HEWLETT PACKARD

Online Reference Guide

HP Brio PC

Online Guide
Date: Spring1998

How to Use This Online Guide

Topic

Click underlined red text to go to the topic indicated. Underlined red text is text that is "linked" to another topic in the guide.

Acronym

Click green text to go to the glossary, where a definition of the acronym is given.

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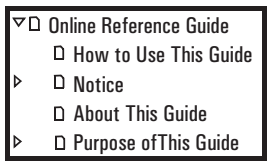

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About This Guide

This Online Reference Guide is broken down into three main sections:

- About Your Hardware - information about the main hardware components that make up your computer: the system board, your sound card, your keyboard, and so on.
- About Your BIOS (Basic Input/Output system) - information about the set of programs that control the input and output of data to peripherals.
- Upgrading and Adding Accessories - information about how to install new hardware components such as main memory or expansion cards.

Purpose of This Guide

The purpose of this guide is to provide you with technical information about your computer. This is information that you won't need to reference every day, but which you will find useful if you ever want to upgrade or customize your computer.

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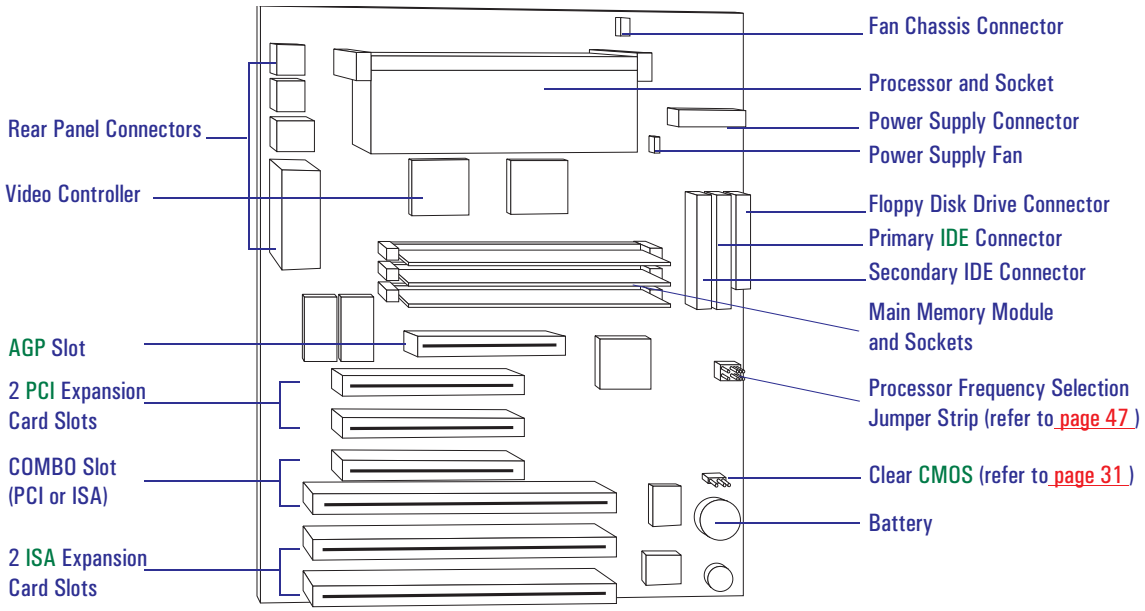
1

About Your Hardware

A Quick Look Inside Your Computer

System Board Layout

The following system board block diagram will help you identify where the different components and connections are located on the board.



Main Components and Features of the System Board

The main components and features of your HP Brio PC are:

- Enhanced IDE controller with two channels on the computer bus:
  - ❒ A primary IDE channel used, for example, for one or two IDE hard disk drives.
  - ❒ A secondary IDE channel used, for example, for IDE CD-ROM drives, IDE hard disk drives, or IDE Zip drives.
- Floppy Disk Drive controller supporting two devices.
- Rear panel connectors:
  - ❒ 1 mouse socket
  - ❒ 1 keyboard socket
  - ❒ 1 display connector
  - ❒ 2 Universal Serial Bus (USB) connectors
  - ❒ 1 parallel port
  - ❒ 1 serial port
- The main memory controller supports three DIMM slots. Each slot can host a 168-pin unbuffered DIMM module, for a total of up to 192 MB of dynamic random access memory. These slots can be filled in any order.
- Depending on the model you have purchased, your computer is supplied with one of the following:
  - ❒ An on-board video controller with 2 MB of video memory on the system board.
  - ❒ An AGP video card installed in the AGP expansion slot.

- Six expansion card slots for the installation of:
  - ❒ Two 32-bit PCI cards, three 16-bit ISA cards and one AGP card,
    or
  - ❒ Three 32-bit PCI cards, two 16-bit ISA cards and one AGP card.

Note	PCI expansion card slots are generally white plastic grooves. ISA expansion card slots are generally black plastic grooves lined with silver.

System Board Configuration Jumpers

Clear CMOS Jumper (J22)

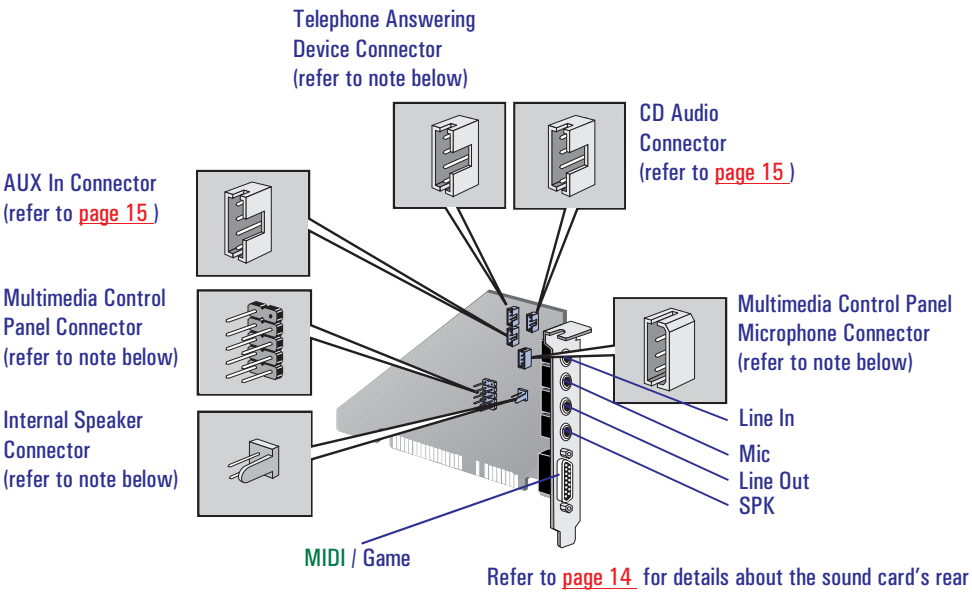
The CMOS memory stores information, such as your computer's configuration, which is preserved when you turn off your computer. A jumper placed on pins 1-2 prevents changes to the CMOS configuration. This is the default setting. Refer to "Clearing the CMOS Configuration" on page 31 for information about clearing the CMOS and using this jumper.

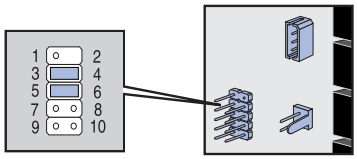
Microprocessor Configuration Jumper (J23)

This jumper allows the system board to be set so that it matches the speed of the installed processor. You only need to change the microprocessor configuration jumper, if you install a new processor that has a different processor speed to the one that is currently installed. Refer to "Upgrading a Processor" on page 44 for more information about installing a processor upgrade, and changing the jumper settings.

Your Sound Card

Depending on the computer you have purchased, a sound card may be already installed. The sound card has several connectors that allow you to connect the card to other devices. This figure shows where the connectors are located on the sound card.





Jumpers are required between pins 3 and 4 and between pins 5 and 6 of the Multimedia Control Panel Connector. Without these jumpers, the sound card will not output sound through the rear panel. (These jumper connections are set by default).

Refer to page 14 for details about the sound card's rear panel

Note The internal connectors Internal Speaker Connector, Multimedia Control Panel Connector, Telephone Answering Device Connector and Multimedia Control Panel Microphone Connector are not used on this computer.

Connecting Audio Devices to the Rear Panel

You can connect external speakers, a microphone, or other audio devices to the rear panel. Do not connect headphones to the jack on the CD-ROM drive, as this will only let you hear output from music CDs. Through the rear panel jack on your computer you will hear sounds from training presentations, MIDI music files, any other audio software, and music CDs too.

Warning **Before connecting any headphones or speakers, always turn the volume down to avoid discomfort from unexpected noise or static. Listening to loud sounds for prolonged periods of time may permanently damage your hearing. Before putting on any headphones, place them around your neck and turn the volume down. Then, put on the headphones and slowly increase the volume by using the Audio Mixer Applet or the enhanced keyboard until you find a comfortable listening level, where the sound is clear, without being too loud. When you can hear comfortably and clearly, without distortion, leave the volume control in that position.**

Details of what each jack on the sound card is for are given below.

LINE IN	Connect devices such as a cassette, DAT, or Minidisc player for playback and recording.
MIC	Connect a microphone for voice input.
LINE OUT	Bypass the sound card's internal amplifier to connect powered speakers, an external amplifier for audio output, a recording device (tape deck), or stereo headphones. You can use this jack for headphones with limited power output. You can also use it with amplified speakers which have a dedicated headphone jack for this purpose.
SPK	Connect speakers for audio output from the card's built-in power amplifier. Adjust the volume from within the software or from the multimedia control panel if this feature is on your computer.

Warning **The SPK jack is for a highly amplified output and is therefore not suitable for connecting headphones.**

MIDI/GAME	Connect a joystick (for game software) or MIDI instrument. The MIDI port is disabled by default. You will have to enable this port if you wish to use it with a MIDI.

Connecting Audio Devices to the Internal Connectors

There are also several internal connectors located on the sound card itself. These are shown on page 13, and those that are used are described below.

AUX In Connector

This Auxiliary Connector allows you to connect an additional internal audio source such as a TV tuner, or another similar card. It can also be used to accept decompressed audio data from an MPEG video card. The AUX In connector has the following pin assignments:

Pin	Signal	I/O
1	Analog Ground	-
2	AUX right channel	IN
3	Analog Ground	-
4	AUX left channel	IN

CD Audio Connector

The CD Audio Connector, labeled “CDAUDIO”, allows you to connect the sound card to the CD-ROM drive via the audio cable, so that you can listen to audio from the CD-ROM drive. The CD Audio Connector has the following pin assignments:

Pin	Signal	I/O
1	Analog Ground	-
2	CD right channel	IN
3	Analog Ground	-
4	CD left channel	IN

Power Consumption

Note The figures given below are valid for computers with a standard configuration—no expansion cards and no CD-ROM drive. For certain configurations, the power consumption values will be higher.

Full Power Mode	< 44 W
Suspend Mode	< 30 W
Off	< 3 W[1]

1. The power supply in your HP PC continues to supply power to the CMOS memory, even when turned off.

Note When the computer is turned off with the power button on the front panel, the power consumption falls below 3 watts, but it is not zero. The special on/off method used by this computer considerably extends the lifetime of the power supply. To reach zero power consumption in "off" mode, either unplug the computer from the power outlet or use a power block with a switch.

