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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Microsoft	Microsoft Corporation
OverDrive	Intel Corporation
Pentium	Intel Corporation
Soundblaster	Creative Labs, Incorporated
VESA	Video Electronics Standards Association
Windows	Microsoft Corporation
Windows NT	Microsoft Corporation
Works for Windows	Microsoft Corporation

Hardware and software assistance

See *A Guide to HelpWare and All the Extras* folder for information on getting hardware and software assistance.

About this book

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

This book has been written for several model configurations. If the model you purchased did not come with some of the hardware mentioned in this book, you will not be able to use the software functions associated with that hardware.

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 Input/Output devices
- Using Rapid Resume Manager
- Installing printer drivers
- Controlling the volume on multimedia systems
- Troubleshooting problems
- Using the computer's Setup Utility.

"Part 2. Installing options" contains instructions for installing options in both the desktop and minitower system unit and on the system board.

"Appendix. 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.

A Guide to HelpWare and All the Extras. This folder contains information about :

- Hardware service and software support for your computer
- The 1-800-number (for hardware assistance) and IBM support services (for answers to questions about your new computer)
- The Program License and Limited Warranty Agreement
- Awide 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. Your computer comes with different types of 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. It also includes help text, which you can access from the Help option in the software program or from the Windows 95 desktop.

Reference information Part 1

In this part, you will find these chapters:

- "First steps" on page 3 describes how the monitor controls work and explains how to set up the software that lets you get the best performance from your monitor. This chapter also explains how your computer functions with Rapid Resume Manager features enabled, and how to install a printer driver, and how to control the volume on multimedia models of the IBM Aptiva PC.

- "Input/Output device information" on page 17 describes the input/output devices (such as a sound card, an Mwave card, and a modem) that come on some models of the IBM Aptiva PC.

- "Troubleshooting" on page 39 describes potential computer problems and their solutions.

- "Working with the Setup Utility" on page 65 explains how to use the Setup Utility to view and change your computer's hardware information.

First steps 1

This chapter covers a variety of topics that affect the performance of your computer, and that you may want to learn about before you begin working on your computer. It includes detailed information that will help you:

- Set up your monitor so that you can use it at its best performance.
- Learn about 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.

Monitor setup and use

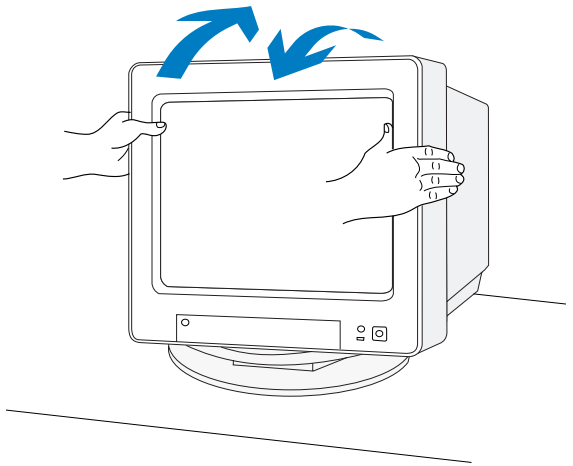
If you have not done so already, follow the setup instructions in the *Read me first* booklet to connect the monitor to the system unit. If your monitor came with a user's guide, refer to the guide for specific monitor settings.

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.



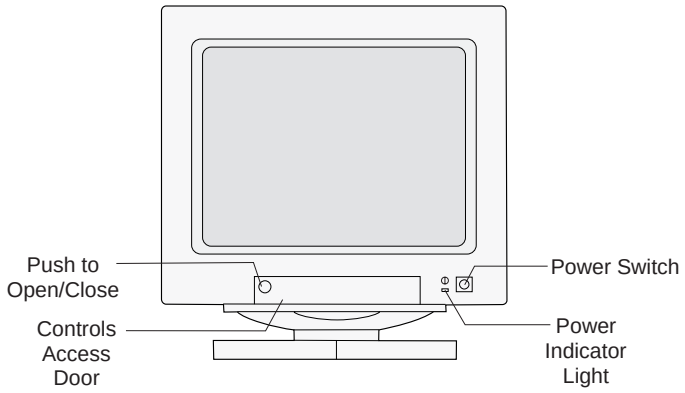
Adjustment tips:

- 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

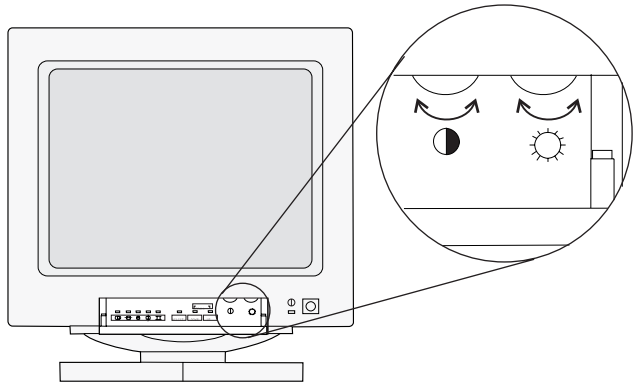
Your monitor has controls for adjusting the image that you see on the screen. The instructions on the next few pages will help you identify and adjust these controls.

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.

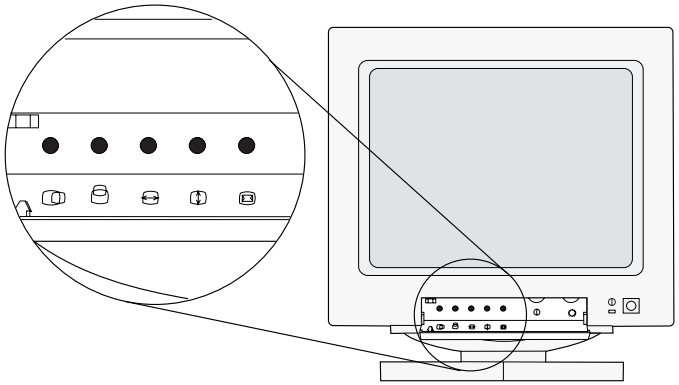
Adjusts the vertical sides of the image from appearing to bow in or out.

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 adjust rotary image controls by turning knobs. 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

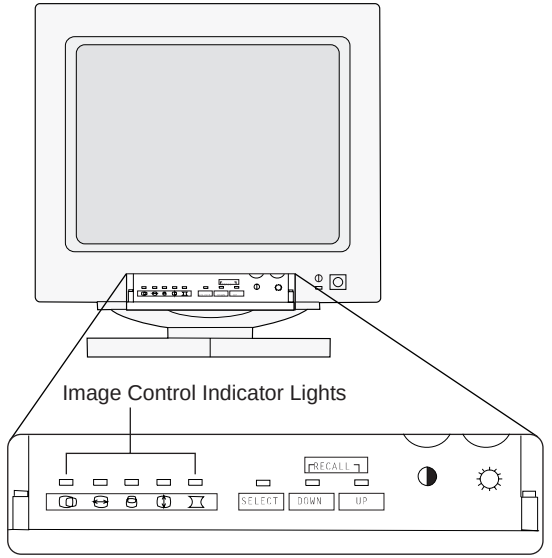
You adjust some image controls by pressing push buttons. The way that you adjust the push button image controls depends on whether you have a monitor *with* or *without indicator lights.*

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

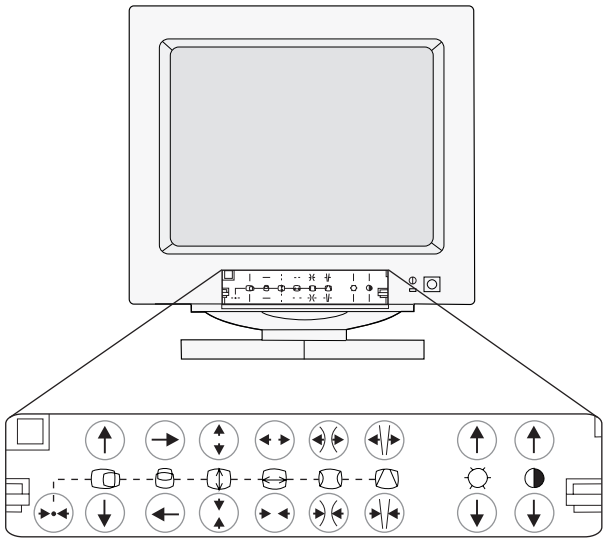
   press UP to increase the selected effect.



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.

Reset 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 UP and DOWN 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 (this is a common display mode), 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

Digital image controls

You adjust digital image controls by pressing on the image control symbol, or by pressing on the up or down arrows located next to the image control symbol. If your monitor has up and down arrows next to the image control symbol, adjust the image controls by pressing the arrows next to the symbol to increase or decrease the effect. If your monitor has digital image controls, see the user's guide that came with your monitor for more information about adjusting digital image controls.

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. During Rapid Resume, the monitor's power indicator light will begin to flash and/or change color soon after the screen goes blank. For more information about Rapid Resume, see "Using Rapid Resume Manager" on page 12.

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".

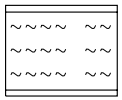
Setting up your monitor

The first time you turn on your computer, it automatically selects common settings for your monitor. If you purchased a monitor that supports Data Display Channel (DDC), the computer will automatically select the best horizontal frequency and refresh rate your monitor can support. To change the settings, you must first select the monitor horizontal frequency. Then, in each operating system, you can change options such as screen resolution, refresh rates and number of colors.

Selecting the Monitor Horizontal Frequency

The horizontal frequency sets the computer's video output frequency to match the monitor's frequency. You must use the Setup Utility to select the Monitor Horizontal Frequency setting. 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. Press the F1 key while the following symbol appears in the upper right corner of your screen:



   The main menu of the Setup Utility is displayed.
3. Your computer comes with Rapid Resume enabled. If you have kept Rapid Resume enabled, the Setup Utility will display the Summary View. To see all the options in the Setup Utility, press the Ctrl, Alt, and Delete keys at the same time to restart your system, then repeat Step 2.
   If you are not using Rapid Resume, do not press the Ctrl, Alt, and Delete keys.
4. Press the down arrow key until "Video and Monitor" is highlighted, and then press Enter.
5. Press the down arrow key until "Monitor Setup" is highlighted.

note: *If the option "Plug and Play / DDC" is selected, exit the Setup Utility and do not save changes to the video and monitor settings.*

6. Press the right arrow key until you see "Set Frequency".
7. 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.*
8. Press the down arrow key until "Monitor Horizontal Frequency" is highlighted.
9. 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 9.*

10. To save your selection and exit the Setup Utility:

    a. Press Esc until you return to the Main Menu.
    b. At the Main Menu, press Esc and then press Enter.

Selecting Monitor Settings

Now that you have selected the monitor horizontal frequency, you can change options such as screen resolution, number of colors and font size:

- Screen 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.

The values you can choose for monitor resolution and number of colors depend on the:

- Horizontal frequency setting you chose for your monitor.
- 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 Setup Utility. For instructions on using the Setup Utility, see page 65.

Tips for choosing monitor settings:

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

- Higher resolutions display more pels (picture elements). While this allows more text and graphics to be displayed, it makes them appear smaller. For most users, 640x480 or 800x600 is a comfortable resolution setting.
- When you select more colors, most software applications will slow down. Only choose as many colors as you need. A color setting of 256 typically provides the fastest performance.
- You can determine which settings are most comfortable to work with by selecting and trying each one.
- While your monitor resolution may allow you to change the font size, some applications do not support large fonts. Large fonts may cause words to appear cut off or pushed together.

Using the Windows Help function to select monitor settings:

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

1. From the Windows 95 desktop, click on the Start button at the lower left corner of your screen.
2. Click on Help.
3. The "Windows Help" folder appears.
4. Click on the Index tab at the top of the folder.
5. In the first box, type:
   `monitor`
6. The second box will automatically display a list of tasks related to the monitor. Select the task you

want and click on the Display button for instructions.
If you want to return to the Index list, click on the Help Topics button.

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. (If your computer came with speakers, those speakers are shielded.)
- Keep the monitor screen clean by using a nonabrasive screen or glass cleaner. Do not spray the cleaner directly 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 applications to see if it will let you select combinations of resolution and color. This could make viewing the screen more comfortable.

Using Rapid Resume Manager

Your IBM Aptiva Personal Computer comes with a special software group called Rapid Resume Manager. Rapid Resume Manager contains programs that save energy and make using your computer easier. Rapid Resume Manager has the following programs:

- 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. Your computer comes with Rapid Resume enabled (turned on).
- Standby. Lets your computer use less energy after it has been inactive for a period of time that you set. Your computer comes with Standby enabled (turned on).
- 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 phone call, message, fax, or data. To use this feature, you must have an internal modem that supports Wake Up on Ring.

How Rapid Resume stores information

While you are working, the computer stores the information you are working on in temporary memory. When you turn off your computer, Rapid Resume will take the information from temporary memory and store it in a special file on your hard disk.

While Rapid Resume will bring back the information you were working on before you turned off your computer, it does not save that information to your files on the hard disk (C:\). Even when you are using Rapid Resume, you need to save the information you are working on.

Your computer comes with Rapid Resume enabled (turned on). You can disable (turn off) Rapid Resume in Rapid Resume Manager. For more technical information about Rapid Resume, see the README.TXT file located in the PS1TOOLS directory of your computer.

Normal operation of Rapid Resume Manager

The following table describes the way your computer will normally operate when each of the Rapid Resume Manager features is enabled (turned on). Your computer comes with the Rapid Resume Manager features already enabled. If you would like to disable (turn off) the Rapid Resume Manager features, double-click on the AptivaWare icon, click on the Rapid Resume button and select Disabled.

Table 2: Rapid Resume Manager normal operation

What happens:	Explanation:
Computer does not automatically go into standby when Auto insert notification (AutoPlay) is enabled.	If AutoPlay is enabled, your computer will not enter Standby. You must disable the AutoPlay feature in order to for Standby to work properly.
Computer waits before turning off.	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.
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.

Table 2: Rapid Resume Manager normal operation

What happens:	Explanation:
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.
System unit power indicator light is blinking while the system unit and monitor are on.	This is an option in Standby. You can turn this option on or off 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 that your computer turned on to receive data, a fax, or voice message. 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.
Computer comes on when the phone rings.	This is a normal function of the Wake Up on Ring feature. You can turn this feature off by disabling Wake Up on Ring in Rapid Resume Manager or in the Rapid Resume feature of the Configuration/Setup Utility.

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 for the operating system you are using. 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.

Using the Windows Help function to install a printer driver:

note: *Follow these instructions if you want to print from any Windows 95 program.*

Windows Help provides instructions for installing the driver for your printer. To install a printer driver, follow these steps:

1. From the Windows 95 desktop, click on the Start button at the lower left corner of your screen.
2. Click on Help.
3. The "Windows Help" folder appears.
4. Click on the Index tab at the top of the folder.
5. In the first box, type:
   printer
6. The second box will automatically display a list of tasks related to the printer. Select "printer drivers, installing" and click on the Display button for instructions.

   note: *If you want to return to the Index list, after reading the printer drivers entry, click on the Help Topics button.*

7. As you follow the instructions, you will need to indicate:

   - The manufacturer and the model of your printer. If you do note see the manufacturer or model name of your printer in the list, see if your printer came with a diskette that has a driver for Windows 95. If so, follow the instructions for using the diskette.

     Or, 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.

   - The default port for your printer.
     Select the LPT1: ECP Printer Port option.

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.

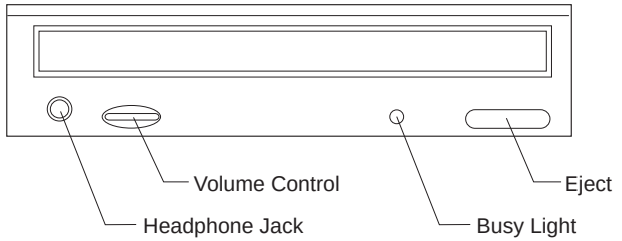
The volume control on the front of the speaker is affected by the volume control setting in the multimedia software that came with your computer. For example, if you turn the volume on the speaker all the way up, and no sound comes out of the speakers, the volume setting in your multimedia software is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

The multimedia software volume controls are located in the multimedia mixer applications.

Adjusting the headphone volume

You may be able to plug headphones into the headphone jack on the CD-ROM drive (not available on all systems) or into the 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.
  When using this jack, a few sounds may not be audible through the headphones, such as the beep when you turn on your computer.

Input/Output device information 2

About sound cards

Some IBM Aptiva PCs come with a sound card already installed.

Many software programs use the sound card for sound effects and music. The sound card works with the CD-ROM drive to play audio compact discs and to process audio data files.

Most sound cards have the following connections:

Line in	This connector is designed to receive the output from another device such as a stereo receiver or tape recorder.
Mic	This connector is designed to receive input from an external microphone.
Line out	This connector is designed to transmit audio output from the sound card to another device such as amplified speakers, a stereo, tape recorder, or headphones.
MIDI	This connector is designed to receive or transmit MIDI (Musical Instrument Digital Interface) signals from devices such as a keyboard. This connector may also be used with input devices for games such as a joystick.

If you need more information about the sound card that came installed in your computer, please refer to the documentation that came with it.

note: *The documentation that came with your sound card may either be online or in a printed book.*

About television cards

Some IBM Aptiva PCs come with a television (TV) card already installed.

The TV card is designed to work with many devices, for example, a TV antenna, cable TV, VCR, laser-disc player, or a video camera. You can also attach speakers to the audio-output connector.

If you need more information about the TV card that came installed in your computer, please refer to the documentation that came with it.

note: *The documentation that came with your TV card may either be online or in a printed book.*

About Mwave cards

Some IBM Aptiva PCs come with an Mwave card already installed.

The Mwave card in Aptiva combines all of the features of a sound card and modem. The Mwave adapter card works with the software to provide applications with:

- A sound system with CD quality stereo playback and record
- SoundBlaster compatibility
- A joystick port
- A set of telephone functions that include:
  - Full duplex (two way) speaker phone
  - Telephone answering machine
  - Fax modem
  - Data modem

Changing the I/O address or disabling the joystick

If the card you are installing has a conflict with the I/O address or the joystick port on the Mwave card, you may need to change the I/O address or disable the joystick port. Follow the instructions that came with the card to change its I/O address or disable the joystick port. If the card did not come with instructions, follow these steps to make changes to the Mwave card.

Changing the I/O address

To change adapter I/O address, you must:

- Change the software settings in the Mwave Configuration utility.
- Change the jumper settings on the adapter card. For instructions on changing the adapter card jumper settings, see page 19.

Changing I/O addresses in the Mwave Configuration utility

The I/O adapter card address in the Mwave Configuration utility must match the jumper settings on the Mwave card. To change the I/O adapter card address, following these steps:

1. From the Windows 95 desktop, click on the Start button at the lower left corner of the screen.
2. Click on Programs, and click on Mwave.
3. Click on Hardware Configuration. The Hardware Configuration utility window appears.
4. Click on the down arrow in the "I/O Addr" box of the "Mwave System" item.

   note: *If you accidentally click on the wrong box, press Esc. The box will close and you can try your selection again.*

5. Double-click on the address that you want your adapter card to use.

6. Click on Update. An “Information” window appears. When you have read the contents, click on OK. A “Confirm” window appears. When you have read the contents, click on Yes.

7. An “Information” window appears. When you have read the contents, click on OK.

8. Click on Exit to exit the Mwave Configuration utility. You must re-boot your computer for these changes to take effect.

9. Close all open programs. From the Windows 95 desktop, click on the Start button. Click on Shut Down, and then click on Yes to shut down the computer.

Changing jumper settings on the Mwave card

Once you have changed the I/O address, you will need to change the jumper settings on the Mwave card. To change the jumper settings, you may need to remove the Mwave adapter card.

To remove the Mwave adapter card:

1. Disconnect the cables attached to the adapter card. (Be sure to notice where the cables connect to the card. You will need to reattach the cables when you reinstall the adapter card.)

