

Service Reference Guide

HP Compaq dx2450 Business PC

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Service Reference Guide

Business PCs

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1 Installing and Customizing the Software

-  **NOTE:** If the computer was shipped with Windows Vista loaded, you will be prompted to register the computer with HP Total Care before installing the operating system. You will see a brief movie followed by an online registration form. Fill out the form, click the **Begin** button, and follow the instructions on the screen.
-  **CAUTION:** Do not add optional hardware or third-party devices to the computer until the operating system is successfully installed. Doing so may cause errors and prevent the operating system from installing properly.
-  **NOTE:** Be sure there is a 10.2-cm (4-inch) clearance at the back of the unit and above the monitor to permit the required airflow.

Installing the Operating System

The first time you turn on the computer, the operating system is installed automatically. This process takes about 5 to 10 minutes, depending on which operating system is being installed. Carefully read and follow the instructions on the screen to complete the installation.

-  **CAUTION:** Once the automatic installation has begun, **DO NOT TURN OFF THE COMPUTER UNTIL THE PROCESS IS COMPLETE.** Turning off the computer during the installation process may damage the software that runs the computer or prevent its proper installation.
-  **NOTE:** If the computer shipped with more than one operating system language on the hard drive, the installation process could take up to 60 minutes.

If your computer was not shipped with a Microsoft operating system, some portions of this documentation do not apply. Additional information is available in online help after you install the operating system.

Installing or Upgrading Device Drivers

When installing optional hardware devices after the operating system installation is complete, you must also install the drivers for each of the devices.

If prompted for the i386 directory, replace the path specification with `C:\i386`, or use the **Browse** button in the dialog box to locate the i386 folder. This action points the operating system to the appropriate drivers.

Obtain the latest support software, including support software for the operating system from <http://www.hp.com/support>. Select your country and language, select **Download drivers and software**, enter the model number of the computer, and press **Enter**.

HP Backup and Recovery Manager

The HP Backup and Recovery Manager is an easy-to-use, versatile application that allows you to back up and recover the primary hard drive on the PC. The application works within Windows to create backups of Windows, all applications, and all data files. Backups can be scheduled to occur automatically at designated intervals, or they can be initiated manually. Important files can be archived separately from regular backups.

HP Backup and Recovery Manager is preinstalled on the C: drive and creates a Recovery Partition.


Recovery Points and file backups can be copied to CD or DVD discs, while all backups can be copied to network or secondary hard disks.

HP highly recommends that you create a Recovery Disc Set immediately before using the computer and schedule regular automatic Recovery Point backups.

To create the Recovery Disc Set:

1. Click **Start > HP Backup and Recovery > HP Backup and Recovery Manager** to open the Backup and Recovery Wizard, then click **Next**.
2. Select **Create a set of recovery discs (Recommended)** and click **Next**.
3. Follow the instructions in the wizard.

For more information on using HP Backup and Recovery Manager, refer to the *HP Backup and Recovery Manager User Guide* by selecting **Start > HP Backup and Recovery > HP Backup and Recovery Manager Manual**.

 **NOTE:** You can order a Recovery Disc Set from HP by calling the HP support center. Go to the following Web site, select your region, and click the **Technical support after you buy** link under the **Call HP** heading to obtain the support center telephone number for your region.

http://welcome.hp.com/country/us/en/wwcontact_us.html

2 Computer Setup (F10) Utility

Computer Setup (F10) Utilities


Use Computer Setup (F10) Utility to do the following:

- Change factory default settings.
- Set the system date and time.
- Set, view, change, or verify the system configuration, including settings for graphics, audio, storage, communications, and input devices.
- View settings for processor and memory.
- Modify the boot order of bootable devices such as hard drives, diskette drives, optical drives, or USB flash media devices.
- Restrict a device from booting the unit.
- Run hard drive self-tests.
- Establish a supervisor password that controls access to Computer Setup (F10) Utility and the settings described in this section.
- Enable or disable removable media boot ability.

Using Computer Setup (F10) Utilities

Computer Setup can be accessed only by turning the computer on or restarting the system. To access the Computer Setup Utilities menu, complete the following steps:

1. Turn on or restart the computer.
2. As soon as the computer is turned on, press **F10** when the monitor light turns green to enter Computer Setup.

 **NOTE:** If you do not press **F10** at the appropriate time, you must restart the computer and again press **F10** when the monitor light turns green to access the utility.

3. The Computer Setup Utility screen is divided into menu headings and actions.

Five menu headings appear on the Computer Setup Utility screen:

- Main
- Advanced
- Power

- Boot
- Exit

Use the arrow keys to select the appropriate heading, then press **Enter**. Use the arrow (up and down) keys to select the option you want, then press **Enter**. To return to the previous screen, press **Esc**.

△ **CAUTION:** Do NOT turn the computer power OFF while the ROM is saving the Computer Setup (F10) changes because the CMOS could become corrupted. It is safe to turn off the computer only after exiting the F10 Setup screen.

Computer Setup—Main



 **NOTE:** Support for specific Computer Setup options may vary depending on the hardware configuration.

Table 2-1 Computer Setup—Main

Option	Description
System Time	Allows you to set system time.
System Date	Allows you to set system date.
Language	Allows you to select language.
Floppy Diskette A:	Allows you to set drive A to: <ul style="list-style-type: none"> • Disabled • 1.44 MB 3.5" • Not Installed
1st Drive	For each, allows you to:
2nd Drive	<ul style="list-style-type: none"> • (view only)
3rd Drive	<ul style="list-style-type: none"> ◦ Capacity (Size - HDD only)
4th Drive	<ul style="list-style-type: none"> ◦ Transfer Mode ◦ SATA Speed ◦ NCQ • Smart Support - run HDD self-test for selected channel: <ul style="list-style-type: none"> ◦ SMART Status Check ◦ SMART Short Self-Test ◦ SMART Extended Self-Test
System Information	(view only) <ul style="list-style-type: none"> • Installed Memory • Memory Bank 1 • Memory Bank 2 • Memory Bank 3

- Memory Bank 4
- BIOS Revision
- Core Version
- Model Number
- Product Number
- Asset Tag (press Enter to change)

Computer Setup—Advanced

 **NOTE:** Support for specific Computer Setup options may vary depending on the hardware configuration.


 **WARNING!** Setting items on this menu to incorrect values may cause your system to malfunction.

Table 2-2 Computer Setup—Advanced

Option	Description
CPU Type	(view only)
CPU Speed	(view only)
Cache RAM (L2)	(view only)
Cache RAM (L3)	(view only - some models)
Primary Video Adapter	Allows you to select the boot display device when more than 2 video options are offered by the system: <ul style="list-style-type: none"> • PCI • PCI-Ex1 • PCI-Ex16 • Onboard
Onboard Video Memory Size	<ul style="list-style-type: none"> • 32MB • 128MB • 256MB
PS/2 Mouse	Allows you to set: <ul style="list-style-type: none"> • Disabled • Enabled • Auto Detect
USB Legacy Mode Support	Allows you to set: <ul style="list-style-type: none"> • Disabled • Enabled
Onboard LAN	Allows you to disable/enable onboard LAN controller.

Table 2-2 Computer Setup—Advanced (continued)

Onboard LAN Boot ROM	Allows you to disable/enable the boot ROM of the onboard LAN chip.
SATA Controller	Allows you to set: <ul style="list-style-type: none">• Disabled• SATA1• SATA1+2
Onboard Audio	Allows you to set the onboard audio to: <ul style="list-style-type: none">• Auto• Disabled• Enabled
Internal Speaker	Allows you to set the internal speaker to: <ul style="list-style-type: none">• Disabled• Enabled
Supervisor Password	Allows you to change supervisor password.
User Password	Allows you to change the user password.

Computer Setup—Power


 **NOTE:** Support for specific Computer Setup options may vary depending on the hardware configuration.

Table 2-3 Computer Setup—Power

Option	Description
After AC Power Failure	Allows you to select system restart behavior after power loss: <ul style="list-style-type: none">• Auto• Power On• Stay Off
NX	Disables/enables NX bit.

Computer Setup—Boot


 **NOTE:** Support for specific Computer Setup options may vary depending on the hardware configuration.

Table 2-4 Computer Setup—Boot

Option	Description
Boot-time Diagnostic Screen	Disables/enables POST diagnostic messages display.
1st Boot Device	Allows you to specify which device groups will boot first, second, third, and fourth or to disable any of the four: <ul style="list-style-type: none">• Floppy Group• Hard Drive Group• CD-ROM Group• Network Boot Group <p>NOTE: MS-DOS drive lettering assignments may not apply after a non-MS-DOS operating system has started.</p>
2nd Boot Device	
3rd Boot Device	
4th Boot Device	
Floppy Group Boot Priority	Specifies boot device priority within removable devices.
CD-ROM Group Boot Priority	Specifies boot device priority within CD/DVD drives.
Hard Drive Group Boot Priority	Specifies boot device priority within hard drives.
Network Group Boot Priority	Specifies boot device priority within bootable network devices.

Computer Setup—Exit


 **NOTE:** Support for specific Computer Setup options may vary depending on the hardware configuration.

Table 2-5 Computer Setup—Exit

Option	Description
Exit Saving Changes	Press Enter to exit saving changes.
Exit Discarding Changes	Press Enter to exit discarding changes.
Load Setup Defaults	Press Enter to load setup defaults.
Discard Changes	Press Enter to discard changes.
Save Changes	Press Enter to save changes.


Recovering the Configuration Settings

To reset all BIOS Setup options to their default values (including options for [ctrl+F10](#)), you must enter F10 Setup mode and press [F5](#).

This does not include updates to **system date**, **system time**, **supervisor password**, **user password**, and **CPU frequency multiplier**.

3 Computer Diagnostic Features

HP Insight Diagnostics


 **NOTE:** HP Insight Diagnostics is included on CD with some computer models only.

The HP Insight Diagnostics utility allows you to view information about the hardware configuration of the computer and perform hardware diagnostic tests on the subsystems of the computer. The utility simplifies the process of effectively identifying, diagnosing, and isolating hardware issues.

The Survey tab is displayed when you invoke HP Insight Diagnostics. This tab shows the current configuration of the computer. From the Survey tab, there is access to several categories of information about the computer. Other tabs provide additional information, including diagnostic test options and test results. The information in each screen of the utility can be saved as an html file and stored on a diskette or USB HP Drive Key.


Use HP Insight Diagnostics to determine if all the devices installed on the computer are recognized by the system and functioning properly. Running tests is optional but recommended after installing or connecting a new device.

You should run tests, save the test results, and print them so that you have printed reports available before placing a call to the Customer Support Center.

 **NOTE:** Third party devices may not be detected by HP Insight Diagnostics.

Accessing HP Insight Diagnostics


To access HP Insight Diagnostics, you must create a Recovery Disc Set then boot to the CD containing the utility. It can also be downloaded from <http://www.hp.com>. See [Downloading the Latest Version of HP Insight Diagnostics on page 13](#) for more information.

 **NOTE:** HP Insight Diagnostics is included as part of the Recovery Disk Set with some computer models only.


If you have already created a Recovery Disc Set, begin the following procedure at step 4.

1. Click **Start > HP Backup and Recovery > HP Backup and Recovery Manager** to open the Backup and Recovery Wizard, then click **Next**.
2. Select **Create a set of recovery discs (Recommended)** and click **Next**.
3. Follow the instructions in the wizard to create a Recovery Disc Set.
4. Use Windows Explorer to search the Recovery Disc Set for the CD with the **compaq\hpdia** directory.
5. While the computer is on, insert the CD into an optical drive on the computer.

6. Shut down the operating system and turn off the computer.
7. Turn on the computer. The system will boot to the CD.

 **NOTE:** If the system does not boot to the CD in the optical drive, you may need to change the boot order in the Computer Setup (F10) utility so that the system attempts to boot to the optical drive before booting to the hard drive. Refer to [Computer Setup \(F10\) Utility on page 3](#) for more information.

8. Select the appropriate language and click **Continue**.

 **NOTE:** It is recommended that you accept the assigned default keyboard for your language unless you want to test your specific keyboard.

9. In the End User License Agreement page, click **Agree** if you agree with the terms. The HP Insight Diagnostics utility launches with the Survey tab displayed.

Survey Tab

The **Survey** tab displays important system configuration information.

In the **View level** field, you can select the **Summary** view to see limited configuration data or select the **Advanced** view to see all the data in the selected category.

In the **Category** field, you can select the following categories of information to display:

All—Gives a listing of all categories of information about the computer.

Overview—Gives you a listing of general information about the computer.

Architecture—Provides system BIOS and PCI device information.

Asset Control—Shows product name, asset tag, system serial number, and processor information.

Communication—Shows information about the computer parallel (LPT) and serial (COM) port settings, plus USB and network controller information.

Graphics—Shows information about the graphics controller of the computer.

Input Devices—Shows information about the keyboard, mouse, and other input devices connected to the computer.

Memory—Shows information about all memory in the computer. This includes memory slots on the system board and any memory modules installed.

Miscellaneous—Shows HP Insight Diagnostics version information, computer configuration memory (CMOS) information, system board data, and system management BIOS data.

Storage—Shows information about storage media connected to the computer. This list includes all fixed disks, diskette drives, and optical drives.

System—Shows information about the computer model, processor, chassis, and BIOS, plus internal speaker and PCI bus information.

Test Tab

The Test tab allows you to choose various parts of the system to test. You can also choose the type of test and testing mode.

There are three types of tests to choose from:

- **Quick Test**—Provides a predetermined script where a sample of each hardware component is exercised and requires no user intervention in either Unattended or Interactive mode.
- **Complete Test**—Provides a predetermined script where each hardware component is fully tested. There are more tests available in the Interactive mode, but these require user intervention.
- **Custom Test**—Provides the most flexibility in controlling the testing of a system. The Custom Test mode allows you to specifically select which devices, tests, and test parameters are run.

For each test type, there are two test modes to choose from:

- **Interactive Mode**—Provides maximum control over the testing process. The diagnostic software will prompt you for input during tests that require your interaction. You may also determine whether the test passed or failed.
- **Unattended Mode**—Does not display prompts and requires no interaction. If errors are found, they are displayed when testing is complete.

To begin testing:

1. Select the Test tab.
2. Select the tab for the type of test you want to run: **Quick**, **Complete**, or **Custom**.
3. Select the **Test Mode: Interactive** or **Unattended**.
4. Choose how you want the test to be executed, either **Number of Loops** or **Total Test Time**. When choosing to run the test over a specified number of loops, enter the number of loops to perform. If you desire to have the diagnostic test for a specified time period, enter the amount of time in minutes.
5. If performing a Quick Test or Complete Test, select the device to be tested from the drop-down list. If performing a Custom Test, Click the **Expand** button and select the devices to be tested or click the **Check All** button to select all devices.
6. Click the **Begin Testing** button at the bottom right corner of the screen to start the test. The Status tab, which allows you to monitor the progress of the test, is automatically displayed during the testing process. When the test is complete, the Status tab shows whether the device passed or failed.
7. If errors are found, go to the Log tab and click the **Error Log** to display more detailed information and recommended actions.

Status Tab

The Status tab displays the status of the selected tests. The type of test executed (**Quick**, **Complete**, or **Custom**) is also displayed. The main progress bar displays the percent complete of the current set of tests. While testing is in progress, a **Cancel Testing** button is displayed for use if you want to cancel the test.

After testing has completed, the **Cancel Testing** button is replaced with a **Retest** button. The **Retest** button will retest the last set of tests executed. This enables you to re-run the set of tests without having to re-enter the data in the Test tab.

The Status tab also shows:

- The devices being tested
- The test status (running, passed, or failed) of each device being tested
- The overall test progress of all devices being tested
- The test progress for each device being tested
- The elapsed test times for each device being tested

Log Tab

The Log tab contains a **Test Log** tab and an **Error Log** tab.

The **Test Log** displays all tests that have been executed, the number of times of execution, the number of times failed, and the time it took to complete each test. The **Clear Test Log** button will clear the contents of the **Test Log**.

The **Error Log** displays the tests for devices that have failed during the diagnostic testing and includes the following columns of information.

- The **Device** section displays the device tested.
- The **Test** section displays the type of test run.
- The **Description** section describes the error that the diagnostic test found.
- The **Recommended Repair** will give a recommended action that should be performed to resolve the failed hardware.
- The **Failed Count** is the number of times the device has failed a test.
- The **Error Code** provides a numerical code for the failure. The error codes are defined in the Help tab.

The **Clear Error Log** button will clear the contents of the Error Log.

Help Tab

On the Help tab contains an **HP Insight Diagnostics** tab, an **Error Codes** tab, and a **Test Components** tab.

The **HP Insight Diagnostics** tab contains help topics and includes search and index features.


The **Error Codes** tab provides a description of each numerical error code that may appear in the **Error Log** tab located on the **Log** tab. Each code has a corresponding error **Message** and a **Recommended Repair** action that should help solve the problem. To find an error code description quickly, enter the code in the box at the top of the tab and click the **Find Error Codes** button.

The **Test Components** tab displays low-level information on tests that are run.


Saving and Printing Information in HP Insight Diagnostics

You can save the information displayed in the HP Insight Diagnostics **Survey** and **Log** tabs to a diskette or a USB 2.0 HP Drive Key (64MB or higher). You can not save to the hard drive. The system will automatically create an html file that has the same appearance as the information displayed on the screen.

1. Insert a diskette or USB 2.0 HP Drive Key (capacity must be 64MB or higher). USB 1.0 Drive Keys are not supported.
2. Click **Save** in the bottom right corner of the screen.
3. Select **Save to the floppy** or **Save to USB key**.
4. Enter a file name in the **File Name** box and click the **Save** button. An html file will be saved to the inserted diskette or USB HP Drive Key.


 **NOTE:** Do not remove the diskette or USB key until you see a message indicating that the html file has been written to the media.

5. Print the information from the storage device used to save it.

 **NOTE:** To exit HP Insight Diagnostics, click Exit Diagnostics button in the bottom left corner of the screen then remove the CD from the optical drive.

Downloading the Latest Version of HP Insight Diagnostics

1. Go to <http://www.hp.com>.
2. Click the **Software & Driver Downloads** link.
3. Enter your product number (for example, dx2400) in the text box and press the **Enter** key.
4. Select your specific computer model.
5. Select your OS.
6. Click the **Diagnostic** link.
7. Click **HP Insight Diagnostics Offline Edition**.
8. Select a language and click **Download**.

 **NOTE:** The download includes instructions on how to create the bootable CD.

Protecting the Software

To protect software from loss or damage, you should keep a backup copy of all system software, applications, and related files stored on the hard drive. See the operating system or backup utility documentation for instructions on making backup copies of data files.

HP Backup and Recovery Manager

The HP Backup and Recovery Manager is an easy-to-use, versatile application that allows you to back up and recover the primary hard drive on the PC. The application works within Windows to create backups of Windows, all applications, and all data files. Backups can be scheduled to occur automatically at designated intervals, or they can be initiated manually. Important files can be archived separately from regular backups.

HP Backup and Recovery Manager is preinstalled on the C: drive and creates a Recovery Partition.


Recovery Points and file backups can be copied to CD or DVD discs, while all backups can be copied to network or secondary hard disks.

HP highly recommends that you create a Recovery Disc Set immediately before using the computer and schedule regular automatic Recovery Point backups.

To create the Recovery Disc Set:

1. Click **Start > HP Backup and Recovery > HP Backup and Recovery Manager** to open the Backup and Recovery Wizard, then click **Next**.
2. Select **Create a set of recovery discs (Recommended)** and click **Next**.
3. Follow the instructions in the wizard.

For more information on using HP Backup and Recovery Manager, refer to the *HP Backup and Recovery Manager User Guide* by selecting **Start > HP Backup and Recovery > HP Backup and Recovery Manager Manual**.

 **NOTE:** You can order a Recovery Disc Set from HP by calling the HP support center. Go to the following Web site, select your region, and click the **Technical support after you buy** link under the **Call HP** heading to obtain the support center telephone number for your region.

http://welcome.hp.com/country/us/en/wwcontact_us.html

4 Serial and Parallel ATA Drive Guidelines and Features

 **NOTE:** Serial ATA = SATA


Parallel ATA = PATA

SATA Hard Drives

Serial ATA Hard Drive Characteristics	
Number of pins/conductors in data cable	7/7
Number of pins in power cable	15
Maximum data cable length	39.37 in (100 cm)
Data interface voltage differential	400-700 mV
Drive voltages	3.3 V, 5 V, 12 V
Jumpers for configuring drive	N/A
Data transfer rate	3.0 Gb/s

SATA connectors on the system board are color coded to make identification easier.