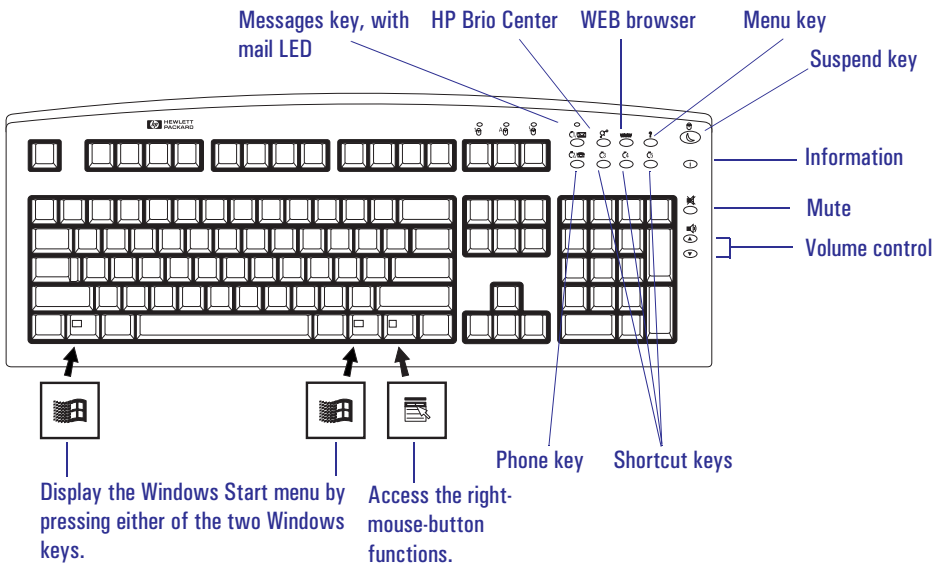
Typical Power Consumption/Availability

ISA Expansion Card Slots		PCI Expansion Card Slots	
+ 5 V	4.5A limit per slot (limited by system board)	**+ 5 V**	4.5A maximum per slot
+ 12 V	1.5A limit per slot (limited by system board)	**+ 12 V**	0.5A maximum per slot
- 5 V	0.1A total power limit (limited by power supply)	**- 12 V**	0.1A maximum per slot
- 12 V	0.3A total power limit (limited by power supply)		

There is a maximum per-slot limit of 25 W between all supply rails.

Your HP Enhanced Keyboard

Depending on the computer you have purchased, you may have the HP Enhanced Keyboard. As well as offering standard keys, the Enhanced Keyboard allows you direct access to various software applications. You can also create your own shortcuts to your most frequent tasks by configuring certain keys. For example, you can access your word processor application at a touch of the single key.



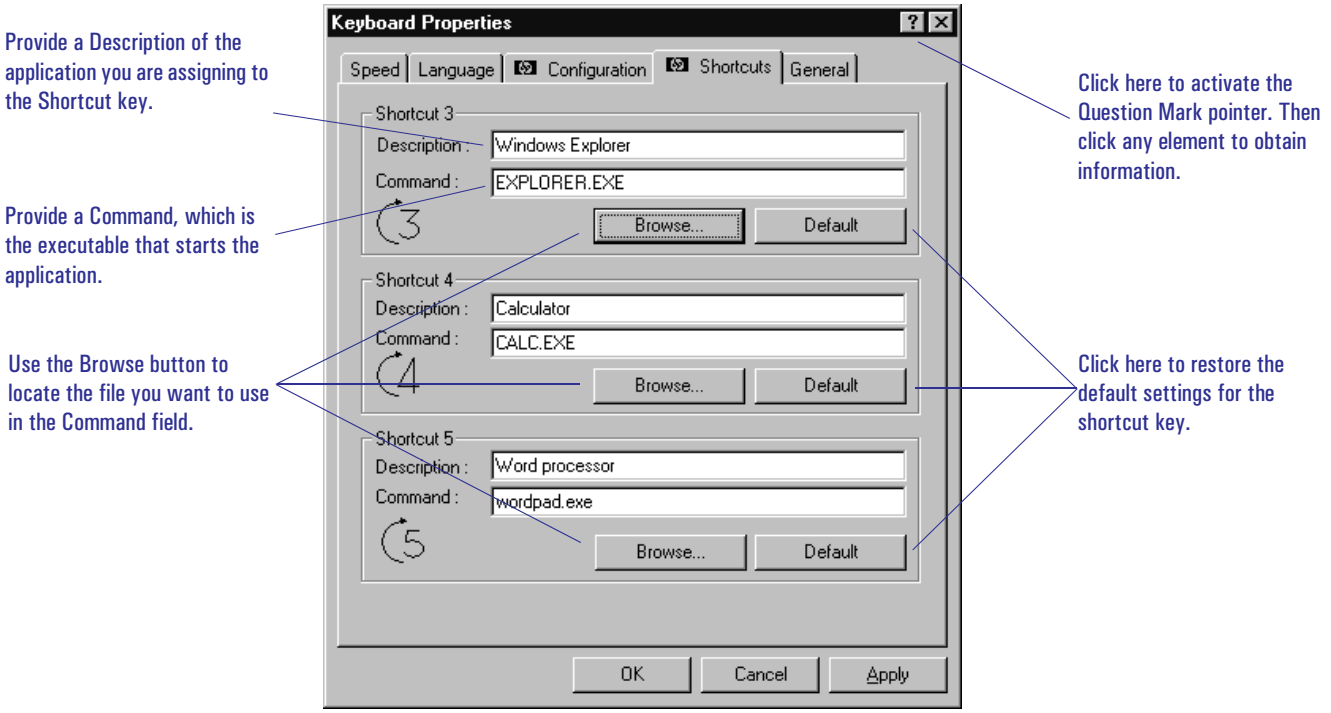
Using the Enhanced Keys

The keys are located on the top right-hand side of the keyboard and can be used as follows:

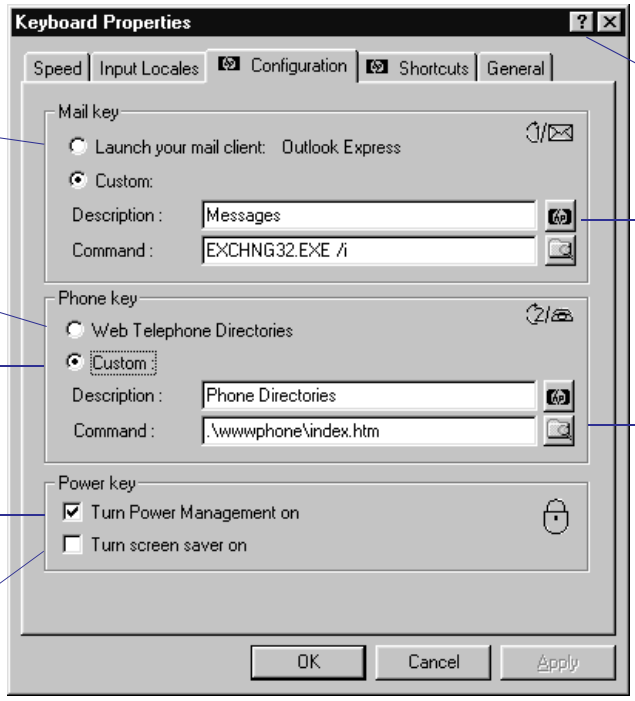
Key	Function	Configurable Key
Messages and LED	Monitors the arrival of fax messages or electronic mail. The LED blinks when a new fax or E-mail arrives. The LED is turned off when you open the message. Press this key to launch your e-mail application.	Yes. Refer to page 19
HP Brio Center	Accesses the HP Brio Center.	No
Web Browser	Launches the default Internet browser configured in your system.	No
Menu	Displays a window displaying the current configuration of the keys and the actions mapped to them. Pressing the Menu key again will close this window without further action needed. Pressing any other extended key will close the window and launch the associated command.	No
Suspend	This key can be used to either turn on the power saving capabilities if configured in the Control Panel, or start the screen saver. It is recommended that you configure your screen saver with a password to lock the computer when the screen saver is activated. A screen saver will not be cleared until the correct password has been typed.	No
Information	Accesses the information section of the HP Brio Center.	No
Mute and Volume Control	Press the Mute key to mute the audio. The volume keys are used to adjust the volume level. If no sound card is installed in your computer, a warning will be displayed on the screen if one of these three keys is pressed.	No
Shortcuts (S3, S4, S5)	You can assign these keys to start applications, open files, or open URLs on the Internet. For example, you can access your word processor application at the touch of a single key.	Yes. Refer to page 19
Phone	This key can be used to access telephone directory sites world-wide. To do this, however, you must have an Internet connection. You can also configure this key in the same way as the shortcut keys.	Yes. Refer to page 19

Configuring Keyboard Shortcut Keys

You have three standard configurable shortcut keys (S3, S4, S5). You can configure shortcut keys from the Control Panel. Double-click the Keyboard icon, then select the Shortcuts tab from the Keyboard Properties screen. To define a Shortcut key, you need to:



You can also reconfigure the mail, phone, and power keys on your keyboard. Double-click the Keyboard icon, then select the Configuration tab from the Keyboard Properties screen.



Launch your default mail client that has been configured in your Internet settings.

Link to several telephone directories world-wide.

Create a link to your frequently used telephone directory on the Web.

Reduce the power used by the computer by putting it in suspend mode. This option is activated by pressing the Suspend key

Launch the screen saver when the Suspend key is activated[1].

Click here to activate the Question Mark pointer. Then click any element to obtain information.

Click this button to restore the default settings for the shortcut key.

Click this button to browse through the folders to locate the file you want to use in the Command field.

1. The Turn Power Management on and Turn screen saver on options can both be enabled at the same time

2

About Your BIOS

The BIOS in Your Computer

What Is the BIOS?

The BIOS has two main roles:

- It tests and configures the computer's hardware components during the POST, and lets you perform further configuration by using the *Setup* program.
- It provides the link between the software running on your computer, which has been written to be independent of any particular computer, and your computer's hardware (the hard disk, the keyboard, the display, and so on).

The BIOS is part of the System ROM and is stored in a chip on the system board. A computer's BIOS is specific to that computer.

What Can I Do with the BIOS?

You can configure certain aspects of your computer by using the *Setup* program which is part of the BIOS. Refer to "The HP Setup Program" on page 23 for more information about the *Setup* program.

The HP Setup Program

The built-in *Setup* program is accessed by pressing the F2 key during the POST. Online help for an item on the *Setup screen* can be obtained by highlighting the item (refer to page 24 for instructions on how to use the key functions). Help is then displayed on the right of the screen. It is updated as you move the cursor to each field.

If you have any doubts about using the *Setup* program, contact your reseller for help.

The band along the top of the screen offers the following menus:

- *Main:* for basic system configuration.
- *Advanced*: for setting the Advanced Features.
- *Security*: for setting a password to restrict access to your computer. For information on how to set a password, refer to "Restricting Access to Your Computer - Setting a Password" on page 26.
- *Power*: for selecting power-management modes to reduce the amount of energy used after specified periods of inactivity. Refer to "Power Management in the BIOS" on page 27.
- *Boot*: for choosing your boot device order and priority. Refer to "Boot Device Priority" on page 25.
- *Exit*: for leaving the *Setup* program. Refer to "Saving Your Changes and Leaving Setup" on page 25.

The *Setup* program changes system behavior by modifying the power-on initialization parameters. Setting incorrect values may cause system boot failure. Should this occur, press the F9 key while you are in the *Setup* program to load the *Setup* program's default values. This should enable the computer to boot properly.

HP strongly recommends that you make a note of any changes you make while in the *Setup* program.

Working Within the Setup Program

The following key functions are available when using the HP *Setup* program.

- The △ or ▽ arrows can be used to select fields in the current menu.
- The Home key moves the cursor to the top item, and the End key moves the cursor to the bottom item of the current menu.
- The ↵ Enter key displays a sub-menu for menu items marked with a solid right arrow ▶.
- The Esc key or Alt + X keys allow you to exit from a sub-menu.
- The ◁ and ▷ arrows select menus from the menu bar.
- The F9 key loads factory-installed default values.
- The F10 key saves and exits from the *Setup* program.
- The F1 key or Alt + H keys display the general help screen.
- The Esc key exits from the general help screen.

Pressing the ◁ or ▷ arrows while you are on a main menu screen will take you to the next menu option. If, however, you are on a sub-menu screen and you press these arrows, you will stay on that screen.

Use the △ and ▽ arrows to scroll through the items on the general help screen.

Boot Device Priority

You can select the order of the devices from which the BIOS attempts to boot the operating system. During the POST, if the BIOS is unsuccessful at booting from one device, it will try the next one on the *Boot Device Priority* list until an operating system is found. The default boot device is the floppy disk. To speed up booting, you may wish to set the hard disk as the default boot device. If you ever need to boot from a floppy though, remember to reset the floppy as the default boot device.

The *Boot Device Priority* can be changed through the *Boot* menu. Use the ◁ or ▷ arrows to move along the top of the main menu bar to its location. The item is then highlighted and displays the available boot options.

To select the boot device, use the △ and ▽ arrows, then press the + key to move the device up the list, or the − key to move it down the list.

