

Service Reference Guide

HP Compaq dx7400 Business PC

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Service Reference Guide

Business PCs

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About This Book




-  **WARNING!** Text set off in this manner indicates that failure to follow directions could result in bodily harm or loss of life.
 -  **CAUTION:** Text set off in this manner indicates that failure to follow directions could result in damage to equipment or loss of information.
 -  **NOTE:** Text set off in this manner provides important supplemental information.
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1 Installing and Customizing the Software


 **NOTE:** If the computer was shipped with Microsoft 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.

If the computer was not shipped with a Microsoft operating system, some portions of this documentation do not apply. Refer to the operating system documentation and online Help for operating instructions.

△ **CAUTION:** Do not add optional hardware or third-party devices to your computer until the operating system is successfully installed. Doing so may cause errors and may prevent the operating system from installing properly. 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 might damage the software that runs the computer or prevent its proper installation.

 **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.

The first time the computer is turned on, the operating system is automatically installed. This takes approximately 5 to 10 minutes, depending on the operating system being installed. Carefully read and follow the instructions that appear on the screen to complete the 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.

Microsoft security updates are available on the Microsoft Web site.

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 is installed on each system and allows you to:

- Create Recovery Points to back up the entire system incrementally
- Back up the entire system in a single hard archive
- Back up individual files


Backups can be scheduled to occur automatically at designated intervals, or they can be initiated manually. Recovery can be performed from the Recovery Partition on the hard drive or the Recovery Disc Set. The Recovery Disc Set includes the *Restore Plus!* CD, the Microsoft Operating System, and any Supplemental Software CDs.

 **NOTE:** 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 factory software recovery CDs or DVDs to recover the system**.
3. Follow the instructions in the wizard.

The HP Backup and Recovery Manager provides two basic recovery methods. The first, recovery of files and folders, operates in Windows. The second, PC Recovery, requires a reboot to the Recovery Partition or from the Recovery Disc Set. To reboot to the Recovery Partition, press F11 at startup when you see the message "Press F11 for Emergency Recovery."

 **NOTE:** 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**.

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 processor, graphics, memory, audio, storage, communications, and input devices.
- 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.
- View CPU and system temperatures.
- Enter the Asset Tag or property identification number assigned by the company to this computer.
- Establish a supervisor password that controls access to Computer Setup (F10) Utility and the settings described in this section.
- Secure integrated I/O functionality, including the serial, USB, or parallel ports, audio, or embedded NIC, so that they cannot be used until they are unsecured.
- Enable or disable removable media boot ability.
- Enable or disable legacy diskette write ability (when supported by hardware).

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. Press **Enter** to bypass the title screen, if necessary.

 **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.

Six menu headings appear on the Computer Setup Utility screen:

- System Information
- Main
- Advanced
- Boot
- PC Health
- 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](#).

4. To apply and save changes, press the [F10](#) key.

If you have made changes that you do not want applied, press the [F9](#) key to exit without saving.

To load optimized default values, press the [F7](#) key.

△ **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.

Table 2-1 Computer Setup (F10) Utility Main Menu

Heading	Table
System Information	Table 2-2 Computer Setup—System Information on page 5
Main	Table 2-3 Computer Setup—Main on page 6
Advanced	Table 2-4 Computer Setup—Advanced on page 7
Boot	Table 2-5 Computer Setup—Boot on page 9
PC Health	Table 2-6 Computer Setup—PC Health on page 10
Exit	Computer Setup—Exit on page 10

Computer Setup—System Information



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

Table 2-2 Computer Setup—System Information

Option	Description
Product Name	(view only)
SKU Number	(view only)
Processor Type	(view only)
Processor Speed	(view only)
System ROM	(view only)
Cache Size	(view only)
Memory Size	(view only)
Integrated MAC	(view only)
UUID	(view only)
System Serial #	(view only)
Asset Tracking Number	(view only)

Computer Setup—Main


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

Table 2-3 Computer Setup—Main

Option	Description
Date (mm:dd:yy)	Allows you to set system date.
Time (hh:mm:ss)	Allows you to set system time.
SATA Port 1	For each, allows you to:
SATA Port 2	<ul style="list-style-type: none">run HDD self-test for selected channel:
SATA Port 3	<ul style="list-style-type: none">SMART Status Check
SATA Port 4	<ul style="list-style-type: none">HDD Short Self-TestHDD Extended Self-Testauto-detect HDD size and headset IDE drive on selected channel to:<ul style="list-style-type: none">NoneAutoset access mode on selected channel to:<ul style="list-style-type: none">LargeAutoview:<ul style="list-style-type: none">FirmwareCapacityCylinderHeadPrecompLanding ZoneSector
Onboard FDC Controller	Disables/enables the floppy disk controller.
Drive A	Allows you to set Drive A to: <ul style="list-style-type: none">None1.44M, 3.5 in.

Table 2-3 Computer Setup—Main (continued)

Halt On	Allows you to set POST error behavior to: <ul style="list-style-type: none"> • All Errors • No Errors • All, but Keyboard
POST Delay	Allows you to set a POST delay to: <ul style="list-style-type: none"> • 0 seconds • 5 seconds • 10 seconds • 15 seconds • 30 seconds

Computer Setup—Advanced



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

Table 2-4 Computer Setup—Advanced

Option	Description
Execute Disable Bit	Disables/enables hardware DEP functionality.
MAX DVMT Allocation	Specify the size of DVMT/system memory to allocate for video memory: <ul style="list-style-type: none"> • 128MB • 256MB • 384MB
Init Display First (VGA Setting)	Allows you to select the primary display device: <ul style="list-style-type: none"> • PCI Slot • OnChipVGA • PCIEx
Onboard HD Audio	Disables/enables onboard HD audio.
OnChip USB Controller	Disables/enables USB controller.
USB Legacy Support	Disables/enables USB legacy support function (USB keyboard, USB mouse, and USB flash media).
Onboard LAN	Disables/enables onboard LAN controller.
Onboard LAN Boot ROM	Disables/enables the boot ROM of the onboard LAN chip.
Onboard Serial Port 1	Allows you to select a setting for the onboard serial port:
Onboard Serial Port 2	<ul style="list-style-type: none"> • Disabled • 3F8/IRQ4

Table 2-4 Computer Setup—Advanced (continued)

	<ul style="list-style-type: none">• 2F8/IRQ3• 3E8/IRQ4• 2E8/IRQ3
Onboard Parallel Port	Allows you to select a setting for the onboard parallel port: <ul style="list-style-type: none">• Disabled• 378/IRQ7• 278/IRQ5• 3BC/IRQ7
Parallel Port Mode	Allows you to select parallel port mode: <ul style="list-style-type: none">• SPP• EPP• ECP• ECP+EPP• Normal
After AC Power Loss	Allows you to select system power loss behavior: <ul style="list-style-type: none">• On• Off• Last State
Wake on PCI Device from S5	Disables/enables waking up from S5 by PCI device.
RTC Alarm Resume	Disables/enables RTC (real-time clock) alarm.
Date (of Month)	If RTC Alarm Resume is enabled, allows you to select the day of the month for resumption of RTC alarm. (Set to 0 for every day.)
Resume Time (hh:mm:ss)	If RTC Alarm Resume is enabled, allows you to select what time the RTC alarm will resume.

Computer Setup—Boot


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

Table 2-5 Computer Setup—Boot

Option	Description
Device Boot Disabling	Allows disabling of bootable device groups. Choose from: <ul style="list-style-type: none">• None• USB• Internal ODD• Internal FDD• USB+ODD+FDD
F9 Boot Menu	Disables/enables F9 Boot Menu.
F10 Setup Prompting	Disables/enables on screen F10 prompt
F11 Recovery Prompting	Disables/enables on screen F11 prompt
F12 Boot from LAN Prompting	Disables/enables on screen F12 prompt
Removable Device Boot Seq.	Allows you to specify the order of attached removable devices (such as Floppy Discs or USB FDD). The first drive in the order has priority in the boot sequence and is recognized as drive A.
Hard Disk Boot Priority	Allows you to specify the order of attached hard drive devices (such as USB HDD storage, USB2 Drive Key, or USB flash media). The first drive in the order has priority in the boot sequence and is recognized as drive C (if any devices are attached).
Optical Drive Boot Seq.	Allows you to specify the order in which attached optical drives (including USB ODD) are checked for a bootable operating system image.
Network Boot Seq.	Allows you to specify the order in which network devices (including UP NIC cards) are checked for a bootable operating system image.
First Boot Device Second Boot Device Third Boot Device Fourth Boot Device	Allows you to specify which devices will boot first, second, third, and fourth or to disable any of the four: <ul style="list-style-type: none">• Removable• Hard Disk• CDROM• Network• Disabled <p>NOTE: MS-DOS drive lettering assignments may not apply after a non-MS-DOS operating system has started.</p>
Set Supervisor Password	Allows you to establish a password to control access to Computer Setup.
Set User Password	Allows you to establish a password to control access to the computer. (Supervisor password must be set before you can set a User password.)