SATA Identification	Color	Port	Attachment Sequence
Primary channel, device 0	Dark blue	SATA 0	1
Primary channel, device 1	Light Blue	SATA 2	4
Secondary channel, device 0	White	SATA 1	2
Secondary channel, device 1	Orange	SATA 3	3

 **NOTE:** If there is an error on the application of the attach rules, a POST error message may be displayed.

SATA Hard Drive Cables

SATA Data Cable

Always use an HP approved SATA 3.0 Gb/s cable as it is fully backwards compatible with the SATA 1.5 Gb/s drives.

Current HP desktop products ship with SATA 3.0 Gb/s hard drives.

SATA data cables are susceptible to damage if overflexed. Never crease a SATA data cable and never bend it tighter than a 30 mm (1.18 in) radius.

The SATA data cable is a thin, 7-pin cable designed to transmit data for only a single drive. As shown in the table, each cable has 3 grounds, and 4 transmit/receive pins.

Pin Number	Usage	Device Plug	Host Plug
P1	Ground	Ground	Ground
P2	A+	Transmit data	Receive data
P3	A-	Transmit data	Receive data
P4	Ground	Ground	Ground
P5	B-	Receive data	Transmit data
P6	B+	Receive data	Transmit data
P7	Ground	Ground	Ground

P2 and P3 differential signal pair
P5 and P6 differential signal pair

SATA Power Cable

Pin	Usage	Notes	Pin	Usage	Notes
P1	V3.3	3.3 V power	P9	V5	5 V power
P2	V3.3	3.3 V power	P10	Ground	
P3	V3.3	3.3 V power	P11	Ground	
P4	Ground		P12	Ground	
P5	Ground		P13	V12	12 V power
P6	Ground		P14	V12	12 V power
P7	V5	5 V power	P15	V12	12 V power
P8	V5	5 V power			

PATA Device Information

The USDT model is the only product that supports a PATA optical drive. No PATA drives are supported on any other model.

ATA SMART Drives

The Self Monitoring Analysis and Recording Technology (SMART) ATA drives for the HP Personal Computers have built-in drive failure prediction that warns the user or network administrator of an impending failure or crash of the hard drive. The SMART drive tracks fault prediction and failure indication parameters such as reallocated sector count, spin retry count, and calibration retry count. If the drive determines that a failure is imminent, it generates a fault alert.

Hard Drive Capacities

The combination of the file system and the operating system used in the computer determines the maximum usable size of a drive partition. A drive partition is the largest segment of a drive that may be properly accessed by the operating system. A single hard drive may therefore be subdivided into a number of unique drive partitions in order to make use of all of its space.

Because of the differences in the way that drive sizes are calculated, the size reported by the operating system may differ from that marked on the hard drive or listed in the computer specification. Drive size calculations by drive manufacturers are bytes to the base 10 while calculations by Microsoft are bytes to the base 2.

Drive/Partition Capacity Limits				
File System	Controller Type	Operating System	Maximum Size	
			Partition	Drive
FAT 32	ATA	Windows 2000/XP/Vista	32 GB	2 TB
NTFS	ATA	Windows 2000/XP/Vista	2 TB	2 TB

5 Identifying the Chassis, Routine Care, and Disassembly Preparation

This chapter provides general service information for the computer. Adherence to the procedures and precautions described in this chapter is essential for proper service.

- △ **CAUTION:** When the computer is plugged into an AC power source, voltage is always applied to the system board. You must disconnect the power cord from the power source before opening the computer to prevent system board or component damage.
-

Chassis Designation

Microtower (MT)



Electrostatic Discharge Information

A sudden discharge of static electricity from your finger or other conductor can destroy static-sensitive devices or microcircuitry. Often the spark is neither felt nor heard, but damage occurs. An electronic device exposed to electrostatic discharge (ESD) may not appear to be affected at all and can work perfectly throughout a normal cycle. The device may function normally for a while, but it has been degraded in the internal layers, reducing its life expectancy.

Networks built into many integrated circuits provide some protection, but in many cases, the discharge contains enough power to alter device parameters or melt silicon junctions.


Generating Static

The following table shows that:

- Different activities generate different amounts of static electricity.
- Static electricity increases as humidity decreases.

Event	Relative Humidity		
	55%	40%	10%
Walking across carpet	7,500 V	15,000 V	35,000 V
Walking across vinyl floor	3,000 V	5,000 V	12,000 V
Motions of bench worker	400 V	800 V	6,000 V
Removing DIPs from plastic tube	400 V	700 V	2,000 V
Removing DIPs from vinyl tray	2,000 V	4,000 V	11,500 V
Removing DIPs from Styrofoam	3,500 V	5,000 V	14,500 V
Removing bubble pack from PCB	7,000 V	20,000 V	26,500 V
Packing PCBs in foam-lined box	5,000 V	11,000 V	21,000 V

These are then multi-packaged inside plastic tubes, trays, or Styrofoam.

 **NOTE:** 700 volts can degrade a product.

Preventing Electrostatic Damage to Equipment

Many electronic components are sensitive to ESD. Circuitry design and structure determine the degree of sensitivity. The following packaging and grounding precautions are necessary to prevent damage to electric components and accessories.

- To avoid hand contact, transport products in static-safe containers such as tubes, bags, or boxes.
- Protect all electrostatic parts and assemblies with conductive or approved containers or packaging.
- Keep electrostatic sensitive parts in their containers until they arrive at static-free stations.
- Place items on a grounded surface before removing them from their container.
- Always be properly grounded when touching a sensitive component or assembly.

- Avoid contact with pins, leads, or circuitry.
- Place reusable electrostatic-sensitive parts from assemblies in protective packaging or conductive foam.

Personal Grounding Methods and Equipment

Use the following equipment to prevent static electricity damage to equipment:

- **Wrist straps** are flexible straps with a maximum of one-megohm \pm 10% resistance in the ground cords. To provide proper ground, a strap must be worn snug against bare skin. The ground cord must be connected and fit snugly into the banana plug connector on the grounding mat or workstation.
- **Heel straps/Toe straps/Boot straps** can be used at standing workstations and are compatible with most types of shoes or boots. On conductive floors or dissipative floor mats, use them on both feet with a maximum of one-megohm \pm 10% resistance between the operator and ground.

Static Shielding Protection Levels	
Method	Voltage
Antistatic plastic	1,500
Carbon-loaded plastic	7,500
Metallized laminate	15,000

Grounding the Work Area

To prevent static damage at the work area, use the following precautions:

- Cover the work surface with approved static-dissipative material. Provide a wrist strap connected to the work surface and properly grounded tools and equipment.
- Use static-dissipative mats, foot straps, or air ionizers to give added protection.
- Handle electrostatic sensitive components, parts, and assemblies by the case or PCB laminate. Handle them only at static-free work areas.
- Turn off power and input signals before inserting and removing connectors or test equipment.
- Use fixtures made of static-safe materials when fixtures must directly contact dissipative surfaces.
- Keep work area free of nonconductive materials such as ordinary plastic assembly aids and Styrofoam.
- Use field service tools, such as cutters, screwdrivers, and vacuums, that are conductive.

Recommended Materials and Equipment

Materials and equipment that are recommended for use in preventing static electricity include:

- Antistatic tape
- Antistatic smocks, aprons, or sleeve protectors
- Conductive bins and other assembly or soldering aids

- Conductive foam
- Conductive tabletop workstations with ground cord of one-megohm +/- 10% resistance
- Static-dissipative table or floor mats with hard tie to ground
- Field service kits
- Static awareness labels
- Wrist straps and footwear straps providing one-megohm +/- 10% resistance
- Material handling packages
- Conductive plastic bags
- Conductive plastic tubes
- Conductive tote boxes
- Opaque shielding bags
- Transparent metallized shielding bags
- Transparent shielding tubes

Operating Guidelines

To prevent overheating and to help prolong the life of the computer:

- Keep the computer away from excessive moisture, direct sunlight, and extremes of heat and cold.
- Operate the computer on a sturdy, level surface. Leave a 10.2-cm (4-inch) clearance on all vented sides of the computer and above the monitor to permit the required airflow.
- Never restrict the airflow into the computer by blocking any vents or air intakes. Do not place the keyboard, with the keyboard feet down, directly against the front of the desktop unit as this also restricts airflow.
- Occasionally clean the air vents on all vented sides of the computer. Lint, dust, and other foreign matter can block the vents and limit the airflow. Be sure to unplug the computer before cleaning the air vents.
- Never operate the computer with the cover or side panel removed.
- Do not stack computers on top of each other or place computers so near each other that they are subject to each other's re-circulated or preheated air.
- If the computer is to be operated within a separate enclosure, intake and exhaust ventilation must be provided on the enclosure, and the same operating guidelines listed above will still apply.
- Keep liquids away from the computer and keyboard.
- Never cover the ventilation slots on the monitor with any type of material.
- Install or enable power management functions of the operating system or other software, including sleep states.

Routine Care

General Cleaning Safety Precautions

1. Never use solvents or flammable solutions to clean the computer.
2. Never immerse any parts in water or cleaning solutions; apply any liquids to a clean cloth and then use the cloth on the component.
3. Always unplug the computer when cleaning with liquids or damp cloths.
4. Always unplug the computer before cleaning the keyboard, mouse, or air vents.
5. Disconnect the keyboard before cleaning it.
6. Wear safety glasses equipped with side shields when cleaning the keyboard.

Cleaning the Computer Case

Follow all safety precautions in [General Cleaning Safety Precautions on page 22](#) before cleaning the computer.

To clean the computer case, follow the procedures described below:

- To remove light stains or dirt, use plain water with a clean, lint-free cloth or swab.
- For stronger stains, use a mild dishwashing liquid diluted with water. Rinse well by wiping it with a cloth or swab dampened with clear water.
- For stubborn stains, use isopropyl (rubbing) alcohol. No rinsing is needed as the alcohol will evaporate quickly and not leave a residue.
- After cleaning, always wipe the unit with a clean, lint-free cloth.
- Occasionally clean the air vents on the computer. Lint and other foreign matter can block the vents and limit the airflow.

Cleaning the Keyboard

Follow all safety precautions in [General Cleaning Safety Precautions on page 22](#) before cleaning the keyboard.

To clean the tops of the keys or the keyboard body, follow the procedures described in [Cleaning the Computer Case on page 22](#).

When cleaning debris from under the keys, review all rules in [General Cleaning Safety Precautions on page 22](#) before following these procedures:

△ **CAUTION:** Use safety glasses equipped with side shields before attempting to clean debris from under the keys.

- Visible debris underneath or between the keys may be removed by vacuuming or shaking.
- Canned, pressurized air may be used to clean debris from under the keys. Caution should be used as too much air pressure can dislodge lubricants applied under the wide keys.

- If you remove a key, use a specially designed key puller to prevent damage to the keys. This tool is available through many electronic supply outlets.
-
- △ **CAUTION:** Never remove a wide leveled key (like the space bar) from the keyboard. If these keys are improperly removed or installed, the keyboard may not function properly.
-
- Cleaning under a key may be done with a swab moistened with isopropyl alcohol and squeezed out. Be careful not to wipe away lubricants necessary for proper key functions. Use tweezers to remove any fibers or dirt in confined areas. Allow the parts to air dry before reassembly.

Cleaning the Monitor

- Wipe the monitor screen with a clean cloth moistened with water or with a towelette designed for cleaning monitors. Do not use sprays or aerosols directly on the screen; the liquid may seep into the housing and damage a component. Never use solvents or flammable liquids on the monitor.
- To clean the monitor body follow the procedures in [Cleaning the Computer Case on page 22](#).

Cleaning the Mouse

Before cleaning the mouse, ensure that the power to the computer is turned off.

- Clean the mouse ball by first removing the retaining plate and the ball from the housing. Pull out any debris from the ball socket and wipe the ball with a clean, dry cloth before reassembly.
- To clean the mouse body, follow the procedures in [Cleaning the Computer Case on page 22](#).

Service Considerations

Listed below are some of the considerations that you should keep in mind during the disassembly and assembly of the computer.

Power Supply Fan

The power supply fan is a variable-speed fan based on the temperature in the power supply.

- △ **CAUTION:** The cooling fan is always on when the computer is in the “On” mode. The cooling fan is off when the computer is in “Standby,” “Suspend,” or “Off” modes.

You must disconnect the power cord from the power source before opening the computer to prevent system board or component damage.

Tools and Software Requirements

To service the computer, you need the following:

- Torx T-15 screwdriver (HP screwdriver with bits, PN 161946-001)
- Torx T-15 screwdriver with small diameter shank (for certain front bezel removal)
- Flat-bladed screwdriver (may sometimes be used in place of the Torx screwdriver)
- Phillips #2 screwdriver

- Diagnostics software
- HP tamper-resistant T-15 wrench (Smart Cover FailSafe Key, PN 166527-001) or HP tamper-resistant bits (Smart Cover FailSafe Key, PN 166527-002)

Screws

The screws used in the computer are not interchangeable. They may have standard or metric threads and may be of different lengths. If an incorrect screw is used during the reassembly process, it can damage the unit. HP strongly recommends that all screws removed during disassembly be kept with the part that was removed, then returned to their proper locations.

△ **CAUTION:** Metric screws have a black finish. U.S. screws have a silver finish and are used on hard drives only.

CAUTION: As each subassembly is removed from the computer, it should be placed away from the work area to prevent damage.

Cables and Connectors

Most cables used throughout the unit are flat, flexible cables. These cables must be handled with care to avoid damage. Apply only the tension required to seat or unseat the cables during insertion or removal from the connector. Handle cables by the connector whenever possible. In all cases, avoid bending or twisting the cables, and ensure that the cables are routed in such a way that they cannot be caught or snagged by parts being removed or replaced.

△ **CAUTION:** When servicing this computer, ensure that cables are placed in their proper location during the reassembly process. Improper cable placement can damage the computer.

Hard Drives

Handle hard drives as delicate, precision components, avoiding all physical shock and vibration. This applies to failed drives as well as replacement spares.

- If a drive must be mailed, place the drive in a bubble-pack mailer or other suitable protective packaging and label the package “Fragile: Handle With Care.”
- Do not remove hard drives from the shipping package for storage. Keep hard drives in their protective packaging until they are actually mounted in the CPU.
- Avoid dropping drives from any height onto any surface.
- If you are inserting or removing a hard drive, turn off the computer. Do not remove a hard drive while the computer is on or in standby mode.
- Before handling a drive, ensure that you are discharged of static electricity. While handling a drive, avoid touching the connector. For more information about preventing electrostatic damage, refer to [Electrostatic Discharge Information on page 19](#)
- Do not use excessive force when inserting a drive.
- Avoid exposing a hard drive to liquids, temperature extremes, or products that have magnetic fields such as monitors or speakers.

Lithium Coin Cell Battery

The battery that comes with the computer provides power to the real-time clock and has a minimum lifetime of about three years.


See the appropriate removal and replacement chapter for the chassis you are working on in this guide for instructions on the replacement procedures.

⚠ **WARNING!** This computer contains a lithium battery. There is a risk of fire and chemical burn if the battery is handled improperly. Do not disassemble, crush, puncture, short external contacts, dispose in water or fire, or expose it to temperatures higher than 140°F (60°C). Do not attempt to recharge the battery.

📄 **NOTE:** Batteries, battery packs, and accumulators should not be disposed of together with the general household waste. In order to forward them to recycling or proper disposal, please use the public collection system or return them to HP, their authorized partners, or their agents.

6 Removal and Replacement Procedures Microtower (MT) Chassis

Adherence to the procedures and precautions described in this chapter is essential for proper service. After completing all necessary removal and replacement procedures, run the Diagnostics utility to verify that all components operate properly.

 **NOTE:** Not all features listed in this guide are available on all computers.

Serial Number Location

Each computer has a unique serial number and product ID number that are located on the top of the computer. Keep these numbers available for use when contacting customer service for assistance.



Preparation for Disassembly


See [Identifying the Chassis, Routine Care, and Disassembly Preparation on page 18](#) for initial safety procedures.

1. Remove/disengage any security devices that prohibit opening the computer ([External Security Devices on page 28](#)).
2. Close any open software applications.
3. Exit the operating system.
4. Remove any diskette, compact disc, or media card from the computer.
5. Turn off the computer and any peripheral devices that are connected to it.

△ **CAUTION:** Turn off the computer before disconnecting any cables.

Regardless of the power-on state, voltage is always present on the system board as long as the system is plugged into an active AC outlet. In some systems the cooling fan is on even when the computer is in the “Standby,” or “Suspend” modes. The power cord should always be disconnected before servicing a unit.

6. Disconnect the power cord from the electrical outlet and then from the computer.
7. Disconnect all peripheral device cables from the computer.
8. Lay the computer down on its side to achieve a safe working position.

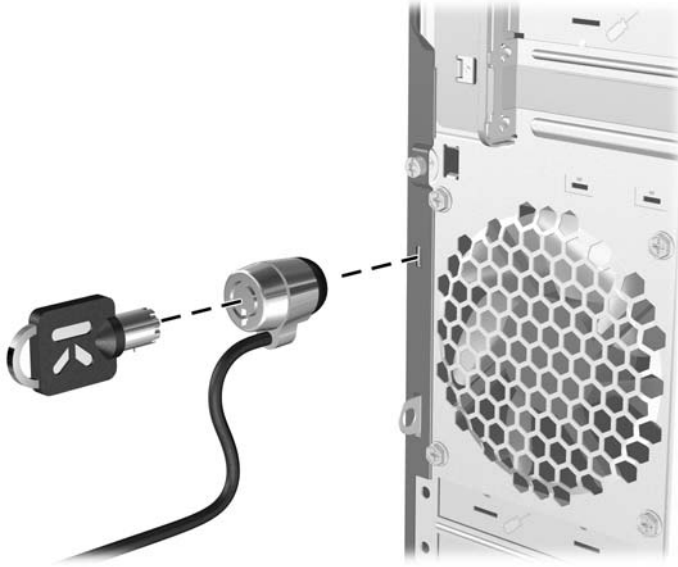
 **NOTE:** During disassembly, label each cable as you remove it, noting its position and routing. Keep all screws with the units removed.

△ **CAUTION:** The screws used in the computer are of different thread sizes and lengths; using the wrong screw in an application may damage the unit.

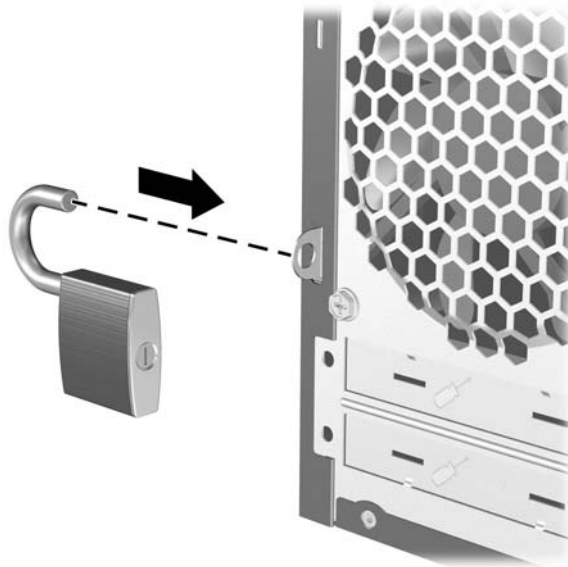
External Security Devices

The following security devices are used to prevent unauthorized access to the internal components of the computer and/or secure the computer to a fixed object.