Changing the *Boot Device Priority* for the current boot:
You can also change the boot order just for the current boot. To do this, press Esc while the logo and the message **Press <F2> to enter SETUP** are displayed during system startup. This initially displays the POST before displaying the *Boot* Menu. On the *Boot* Menu use the △ and ▽ arrows to select the device from which you want to boot, and then press Enter. The computer then attempts to boot from the selected drive.

Saving Your Changes and Leaving Setup

When you have made all your changes, you must save them and exit *Setup*.

1 Press the Esc key to enter the *Exit* menu.

2 Select *Exit Saving Changes* to save your changes and exit *Setup*.

The computer will automatically restart. If you set a Password, the computer will display the power-on prompt. Enter the Password to use the computer.

Protecting Your Computer

Restricting Access to Your Computer - Setting a Password

Note It is recommended that you set a password that you can easily remember.

Setting a Password

Set a password to protect your computer's configuration by preventing access to the *Setup* menus. Full access to the *Setup* menus will only be possible by using your password. To set a Password:

1 Start the Setup Program. Refer to "The HP Setup Program" on page 23.

2 Select the *Security* menu group. Then select the "*Set Password*" item.

3 You will be asked to enter your password twice. Be sure to save your changes before you exit the *Setup* program.

Password on Boot

Enabling a password entry on boot can provide a power-on password prompt to prevent your computer being started or used in your absence. The password is entered when the POST has completed, before the computer finishes its normal startup procedure. *Password on boot* can only be enabled if the *Password* has already been set. It should be noted that this password option is not linked with your Windows operating system.

Note After three unsuccessful attempts, your computer will be disabled. If this is the case, turn your computer off and then on again, then enter the correct password. If you have forgotten your password, you need to clear the CMOS configuration. Refer to page 31 for an explanation on how to clear the CMOS.

To enable a *Password on Boot*:

1 Start the Setup Program.

2 Select the *Security* menu group. Then enable the "*Password on Boot*" item.

3 Be sure to save your changes before you exit the *Setup* program.

Power Management in the BIOS

If your computer stays idle for a certain amount of time, your system BIOS switches the system from Full Power Mode to Suspend Mode in order to reduce power consumption.

In Suspend Mode, graphics, the processor and hard disks are stopped. Any user event, such as from the mouse or keyboard, will cause the system to resume to Full Power Mode within a few seconds.

Other events may also wake up the system: a daily alarm clock (for a scheduled backup), a ring on an external modem, an IRQ signal sent by an expansion card (modem, network card, etc.).

To customize the power management settings though the HP *Setup* program, use the ◁ or ▷ keys to move along the top of the main menu bar to the Power Menu. The item is then highlighted and displays the available power management options.

You will be able to set the delay before the system can automatically enter Suspend Mode, and also specify the events which will make the computer wake up.

In most cases, default settings should be appropriate. However, you may need to configure the IRQs which will be monitored in accordance with your system components (additional network card or modem ...). For this, select the field >**IRQ Activity Monitoring**.

Note Windows can provide you with a list of IRQs used by all system components: right-click the My computer icon, select Properties, select the Device Manager tab, then click Properties. The list of IRQs used will be displayed.

Checking Your Configuration

To view your computer's current configuration, press the Esc key just after you computer is turned on and while the computer's logo is being displayed during the POST.

The text-based POST screen will replace the computer's logo, displaying the system components and devices. Press the Pause/Break key to "freeze" the screen. When you have finished reading the POST screen, press any key to continue. At the end of the POST screen, the *Boot* Menu will be displayed.

You can either, select to exit the menu by pressing the Esc key, or enter the *Boot* Menu to modify the device for the current boot. How to modify the current boot device priority is described in "Changing the Boot Device Priority for the current boot:" on page 25.

Warning Messages and the Power-On Self-Test

The POST is executed each time the system is turned on or a reset is performed. The POST process checks that system components are operating correctly and initializes certain system parameters.

Beep Codes

If a terminal error occurs during POST, the system issues a beep code before attempting to display the error. Beep codes are useful for identifying the error when the system is unable to display the error messages.

The following table is a list of beep codes issued for terminal errors.

Beep Pattern	Numeric Code	Description
-	B4h	This does not indicate an error There is one short beep before system startup
— -- -- ---	16h	BIOS ROM checksum failure
— --- — —	20h	DRAM refresh test failure
— --- —---	22h	8742 Keyboard controller test failure
— --- ---- —	2Ch	RAM failure on address line
— --- ---- ---	2Eh	RAM failure on data bits in low byte of memory bus
— ---- — —	30h	RAM failure on data bits in high byte of memory bus
-- — -- ---	46h	ROM copyright notice check failure
-- -- --- —	58h	Unexpected interrupts test failure
— --	98h	Video configuration failure or no card installed Option ROMs checksum failure

How to Recover if Things Go Wrong

System Boot Failure

If you have made some modifications in the *Setup* program and there is a system boot failure, you should do the following:

1 Restart the computer, then press F2 when **Press <F2> to enter SETUP** is displayed at the bottom of the screen. Change the setting that you have modified to its original configuration, save it and exit the *Setup* program, then continue with the system startup.

2 If the system still fails to start up, restart the computer, enter the *Setup* program, then press the F9 key. This will load the *Setup* default values to recover. However, by doing this, you will lose all customized settings in the *Setup* program. These settings will have to be reconfigured.

Note **HP strongly recommends that you take note of any change to the system setup and store it in a safe place. If you have any doubts about using the HP *Setup* program, contact you HP-authorized support agent or reseller for help.**

If you are having problems with POST error messages, you probably need to clear the current configuration memory values and reset the built-in default values. Refer to "Clearing the CMOS Configuration" below for details on how to do this.

Incorrect Password on Startup

After three unsuccessful attempts to enter the correct password on *Password on Boot*, your computer becomes disabled. If this happens, turn your computer off and then on again, then enter the correct password. If you have forgotten your password, you need to clear the CMOS configuration. Refer to "Clearing the CMOS Configuration" below for details on how to do this.

Clearing the CMOS Configuration

The CMOS memory stores information, such as your computer's configuration, which is preserved when you turn off your computer. The only time you need to clear the CMOS is if the configuration stored in memory is corrupted or you have forgotten the system password. A jumper placed on pins 1-2 prevents changes to the CMOS configuration.

The following table shows the possible pin settings:

Jumper Function	Pins	Description
Default setting	**1 - 2**	The jumper on these pins prevents any change to the CMOS configuration. Refer to page 10 for the jumper position on the system board.
Clear CMOS	2 - 3	Place the jumper on these pins to clear the CMOS. You only need to leave it there for a few seconds, otherwise you run the risk of discharging the battery.

To clear the configuration:

1 Turn off the computer. Unplug the computer from the electrical socket. Disconnect any peripherals from the computer.

Note **The CMOS will be cleared only if the computer is unplugged from the electrical socket.**

2 Remove the computer's cover (refer to "Removing and Replacing the Cover" on page 37 for any assistance).

3 Place the jumper on pins 2-3 (refer to page 10 for the jumper strip (J22) location on the system board to clear the CMOS).

4 Wait for a couple of seconds, then place the jumper on pins 1-2 to re-enable the configuration.

5 Replace the cover. Reconnect the power cord and any peripherals to the computer.

6 Turn on the computer.
To set a new system password, you will need to run the *Setup* program.

3

Upgrading and Adding Accessories

Why Upgrade?

Your computer uses some of the latest hardware technology to achieve outstanding performance. If required, performance can be even further enhanced thanks to this computer's upgradeable design.

Main Memory

Main memory is the workspace of the computer in which the processor stores all work in progress. You can increase the size of the computer's workspace by adding more main memory.

To find out more about upgrading the main memory, refer to "Upgrading Main Memory" on page 39.

Video Memory

Video memory stores everything that you see on your computer screen. In order to provide a solid image on the screen, the screen image has to be continually refreshed. The computer's graphics system uses the image stored in video memory to refresh the screen. Increasing the amount of video memory enables higher screen resolutions, higher refresh rates and many more colors for existing resolutions, enhancing and accelerating graphics-intensive applications.

To find out more about upgrading the video memory, refer to "Upgrading Video Memory" on page 42.

Expansion Cards

An expansion card, or accessory board, is a component that usually adds some specialized function to a computer. For example, installing a network card can, in conjunction with the necessary software and cables, connect a computer to a network.

To find out more about installing expansion cards, refer to "Adding Accessories" on page 49.

Storage Devices

A storage device is a device that stores software (for example, applications, programs, the operating system, data, and so on). Hard disk drives, CD-ROM drives, tape drives, Zip drives, and floppy disk drives are all examples of storage devices.

To find out more about installing storage devices, refer to "Installing Storage Devices" on page 54.

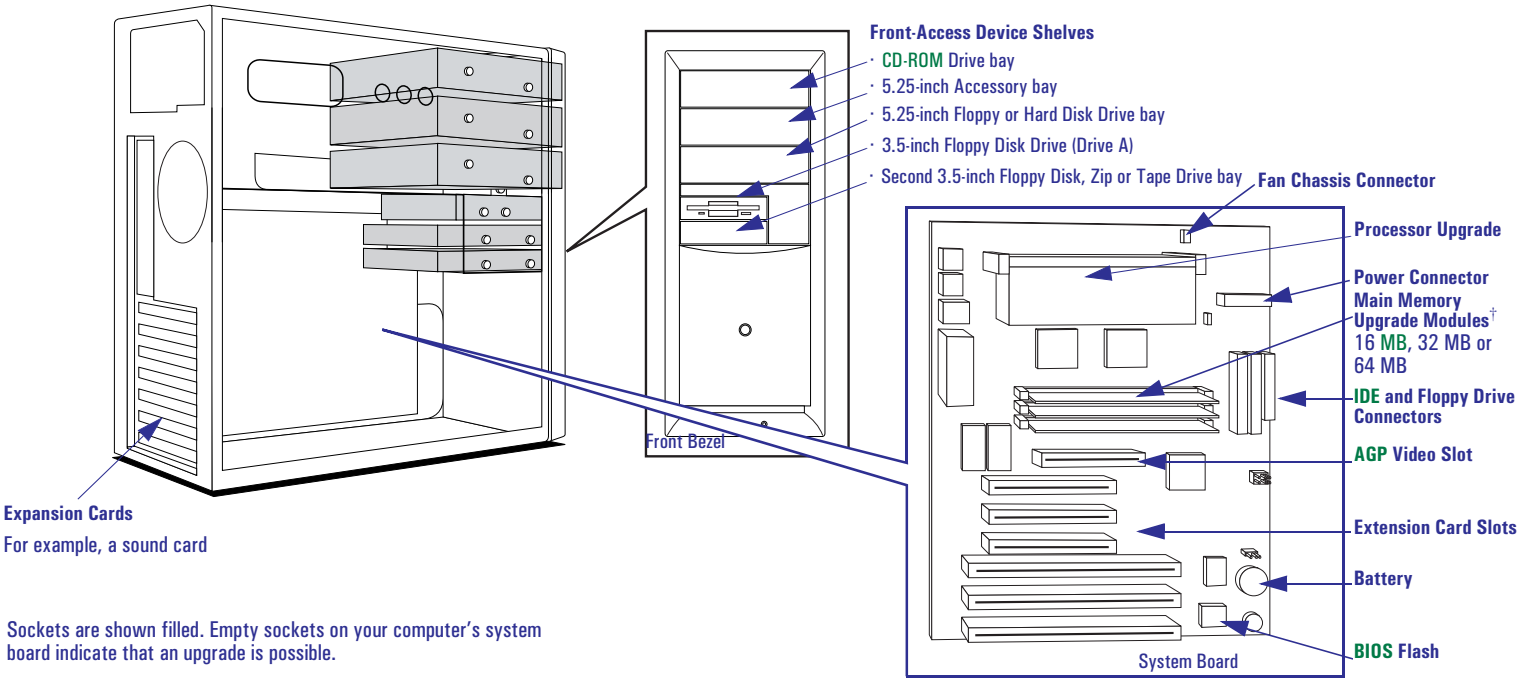
Processor

The processor is the primary computational chip inside the computer. It can be thought of as the computer's brain. It may be upgraded to provide more power for processor-intensive applications.

To find out more about installing a processor upgrade, refer to "Upgrading a Processor" on page 44.

Upgrades and Accessories You Can Install

Some of the additional accessories that you can add to your computer are shown here.