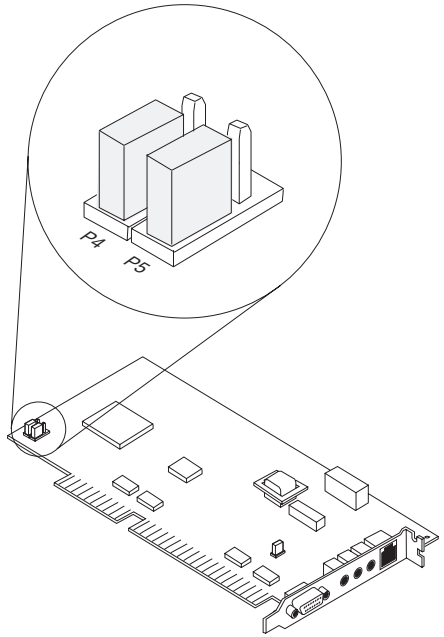
2. Remove the adapter card screw. Carefully remove the card from the adapter card slot.

3. Proceed to either Changing the jumper settings or Disabling the joystick port.

To change the jumper settings on the Mwave card:

You must change the jumpers on the adapter card to match the software settings. The jumpers you should change are labeled P4 and P5 on the adapter card. To change the jumpers:

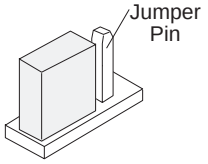
1. Locate the jumpers.



2. Use the following table and picture to determine how to set the jumpers.

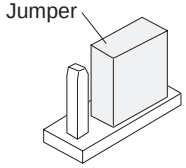
If you choose I/O address:	Set P4 to:	Set P5 to:
CE30	Position B	Position B
03B0	Reserved	
01B0	Position A	Position B
0130	Position A	Position A

Position A



(P4 and P5)

Position B



(P4 and P5)

3. Align and insert the Mwave adapter card into the adapter card connector from which you removed it. Insert the screw.

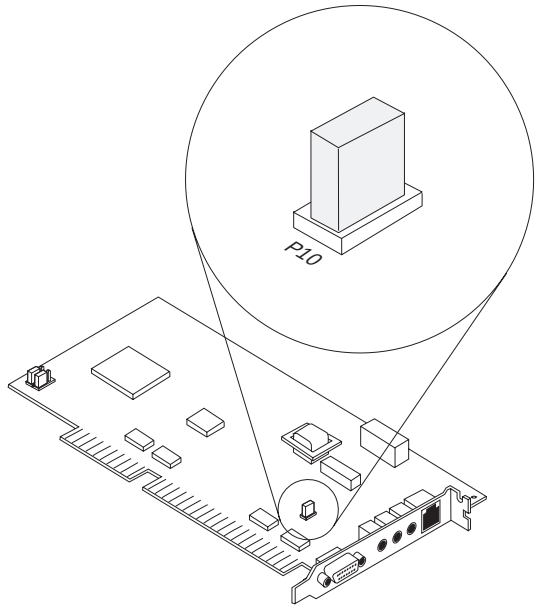
4. Reattach the cables to the Mwave adapter card.

Disabling the joystick port

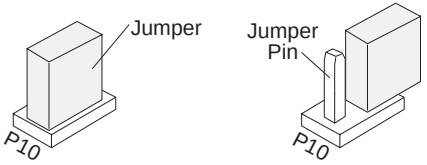
To disable the joystick port on your Mwave adapter card, you must change the joystick jumper. Before you change the joystick jumper, you may need to remove the Mwave adapter card. See “To remove the Mwave adapter card:” on page 19 for instructions.

To change the joystick jumper:

1. Locate the jumper labeled *P10* on your Mwave adapter card.



2. Move the jumper from the enabled position to the disabled position as shown in the picture.



(Enable) (Disable)

3. Align and insert the Mwave adapter card into the adapter card connector from which you removed it. Insert the screw.

4. Reattach the cables to the Mwave adapter card.

If you need more information about Mwave card that is already installed in your computer, please refer to the documentation that came with it.

note: *The documentation that came with your Mwave card may either be online or in a printed book.*

About serial ports

IBM Aptiva PCs have built-in external serial ports already installed in the computer. The connectors for these ports are located on the back of your computer. These ports can be used to connect a serial mouse, serial printer or other serial devices and to transfer data between computers.

Serial ports A and B support these addresses and interrupts.

Address	Interrupt
3F8	IRQ 4
3E8	
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 Setup Utility to change serial port addresses. See “Working with the Setup Utility” on page 65 for more information.

About modems

Some IBM Aptiva PCs have a modem already installed. Using a telephone network, a modem allows your computer to communicate with other computers, fax machines, or telephones.

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 network 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.*

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 HyperTerminal 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 ATS0=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 34.

- 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 30.

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.

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.

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

Turn Auto Answer off when you are not using your modem. Otherwise, callers will be greeted with the

modem tone. To turn Auto Answer off, use the command: `ATS0=0`.

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.*

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

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

Disabling Call Waiting

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

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

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

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

The dialing sequence you type on your computer 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 34.

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*. Modems communicate by protocol and *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. For example, 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 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 28,800 bps:

- Bell 103
- Bell 212A
- CCITT V.21, V.22, V.22bis,V.23, V.32, V.32bis, and V.34.

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 microcode. Microcode 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. Group 2 machines are also nearly obsolete today. 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 fax machines but not Group 2 or group 1 fax machines.

Choosing fax software applications

If your computer did not come with 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. The modem in your computer supports class 2 fax machines.

note: *CAS and SENDFAX are two other commonly used command sets. These command sets are not supported by the modems already installed in IBM Aptiva PCs.*

Communications settings

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

COM #	Address	Interrupt
COM1	3F8	IRQ 4
COM2	2F8	IRQ 3
COM3	3E8	IRQ 4
COM4	2E8	IRQ 3

Changing modem addresses for the Mwave adapter card

The modem address in your communications software must match the address setting of your modem. To change the modem address settings, following these steps:

1. If you are using OS/2 Warp, double click on the Mwave for OS/2 icon on the OS/2 desktop.

   If you are using Microsoft Windows, double-click on the Mwave icon on the Program Manager screen.

2. Double-click on the Hardware Configuration icon.

3. Click on the down arrow in the “COM #” box of the “Modem / FAX” item.

   note: *If you accidentally click on the wrong box, press Esc. The box will close and you can try your selection again.*

4. Double-click on the COM number that you want your modem to use.

   note: *When you click on a COM number the I/O address and IRQ settings will be updated automatically.*

5. Click on Update. A “Confirm” window appears. When you have read the contents, click on Yes.

6. An “Information” window will be displayed. When you have read the contents, click on OK.

7. Click on Exit to exit the Mwave Hardware Configuration utility. You must re-boot your computer for these changes to take effect.

8. If you are using OS/2 Warp, close all open programs. Click on the Shut down button, then click on OK.

   When you see the message to press Ctrl, Alt, and Delete, turn the computer off.

   If you are using Microsoft Windows, close all open programs. From the “File” menu on the Program Manager screen, click on “Exit Windows”. Click on OK.

   At the “Aptiva Menu” turn the computer off.

Changing modem addresses for non-Mwave adapter cards

If you purchased a computer that does not have Mwave modem support or if your computer has a non-Mwave modem, refer to the documentation that came with the modem for instructions on changing modem addresses.

Modem commands

Table 3 lists common modem commands. The modems that are already installed in your computer 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 ATS*r*? 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 ATS*r*=*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 comes with a modem already installed, 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 IBM Help Center – Aptiva PC, IBM Corporation, 3039 Cornwallis Rd., Dept. BM1 / BIdg. 203, Research Triangle Park, NC 27709-2195, 1-800-722-2227, 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 digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus as set out in the interference-causing equipment standard entitled: “Digital Apparatus”, ICES-003 of Industry Canada.

Avis de conformité aux normes d’Industrie Canada

Cet appareil numérique respecte les limites de bruits radioélectriques applicables aux appareils numériques de Classe B prescrites dans la norme sur le matériel brouilleur: “Appareils numériques”, NMB-003 édictée par Industrie 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.

Étiqueete 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)

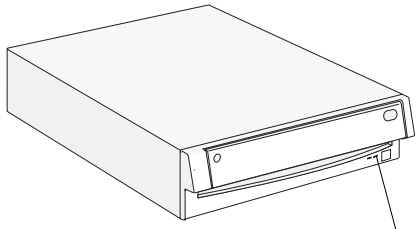
The load number (LN) assigned to each terminal device denotes the percentage of the total load to be connected to a telephone loop which is used by the device, to prevent overloading. The termination on a loop may consist of any combination of devices subject only to the requirement that the total of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

INDICE DE CHARGE (IC)

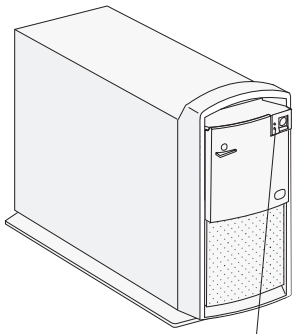
L'INDICE DE CHARGE (IC) assigné à chaque dispositif terminal indique, pour éviter toute surcharge, le pourcentage de la charge totale qui peut être raccordé à un circuit téléphonique bouclé utilisé par ce dispositif. L'extrémité du circuit bouclé peut consister en n'importe quelle combinaison de dispositifs 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

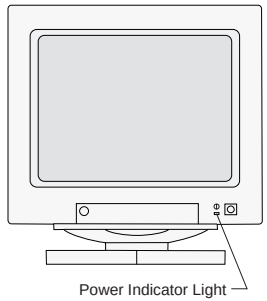
Step 1 Are the power indicator lights on the system unit and monitor lit?



(Desktop)



Power Indicator Light
(Minitower)



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	a. Press the on/off buttons on the system unit and monitor to make sure they are turned on. b. Make sure your system unit and monitor cables are correctly and securely connected. Make sure the system unit and monitor power cords are plugged into electrical outlets. Your *Read me first* booklet shows how the cables and cords should be connected. c. Make sure the electrical outlets you are using are not controlled by a wall or dimmer switch. d. If you are using a multiple outlet device (for example, a power surge protector or power strip), make sure it is plugged in and turned on. If the problem continues, check your *A Guide to HelpWare and All the Extras* folder for information on obtaining service.

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

Yes, once	The system unit has passed the power-on self test (POST). Go to Step 3.
Yes, more than once	There is a problem with the system unit. Find the code in "Error codes, descriptions, and corrective actions" on page 57, and take the action listed.
No	There is a hardware problem. 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 desktop system unit, see page 83. For instructions on installing hardware in your minitower system unit, see page 103. For instructions on installing options on your system board, see "Working with your system board" on page 121. b. Check that memory modules are installed correctly. For instructions, see "Working with your system board" on page 121. If the problem continues, check your *A Guide to HelpWare and All the Extras* folder 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 57, 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 Setup Utility, see page 65.
- A blinking cursor appears. Check your *A Guide to HelpWare and All the Extras* folder for information on obtaining service.
- The image on the screen is unreadable (the image is scrolling, blinking, or flashing). You may have selected a monitor setting that your monitor does not support. Complete these steps to reset your computer, and then follow the steps under “Selecting the Monitor Horizontal Frequency” on page 9 to select another setting.
  1. If you created a Power-on Password, disable it by using the Security Options menu of the 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 Setup Utility, see page 65.
  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 Setup Utility to the factory defaults. After resetting your computer, re-enter any customized settings in the Setup Utility.

(Steps continued on the next page.)

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

- 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.

If the problem continues, check your *A Guide to HelpWare and All the Extras* folder for information on obtaining service.

- 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 continues, or if it does not appear in this list, look for a description of the problem in the troubleshooting tables that begin on page 43.

No

- There may be 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.
- There may be a problem with the battery on your system board. See "Replacing the battery" on page 136 for instructions on how to replace the battery.
- If the problem continues, check your *A Guide to HelpWare and All the Extras* folder 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.
Screen is black (no error code), more than one beep in self-test.	If you installed memory modules or adapter cards, make sure you installed them correctly. For instructions on installing memory modules on your system board, see "Installing and removing memory modules" on page 131. For instructions on installing adapter cards in your desktop system unit, see "Installing adapter cards" on page 88. For instructions on installing adapter cards in your minitower system unit, see "Installing adapter cards" on page 108
Error code (and description), more than one beep in self-test, or continuous beep occurs	If an error code: • *Is* displayed, find the code in "Error codes, descriptions, and corrective actions" on page 57 and take the action listed. • *Is not* displayed, check your *A Guide to HelpWare and All the Extras* folder for information on obtaining service.
Computer turns off without warning	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.
Note: If any of these problems continue after taking the actions listed, check your *A Guide to HelpWare and All the Extras* folder for information on obtaining service.	

Table 6: Troubleshooting: Hardware problems (Continued)

If the problem is:	Here's what to do:
Can't enter password	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 *A Guide to HelpWare and All the Extras* folder for information on obtaining service.
Can't read information on diskette or CD	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 desktop system unit, see page 83. For instructions on working in the minitower system unit, see page 103.
Audio CD does not play when inserted into CD-ROM drive	Make sure you have enabled AutoPlay. To enable AutoPlay: 1. Click on Start. 2. Select Settings and click on Control Panel. 3. Double click on the System icon. 4. Click on the Device Manager tab. 5. Double click on CD-ROM and select MITSUMI CD-ROM. 6. Click on the Settings tab. 7. Under Options, click on Auto insert notification (a check appears in the box). 8. Click on OK.
Note: If any of these problems continue after taking the actions listed, check your *A Guide to HelpWare and All the Extras* folder for information on obtaining service.	

Table 6: Troubleshooting: Hardware problems (Continued)

If the problem is:	Here's what to do:
Can't send information (write) to diskette	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 desktop system unit, see page 83. For instructions on working in the minitower system unit, see page 103. 6. Make sure Diskette Drive Access is enabled in the Setup Utility under Advanced Options, Security Options.
Can't format diskette	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 desktop system unit, see page 83. For instructions on working in the minitower system unit, see page 103. 4. Make sure Diskette Drive Access is enabled in the Setup Utility under Advanced Options, Security Option.
Keyboard doesn't work or only some keys work	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.
Note: If any of these problems continue after taking the actions listed, check your *A Guide to HelpWare and All the Extras* folder for information on obtaining service.	

Table 6: Troubleshooting: Hardware problems (Continued)

If the problem is:	Here's what to do:
Mouse does not move the cursor	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. a. Turn the computer off. b. Disconnect the mouse cable from the system unit. c. Turn the mouse upside down. Unlock the retainer on the bottom of the mouse by turning it counterclockwise. Now turn the mouse right-side up, and the retainer and the ball will drop out. d. Using a damp cloth, wipe the outside of the mouse and the retainer. Be sure to wipe the rollers inside the mouse. e. Insert the ball and retainer. Lock the retainer by turning it clockwise. f. Reconnect the mouse cable to the system unit. 5. Turn the system unit off, wait 10 seconds, and then turn the system unit on again.
Note: If any of these problems continue after taking the actions listed, check your *A Guide to HelpWare and All the Extras* folder for information on obtaining service.	

Table 6: Troubleshooting: Hardware problems (Continued)

If the problem is:	Here's what to do:
Modem/communications errors	1. Make sure the telephone cord is securely connected. Your *Read me first* 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 "Input/Output device information" on page 17. 7. Make sure the modem adapter card is installed correctly. For instructions on installing adapter cards in a desktop system unit, see "Installing adapter cards" on page 88. For instructions on installing adapter cards in a minitower system unit, see "Installing adapter cards" on page 108.
When the computer is turned on, a picture appears indicating a diskette should be inserted into drive A	1. Choose Startup Options from the 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 desktop system unit, see page 83. For instructions on working in the minitower system unit, see page 103. 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 *A Guide to HelpWare and All the Extras* folder for information on obtaining service.
Note: If any of these problems continue after taking the actions listed, check your *A Guide to HelpWare and All the Extras* folder for information on obtaining service.	

Table 6: Troubleshooting: Hardware problems (Continued)

If the problem is:	Here's what to do:
Printer error	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 14. 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 *first*, and then the system unit. 7. Make sure the Parallel Port option is not set to "Disabled" in the Input/Output Ports feature of the Setup Utility. 8. Make sure the Parallel Port Mode option is set to a mode that matches your printer. 9. For additional help, see the user's guide that came with the printer.
Note: If any of these problems continue after taking the actions listed, check your *A Guide to HelpWare and All the Extras* folder for information on obtaining service.	

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 the information your computer uses to start. Installing new software sometimes changes your AUTOEXEC.BAT file. If you installed new software, make sure the following line is still in the AUTOEXE.BAT file, and "REM" does not appear at the beginning of the line: C:\PS1TOOLS\PS1PFILE
Computer doesn't go into Standby or automatically power off when the set time has elapsed.	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 95 screen saver. These activities make the timer start over. 2. Make sure AutoPlay is disabled. When AutoPlay is enabled, Rapid Resume detects activity in the CD-ROM drive and keeps the computer from going into Standby. 3. 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 Setup Utility. For instructions on using the Setup Utility, see page 65.
The Rapid Resume Features screen does not appear in the Setup Utility and the Rapid Resume Manager icon does not appear in the "AptivaWare" window.	Check your *A Guide to HelpWare and All the Extras* folder for information on obtaining service.
Note: If any of these problems continue after taking the actions listed, check your *A Guide to HelpWare and All the Extras* folder for information on obtaining service.	

Table 7: Troubleshooting: Software problems (Continued)

If the problem is:	Here's what to do:
When you turn the computer on, the desktop is not as you left it when you turned the computer off.	1. Make sure another person hasn't used the computer and changed the desktop. 2. Check that Rapid Resume is enabled. 3. Choose Rapid Resume from the Setup Utility main menu, and make sure that the APM BIOS Mode option is set correctly for the operating system you are using: • Windows: "32 Bit Protected". • OS/2 2.1: "16 Bit Protected". 4. If you are working in Windows 95, 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.	If you are working in Windows 95 or OS/2 2.1: 1. Check that Rapid Resume is enabled. 2. Choose Rapid Resume from the Setup Utility main menu, and make sure that the APM BIOS Mode option is set correctly for the operating system you are using: • OS/2 2.1: "16 Bit Protected" or "16 and 32 Bit". • Windows: "32 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 *A Guide to HelpWare and All the Extras* folder 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 *A Guide to HelpWare and All the Extras* folder 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.	If you boot (start) your computer to Windows 95: In the Rapid Resume menu of the 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).	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 using a joystick.
The game or application you were using does not have sound after a Rapid Resume.	You were probably playing a game or using an application that communicates directly to the sound card, instead of communicating through the driver to the sound card. Rapid Resume must communicate with the driver in order to restore the game or application.
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.	1. Try reconnecting to your network drives. 2. If your computer has only DOS/Windows on it, 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. 5. Some network cards are not designed to support Advanced Power Management (APM). These cards will not work with Rapid Resume.
Computer shuts off without pressing the on/off button.	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 Setup Utility. For instructions on using the Setup Utility, see page 65.
Note: If any of these problems continue after taking the actions listed, check your *A Guide to HelpWare and All the Extras* folder for information on obtaining service.	

Table 7: Troubleshooting: Software problems (Continued)

If the problem is:	Here's what to do:
You set the computer to start when the phone rings in order to receive a fax, but it receives a regular phone call instead.	If you have an Mwave card: Make sure that the Aptiva Fax Center is running. If your sound card and modem are separate: Either disable the Wake Up on Ring feature in the Rapid Resume menu of the 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 Setup Utility, see page 65. 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).
You click on the Suspend button and your computer does not turn off.	Rapid Resume must be enabled for the suspend button to work properly. In Rapid Resume Manager, check Rapid Resume. Make sure it is enabled (turned on).
Your computer turns on automatically when you dial out on a rotary or pulse telephone.	Either disable the Wake Up on Ring feature in the Rapid Resume menu of the 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 Setup Utility, see page 65. 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).
The phone rings and the computer turns on, but a fax isn't received.	The fax software must be open and set to receive faxes. See the documentation that came with your fax software to make sure it is set up to answer the phone.
Standby Snapshot is enabled (turned on), but the computer does not Rapid Resume after a power failure.	In order for Standby Snapshot to work properly after a power failure, make sure that: 1. Rapid Resume is enabled. 2. Standby is enabled. 3. Your computer is in Standby when the power failure occurs.
Note: If any of these problems continue after taking the actions listed, check your *A Guide to HelpWare and All the Extras* folder for information on obtaining service.	