Cable Lock



Padlock

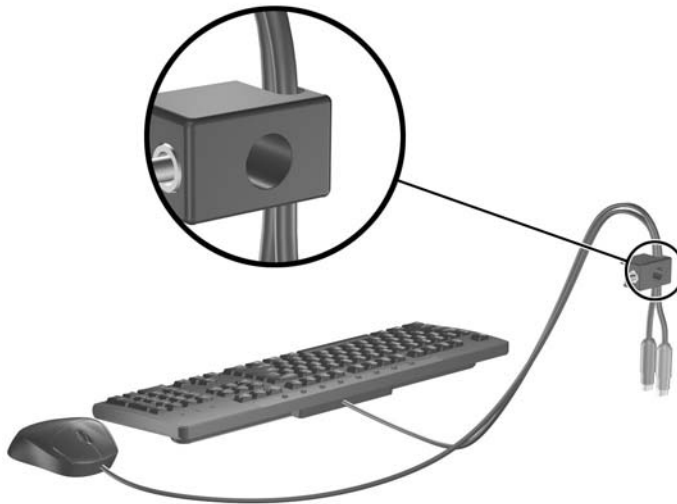


HP Business PC Security Lock

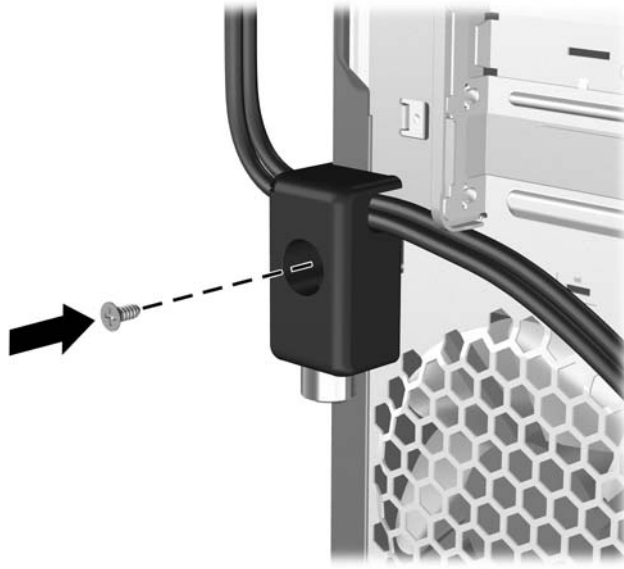
1. Fasten the security cable by looping it around a stationary object.



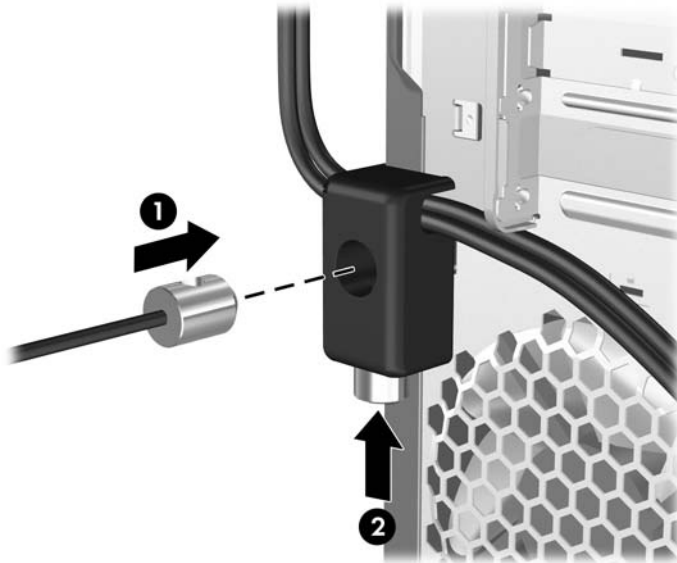
2. Thread the keyboard and mouse cables through the lock.



3. Screw the lock to the chassis using the screw provided.

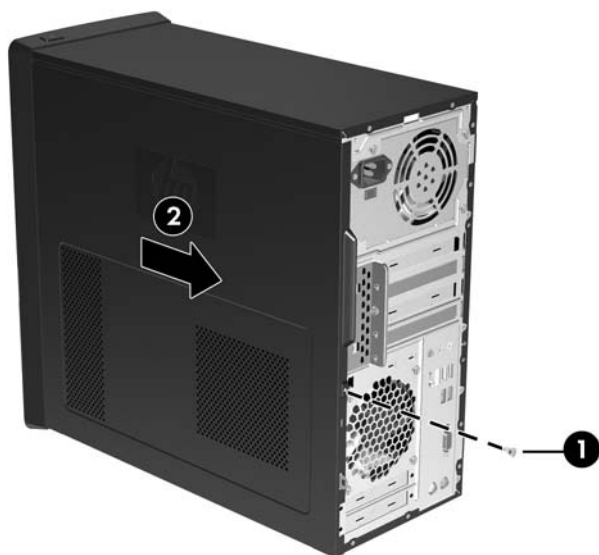


4. Insert the plug end of the security cable into the lock (1) and push the button in (2) to engage the lock. Use the key provided to disengage the lock.



Computer Access Panel

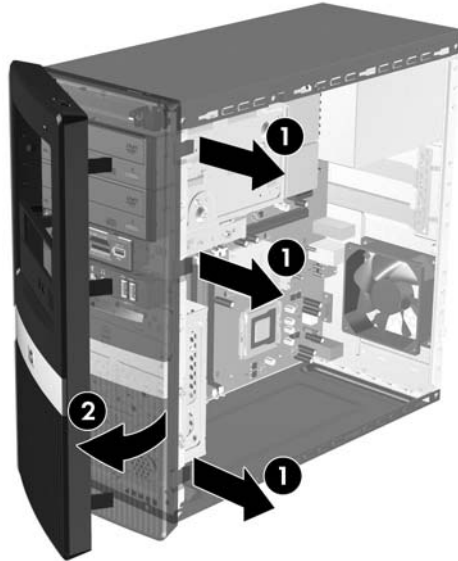
1. Prepare the computer for disassembly ([Preparation for Disassembly on page 27](#)).
△ **CAUTION:** Before removing the computer access panel, ensure that the computer is turned off and that the power cord is disconnected from the electrical outlet.
2. Loosen the screw (1) that secures the access panel to the computer chassis.
3. Slide the access panel back (2) about 1.3 cm (1/2 inch), then lift it off the unit.



To install the access panel, reverse the removal procedure.

Front Bezel

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 27](#)).
2. Remove the computer access panel ([Computer Access Panel on page 31](#)).
3. Press outward on the three latches on the right side of the bezel (1), then rotate the right side of the bezel off the chassis (2) followed by the left side.



To reinstall the front bezel, reverse the removal procedure.

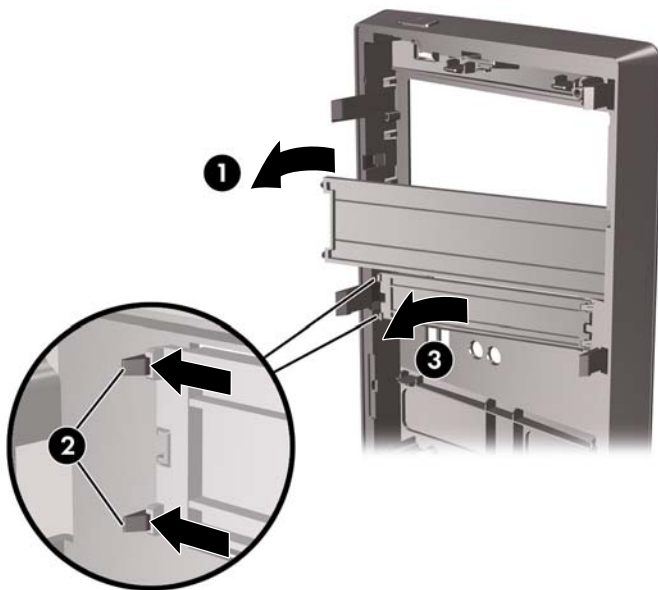
Removing Bezel Blanks

On some models, there are bezel blanks covering the 3.5-inch and 5.25-inch external drive bays that need to be removed before installing a drive. To remove a bezel blank:

1. Remove the front bezel.
2. To remove a 5.25-inch blank, break the blank out of the bezel **(1)**.

– or –

To remove a 3.5-inch blank, press the two tabs on the left side of the blank **(2)** toward the right, and then pull the blank inward to remove it **(3)**.



3. Replace the front bezel.

Cable Management

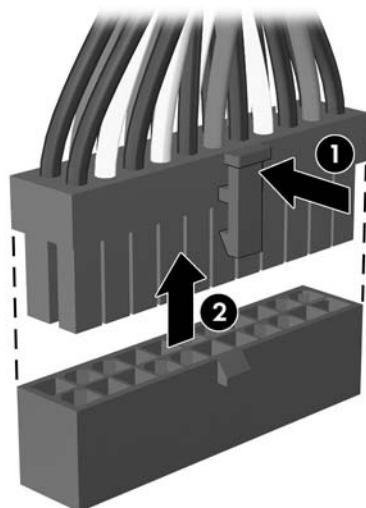
Always follow good cable management practices when working inside the computer.

- Keep cables away from major heat sources like the heatsink.
- Do not jam cables on top of expansion cards or memory modules. Printed circuit cards like these are not designed to take excessive pressure on them.
- Keep cables clear of sliding or moveable parts to prevent them from being cut or crimped when the parts are moved.
- When folding a flat ribbon cable, never fold to a sharp crease. Sharp creases may damage the wires.
- Some flat ribbon cables come pre-folded. Never change the folds on these cables.
- Do not bend any cable sharply. A sharp bend can break the internal wires.
- Never bend a SATA data cable tighter than a 30 mm (1.18 in) radius.
- Never crease a SATA data cable.
- Do not rely on components like the drive cage, power supply, or computer cover to push cables down into the chassis. Always position the cables to lay properly by themselves.

When removing the power supply power cables from the P1 or P3 connectors on the system board, always follow these steps:

1. Squeeze on the top of the retaining latch attached to the cable end of the connector **(1)**.
2. Grasp the cable end of the connector and pull it straight up **(2)**.

△ **CAUTION:** Always pull the connector - NEVER pull on the cable. Pulling on the cable could damage the cable and result in a failed power supply.



Cable Connections

System board connectors are color-coded to make it easier to find the proper connection.

System Board Connections

System Board Connector Name	Connector Color	Description
ATXPOWER	white	Power supply, 24-pin
ATX_CPU	white	Power supply, 4-pin
FLOPPY	black	Diskette drive
CPU_FAN	white	Heatsink fan
CHASSIS_FAN	red	Chassis fan
F_PANEL	black	Front power button/LED
F_USB1	white	Front I/O USB
F_USB2	black	Media card reader
F_AUDIO	yellow	Front I/O audio
SPEAKER	white	Internal speaker
XMM1	black	Memory slots
XMM2	black	
XMM3	blue	
XMM4	blue	
PCI 1	white	PCI 2.3 full-height slot
PCIE_X1_1	black	PCI Express X1 slot
PCIE_X1_2	black	PCI Express X1 slot
PCIE X16	black	PCI Express X16 slot
PROCESSOR	silver	Processor
CMOS+PW	black with blue cap	Clear CMOS/password header
SATA0	dark blue	SATA drives
SATA1	white	
SATA2	light blue	
SATA3	orange	
BATTERY	black	RTC battery

Memory

The computer comes with double data rate 2 synchronous dynamic random access memory (DDR2-SDRAM) dual inline memory modules (DIMMs).

The memory sockets on the system board can be populated with up to four industry-standard DIMMs. These memory sockets are populated with at least one preinstalled DIMM. To achieve the maximum memory support, you can populate the system board with up to 4 GB of memory configured in a high-performing dual channel mode.

For proper system operation, the DDR2-SDRAM DIMMs must be:

- industry-standard 240-pin
- unbuffered, PC2-5300 667 MHz-compliant or PC2-6400 800 MHz-compliant
- 1.8 volt DDR2-SDRAM DIMMs

The DDR2-SDRAM DIMMs must also:

- support CAS latency 5 DDR2 667 Mhz (5-5-5 timing), CAS latency 5 DDR2 800 Mhz (5-5-5 timing), and CAS latency 6 DDR2 800 Mhz (6-6-6 timing)
- contain the mandatory JEDEC SPD information

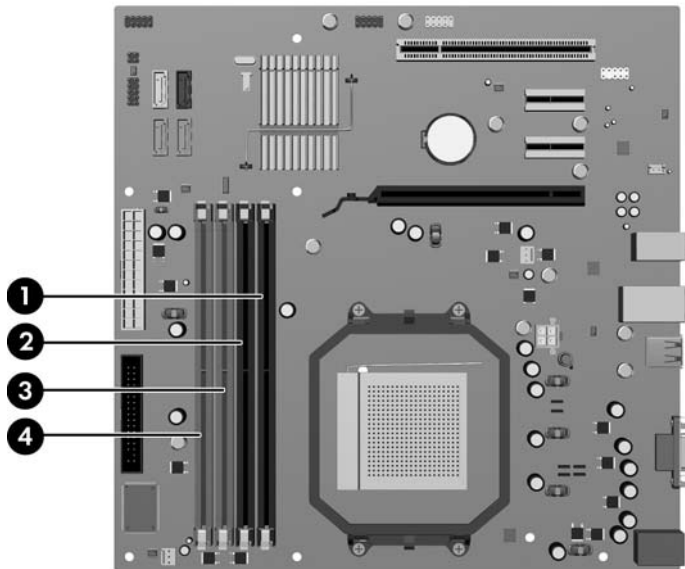
In addition, the computer supports:

- 512Mbit and 1Gbit non-ECC memory technologies
- single-sided and double-sided DIMMs
- DIMMs constructed with x8 and x16 DDR devices; DIMMs constructed with x4 SDRAM are not supported



NOTE: The system will not operate properly if you install unsupported DIMMs.

There are four DIMM sockets on the system board, with two sockets per channel. The sockets are labeled XMM1, XMM2, XMM3, and XMM4. Sockets XMM1 and XMM2 operate in memory channel A. Sockets XMM3 and XMM4 operate in memory channel B.



Item	Description	Socket Color
1	DIMM socket XMM1, Channel A (populate first)	Black
2	DIMM socket XMM2, Channel B (populate second)	Black
3	DIMM socket XMM3, Channel A	Blue
4	DIMM socket XMM4, Channel B	Blue

The system will automatically operate in single channel mode or dual channel mode, depending on how the DIMMs are installed.

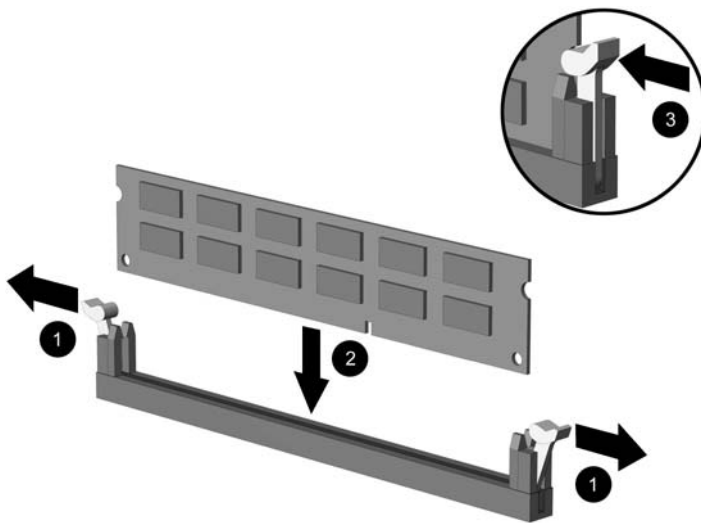
- The system will operate in a higher-performing dual channel mode if like-sized DIMMs of equal capacity are populated in one or both pairs of sockets. For example, if the Channel A XMM1 socket and Channel B XMM2 socket (the two black sockets) both have 1024MB DIMMs installed, the system will operate in dual channel mode. If this system had two additional DIMMs added into the blue sockets, they could be a pair of 512MB or 1024MB DIMMs and the system would still operate in dual channel mode. For purposes of “like sizes,” a single-sided 512MB DIMM and a double-sided 512MB DIMM would not be the same size because they have different numbers of memory chips on them.
- The system will operate in single channel mode if the DIMMs are populated in any other supported configuration. Supported configurations consist of any combination of one, two, three, or four DIMMs as long as socket XMM1 is populated before socket XMM3 in Channel A, and socket XMM2 is populated before socket XMM4 in Channel B.
- If a single DIMM is installed, it must be installed in the XMM1 socket.
- In either mode, the maximum operational speed is determined by the slowest DIMM in the system.


- △ **CAUTION:** The memory module sockets have gold metal contacts. When upgrading the memory, it is important to use memory modules with gold metal contacts to prevent corrosion and/or oxidation resulting from having incompatible metals in contact with each other.

Static electricity can damage the electronic components of the computer or optional cards. Before beginning these procedures, ensure that you are discharged of static electricity by briefly touching a grounded metal object. Refer to [Electrostatic Discharge Information on page 19](#) for more information.

When handling a memory module, be careful not to touch any of the contacts. Doing so may damage the module.


1. Prepare the computer for disassembly ([Preparation for Disassembly on page 27](#)).
2. Remove the computer access panel ([Computer Access Panel on page 31](#)).
3. Open both latches of the memory module socket (1), and insert the memory module into the socket (2).



 **NOTE:** A memory module can be installed in only one way. Match the notch on the module with the tab on the memory socket. A DIMM must occupy the black XMM1 socket.

NOTE: For maximum performance, populate the sockets so that the memory capacity is spread as equally as possible between Channel A and Channel B.

4. Push the DIMM module down firmly into the socket, ensuring that the module is fully inserted and properly seated. The DIMM must be pushed all the way down into the socket and sit evenly in the socket to avoid memory corruption. Make sure the latches are in the closed position (3).
5. Repeat steps 3 and 4 for any additional modules that you want to install.

 **NOTE:** The computer automatically recognizes the additional memory when turned on.

To reassemble the computer, reverse the removal procedure.

Expansion Cards

The computer has one standard PCI expansion slot that can accommodate an expansion card up to 17.46 cm (6.875 inches) in length. The computer also has two PCI Express x1 expansion slots and one PCI Express x16 expansion slot.

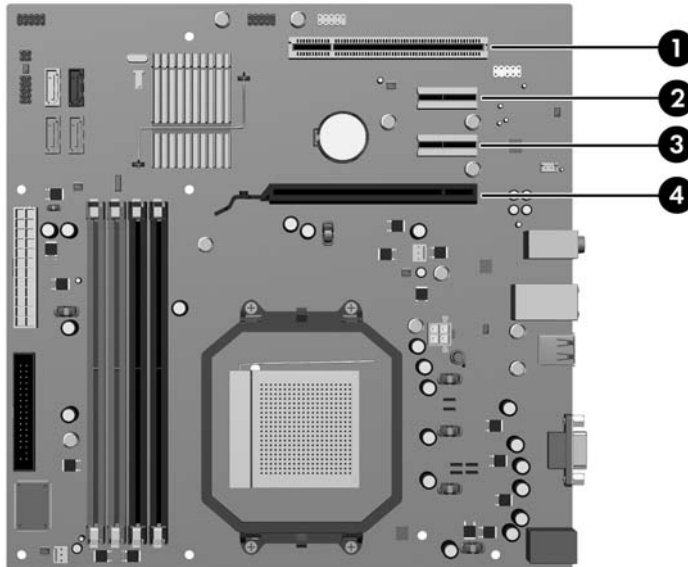


Table 6-1 Expansion Slot Locations

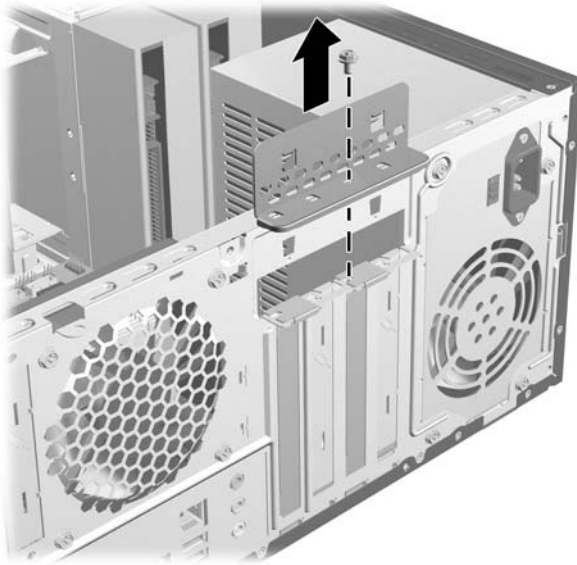
Item	Description
1	PCI expansion slot
2	PCI Express x1 expansion slot
3	PCI Express x1 expansion slot
4	PCI Express x16 expansion slot

NOTE: You can install a PCI Express x1, x4, x8, or x16 expansion card in the PCI Express x16 expansion slot.


To remove, replace, or add an expansion card:

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 27](#)).
2. Remove the computer access panel ([Computer Access Panel on page 31](#)).
3. Locate the correct vacant expansion socket on the system board and the corresponding expansion slot on the back of the computer chassis.