† Sockets are shown filled. Empty sockets on your computer's system board indicate that an upgrade is possible.

Contact your reseller for HP accessory part numbers.

Upgrading the BIOS

What Is the BIOS?

For a description of the BIOS, refer to "The BIOS in Your Computer" on page 22.

Why Upgrade the BIOS?

Hewlett-Packard are continually improving the BIOS in their computers, introducing new features and making them more efficient. You can therefore keep your own computer up-to-date by upgrading the BIOS.

How Do I Upgrade the BIOS?

To upgrade your system BIOS, download the appropriate BIOS utility from our support WEB site:

`http://www.hp.com/go/smallbizsupport`

Upgrading Hardware

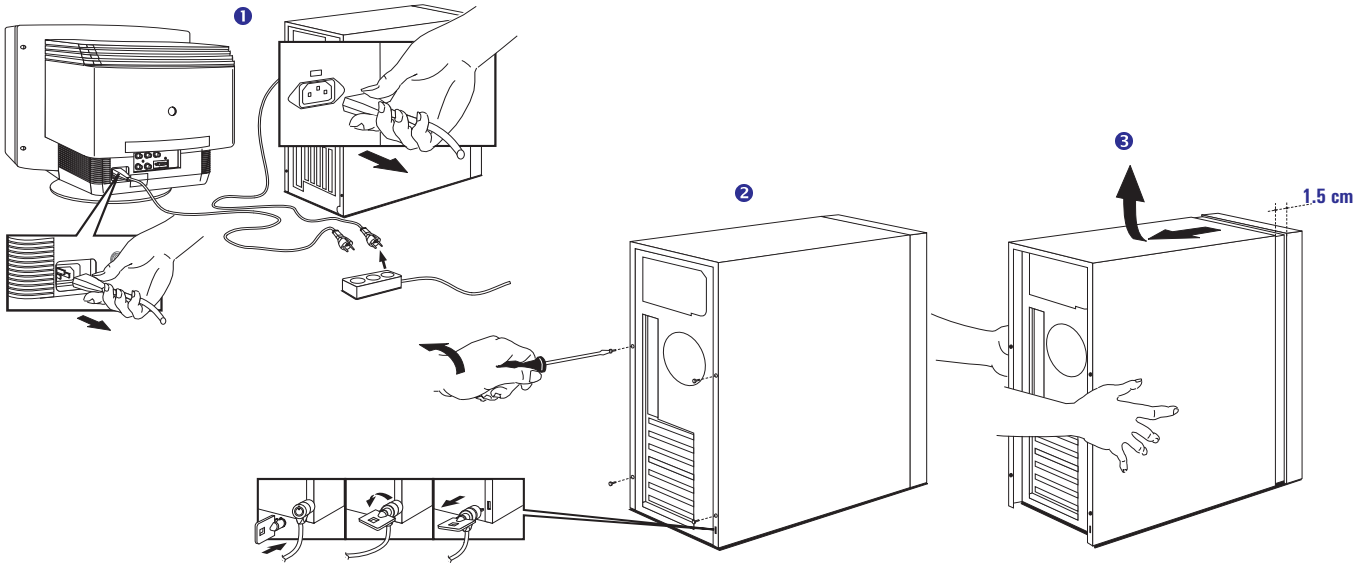
Warning For your safety, never remove the computer's cover without first removing the power cord and any connection to a telecommunications network. Always replace the cover before reconnecting any cables to your computer.

Removing and Replacing the Cover

You need to remove the computer's cover to install accessories or to gain access to the system configuration jumpers.

Removing the Cover

1 Turn off the computer and display, and disconnect all power supply cords and any telecommunications cables.
2 If necessary, unlock the cover using the key on the back panel. Remove the four screws from the back of the computer.
3 Pull the cover back 1.5 cm, then lift the cover completely off the computer's chassis.



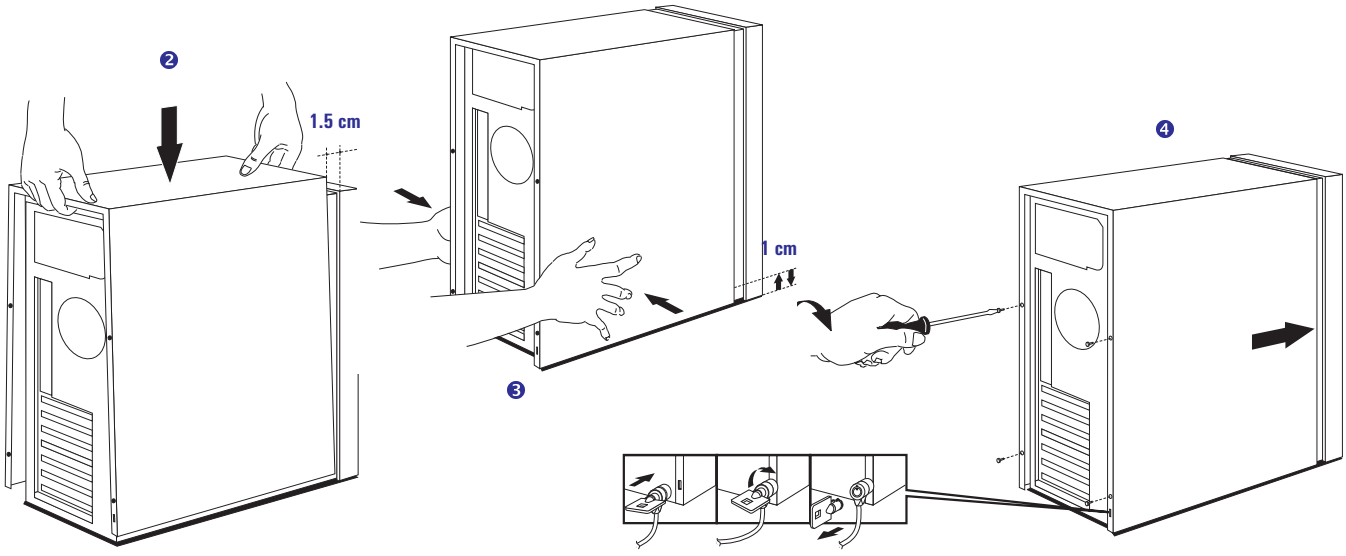
Replacing the Cover

1 Check that you have installed all your accessories and that internal cables are properly connected and safely routed (for example, check that they will not interfere with the cover when it is replaced).

2 Lower the cover onto the computer. Position the cover so that there is a 1.5 cm gap between the front edge of the cover and the front bezel.

3 While holding the cover as shown, lift the cover up approximately 1 cm until a 'pop' is heard, then lower the cover. Metal tabs at the bottom of the cover should now be hooked onto the chassis of the computer.

4 Push the cover forward until it meets the front bezel. Secure the cover in place by replacing the four screws on the rear panel. If required, lock the cover using the key provided.



5 Reconnect the power supply cords and any telecommunications cables. Turn on the display and computer.

Upgrading Main Memory

How Much Main Memory Does My Computer Have?

The amount of main memory that your computer has depends on the particular model that you have. To see how much main memory is installed, right-click the My Computer icon on the desktop. Then click Properties in the drop-down menu.

Why Add More Main Memory?

By adding more memory you can significantly improve the computer's performance. If your computer does not have enough memory, it uses hard disk space as virtual memory which allows large applications to execute even though the physical memory is not sufficient. Virtual memory, however, is approximately 200 times slower than main memory.

The amount of main memory your computer requires depends on the operating system and the applications you use. You may need more memory if you use memory-hungry applications (for example, image processing and desktop publishing applications) or if you run several applications at the same time.

How Much Main Memory Can I Add?

Your computer is capable of supporting up to 192 MB of main memory (3 x 64 MB), using three memory module sockets on the system board.

Main memory is available in modules of 16 MB, 32 MB, and 64 MB non-ECC SDRAMs.

Will Adding Memory Always Improve Performance?

If your computer has sufficient memory, installing extra memory will not improve performance.

Installing Main Memory Modules

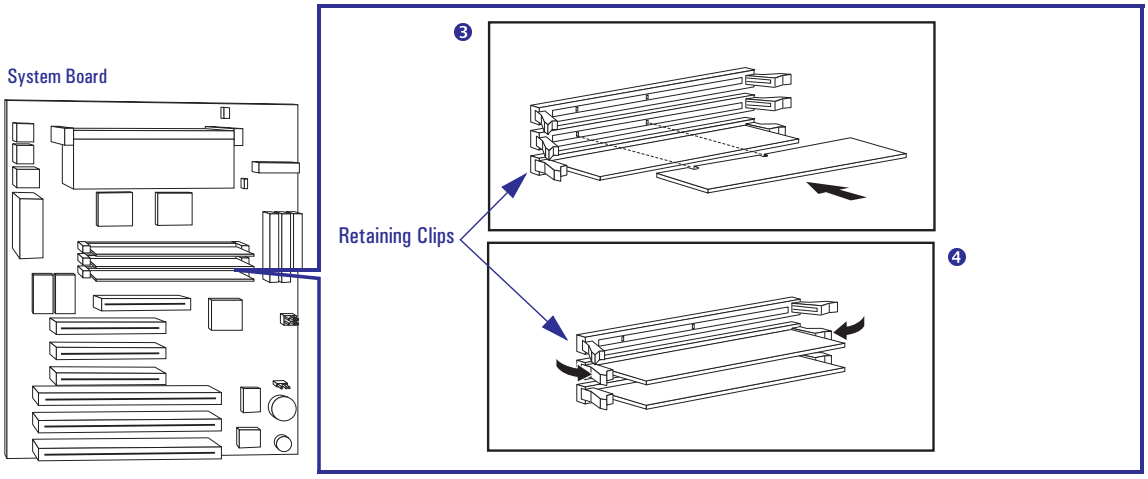
1 Remove the computer's cover (refer to "Removing the Cover" on page 37).

2 On a table top turn the computer on to its side, with the system board closest to the surface of the table top.

Caution Static electricity can damage electronic components. Turn off all equipment. Don't let your clothes touch the accessory. To equalize the static electricity, rest the accessory bag on top of the computer while you are removing the accessory from the bag. Handle the accessory as little as possible and with care.

3 Handle the memory module by its edges. Slide the memory module into the connector at 90° to the system board (the module will only fit into the socket one way round).

4 Firmly press the memory module completely into the connector until the retaining clips click into position.



5 If you need to remove a memory module, perhaps because you are replacing an existing module, refer to "Removing a Memory Module" below.

6 Install any other accessories before returning the computer to the upright position, replacing the cover, and reconnecting the power supply cords and any telecommunications cables.

7 Turn on the display, and then turn on the computer.

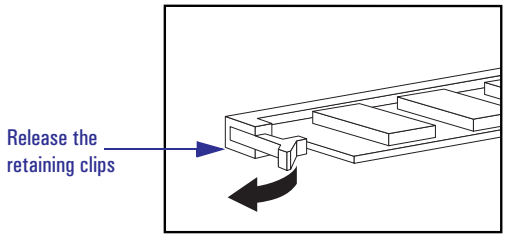
8 In Windows, check that the new memory has been recognized. To do this, right-click the My Computer icon on the desktop, then click Properties in the drop-down menu.

Troubleshooting

- ❒ If the new memory is not recognized, check that you have correctly followed the installation procedure described above.
- ❒ If there are any errors reported during the computer's startup routine, press F2 to view the error(s) and take any necessary action. If you have any doubts about using the HP *Setup* program, contact your reseller for help.
- ❒ If you cannot start your computer properly, remove the memory and try starting your computer again. If the computer now starts without any problems, there may be a problem with the new memory.
- ❒ If you experience any other problems as a result of the upgrade, and your computer is supplied with the HP Brio Center, refer to the support tools for further assistance.

Removing a Memory Module

If you need to remove a main memory module, release the retaining clips at both ends of the socket. This raises the module out of the socket. Handle the memory module by its edges, then lift it up and clear of the system board.



Upgrading Video Memory

How Much Video Memory Does My Computer Have?

The amount of video memory that your computer has depends on the particular model that you have. To find out how much video memory is installed, select the Display icon from the Control Panel and click the Settings tab, then select the Advanced Properties button.

Why Increase the Amount of Video Memory?

You should upgrade the amount of video memory if you want to increase your display resolution or the number of displayable colors.