Table 2-5 Computer Setup—Boot (continued)

Security Option	Allows you to set the security option to Setup or System so that the password is required every time the system boots or only when entering Computer Setup.
BIOS Write Protection	Enables/disables to prevent the BIOS from being updated.

Computer Setup—PC Health



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

Table 2-6 Computer Setup—PC Health

Option	Description
System Fan Fail Check	Disables/enables system fan detection during POST.
Smart Fan Function	Disables/enables smart fan functionality.
Current CPU Temperature	(view only)
Current System Temperature	(view only)
Current CPU Fan Speed	(view only)
Current System Fan Speed	(view only)
Vcore	(view only)
12V	(view only)
5V	(view only)
VBAT (V)	(view only)
5VSB (V)	(view only)

Computer Setup—Exit

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

Option	Description
Save & Exit Setup	Saves Data to CMOS before exiting.
Exit Without Saving	Abandons all modifications and exits.
Load Optimized Defaults	Loads Optimized Defaults.

Recovering the Configuration Settings

Recovering the configuration settings established in the Computer Setup (F10) Utility requires that you first back up the settings before a recovery is needed.

The CMOS Save/Load utility can be found at <http://www.hp.com> under the Software & Driver Downloads for your specific model. Download the firmware files into a folder on a removable storage device. It is recommended that you save any modified computer configuration settings to a diskette, a USB flash media device, or a diskette-like device (a storage device set to emulate a diskette drive) and save the diskette or device for possible future use.

Backing Up the CMOS


1. Make sure the computer to be backed up is turned on. Connect the removable storage to the computer.
2. Boot to DOS.
3. Type `N:\folder\BIOS.exe SAVE:ABC001.DAT` (where N is the drive letter of the removable storage) to save the CMOS setting to the removable storage device.

Restoring the CMOS

1. Make sure the target computer is turned on. Connect the removable storage to the target computer.
2. Boot to DOS.
3. Type `N:\folder\BIOS.exe LOAD:ABC001.DAT` (where N is the drive letter of the removable storage) to load the custom CMOS setting onto the target system.

3 HP Insight Diagnostics

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 16](#) 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 the *Computer Setup (F10) Utility Guide* 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, dc7700) 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.

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 hard drive's Recovery Partition and allows you to:

- create Recovery Points to back up the entire system incrementally
- back up the entire system in a single archive
- back up individual files and folders

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.

The HP Backup and Recovery Manager provides two basic recovery methods. The first, recovery of files and folders, operates in Windows. The second, PC Recovery, requires a reboot to the Recovery Partition or from the Recovery Disc Set. To reboot to the Recovery Partition, press F11 at startup when you see the message "Press F11 for Emergency Recovery."

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 Desktop Management

Desktop Management Overview

HP Client Management Solutions provides standards-based solutions for managing and controlling desktops, workstations, and notebook PCs in a networked environment. HP pioneered desktop manageability in 1995 with the introduction of the industry's first fully manageable desktop personal computers. HP is a patent holder of manageability technology. Since then, HP has led an industry-wide effort to develop the standards and infrastructure required to effectively deploy, configure, and manage desktops, workstations, and notebook PCs. HP develops its own management software and works closely with leading management software solution providers in the industry to ensure compatibility between HP Client Management Solutions and these products. HP Client Management Solutions are an important aspect of our broad commitment to providing you with solutions that assist you in lowering the total cost of owning and maintaining the PCs throughout their lifecycle.

The key capabilities and features of desktop management are:

- Initial configuration and deployment
- Remote system installation
- Software updating and management
- ROM flash
- Hardware option configuration
- Asset tracking and security
- Fault notification and recovery

 **NOTE:** Support for specific features described in this guide may vary by model or software version.

Initial Configuration and Deployment

The computer comes with a preinstalled system software image. After a brief software “unbundling” process, the computer is ready to use.

You may prefer to replace the preinstalled software image with a customized set of system and application software. There are several methods for deploying a customized software image. They include:

- Installing additional software applications after unbundling the preinstalled software image.
- Using software deployment tools, such as HP OpenView Client Configuration Manager (not currently available for Windows Vista), HP OpenView PC Configuration Management Solution (based on Radia technology) (not currently available for Windows Vista), or Altiris Deployment Solution, to replace the preinstalled software with a customized software image.
- Using a disk cloning process to copy the contents from one hard drive to another.

The best deployment method depends on your information technology environment and processes. The PC Deployment section of the HP Lifecycle Service Web site (<http://h20219.www2.hp.com/services/cache/80906-0-0-225-121.html>) provides information to help you select the best deployment method.

The *Restore Plus!* CD, ROM-based setup, and ACPI hardware provide further assistance with recovery of system software, configuration management and troubleshooting, and power management.

HP OpenView Agent



NOTE: HP OpenView Agent is not currently available for Windows Vista.

The management agent used by both HP OpenView Client Configuration Manager and HP OpenView PC Configuration Management Solution is pre-loaded on the computer. When installed, it enables communication with the HP OpenView management console.

To install the HP OpenView Agent:

1. Click **Start**.
2. Click **All Programs**.
3. Click **HP Manageability**.
4. Click **Radia Management Agent Readme**.
5. Review and follow the instructions contained in the Readme file to install the HP OpenView Agent.

The HP OpenView Agent is a key infrastructure component for enabling all of the HP OpenView PC Configuration Management Solution. To learn about the other infrastructure components necessary for implementing the HP OpenView PC Configuration Management Solution, please visit <http://h20229.www2.hp.com/solutions/ascm/index.html>.

Altiris Deployment Solution Agent

This program is pre-loaded on the computer. When installed, it enables communication with the administrator Deployment Solution console.

To install Altiris Deployment Solution Agent:

1. Click **Start**.
2. Click **All Programs**.
3. For Windows Vista, click **Install Altiris DAgent**.

For Windows XP, click **Install Altiris AClient**.

4. Follow the onscreen instructions to set up and configure the Altiris client.

The Altiris Deployment Solution Agent is a key infrastructure component for enabling the HP Client Foundation Suite and the Client Premium Suite. To learn about the other infrastructure components necessary for implementing the HP Client Foundation Suite and Client Premium Suite, please visit <http://www.hp.com/go/easydeploy>.

Remote System Installation

Remote System Installation allows you to start and set up the system using the software and configuration information located on a network server by initiating the Preboot Execution Environment (PXE). The Remote System Installation feature is usually used as a system setup and configuration tool, and can be used for the following tasks:

- Formatting a hard drive
- Deploying a software image on one or more new PCs
- Remotely updating the system BIOS in flash ROM ([Remote ROM Flash on page 29](#))
- Configuring the system BIOS settings

To initiate Remote System Installation, press **F12** when the **F12 = Network Service Boot** message appears in the lower-right corner of the HP logo screen when the computer is booting up. Follow the instructions on the screen to continue the process. The default boot order is a BIOS configuration setting that can be changed to always attempt to PXE boot.

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Software Updating and Management

HP provides several tools for managing and updating software on desktops, workstations, and notebooks:

- HP Client Management Interface
- HP System Software Manager
- HP Client Manager
- HP ProtectTools Security Manager
- HP Client Premium Suite
- HP Client Foundation Suite
- HP OpenView Client Configuration Manager (not currently available for Windows Vista)
- HP OpenView PC Configuration Management Solution (not currently available for Windows Vista)
- HP Client Catalog for SMS
- HP Backup and Recovery Manager
- Intel vPro-branded PCs with Active Management Technology
- HP Proactive Change Notification
- HP Subscriber's Choice

HP Client Management Interface

Regardless of the system management tools your IT department uses, managing both your hardware and software assets is important to keeping your IT costs low and your business agile. The IT administrator can access the HP Client Management Interface by writing simple scripts and integrating those scripts to the management solution of their choice.

With the HP Client Management Interface (HP CMI), new HP business computers seamlessly integrate into your managed IT environment. HP CMI provides an interface that simplifies the integration of HP business computers with popular industry system management tools (including Microsoft Systems Management Server, IBM Tivoli Software, and HP OpenView Operations) and custom inhouse developed management applications. Using HP CMI, systems management tools and applications can request in-depth client inventory, receive health status information, and manage system BIOS settings by communicating directly with the client computer, reducing the need for agent or connector software to achieve integration.

HP Client Management Interface is based on industry standards that include Microsoft Windows Management Interface (MS WMI), Web-Based Enterprise Management (WBEM), System Management BIOS (SMBIOS), and Advanced Configuration and Power Interface (ACPI). HP CMI is a foundation technology utilized in HP Client Management Solutions. With HP CMI, HP gives you flexibility in choosing how you manage your HP client computers.