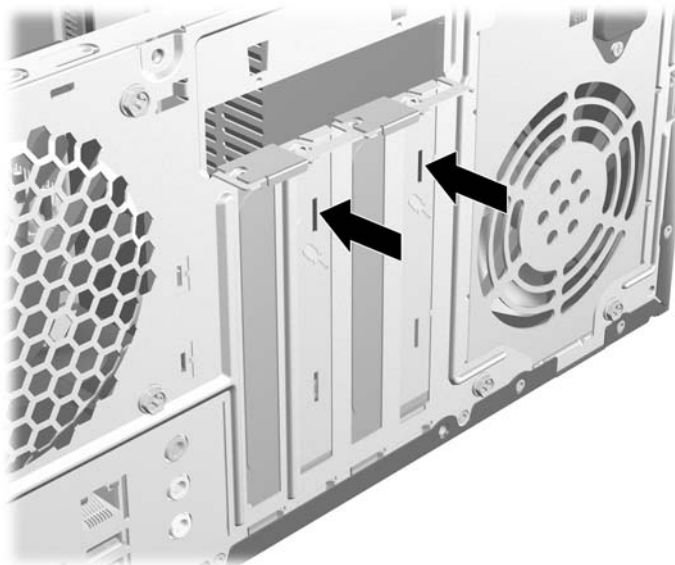
4. On the rear of the computer, a slot cover lock secures the expansion card brackets in place. Remove the screw from the slot cover lock then slide the slot cover lock up to remove it from the chassis.



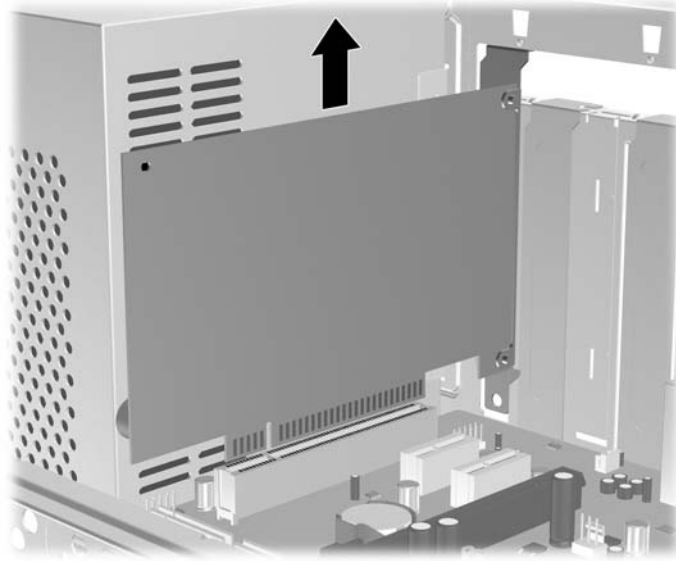
5. Before installing an expansion card, remove the expansion slot cover or the existing expansion card.

 **NOTE:** Before removing an installed expansion card, disconnect any cables that may be attached to the expansion card.

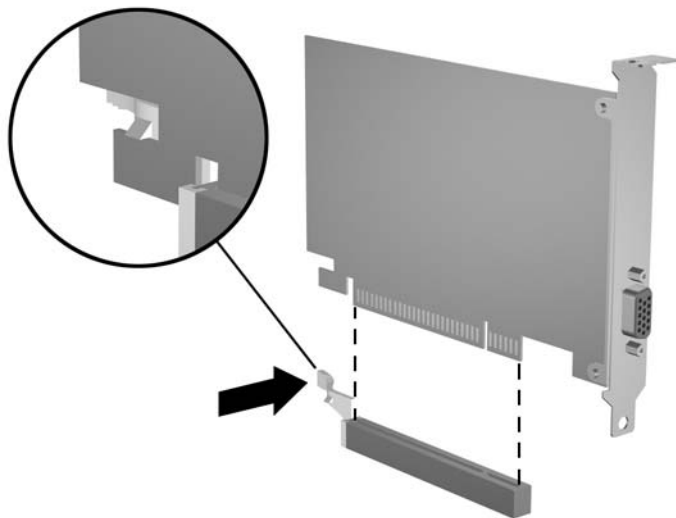
- a. If you are installing an expansion card in a vacant socket, you must use a flatblade screwdriver to pry out the metal shield on the rear panel that covers the expansion slot. Be sure to remove the appropriate shield for the expansion card you are installing.



- b. If you are removing a standard PCI card, hold the card at each end and carefully rock it back and forth until the connectors pull free from the socket. Be sure not to scrape the card against the other components.



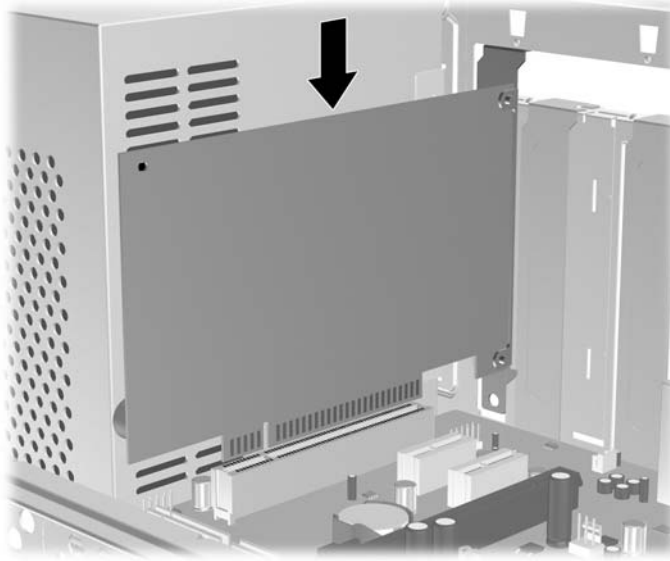
- c. If you are removing a PCI Express x16 card, pull the retention arm on the back of the expansion socket away from the card and carefully rock the card back and forth until the connectors pull free from the socket. Be sure not to scrape the card against the other components.




6. Store the removed card in anti-static packaging.
7. If you are not installing a new expansion card, install an expansion slot cover to close the open slot.

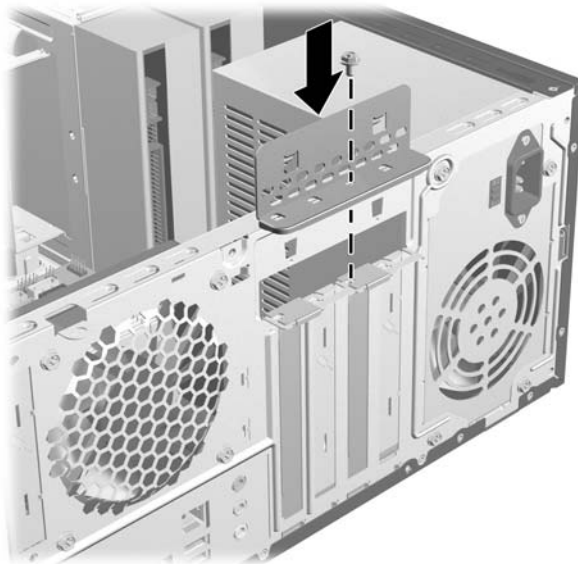
△ **CAUTION:** After removing an expansion card, you must replace it with a new card or expansion slot cover for proper cooling of internal components during operation.

8. To install a new expansion card, hold the card just above the expansion socket on the system board then move the card toward the rear of the chassis so that the bottom of the bracket on the card slides into the small slot on the chassis. Press the card straight down into the expansion socket on the system board.



 **NOTE:** When installing an expansion card, press firmly on the card so that the whole connector seats properly in the expansion card slot.

9. Replace the slot cover lock and secure it in place with the screw that was previously removed.

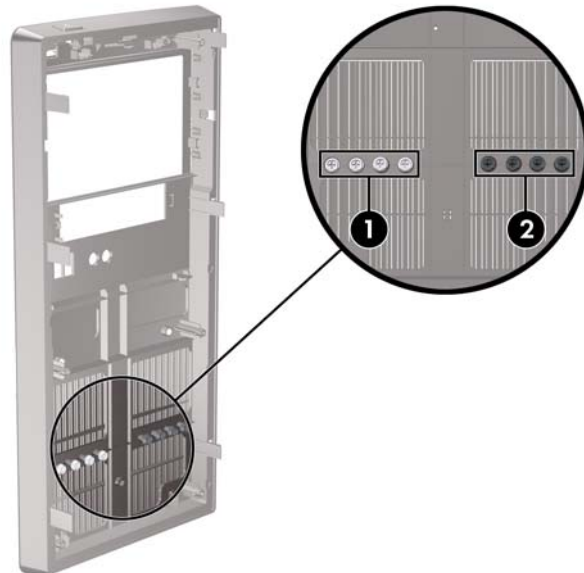


10. Connect external cables to the installed card, if needed. Connect internal cables to the system board, if needed.
11. Reconfigure the computer, if necessary. Refer to the *Computer Setup (F10) Utility Guide* for instructions on using Computer Setup.

Drives

When installing additional drives, follow these guidelines:

- The primary Serial ATA (SATA) hard drive must be connected to the dark blue primary SATA connector on the system board labeled SATA0.
- Connect the first SATA optical drive to the white SATA connector on the system board labeled SATA1.
- Always populate the dark blue SATA0 and white SATA1 connectors before the light blue SATA2 and orange SATA3 connectors.
- Connect a second SATA optical drive to the orange SATA3 connector.
- Connect additional SATA hard drives to the next available (unpopulated) SATA connector on the system board in the following order: SATA0, SATA1, SATA3, SATA2.
- Connect a diskette drive to the connector labeled FLOPPY.
- Connect a media card reader to the USB connector labeled F_USB2.
- The system does not support Parallel ATA (PATA) optical drives or PATA hard drives.
- You may install either a third-height or a half-height drive into a half-height bay.
- If needed, HP has provided extra drive retainer screws on the interior of the front bezel that are used to secure the drives in the drive cage. Hard drives use 6-32 standard screws. All other drives use M3 metric screws. The HP-supplied 6-32 standard screws **(1)** are silver. The HP-supplied M3 metric guide screws **(2)** are black.



△ **CAUTION:** To prevent loss of work and damage to the computer or drive:

If you are inserting or removing a drive, shut down the operating system properly, turn off the computer, and unplug the power cord. Do not remove a drive while the computer is on or in standby mode.

Before handling a drive, ensure that you are discharged of static electricity. While handling a drive, avoid touching the connector.

Handle a drive carefully; do not drop it.

Do not use excessive force when inserting a drive.

Avoid exposing a hard drive to liquids, temperature extremes, or products that have magnetic fields such as monitors or speakers.

If a drive must be mailed, place the drive in a bubble-pack mailer or other protective packaging and label the package "Fragile: Handle With Care."

System Board Drive Connections

Refer to the following illustration and table to identify the system board drive connectors.

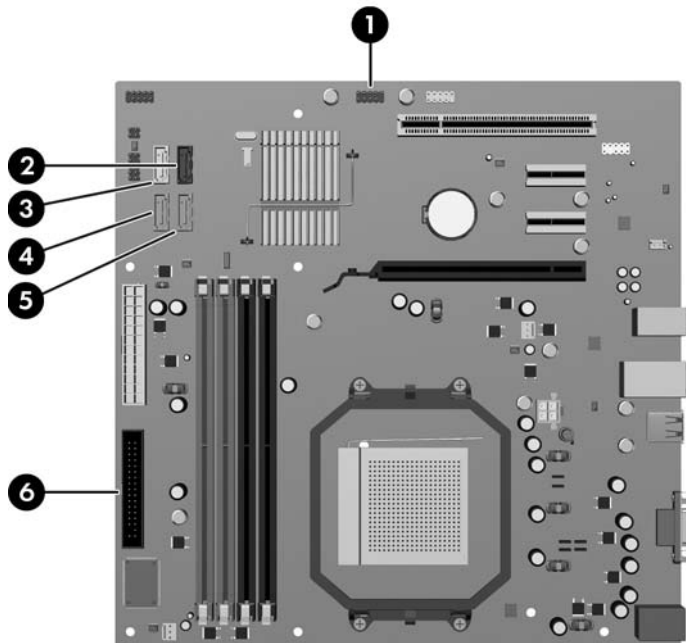


Table 6-2 System Board Drive Connections

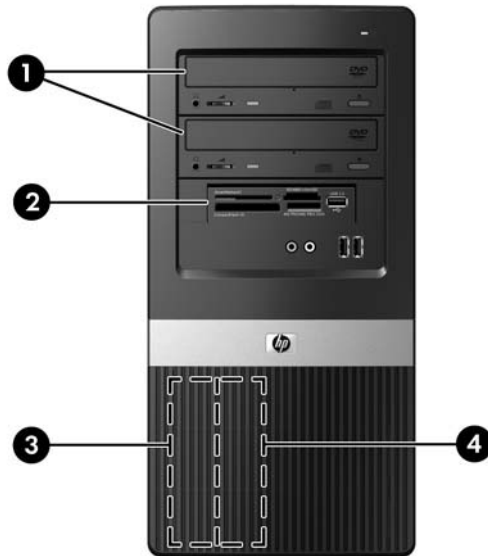
No.	System Board Connector	System Board Label	Color
1	Media Card Reader	F_USB2	black
2	SATA0	SATA0	dark blue
3	SATA1	SATA1	white
4	SATA2	SATA2	light blue

Table 6-2 System Board Drive Connections (continued)

No.	System Board Connector	System Board Label	Color
5	SATA3	SATA3	orange
6	Diskette Drive	FLOPPY	black

To verify the type, size, and capacity of the storage devices installed in the computer, run Computer Setup. Refer to [Computer Setup \(F10\) Utility on page 3](#) for more information.

Drive Positions



- | | |
|---|--|
| 1 | Two 5.25-inch external drive bays for optional drives (optical drives shown) |
| 2 | One 3.5-inch external drive bay for optional drive (media card reader shown) |
| 3 | Primary 3.5-inch internal hard drive bay |
| 4 | Secondary 3.5-inch internal hard drive bay for optional hard drive |

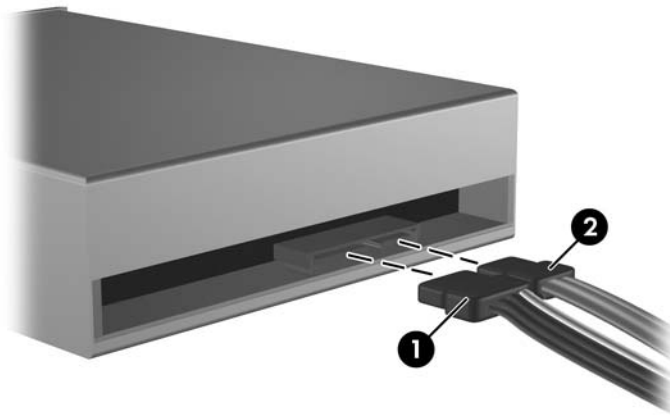
To verify the type and size of the storage devices installed in the computer, run Computer Setup. Refer to [Computer Setup \(F10\) Utility on page 3](#) for more information.

Removing an Optical Drive

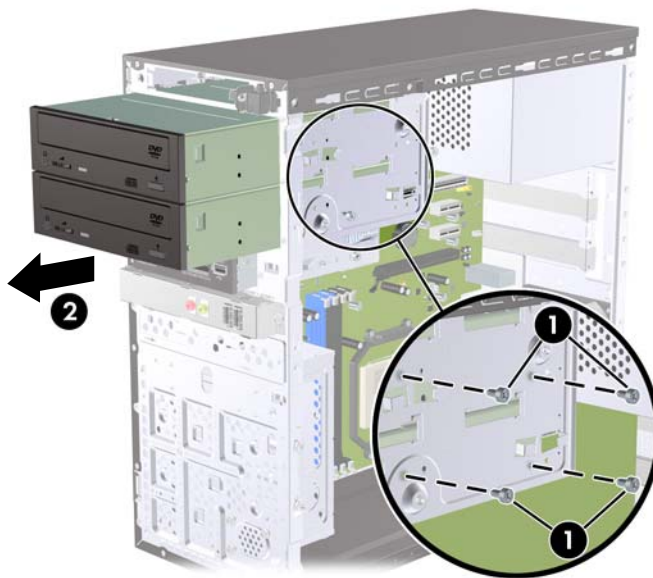
△ **CAUTION:** All removable media should be taken out of a drive before removing the drive from the computer.

To remove an optical drive:

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 27](#)).
2. Remove the computer access panel ([Computer Access Panel on page 31](#)).
3. Remove the front bezel ([Front Bezel on page 32](#)).
4. Disconnect the power cable (1) and data cable (2) from the rear of the optical drive.




5. Remove the screws that secure the drive to the drive cage (1), then slide the drive out of the front of the chassis (2).

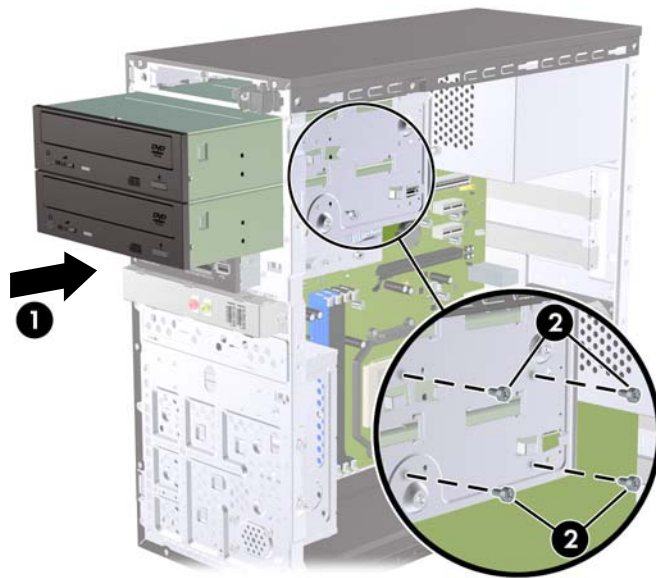


Installing an Optical Drive into the 5.25-inch Drive Bay

To install an optional 5.25-inch optical drive:

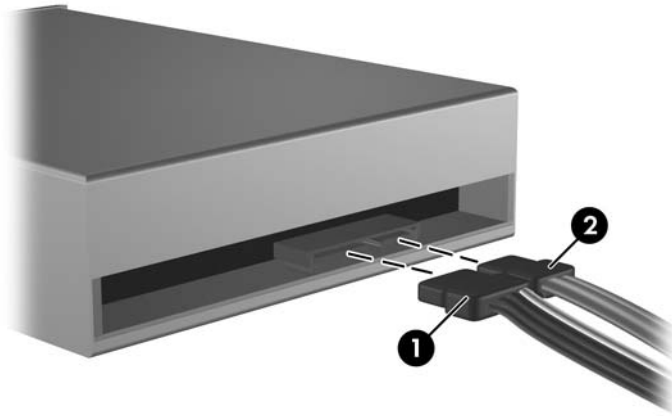
1. Prepare the computer for disassembly ([Preparation for Disassembly on page 27](#)).
2. Remove the computer access panel ([Computer Access Panel on page 31](#)).
3. Remove the front bezel ([Front Bezel on page 32](#)).
4. If you are installing a drive in a bay covered by a bezel blank, remove the front bezel then remove the bezel blank. See [Removing Bezel Blanks on page 33](#) for more information.
5. If you are adding a drive to an empty lower optical drive bay, you must remove the knockout plate from the bay. To do so, insert a flat screwdriver into the knockout plate slot and rotate the screwdriver to break the knockout plate out of the chassis. Discard the knockout plate.
6. If the new drive has screws installed on the sides of the drive, remove the screws before inserting the drive into the chassis.
7. Slide the drive in through the front of the chassis **(1)** until the bezel on the drive is evenly aligned with the computer front bezel and install the M3 metric retainer screws **(2)** as shown in the illustration below.

 **NOTE:** Extra drive retainer screws are provided on the interior of the front bezel if needed. The M3 metric retainer screws for optical drives are black.



8. If the system configuration includes only one optical drive, connect the SATA data cable to the white system board connector labeled SATA1 . If you are adding a second optical drive, connect the SATA data cable to the orange system board connector labeled SATA3.

9. Connect the power cable (1) and data cable (2) to the rear of the optical drive.



10. Replace the front bezel and access panel.
 11. Lock any security devices that were disengaged when the access panel was removed.
- The system automatically recognizes the drive and reconfigures the computer.

