System board interrupts

| Interrupt request (IRQ) | Function |
|-------------------------|-----------------------------------|
| SMI | Power management |
| NMI | Parity error or I/O channel check |
| 0 | Timer |
| 1 | Keyboard |
| 2 | Cascade to IRQ8-IRQ15 |
| 3 | Serial port B |
| 4 | Serial port A |
| 5 | User available |
| 6 | Diskette |
| 7 | Parallel port |
| 8 | Real-time clock |
| 9 | Redirect cascade (user available) |
| 10 | User available |
| 11 | User available |
| 12 | Mouse |
| 13 | Math coprocessor |
| 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 open DMA channel if you add an I/O device that uses DMA.

Table 15: DMA channel assignments

| DMA channel | Assignment |
|-------------|----------------|
| 0 | User available |
| 1 | User available |
| 2 | Diskette |
| 3 | User available |
| 4 | Cascade |
| 5 | User available |
| 6 | User available |
| 7 | User available |

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