HP Client Management Interface used in conjunction with system management software can:

- Request in-depth client inventory information—Capture detailed information about the processors, hard drives, memory, BIOS, drivers, including sensor information (such as fan speed, voltage, and temperature).
- Receive health status information—Subscribe for a wide range of client hardware alerts (such as over-temperature, fan stall, and hardware configuration changes) to be sent to the system management console, application, or to the local client computer. Alerts are sent real-time when triggered by hardware events.
- Manage system BIOS settings—Perform F10 functions including setting and changing the BIOS passwords and computer boot order remotely from your system management console on any or all of your client systems without having to visit each machine.

For more information on HP Client Management Interface, refer to <http://www.hp.com/go/hpcmi/>.

HP System Software Manager

HP System Software Manager (SSM) is a free utility that automates remote deployment of device drivers and BIOS updates for your networked HP business PCs. When SSM runs, it silently (without user interaction) determines the revision levels of drivers and BIOS installed on each networked client system and compares this inventory against system software SoftPaqs that have been tested and stored in a central file store. SSM then automatically updates any down-revision system software on the networked PCs to the later levels available in the file store. Since SSM only allows distribution of SoftPaq updates to the correct client system models, administrators can confidently and efficiently use SSM to keep system software updated.

System Software Manager integrates with enterprise software distribution tools such as HP OpenView PC Configuration Management Solution (not currently available for Windows Vista), Altiris HP Client Manager, and Microsoft Systems Management Server (SMS). Using SSM, you can distribute customer-created or third-party updates that have been packaged in the SSM-format.

SSM may be downloaded at no charge by visiting <http://www.hp.com/go/ssm>.



NOTE: SSM does not currently support remote ROM flash on systems that have Windows Vista BitLocker enabled and are using TPM measurements to protect the BitLocker keys because flashing the BIOS would invalidate the trust signature that BitLocker created for the platform. Disable BitLocker via Group Policy in order to flash the system BIOS.

You can enable BitLocker support without TPM measurements of BIOS to avoid invalidating the BitLocker keys. HP recommends you keep a secure backup of the BitLocker credentials in case of recovery emergencies.

HP Client Manager

HP Client Manager, developed with Altiris, is available free for all supported HP business desktop, notebook, and workstation models. SSM is integrated into HP Client Manager, and enables central tracking, monitoring, and management of the hardware aspects of HP client systems.

Use HP Client Manager to:

- Get valuable hardware information such as CPU, memory, video, and security settings
- Monitor system health to fix problems before they occur
- Automatically acquire and install drivers and BIOS updates without visiting each PC
- Remotely configure BIOS and security settings
- Automate processes to quickly resolve hardware problems

Tight integration with HP Instant Support tools reduces hardware troubleshooting time.

- Diagnostics—remotely run & view reports on HP desktop, notebook, and workstation models
- System Health Scan—check for known hardware issues in your installed base of HP client systems
- Active Chat—connect to HP customer support to resolve issues
- HP Knowledgebase—link to expert information
- Automated SoftPak collection and delivery process for fast resolution of hardware problems
- Identify, inventory, and initialize systems with HP ProtectTools embedded security chip
- Option for health alerts to display locally on the client system
- Report basic inventory information for non-HP clients
- Setup and configure TPM security chip
- Centrally schedule client backup and recovery
- Add on support for managing Intel AMT

For more information on HP Client Manager, visit <http://www.hp.com/go/clientmanager>.

HP ProtectTools Security Manager

ProtectTools Security Manager software provides security features that help protect against unauthorized access to the computer, networks, and critical data. Enhanced security functionality is provided by the following modules:

- Smart Card Security for ProtectTools
- Embedded Security for ProtectTools
- BIOS Configuration for ProtectTools
- Credential Manager for ProtectTools

The modules available for your computer may vary depending on your model. For example, Embedded Security for ProtectTools requires that the Trusted Platform Module (TPM) embedded security chip (some models only) be installed on your computer, and Smart Card Security for ProtectTools requires an optional smart card and reader.

ProtectTools modules may be preinstalled, preloaded, or available for purchase from the HP Web site. Visit <http://www.hp.com/products/security> for more information.

HP Client Premium Suite

HP Client Premium Suite (HP CPS) is designed for organizations wanting full client hardware and software lifecycle management from a single, Web-based management console. It combines:

- HP Client Manager
- HP Systems Insight Manager Connector
- HP OpenView Connector (not currently available for Windows Vista)
- Altiris Client Manager Suite - Level 1
- Altiris Connector Solution
- Altiris Local Recovery Pro
- Altiris AuditExpress

For more information on HP Client Premium Suite, visit <http://www.hp.com/go/easydeploy>.


HP Client Foundation Suite

The HP Client Foundation Suite (HP CFS) is designed for organizations wanting essential client management functionality. It combines:

- HP Client Manager
- HP Systems Insight Manager Connector
- Altiris Migration Suite
- Altiris Local Recovery Pro

For more information about the HP Client Foundation Suite, visit <http://www.hp.com/go/easydeploy>.

HP OpenView Client Configuration Manager

 **NOTE:** HP OpenView Client Configuration Manager is not currently available for Windows Vista.


HP OpenView Client Configuration Manager is a hardware and software management solution for Windows XP and HP Thin Client environments that is easy to use and quick to deploy, while providing a strong foundation for future requirements. It is offered in two editions:

- The Basic Edition is a free product for managing HP desktops, notebooks and workstations, providing hardware and software inventory, remote control, HP alert monitoring, HP BIOS and driver updates, integration with HP Protect Tools and add-on support for Intel AMT. The Basic Edition also supports deployment and management of HP Thin Clients.
- The Premium Edition, available for purchase, includes all functionality provided in Basic Edition and adds Windows deployment and migration, patch management capabilities, software distribution and software usage metering.

HP Client Configuration Manager provides a migration path to HP OpenView PC Configuration Management Solution (based on Radia technology) for automated management of large, heterogeneous and continuously changing IT environments.

For more information about the HP OpenView Client Configuration Manager, visit <http://www.managementsoftware.hp.com/products/ccm/index.html>.

HP OpenView PC Configuration Management Solution

 **NOTE:** HP OpenView PC Configuration Management Solution is not currently available for Windows Vista.

HP OpenView PC Configuration Management Solution is a policy-based solution that enables administrators to inventory, deploy, patch, and continuously manage software and content across heterogeneous client platforms. With the HP OpenView PC Configuration Management Solution, the IT professional can:

- Automate the entire lifecycle management process from discovery, deployment, and ongoing management through migration and retirement
- Automatically deploy and continuously manage an entire software stack (operating systems, applications, patches, settings, and content) to a desired state
- Manage software on virtually any device, including desktops, workstations, and notebooks, in a heterogeneous or standalone infrastructure
- Manage software on most operating systems

With continuous configuration management, HP customers report dramatic savings in IT costs, accelerated time-to-market for software and content, and increased user productivity and satisfaction.

For more information on HP OpenView PC Configuration Management Solution, visit <http://h20229.www2.hp.com/solutions/ascm/index.html>.

HP Client Catalog for SMS

Update management is an important function of maintaining any set of computers, from a single PC to an enterprise datacenter. The ability to identify which updates exist—and selectively deploy those updates in a timely and automated manner—can help maintain security and productivity for the managed organization. HP now offers a mechanism to streamline updates for HP systems within a Microsoft

System Management Server management infrastructure. The HP Client Catalog for SMS contains software driver and patch information for desktop, mobile and workstation platforms. With SMS 2003 R2 and Inventory Tool for Custom Updates, organizations can integrate and deploy HP software updates quickly and easily, based on detailed platform characteristics that the HP Client Catalog for SMS provides to target appropriate client systems within the managed enterprise.

For more information on HP Client Catalog for SMS, visit <http://www.hp.com/go/easydeploy/>.

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 hard drive's Recovery Partition and allows you to:

- create Recovery Points to back up the entire system incrementally
- back up the entire system in a single archive
- back up individual files and folders

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.

The HP Backup and Recovery Manager provides two basic recovery methods. The first, recovery of files and folders, operates in Windows. The second, PC Recovery, requires a reboot to the Recovery Partition or from the Recovery Disc Set. To reboot to the Recovery Partition, press F11 at startup when you see the message "Press F11 for Emergency Recovery."

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

Intel vPro-branded PCs with Active Management Technology

Intel Active Management Technology (AMT) allows better discovery, healing, and protection of networked computing assets. With AMT, PCs can be managed whether the system is on, off, or the operating system is hung.

Intel vPro features include:

- Hardware inventory information
- Alerting
- Power management—power on/off, cycle power
- Remote diagnosis and repair
 - Serial-over-LAN—allows console control of remote PC during its boot phase
 - IDE-Redirect—allows system booting from a remote boot drive, disk, or ISO image
- Hardware-based isolation and recovery—limit or cut off PC network access, if virus-like activity is detected



NOTE: For an overview of Intel vPro technology, visit <http://www.intel.com/vpro>.