Table 7: Troubleshooting: Software problems (Continued)

If the problem is:	Here's what to do:
A POST error code appears after you turn your computer on using Rapid Resume.	1. Turn the system unit off. 2. If you have: • *Not changed* your hardware (installed or removed an option), find the error code in "Error codes, descriptions, and corrective actions" on page 57 and take the action listed. • *Changed* 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 desktop system unit, see "Working with your desktop system unit" on page 83. For instructions on installing hardware in your minitower system unit, see "Working with your minitower system unit" on page 103. For instructions on installing options on your system board, see "Working with your system board" on page 121.
Note: If any of these problems continue after taking the actions listed, check your *A Guide to HelpWare and All the Extras* folder for information on obtaining service.	

Table 8: Troubleshooting: Monitor problems

If the problem is:	Here's what to do:
Discolored screen	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.
Display fonts appear cut off or pushed together	1. While your monitor resolution may allow you to change the font size, some applications do not support large fonts. Large fonts may cause words to appear cut off or pushed together. Check the settings in Display Properties. Make sure the font size selected is small fonts.
White screen	1. Make sure the monitor cable is correctly and securely connected to the system unit. 2. Make sure the system unit is turned on. 3. 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	1. Select lower resolution, lower color settings, and higher refresh rates. 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 *A Guide to HelpWare and All the Extras* folder 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.
Note: If any of these problems continue after taking the actions listed, check your *A Guide to HelpWare and All the Extras* folder for information on obtaining service.	

Table 8: Troubleshooting: Monitor problems (Continued)

If the problem is:	Here's what to do:
Image control indicator lights on the monitor flash consecutively	Make sure the monitor cable is correctly and securely connected to the system unit.
Any of the following: • Totally blank screen • No cursor displayed • Only the cursor is displayed • Screen is unreadable • Other monitor problems	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. 9. There may be a problem with the battery on your system board. See "Replacing the battery" on page 136 for instructions on how to replace the battery.
Note: If any of these problems continue after taking the actions listed, check your *A Guide to HelpWare and All the Extras* folder for information on obtaining service.	

Table 9: Troubleshooting: Mwave multimedia problems

If the problem is:	Here's what to do:
You don't hear sound from the audio application when you start the modem.	Set the modem to operate at a lower transfer rate. See "Mwave Help" in the Mwave group.
You can't play or record messages when a speaker phone application is running.	Close the speaker phone application when you want to play or record messages.
You can't use Windows applications, play games, telegame, or use the modem in a DOS box under OS/2 Warp.	Close all DOS boxes running under OS/2 Warp, then re-open a DOS box. Mwave DOS functions are available only in the first DOS box you open under OS/2 Warp.
The option for an installed Mwave card does not appear in the Setup Utility.	1. If you removed the adapter cards from your system unit, make sure you re-installed the Mwave card. 2. If the Mwave card is installed properly, enter the Setup Utility and press F5 from the Main Menu to reload the factory settings. (Pressing F5 restores factory settings for all options. If you changed any settings in the Setup Utility, you will need to make your changes again.)
You don't hear sound and the modem doesn't work after you change the I/O address jumpers on the Mwave card.	Make sure the I/O adapter settings in the Mwave Hardware Configuration utility match the jumper settings on the Mwave adapter card. For instructions on changing Mwave adapter card settings, see "Changing modem addresses for the Mwave adapter card" on page 28.
Note: If any of these problems continue after taking the actions listed, check your *A Guide to HelpWare and All the Extras* folder for information on obtaining service.	

Error codes, descriptions, and corrective actions

Table 10: Error codes, descriptions, and corrective actions

Error Code	Description	Here's what to do:
	No beep during power-on self test (POST)	Make sure that the system unit is turned on.
	Screen is black (no error code), more than one beep in self-test.	• If you installed memory modules or adapter cards make sure you installed them correctly. For instructions on installing memory modules on your system board, see "Installing and removing memory modules" on page 131. For instructions on installing adapter cards in your desktop system unit, see "Installing adapter cards" on page 88. For instructions on installing adapter cards in your minitower system unit, see "Working with your minitower system unit" on page 103. • There may be a problem with the battery on your system board. See "Replacing the battery" on page 136 for instructions on how to replace the battery.
10X 129 15X	System Board Error	Turn the system unit off, wait 10 seconds, and then turn the system unit on again.
110	System Board Parity Error	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 131. 2. Turn the system unit off, wait 10 seconds, and then turn the system unit on again.
Notes: 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 *A Guide to HelpWare and All the Extras* folder for information on obtaining service.		

Table 10: Error codes, descriptions, and corrective actions (Continued)

Error Code	Description	Here's what to do:
111 114	I/O Channel Parity Error Adapter ROM Error	1. Make sure all adapter cards are installed correctly. For instructions on installing adapter cards in your desktop system unit, see "Working with your desktop system unit" on page 83. For instructions on installing adapter cards in your minitower system unit, see "Working with your minitower system unit" on page 103. 2. Turn the system unit off, wait 10 seconds, and then turn the system unit on again.
127	Processor Speed Error	Turn the computer off, wait 10 seconds, and then turn the computer 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 136.

Notes:

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 *A Guide to HelpWare and All the Extras* folder for information on obtaining service.

Table 10: Error codes, descriptions, and corrective actions (Continued)

Error Code	Description	Here's what to do:
162	Configuration Error Configuration Change Has Occurred	• If you are using Rapid Resume, complete the following steps: - If you *have not changed* your hardware (installed or removed an option), check your *A Guide to HelpWare and All the Extras* folder for information on obtaining service. *Note: Any work that you did not save before the computer was turned off cannot be retrieved.* - If you *have changed* 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 *A Guide to HelpWare and All the Extras* folder for information on obtaining service. • If you are *not* using Rapid Resume: - Press Enter while the error message is displayed to start the Setup Utility. Look through the Setup Utility and verify that the options with ▶ next to them were supposed to change. If so, press the Esc key and then press Enter to save the new settings. Then exit the Setup Utility. For more information on using the Setup Utility, see page 65. If options changed that were not supposed to, check your *A Guide to HelpWare and All the Extras* folder 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 Setup Utility. For instructions on using the Setup Utility, see page 65.

Notes:

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 *A Guide to HelpWare and All the Extras* folder for information on obtaining service.

Table 10: Error codes, descriptions, and corrective actions (Continued)

Error Code	Description	Here's what to do:
164	Memory Size Error	1. If you are using Rapid Resume and you *have changed* 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 *A Guide to HelpWare and All the Extras* folder for information on obtaining service. 2. If you are not using Rapid Resume and you have added or removed memory from your computer, press Enter while the error message is displayed to enter the Setup Utility. Choose System Information from the Setup Utility Main Menu to verify that the new memory size is correct. For instructions on using the Setup Utility, see page 65. If you have not removed memory from your computer, check your *A Guide to HelpWare and All the Extras* folder for information on obtaining service.
201	Memory Error	Make sure memory modules (SIMMs) are inserted correctly and completely. For instructions on inserting SIMMs, see "Installing and removing memory modules" on page 131.
229	External Cache Error	If you have added any external cache modules, make sure they are inserted correctly and completely. For instructions on inserting cache memory modules, see "Installing cache memory" on page 127.
262	DRAM Parity Configuration Error	1. If you added or changed the memory modules (SIMMs), press Enter while the error message is displayed to enter the Setup Utility. From the Setup Utility Main Menu, choose System Information and verify that the Memory Type setting is correct. For instructions on using the Setup Utility, see "Using the Setup Utility" on page 65. 2. If you did not add or change the memory modules (SIMMs), make sure the existing memory modules have been installed properly. For instructions on installing memory modules, see "Installing and removing memory modules" on page 131.

Notes:

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 *A Guide to HelpWare and All the Extras* folder for information on obtaining service.

Table 10: Error codes, descriptions, and corrective actions (Continued)

Error Code	Description	Here's what to do:
264	External Cache Size Error	If you have removed cache memory from your computer, press Enter while the error message is displayed to enter the Setup Utility. Choose System Information from the Setup Utility Main Menu to verify that the new cache memory size is correct. For instructions on using the Setup Utility, see page 65. If you have not removed memory from your computer, check your *A Guide to HelpWare and All the Extras* folder for information on obtaining service.
30X	Keyboard Error	1. 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: 2. Make sure that a keyboard key or a mouse button is not being held down.
602	Diskette Boot Error	Make sure the diskette has been formatted. If you don't want to use the diskette to boot (start) your computer, remove the diskette from the drive.
662	Diskette Drive Configuration Error	1. If you added or removed a diskette drive, press Enter while the error message is displayed to enter the Setup Utility. Choose Input/Output Ports from the 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 Setup Utility, see page 65. 2. If you did not add or remove a diskette drive, make sure the diskette drive cables are connected correctly.
762	Math Coprocessor Configuration Error	Check your *A Guide to HelpWare and All the Extras* folder for information on obtaining serviceS.
Notes: 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 *A Guide to HelpWare and All the Extras* folder for information on obtaining service.		

Table 10: Error codes, descriptions, and corrective actions (Continued)

Error Code	Description	Here's what to do:
962	Parallel Port Configuration Error	If you changed a hardware option, press Enter while the error message is displayed to enter the Setup Utility. Choose Input/Output Ports from the 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 Setup Utility, see page 65.
1162	Serial Port Configuration Error	If you changed a hardware option, press Enter while the error message is displayed to enter the Setup Utility. Choose Input/Output Ports from the 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 Setup Utility, see page 65.
1362	Mwave Sound Card Configuration Error	Make sure the I/O adapter settings in the Mwave Hardware Configuration utility match the jumper settings on the Mwave adapter card. For instructions on changing Mwave adapter card settings, see "Changing modem addresses for the Mwave adapter card" on page 28.
1762	Hard Disk Configuration Error	1. Make sure the cables to all drives are securely attached. 2. Press Enter while the error message is displayed to enter the Setup Utility. Choose Disk Drives from the Setup Utility Main Menu. Make sure the settings for the drive options are correct. If the settings are not correct, change the settings. For instructions on using the Setup Utility, see page 65.

Notes:

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 *A Guide to HelpWare and All the Extras* folder for information on obtaining service.

Table 10: Error codes, descriptions, and corrective actions (Continued)

Error Code	Description	Here's what to do:
1780 1781 1782 1783	Drive 1 (Hard Disk) Error Drive 2 (Hard Disk) Error Drive 3 (Hard Disk) Error Drive 4 (Hard Disk) Error	1. Make sure the cables to all drives are securely attached. 2. Press Enter while the error message is displayed to enter the Setup Utility. Choose System Information from the Setup Utility Main Menu and verify that the Processor 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 *A Guide to HelpWare and All the Extras* folder 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 in the desktop system unit, see "Installing additional drives" on page 91. For information about drive connectors and settings in the minitower system unit, see "Installing additional drives" on page 112.
24XX	Video Error	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	1. Make sure the monitor cables are correctly and securely connected to the system unit. 2. If you added or removed video memory, or if you installed a video adapter card, press Enter while the error message is displayed to enter the Setup Utility. Press the Esc key and then press Enter to save the new setting. 3. Press Enter while the error message is displayed to enter the Setup Utility. Choose System Information and Video and Monitor from the Setup Utility Main Menu to verify that the settings for the Video Controller, Video Memory, and Monitor Horizontal Frequency options are correct in the Setup Utility. For instructions on using the Setup Utility, see page 65.

Notes:

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 *A Guide to HelpWare and All the Extras* folder for information on obtaining service.

Table 10: Error codes, descriptions, and corrective actions (Continued)

Error Code	Description	Here's what to do:
5962	CD-ROM Configuration Error	1. Check that all CD-ROM drive cables are correctly and securely connected. 2. If you added, removed, or moved any drives in your system unit, press Enter while the error message is displayed to enter the Setup Utility. Choose the System Information from the Setup Utility Main Menu to verify that only the options for the drives you changed have ▶ next to them. Return to the main menu, press the Esc key and then press Enter to save the new configuration. If options changed that were not supposed to, check your *A Guide to HelpWare and All the Extras* folder for information on obtaining service.
86XX	Pointing Device Error	1. 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: 2. Make sure that a keyboard key or a mouse button is not being held down.

Notes:

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 *A Guide to HelpWare and All the Extras* folder for information on obtaining service.

Working with the Setup Utility 4

Using the Setup Utility

The Setup Utility allows you to view and change important information about your computer and its hardware. You may need to use the 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 Setup Utility to:

- Check your 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 your computer's serial and parallel port settings, and the parallel port mode.
- Set up or change Power-on password on your computer.
- Change the date and time on your computer.
- Reduce the amount of energy your computer uses by setting up your computer's Rapid Resume features.

Starting the Setup Utility

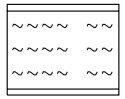
The Setup Utility opens with a Main Menu that lists the features of the utility. When you choose a feature from the Main Menu, the Setup Utility displays screens that let you view information about how your computer is set up (called the *configuration*), or change certain information on your computer.

When you get an error, your computer shows a *popup window* with an error code and description. Press Enter to get the 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.

2. This symbol appears on the screen.



   Press F1 while the symbol is displayed to get the Setup Utility. *(Steps continued on the next page.)*

3. Your computer comes with Rapid Resume enabled. If you have kept Rapid Resume enabled, the Setup Utility will display the Summary View. To see all the options in the Setup Utility, press the Ctrl, Alt, and Delete keys at the same time to restart your system, then repeat Step 2.

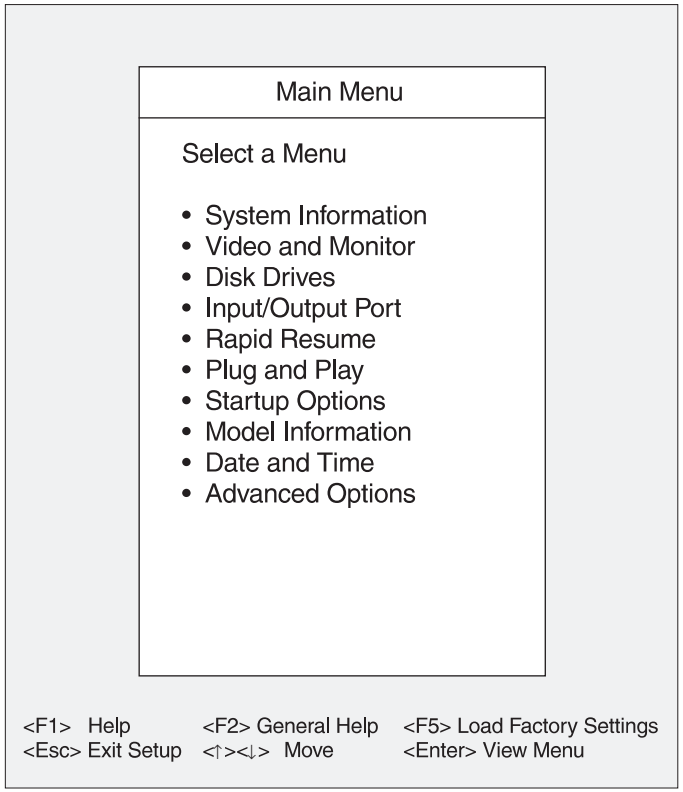
Making changes with the Setup Utility

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 Setup Utility screens and provide a step-by-step example of how to use the Setup Utility.

The Setup Utility Main Menu

The Main Menu appears when you start the Setup Utility. The Main Menu lists all of the features of the Setup Utility.

note: *(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 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 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 Setup Utility screens

You use keys on the keyboard to move through and make changes to the 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.
–	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.
F2	Press this key once if you want general information on using the Setup Utility.
F5	Press this key if you want to return the Setup settings to the factory defaults (the original settings that were made at the factory).
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 Setup Utility screen, you will return to the Main Menu. To exit the Setup Utility:

1. From the Main Menu, press the Esc key.

2. The "Exit Setup" window appears. If you have made any changes to the Setup Utility, it will ask you if you want to save your changes.

   a. If you would like to save your changes, highlight the option to save your changes and exit the Setup Utility, then press Enter.
   b. If you do not want to save your changes, highlight the option to exit the Setup Utility without saving, then press Enter.

If you have made changes to the Setup utility, and you would like to restore the settings to the original settings that were made at the factory:

1. From the Main Menu, press the F5 key. The "Load Factory Settings" window appears.

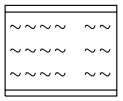
2. Highlight the option to reload the factory settings and restart, then press Enter. Your computer will restart. Any options that were changed will return to the factory settings (the original settings that were made at the factory).

Example of using the Setup Utility

To give you an idea of how to work with the Setup Utility, the following example walks you step-by-step through the process of changing the time on your 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. This symbol appears on the screen.

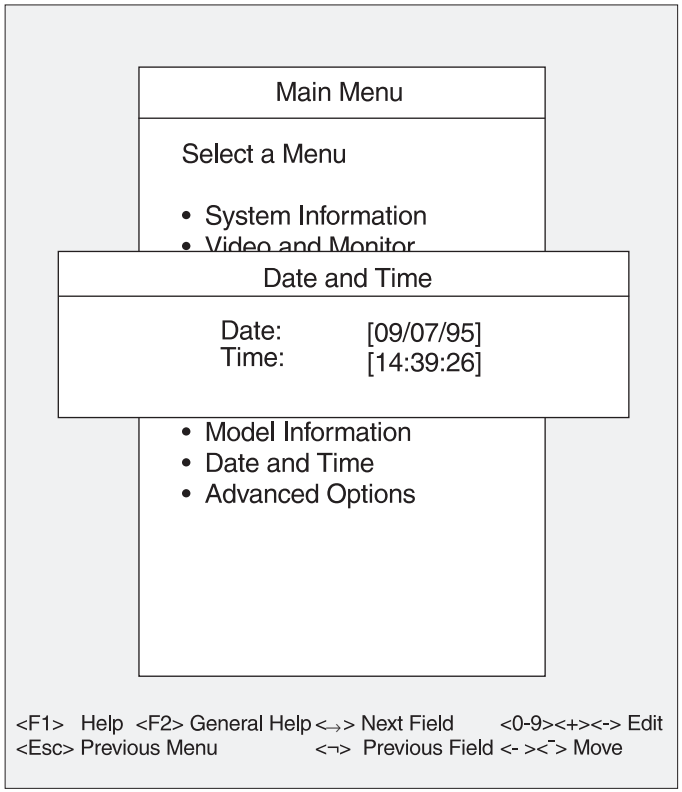


   Press F1 while the symbol is displayed to get the Setup Utility.

3. Your computer comes with Rapid Resume enabled. If you have kept Rapid Resume enabled, the Setup Utility will display the Summary View. To see all the options in the Setup Utility, press the Ctrl, Alt, and Delete keys at the same time to restart your system, then repeat Step 2.

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 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 Date setting should be highlighted when the Date and Time screen appears (the date setting is 09/07/95 in the picture). To select the Time setting, use the arrow keys on the keyboard to highlight it. (The time setting is 14:39:26 in the picture).

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 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 appears. From the Main Menu, press the Esc key to exit the Setup Utility.

9. The Exit Setup window appears, select the option "Yes, save and exit the Setup Utility" and press Enter.

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

Features of the Setup Utility

The Setup Utility contains the following features, which you select from the Main Menu:

- System Information
- Video and Monitor
- Disk Drives
- Input/Output Ports
- Rapid Resume
- Plug and Play
- Startup Options
- Model Information
- Date and Time
- Advanced Options

Each feature is described in the following pages. Each feature also contains online help information which you can access by pressing the F1 key.

System Information

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

- Add or change an option on your computer.
- Make changes to other screens in the Setup Utility and save those changes.

The System Information screen contains information about the processor, system memory, video memory, cache memory, and the diskette, hard drives, and CD-ROM drive installed on your system. This screen also shows if the mouse is installed.

Video and Monitor

The Video and Monitor screen shows the video controller and the amount of video memory installed on your computer. It also allows you to change your monitor's setup, which includes *refresh rates*. The refresh rate is the rate in hertz (Hz) at which the entire image is drawn on the screen.