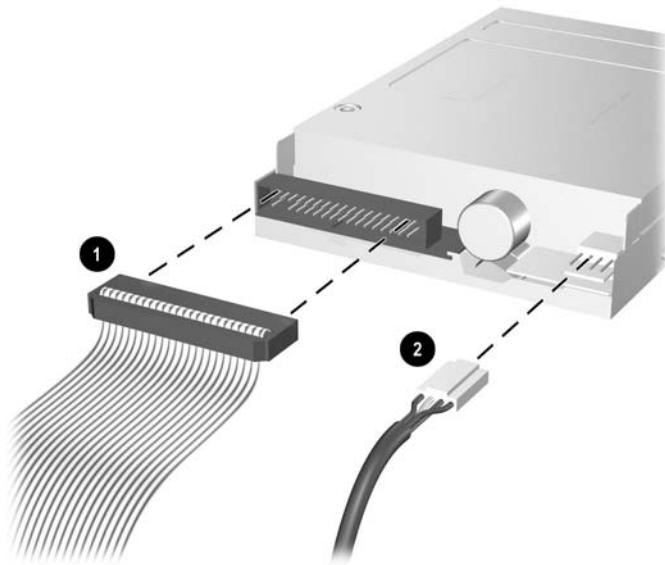
Removing an External 3.5-inch Drive

△ **CAUTION:** All removable media should be taken out of a drive before removing the drive from the computer.

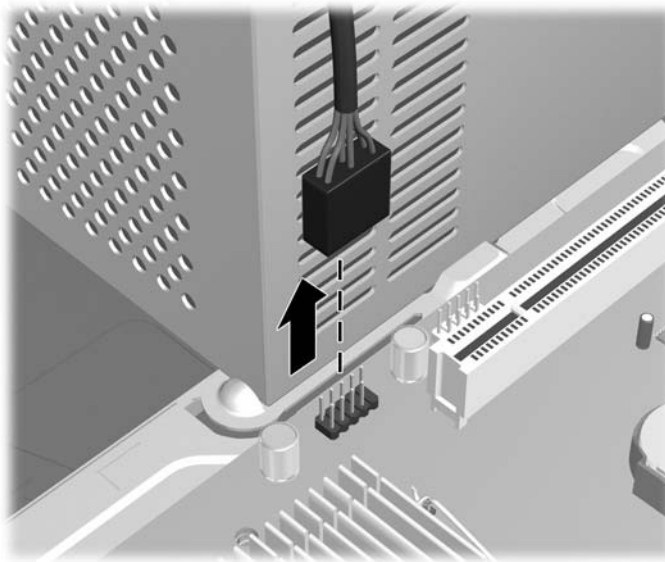
📝 **NOTE:** The 3.5-inch drive bay may contain a diskette drive or a media card reader.

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 27](#)).
2. Remove the computer access panel ([Computer Access Panel on page 31](#)).
3. Remove the front bezel ([Front Bezel on page 32](#)).

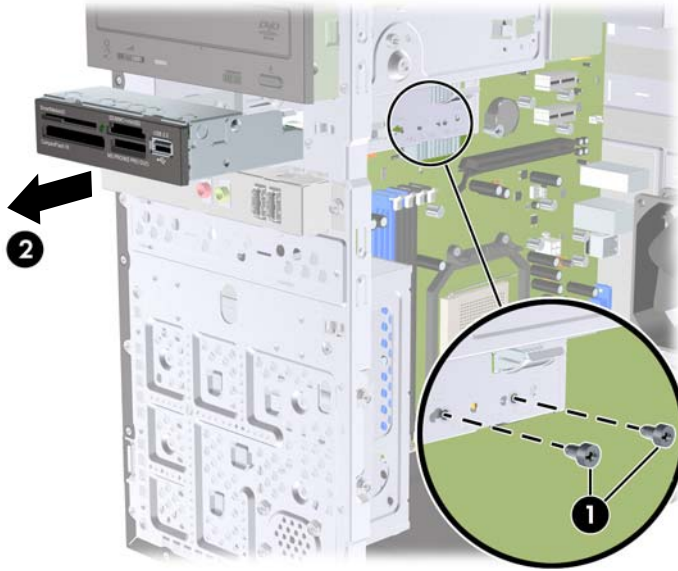
4. Disconnect the drive cables, as indicated in the following illustrations:
- If you are removing a diskette drive, disconnect the data cable (1) and power cable (2) from the back of the drive.



- If you are removing a media card reader, disconnect the USB cable from the system board.



5. Remove the retainer screws that secure the drive to the bay (1) then slide the drive forward and out of the bay (2).




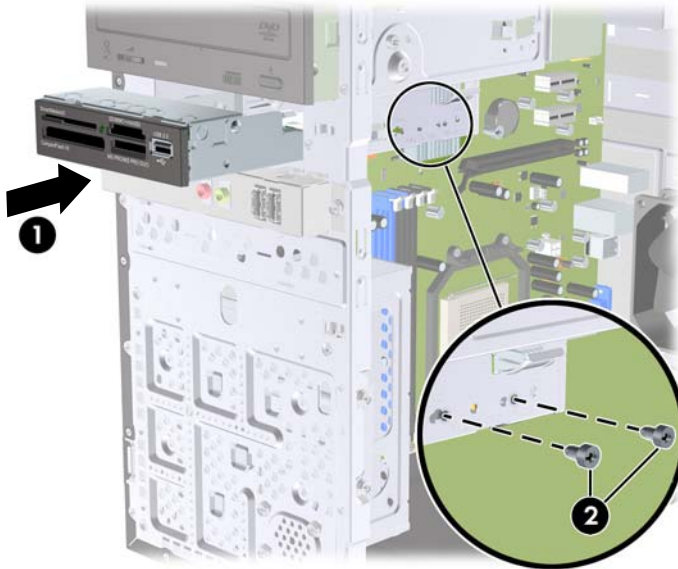
Installing a Drive into the 3.5-inch External Drive Bay

The 3.5-inch external drive bay on the front of the computer can be configured with a media card reader or a diskette drive.

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 27](#)).
2. Remove the computer access panel ([Computer Access Panel on page 31](#)).
3. Remove the front bezel ([Front Bezel on page 32](#)).
4. If you are installing a diskette drive or media card reader in a bay covered by a bezel blank, remove the front bezel then remove the bezel blank. See [Removing Bezel Blanks on page 33](#) for more information.
5. If you are adding a drive to an empty drive bay for the first time, you must remove the knockout plate from the bay. To do so, insert a flat screwdriver into the knockout plate slot and rotate the screwdriver to break the knockout plate out of the chassis. Discard the knockout plate.
6. If the new drive has screws installed on the sides of the drive, remove them before inserting the drive into the chassis.

7. Slide the drive in through the front of the chassis (1) until the bezel on the drive is evenly aligned with the computer front bezel and install the M3 metric retainer screws (2) as shown in the illustration below.

 **NOTE:** Extra drive retainer screws are provided on the interior of the front bezel if needed. The M3 metric retainer screws for diskette drives or media card readers are black.




8. Connect the appropriate drive cables:
 - a. If installing a diskette drive, connect the power and data cables to the rear of the drive and connect the other end of the data cable to the connector on the system board labeled FLOPPY.
 - b. If installing a media card reader, connect the USB cable from the media card reader to the USB connector on the system board labeled F_USB2.

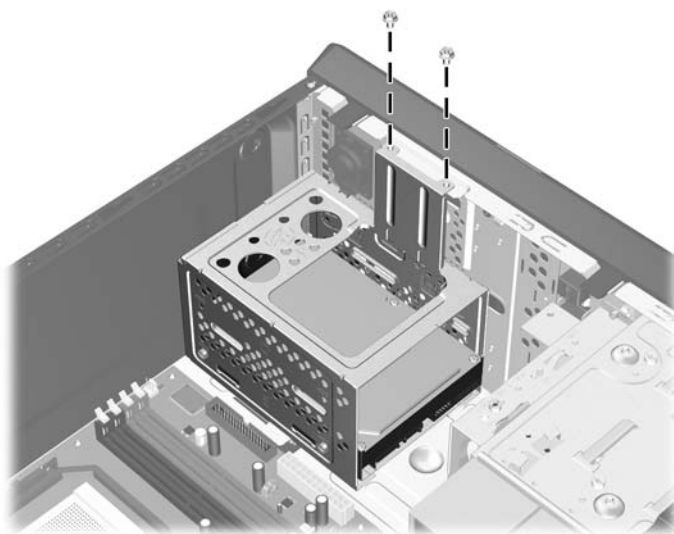
 **NOTE:** Refer to [System Board Drive Connections on page 44](#) for an illustration of the system board drive connectors.

9. Replace the front bezel and access panel.
10. Lock any security devices that were disengaged when the access panel was removed.

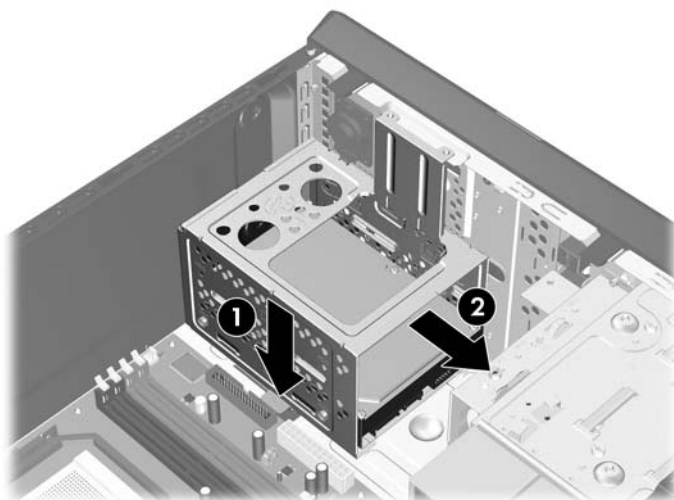
Removing an Internal 3.5-inch Hard Drive

 **NOTE:** Before you remove the old hard drive, be sure to back up the data from the old hard drive so that you can transfer the data to the new hard drive. Also, if you are replacing the primary hard drive, make sure you have created a Recovery Disc Set to restore the operating system, software drivers, and any software applications that were preinstalled on the computer. If you do not have this CD set, select **Start > HP Backup and Recovery** and create it now.

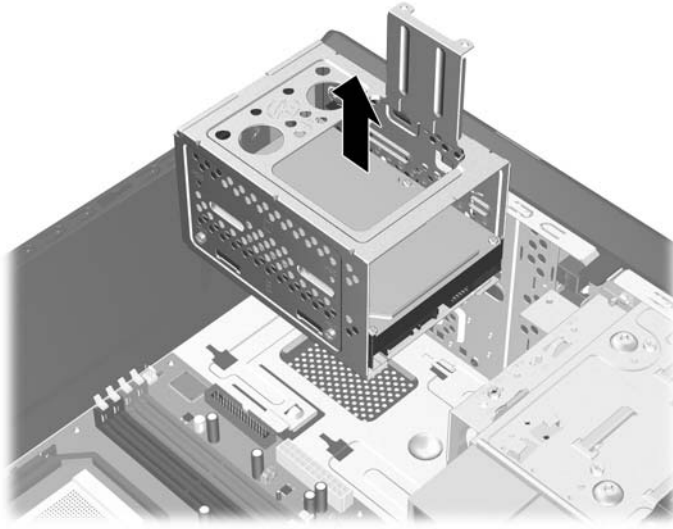
1. Prepare the computer for disassembly ([Preparation for Disassembly on page 27](#)).
2. Remove the computer access panel ([Computer Access Panel on page 31](#)).
3. Remove the two screws that secure the hard disk drive cage to the chassis.



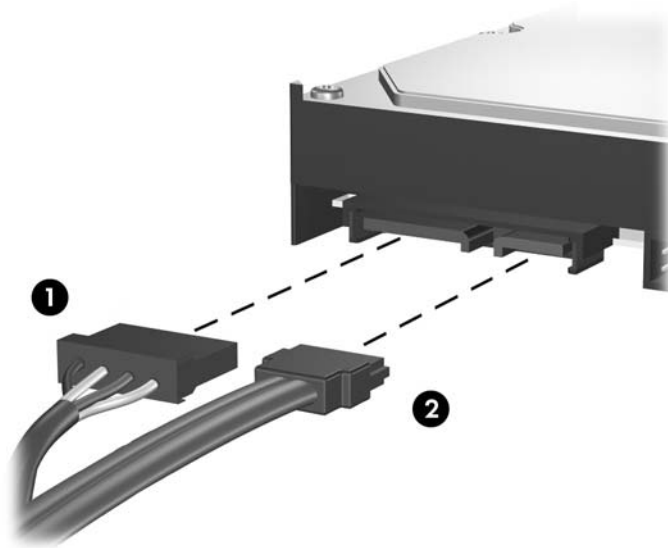
4. Push down the latch on the side of the hard disk drive cage (**1**), then slide the hard disk drive cage away from the bottom of the chassis (**2**) as shown below.



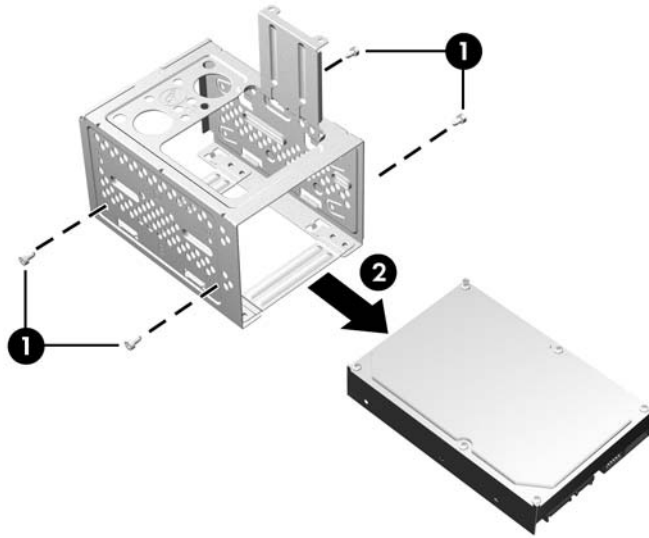
5. Lift the hard disk drive cage out of the chassis.



6. Disconnect the power cable (1) and data cable (2) from the back of the hard drive.




7. Remove the four screws that secure the hard disk drive to the hard disk drive cage (1), then slide the hard disk drive out of the hard disk drive cage (2).



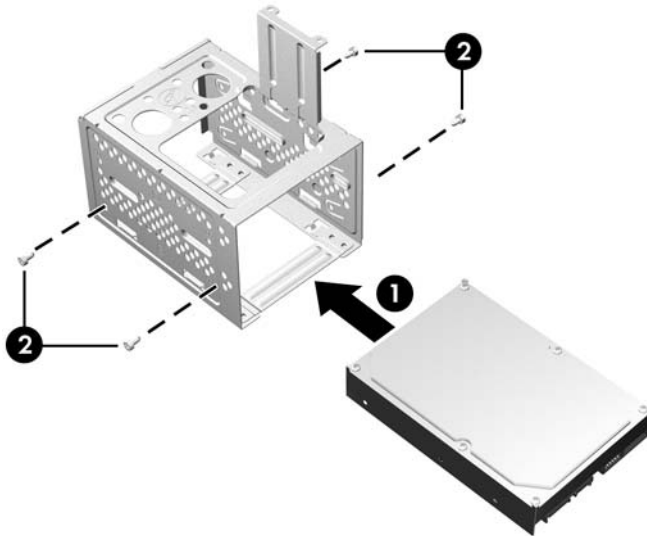
Installing an Internal 3.5-inch Hard Drive

1. Follow the steps in [Removing an Internal 3.5-inch Hard Drive on page 52](#) to remove the hard drive cage and, if necessary, the existing hard drive.

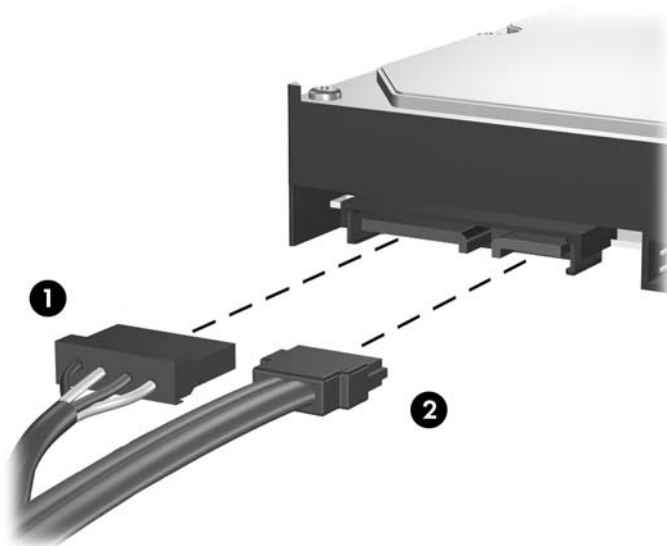
- Slide the new drive into the hard disk drive cage (1), aligning the drive with the four screw holes on the cage. Install the four 6-32 standard screws that secure the hard disk drive to the hard disk drive cage (2). Make sure the hard disk drive cables are facing the top of the drive cage.


 **NOTE:** If you are replacing an old drive with a new drive, use the four retainer screws from the old drive to install the new drive.

NOTE: If you are installing a second hard drive, use four of the extra standard 6-32 screws that are installed on the interior of the front bezel. The 6-32 screws are silver.

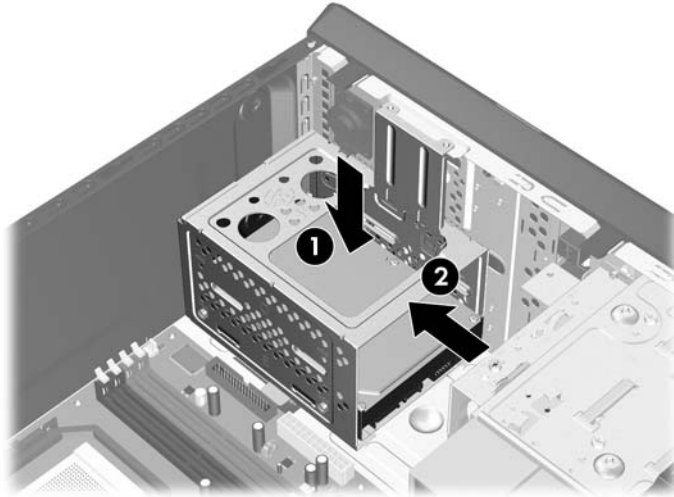


- Connect the power cable (1) and data cable (2) to the back of the hard drive.

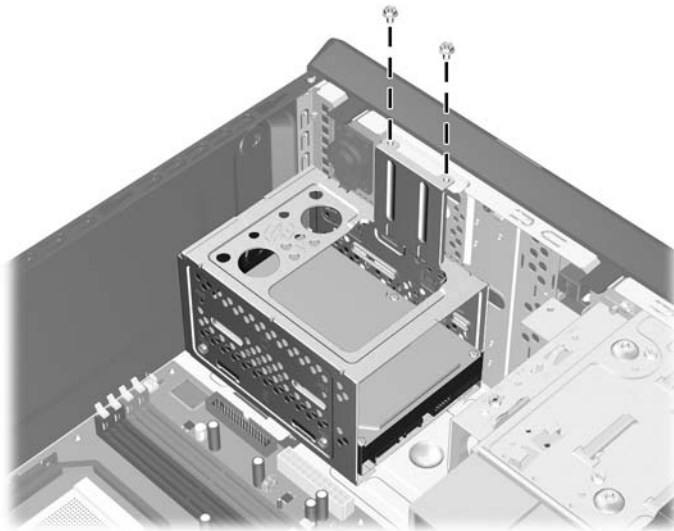


 **CAUTION:** Never crease or bend a SATA data cable tighter than a 30 mm (1.18 in) radius. A sharp bend can break the internal wires.


4. Place the hard disk drive cage into the chassis (1), then slide it down toward the bottom of the chassis until it locks into place (2).