For HP-specific information on Intel vPro technology, see the white papers at <http://www.hp.com/support>. Select your country and language, select **See support and troubleshooting information**, enter the model number of the computer, and press **Enter**. In the **Resources** category, click **Manuals (guides, supplements, addendums, etc.)**. Under **Quick jump to manuals by category**, click **White papers**.

On Intel vPro-branded PCs, available management technologies include the following:

- AMT
- ASF
- Virtualization Technology (VT)

ASF and AMT may not be configured at the same time, but both are supported.

To configure Intel vPro systems for AMT or ASF:

1. Turn on or restart the computer. If you are in Microsoft Windows, click **Start > Shut Down > Restart**.
2. As soon as the computer is turned on, press the hot key, **Ctrl+P**, when the monitor light turns green.



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

This hot-key enters the Intel Management Engine BIOS Execution (MEBx) setup utility. This utility allows the user to configure various aspects of the management technology. Configuration options include:

- ME Platform Configuration
 - ME Platform State Control—enable/disable management engine
 - ME Firmware Local Update—local enable/disable management of firmware updates
 - LAN Controller—enable/disable integrated network controller

- ME Features Control—enable AMT, ASF, or none
- ME Power Control—configure management engine power policies
- Intel AMT Configuration
 - Change AMT Password—required in order to configure AMT (the default password is **admin**)
 - Host Name—allows administrator to assign a name to the client
 - TCP/IP—allows administrator to assign an IP address or enable DHCP
 - Provisioning Server—allows administrator to assign IP address of provisioning server
 - Provision Model—allows administrator to configure either enterprise or SMB mode
 - Set PID and PPS—allows administrator to provide pre-provisioning key (see HP's white paper, *Intel vPro Provisioning*)
 - Un-Provision—allows administrator to reset AMT configuration to factory defaults
 - VLAN—allows administrator to enable LAN virtualization support
 - SOL/IDE-R—allows administrator to enable remote boot and control sessions
- Change MEBx Password (HP highly recommends that this password be changed. The default password is **admin**.)

In order to remotely manage AMT systems, the administrator must use a remote console that supports AMT. Enterprise management consoles are available from suppliers such as HP OpenView (not currently available for Windows Vista), Altiris and Microsoft SMS. In SMB mode, the client provides a Web browser interface. To access this feature, open a browser from any other system on the network and enter `http://host_name:16992` where `host_name` is the name assigned to the system. Alternatively, the IP address may be used in place of the host name.

HP Proactive Change Notification

The Proactive Change Notification program uses the Subscriber's Choice Web site in order to proactively and automatically:

- Send you Proactive Change Notification (PCN) e-mail informing you of hardware and software changes to most commercial computers and servers, up to 60 days in advance
- Send you e-mail containing Customer Bulletins, Customer Advisories, Customer Notes, Security Bulletins, and Driver alerts for most commercial computers and servers

You create your own profile to ensure that you only receive the information relevant to a specific IT environment. To learn more about the Proactive Change Notification program and create a custom profile, visit <http://h30046.www3.hp.com/subhub.php>

Subscriber's Choice

Subscriber's Choice is a client-based service from HP.

Based on your profile, HP will supply you with personalized product tips, feature articles, and/or driver and support alerts/notifications.

Subscriber's Choice Driver and Support Alerts/Notifications will deliver e-mails notifying you that the information you subscribed to in your profile is available for review and retrieval. To learn more about Subscriber's Choice and create a custom profile, visit <http://h30046.www3.hp.com/subhub.php>.

Retired Solutions

Two software packages, Altiris Local Recovery, and Dantz Retrospect, will no longer be shipping on HP business desktops, notebooks, or workstations. Starting with new business desktops, notebooks, and workstations released in 2006, all will ship with HP Backup and Recovery Manager.


ROM Flash

The computer's BIOS is stored in a programmable flash ROM (read only memory). By establishing a setup password in the Computer Setup (F10) Utility, you can protect the ROM from being unintentionally updated or overwritten. This is important to ensure the operating integrity of the computer. Should you need or want to upgrade the BIOS, you may download the latest BIOS images from the HP driver and support page, <http://www.hp.com/support/files>.

- △ **CAUTION:** For maximum ROM protection, be sure to establish a setup password. The setup password prevents unauthorized ROM upgrades. System Software Manager allows the system administrator to set the setup password on one or more PCs simultaneously. For more information, visit <http://www.hp.com/go/ssm>.

Remote ROM Flash

Remote ROM Flash allows the system administrator to safely upgrade the BIOS on remote HP computers directly from the centralized network management console. Enabling the system administrator to perform this task remotely on multiple computers results in a consistent deployment of, and greater control over, HP PC BIOS images over the network. It also results in greater productivity and lower total cost of ownership.

-  **NOTE:** SSM does not currently support remote ROM flash on systems that have Windows Vista BitLocker enabled and are using TPM measurements to protect the BitLocker keys because flashing the BIOS would invalidate the trust signature that BitLocker created for the platform. Disable BitLocker via Group Policy in order to flash the system BIOS.

The computer must be powered on, or turned on through Remote Wakeup, to take advantage of Remote ROM Flash.

For more information on Remote ROM Flash, refer to the HP Client Manager Software or System Software Manager at <http://www.hp.com/go/ssm/>.

HPQFlash

The HPQFlash utility is used to locally update or restore the system BIOS of individual PCs from a Windows operating system.

For more information on HPQFlash, visit <http://www.hp.com/support/files> and enter the model number of the computer when prompted.

Boot Block Emergency Recovery Mode

Boot Block Emergency Recovery Mode permits system recovery in the unlikely event of a ROM flash failure. For example, if a power failure were to occur during a BIOS upgrade, the ROM flash would be


incomplete. This would render the system BIOS unusable. The Boot Block is a flash-protected section of the ROM that contains code that checks for a valid system BIOS image when the system is turned on.

- If the system BIOS image is valid, the system starts normally.
- If the system BIOS image is not valid, a failsafe Boot Block BIOS provides enough support to search removable media for BIOS image files. If an appropriate BIOS image file is found, it is automatically flashed into the ROM.

When an invalid system BIOS image is detected, the system power LED will blink red 8 times, one blink every second. Simultaneously, the speaker will beep 8 times. If the portion of the system ROM containing the video option ROM image is not corrupt, **Boot Block Emergency Recovery Mode** will be displayed on the screen.

To recover the system after it enters Boot Block Emergency Recovery Mode, complete the following steps:

1. Turn off the power.
2. Insert a CD or USB flash device containing the desired BIOS image file in the root directory.


 **NOTE:** The media must be formatted using the FAT12, FAT16, or FAT32 file system.

3. Turn on the computer.

If no appropriate BIOS image is found, you will be prompted to insert media containing a BIOS image file.


If the system successfully reprograms the ROM, the system will automatically power off.

4. Remove the removable media used to upgrade the BIOS.
5. Turn the power on to restart the computer.

 **NOTE:** BitLocker prevents Windows Vista from booting when a CD containing the BIOS image file is in an optical drive. If BitLocker is enabled, remove this CD before attempting to boot to Windows Vista.

Replicating the Setup


The following procedures give an administrator the ability to easily copy one setup configuration to other computers of the same model. This allows for faster, more consistent configuration of multiple computers.

 **NOTE:** Both procedures require a diskette drive or a supported USB flash media device, such as an HP Drive Key.

Copying to Single Computer

△ **CAUTION:** A setup configuration is model-specific. File system corruption may result if source and target computers are not the same model. For example, do not copy the setup configuration from a dc7xxx PC to a dx7xxx PC.


1. Select a setup configuration to copy. Turn off the computer. If you are in Windows, click **Start > Shut Down > Shut Down**.
2. If you are using a USB flash media device, insert it now.

3. Turn on the computer.
 4. As soon as the computer is turned on, press **F10** when the monitor light turns green to enter Computer Setup. Press **Enter** to bypass the title screen, if necessary.
-
-  **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.
-
5. If you are using a diskette, insert it now.
 6. Click **File > Replicated Setup > Save to Removable Media**. Follow the instructions on the screen to create the configuration diskette or USB flash media device.
 7. Turn off the computer to be configured and insert the configuration diskette or USB flash media device.
 8. Turn on the computer to be configured.
 9. As soon as the computer is turned on, press **F10** when the monitor light turns green to enter Computer Setup. Press **Enter** to bypass the title screen, if necessary.
 10. Click **File > Replicated Setup > Restore from Removable Media**, and follow the instructions on the screen.
 11. Restart the computer when the configuration is complete.

Copying to Multiple Computers

- △ **CAUTION:** A setup configuration is model-specific. File system corruption may result if source and target computers are not the same model. For example, do not copy the setup configuration from a dc7xxx PC to a dx7xxx PC.