Monitor Setup. The Monitor Setup options you can choose to change the monitor's refresh rates are Set Frequency (the monitor horizontal frequency will be highlighted), Plug and Play / DDC, and Set Refresh Rates (the refresh rates option will be highlighted).

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.*

Set Frequency. This option allows you to choose the monitor horizontal frequency for your computer. The monitor horizontal frequency you specify will automatically set the refresh rates for your computer. 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.

Plug and Play / DDC. If you have a monitor that supports DDC (Display Data Channel), this option allows your

computer to automatically set the best refresh rates for your monitor.

Set Refresh Rates (resolution). This option allows you to 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 Setup Utility.

Disk Drives

The Disk Drives Setup screen shows you the size of the drives installed in your computer and what additional drives can be installed. The following paragraphs describe each of these options:

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 Disk Drives screen.

Hard Disk Drive and CD-ROM Drive: These options show you entries for each hard disk drive and the CD-ROM drive that are already installed, or that can be installed in your computer. You can have a maximum of four IDE drives installed on your system.

The Disk Drives Setup screen lists four IDE drive selections:

- *Hard Disk Drive 1* 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 Drive 2* (if installed) is attached to Local Bus connector 1 on the system board and set as the Slave device.
- *CD-ROM Drive 3* (if installed) is attached to Local Bus connector 2 on the system board and set as the Master device. If your computer does not have a CD-ROM drive, this selection will read *Hard Disk Drive 3*.
- *Hard Disk Drive 4* (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 Disk Drives Setup screen, the screen for that drive appears. That screen shows the size of the hard disk installed and allows you to choose the IDE Performance mode for each drive. It may also allow you to make changes to the following:

Local Bus IDE Mode. This option allows you to set the speed (performance) at which the drive will transfer data. To get the best disk performance, run IDE drives (such as a hard disk or CD-ROM drive) in High Performance mode.

Read Prefetch. If the Local Bus IDE mode is set for High Performance, you can enable this option for maximum hard disk performance.

note: *A CD-ROM drive connected at the Drive 1 location may require this option to be disabled. Some operating systems, such as Windows NT** and OS/2**, may also require this option to be disabled.*

Disk BIOS Translation. This option allows your computer to use IDE hard disks larger than 528 MB with most operating systems.

note: *You may need to disable this option if you are using Novell Netware** with IDE hard disks larger than 528 MB.*

Parameter Table Type. This option allows your computer to use IDE hard disks larger than 528 MB with most operating systems.

note: *You may need to use Standard tables with the UNIX** operating system.*

Input/Output Ports

The Input/Output Ports feature contains options relating to serial and parallel ports, the mouse, and keyboard. 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 Input/Output 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 allows you to 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 allows you to choose either the Compatible mode or one of the extended modes (ECP or PS/2 Bi-directional) for a parallel port.

The parallel port extended modes will increase the efficiency of your parallel port, however the extended modes use recent technology and are only supported by newer hardware (such as a printer). The available extended modes are:

- *PS/2 Bidirectional:* This mode is used for data transfer to other PC systems and supported devices.
- *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.

- ECP and EPP 1.7: This mode combines the capabilities of the Extended Capabilities Port (ECP) and Enhanced Parallel Port (EPP) modes. This mode is not compatible with the ECP and EPP 1.9 mode.
- ECP and EPP 1.9: This mode combines the capabilities of the Extended Capabilities Port (ECP) and Enhanced Parallel Port (EPP) modes. This mode is not compatible with the ECP and EPP 1.7 mode.

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

Mouse. This option shows if the mouse is installed.

Keyboard NumLock State. This option allows you to set the NumLock function on the keyboard to turn on automatically each time you turn your computer on.

Keyboard Speed. This option allows you to 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.

Mwave Adapter. This option shows you if you have an Mwave adapter card installed in your computer.

If you have an Mwave adapter card installed but this option does not appear, make sure the card is installed properly. If the card is installed properly, press F5 to reload the factory settings.

Rapid Resume

Rapid Resume is an exclusive IBM energy-saving feature with many useful options. Your computer comes with Rapid Resume enabled (turned on). Rapid Resume:

- Saves the current state of your computer when you turn it off. Any applications, programs, or data files open when you turn off your computer will be open when you turn it back on.
- Automatically turns 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.
- Reduces the time your computer takes to start up.
- Puts 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.
- Can automatically turn on your computer with Wake Up on Ring when the phone rings so that your computer can receive a fax.
- Can automatically turn on your computer with Scheduler at a date and time you specify.

The following paragraphs describe each of the Rapid Resume 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 allows you to enable (turn on) or disable (turn off) Rapid Resume.

Automatic Power Off. If Rapid Resume is enabled, this option allows you to 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, your computer turns off automatically.

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

The current state of your computer is saved before it turns off. Any applications or programs open when your computer turns off will be open when you turn it 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 Timer. This option allows you to 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.

Standby Snapshot. This option allows you to have the state of your computer saved when it enters Standby. If the electricity goes out or your computer is turned off while in Standby, your computer resumes at the saved state when you turn it back on. Any applications or programs open when your computer is turned off will be open when the power returns.

Monitor Mode. This option allows you to 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 allows you to stop the central processing unit (CPU) during Standby. This conserves power without affecting the operation of your computer.

Blink LED in Standby. If you are using the Standby feature, and you enable the Blink LED in Standby option, the power light will blink to indicate that your computer is in Standby mode.

Wake Up on Ring. This option allows you to have your 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 or an external modem connected to serial port A.

Indicator. If you are using the Wake Up on Ring feature, and you enable the Indicator option, the power light will blink to indicate your computer answered the phone. The Indicator resets when you turn your 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 allows you to have your 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 Alarm Time. If you are using the Wake Up on Alarm feature, these options let you set the date and time you want your 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

Plug and Play

The Plug and Play (PnP) screen shows the number of ISA Plug and Play adapter cards you have installed in your computer. It also allows you to manually configure an ISA legacy (non-Plug and Play or non-PCI) adapter card that you installed.

PnP Cards Detected. This option shows the number of ISA Plug and Play adapter cards installed in your computer.

ISA Legacy Resources. This feature allows you to set the following legacy resources typically required by ISA legacy (non-Plug and Play or non-PCI) adapter cards:

- Memory resources
- I/O port resources
- DMA resources
- Interrupt resources

The following paragraphs describe each of these options.

Memory Resources. This option allows you to 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 allows you to 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.

Startup Options

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

- Set how much time your computer will spend testing itself when you turn it on
- Enable your computer to operate without a diskette drive, display, or keyboard
- Enable Virus Detection when your computer is turned on

The following paragraphs describe each of these options.

Startup Devices (First – Fourth). When you turn your computer on, it searches for the operating system files. Your 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 your 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, your computer will search for

the operating system files on diskette drive A first and hard disk 0 second.

note: *Hard disk 1 is the hard disk that came preinstalled in your computer. For more information, see “Disk Drives” on page 71.*

System Memory Test. Each time you turn on your 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).

The system memory test is part of POST. This option allows you to tell your computer whether or not to run the system memory test. If you choose Enabled, your computer tests the system memory and it takes longer for your operating system or application to become available. If you choose Disable, your computer does not perform the system memory test.

Virus Detection. This option allows you to have your computer search for certain computer viruses each time you turn on your computer.

Model Information

The Model Information feature shows information about your computer, including model and serial number, the BIOS (Basic Input/Output System) version and date. You cannot change any information that appears on this screen.

Date and Time

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

Date and Time. 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.

Advanced Options

The Advanced Options feature allows you to set security options for your computer and to enable or disable the cache memory and the ROM (read-only memory) shadowing of a memory region.

Security Options. The Security Option allows you to set or delete a Power-on password, to enable or disable access to diskette drive(s), and to tell your computer to operate with or without a keyboard or the diskette drive(s). This feature includes the following options:

Power-on Password. This option allows you to 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 your 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. After you type in your password, highlight the option Set or Change Power-on Password and press Enter. 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.*

Diskette Drive Access. This option allows you to enable or disable access to the diskette drive.

Operate without Keyboard. This option allows you to avoid a POST error when the keyboard is disconnected. This option is useful if you use your computer as a network server.

Operate without Diskette Drive(s). This option allows you to avoid a power-on self test (POST) error when the diskette drive is disconnected. This option is useful if you use your computer as a network server.

Cache Options. The Cache Control option allows you to enable or disable Cache memory and shows you the amount of Cache memory installed in your computer. You can install a maximum of 512K cache memory on your computer.

Cache memory is special buffer storage that holds frequently used instructions and data, and works faster than main storage.

Cache State. This option allows you to enable or disable the cache memory in your computer. With cache memory enabled, your applications and programs run faster. You can disable cache memory to slow down your computer.

Cache System BIOS. If the Cache State option is enabled, you can enable this option to improve the performance of your computer's BIOS. You may need to disable this option when you are using an application that attempts to write to the BIOS, such as a virus checking application.

ROM Shadowing. The ROM Shadowing option stores BIOS in random access memory (RAM). RAM works faster than ROM, so your programs will run faster.

If you install an adapter card that has its own ROM, you can enable the ROM shadowing option so that your adapter cards will run faster.

note: *The ROM Shadowing option may not work on cards that use memory-mapped I/O, such as network cards.*

Upper Memory Boundary. This option gives you the upper memory boundary for your computer. This boundary is the beginning of the computer's BIOS region that is not available to an upper memory manager.

Memory Options. This option allows you to configure your computer to use Extended Data Out (EDO) memory or standard memory. EDO memory is faster than standard memory and will help increase the performance of your system. You can configure each memory bank on the system board separately.

Warning! *Do not choose "EDO" memory if your memory modules are standard. If you choose "EDO" and you have standard memory installed, you may lose data.*

PCI Card Options. This option allows you to enable or disable PCI Card Bus Mastering during POST. Bus Mastering allows installed bus master PCI cards to process information without using the microprocessor.

If PCI cards do not operate properly, you may need to disable this option.

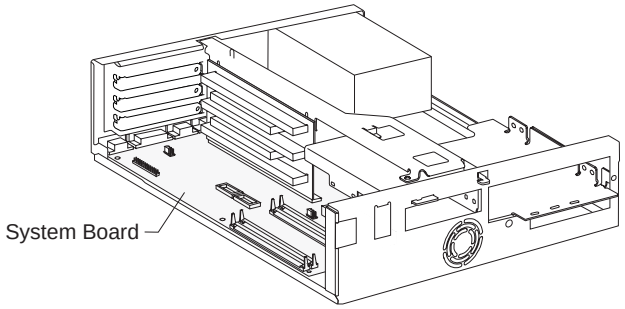
Installing options Part 2

In this part, you will find these chapters:

- "Working with your desktop system unit" on page 83 explains how to install adapter cards and drives in your system unit.
- "Working with your minitower system unit" on page 103 explains how to install adapter cards and drives in your system unit.
- "Working with your system board" on page 121 explains how to install the following options on your system board:
  - Upgrade processors
  - Cache memory
  - Single inline memory modules (SIMMs)
  - Video memory module
  - Replacement batteries

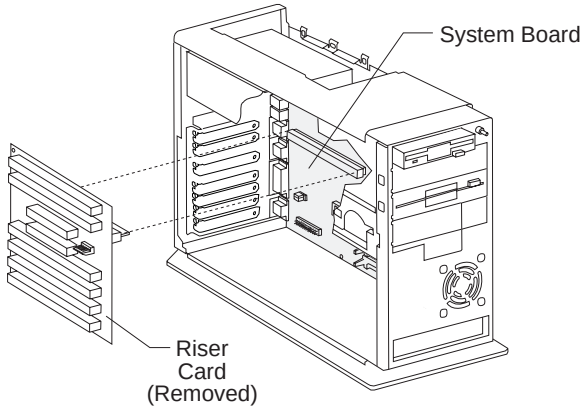
Desktop System

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

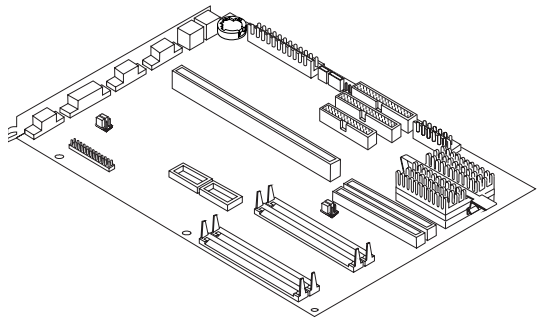


Minitower System

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



This is how the system board is shown in the "Working with your system board" chapter. Place your computer so the system board is positioned as shown. This will make it easier to identify the parts of the system board.



Working with your desktop system unit 5

How to begin

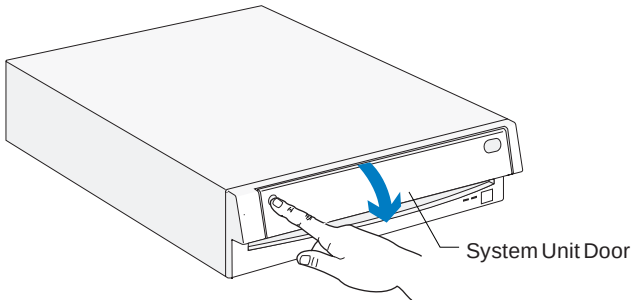
FOR YOUR SAFETY, follow these simple precautions:

1. Turn off the system unit, monitor, and any external options (such as a printer).

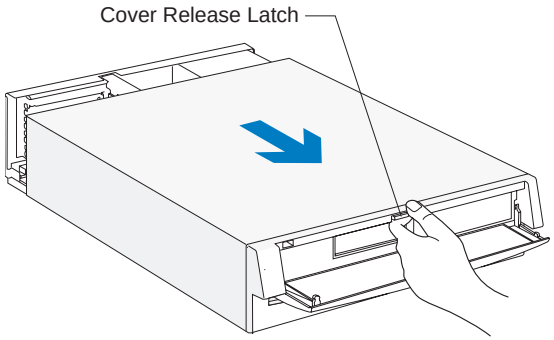
2. Disconnect the telephone cord from the system unit. Also disconnect any other cords and cables that may be attached to the system unit.

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.

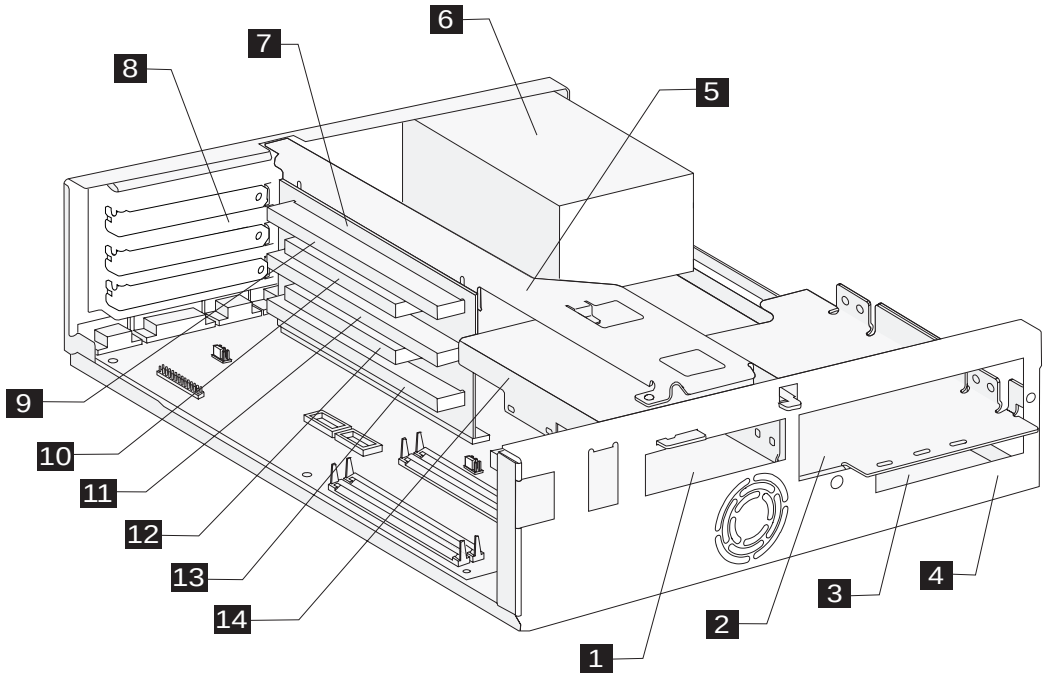


Important: *To prevent an electrostatic charge from damaging any part of your computer, touch the computer's bare metal frame before you unplug the system unit, or wear an antistatic wrist strap while making hardware changes.*

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 desktop system unit



Specifications of the desktop system unit

The system unit of your computer has four bays (bays are locations for drives) and three adapter card slots. You may want to purchase a drive to install in any empty bay or an adapter card to install in any empty slot.

You can install industry standard architecture (ISA) advanced technology (AT) adapter cards, and peripheral component interconnect (PCI) adapter cards. You can install an AT adapter card in any AT adapter card connector. You can install a PCI adapter card in any PCI adapter card connector.

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. (No external access).

4 Bay 4. Located under bay 3. Holds a 3.5-inch slim hard disk. (No external access).

5 Right bracket. Holds drives in bays 2, 3, and 4.

6 Power supply. Capable of providing at least 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 AT adapter card connector 1 (AT – 1). Holds AT adapter cards.

10 PCI adapter card connector 1 (PCI – 1). Holds PCI adapter cards.

11 AT adapter card connector 2 (AT – 2). Holds AT adapter cards.

12 PCI adapter card connector 2 (PCI – 2). Holds PCI adapter cards.

13 AT adapter card connector 3 (AT – 3). 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 length adapter cards you can install in each adapter card connector.

Adapter card connector	Specifications
AT – 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.
PCI – 1	Can hold a half-length or full-length PCI adapter card.
AT – 2	Can hold a half-length, three-quarter-length, or full-length ISA-AT adapter card.
PCI – 2	Can hold a half-length or full-length PCI adapter card.
AT – 3	Can hold a half-length, three-quarter-length, or full-length ISA-AT adapter card.

note: *You can install a PCI adapter card in connector PCI – 1 or an AT adapter card in connector AT – 2. However, you cannot install adapter cards in connectors PCI – 1 and AT – 2 at the same time. You can install a PCI adapter card in connector PCI – 2 or an AT adapter card in connector AT – 3. However, you cannot install adapter cards in connectors PCI – 2 and AT – 3 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 the "Appendix" on page 137.

Before you install an adapter card, use the table on page 87 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.*

Table 11: Adapter card configurations

If the adapter card or cards currently installed are:	and the adapter card you are installing is:	then:
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 *before* 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 *before* 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 *before* installing the card. For instructions on changing the Plug and Play Setup Utility, see the Aptiva Index.

Video Adapter Cards

When you install a video adapter card, you do not need to reset (move) jumpers on the system board. The built-in video controller will be disabled automatically. However, you may need to set jumpers on the video adapter card. Check the users guide that came with the card to see if any jumpers need to be set.

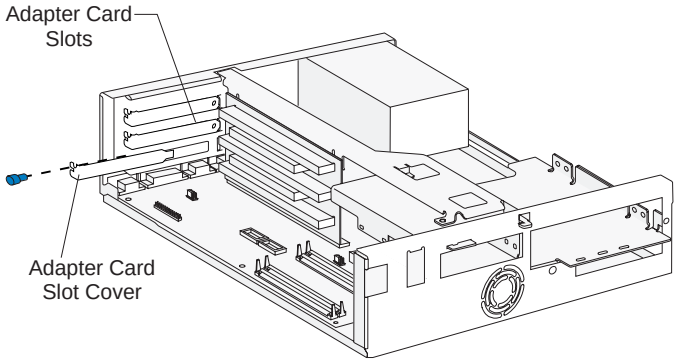
Installing adapter cards

Before you install an adapter card, you must remove the system unit cover. For instructions, see page 83.