For example, with 1 MB, you can have up to 65K colors with a screen resolution of 800 x 600 (default setting). If you increase the resolution to 1024 x 768, you will only be able to have 256 colors available, which will result in a flickering and bad ergonomic display. In this case, 2 MB of video memory is necessary to keep the optimal colors and refresh rate.

How Much Video Memory Can I Add?

If your computer has 2 MB of video memory on the system board, it cannot be increased (unless you use a separate video card, such as an AGP video card).
If your computer has an AGP video card supplied with 4 MB of video memory, you can upgrade it to 8 MB by installing a video memory module.

Note If you install an AGP video card, the video memory on the system board (if any) will no longer be available. The 2 MB of system board video memory is not added to the total amount of available video memory.

Installing Video Memory on an AGP Video Card

Caution Static electricity can damage electronic components. Turn off all equipment. Don't let your clothes touch the accessory. To equalize the static electricity, rest the accessory bag on top of the computer while you are removing the accessory from the bag. Handle the accessory as little as possible and with care.

1 Remove the computer's cover (refer to "Removing the Cover" on page 37).

2 On a table top turn the computer onto its side, with the system board closest to the surface of the table.

3 Carefully remove the card from the AGP expansion card slot. Handle the card by its edges. Do not bend the card. With its components facing up, place the card on a clean, flat, solid, static-free surface. If you have any doubts about removing an expansion card, refer to "Removing an Expansion Card" on page 53

4 Install the video memory upgrade module in the upgrade socket.

5 Replace the AGP video card in the computer. Carefully slide the card back into its expansion slot. Firmly press the card into the slot. Make sure that the card slides into the slot completely and does not touch any components on other cards. Secure the AGP video card. How to install an expansion card is described on page 50.

6 Install any other accessories before returning the computer to the upright position, and replacing the cover. Reconnect all cables and power cords.

7 Turn on the display, and then turn on the computer.

8 In Windows, change the video resolution and the number of colors displayed. To do this, right-click on the desktop, and then click Properties, then select the Settings tab.

Note If you need to use a special video driver for your application, you may be asked to insert the CD-ROM or floppy disk containing the driver.

Troubleshooting

- If the new memory is not recognized, check that you have correctly followed the installation procedures described above.
- If there are any errors reported during the computer's startup routine, press F2 to view the error(s) and take any necessary action. If you have any doubts about using the HP *Setup* program, contact your reseller for help.
- If you cannot start your computer properly, remove the memory and try starting your computer again. If the computer now starts without any problems, there may be a problem with the new memory.
- If you experience any other problems as a result of the upgrade, and your computer is supplied with the HP Brio Center, refer to the support tools for further assistance.

Upgrading a Processor

Why Upgrade the Processor?

The speed at which the processor can perform tasks is determined by the processor's internal speed; the faster the internal speed, the faster tasks can be performed. Replacing the processor by one with a faster internal speed will improve the performance of your computer.

What Is the Fastest Processor I Can Install?

New, faster processors are being developed all the time. Check with your reseller to find out what is the fastest processor that you can install in your computer. Information about processor upgrades is also available at:

http://www.hp.com/go/smallbizsupport

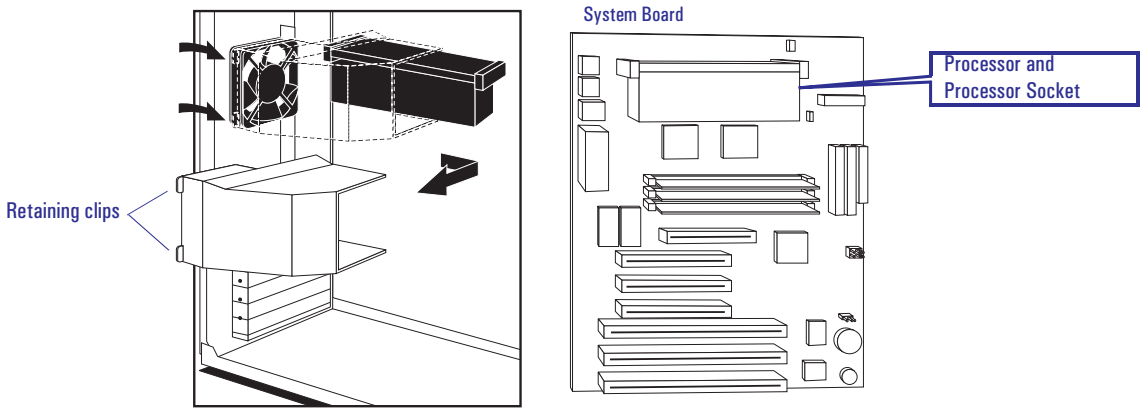
Installing a Processor Upgrade

Removing the Old Processor

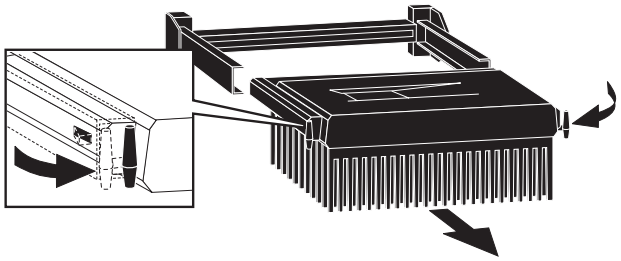
1 Remove the computer's cover (refer to "Removing the Cover" on page 37).

2 On a table top turn the computer on its side, with the system board closest to the surface of the table top.

3 Remove the airflow guide covering the processor: open the retaining clips on top of the airflow guide, slide it back so that it clears the fan, then lift it out of the computer.



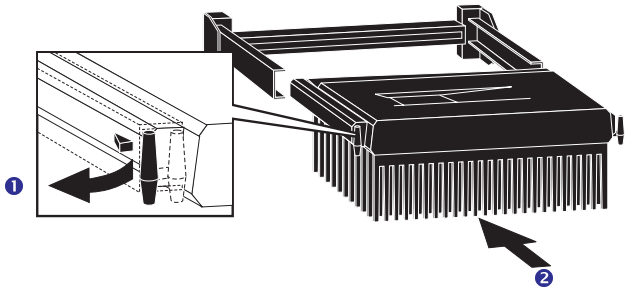
4 Squeeze the tabs on either side of the processor and gently pull the processor away from the system board.



Installing the New Processor

1 Verify that the tabs on either side of the processor are open.

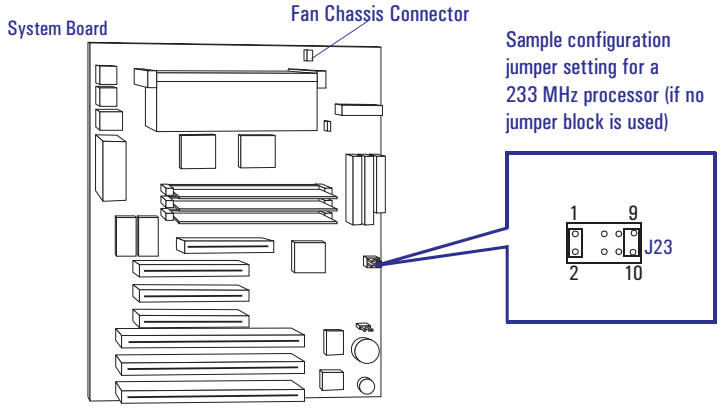
2 Slide the new processor into the processor socket and push gently until it snaps into place (the processor can only go in one way).



Setting the System Board for the Processor Type

Set the system board configuration jumpers (or jumper block).

The following diagram shows the location on the system board of the jumpers used to configure the computer for the new processor. If you are in any doubt as to whether you should change jumper settings or not, contact your reseller.



CPU Clock Ratio (J23):

CPU SPEED		
CPUCLK	**Ratio**	**Jumper Position**
233 MHz	2 / 7	1-2 and 9-10
266 MHz	1 / 4	5-6, 7-8 and 9-10
300 MHz	2 / 9	5-6 and 9-10
333 MHz	1 / 5	7-8 and 9-10

Note If your computer is supplied with a jumper block, you will need to change this with individual jumpers when you upgrade the processor.

Completing the Installation

1. Replace the airflow guide covering the processor. Verify that the Fan cable is still connected to the Fan Chassis Connector on the system board.
2. Install any other accessories before returning the computer to the upright position, replacing the cover, and reconnecting the power cords and any telecommunications cables.
3. Turn on the display and computer. The computer should recognize the new processor.

Troubleshooting

- If the new processor is not recognized, the startup routine will stop shortly after you turn on the computer. If this happens, turn off the computer and check that you have correctly installed the processor.
- If the new processor is still not recognized, remove it and put the old processor back into the computer (remember to reset any system board jumpers if necessary), and then restart the computer. If the computer now starts without any problems, there may be a problem with the new processor.
- If you experience any other problems as a result of the upgrade, and your computer is supplied with the HP Brio Center, refer to the support tools for further assistance.

Adding Accessories

Adding Expansion Cards

What Is an Expansion Card?

An expansion card, or accessory board, is a component that usually adds some specialized function to a computer. For example, installing a network card can, in conjunction with the necessary software and cables, connect a computer to a network.

There are two types of expansion cards that you can install in your computer: PCI cards and ISA cards. PCI cards use the computer's PCI bus (information pathway), and ISA cards use the computer's ISA bus. The PCI bus is faster than the ISA bus.

How Many Expansion Cards Do I Have?

You can tell how many cards are installed by looking at the back of your computer and counting the number of slots that are occupied. This is the number of expansion cards that are installed.

How Many Expansion Cards Can I Install?

Your computer supports up to six cards (refer to page 12).

The Windows operating system can automatically recognize and configure many expansion cards that you may want to install in your computer. With other cards, you will be required either to install a driver, or to run the Windows Add New Hardware wizard to help Windows to recognize the card.

You must physically install the card before you run the wizard. Refer to your Windows documentation and online help for more information about using the wizard.

For non plug and play (legacy) expansion cards, the settings selected by Windows may be different from those recommended by the card's manufacturer. In this case, the card's jumper settings and driver options might need to be altered. Refer to the manual supplied with the card for more information.

Installing an Expansion Card

Caution Static electricity can damage electronic components. Turn off all equipment. Don't let your clothes touch the accessory. To equalize the static electricity, rest the accessory bag on top of the computer while you are removing the accessory from the bag. Handle the accessory as little as possible and with care.

1 Remove the computer's cover (refer to "Removing the Cover" on page 37).

2 On a table top turn the computer on to its side, with the system board closest to the surface of the table top.

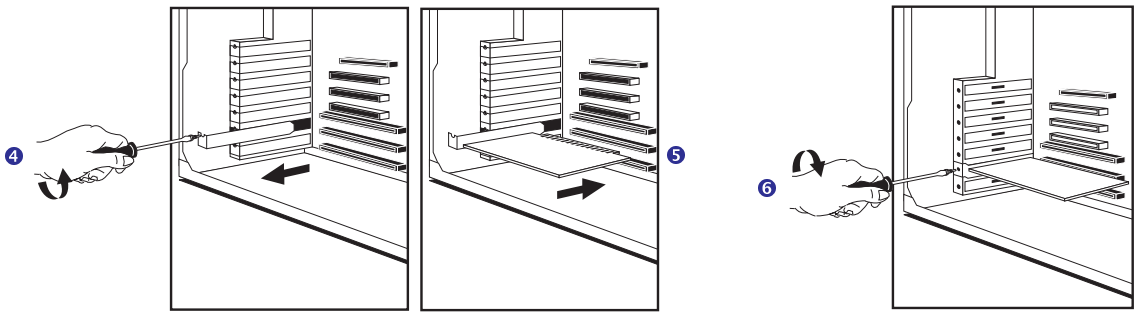
3 Find a free expansion card slot with the correct type of connector (PCI or ISA). Some cards may have preferred locations, in which case special installation instructions should be detailed in their manuals.

4 Remove the faceplate. If it is tight, loosen the screws on the adjacent slots. Save the retaining screw(s).

Note Some models may be provided with faceplate that have to be removed with a screwdriver. To do this, insert a flathead screwdriver into the slot on the faceplate, then push forward until it snaps off.

5 Handle the card horizontally by its "top" edge with the card's connector pointing towards the slot's connector. Do not bend the card. Carefully slide the card into the slot and firmly press it into place. Ensure that the card's connector engages completely with the slot's connector and does not touch components on other cards.