This method takes a little longer to prepare the configuration diskette or USB flash media device, but copying the configuration to target computers is significantly faster.

-  **NOTE:** A bootable diskette is required for this procedure or to create a bootable USB flash media device. If Windows XP is not available to use to create a bootable diskette, use the method for copying to a single computer instead (see [Copying to Single Computer on page 30](#)).

1. Create a bootable diskette or USB flash media device. See [Supported USB Flash Media Device on page 32](#) or [Unsupported USB Flash Media Device on page 33](#).

- △ **CAUTION:** Not all computers can be booted from a USB flash media device. If the default boot order in the Computer Setup (F10) Utility lists the USB device before the hard drive, the computer can be booted from a USB flash media device. Otherwise, a bootable diskette must be used.

2. Select a setup configuration to copy. Turn off the computer. If you are in Windows, click **Start > Shut Down > Shut Down**.
3. If you are using a USB flash media device, insert it now.
4. Turn on the computer.
5. As soon as the computer is turned on, press **F10** when the monitor light turns green to enter Computer Setup. Press **Enter** to bypass the title screen, if necessary.

-  **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.

6. If you are using a diskette, insert it now.
7. Click **File > Replicated Setup > Save to Removable Media**. Follow the instructions on the screen to create the configuration diskette or USB flash media device.
8. Download a BIOS utility for replicating setup (repset.exe) and copy it onto the configuration diskette or USB flash media device. To obtain this utility, go to <http://welcome.hp.com/country/us/en/support.html> and enter the model number of the computer.
9. On the configuration diskette or USB flash media device, create an autoexec.bat file containing the following command:

`repset.exe`
10. Turn off the computer to be configured. Insert the configuration diskette or USB flash media device and turn the computer on. The configuration utility will run automatically.
11. Restart the computer when the configuration is complete.

Creating a Bootable Device

Supported USB Flash Media Device

Supported devices have a preinstalled image to simplify the process of making them bootable. All HP or Compaq and most other USB flash media devices have this preinstalled image. If the USB flash media device being used does not have this image, use the procedure later in this section (see [Unsupported USB Flash Media Device on page 33](#)).

To create a bootable USB flash media device, you must have:

- a supported USB flash media device
- a bootable DOS diskette with the FDISK and SYS programs (If SYS is not available, FORMAT may be used, but all existing files on the USB flash media device will be lost.)
- a PC that is bootable from a USB flash media device

△ **CAUTION:** Some older PCs may not be bootable from a USB flash media device. If the default boot order in the Computer Setup (F10) Utility lists the USB device before the hard drive, the computer can be booted from a USB flash media device. Otherwise, a bootable diskette must be used.

1. Turn off the computer.
2. Insert the USB flash media device into one of the computer's USB ports and remove all other USB storage devices except USB diskette drives.
3. Insert a bootable DOS diskette with FDISK.COM and either SYS.COM or FORMAT.COM into a diskette drive and turn on the computer to boot to the DOS diskette.
4. Run FDISK from the **A:** prompt by typing `FDISK` and pressing Enter. If prompted, click **Yes (Y)** to enable large disk support.
5. Enter Choice [5] to display the drives in the system. The USB flash media device will be the drive that closely matches the size of one of the drives listed. It will usually be the last drive in the list. Note the letter of the drive.

USB flash media device drive: _____

△ **CAUTION:** If a drive does not match the USB flash media device, do not proceed. Data loss can occur. Check all USB ports for additional storage devices. If any are found, remove them, reboot the computer, and proceed from step 4. If none are found, either the system does not support the USB flash media device or the USB flash media device is defective. DO NOT proceed in attempting to make the USB flash media device bootable.

6. Exit FDISK by pressing the **Esc** key to return to the **A:** prompt.
7. If your bootable DOS diskette contains SYS.COM, go to step 8. Otherwise, go to step 9.
8. At the **A:** prompt, enter `SYS x:` where x represents the drive letter noted above.

△ **CAUTION:** Be sure that you have entered the correct drive letter for the USB flash media device.


After the system files have been transferred, SYS will return to the **A:** prompt. Go to step 13.

9. Copy any files you want to keep from your USB flash media device to a temporary directory on another drive (for example, the system's internal hard drive).
10. At the **A:** prompt, enter `FORMAT /S x:` where x represents the drive letter noted before.

△ **CAUTION:** Be sure that you have entered the correct drive letter for the USB flash media device.

FORMAT will display one or more warnings and ask you each time whether you want to proceed. Enter **Y** each time. FORMAT will format the USB flash media device, add the system files, and ask for a Volume Label.

11. Press **Enter** for no label or enter one if desired.
12. Copy any files you saved in step 9 back to your USB flash media device.
13. Remove the diskette and reboot the computer. The computer will boot to the USB flash media device as drive C.

 **NOTE:** The default boot order varies from computer to computer, and it can be changed in the Computer Setup (F10) Utility.

If you have used a DOS version from Windows 9x, you may see a brief Windows logo screen. If you do not want this screen, add a zero-length file named LOGO.SYS to the root directory of the USB flash media device.

Return to [Copying to Multiple Computers on page 31](#).

Unsupported USB Flash Media Device

To create a bootable USB flash media device, you must have:


- a USB flash media device
- a bootable DOS diskette with the FDISK and SYS programs (If SYS is not available, FORMAT may be used, but all existing files on the USB flash media device will be lost.)
- a PC that is bootable from a USB flash media device

△ **CAUTION:** Some older PCs may not be bootable from a USB flash media device. If the default boot order in the Computer Setup (F10) Utility lists the USB device before the hard drive, the computer can be booted from a USB flash media device. Otherwise, a bootable diskette must be used.

1. If there are any PCI cards in the system that have SCSI, ATA RAID or SATA drives attached, turn off the computer and unplug the power cord.

△ **CAUTION:** The power cord **MUST** be unplugged.


2. Open the computer and remove the PCI cards.
3. Insert the USB flash media device into one of the computer's USB ports and remove all other USB storage devices except USB diskette drives. Close the computer cover.
4. Plug in the power cord and turn on the computer.
5. As soon as the computer is turned on, press **F10** when the monitor light turns green to enter Computer Setup. Press **Enter** to bypass the title screen, if necessary.

 **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.

6. Go to **Advanced > PCI Devices** to disable both the PATA and SATA controllers. When disabling the SATA controller, note the IRQ to which the controller is assigned. You will need to reassign the IRQ later. Exit setup, confirming the changes.

SATA IRQ: _____

7. Insert a bootable DOS diskette with FDISK.COM and either SYS.COM or FORMAT.COM into a diskette drive and turn on the computer to boot to the DOS diskette.
8. Run FDISK and delete any existing partitions on the USB flash media device. Create a new partition and mark it active. Exit FDISK by pressing the **Esc** key.
9. If the system did not automatically restart when exiting FDISK, press **Ctrl+Alt+Del** to reboot to the DOS diskette.
10. At the **A:** prompt, type `FORMAT C: /S` and press **Enter**. Format will format the USB flash media device, add the system files, and ask for a Volume Label.
11. Press **Enter** for no label or enter one if desired.
12. Turn off the computer and unplug the power cord. Open the computer and re-install any PCI cards that were previously removed. Close the computer cover.
13. Plug in the power cord, remove the diskette, and turn on the computer.
14. As soon as the computer is turned on, press **F10** when the monitor light turns green to enter Computer Setup. Press **Enter** to bypass the title screen, if necessary.
15. Go to **Advanced > PCI Devices** and re-enable the PATA and SATA controllers that were disabled in step 6. Put the SATA controller on its original IRQ.
16. Save the changes and exit. The computer will boot to the USB flash media device as drive C.

 **NOTE:** The default boot order varies from computer to computer, and it can be changed in the Computer Setup (F10) Utility. Refer to the *Computer Setup (F10) Utility Guide* on the *Documentation and Diagnostics CD* for instructions.

If you have used a DOS version from Windows 9x, you may see a brief Windows logo screen. If you do not want this screen, add a zero-length file named LOGO.SYS to the root directory of the USB flash media device.

Return to [Copying to Multiple Computers on page 31](#).

Dual-State Power Button

With Advanced Configuration and Power Interface (ACPI) enabled, the power button can function either as an on/off switch or as a standby button. The standby feature does not completely turn off power, but instead causes the computer to enter a low-power standby state. This allows you to power down quickly without closing applications and to return quickly to the same operational state without any data loss.

To change the power button's configuration, complete the following steps:

1. Left click on the **Start Button**, then select **Control Panel > Power Options**.
2. In the **Power Options Properties**, select the **Advanced** tab.
3. In the **Power Button** section, select **Stand by**.

After configuring the power button to function as a standby button, press the power button to put the system in a very low power state (standby). Press the button again to quickly bring the system out of standby to full power status. To completely turn off all power to the system, press and hold the power button for four seconds.