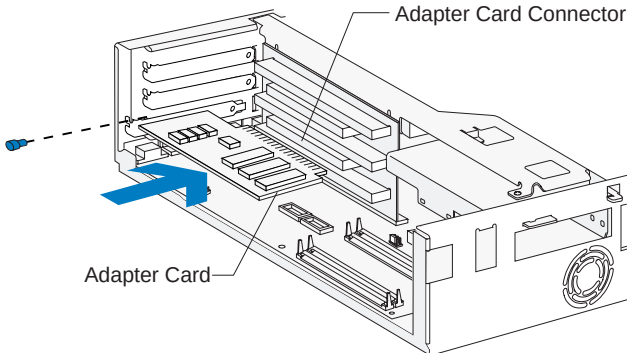
For some hardware changes, you may need to remove preinstalled adapter cards. If these adapter cards have cables attached, disconnect them. (Be sure to notice where the cables connect to the cards. You will need to reattach the cables when you reinstall the adapter cards.)

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.)



3. Reinstall all hardware you removed to install the adapter card by reversing the removal procedure. Reconnect 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 91.
- 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. See the instructions and picture on page 90 to remove the panel.

Deciding which drive bay to use

Use the following table to help you determine where to install your drive.

note: *You can install a drive in any empty bay in which the drive fits.*

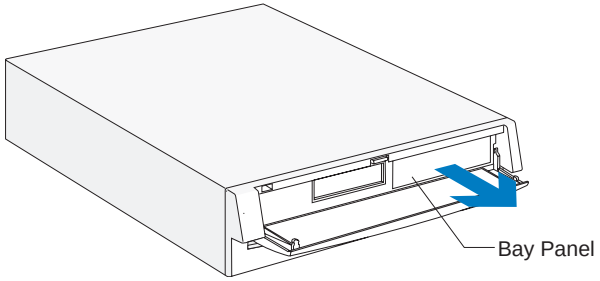
Bay	Drive Specifications	Bay Capacity
1	Holds a 3.5-inch slim drive, such as a diskette or tape drive.	101.6 x 25.4 mm (4.0 x 1.0 in.)
2	Holds up to a 5.25-inch half high drive, such as a diskette, tape, or CD-ROM drive.	149.0 x 41.3 mm (5.87 x 1.625 in.)
3	Holds a 3.5-inch slim hard disk. (No external access)	101.6 x 25.4 mm (4.0 x 1.0 in.)
4	Holds a 3.5-inch slim hard disk. (No external access)	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.*	

Removing a drive bay panel

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 83.

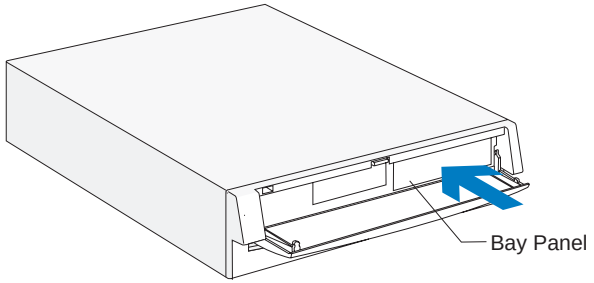
3. Locate the panel latches on the inside of the cover. Then squeeze the latches and push the panel out.



Replacing a drive bay panel

1. Remove the system unit cover. For cover removal instructions, see page 83.

2. Insert the panel into the opening (from the front of the cover) until you hear the latch 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 J10 on your system board)

See pages 123 and 124 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 and 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 should be attached here.
Diskette connector (J10)	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 93 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.

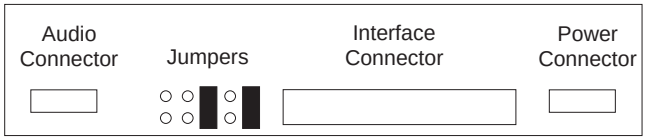
If your computer came with a CD-ROM drive, it is attached to Local Bus connector 2 and is set as a master device.

Guidelines for attaching additional IDE/AT interface drives

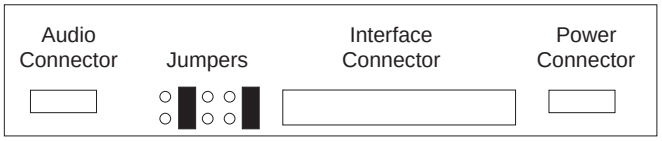
- If only one drive is attached to a connector, it must be set as a master device.
- On each connector, there can be only one drive set as the master device and one drive set as the slave device.
- A maximum of four IDE drives can be attached to your computer, two on Local Bus connector 1, and two on 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 93 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 1 address. You set this address with a switch on the drive.

See “Connectors and settings for additional drives” on page 93 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 92 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 1 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.*

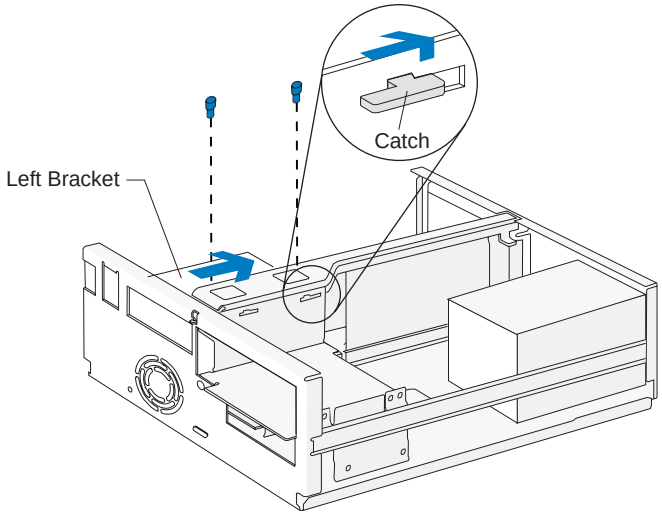
Installing and removing a drive in bay 1

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 88.

1. *Left bracket removal*

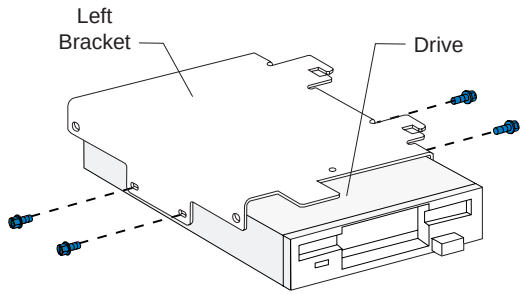
   Remove the screws and disconnect any drive cables. (Notice how the cables are attached. You may need to attach these cables when you are finished.) Slide the left bracket back to release the catches, and then remove the bracket (with any attached drive, if present).



(Front View)

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.)



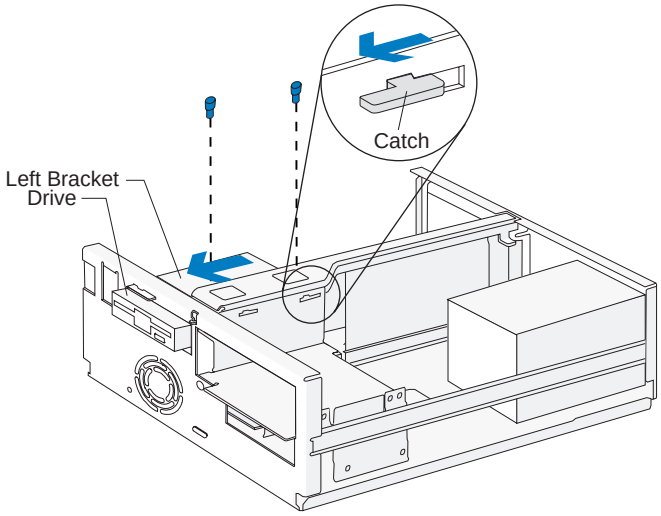
(Front View)

note: *Screw locations may differ.*

Installing and removing a drive in bay 1 (continued)

3. *Left bracket replacement*

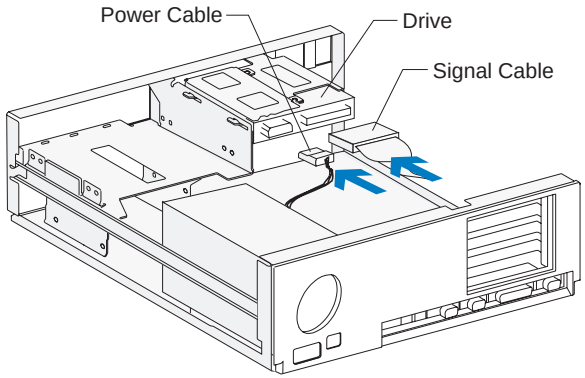
Insert the left bracket catches into the slots and slide the bracket forward until it locks into place. Align the screw holes and insert the screws



(Front View)

4. *Drive cable connection*

Connect all drive cables.



(Back View)

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 123.*

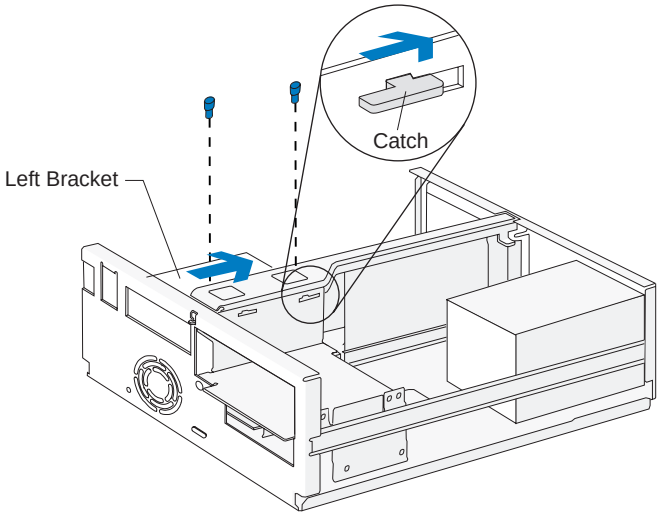
Installing and removing a drive in bay 2

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 88.

1. *Left bracket removal*

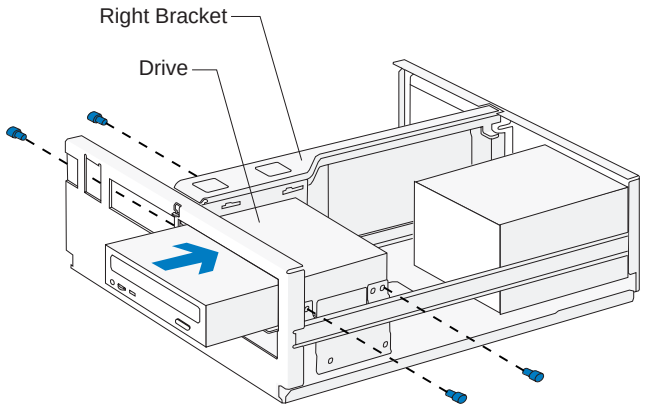
   Remove the screws and disconnect any drive cables. (Notice how the cables are attached. You may need to attach these cables when you are finished.) Slide the left bracket back to release the catches, and then remove the bracket (with any attached drive, if present).



(Front View)

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.)

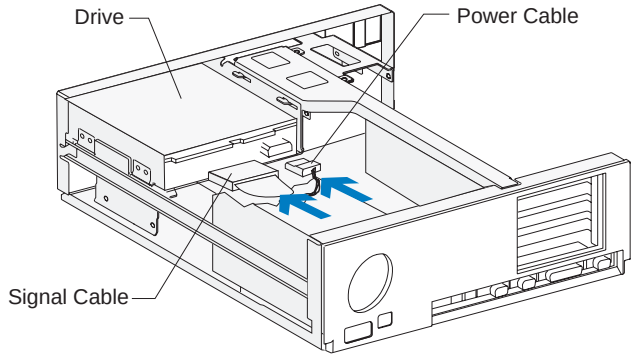


note: *Screw locations may differ.*

Installing and removing a drive in bay 2 (continued)

3. *Drive cable connections*

   Connect all drive cables.



(Back View)

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 123.*

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 95.

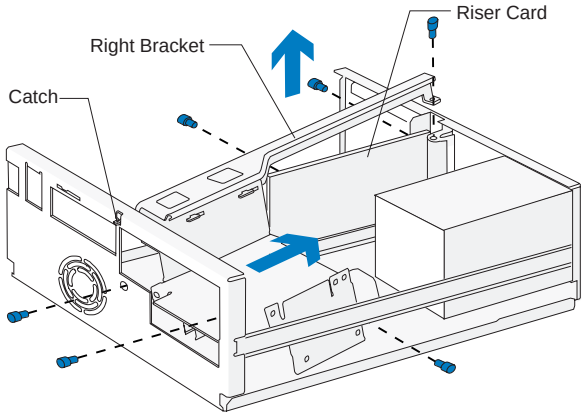
Installing and removing a hard disk in bay 3

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 94. For instructions on removing a drive from bay 2, see page 96.

1. *Right bracket removal*

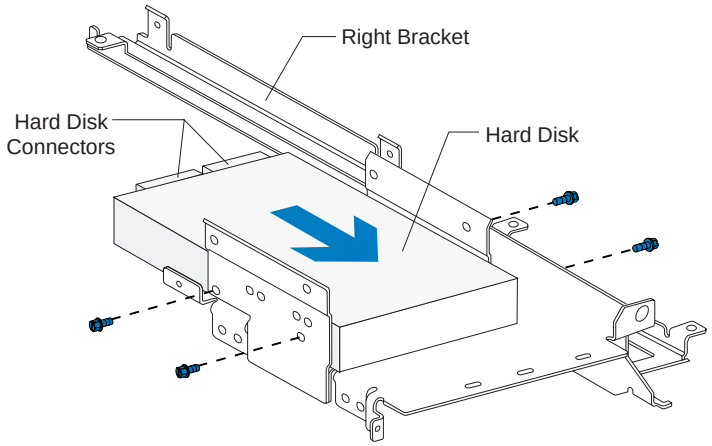
   Remove the screws and disconnect any drive cables. (Notice how the cables are attached. You may need to attach these cables when you are finished.) Slide the right bracket back to release the catch, then lift and remove the bracket.



(Front View)

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.)



(Front Upside Down View)

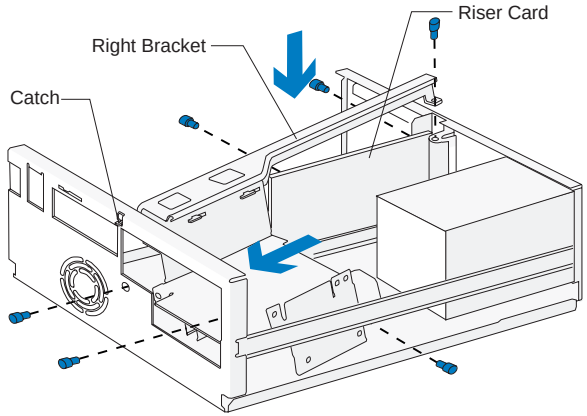
note: *Screw locations may differ.*

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

3. *Right bracket replacement*

Slide the right bracket into the bay. Make sure you insert the catch into its slot on the front of the system unit. Also make sure the riser card is located to the left of the bracket.

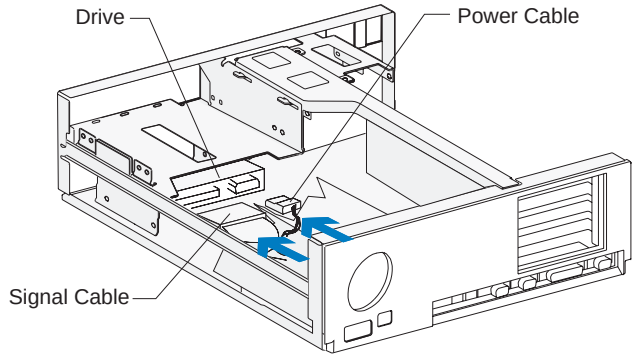
Align the screw holes. Insert the two front screws first, then insert the remaining screws. (The riser card should be located to the left of the bracket so that the screws go through the riser card first.)



(Front View)

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 94. For instructions on installing a drive in bay 2, see page 96.



(Back View)

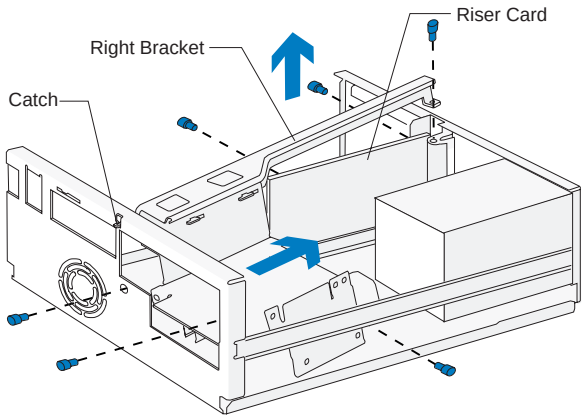
Installing and removing a hard disk in bay 4

Bay 4 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 94. For instructions on removing a drive from bay 2, see page 96.

1. *Right bracket removal*

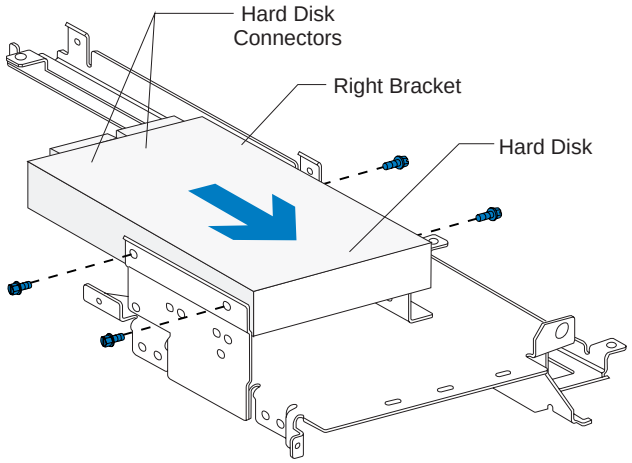
   Remove the screws and disconnect any drive cables. (Notice how the cables are attached. You may need to attach these cables when you are finished.) Slide the right bracket back to release the catch, then lift and remove the bracket.



(Front View)

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.)



(Front Upside Down View)

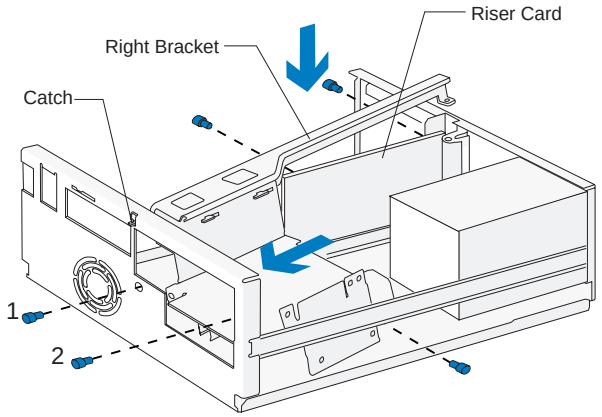
note: *Screw locations may differ.*

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.

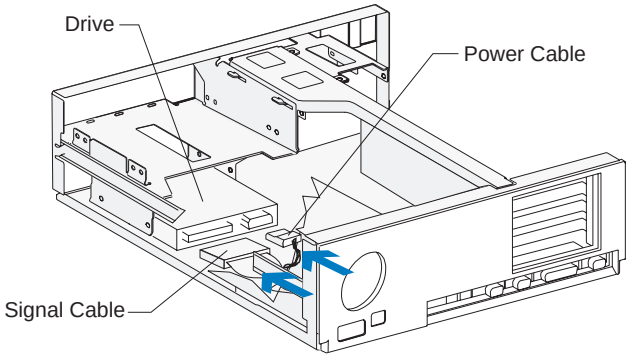
Align the screw holes. Insert the two front screws first, then insert the remaining screws. (The riser card should be located to the left of the bracket so that the screws go through the riser card first.)



(Front View)

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 94. For instructions on installing a drive in bay 2, see page 96.