5. Attach the two screws that secure the hard disk drive cage to the chassis.



6. If installing a new drive, connect the opposite end of the data cable to the appropriate system board connector.

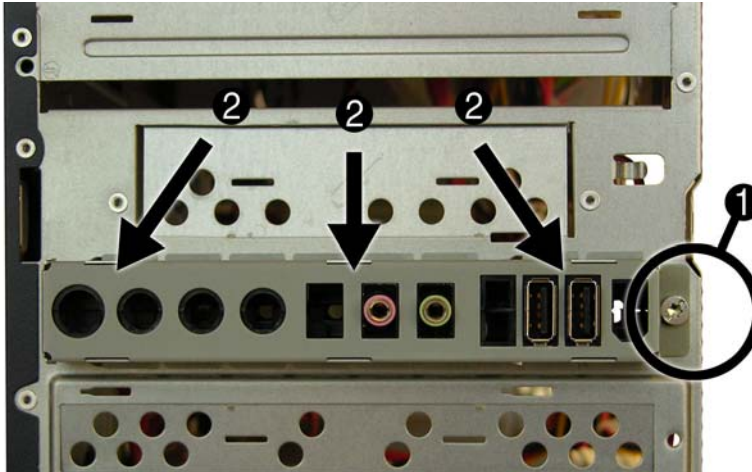
 **NOTE:** If your system has only one SATA hard drive, you must connect the hard drive data cable to the dark blue connector labeled SATA0 to avoid any hard drive performance problems. If you are adding a second hard drive, connect the data cable to the next available (unpopulated) SATA connector on the system board in the following order: SATA0, SATA1, SATA3, SATA2.

7. Replace the computer access panel.
8. Lock any security devices that were disengaged when the access panel was removed.

 **NOTE:** If you are replacing the primary hard drive, use the Recovery Disc Set to restore the operating system, software drivers, and any software applications that were preinstalled on the computer.

Front USB Panel

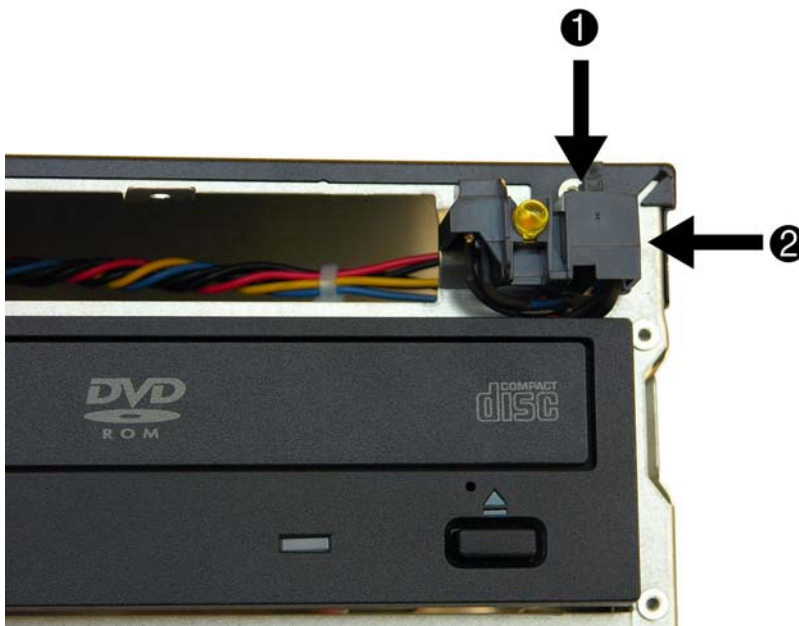
1. Prepare the computer for disassembly ([Preparation for Disassembly on page 27](#)).
2. Remove the computer access panel ([Computer Access Panel on page 31](#)).
3. Remove the front bezel ([Front Bezel on page 32](#)).
4. Disconnect the front USB cable from the yellow system board connector (F_AUDIO) and the I/O cable from the white system board connector (F_USB1).
5. Stand the unit upright.
6. Remove the silver T15 screw (1) that secures the panel to the chassis.
7. Pull the panel (2) away from the unit while threading the wires between the drive cage and the baffle and through the hole in the front of the chassis.



To reinstall the panel, reverse the removal procedure.

Power Switch/LED Assembly

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 27](#)).
2. Remove the computer access panel ([Computer Access Panel on page 31](#)).
3. Remove the front bezel ([Front Bezel on page 32](#)).
4. Remove the optical drive ([Removing an Optical Drive on page 46](#)).
5. Disconnect the cable from the black system board connector labeled F_PANEL.
6. Remove the cable from the metal clamps on the side of the drive cage. This step may require a flat blade screwdriver to lift the clamps enough to remove the cable.
7. To remove the power button assembly, perform the following steps simultaneously:
 - a. On the right side of the assembly, press down on the top tab (1).
 - b. Press in on the tab on the right side of the assembly (2).
 - c. While pressing the two tabs, pull the assembly away from the chassis enough to loosen the tabs from their slots in the chassis.



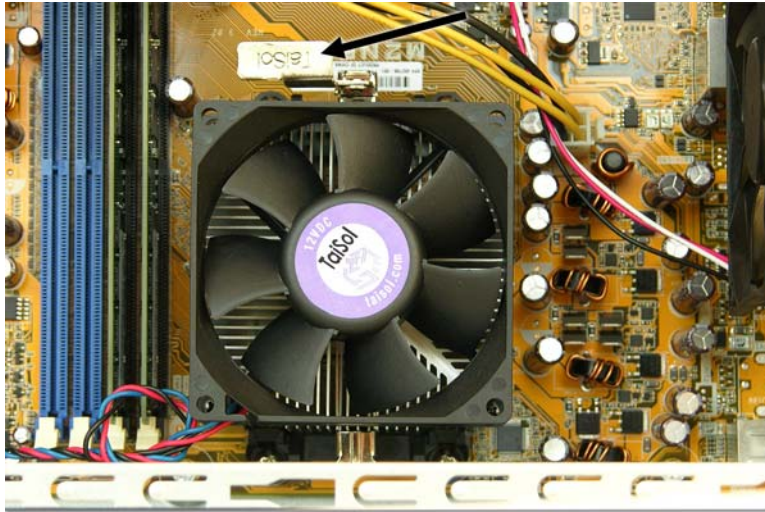
8. Pull the assembly away from the chassis while threading the wire through the hole in the front of the chassis.
9. Remove the assembly from the chassis.

To reinstall the assembly, reverse the removal procedures. Be sure to route the cable through the metal clamps on the side of the drive cage.

Heatsink

You will need a screwdriver with a narrow shaft to loosen the heatsink screws.

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 27](#)).
2. Remove the computer access panel ([Computer Access Panel on page 31](#)).
3. Unplug the fan cable from the system board (CPU FAN).
4. Lift the silver latch that tightens the heatsink, and then pull the latch toward the heatsink to remove the metal hook from the tab on the backplate.



5. Pull the latch up so the metal hook rests above the tab on the backplate, and then press the latch toward the heatsink to disengage the metal hook on the opposite side of the heatsink from the backplate.
6. Lift the heatsink from the processor.
7. Remove the heatsink from the processor.

When reinstalling the heatsink, make sure that its bottom has been cleaned with an alcohol wipe and fresh thermal grease has been applied to the top of the processor.

△ **CAUTION:** Heatsink retaining screws should be tightened in diagonally opposite pairs (as in an X) to evenly seat the heatsink on the processor. This is especially important as the pins on the socket are very fragile and any damage to them may require replacing the system board.

To remove the backplate from the system board:

1. Remove the four silver Phillips screws that secure the backplate to the system board.



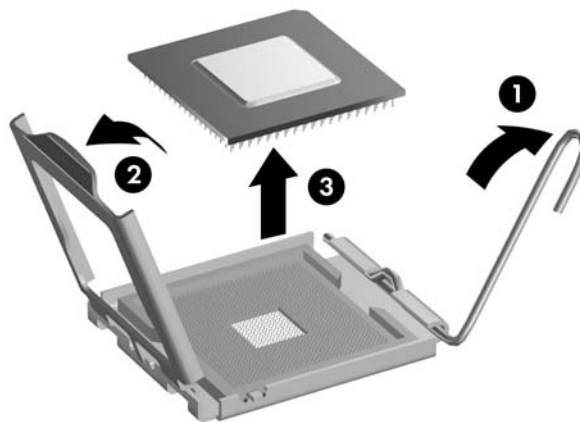
2. Remove the backplate from the system board.

Processor

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 27](#)).
2. Remove the computer access panel ([Computer Access Panel on page 31](#)).
3. Remove the heatsink ([Heatsink on page 59](#)).
4. Rotate the locking lever to its full open position **(1)**.
5. Raise and rotate the microprocessor retainer to its fully open position **(2)**.
6. Carefully lift the processor from the socket **(3)**.

△ **CAUTION:** Do NOT handle the pins in the processor socket. These pins are very fragile and handling them could cause irreparable damage. Once pins are damaged it may be necessary to replace the system board.

The heatsink must be installed within 24 hours of installing the processor to prevent damage to the processor's solder connections.



To install a new processor:

1. Place the processor in its socket and close the retainer.
2. Secure the locking lever.
If reusing the existing heatsink, go to step 3.
If using a new heatsink, go to step 5.
3. If reusing the existing heatsink, apply the thermal grease provided in the spares kit to the top of the processor.
4. Clean the bottom of the heatsink with the provided alcohol pad and place it atop the processor.

5. If using a new heatsink, remove the protective covering from the bottom of the heatsink and place it in position atop the processor.
6. Secure the heatsink to the system board and system board tray with the four captive screws and attach the heatsink control cable to the system board.

△ **CAUTION:** Heatsink retaining screws should be tightened in diagonally opposite pairs (as in an X) to evenly seat the heatsink on the processor. This is especially important as the pins on the socket are very fragile and any damage to them may require replacing the system board.

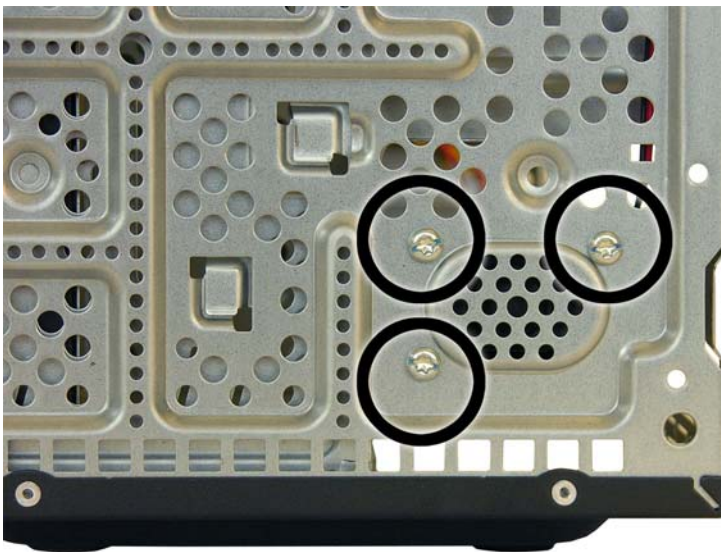
📄 **NOTE:** After installing a new processor onto the system board, always update the system ROM to ensure that the latest version of the BIOS is being used on the computer. The latest system BIOS can be found on the Web at: <http://h18000.www1.hp.com/support/files>.

Speaker

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 27](#)).
2. Remove the computer access panel ([Computer Access Panel on page 31](#)).
3. Remove the front bezel ([Front Bezel on page 32](#)).
4. Disconnect the wire from the white system board connector labeled SPEAKER.

📄 **NOTE:** Note the routing of the speaker wire – behind the hard drive cage bracket, through the metal clamp on the chassis, through the metal clamp on the side of the second hard drive cage, and then down to the system board.

5. From the outside of the chassis, remove the three silver T15 screws that secure the speaker to the chassis.



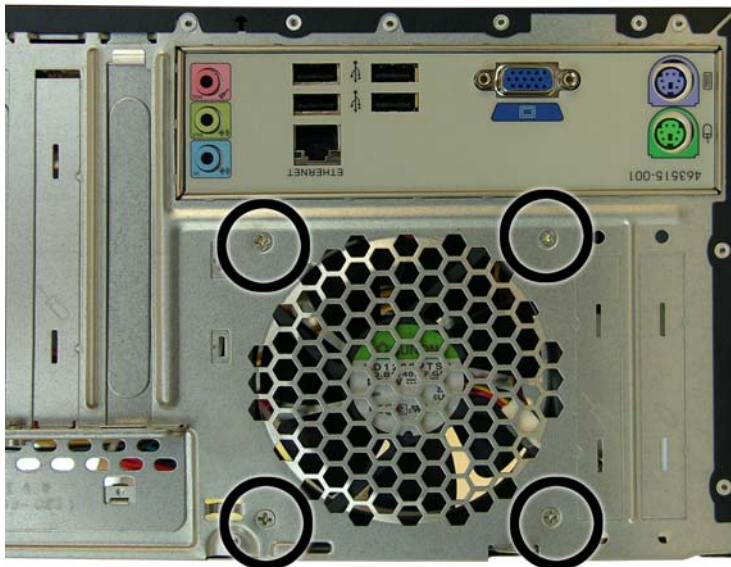
6. Lift the speaker out of the chassis.

To replace the speaker, reverse the removal procedures.

When replacing the speaker, be sure to route the wire behind the hard drive cage bracket, through the metal clamp on the chassis, through the metal clamp on the side of the second hard drive cage, and then down to the system board.

Rear Chassis Fan

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 27](#)).
2. Remove the computer access panel ([Computer Access Panel on page 31](#)).
3. Disconnect the fan control cable from the red system board connector labeled SYS_FAN1.
4. From the outside, remove the four silver Phillips screws that secure the fan to the chassis.



5. Lift the fan out of the chassis.

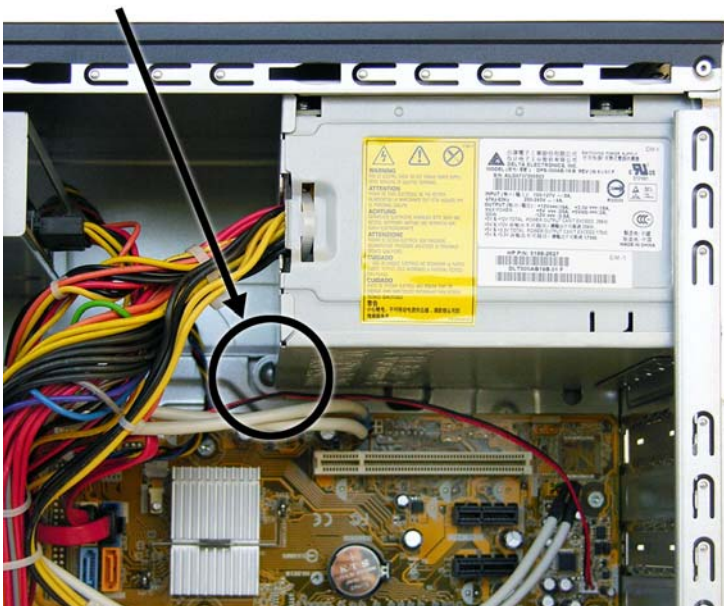
To install the fan assembly, reverse the removal procedure. Be sure to orient the air flow out of the unit.

Power Supply

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 27](#)).
2. Remove the computer access panel ([Computer Access Panel on page 31](#)).
3. Disconnect all power cables from the drives and from the system board.
4. Remove the four silver T15 screws that connect the power supply to the chassis.



5. While pressing the tab in front of the power supply that holds it in place, pull the power supply up slightly to loosen it from the chassis.

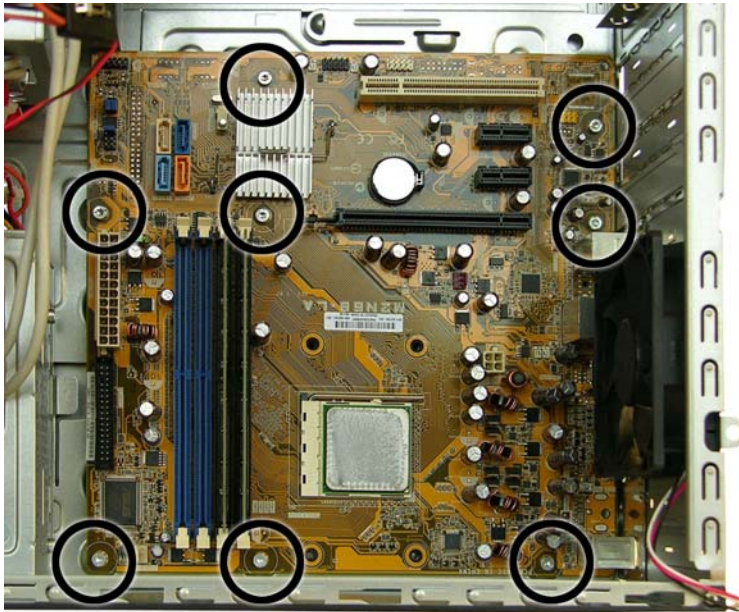


6. Lift the power supply out of the chassis.

To install the power supply, reverse the removal procedure.


System Board

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 27](#)).
2. Remove the computer access panel ([Computer Access Panel on page 31](#)).
3. Remove all expansion boards ([Expansion Cards on page 39](#)).
4. Disconnect all cables connected to the system board, noting their location for reinstallation.
5. Remove the heatsink ([Heatsink on page 59](#)).
6. Remove the remaining eight screws that secure the system board to the chassis.



7. Slide the system board toward the front of the computer to disengage the I/O panel from the rear of the chassis.
8. Lift the system board out of the computer.

When reinstalling the system board, first insert the I/O panel back into the slots in the rear of the chassis, and then align the board with the chassis screw holes.

 **NOTE:** When replacing the system board, you must change the chassis serial number in the BIOS.

Battery

The battery that comes with the computer provides power to the real-time clock. When replacing the battery, use a battery equivalent to the battery originally installed in the computer. The computer comes with a 3-volt lithium coin cell battery.

- ⚠ **WARNING!** The computer contains an internal lithium manganese dioxide battery. There is a risk of fire and burns if the battery is not handled properly. To reduce the risk of personal injury:

Do not attempt to recharge the battery.

Do not expose to temperatures higher than 60°C (140°F).

Do not disassemble, crush, puncture, short external contacts, or dispose of in fire or water.

Replace the battery only with the HP spare designated for this product.

- ⚠ **CAUTION:** Before replacing the battery, it is important to back up the computer CMOS settings. When the battery is removed or replaced, the CMOS settings will be cleared. Refer to [Computer Setup \(F10\) Utility on page 3](#) for information on backing up the CMOS settings.

Static electricity can damage the electronic components of the computer or optional equipment. Before beginning these procedures, ensure that you are discharged of static electricity by briefly touching a grounded metal object.

- 📝 **NOTE:** The lifetime of the lithium battery can be extended by plugging the computer into a live AC wall socket. The lithium battery is only used when the computer is NOT connected to AC power.

HP encourages customers to recycle used electronic hardware, HP original print cartridges, and rechargeable batteries. For more information about recycling programs, go to <http://www.hp.com/recycle>.

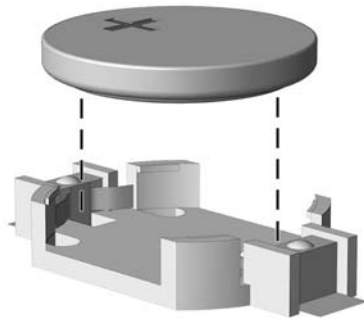
1. Prepare the computer for disassembly ([Preparation for Disassembly on page 27](#)).
2. Remove the computer access panel ([Computer Access Panel on page 31](#)).

- 📝 **NOTE:** It may be necessary to remove an expansion card to gain access to the battery.

3. Locate the battery and battery holder on the system board.
4. Depending on the type of battery holder on your system board, complete the following instructions to replace the battery:

Type 1 Battery Holder

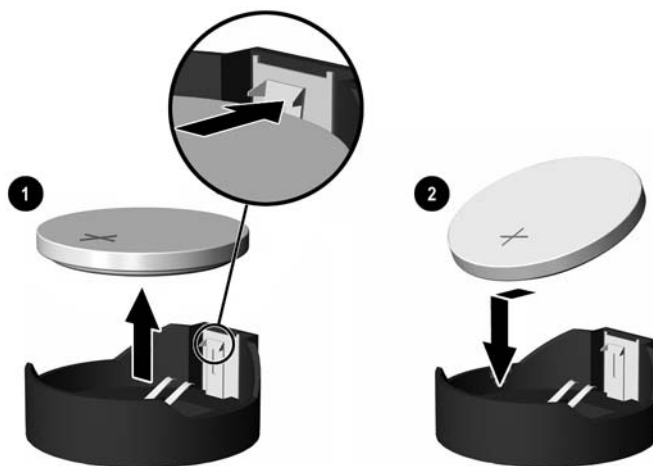
1. Lift the battery out of its holder.