△ **CAUTION:** Do not use the power button to turn off the computer unless the system is not responding; turning off the power without operating system interaction could cause damage to or loss of data on the hard drive.

HP Web Site Support

HP engineers rigorously test and debug software developed by HP and third-party suppliers, and develop operating system specific support software, to ensure performance, compatibility, and reliability for HP computers.

When making the transition to new or revised operating systems, it is important to implement the support software designed for that operating system. If you plan to run a version of Microsoft Windows that is different from the version included with the computer, you must install corresponding device drivers and utilities to ensure that all features are supported and functioning properly.

HP has made the task of locating, accessing, evaluating, and installing the latest support software easier. You can download the software from <http://www.hp.com/support>.

The Web site contains the latest device drivers, utilities, and flashable ROM images needed to run the latest Microsoft Windows operating system on the HP computer.

Industry Standards


HP management solutions integrate with other systems management applications, and are based on industry standards, such as:

- Web-Based Enterprise Management (WBEM)
- Windows Management Interface (WMI)
- Wake on LAN Technology
- ACPI
- SMBIOS
- Pre-boot Execution (PXE) support

Asset Tracking and Security

Asset tracking features incorporated into the computer provide key asset tracking data that can be managed using HP Systems Insight Manager, HP Client Manager, HP OpenView PC Configuration Management, OpenView Client Configuration Manager, and Asset Management solutions (not currently available for Windows Vista), or other system management applications. Seamless, automatic integration between asset tracking features and these products enables you to choose the management tool that is best suited to the environment and to leverage the investment in existing tools.

HP also offers several solutions for controlling access to valuable components and information. HP Embedded Security for ProtectTools, if installed, prevents unauthorized access to data and checks system integrity and authenticates third-party users attempting system access. (For more information, refer to the *HP ProtectTools Security Manager Guide* at <http://www.hp.com>.) Security features such as HP Embedded Security for ProtectTools, the Smart Cover Sensor and the Smart Cover Lock, available on some models, help to prevent unauthorized access to the internal components of the personal computer. By disabling parallel, serial, or USB ports, or by disabling removable media boot capability, you can protect valuable data assets. Memory Change and Smart Cover Sensor alerts can be automatically forwarded to system management applications to deliver proactive notification of tampering with a computer's internal components.

 **NOTE:** HP Embedded Security for ProtectTools, the Smart Cover Sensor, and the Smart Cover Lock are available as options on some systems.

Use the following utilities to manage security settings on the HP computer:

- Locally, using the Computer Setup Utilities. See the *Computer Setup (F10) Utility Guide* on the *Documentation and Diagnostics CD* included with the computer for additional information and instructions on using the Computer Setup Utilities. Some computers also have HP BIOS Configuration for ProtectTools, which is a Windows-based component of ProtectTools that allows administrators to configure BIOS security settings from within the running OS.
- Remotely, using HP Client Manager Software, OpenView Client Configuration Manager, or System Software Manager. This software enables the secure, consistent deployment and control of security settings.

The following table and sections refer to managing security features of the computer locally through the Computer Setup (F10) Utilities.

Table 4-1 Security Features Overview

Option	Description
Setup Password	<p>Allows you to set and enable setup (administrator) password.</p> <p>NOTE: If the setup password is set, it is required to change Computer Setup options, flash the ROM, and make changes to certain plug and play settings under Windows.</p> <p>See the <i>Computer Setup (F10) Utility Guide</i> on the <i>Documentation and Diagnostics CD</i> for more information.</p>
Power-On Password	<p>Allows you to set and enable power-on password.</p> <p>See the <i>Computer Setup (F10) Utility Guide</i> on the <i>Documentation and Diagnostics CD</i> for more information.</p>
Password Options (This selection will appear only if a power-on password is set.)	<p>Allows you to specify whether the password is required for warm boot (Ctrl+Alt+Del).</p> <p>See the <i>Computer Setup (F10) Utility Guide</i> on the <i>Documentation and Diagnostics CD</i> for more information.</p>
Pre-Boot Authorization	<p>Allows you to enable/disable the Smart Card to be used in place of the Power-On Password.</p>
Smart Cover	<p>Allows you to:</p> <ul style="list-style-type: none"> • Enable/disable the Cover Lock. • Enable/disable the Cover Removal Sensor. <p>NOTE: <i>Notify User</i> alerts the user that the sensor has detected that the cover has been removed. <i>Setup Password</i> requires that the setup password be entered to boot the computer if the sensor detects that the cover has been removed.</p> <p>This feature is supported on some models only. See the <i>Computer Setup (F10) Utility Guide</i> on the <i>Documentation and Diagnostics CD</i> for more information.</p>
Embedded Security	<p>Allows you to:</p> <ul style="list-style-type: none"> • Enable/disable the Embedded Security device. • Reset the device to Factory Settings. <p>This feature is supported on some models only. See the <i>HP ProtectTools Security Manager Guide</i> at http://www.hp.com</p>
Device Security	<p>Enables/disables serial ports, parallel port, front USB ports, system audio, network controllers (some models), and SCSI controllers (some models).</p>
Network Service Boot	<p>Enables/disables the computer's ability to boot from an operating system installed on a network server. (The network controller must reside on the PCI bus or be embedded on the system board.)</p>
System IDs	<p>Allows you to set:</p> <ul style="list-style-type: none"> • Asset tag (18-byte identifier) and ownership Tag (80-byte identifier displayed during POST). See the <i>Computer Setup (F10) Utility Guide</i> on the <i>Documentation and Diagnostics CD</i> for more information. • Chassis serial number or Universal Unique Identifier (UUID) number. The UUID can only be updated if the current chassis serial number is invalid. (These ID numbers are normally set in the factory and are used to uniquely identify the system.)

Table 4-1 Security Features Overview (continued)

Option	Description
	Keyboard locale setting (for example, English or German) for System ID entry.
DriveLock (some models)	<p>Allows you to assign or modify a master or user password for ATA hard drives. When this feature is enabled, the user is prompted to provide one of the DriveLock passwords during POST. If neither is successfully entered, the hard drive will remain inaccessible until one of the passwords is successfully provided during a subsequent cold-boot sequence.</p> <p>NOTE: This selection will only appear when at least one ATA drive that supports the ATA Security command set is attached to the system.</p> <p>See the <i>Computer Setup (F10) Utility Guide</i> on the <i>Documentation and Diagnostics CD</i> for more information.</p>
For more information about Computer Setup, see the <i>Computer Setup (F10) Utility Guide</i> on the <i>Documentation and Diagnostics CD</i> .	
Support for security features may vary depending on the specific computer configuration.	

Password Security


The power-on password prevents unauthorized use of the computer by requiring entry of a password to access applications or data each time the computer is turned on or restarted. The setup password specifically prevents unauthorized access to Computer Setup, and can also be used as an override to the power-on password. That is, when prompted for the power-on password, entering the setup password instead will allow access to the computer.

A network-wide setup password can be established to enable the system administrator to log in to all network systems to perform maintenance without having to know the power-on password, even if one has been established.

Establishing a Setup Password Using Computer Setup

If the system is equipped with an embedded security device, refer to the *HP ProtectTools Security Manager Guide* at <http://www.hp.com>. Establishing a setup password through Computer Setup prevents reconfiguration of the computer (use of the Computer Setup (F10) utility) until the password is entered.

1. Turn on or restart the computer. If you are in Windows, click **Start > Shut Down > Restart**.
2. As soon as the computer is turned on, press **F10** when the monitor light turns green to enter Computer Setup. Press **Enter** to bypass the title screen, if necessary.

 **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. Select **Security**, then select **Setup Password** and follow the instructions on the screen.
4. Before exiting, click **File > Save Changes and Exit**.

Establishing a Power-On Password Using Computer Setup

Establishing a power-on password through Computer Setup prevents access to the computer when power is turned on, unless the password is entered. When a power-on password is set, Computer Setup presents **Password Options** under the **Security** menu. Password options include **Password Prompt**

on Warm Boot. When **Password Prompt on Warm Boot** is enabled, the password must also be entered each time the computer is rebooted.

1. Turn on or restart the computer. If you are in Windows, click **Start > Shut Down > Restart**.
2. As soon as the computer is turned on, press **F10** when the monitor light turns green to enter Computer Setup. Press **Enter** to bypass the title screen, if necessary.


 **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. Select **Security**, then **Power-On Password** and follow the instructions on the screen.
4. Before exiting, click **File > Save Changes and Exit**.

Entering a Power-On Password

To enter a power-on password, complete the following steps:

1. Turn on or restart the computer. If you are in Windows, click **Start > Shut Down > Restart the Computer**.
2. When the key icon appears on the monitor, type the current password, then press **Enter**.

 **NOTE:** Type carefully; for security reasons, the characters you type do not appear on the screen.


If you enter the password incorrectly, a broken key icon appears. Try again. After three unsuccessful tries, you must turn off the computer, then turn it on again before you can continue.