(Back View)

Working with your minitower system unit 6

How to begin

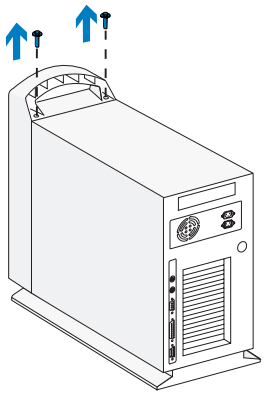
Follow these simple precautions:

1. Turn off the system unit, monitor, and any external options (such as a printer).

2. Disconnect the telephone cord and any external cables.

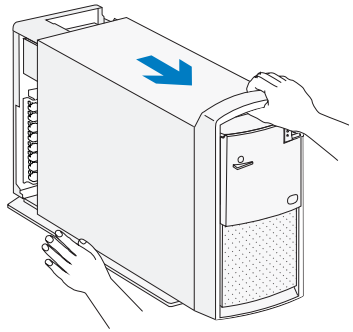
3. Remove the system unit cover:

   a. Remove the screws.



(Back View)

   b. Slide the cover forward and completely remove it from the system unit.



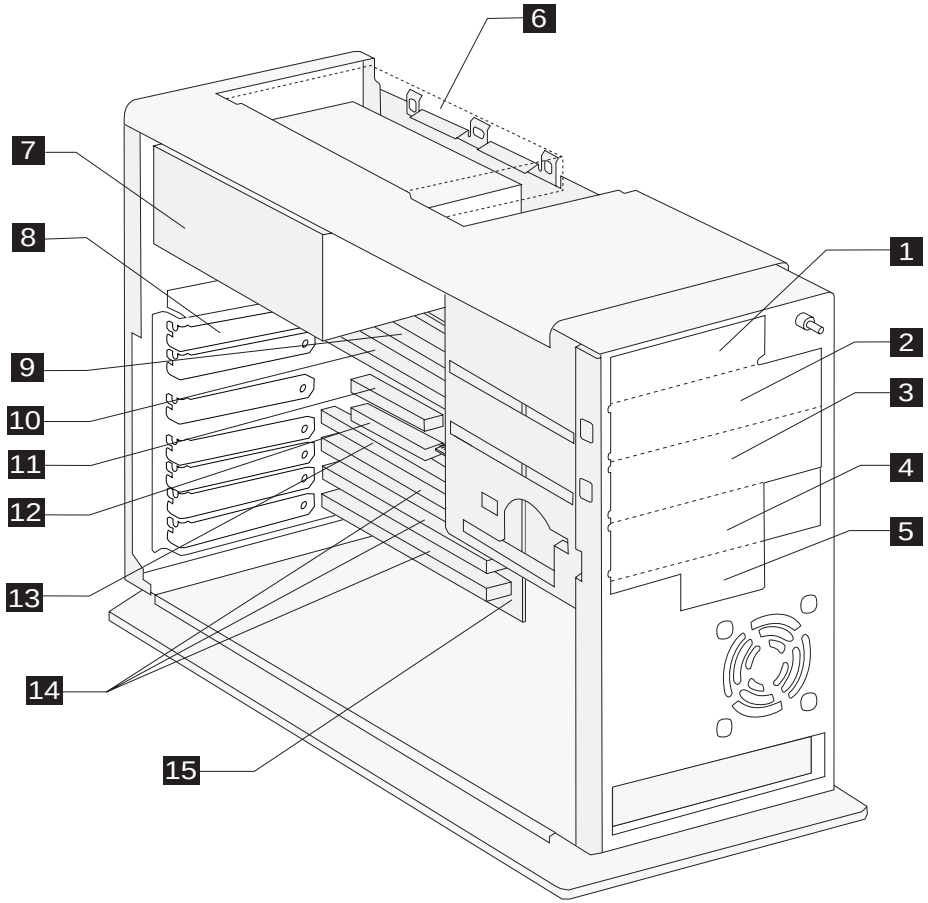
(Front View)

Important: *To prevent 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 minitower system unit



Specifications of the minitower system unit

The system unit of your computer has six bays (bays are locations for drives) and seven adapter card slots. You may want to purchase a drive to install in any empty bay or an adapter card to install in any empty slot.

You can install industry standard architecture (ISA) advanced technology (AT) adapter cards, and peripheral component interconnect (PCI) adapter cards. You can install an AT adapter card in any AT adapter card connector. You can install a PCI adapter card in any PCI adapter card connector.

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

1 Bay 1. This bay can hold a 3.5-inch slim drive, such as a diskette or tape drive.

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

3 Bay 3. This bay can hold up to a 5.25-inch half high drive, such as a diskette, tape, or CD-ROM drive.

4 Bay 4. This bay can hold up to a 3.5-inch half high drive, such as a diskette or tape drive.

5 Bay 5. This bay can hold a 3.5-inch slim hard disk. (No external access.)

6 Bay 6. This bay can hold up to a 3.5-inch slim hard disk. (No external access.)

7 Power supply. Capable of providing at least 145 watts of power to the system unit.

8 Adapter card slots. Eight openings for a maximum of seven openings for adapter cards.

9 AT adapter card connector 1 (AT – 1). Holds AT adapter cards.

10 AT adapter card connector 2 (AT – 2). Holds AT adapter cards.

11 PCI adapter card connector 1 (PCI – 1). Holds PCI adapter cards.

12 PCI adapter card connector 2 (PCI – 2). Holds PCI adapter cards.

13 AT adapter card connector 3 (AT – 3). Holds AT adapter cards.

14 AT adapter card connectors 4 - 6 (AT – 4 - 6). Holds AT adapter cards.

15 Riser card. Holds the adapter card connectors.

Preparing to install adapter cards

The system unit has seven slots and eight connectors for adapter cards. A maximum of seven 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 length adapter cards you can install in each adapter card connector.

Adapter card connector	Specifications
AT – 1	Can hold a half-length ISA-AT adapter card.
AT – 2	Can hold a half-length, three-quarter-length, or full-length ISA-AT adapter card.
PCI – 1	Can hold a half-length or full-length PCI adapter card.
PCI – 2	Can hold a half-length or full-length PCI adapter card.
AT – 3	Can hold a half-length, three-quarter-length, or full-length ISA-AT adapter card.
AT – 4 - 6	Can hold a half-length, three-quarter-length, or full-length ISA-AT adapter card.

note: *You can install a PCI adapter card in connector PCI – 2* or *an AT adapter card in connector AT – 3. However, you cannot install adapter cards in connectors PCI – 2 and AT – 3 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 already be 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, make sure the settings are correct. The documentation that came with the card contains instructions on changing system settings. If the documentation refers 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" on page 137.

Before you install an adapter card, use the table on page 107 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.*

Table 12: 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 *before* 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 *before* 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 *before* installing the card. For instructions on changing the Plug and Play Setup Utility, see the Aptiva Index.

Video Adapter Cards

When you install a video adapter card you do not need to reset (move) jumpers on the system board. The built-in video controller will be disabled automatically. However, you may need to set jumpers on the video adapter card. Check the users guide that came with the card to see if any jumpers need to be set.

Installing adapter cards

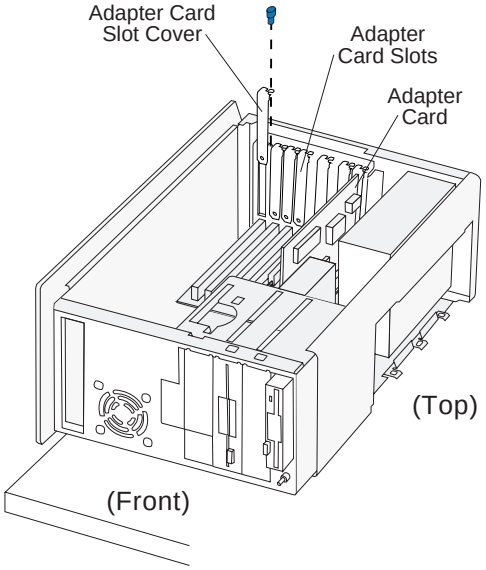
Before you install an adapter card, you must remove the system unit cover. For instructions, see page 103.

Lay the system unit on its side. To ensure that the system unit lays flat, make sure the base (bottom) of the system unit hangs over the edge of your work surface as shown in the illustration.

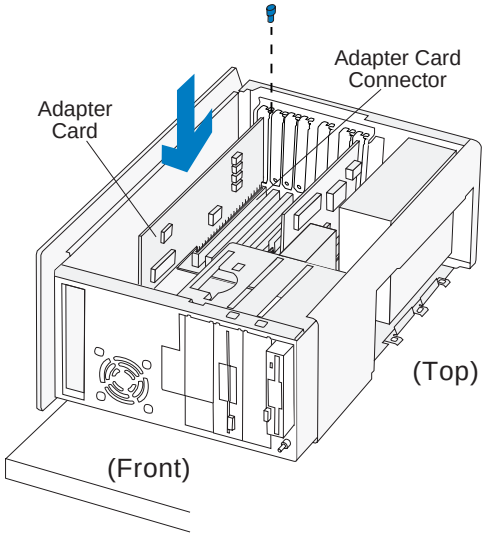
To install an adapter card:

1. Rest your system on a sturdy, flat surface. Turn the system unit so that the system board faces you.

2. Remove the adapter card slot cover screw. Then remove the slot cover.



3. Align and insert the adapter card into the adapter card connector. Insert the screw.



4. Reinstall all hardware and screws you removed to install the adapter card. Reconnect cables, if necessary.

Removing adapter cards and riser card

Before you remove an adapter card, you must remove the system unit cover. For instructions, see page 103.

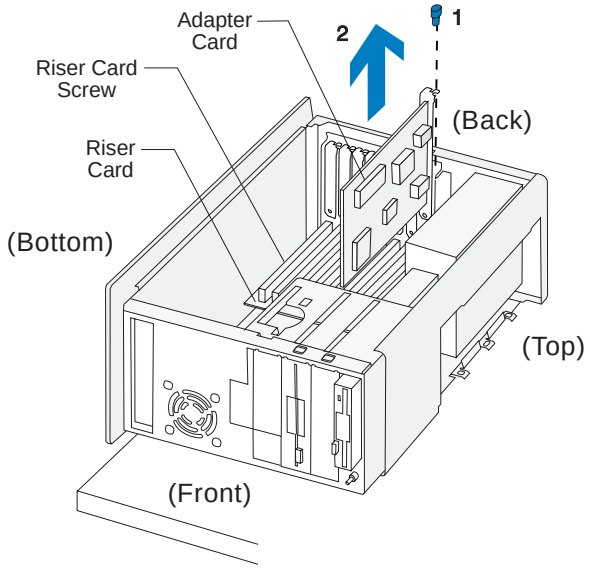
Lay the system unit on its side. To ensure that the system unit lays flat, make sure the base (bottom) of the system unit hangs over the edge of your work surface as shown in the illustration.

1. Rest your system on a sturdy, flat surface. Turn the system unit so that the system board faces you.
   Lay the system unit on its side. To ensure that the system unit lays flat, make sure the base (bottom) of the system unit hangs over the edge of your work surface as shown in the illustration.

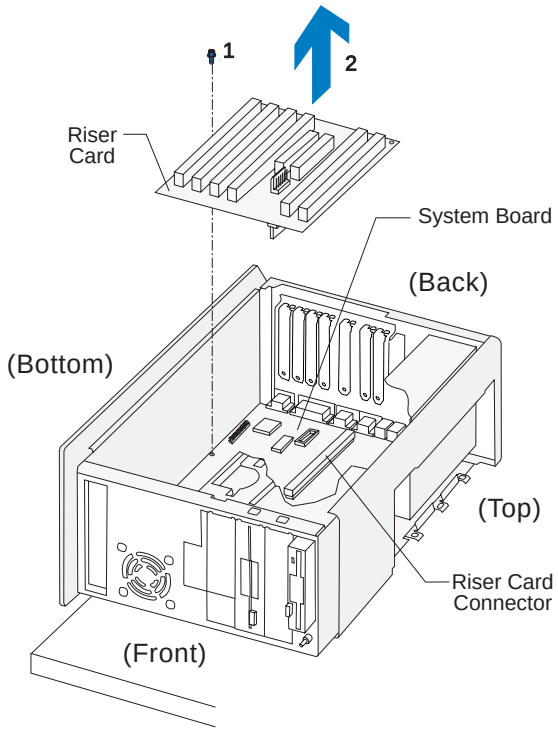
2. Remove all adapter cards from the adapter card slots.

   To remove an adapter card:

   Remove the adapter card screw. Carefully pull the adapter card straight out of the slot so that the card's components do not bend. If an adapter card has cables, disconnect them. Be sure to notice where the cables connect to the cards. You will have to reconnect these cables when you reinstall the card.



3. Disconnect the power cable from the riser card and remove the riser card screw. Then remove the riser card.



note: *To reinstall the adapter cards and the riser card, reverse the removal procedure.*

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 112.

Deciding which drive bay to use

Use the following table to help you determine where to install your drive.

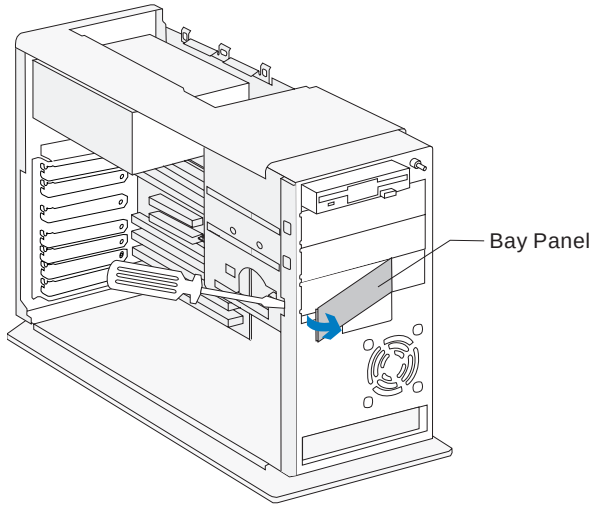
note: *You can install a drive in any empty bay in which the drive fits.*

Bay	Drive Specifications	Bay Capacity
1	Can hold 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	Can hold up to a 5.25-inch half high drive, such as a diskette, tape, or CD-ROM drive.	149 x 41.3 mm (5.87 x 1.625 in.)
3	Can hold up to a 5.25-inch half high drive, such as a diskette, tape, or CD-ROM drive.	149 x 41.3 mm (5.87 x 1.625 in.)
4	Can hold up to a 3.5-inch half high drive, such as a diskette or tape drive.	101.6 x 41.3 mm (4.0 x 1.625 in.)
5	Can hold a 3.5-inch slim hard disk. (No external access.)	101.6 x 25.4 mm (4.0 x 1.0 in.)
6	Can hold a 3.5-inch slim hard disk. (No external access.)	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, make sure you remove the system unit cover. For cover removal instructions, see page 103.

1. If you are installing a drive in bay 2, 3, or 4, you may need to remove the bay panel first. Insert a small, flat-blade screwdriver behind the panel and depress the panel latches. Refer to the illustration as an example.



(Front View)

2. To ensure that a drive is aligned properly in a bay, do the following:
   a. Insert each screw and tighten loosely.
   b. Then tighten all screws securely.

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 J10 on your system board)

See pages 123 and 124 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 and 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 should be attached here.
Diskette connector (J10)	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 114 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.

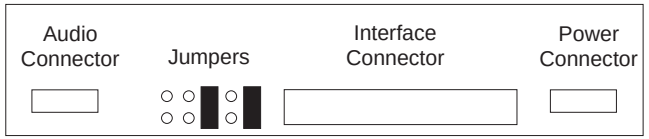
If your computer came with a CD-ROM drive, it is attached to Local Bus connector 2 and is set as a master device.

Guidelines for attaching additional IDE/AT interface drives

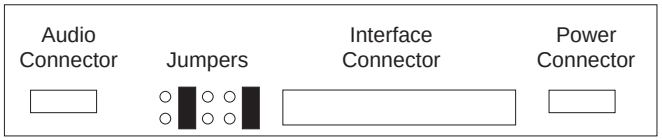
- If only one drive is attached to a connector, it must be set as a master device.
- On each connector, there can be only one drive set as the master device and one drive set as the slave device.
- A maximum of four IDE drives can be attached to your computer, two on Local Bus connector 1, and two on 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 114 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 1 address. You set this address with a switch on the drive.

See “Connectors and settings for additional drives” on page 114 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 113 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 1 address.

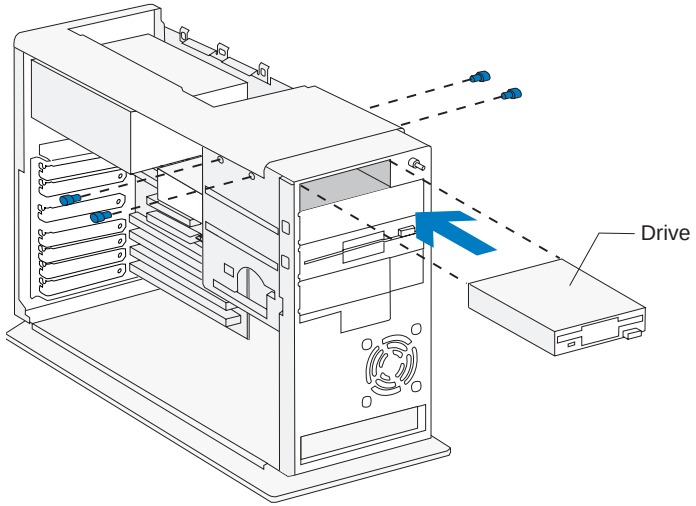
  If the new drive is a:
  - 5.25-inch device, you must purchase a signal cable with a "card edge" connector. Attach the card edge connector to the 5.25" drive.
  - 3.5-inch device, you may have to purchase a signal cable.

  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

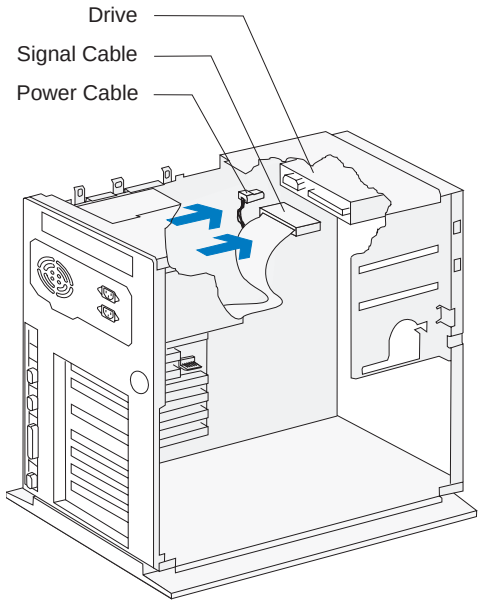
Bay 1 can hold a 3.5-inch slim drive, such as a diskette, or tape drive. For drive removal, reverse the steps shown below.

1. Insert the drive into the bay. Align the screw holes and insert the four screws.



(Front View)

2. Connect the power and signal cables to the drive.



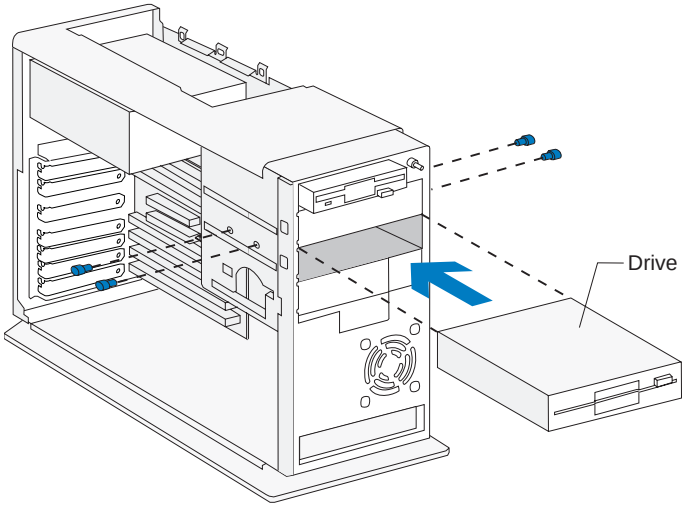
(Back View)

note: *If you are adding a diskette drive or a 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 on the system board, see “Identifying parts of the minitower system unit” on page 104.*

Installing and removing a drive in bay 2 or 3

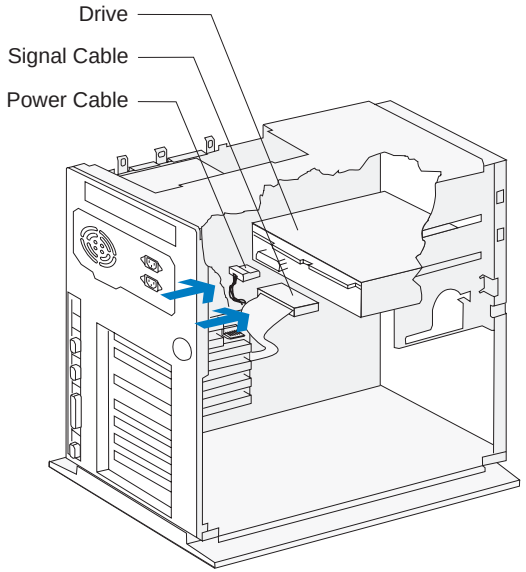
Bay 2 or 3 can hold up to a 5.25-inch half high drive, such as a diskette, tape, or CD-ROM drive. For drive removal, reverse these steps.