6 Secure the card with the retaining screw. If you loosened the screws on adjacent faceplates, remember to tighten them.



7 Install any other accessories before returning the computer to the upright position, replacing the cover and reconnecting the power cords and any telecommunications cables. Turn on the display, and then turn on the computer.

8 If you have just installed a Plug and Play expansion card, Windows is able to recognize and configure the card automatically. The New Hardware Found dialog box is displayed while Windows loads the necessary driver(s).

If Windows does not find the correct driver, it displays the following choices for you to select:

- **Windows default driver**.
  (Shaded if the card is not known by Windows). If this option is available, select it.
- **Driver from disk provided by the manufacture**r.
  If a Windows default driver is not available, and you have a driver disk, select this option. You then need to insert the disk and click the OK button.
- **Do not install a driver. Windows will not prompt you again**.
  In this case, the card will be installed but it will not work.
- **Select from a list of alternative drivers**.

If you have just installed a non-Plug and Play expansion card, you will be required to either install a driver, or run the Windows Add New Hardware wizard (accessible from the Control Panel) to help Windows to recognize and configure the card.

Troubleshooting

- If the new card is not recognized, check that you have correctly followed the installation procedure described above.
- If there are any errors reported during the computer's startup routine, press F2 to view the error(s) and take any necessary action. If you have any doubts about using the HP *Setup* program, contact your reseller for help.
- If you cannot start your computer properly, remove the card and try starting your computer again. If the computer now starts without any problems, there may be a problem with the new card.
- If you experience any other problems as a result of the upgrade, and your computer is supplied with the HP Brio Center, refer to the support tools for further assistance.

Fax/Modem Card Warning

Do not attempt to connect this product to the phone line during a lightning storm. Never install telephone jacks in wet locations unless the telephone line has been disconnected at the network interface. Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface. Use caution when installing or modifying telephone lines. Avoid using a telephone (other than a cordless type) during a lightning storm. There may be a risk from lightning. Do not use the telephone to report a gas leak in the vicinity of the leak. Never touch or remove the Communications board without first removing the connection to the telephone network.

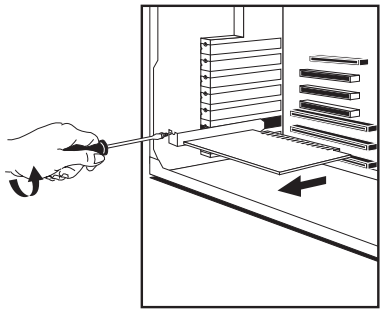
Removing an Expansion Card

You might need to remove an expansion card to install a component on it, or to improve access to components on the system board.

Removing a Card

1 Follow steps 1 to 3 of "Installing an Expansion Card" on page 50.

2 Unscrew and remove the retaining screw securing the card. Keep the retaining screw.



3 Carefully remove the card from its connector, handling the card at each end by its top edge. If the card is tight, loosen the screws on the adjacent slots. Do not bend the card. If you intend to replace the card later, note which connector it is in.

4 With its components facing up, place the card on a clean, flat, solid, static-free surface. Handle the card by its edges.

5 Install any new accessories.

6 Replace the expansion card if necessary (refer to steps 5 and 6 on pages 50 and 51).
If you do not replace the card, remember to insert a faceplate.

7 Return the computer to the upright position, then replace the cover. Reconnect the power cords and any telecommunications cables. Turn on the display, and then turn on the computer.

Installing Storage Devices

How Many Storage Devices Does My Computer Have?

Your computer is supplied with one hard disk drive mounted on an internal shelf, and one front-access 3.5-inch floppy disk drive. There may also be a CD-ROM drive installed.

Why Add More Storage Devices?

Adding additional storage devices is often necessary when, for example, a large amount of information needs to be frequently accessed.

You can install additional storage devices if, for example, you need extra storage space for your application software.

How Many Storage Devices Can I Add?

The number of storage devices that you can add to your computer is determined by the number of mounting shelves that are unused and by the number of storage device interface channels that are unused.

Your computer has a 3.5-inch floppy disk drive and either a 3.5-inch or 5.25-inch hard disk drive already installed. There may also be a CD-ROM drive installed.

The on-system board electronics have a total of six interface channels that can support up to six storage devices—two FDD devices and four IDE devices.

Note Disk drives ordered from HP may be supplied with mounting rails. Remove all mounting rails from the drive, as your computer does not need them. You can install a non-IDE device such as a SCSI drive but you will also need to install an interface card and software for it.

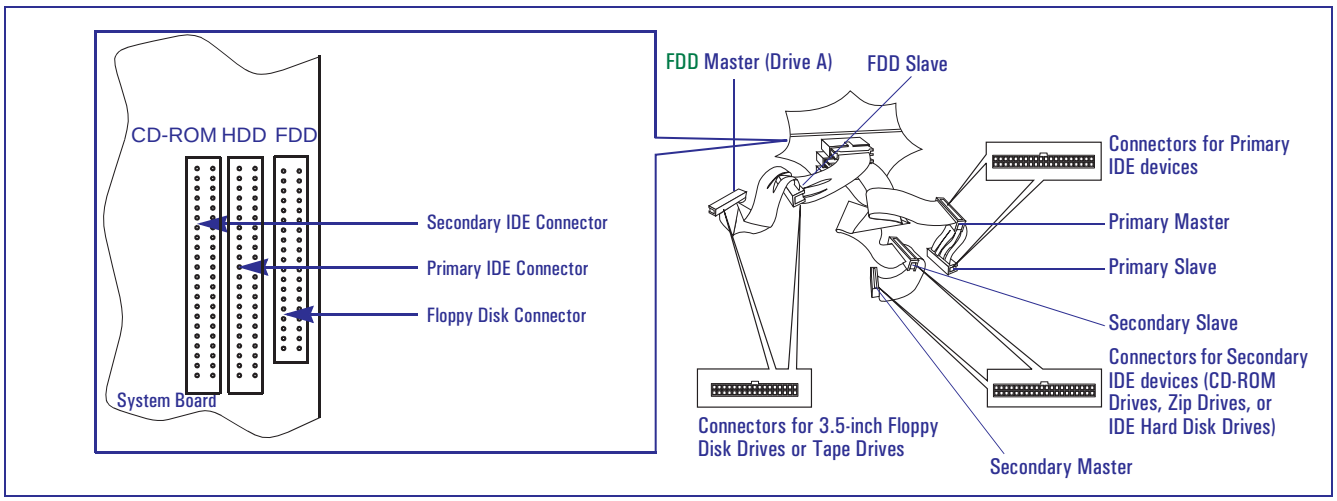
Storage Device Cables

Your computer has the following cables which may be used by storage devices:

- A primary IDE hard disk drive cable with two connectors. This cable supports up to two IDE hard disk drives, one of which is already connected to the Master connector on this cable.
- A secondary IDE drive cable with two connectors. If you already have a CD-ROM drive installed, it is connected to the Master connector on this cable. If you install a CD-ROM drive, or a third hard disk drive, or both, connect it or them to this cable.
- A floppy disk drive cable. This supports up to two floppy disk drives (or one floppy disk drive and one tape drive). One 3.5-inch floppy disk (Drive A) is already connected to the Master connector on this cable.

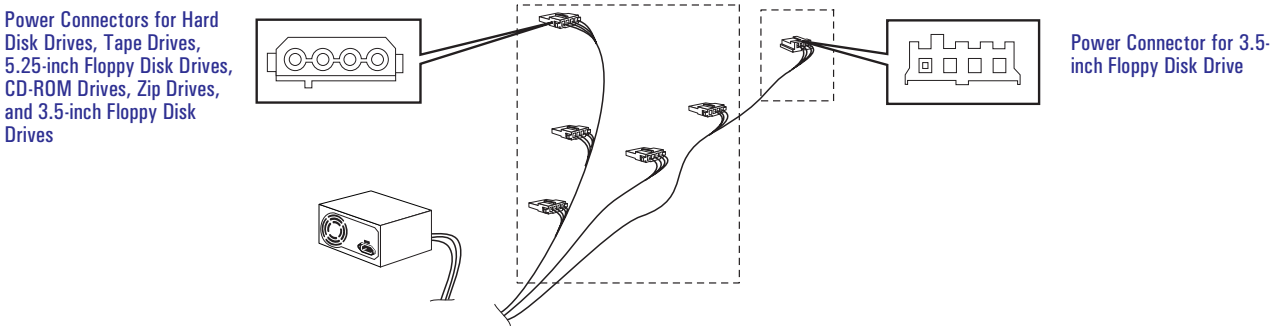
System Board Connectors

If you add a floppy disk drive, hard disk drive, CD-ROM drive, Zip drive, or tape drive, you need to connect it to power and data cables. The connectors are shaped to fit one way only. The data cables are shown below.



Note If you install a hard disk drive and connect it to the cable that the CD-ROM drive is connected to, the hard disk drive must be connected to the Master connector in the cable from the system board, not the Slave connector. If you have a CD-ROM drive currently connected to the Master connector, you must reconnect the CD-ROM drive to the Slave connector of the cable, and then attach the new hard disk drive to the Master connector.

There are two different types of power connectors:



If you install a device that requires a different connector, the connector converter should be supplied with the device.

Installing an Additional Hard Disk Drive

Refer to the drive's manual(s) to see if you must set jumpers or if there is a special installation procedure to follow.

Note If your new hard disk drive already has a mounting tray attached, you must remove it before you can install the drive in your computer.

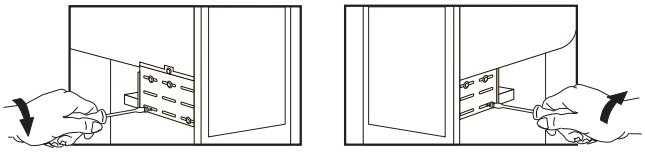
Installing the Drive

1 Remove the computer's cover (refer to "Removing the Cover" on page 37).

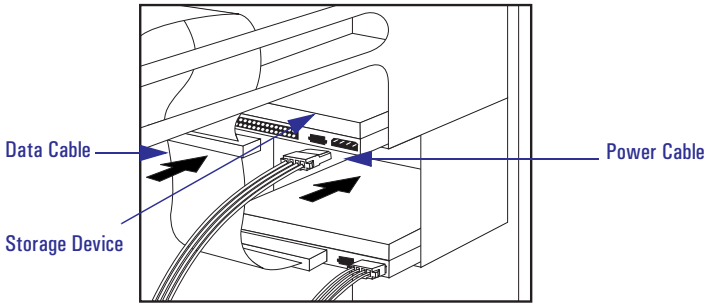
2 Install the new hard disk drive in the computer:

- For a 3.5-inch hard disk drive – mount the new hard disk drive in the 3.5-inch bay (below the floppy disk drive). Have the connectors of the new hard disk drive pointing towards the back of the computer.
- For a 5.25-inch hard disk drive – mount the new hard disk in the 5.25-inch bay. Have the connectors of the new hard disk drive pointing towards the back of the computer.

3 Secure the drive to the computer using the four screws provided with the drive. Two screws must be inserted in each side of the drive. Using screws other than those provided may cause damage to the device.



4 Connect the power and data cables to the rear of the drive. Both connectors are shaped to fit one way only. Use the second connector on the hard disk drive data cable. Refer to "System Board Connectors" on page 55 for an illustration of the cables and connectors.



5 Install any other accessories before replacing the cover and reconnecting the power cords and any telecommunications cables.

6 Turn on the display, and then turn on the computer.

7 In Windows, check that the new hard disk drive has been recognized. To do this, double-click the My Computer icon on the desktop, the disk drives that are available on your computer are displayed in the My Computer window.