Entering a Setup Password


If the system is equipped with an embedded security device, refer to the *HP ProtectTools Security Manager Guide* at <http://www.hp.com>.

If a setup password has been established on the computer, you will be prompted to enter it each time you run Computer Setup.

1. Turn on or restart the computer. If you are in Windows, click **Start > Shut Down > Restart**.
2. As soon as the computer is turned on, press **F10** when the monitor light turns green to enter Computer Setup. Press **Enter** to bypass the title screen, if necessary.

 **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. When the key icon appears on the monitor, type the setup password, then press **Enter**.

 **NOTE:** Type carefully; for security reasons, the characters you type do not appear on the screen.

If you enter the password incorrectly, a broken key icon appears. Try again. After three unsuccessful tries, you must turn off the computer, then turn it on again before you can continue.


Changing a Power-On or Setup Password

If the system is equipped with an embedded security device, refer to the *HP ProtectTools Security Manager Guide* at <http://www.hp.com>.


1. Turn on or restart the computer. If you are in Windows, click **Start > Shut Down > Restart the Computer**.

2. To change the Power-On password, go to step 3.

To change the Setup password, as soon as the computer is turned on, press **F10** when the monitor light turns green to enter Computer Setup. Press **Enter** to bypass the title screen, if necessary.


 **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. When the key icon appears, type the current password, a slash (/) or alternate delimiter character, the new password, another slash (/) or alternate delimiter character, and the new password again as shown: `current password/new password/new password`

 **NOTE:** Type carefully; for security reasons, the characters you type do not appear on the screen.

4. Press **Enter**.

The new password takes effect the next time you turn on the computer.

 **NOTE:** Refer to the [National Keyboard Delimiter Characters on page 41](#) for information about the alternate delimiter characters. The power-on password and setup password may also be changed using the Security options in Computer Setup.


Deleting a Power-On or Setup Password

If the system is equipped with an embedded security device, refer to the *HP ProtectTools Security Manager Guide* at <http://www.hp.com>.

1. Turn on or restart the computer. If you are in Windows, click **Start > Shut Down > Restart the Computer**.


2. To delete the Power-On password, go to step 3.

To delete the Setup password, as soon as the computer is turned on, press **F10** when the monitor light turns green to enter Computer Setup. Press **Enter** to bypass the title screen, if necessary.

 **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. When the key icon appears, type the current password followed by a slash (/) or alternate delimiter character as shown: `current password/`

4. Press **Enter**.

 **NOTE:** Refer to [National Keyboard Delimiter Characters on page 41](#) for information about the alternate delimiter characters. The power-on password and setup password may also be changed using the Security options in Computer Setup.

National Keyboard Delimiter Characters

Each keyboard is designed to meet country-specific requirements. The syntax and keys that you use to change or delete the password depend on the keyboard that came with the computer.

National Keyboard Delimiter Characters					
/	Arabic	-	Greek	/	Russian
=	Belgian	.	Hebrew	-	Slovakian
-	BHCSY*	-	Hungarian	-	Spanish
/	Brazilian	-	Italian	/	Swedish/Finnish
/	Chinese	/	Japanese	-	Swiss
-	Czech	/	Korean	/	Taiwanese
-	Danish	-	Latin American	/	Thai
!	French	-	Norwegian	.	Turkish
é	French Canadian	-	Polish	/	U.S. English
-	German	-	Portuguese		
* For Bosnia-Herzegovina, Croatia, Slovenia, and Yugoslavia					

Clearing Passwords

If you forget the password, you cannot access the computer. Refer to the *Troubleshooting Guide* on the *Documentation and Diagnostics CD* for instructions on clearing passwords.

If the system is equipped with an embedded security device, refer to the *HP ProtectTools Security Manager Guide* at <http://www.hp.com>.

DriveLock

DriveLock is an industry-standard security feature that prevents unauthorized access to the data on ATA hard. DriveLock has been implemented as an extension to Computer Setup. It is only available when hard drives that support the ATA Security command set are detected. DriveLock is intended for HP customers for whom data security is the paramount concern. For such customers, the cost of the hard drive and the loss of the data stored on it is inconsequential when compared with the damage that could result from unauthorized access to its contents. In order to balance this level of security with the practical need to accommodate a forgotten password, the HP implementation of DriveLock employs a two-password security scheme. One password is intended to be set and used by a system administrator while the other is typically set and used by the end-user. There is no "back-door" that can be used to unlock the drive if both passwords are lost. Therefore, DriveLock is most safely used when the data contained on the hard drive is replicated on a corporate information system or is regularly backed up. In the event that both DriveLock passwords are lost, the hard drive is rendered unusable. For users who do not fit the previously defined customer profile, this may be an unacceptable risk. For users who do fit the customer profile, it may be a tolerable risk given the nature of the data stored on the hard drive.

Using DriveLock

When one or more hard drives that support the ATA Security command set are detected, the DriveLock option appears under the Security menu in Computer Setup. The user is presented with options to set the master password or to enable DriveLock. A user password must be provided in order to enable

DriveLock. Since the initial configuration of DriveLock is typically performed by a system administrator, a master password should be set first. HP encourages system administrators to set a master password whether they plan to enable DriveLock or keep it disabled. This will give the administrator the ability to modify DriveLock settings if the drive is locked in the future. Once the master password is set, the system administrator may enable DriveLock or choose to keep it disabled.

If a locked hard drive is present, POST will require a password to unlock the device. If a power-on password is set and it matches the device's user password, POST will not prompt the user to re-enter the password. Otherwise, the user will be prompted to enter a DriveLock password. On a cold boot, either the master or the user password may be used. On a warm boot, enter the same password used to unlock the drive during the preceding cold-boot. Users will have two attempts to enter a correct password. On a cold boot, if neither attempt succeeds, POST will continue but the drive will remain inaccessible. On a warm boot or restart from Windows, if neither attempt succeeds, POST will halt and the user will be instructed to cycle power.

DriveLock Applications

The most practical use of the DriveLock security feature is in a corporate environment. The system administrator would be responsible for configuring the hard drive which would involve, among other things, setting the DriveLock master password and a temporary user password. In the event that the user forgets the user password or the equipment is passed on to another employee, the master password can always be used to reset the user password and regain access to the hard drive.

HP recommends that corporate system administrators who choose to enable DriveLock also establish a corporate policy for setting and maintaining master passwords. This should be done to prevent a situation where an employee intentionally or unintentionally sets both DriveLock passwords before leaving the company. In such a scenario, the hard drive would be rendered unusable and require replacement. Likewise, by not setting a master password, system administrators may find themselves locked out of a hard drive and unable to perform routine checks for unauthorized software, other asset control functions, and support.

For users with less stringent security requirements, HP does not recommend enabling DriveLock. Users in this category include personal users or users who do not maintain sensitive data on their hard drives as a common practice. For these users, the potential loss of a hard drive resulting from forgetting both passwords is much greater than the value of the data DriveLock has been designed to protect. Access to Computer Setup and DriveLock can be restricted through the Setup password. By specifying a Setup password and not giving it to end users, system administrators are able to restrict users from enabling DriveLock.

Smart Cover Sensor

CoverRemoval Sensor, available on some models, is a combination of hardware and software technology that can alert you when the computer cover or side panel has been removed. There are three levels of protection, as described in the following table.

Table 4-2 Smart Cover Sensor Protection Levels

Level	Setting	Description
Level 0	Disabled	Smart Cover Sensor is disabled (default).
Level 1	Notify User	When the computer is restarted, the screen displays a message indicating that the computer cover or side panel has been removed.


Table 4-2 Smart Cover Sensor Protection Levels (continued)

Level	Setting	Description
Level 2	Setup Password	When the computer is restarted, the screen displays a message indicating that the computer cover or side panel has been removed. You must enter the setup password to continue.

NOTE: These settings can be changed using Computer Setup. For more information about Computer Setup, see the *Computer Setup (F10) Utility Guide* on the *Documentation and Diagnostics CD*.

Setting the Smart Cover Sensor Protection Level


To set the Smart Cover Sensor protection level, complete the following steps:

1. Turn on or restart the computer. If you are in Windows, click **Start > Shut Down > Restart**.
 2. As soon as the computer is turned on, press **F10** when the monitor light turns green to enter Computer Setup. Press **Enter** to bypass the title screen, if necessary.
-  **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. Select **Security > Smart Cover > Cover Removal Sensor**, and select the desired security level.
 4. Before exiting, click **File > Save Changes and Exit**.

Smart Cover Lock


The Smart Cover Lock is a software-controllable cover lock featured on some HP computers. This lock prevents unauthorized access to the internal components. Computers ship with the Smart Cover Lock in the unlocked position.

△ **CAUTION:** For maximum cover lock security, be sure to establish a setup password. The setup password prevents unauthorized access to the Computer Setup utility.