1. Insert the drive into the bay. Align the screw holes and insert the four screws.



(Front View)

2. Connect the power and signal cables to the drive.



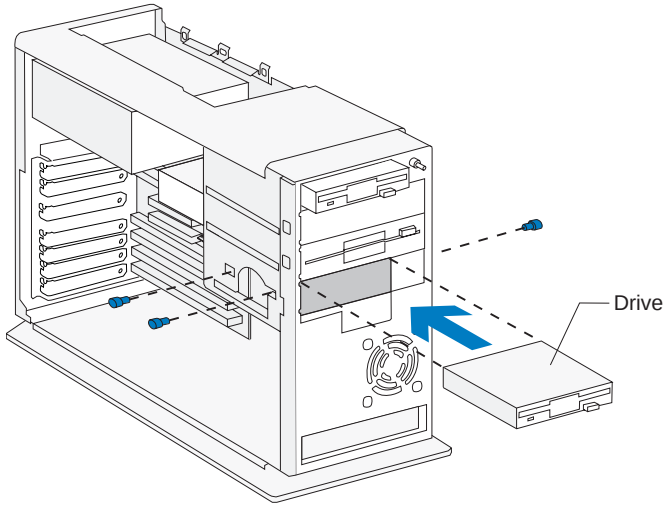
(Back View)

note: *If you are adding a diskette drive 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. If you are adding a CD-ROM, it is recommended that you use the signal cable attached to the Local Bus connector on the system board. To identify the connectors on the system board, see page 123.*

Installing and removing a drive in bay 4

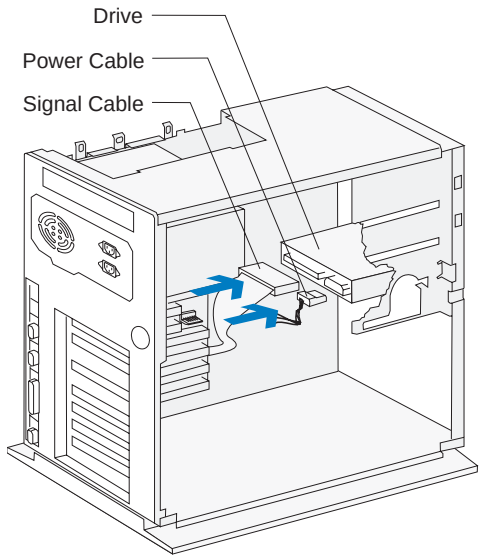
Bay 4 can hold up to a 3.5-inch half high drive, such as a diskette or tape drive. For drive removal reverse these steps.

1. Insert the drive into the bay. Align the screw holes and insert the three screws.



(Front View)

2. Connect the power and signal cables to the drive.



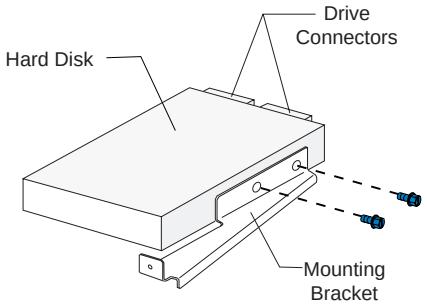
(Back View)

note: *If you are adding a diskette drive or a 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 on the system board, see “Identifying parts of the system board” on page 123.*

Installing and removing a hard disk in bay 5

Bay 5 can hold a 3.5-inch slim hard disk. For hard disk removal, reverse these steps.

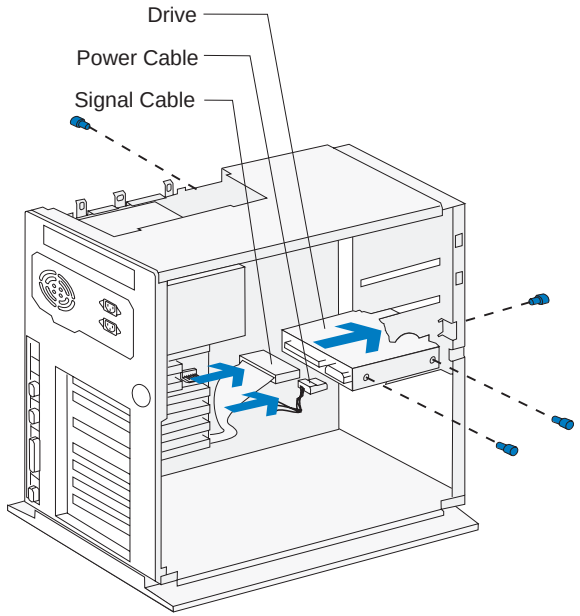
1. To attach the mounting bracket, align the screw holes and insert the two screws.



(Front View)

note: *The drive is drawn in this position to show bracket attachment. Once the bracket is installed on the drive, rotate the drive 180 degrees so that the front of the drive faces the front of the system unit.*

2. Insert the hard disk (with the bracket attached) into the bay. Align the screw holes and insert the four screws. Connect the power and signal cables. (To ensure that your hard drive functions properly, read “Installing additional drives” on page 112 before connecting the cables.)

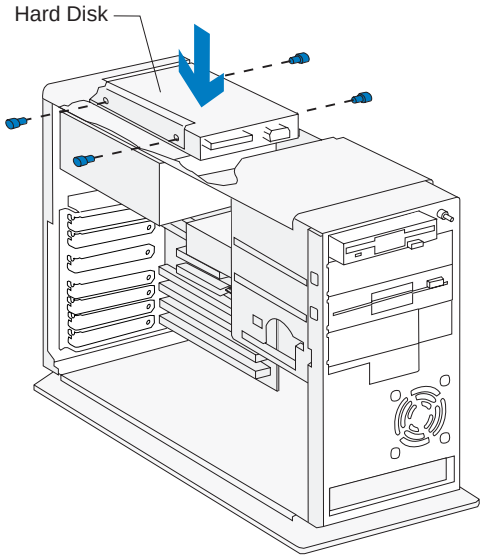


(Back View)

Installing and removing a hard disk in bay 6

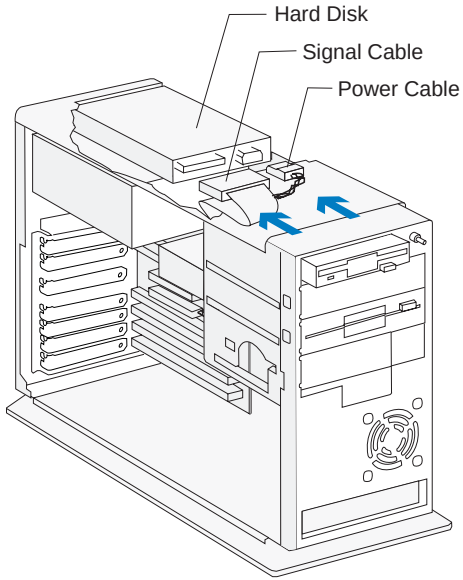
Bay 6 can hold a 3.5-inch slim hard disk. For hard disk removal, reverse these steps.

1. Insert the drive into the bay. Align the screw holes and insert the four screws.



(Front View)

2. Connect the power and signal cables. (To ensure that your hard drive functions properly, read “Installing additional drives” on page 112 before connecting the cables.)



Working with your system board 7

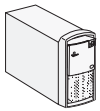
How to begin

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 and any other cords and cables attached to the system unit, but do not disconnect the system unit power cord yet, or unplug it from the electrical outlet.

If you have a desktop system, see step 3 on page 121 for instructions on removing the cover.

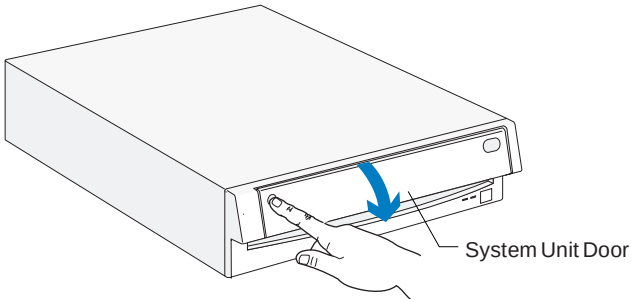


If you have a minitower system, see step 5 on page 122 for instructions on removing the cover.

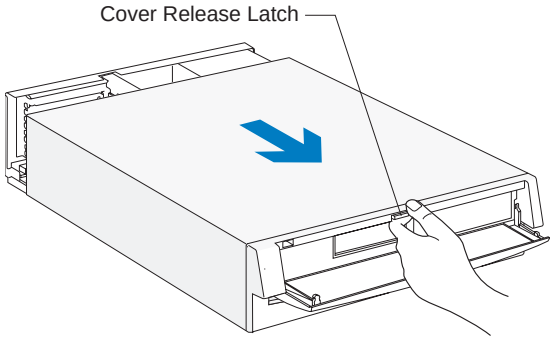
3. Remove the monitor from the system unit.

4. Remove the system unit cover:

   a. Press on the upper left corner of the system unit door to open it.



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

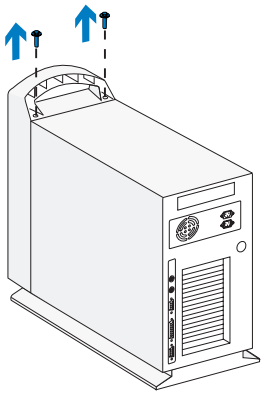


Important: *To prevent electrostatic charge from damaging any part of your computer, touch the computer's bare metal frame before you unplug the system unit, or wear an antistatic wrist strap while making hardware changes.*

   c. Go to step 6.

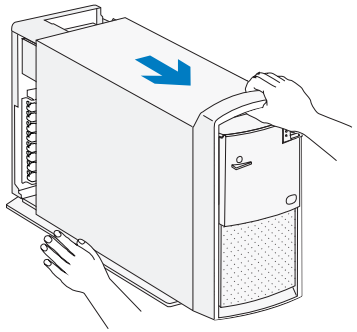
5. Remove the system unit cover:

   a. Remove the screws.



(Back View)

   b. Slide the cover forward and completely remove it from the system unit.



(Front View)

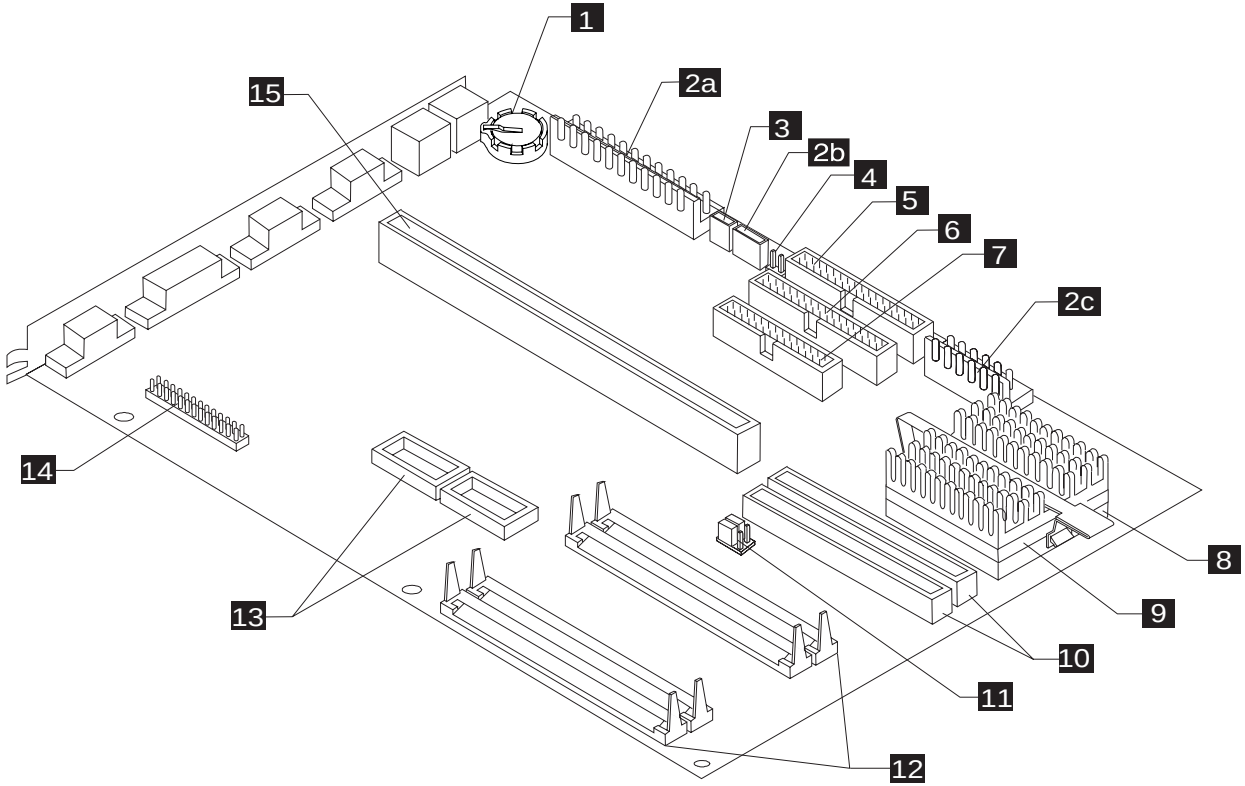
Important:	*To prevent electrostatic charge from damaging any part of your computer, touch the computer's bare metal frame before you unplug the system unit, or wear an antistatic wrist strap while making hardware changes.*

6. Unplug the system unit and monitor from the electrical outlets.

7. 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*, sometimes called the *planar* or *motherboard,* is the main circuit board in the system unit. It supports a variety of devices and provides other basic computer functions that are preinstalled or that you can install later. The system board shown on page 123 has the following parts:

1 Battery. Replace the battery with a 3-volt (CR2032) lithium battery only.

2 Power supply connectors. Holds the connectors from the power supply. 2a holds connectors P1 and P2; 2b holds the 3-wire connector; 2c holds connector P11; connector P10 attaches to the riser card.

3 Power switch connector. Holds the connector from the power switch.

4 Wake Up on Ring connector. Holds the Wake Up on Ring cable attached to the internal modem.

5 Local Bus IDE connector 1. Holds signal cables that attach to drives.

6 Local Bus IDE connector 2. Holds signal cables that attach to drives.

7 Diskette connector. Holds signal cables that attach to drives.

8 Processor socket. Holds the processor.

9 Processor. A Pentium** class processor.

10 Cache memory module sockets. You can install a total of 512KB of cache memory in 256KB increments on your system board.

11 Cache memory jumper. You may have to reset this jumper if you install cache memory modules.

12 Memory module sockets (for SIMMs). Your system board has two sets (banks) of sockets for memory modules. Memory modules are called *single inline memory modules* (*SIMMs)*. You can upgrade the memory on your system board to a maximum of 128MB.

You must install SIMMs in pairs (filling bank 1 or bank 2). Both SIMMs in a bank must have the same specifications. You may only install SIMMs with different specifications in a different bank.

Specifications: 72-pin; 32-bit or 36-bit; 4MB, 8MB, 16MB, or 32MB; 70 *nanoseconds* (ns); gold contacts; *dynamic random access memory* (DRAM).

13 Video memory module sockets. If your system board has empty sockets here, you can upgrade the video memory to a maximum of 2MB by putting 512KB in each socket. The system board already has 1MB of video memory installed.

Specifications: 40-pin, surface mount package (SOJ), 256K x 16, 70 ns, (DRAM).

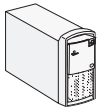
14 VESA feature connector. Used for motion video adapter cards.

15 Riser card connector. Holds the riser card.

Installing an upgrade processor

No upgrade processor is available at this time. When an upgrade processor becomes available, instructions for installing it should come packaged with it. Instructions for removing your old processor are given in this part.

If you have a desktop system, you must remove all drives and brackets installed in bays 1 to 4, and you may have to remove installed adapter cards. Instructions for removing drives and brackets begin on page 94. For instructions on removing adapter cards, see page 88.

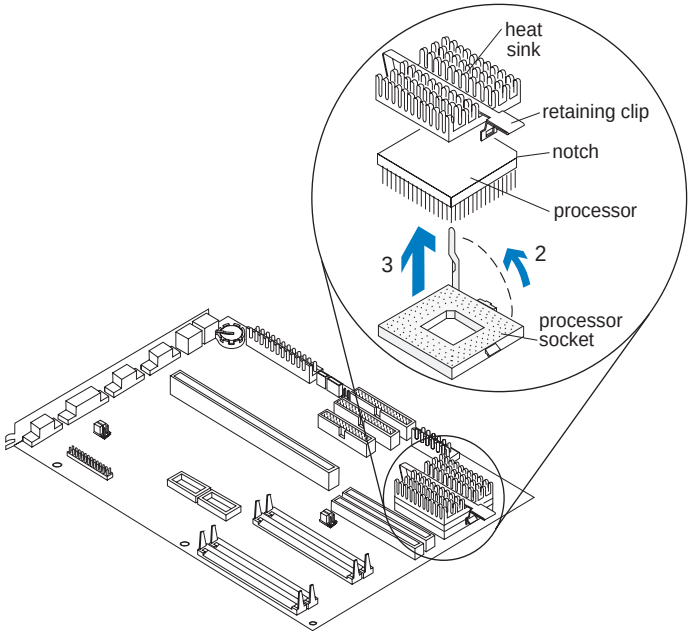


If you have a minitower system, you must remove the drive installed in bay 5 and you may have to remove the drive in bay 4, installed adapter cards and the riser card. Instructions for removing drives begin on page 111. Follow the instructions on page 109 to remove the adapter cards and the riser card.

To remove the old processor:

Warning! *The heatsink retaining clip is under tension and may disengage suddenly if not held while being removed.*

1. Remove the heatsink retaining clip by pressing the release tab (square end) of the clip. If pressing the tab does not release the clip, press the tab while using the tip of a thin bladed screwdriver or other similar object to gently push out the leg that is hooked on the catch underneath the tab. Take extreme care not to push the leg too hard, or you may accidentally damage surrounding parts
2. Remove the heatsink by lifting it straight up.
3. Unlatch the handle on the side of the processor socket and lift it all the way up.
4. Lift the processor out of the processor socket.



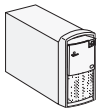
(*Steps continued on the next page*).

5. Install the new processor by following the instructions that came with it.

6. Reinstall all hardware you removed to access the processor.

Installing cache memory

If you have a desktop system, you may have to remove installed adapter cards and the drive and bracket installed in bay 1. For instructions on removing adapter cards, see page 88. For instructions on removing the drive and bracket in bay 1, see page 94.



If you have a minitower system, you may have to remove installed adapter cards and the drive in bay 5. Follow the instructions on page 109 to remove the adapter cards. For instructions on removing the drive in bay 5, see page 118.