2. Slide the replacement battery into position, positive side up.
3. The battery holder automatically secures the battery in the proper position.
4. Replace the computer access panel.
5. Plug in the computer and turn on power to the computer.
6. Reset the date and time and any special system setups using Computer Setup. Refer to [Computer Setup \(F10\) Utility on page 3](#).

Type 2 Battery Holder

1. To release the battery from its holder, squeeze the metal clamp (1) that extends above one edge of the battery. When the battery pops up, lift it out.
2. To insert the new battery, slide one edge of the replacement battery under the holder's lip with the positive side up (2). Push the other edge down until the clamp snaps over the other edge of the battery.

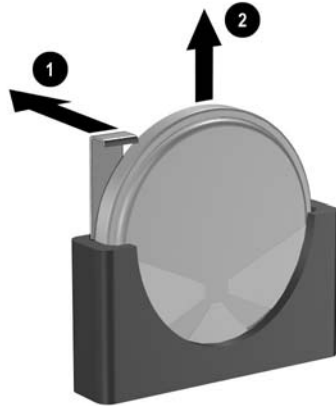


3. Replace the computer access panel.

4. Plug in the computer and turn on power to the computer.
5. Reset the date and time and any special system setups using Computer Setup. Refer to [Computer Setup \(F10\) Utility on page 3](#).

Type 3 Battery Holder

1. Pull back on the clip (1) that holds the battery in place, then remove the battery (2).
2. Insert the new battery and position the clip back in place.




3. Replace the computer access panel.
4. Plug in the computer and turn on power to the computer.
5. Reset the date and time and any special system setups using Computer Setup. Refer to [Computer Setup \(F10\) Utility on page 3](#).


A Connector Pin Assignments

This appendix contains the pin assignments for many computer and workstation connectors. Some of these connectors may not be used on the product being serviced.


Keyboard

Connector and Icon	Pin	Signal
	1	Data
	2	Unused
	3	Ground
	4	+5 VDC
	5	Clock
	6	Unused


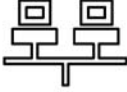
Mouse

Connector and Icon	Pin	Signal
	1	Data
	2	Unused
	3	Ground
	4	+5 VDC
	5	Clock
	6	Unused

Ethernet BNC

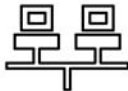
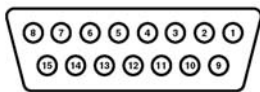
Connector and Icon	Pin	Signal
	1	Data
	2	Ground

Ethernet RJ-45

Connector and Icon	Pin	Signal
 	1	(+) Transmit Data
	2	(-) Transmit Data
	3	(+) Receive Data
	4	Unused
	5	Unused
	6	(-) Receive Data
	7	Unused
	8	Unused

Ethernet AUI

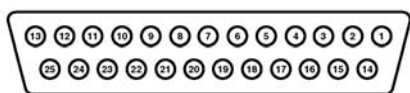
Connector and Icon



Pin	Signal	Pin	Signal
1	Ground	9	Positive AUI Differential Receive
2	Negative AUI Differential Collision	10	+12V
3	Positive AUI Differential Collision	11	Ground
4	Negative AUI Differential Transmit	12	Ground
5	Positive AUI Differential Transmit	13	Unused
6	Ground	14	Unused
7	Ground	15	Unused
8	Negative AUI Differential Receive	16	Unused

Parallel Interface

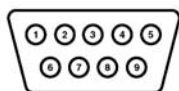
Connector and Icon



Pin	Signal	Pin	Signal
1	Strobe	10	Acknowledge
2	Data Bit 0	11	Busy
3	Data Bit 1	12	Paper End
4	Data Bit 2	13	Select
5	Data Bit 3	14	Auto Linefeed
6	Data Bit 4	15	Error
7	Data Bit 5	16	Initialize Printer
8	Data Bit 6	17	Select IN
9	Data Bit 7	18–25	Signal Ground


Serial Interface, Powered and Non-Powered

Connector and Icon

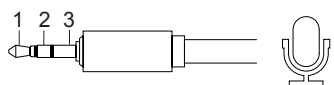


Pin	Signal
1	Carrier Detect (12V if powered)
2	Receive Data
3	Transmit Data
4	Data Terminal Ready
5	Signal Ground
6	Data Set Ready
7	Request to Send
8	Clear to Send
9	Ring Indicator (5V if powered)

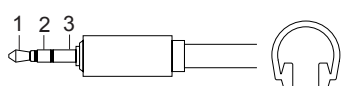
USB

Connector and Icon	Pin	Signal
	1	+5 VDC
	2	- Data
	3	+ Data
	4	Ground

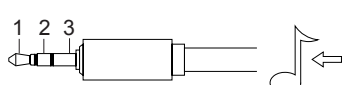
Microphone

Connector and Icon (1/8" miniphone)	Pin	Signal
	1 (Tip)	Audio_left
	2 (Ring)	Power_Right
	3 (Shield)	Audio_right

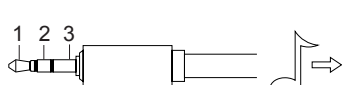
Headphone

Connector and Icon (1/8" miniphone)	Pin	Signal
	1 (Tip)	Audio_left
	2 (Ring)	Power_Right
	3 (Shield)	Ground


Line-in Audio

Connector and Icon (1/8" miniphone)	Pin	Signal
	1 (Tip)	Audio_In_Left
	2 (Ring)	Audio_In_Right
	3 (Shield)	Ground


Line-out Audio

Connector and Icon (1/8" miniphone)	Pin	Signal
	1 (Tip)	Audio_Out_Left
	2 (Ring)	Audio_Out_Right
	3 (Shield)	Ground

External Infrared Transceiver

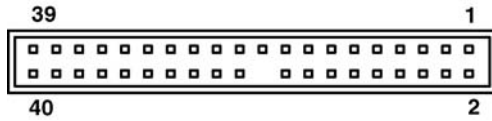
Connector and Icon	Pin	Signal
	1	Transmit
	2	Receive
	3	Ground
	4	5V
	5	Mode
	6	Not Used
	7	Not Used
	8	Not Used

Monitor

Connector and Icon			
			
Pin	Signal	Pin	Signal
1	Red Analog	9	+5V (fused)
2	Green Analog	10	Ground
3	Blue Analog	11	Not used
4	Not used	12	DDC Serial Data
5	Ground	13	Horizontal Sync
6	Ground	14	Vertical Sync
7	Ground	15	DDC Serial Clock
8	Ground		

ATA/ATAPI (IDE) Standard Drive Cable

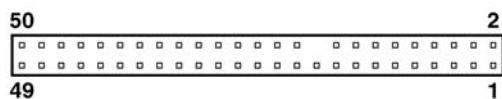
Connector



Pin	Signal	Pin	Signal	Pin	Signal
1	Reset	15	DD1	29	DMAK
2	Ground	16	DD14	30	Ground
3	DD7	17	DD0	31	INTRQ
4	DD8	18	DD15	32	IOCS16
5	DD6	19	Ground	33	DA1
6	DD9	20	(Key)	34	PDIAG (cable detect)
7	DD5	21	DMARQ	35	DA0
8	DD10	22	Ground	36	DA2
9	DD4	23	DIOW	37	CS1FX
10	DD11	24	Ground	38	CS3FX
11	DD3	25	DIOR	39	DASP
12	DD12	26	Ground	40	Ground
13	DD2	27	IORDY		
14	DD13	28	CSEL		

CD-ROM 50-Pin Connector

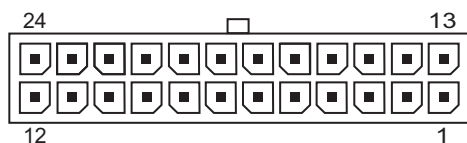
Connector



Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	Audio L-ch	14	DD12	27	IORDY	40	+5V
2	Audio R-ch	15	DD3	28	DMACK	41	+5V
3	Audio GND	16	DD13	29	INTRQ	42	+5V
4	GND	17	DD2	30	IOCS16	43	GND
5	RESET	18	DD14	31	DA1	44	GND
6	DD8	19	DD1	32	PDIAG	45	GND
7	DD7	20	DD15	33	DA0	46	GND
8	DD9	21	DD0	34	DA2	47	CSEL
9	DD6	22	DMARQ	35	CS1FX	48	GND
10	DD10	23	GND	36	CS3FX	49	Vendor-specific
11	DD5	24	DIOR	37	DASP	50	Vendor-specific
12	DD11	25	DIOW	38	+5V		
13	DD4	26	GND	39	+5V		

24-Pin Power

Connector

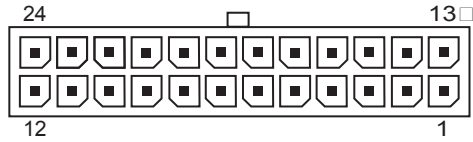


Front

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	+3.3V	7	GND	13	+3.3V	19	GND
2	+3.3V	8	POK	14	-12V	20	open
3	GND	9	+5 Vaux	15	GND	21	+5V
4	+5V	10	+12V	16	PSON	22	+5V
5	GND	11	+12V	17	GND	23	+5V
6	+5V	12	+3.3V	18	GND	24	GND

24-Pin MicroFit Power

Connector

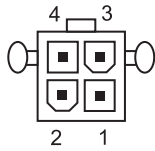


Front

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	+5 Vaux	7	PWRGD	13	+12V	19	GND
2	GND	8	+3.3V	14	+5V Sense	20	+3.3V
3	+5V	9	+3.3V	15	GND	21	Sense
4	+5V	10	Tach	16	+5V	22	+3.3V
5	PS_ON	11	GND	17	+5V	23	+3.3V
6	GND	12	Fan-CMD	18	+3.3V	24	GND

4-Pin Power (for CPU)

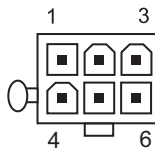
Connector and Icon



Pin	Signal
1	GND
2	GND
3	+12V CPU
4	-12V CPU

6-Pin Power (for CPU)

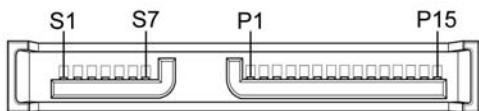
Connector and Icon



Pin	Signal
1	GND
2	GND
3	GND
4	12V CPU
5	12V CPU
6	+12V

SATA Data and Power

Drive Connector



Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
S1	Ground	S2	A+	S3	A-	S4	Ground
S5	B-	S6	B+	S7	Ground		
P1	Ground	P2	V 3.3	P3	V 3.3	P4	Ground
P5	B-	P6	Ground	P7	V 5	P8	V 5
P9	V 5	P10	Ground	P11	Reserved	P12	Ground
P13	V 12	P14	V12	P15	V 12		

S = Data, P = Power

PCI Express

x1, x4, x8, and x16 PCI Express Connector



Pin A

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	PRST#	6	JTAG3	11	PERST#	16	PERp0	21	PERp1
2	+12V	7	JTAG4	12	GND	17	PERn0	22	PERn1
3	+12V	8	JTAG5	13	REFCLK+	18	GND	23	GND
4	GND	9	+3.3V	14	REFCLK-	19	RSVD	24	GND
5	JTAG2	10	+3.3V	15	GND	20	GND	25	PERp2
26	PERn(2)	31	GND	36	PERn4	41	GND	46	GND
27	GND	32	RSVD	37	GND	42	GND	47	PERp7
28	GND	33	RSVD	38	GND	43	PERp6	48	PERn7
29	PERp3	34	GND	39	PERp5	44	PERn6	49	GND
30	PERn3	35	PERp4	40	PERn5	45	GND	50	RSVD
51	GND	56	PERp9	61	PERn10	66	GND	71	GND

52	PERp8	57	PERn9	62	GND	67	GND	72	PERp13
53	PERn8	58	GND	63	GND	68	PERp12	73	PERn13
54	GND	59	GND	64	PERp11	69	PERn12	74	GND
55	GND	60	PERp10	65	PERn11	70	GND	75	GND
76	PERp14	81	PERn15						
77	PERn14	82	GND						
78	GND								
79	GND								
80	PERp15								

NOTE: x1 PCI Express uses pins 1-18

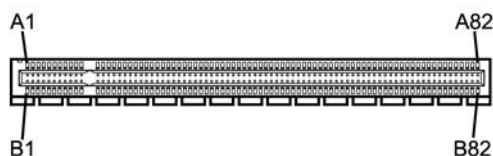
x4 PCI Express uses pins 1-32

x8 PCI Express uses pins 1-49

x16 PCI Express uses pins 1-82

PCI Express

x1, x4, x8, and x16 PCI Express Connector



Pin B

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	+12V	6	SMDAT	11	WAKE#	16	GND	21	GND
2	+12V	7	GND	12	RSVD	17	GND	22	GND
3	RSVD	8	+3.3 V	13	GND	18	GND	23	PETp2
4	GND	9	JTAG1	14	PETp0	19	PETp1	24	PETn2
5	SMCLK	10	3.3vAux	15	PETn0	20	PETn1	25	GND
26	GND	31	PRSNT2#	36	GND	41	PETp6	46	PETn7
27	PETp3	32	GND	37	PETp5	42	PRTn6	47	GND
28	PETn3	33	PETp4	38	PETn5	43	GND	48	PRSNT2#
29	GND	34	PETn4	39	GND	44	GND	49	GND
30	RSVD	35	GND	40	GND	45	PETp7	50	PETp8
51	PETn8	56	GND	61	GND	66	PETp12	71	PETn13

52	GND	57	GND	62	PETp11	67	PETn12	72	GND
53	GND	58	PETp10	63	PETn11	68	GND	73	GND
54	PETp9	59	PETn10	64	GND	69	GND	74	PETp14
55	PETn9	60	GND	65	GND	70	PETp13	75	PETn14
76	GND	81	PRSNT2#						
77	GND	82	RSVD						
78	PETp15								
79	PETn15								
80	GND								

NOTE: x1 PCI Express uses pins 1-18

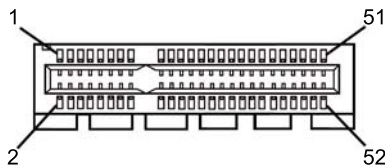
x4 PCI Express uses pins 1-32

x8 PCI Express uses pins 1-49

x16 PCI Express uses pins 1-8

PCI Express Mini Card

PCI Express Mini Card Connector



Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	WAKE#	7	CLKREQ#	13	REFCLK+	19	Reserved*** (UIM_C4)	25	PERp0
2	3.3V	8	UIM_PWR	14	UIM_RESET	20	W_DISABLE#	26	GND
3	Reserved**	9	GND	15	GND	21	GND	27	GND
4	GND	10	UIM_DATA	16	UIM_VPP	22	PERST#	28	+1.5V
5	Reserved**	11	REFCLK-	17	Reserved *** (UIM_C8)	23	PERn0	29	GND
6	1.5V	12	UIM_CLK	18	GND	24	+3.3Vaux	30	SMB_CLK

31	PETn0	37	Reserved*	43	Reserved*	49	Reserved*
32	SMB_DATA	38	USB_D+	44	LED_WLAN#	50	GND
33	PETp0	39	Reserved*	45	Reserved*	51	Reserved*
34	GND	40	GND	46	LED_WPAN#	52	+3.3V
36	GND	41	Reserved*	47	Reserved*		
36	USB_D-	42	LED_WWAN#	48	+1.5V		

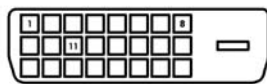
NOTE: *Reserved for future second PCI Express LAN (if needed)

**Reserved for future wireless coexistence control interface (if needed)

***Reserved for future UIM interface (if needed)

DVI Connector

Connector and Icon



Pin	Signal	Pin	Signal
1	T.M.D.S. Data2-	13	T.M.D.S. Data3+
2	T.M.D.S. Data2+	14	+5V Power
3	T.M.D.S. Data2/4 Shield	15	Ground (for +5V)
4	T.M.D.S. Data4-	16	Hot Pug Detect
5	T.M.D.S. Data4+	17	T.M.D.S. Data0-
6	DDC Clock	18	T.M.D.S. Data0+
7	DDC Data	19	T.M.D.S. Data0/5 Shield
8	No Connect	20	T.M.D.S. Data5-
9	T.M.D.S. Data1-	21	T.M.D.S. Data5+
10	T.M.D.S. Data1+	22	T.M.D.S. Data Shield
11	T.M.D.S. Data1/3 Shield	23	T.M.D.S. Clock+
12	T.M.D.S. Data3-	24	T.M.D.S. Clock-

B Power Cord Set Requirements

The power supplies on some computers have external power switches. The voltage select switch feature on the computer permits it to operate from any line voltage between 100-120 or 220-240 volts AC. Power supplies on those computers that do not have external power switches are equipped with internal switches that sense the incoming voltage and automatically switch to the proper voltage.

The power cord set received with the computer meets the requirements for use in the country where you purchased the equipment.

Power cord sets for use in other countries must meet the requirements of the country where you use the computer.

General Requirements

The requirements listed below are applicable to all countries:

1. The power cord must be approved by an acceptable accredited agency responsible for evaluation in the country where the power cord set will be installed.
2. The power cord set must have a minimum current capacity of 10A (7A Japan only) and a nominal voltage rating of 125 or 250 volts AC, as required by each country's power system.
3. The diameter of the wire must be a minimum of 0.75 mm² or 18AWG, and the length of the cord must be between 1.8 m (6 feet) and 3.6 m (12 feet).

The power cord should be routed so that it is not likely to be walked on or pinched by items placed upon it or against it. Particular attention should be paid to the plug, electrical outlet, and the point where the cord exits from the product.

△ **WARNING!** Do not operate this product with a damaged power cord set. If the power cord set is damaged in any manner, replace it immediately.

Japanese Power Cord Requirements

For use in Japan, use only the power cord received with this product.

△ **CAUTION:** Do not use the power cord received with this product on any other products.

Country-Specific Requirements

Additional requirements specific to a country are shown in parentheses and explained below.

Country	Accrediting Agency	Country	Accrediting Agency
Australia (1)	EANSW	Italy (1)	IMQ
Austria (1)	OVE	Japan (3)	METI
Belgium (1)	CEBC	Norway (1)	NEMKO
Canada (2)	CSA	Sweden (1)	SEMKO
Denmark (1)	DEMKO	Switzerland (1)	SEV
Finland (1)	SETI	United Kingdom (1)	BSI
France (1)	UTE	United States (2)	UL
Germany (1)	VDE		

1. The flexible cord must be Type HO5VV-F, 3-conductor, 0.75mm² conductor size. Power cord set fittings (appliance coupler and wall plug) must bear the certification mark of the agency responsible for evaluation in the country where it will be used.
2. The flexible cord must be Type SVT or equivalent, No. 18 AWG, 3-conductor. The wall plug must be a two-pole grounding type with a NEMA 5-15P (15A, 125V) or NEMA 6-15P (15A, 250V) configuration.
3. Appliance coupler, flexible cord, and wall plug must bear a "T" mark and registration number in accordance with the Japanese Dentori Law. Flexible cord must be Type VCT or VCTF, 3-conductor, 0.75 mm² conductor size. Wall plug must be a two-pole grounding type with a Japanese Industrial Standard C8303 (7A, 125V) configuration.

C Troubleshooting

Safety and Comfort

⚠ **WARNING!** Misuse of the computer or failure to establish a safe and comfortable work environment may result in discomfort or serious injury. Refer to the *Safety & Comfort Guide* available on the Web site at <http://www.hp.com/ergo> for more information on choosing a workspace and creating a safe and comfortable work environment.

WARNING! Energized and moving parts inside.

Disconnect power to the equipment before removing the enclosure.

Replace and secure the enclosure before re-energizing the equipment.

Before You Call for Technical Support

If you are having problems with the computer, try the appropriate solutions below to try to isolate the exact problem before calling for technical support.


- Run the HP diagnostic tool.
- Run the hard drive self-test in Computer Setup. Refer to [Computer Setup \(F10\) Utility on page 3](#) for more information.
- Listen for a series of beeps from the computer. The beeps are error codes that will help you diagnose the problem. Refer to [Interpreting POST Audible Codes on page 90](#) to interpret the codes.
- If the screen is blank, plug the monitor into a different video port on the computer if one is available. Or, change out the monitor with a monitor that you know is functioning properly.
- If you are working on a network, plug another computer with a different cable into the network connection. There may be a problem with the network plug or cable.
- If you recently added new hardware, remove the hardware and see if the computer functions properly.
- If you recently installed new software, uninstall the software and see if the computer functions properly.
- Boot the computer to the Safe Mode to see if it will boot without all of the drivers loaded. When booting the operating system, use “Last Known Configuration.”
- Refer to the comprehensive online technical support at <http://www.hp.com/support>.
- Refer to [Helpful Hints on page 84](#) in this guide for more general suggestions.