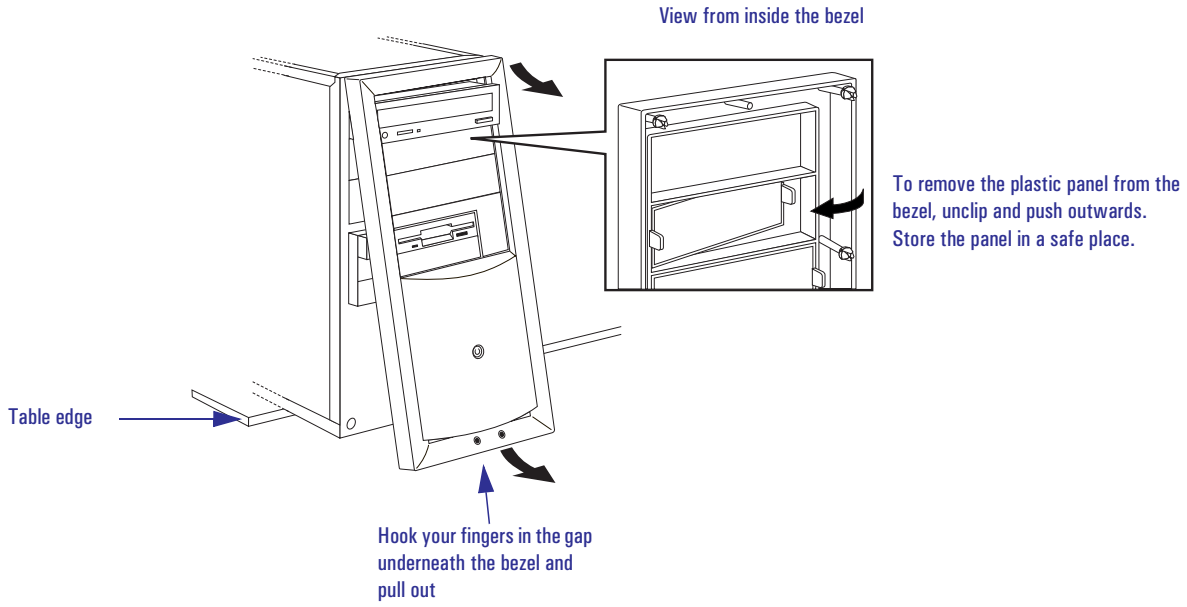
Before you can use the new hard disk drive, you will probably need to set up partitions and then format the drive. To do this, restart your computer in MS-DOS mode, run *fdisk* to set up the partitions, restart the computer, and then format the new drive from within Windows.

Troubleshooting

- If the new drive is not recognized, you may need to run the *Setup* program: restart the computer and press F2 when **Press <F2> to enter SETUP** is displayed at the bottom of the screen. If you have any doubts about using the HP *Setup* program, contact your reseller for help.
- If the new drive is still not recognized, check that you have correctly followed the installation procedure described above.
- If there are any errors reported during the computer's startup routine, press F2 to view the error(s) and take any necessary action.
- If you cannot start your computer properly, remove the drive and try starting your computer again. If the computer now starts without any problems, there may be a problem with the new drive.
- If you experience any other problems as a result of the upgrade, and your computer is supplied with the HP Brio Center, refer to the support tools for further assistance.

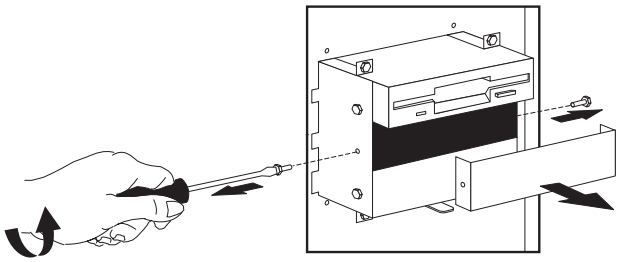
Installing a Floppy Disk Drive, CD-ROM Drive, Zip Drive, or Tape Drive

1 To remove the front bezel, move the computer to the edge of the table (only far enough to be able to place your hand between the table and the front bezel). Pull the front bezel outwards from the computer by hooking your fingers in the gap and pulling (it should still be connected at the top). Then, gently continue to pull the front bezel outwards until it is completely detached from the computer.

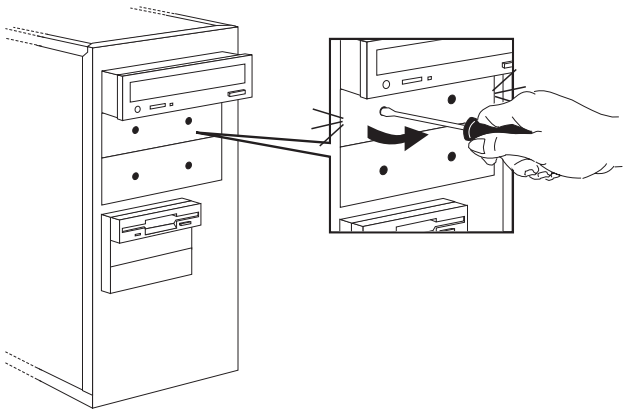


2 Check that there are no mounting rails attached to the device. If there are mounting rails attached, you should remove them.

3 If you are installing a 3.5-inch drive, use a star-shaped screwdriver to unscrew the two screws on either side of the front plate and remove it.



4 If you are installing a 5.25-inch drive, remove the faceplate on the 5.25-inch bay by inserting a flathead screwdriver into the slot, then push outward until the faceplate snaps off.



CD-ROM Warning

To avoid electric shock and harm to your eyes by laser light, do not open the laser module. The laser module should be serviced by service people only. Do not attempt to make any adjustment to the laser unit. Refer to the label on the CD-ROM for power requirements and wavelength. This product is class 1 laser product.

5 Insert the drive into the shelf from the front of the computer.

6 Secure the device in position using the screws provided with it. Using screws other than those provided may cause damage to the device.

7 Connect the power and data cables to the rear of the device. The power connector and data connector are shaped to fit one way only. Refer to "System Board Connectors" on page 55 for more information about which connectors to use.

8 Install any other accessories before replacing the cover and reconnecting the power cords and any telecommunications cables. Replace the front bezel on the computer.

9 Turn on the display, and then turn on the computer.

10 In Windows, check that the drive has been recognized. To do this, double-click the My Computer icon on the desktop, the disk drives that are available on your computer are displayed in the My Computer window.

11 Depending on the type of drive you have installed, you may need to install some driver software. This could be done when you have returned to the operating system.

Troubleshooting

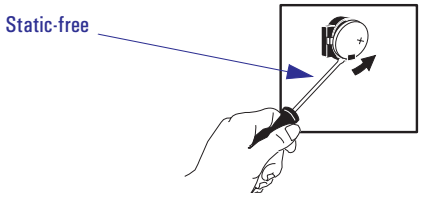
- If the new drive is not recognized, you may need to run the *Setup* program: restart the computer and press F2 when **`Press <F2> to enter SETUP`** is displayed at the bottom of the screen. If you have any doubts about using the HP *Setup* program, contact your reseller for help.
- If the new drive is not recognized, check that you have correctly followed the installation procedure described above.
- If there are any errors reported during the computer's startup routine, press F2 to view the error(s) and take any necessary action. If you have any doubts about using the HP *Setup* program, contact your reseller for help.
- If you cannot start your computer properly, remove the drive and try starting your computer again. If the computer now starts without any problems, there may be a problem with the new drive.
- If you experience any other problems as a result of the upgrade, and your computer is supplied with the HP Brio Center, refer to the support tools for further assistance.

Changing the Battery

Warning There is a danger of explosion if the battery is incorrectly installed. For your safety, never attempt to recharge, disassemble, or burn the old battery. Replace the battery only with the same type or equivalent type recommended by the manufacturer. The battery in this computer is a lithium battery which does not contain heavy metals. Nevertheless, in order to protect the environment, do not dispose of batteries in household waste. Please return used batteries to the shop from where you bought them, to the dealer from whom you purchased your computer, or to HP so that they can be either recycled or disposed of in an environmentally sound way. Returned used batteries will be accepted free of charge.

Replace the battery with a CR2032 coin type manganese/lithium battery, available from most local stores.

1 Remove the computer's cover (refer to "Removing the Cover" on page 37).
2 On a table top turn the computer onto its side, with the system board closest to the surface of the table.
3 Remove the old battery by sliding it from under the retaining clip (note the position of the cross marked on the battery).



4 Place the new battery in the battery holder, with the cross in the same position as on the old battery (the cross should be facing up from the board), and ensure that it is properly seated. Ensure that the clip holds the battery firmly in place.

After installing a replacement battery, install any other accessories before returning the computer to the upright position. Replace the cover, and reconnecting the power cords and any telecommunications cables. Run the *Setup* program to reconfigure the computer.

Note Removing the battery will clear the CMOS memory, returning its configuration to its default settings. Refer to "The BIOS in Your Computer" on page 22 for information on reconfiguring your system.

Appendix

AT Commands

Basic AT Commands

This section describes the AT commands supported by your modem. If you send an AT command that is not applicable, the modem returns an error message. See Modem Response Messages, on page 69.

The following table lists the basic AT commands.

Command	Description
+ + +	Escape characters used to switch between Data mode and Command mode. In either case the computer stays connected to remote modem.
ATA	Manually answers incoming calls. Modem does not answer the telephone.
A/	Repeats the last command line executed.
AT	Attention. Begins each command line, except **A/**. Tests that your modem is working and configured correctly. If characters you type do not appear on your screen, your modem is not configured properly.
ATB*n*	Switches between BELL/ITU standards at 300 or 1200 bps, where *n* is either 0 or 1: **0** - The ITU V.22, V.21 (factory default) standard. **1** - The Bell 212A and Bell 103 standard.

Command	Description
ATD*n*	Tells the modem to go online and dial (automatic dialing). The following characters are authorized as parameters in the dialing sequence: **0 to 9 -** For the telephone numbers. **P -** For pulse dialing. **T -** For touch tone dialing. **W -** Tells modem to wait until it hears the line free signal (for use with branch exchanges). **S=*n* -** Dials the number stored in register *n* (where *n* is a number from 0 to 3). **! -** Calls exchange by flash. **^ -** Switches off calling tone (during current dialing process). **;H -** Terminates the dialing sequence and causes the modem to go offline after dialing so that you can conduct a normal voice conversation. Example: ATDT123456;H. **, -** Pauses the register (S8) time. **@ -** Waits for 5 seconds of silence. **; -** Stays in Command Mode after dialing.
ATE*n*	Controls the Echo function, where *n* is either 0 or 1: **1 -** Enables character echo so that modem commands appear on screen as they are entered. **0 -** Disables the echo function.
ATH*n*	Where *n* is either 0 or 1: **0 -** Forces modem on-hook. **1 -** Forces modem off-hook.

Command	Description
ATI*n*	Returns information about modem product codes, where *n* is a digit from 0 to 8. **0** - Four-digit product code. **1** - Results of poor checksum. **3** - Product type. **4** - Current modem settings. **5** - Nonvolatile memory (NVRAM) settings. **6** - Link diagnostics. **7** - Product configuration. **8** - Return the blacklisted phone numbers.
ATL*n*	Loudspeaker volume control, where *n* is a digit from 0 to 3: **0** - Modem speaker disabled. **1** - Low speaker volume. **2** - Medium speaker volume. **3** - High speaker volume.
ATM*n*	Switches speaker on or off, where *n* is a digit from 0 to 3: **0** - Speaker off. **1** - Speaker on until carrier detected. **2** - Speaker always on. **3** - Speaker on during handshake.

Command	Description
ATO*n*	Returns online, where *n* is either 0 or 1: **0** - Returns online. **1** - Returns online and retains.
ATQ*n*	Control modem responses, where *n* is either 0 or 1: **0** - Enables response messages (default). **1** - Disables response messages.
ATS*r?*	Reads the value of the S register *r*. Example: ATS0?
ATSr=*n*	Changes the value of S register *r* to value *n*. Example: ATS0=1 S0 **=** auto-answers calls on the ring corresponding to this register value: ATS0=1 **-** auto-answers calls on first ring. ATS0=0 **-** turns off auto-answer; to manually answer calls, use the A command.
ATV*n*	Selects modem message format (alphabetic or alphanumeric), where *n* is either 0 or 1: **0** - Sends responses as numbers. **1** - Sends responses as characters.
ATX*n*	Sets result code displayed. Default value is X4.
ATY*n*	Selects power on/reset default configuration, where *n* is either 0 or 1: **0** - Default is profile 0 setting in NVRAM. **1** - Default is profile 1 setting in NVRAM.
ATZ*n*	Resets modem and uses one of two stored profiles. The *n* parameter (0 or 1) is used to reset the modem to the preferred profile. Any commands following the ATZ*n* command are ignored.
AT\N5	Makes MNP links only.