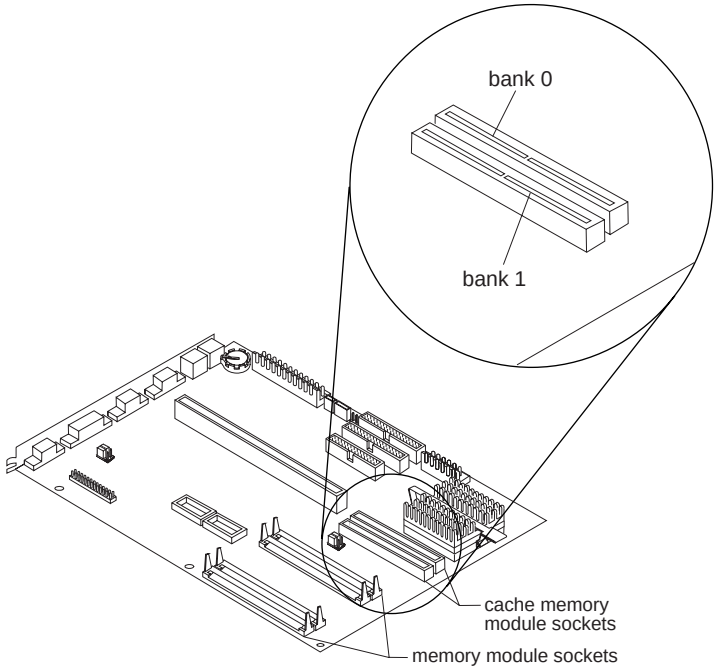
You can install up to 512K of cache memory in your system board. If cache memory modules are not already installed on your system board, you can install 512K of cache memory.

note: *Each cache memory module you install must have these specifications: 160 pin; 64 bit; 256 (32Kx64); 15ns; asynchronous SRAM; 32Kx8; 12ns; tag SRAM.*

Read the following instructions before installing or upgrading cache memory.

To install a cache memory module:

1. Locate the two cache memory module sockets.



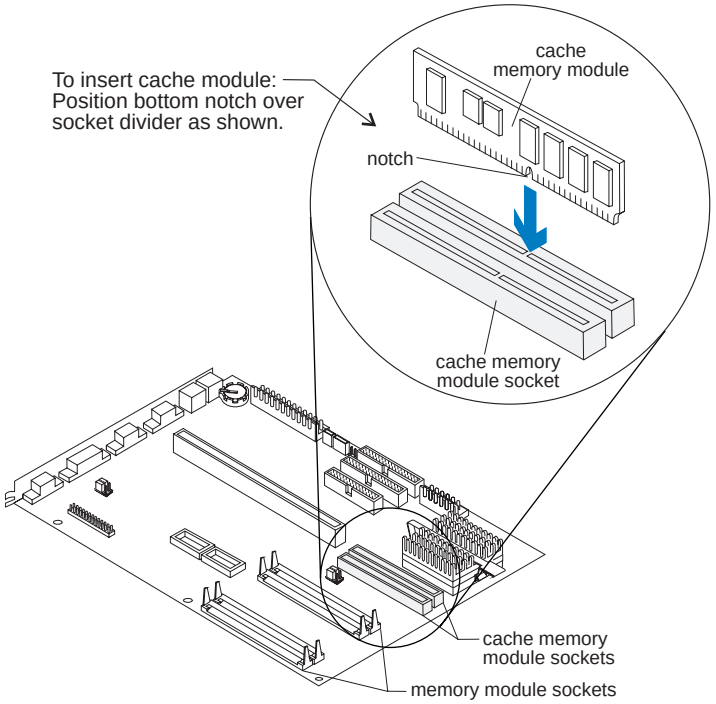
note: *The following step gives general instructions for installing a cache memory module. Read the steps, then read the specific instructions for installing either 256K, 512K or upgrading from 256K to 512K of cache memory as appropriate.*

2. The middle notch at the bottom divides the cache module into two unequal halves.

   Position the notch over the center divider in the socket as shown in the next picture, matching the wide half of the module to the wide half of the opening in the socket.

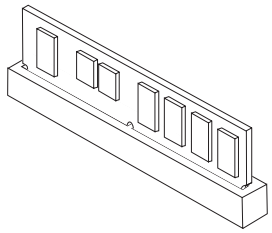
Important:	*The module can be correctly installed only when the wide set of contacts is inserted into the wide socket opening.*

   Push the module straight down into the socket.



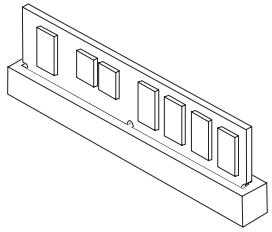
To install 256K:

Insert one 256K cache memory module into Bank 0. A properly-inserted module looks like this:



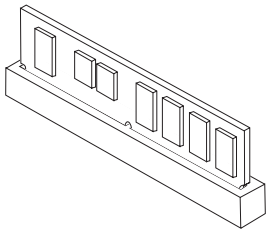
To install 512K:

Insert one 256K cache memory module into each socket (Bank 0 and Bank 1). A properly-inserted module looks like this:



To upgrade from 256K to 512K

If you already have a 256K module installed in Bank 0, you only need to insert a 256K module into Bank 1. A properly-inserted module looks like this:



Resetting the jumper when installing cache memory

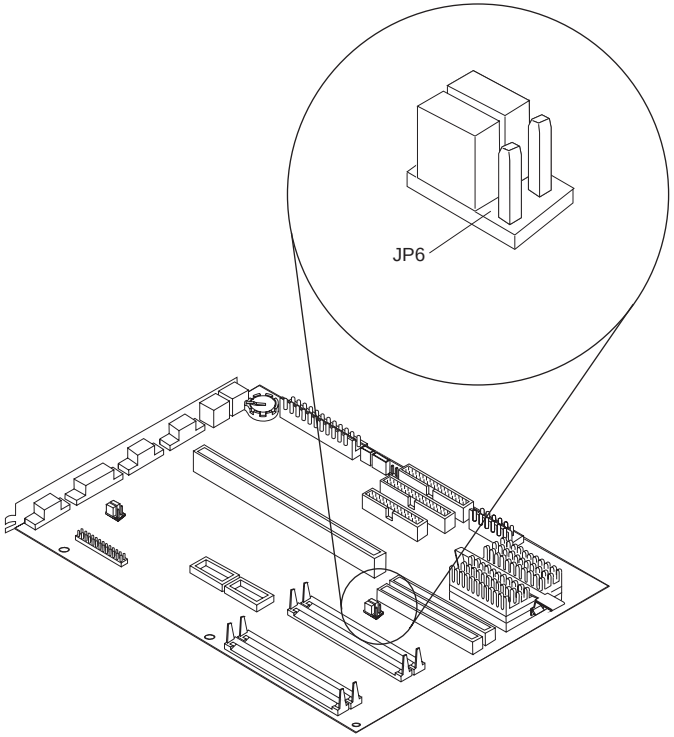
Your computer comes with a jumper preset for the old amount of cache memory. If you install cache memory, you may need to *reset* (move) the cache memory jumper. This jumper is labeled on your system board as *JP6*.

Use the following table to determine whether you need to reset this jumper.

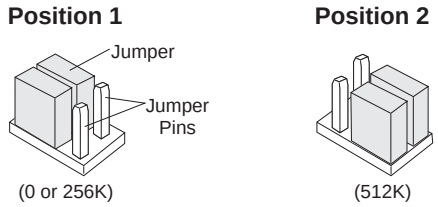
If your computer currently has:	And you install:	Then:
two empty cache memory sockets	one 256K cache memory module	do not reset the jumper
two empty cache memory sockets	two 256K cache memory modules (for a total of 512K)	reset JP6
one cache memory module installed (256K), and one empty socket	one 256K cache memory module (for a total of 512K)	reset JP6

To reset the jumper, do the following:

1. Locate the jumper you need to reset.

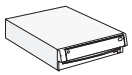


2. Lift the jumper from Position 1 and move it to Position 2, as shown in the picture.

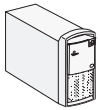


3. Reinstall all hardware you removed to access the cache memory module sockets.

Installing and removing memory modules



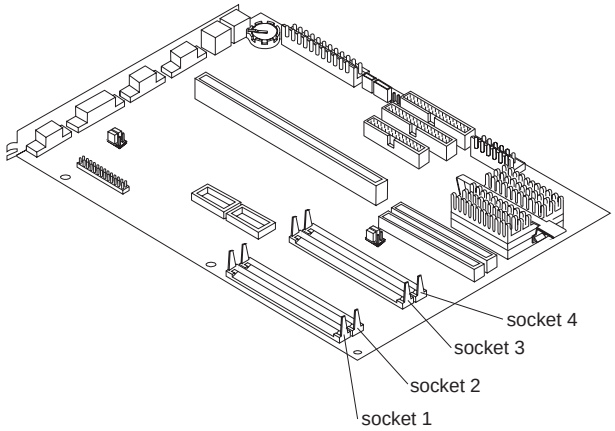
If you have a desktop system, you may have to remove installed adapter cards. For instructions on removing adapter cards, see page 88.



If you have a minitower system, you may have to remove installed adapter cards and the riser card. Follow the instructions on page 109 to remove the adapter cards and the riser card.

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 memory modules installed in Socket 1 and Socket 2. For example, if you have 8MB, a 4MB memory module is installed in Socket 1 and a 4MB memory module is installed in Socket 2. For 16MB, two 8MB memory modules are installed.

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 a set. You must also use two memory modules of the same size and type.

For example, if you install an 8MB memory module in Socket 3, you must also install an 8MB 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 4MB memory module in Socket 3 and an 8MB 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 8MB memory modules installed in Socket 3 and Socket 4.

- You can use either standard memory modules or Extended Data Out (EDO) modules. You may use both types, but you cannot mix them in the same set. For example, if you install an EDO SIMM in Socket 1, you must also use an EDO SIMM in Socket 2.

If you install EDO memory, you must use the Setup Utility to configure each set (Bank) of sockets. Socket 1 and Socket 2 are Bank 1. Socket 3 and Socket 4 are Bank 2. For instructions on using the Setup Utility, see page 65.

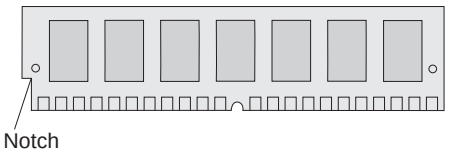
For more information on adding memory, see "Memory module placement" on page 137.

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

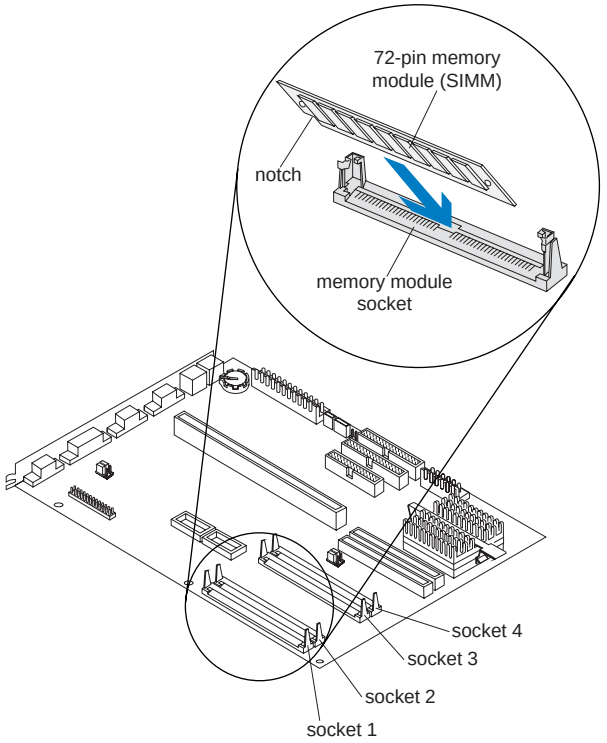
Installing memory modules

To install an additional memory module in an empty socket:

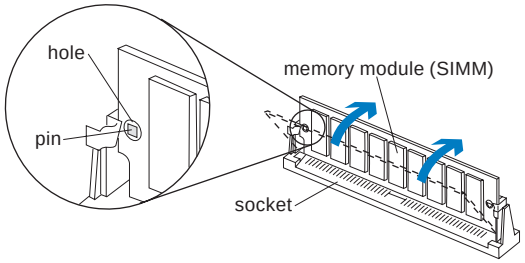
1. Find the notched edge of the module, and position it as shown in step 2.



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.



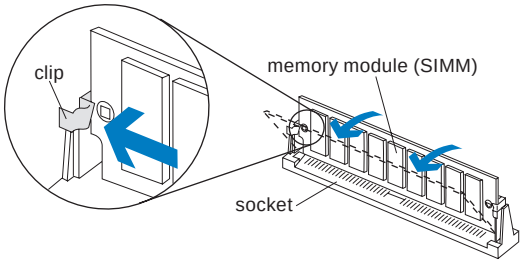
4. Reinstall all hardware removed to access the memory module sockets.

Removing memory modules

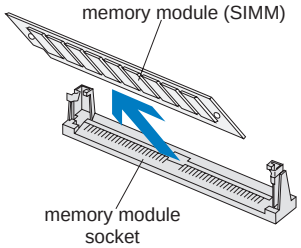
To remove a memory module from its socket:

1. Locate the two clips that hold the memory module in place. One clip holds the left edge of the module and the other clip holds the right edge.

2. At the same time, push both clips downward. The module will release and move forward.



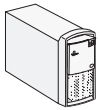
3. Lift the module out of the socket.



4. Reinstall all hardware you removed to access the memory module sockets.

Upgrading video memory

If you have a desktop system, you may have to remove installed adapter cards. For instructions on removing adapter cards, see page 88.



If you have a minitower system, you must remove installed adapter cards and the riser card. Follow the instructions on page 109 to remove the adapter cards and the riser card.

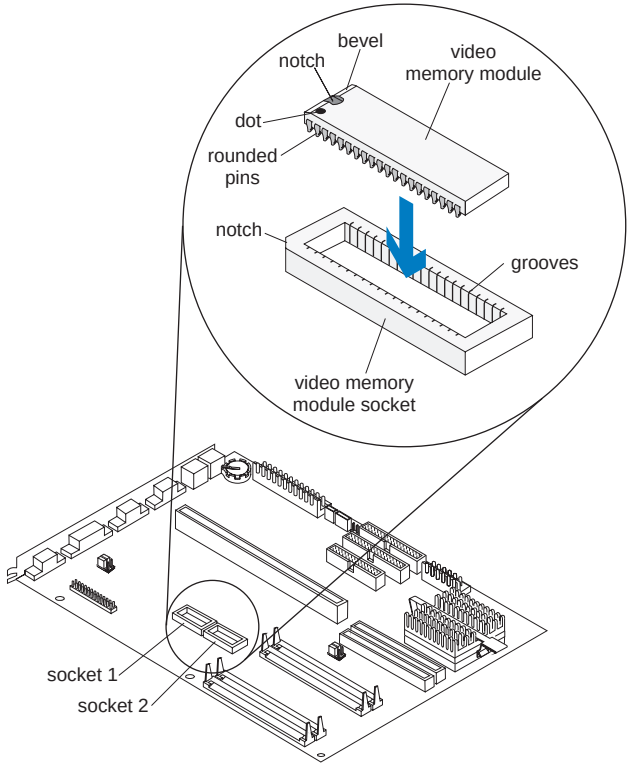
Your system board comes with two external video memory module sockets (Socket 1 and Socket 2 in the picture). You can upgrade the video memory to a maximum of 2MB. To upgrade video memory, you must install two video memory modules. You cannot install a video memory module in one socket and leave the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

note: *Each video memory module you install must have these specifications: 40-pin, surface mount package (SOJ), 256K x 16, 70ns, dual CAS DRAM.*

To upgrade video memory:

1. One end of the video memory module will have a dot, notch, bevel or any combination. Locate the dot, notch or bevel on the video memory module.

2. Position the end of the memory module with the dot, notch or bevel as shown.



3. Align the rounded pins on the sides of the memory module with the grooves in the memory module socket.

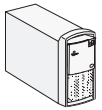
4. Press straight down firmly on the module to insert it into the socket. A properly inserted module will sit completely inside the socket

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

6. Reinstall all hardware you removed to access the video memory module sockets.

Replacing the battery

If you have a desktop system, you may have to remove installed adapter cards. For instructions on removing adapter cards, see page 88.



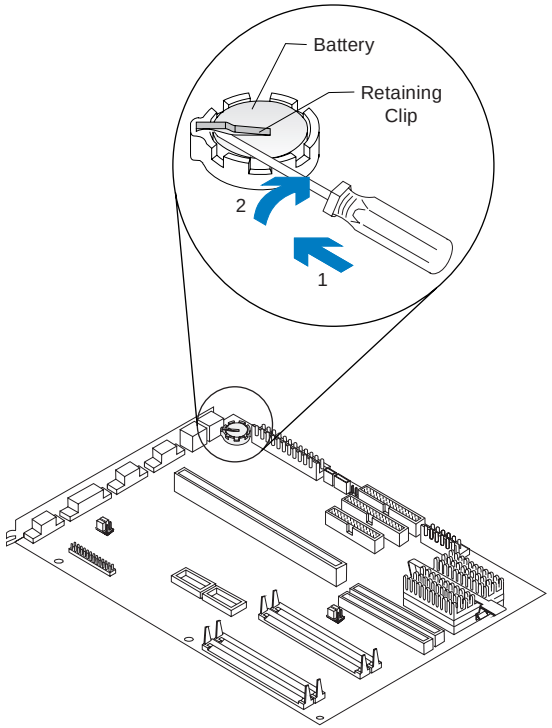
If you have a minitower system, you may have to remove installed adapter cards and the riser card. Follow the instructions on page 109 to remove the adapter cards and the riser card.

To replace the battery

1. Place the blade of a small, flat-blade screwdriver under the rear edge of the retaining clip.
2. Turn the screwdriver one quarter turn, raising the clip while pressing down on the old battery to remove it.
3. Raise the retaining clip, and insert a new 3-volt (CR2032) lithium battery in its place.

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. Reinstall all hardware you removed to access the processor socket.



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 13: Memory module placement

Total memory	Socket 1	Socket 2	Socket 3	Socket 4
8MB	4MB	4MB		
8MB			4MB	4MB
16MB	4MB	4MB	4MB	4MB
16MB	8MB	8MB		
16MB			8MB	8MB
24MB	4MB	4MB	8MB	8MB
24MB	8MB	8MB	4MB	4MB
32MB	8MB	8MB	8MB	8MB
32MB	16MB	16MB		
32MB			16MB	16MB
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

Table 13: Memory module placement (Continued)

Total memory	Socket 1	Socket 2	Socket 3	Socket 4
64MB	32MB	32MB		
64MB			32MB	32MB
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 14: Memory map

Address range	Description
0-640KB (0-9FFFFH)	Base memory
640-768KB (A0000-BFFFFH)	VGA mode video memory
768-800KB (C0000-C7FFFH)	Video BIOS
800-896KB (C8000-DFFFFH)	Adapter card memory or upper memory
896-960KB (E0000-EFFFF)	Available for upper memory
960-1024KB (F0000-FFFFFH)	System BIOS (some may be available for upper memory)
1024KB-128MB (100000-7FFFFFFH)	Extended memory
1GB (40000000H)	Linear video 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 15: System I/O addresses

Address range (hexadecimal)	Function
0000-001F	DMA controller
0020-0021	Interrupt controller 1
0022-0024	Reserved
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
00EA-00ED	Reserved
00F0-00FF	Math coprocessor
0102	SVGA controller
0170-0177, 0376	Secondary IDE controller

Table 15: System I/O addresses (Continued)

Address range (hexadecimal)	Function
01F0-01F7, 03F6	Primary IDE controller
0278-027F, 67B-67A	Parallel port 3
02E8-02EF	Serial port 4
02F8-02FF	Serial port 2
0370-0371	Reserved
0378-037F, 77B-77A	Parallel port 2
03BC-03BF, 7BC-7BE	Parallel port 1
03C0-03CF, 3D4, 3D5, 03DA	SVGA controller
03E8-03EF	Serial port 3
03F2-03F5, 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 16: 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 17: DMA channel assignments

DMA channel	Assignment
0	User available
1	User available
2	Diskette
3	ECP parallel port (default)
4	Cascade
5	User available
6	User available
7	User available

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