To assist you in resolving problems online, HP Instant Support Professional Edition provides you with self-solve diagnostics. If you need to contact HP support, use HP Instant Support Professional Edition's online chat feature. Access HP Instant Support Professional Edition at: <http://www.hp.com/go/ispe>.

Access the Business Support Center (BSC) at <http://www.hp.com/go/bizsupport> for the latest online support information, software and drivers, proactive notification, and worldwide community of peers and HP experts.

If it becomes necessary to call for technical assistance, be prepared to do the following to ensure that your service call is handled properly:

- Be in front of your computer when you call.
- Write down the computer serial number and product ID number, and the monitor serial number before calling.
- Spend time troubleshooting the problem with the service technician.
- Remove any hardware that was recently added to your system.
- Remove any software that was recently installed.

 **NOTE:** For sales information and warranty upgrades (Care Packs), call your local authorized service provider or dealer.

Helpful Hints

If you encounter problems with the computer, monitor, or software, see the following list of general suggestions before taking further action:

- Check that the computer and monitor are plugged into a working electrical outlet.
- Check to see that the voltage select switch (some models) is set to the appropriate voltage for your region (115V or 230V).
- Check to see that the computer is turned on and the power light is on.
- Check to see that the monitor is turned on and the green monitor light is on.
- Turn up the brightness and contrast controls of the monitor if the monitor is dim.
- Press and hold any key. If the system beeps, then the keyboard should be operating correctly.
- Check all cable connections for loose connections or incorrect connections.
- Wake the computer by pressing any key on the keyboard or pressing the power button. If the system remains in suspend mode for more than four seconds, shut down the computer by pressing and holding the power button for at least four seconds then press the power button again to restart the computer. If the system will not shut down, unplug the power cord, wait a few seconds, then plug it in again. The computer will restart if automatic start on power loss is set in Computer Setup. If it does not restart, press the power button to start the computer.
- Reconfigure your computer after installing a non–plug and play expansion board or other option.
- Be sure that all the needed device drivers have been installed. For example, if you are using a printer, you need a driver for that model printer.
- Remove all bootable media (diskette, CD, or USB device) from the system before turning it on.

- If you have installed an operating system other than the factory-installed operating system, check to be sure that it is supported on the system.
- If the system has multiple video sources (embedded, PCI, or PCI-Express adapters) installed and a single monitor, the monitor must be plugged into the monitor connector on the source selected as the primary VGA adapter. During boot, the other monitor connectors are disabled and if the monitor is connected into these ports, the monitor will not function. You can select which source will be the default VGA source in Computer Setup.

△ **CAUTION:** When the computer is plugged into an AC power source, there is always voltage applied to the system board. You must disconnect the power cord from the power source before opening the computer to prevent system board or component damage.

Solving General Problems

You may be able to easily resolve the minor problems described in this section. If a problem persists and you are unable to resolve it yourself or if you feel uncomfortable about performing the operation, contact your HP authorized reseller or service provider.

Computer will not turn on.

Cause	Solution
Cables to the external power source are unplugged.	Ensure that cables connecting the computer to the external power source are plugged in properly and the wall outlet is active.
Voltage selector switch on rear of computer chassis (some models) not switched to correct line voltage (115V or 230V).	Select the proper AC voltage using the selector switch.
A defective PCI card has been installed.	Remove any expansion board that was just installed.
Drive data or power supply cables may not be properly connected.	Reseat drive data and power supply cables.
The unit temperature was exceeded. The fan may be blocked.	<ol style="list-style-type: none"> 1. Unit is in an exceedingly hot environment. Let it cool down. 2. Ensure that computer air vents are not blocked and the internal fan is running. 3. Contact an HP authorized reseller or service provider.

Computer appears locked up and will not turn off when the power button is pressed.

Cause	Solution
Software control of the power switch is not functional.	<ol style="list-style-type: none"> 1. Press and hold the power button for at least four seconds until the computer turns off. 2. Disconnect the power cord from the electrical outlet.

Computer will not respond to USB keyboard or mouse.

Cause	Solution
System has locked up.	Restart computer.

Computer will not respond to USB keyboard or mouse.

Cause	Solution
Keyboard or mouse is not connected to computer.	Connect keyboard and mouse cables to computer.
Computer is in standby mode.	To resume from standby mode, press the power button or press any key. CAUTION: When attempting to resume from standby mode, do not hold down the power button for more than four seconds. Otherwise, the computer will shut down and you will lose any unsaved data.

Computer date and time display is incorrect.

Cause	Solution
RTC (real-time clock) battery may need to be replaced. NOTE: Connecting the computer to a live AC outlet prolongs the life of the RTC battery.	First, reset the date and time under Control Panel (Computer Setup can also be used to update the RTC date and time). If the problem persists, replace the RTC battery. See the <i>Hardware Reference Guide</i> for instructions on installing a new battery, or contact an authorized dealer or reseller for RTC battery replacement.

Cursor will not move using the arrow keys on the keypad.

Cause	Solution
The Num Lock key may be on.	Press the Num Lock key. The Num Lock light should not be on if you want to use the arrow keys. The Num Lock key can be disabled (or enabled) in Computer Setup.

Poor performance is experienced.

Cause	Solution
Processor is hot.	<ol style="list-style-type: none">1. Make sure airflow to the computer is not blocked. Leave a 10.2-cm (4-inch) clearance on all vented sides of the computer and above the monitor to permit the required airflow.2. Make sure fans are connected and working properly (some fans only operate when needed).3. Make sure the processor heatsink is installed properly.
Hard drive is full.	Transfer data from the hard drive to create more space on the hard drive.
Low on memory.	Add more memory.
Hard drive fragmented.	Defragment hard drive.
Program previously accessed did not release reserved memory back to the system.	Restart the computer.
Virus resident on the hard drive.	Run virus protection program.

Poor performance is experienced.

Cause	Solution
Too many applications running.	<ol style="list-style-type: none">1. Close unnecessary applications to free up memory. Some applications run in the background and can be closed by right-clicking on their corresponding icons in the task tray. To prevent these applications from launching at startup, go to Start > Run (Microsoft Windows XP) or Start > All Programs > Accessories > Run (Microsoft Windows Vista) and type <code>msconfig</code>. On the Startup tab of the System Configuration Utility, uncheck applications that you do not want to launch automatically. CAUTION: Do not prevent applications from launching at startup that are required for proper system operation.2. Add more memory.
Some software applications, especially games, are stressful on the graphics subsystem	<ol style="list-style-type: none">1. Lower the display resolution for the current application or consult the documentation that came with the application for suggestions on how to improve performance by adjusting parameters in the application.2. Add more memory.3. Upgrade the graphics solution.
Cause unknown.	Restart the computer.

Blank screen (no video).

Cause	Solution
Monitor is not turned on and the monitor light is not on.	Turn on the monitor and check that the monitor light is on.
The cable connections are not correct.	Check the cable connection from the monitor to the computer and to the electrical outlet.
You may have a screen blanking utility installed or energy saver features are enabled.	Press any key or click the mouse button and, if set, type your password.
Computer is in standby mode.	Press the power button to resume from standby mode. CAUTION: When attempting to resume from standby mode, do not hold down the power button for more than four seconds. Otherwise, the computer will shut down and you will lose any unsaved data.
You are using a fixed-sync monitor and it will not sync at the resolution chosen.	Be sure that the monitor can accept the same horizontal scan rate as the resolution chosen.
Monitor cable is plugged into the wrong connector.	Ensure that the monitor is plugged into an active connector on the rear of the computer. If another connector is available, connect the monitor to that connector and reboot the system.
Bad monitor.	Try a different monitor.

Computer is beeping and will not start.

Cause	Solution
Internal error has occurred and the computer is beeping a code.	Refer to Interpreting POST Audible Codes on page 90 to interpret the error code.

Solving Hardware Installation Problems

You may need to reconfigure the computer when you add or remove hardware, such as an additional drive or expansion card. If you install a plug and play device, the Windows operating system automatically recognizes the device and configures the computer. If you install a non–plug and play device, you must reconfigure the computer after completing installation of the new hardware. In the Windows operating system, use the **Add Hardware Wizard** and follow the instructions that appear on the screen.

⚠ WARNING! When the computer is plugged into an AC power source, voltage is always applied to the system board. To reduce the risk of personal injury from electrical shock, rotating fans, and/or hot surfaces, be sure to disconnect the power cord from the wall outlet and allow the internal system components to cool before touching.

Look for the LED on the system board. If the LED is illuminated, the system still has power. Power off the computer and remove the power cord before proceeding.

A new device is not recognized as part of the system.

Cause	Solution
Device is not seated or connected properly.	Ensure that the device is properly and securely connected and that pins in the connector are not bent down.
Cable(s) of new external device are loose or power cables are unplugged.	Ensure that all cables are properly and securely connected and that pins in the cable or connector are not bent down.
Power switch of new external device is not turned on.	Turn off the computer, turn on the external device, then turn on the computer to integrate the device with the computer system.
When the system advised you of changes to the configuration, you did not accept them.	Reboot the computer and follow the instructions for accepting the changes.
A plug and play board may not automatically configure when added if the default configuration conflicts with other devices.	Use Windows Device Manager to deselect the automatic settings for the board and choose a basic configuration that does not cause a resource conflict. You can also use Computer Setup to reconfigure or disable devices to resolve the conflict.
USB ports on the computer are disabled in Computer Setup.	Enter Computer Setup (F10) and enable the USB ports.

Computer will not start.

Cause	Solution
Wrong memory modules were used in the upgrade or memory modules were installed in the wrong location.	<ol style="list-style-type: none">1. Review the documentation that came with the system to determine if you are using the correct memory modules and to verify the proper installation.2. Listen for beeps from the computer. See Interpreting POST Audible Codes on page 90 to determine possible causes.3. If you still cannot resolve the issue, contact Customer Support.

Interpreting POST Audible Codes


This section covers the audible codes that may occur before or during POST that do not necessarily have an error code or text message associated with them.

⚠ WARNING! When the computer is plugged into an AC power source, voltage is always applied to the system board. To reduce the risk of personal injury from electrical shock and/or hot surfaces, be sure to disconnect the power cord from the wall outlet and allow the internal system components to cool before touching.

Beeps	Meaning	Recommended Action
1 short beep and 1 long beep followed by a three second pause	Bad memory or memory configuration error.	Check that the memory modules have been installed correctly and that proper modules are used.
2 short beeps and 1 long beep followed by a three second pause	No graphics card installed or graphics card initialization failed.	For systems with a graphics card: <ol style="list-style-type: none"> 1. Reseat the graphics card. Power on the system. 2. Replace the graphics card. 3. Replace the system board. For systems with integrated graphics, replace the system board.
3 short beeps and 1 long beep followed by a three second pause	CPU configuration error or invalid CPU detected before graphics card initialized.	<ol style="list-style-type: none"> 1. Upgrade the BIOS to proper version. 2. Change the processor.
1 short beep followed by a one second pause	No legacy floppy drive or optical drive found.	<ol style="list-style-type: none"> 1. Check cable connections. 2. Run the Computer Setup utility and ensure the device port is enabled.
2 short beeps followed by a three second pause	No floppy diskette or CD found.	<ol style="list-style-type: none"> 1. Check the type of drive that you are using and use the correct media type. 2. Replace the diskette or CD with a new one.
3 short beeps followed by a three second pause	Flashing not ready (missing utility or BIOS image file, etc.)	Upgrade the BIOS to proper version.
4 short beeps followed by a three second pause	Flashing operation has failed (checksum error, corrupted image, etc.)	<ol style="list-style-type: none"> 1. Verify the correct ROM. 2. Flash the ROM if needed. 3. If an expansion board was recently added, remove it to see if the problem remains. 4. Clear CMOS. 5. If the message disappears, there may be a problem with the expansion card. 6. Replace the system board.
5 short beeps followed by a three second pause	BIOS recovery was successful	No action required.

Contacting Customer Support

For help and service, contact an authorized reseller or dealer. To locate a reseller or dealer near you, visit <http://www.hp.com>.

 **NOTE:** If you take the computer to an authorized reseller, dealer, or service provider for service, remember to provide the setup and power-on passwords if they are set.

Refer to the number listed in the warranty or in the *Support Telephone Numbers* guide for technical assistance.

D System Board and Riser Board Reference Designators

These reference designators are used on most but not all HP system and riser boards.

Designator	Component
BAT	Battery socket/Battery
CR1	LED - 5V_Aux (on)
CR2	Health-LED
CR3	UID LED
CR4	Power LED
CR35	Hard drive activity LED
E14	Boot block header/jumper
E15	Boot block recovery header
E16	ROM recovery header
E25	CPLD programming header
E49/JP49	Clear Password header/jumper
E50	Clear CMOS header
J7	RJ45 jack
J9	Stacked RJ45/Dual USB
J10	Quad stacked USB
J11	First IEEE 1394 connector
J12	Second IEEE 1394 connector
J13	SPDIF input
J14	SPDIF output
J20 - 29	PCI slots
J30	PCI extender slot (male)
J31 - J35	PCI Express slots
J37	Primary SCSI connector

J38	Secondary SCSI connector
J39	Stacked parallel/SCSI connector
J40	AGP slot
J41	x16 PCI Express slot for graphics
J50	First parallel port
J51	Second parallel port
J52	Double-stacked parallel port, Top = Port B, Bottom = Port A
J53	Parallel port over single Serial Port
J54	Parallel port over Serial Port and Video Port
J55	Parallel port over dual VGA ports
J65	DVI connector
J66	Keyboard connector, PS/2 (Closest to power supply)
J67	Mouse connector, PS/2
J68	Stacked mouse (Top)/keyboard (Bottom) connector
J69	Video connector, VGA
J70	Primary single USB connector
J71	Secondary single USB port
J72	Microphone jack
J73	Line-in jack
J74	Line-out jack
J75	Headphone jack
J76	Volume control
J77	Double-stacked headphone (Bottom)/microphone (Top) connector
J78	Double-stacked line-in (Top)/line-out (Bottom) connector
J80	Stacked serial/audio connector
J81	Primary double-stack USB, Top = Port 2, Bottom = Port 1
J82	Secondary double-stack USB, Top = Port 4, Bottom = Port 3
J83	Triple-stacked audio jack (line in, line out/headphone, microphone)
J101	Security board connector - for security card
J9020-J9029	PCI slots on riser card
J9030-J9034	PCI express slots on riser card
JP49/E49	Clear password header/jumper
L1	USB front port choke (1st)
L2	USB rear port choke (1st)

L3	USB rear port choke (2nd)
L4	USB rear port choke (3rd)
L5	USB front port choke (2nd)
P1	P/S connector (20 or 24 pin)
P2	Second P/S connector (as required)
P3	Processor 12V header
P4	Secondary Processor 12V header
P5	Main Power/HDD LED connector
P6	Speaker connector
P7	Analog audio connector (from CD-ROM)
P8	Primary chassis fan header or primary CPU heatsink fan
P9	Secondary chassis fan header
P10	Diskette drive connector
P11	Auxiliary Audio connector
P12	Alert on LAN connector
P13	VRM module footprint
P15	AUI connector
P16	Fan command/fan sink header (may be 2 or 4 pin)
P17	Digital audio expansion header
P18	SPDIF internal input header
P19	SPDIF internal output header
P20	Primary IDE connector
P21	Secondary IDE/MultiBay connector
P22	Header for NEWCARD
P23	Header for front panel audio
P24	Header for front panel USB
P25	Internal USB connector 1
P26	Internal USB connector 2
P27	MultiBay header
P29	SCSI LED connector
P30	PCI extender slot (female)
P40	Blade PC graphics connector (outboard)
P41	Blade PC graphics connector (inboard)
P52	Second serial port

P54	Primary serial port
P55	Double stack serial port, Top = Serial B, Bottom = Serial A
P58	Riser edge connector (male-mates with J30)
P60	Primary Serial ATA (SATA) connector
P61	Second Serial ATA (SATA) connector
P62	Third Serial ATA (SATA) connector
P63	Fourth Serial ATA (SATA) connector
P64	VSFF expansion connector
P65	Graphics option connector
P66	Fifth Serial ATA (SATA) connector
P67	Sixth Serial ATA (SATA) connector
P68	Seventh Serial ATA (SATA) connector
P69	Eighth Serial ATA (SATA) connector
P70	Primary (CPU) fan header for fansink
P71	Secondary CPU fan header for fansink
P80	Primary Serial Attached SCSI (SAS) connector
P81	Second Serial Attached SCSI (SAS) connector
P82	Third Serial Attached SCSI (SAS) connector
P83	Fourth Serial Attached SCSI (SAS) connector
P84	Fifth Serial Attached (SAS) connector
P85	Sixth Serial Attached (SAS) connector
P86	Seventh Serial Attached (SAS) connector
P87	Eighth Serial Attached (SAS) connector
P101	Security board connector, system board
P106	Secondary speaker connector
P124	Hood lock header
P125	Hood sensor header
P126	Flying parallel port header
P150	Media reader header
P216	White box chassis fan header
SW2	Security hood switch on riser card
SW50	Clear CMOS switch/push button
U2	Single chip solution (combined northbridge/southbridge)
U3	North bridge

U4	South bridge
U5	Super I/O
U6	Clock chip
U7	64 bit Bridge
U10	LOM1
U11	LOM1 EEPROM
U12	LOM1 PHY
U13	Audio Codec
U14	Audio amplifier
U16	LOM2
U17	LOM2 EEPROM
U18	LOM2 PHY
U19	SPI ROM - SOIC-8 footprint
U20	Fan controller
U21	SPI ROM - SO16 footprint
U29	TMD5 controller
U30	Parallel port diode array
U31	First serial port transceiver
U32	Second serial port transceiver
U46	VRM controller
U50	USB front port power switch
U51	First USB rear port power switch
U52	Second USB rear port power switch
U53	Third USB rear port power switch
XBT	Battery retainer
XMM1	Memory slot. DIMM1 or RIMM1 populated and tested
XMM2 - XMM5	Following memory slots
XU1	Primary processor socket
XU2	Secondary processor socket
XU15/U15	System ROM and Socket (Socket = XU15, ROM = U15)
XU19/U19	SPI ROM and socket (XU19 = socket, U19 = SPI ROM)
Y1	Primary (TH) system clock crystal
Y2	Secondary (SMT) system clock crystal
Y3	Primary NIC clock crystal

Y4	Secondary NIC clock crystal
Y5/H5	RTC clock crystal/tie-down

E Specifications

Table E-1 Specifications

Desktop Dimensions		
Height	16.37 in	41.58 cm
Width	7.24 in	18.40 cm
Depth	14.95 in	37.98 cm
Approximate Weight		
	20.26 lb	9.19 kg
Temperature Range		
Operating	50° to 104°F	10° to 40°C
Nonoperating	-22° to 140°F	-30° to 60°C
Relative Humidity (noncondensing)		
Operating	15-90%	15-90%
Nonoperating (38.7°C max wet bulb)	15-90%	15-90%
Maximum Altitude (unpressurized)		
Operating	7,500 ft	2286 m
Nonoperating	15,000 ft	4572 m
NOTE: Operating temperature is derated 1.0° C per 300 m (1000 ft) to 3000 m (10,000 ft) above sea level; no direct sustained sunlight. Maximum rate of change is 10° C/Hr. The upper limit may be limited by the type and number of options installed.		
Heat Dissipation		
Maximum	1575 BTU/hr	397 kg-cal/hr
Typical (idle)	307 BTU/hr	77 kg-cal/hr
Power Supply		
	115V	230V
Operating Voltage Range	90-132 VAC	180-264 VAC
Rated Voltage Range	100-127 VAC	200-240 VAC
Rated Line Frequency	50-60 Hz	50-60 Hz
Power Output		
	300 W	300 W

Table E-1 Specifications (continued)

Rated Input Current (maximum)¹	8A @ 100 VAC	4A @ 200 VAC
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¹ This system utilizes a passive power factor corrected power supply. The power factor correction is present in the 230V operating mode only. This allows the system to pass the CE mark requirements for use in the countries of the European Union. This supply requires the use of an input voltage range select switch.

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