Command	Description
AT&C*n*	Selects data compression for MNP or V.42, where *n* is a digit from 0 to 3. For data compression to work, both the local and the remote modem must have compression capabilities. The *n* parameters are: **0 -** Compression is not authorized. **1 -** Auto enable/disable. **2 -** Data compression enabled. **3 -** MNP5 compression disabled.
AT&D*n*	This command controls the way that your modem responds to the Data Terminal Ready (DTR) signal: **0 -** Ignores DTR signal. **1 -** Modem interprets an ON-to-OFF transition as escape characters and moves to Command Mode, while keeping data connection. **2 -** An ON-to-OFF DTR transition causes the modem to hang up and disables auto-answer. **3 -** An ON-to-OFF DTR transition resets the modem to hang up and disables auto-answer.
AT&F	Modem returns to factory default settings.
AT&K*n*	This command controls the flow control: **0 -** Disables flow control. **1 -** Enables RTS/CTS (hardware) flow control (default). **2 -** Enables XON/XOFF (software) flow control.

Modem Response Messages

In response to AT modem commands, the modem returns status information in the form of response messages. These messages appear on the screen when you enter a modem command and press Enter. You can instruct the modem to return responses in English language words (with the **V1** command) or as numeric values (with the **V0** command).

The most common responses are described in the table below (the numeric equivalents are in parentheses).

Message	Description
(00) OK	The command was carried out successfully.
(01) CONNECT	For **X0**: the modem has made a data connection.
(02) RING	Modem is receiving incoming call.
(03) NO CARRIER	The remote carrier signal is not detected.
(04) ERROR	You typed an invalid command line or a command line that is too long.
(05) CONNECT 1200	Modem is configured to report line speed, which is 1200 bps; or modem is configured to report the DTE speed, which is 1200 bps.
(06) NO DIAL TONE	The modem cannot dial the number you specified because there is no dial tone (this response is enabled when the **X2**, **X4**, or **W** modifier is in effect).
(07) BUSY	Modem has not detected a busy signal (this response is enabled when **X3** or **X4** are in effect).
(08) NO ANSWER	Modem did not detect silence when dialing a command line containing the @ modifier within the time specified by register **S7**.
(09) CONNECT 0600	Modem is configured to report line speed, which is 600 bps; or modem is configured to report the DTE speed, which is 600 bps (this response is disabled when **X0** is in effect).
(10) CONNECT 2400	Modem is configured to report line speed, which is 2400 bps; or modem is configured to report the DTE speed, which is 2400 bps (this response is disabled when **X0** is in effect).

Message	Description
(11) CONNECT 4800	Modem is configured to report the DTE speed, which is 4800 bps.[1]
(12) CONNECT 9600	Modem is configured to report the DTE speed, which is 9600 bps.[1]
(13) CONNECT 7200	Modem is configured to report the DTE speed, which is 7200 bps.[1]
(14) CONNECT 12,000	Modem is configured to report the DTE speed, which is 12,000 bps.[1]
(15) CONNECT 14,400	Modem is configured to report the DTE speed, which is 14,400 bps.[1]
(16) CONNECT 19,200	Modem is configured to report the DTE speed, which is 19,200 bps.[1]
(17) CONNECT 38,400	Modem is configured to report the DTE speed, which is 38,400 bps.[1]
(18) CONNECT 57,600	Modem is configured to report the DTE speed, which is 57,600 bps.[1]
(19) CONNECT 115,200	Modem is configured to report the DTE speed, which is 115,200 bps.[1]
(22) CONNECT 75TX/1200RX	Carrier transmit 75 bps, receive 1200 bps.[1]
(23) CONNECT 1200TX/75RX	Carrier transmit 1200 bps, receive 75 bps.[1]
(24) DELAYED	For **X4**, a call fails to connect and the number dialed is considered "delayed" due to country blacklisting requirements.
(32) BLACKLISTED	Modem has dialled a telephone number that has been blacklisted, and has failed to make a connection.
(33) FAX	Fax/modem connection established in fax mode.
(35) DATA	Data modem connection established in fax mode.
(40) CARRIER 300	V.21 or Bell 103 carrier detected at 300 bps.[2]
(44) CARRIER 1200/75	Carrier—transmit at 1200 bps, receive at 75 bps.[2]
(45) CARRIER 75/1200	V.22 or Bell 212 carrier detected at 1200 bps.[2]

Message	Description
(46) CARRIER 1200	V.22 or Bell 212 carrier detected at 1200 bps.[2]
(47) CARRIER 2400	V.22bis carrier detected at 2400 bps.[2]
(48) CARRIER 4800	V.32bis or V.32 carrier detected at 4800 bps.[2]
(49) CARRIER 7200	V.32bis carrier detected at 7200 bps.[2]
(50) CARRIER 9600	V.32bis or V.32 carrier detected at 9600 bps.[2]
(51) CARRIER 12,000	V.32bis carrier detected at 12,000 bps.[2]
(52) CARRIER 14,400	V.32bis carrier detected at 14,400 bps.[2]
(53) CARRIER 16,800	V.34 carrier detected at 16,800 bps.[2]
(54) CARRIER 19,200	V.34 carrier detected at 19,200 bps.[2]
(55) CARRIER 21,600	V.34 carrier detected at 21,600 bps.[2]
(56) CARRIER 24,000	V.34 carrier detected at 24,000 bps.[2]
(57) CARRIER 26,400	V.34 carrier detected at 26,400 bps.[2]
(58) CARRIER 28,800	V.34 carrier detected at 28,800 bps.[2]
(78) CARRIER 31,200	V.34bis carrier detected at 31,200 bps.[2]
(79) CARRIER 33,600	V.34bis carrier detected at 33,600 bps.[2]
(59) CONNECT 16,800	Modem is configured to report the DTE speed, which is 16,800 bps.[2]
(61) CONNECT 21,600	Modem is configured to report the DTE speed, which is 21,600 bps.[2]
(62) CONNECT 24,000	Modem is configured to report the DTE speed, which is 24,000 bps.[2]
(63) CONNECT 26,400	Modem is configured to report the DTE speed, which is 26,400 bps.[2]
(64) CONNECT 28,800	Modem is configured to report the DTE speed, which is 28,800 bps.[2]

Message	Description
(84) CONNECT 33,600	Modem is configured to report the DTE speed, which is 33,600 bps.[2]
(91) CONNECT 31,200	Modem is configured to report the DTE speed, which is 31,200 bps.[2]
(66) COMPRESSION CLASS 5	MNP 5 compression negotiated.[2]
(67) COMPRESSION V.42bis	V.42bis compression negotiated.[2]
(69) COMPRESSION NONE	No compression negotiated.[2]
(70) PROTOCOL NONE	Protocol reporting enabled using **X4** and Register **S95**, and modem has made a data connection without any error correction.[2]
(77) PROTOCOL LAPM	Modem has made a data connection using V.42 LAPM error correction.[2]
(80) PROTOCOL: ALT	Modem has made an MNP connection.[2]
(81) PROTOCOL: ALT-CELLULAR	Modem has made an MNP 10 connection.[2]

1. Response is enabled by the **\V1** command and ignored when the **W1** command is in effect.
2. These negotiation-progress responses are sent when the **W1** command is in effect.

Glossary

AGP Accelerated Graphics Port. Standard for computer bus architecture.

BIOS Basic Input/Output System. Code within the computer that controls the input and output data.

Bus An electrical connection over which information is transported.

Cache A block of memory used for the temporary storage of data.

CD-ROM Compact Disc-Read Only Memory. A storage device that uses compact disc technology. CDs can store data, but cannot be written to, hence the term “read-only”.

CMOS Complementary Metal-Oxide Semiconductor. A separate portion of your computer’s memory, the contents of which are preserved when you turn off the computer. CMOS memory stores information that must be maintained, such as your computer’s configuration.

Controller A device that enables another device to communicate with the computer.

CPU Central Processing Unit. The CPU is invariably a single chip, the microprocessor. The speed of the CPU is determined by the clock rate.

DAT Digital Audio Tape.

Device driver Software that enables the computer to work with a specific peripheral, such as a printer.

DIMM Dual In-line Memory Module (64 or 72-bit data path)

DMA Direct Memory Access. A DMA channel allows certain types of data transfer between RAM and a device to bypass the microprocessor.

DMA channel Direct Memory Access channel. Speeds up I/O to and from the system’s memory by avoiding CPU processing. However, the system limits the number of cards that can use DMA.

DRAM Dynamic Random Access Memory.

ECC Error Correcting Code can detect and correct errors in memory modules.

EDO Extended Data Output. A memory system for use with a PCI bus structure that allows faster use of DRAM and also allows part of the main memory to be used as a fast cache.

EPA Environment Protection Agency. Sets standards, such as the Energy Star Award.

FDD Floppy Disk Drive.

Hard disk Storage device for computer providing read and write storage. This is one type of mass storage device.

IDE Integrated Device Electronics. A protocol for communications between the computer and a disk drive.

Glossary

I/O address Input/Output address. Address that defines the channel used between the main processor and a peripheral component.

IRQ Interrupt Request. A signal that, when received by the processor, halts the current process and allows a different task to be undertaken.

ISA Industry Standard Architecture. Standard for computer bus architecture.

Jumper An electrically-conductive part that is used to connect two or more points on a circuit board. Commonly used to select configuration options.

K Computing Kilo. The upper-case K is used to mean the number 1024, which is two to the power ten (2^{10}). This is the unit that is implied in words such as Kilobyte.

Mass storage Any device used to store large amounts of data external to the internal memory used by the processor. Usually refers to hard disks and tape backup units.

MB Megabyte. An amount of computer memory equal to two to the power twenty (2^{20} = 1,048,576 bytes = 1,024 kilobytes). One megabyte can store more than one million characters.

Memory modules Miniature boards containing memory chips. Used for increasing the amount of memory available in the computer.

MIDI Musical Instrument Digital Interface. An international hardware/software standard that specifies the cable and hardware interface that allows several devices, instruments and computers to interchange music codes and events.

MPEG Motion Picture Expert Group. A standard for video sequence compression. You can play back MPEG files from the WEB or a video CD-ROM.

Non-Volatile Random Access Memory (NVRAM) A memory device that preserves memory contents when the power is off.

Parallel port Input/output channel for connecting peripheral devices to computers. Parallel ports allow connections to printers or other parallel interface devices.

Parameter A numeric modifier required by some commands.

PCI Peripheral Component Interconnect. Standard for computer bus architecture.

PC Personal Computer. A computer designed to be used by only one person, either in a business environment or at home.

Plug and Play Industry standard for dynamically configuring system resources for the computer and its accessories.

POST Power-On Self Test. A series of tests your computer performs when you turn on the power.

Processor The component of the computer that computes. The power of your processor partly determines the speed at which your computer works.

Glossary

RAM Random Access Memory. Computer memory used to temporarily hold programs and data.

Reset Reload operating characteristics. When you reset your modem, it obtains its operating characteristics from non-volatile random access memory where they are stored.

Resolution How fine the detail is on a screen or printout. Screen resolution is measured in 'pixels across' by 'pixels down' by 'number of colors'. Printer resolution is measured in dpi (dots-per-inch).

ROM Read-Only Memory. Computer memory used to permanently store parts of the computer's operating system. ROM chips can contain instructions and data.

SCSI Small Computer System Interface. A high-speed data bus used for connecting hard disks, tape drives, and other accessories to your computer.

SDRAM Synchronous Dynamic Random-Access Memory.

Serial port Input/output channels for connecting peripheral devices to computer. Serial ports allow connections to a mouse, modem, or printer.

Setup program Used to inform the computer about its configuration, for example, the amount of memory installed, the date and time, disk controllers and so forth. The *Setup* program is stored in ROM on the system board.

Sound files Files containing sound data. Sound files are usually stored in one of two formats, with the extension, .WAV, .MID.

SRAM Static Random-Access Memory. A form of RAM that needs no refresh memory signals and which is very fast. SRAM is used for cache memory.

System board The large circuit board that contains the principle components of the computer, and to which accessories are connected.

Video controller An expansion card or chip whose function is to convert signals in the computer into displayable signals.

Video memory Memory that enables or speeds up drawing to the screen or increases resolution or color options.

WAV files A Microsoft file format for storing digital audio data.

WEB site A computer that makes information available on the World Wide Web.

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