 **NOTE:** The Smart Cover Lock is available as an option on some systems.


Locking the Smart Cover Lock

To activate and lock the Smart Cover Lock, complete the following steps:

1. Turn on or restart the computer. If you are in Windows, click **Start > Shut Down > Restart**.
 2. As soon as the computer is turned on, press **F10** when the monitor light turns green to enter Computer Setup. Press **Enter** to bypass the title screen, if necessary.
-  **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. Select **Security > Smart Cover > Cover Lock > Lock option**.
 4. Before exiting, click **File > Save Changes and Exit**.

Unlocking the Smart Cover Lock

1. Turn on or restart the computer. If you are in Windows, click **Start > Shut Down > Restart**.
2. As soon as the computer is turned on, press **F10** when the monitor light turns green to enter Computer Setup. Press **Enter** to bypass the title screen, if necessary.

 **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. Select **Security > Smart Cover > Cover Lock > Unlock**.
4. Before exiting, click **File > Save Changes and Exit**.

Using the Smart Cover FailSafe Key

If you enable the Smart Cover Lock and cannot enter the password to disable the lock, you will need a Smart Cover FailSafe Key to open the computer cover. You will need the key in any of the following circumstances:

- Power outage
- Startup failure
- PC component failure (such as processor or power supply)
- Forgotten password

△ **CAUTION:** The Smart Cover FailSafe Key is a specialized tool available from HP. Be prepared; order this key before you need one at an authorized reseller or service provider.

To obtain the FailSafe Key, do any one of the following:

- Contact an authorized HP reseller or service provider.
- Call the appropriate number listed in the warranty.

For more information about using the Smart Cover FailSafe Key, consult the *Hardware Reference Guide* on the *Documentation and Diagnostics CD*.


Cable Lock Provision

The rear panel of the computer accommodates a cable lock so that the computer can be physically secured to a work area.

For illustrated instructions, please see the *Hardware Reference Guide* on the *Documentation and Diagnostics CD*.

Fingerprint Identification Technology

Eliminating the need to enter user passwords, HP Fingerprint Identification Technology tightens network security, simplifies the login process, and reduces the costs associated with managing corporate networks. Affordably priced, it is not just for high-tech, high-security organizations anymore.

 **NOTE:** Support for Fingerprint Identification Technology varies by model.

For more information, visit:

<http://h18004.www1.hp.com/products/security/>.

Fault Notification and Recovery

Fault Notification and Recovery features combine innovative hardware and software technology to prevent the loss of critical data and minimize unplanned downtime.

If the computer is connected to a network managed by HP Client Manager, the computer sends a fault notice to the network management application. With HP Client Manager Software, you can also remotely schedule diagnostics to automatically run on all managed PCs and create a summary report of failed tests.

Drive Protection System

The Drive Protection System (DPS) is a diagnostic tool built into the hard drives installed in some HP computers. DPS is designed to help diagnose problems that might result in unwarranted hard drive replacement.

When HP computers are built, each installed hard drive is tested using DPS, and a permanent record of key information is written onto the drive. Each time DPS is run, test results are written to the hard drive. The service provider can use this information to help diagnose conditions that caused you to run the DPS software. Refer to the *Troubleshooting Guide* on the *Documentation and Diagnostics CD* for instructions on using DPS.


Surge-Tolerant Power Supply

An integrated surge-tolerant power supply provides greater reliability when the computer is hit with an unpredictable power surge. This power supply is rated to withstand a power surge of up to 2000 volts without incurring any system downtime or data loss.

Thermal Sensor

The thermal sensor is a hardware and software feature that tracks the internal temperature of the computer. This feature displays a warning message when the normal range is exceeded, which gives you time to take action before internal components are damaged or data is lost.

5 Serial ATA (SATA) Drive Guidelines and Features

 **NOTE:** HP only supports the use of SATA hard drives on these models of computer. No Parallel ATA (PATA) drives are supported.

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 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. See [SATA Data and Power on page 126](#) for the pinout information.

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

6 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 Designations

The following subsection illustrates the dx7400 chassis design.

Microtower (MT)



Small Form Factor (SFF)



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 reheated 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 52](#) 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 52](#) 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 52](#).

When cleaning debris from under the keys, review all rules in [General Cleaning Safety Precautions on page 52](#) 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 52](#).

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 52](#).

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 49](#)
- 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.

7 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.


Preparation for Disassembly

1. Close any open software applications.
2. Exit the operating system.
3. Remove any diskette or compact disc from the computer.
4. Turn off the computer and any peripheral devices that are connected to it.

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

CAUTION: 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.

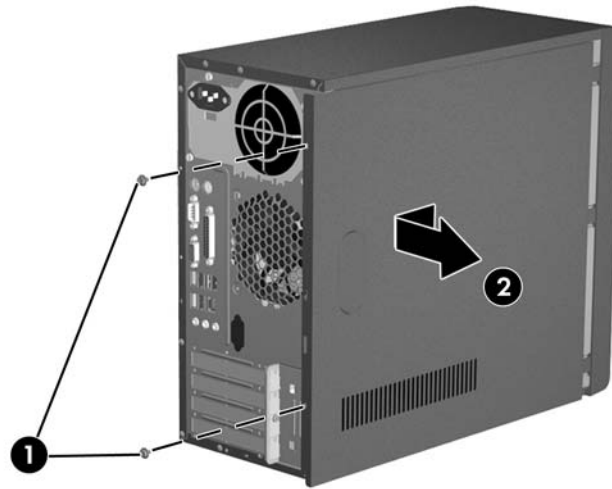
5. Disconnect the power cord from the electrical outlet and then from the computer.
6. Disconnect all peripheral device cables from the computer.

 **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.

Access Panel

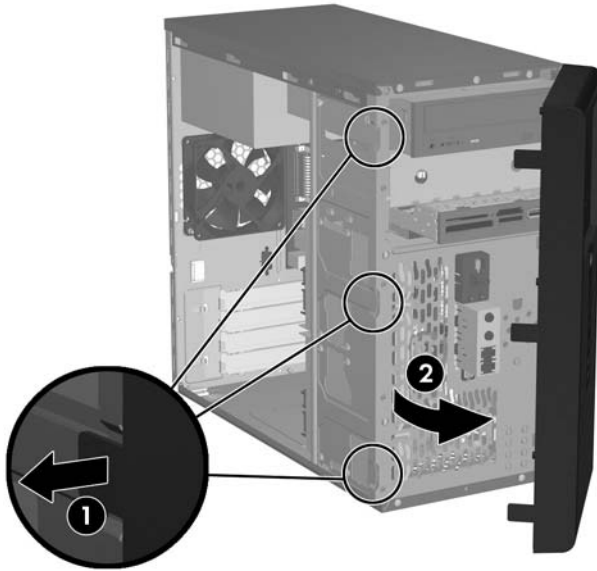
1. Prepare the computer for disassembly ([Preparation for Disassembly on page 56](#)).
2. Remove the two screws that secure the access panel to the computer chassis (1).
3. Slide the access panel back about 1.25 cm (1/2 inch), and then lift it away from and off the unit (2).



To replace the access panel, reverse the removal steps.

Front Bezel

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 56](#)).
2. Remove the access panel ([Access Panel on page 57](#)).
3. Pull outward on all three tabs on the left side of the bezel (1) then rotate the bezel off the chassis (2), beginning with the left side then the right side.



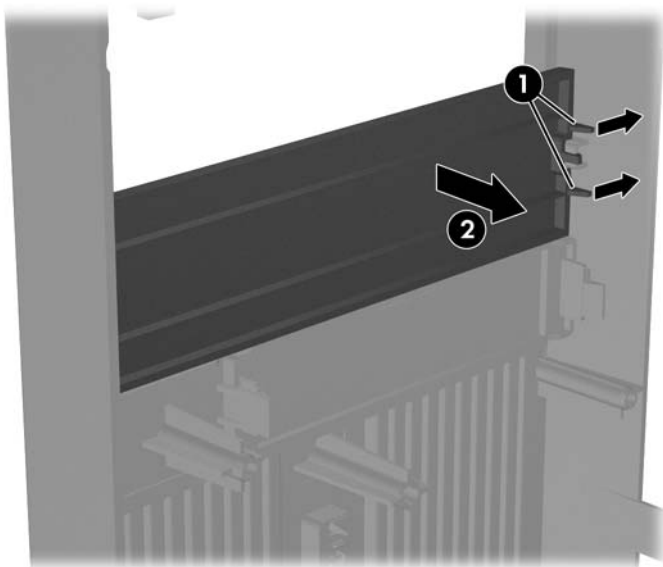
To reinstall the front bezel, reverse the removal procedure.

Bezel Blanks

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 56](#)).
2. Remove the access panel ([Access Panel on page 57](#)).
3. Remove the front bezel ([Front Bezel on page 58](#)).

5.25-inch Drive Bezel Blank

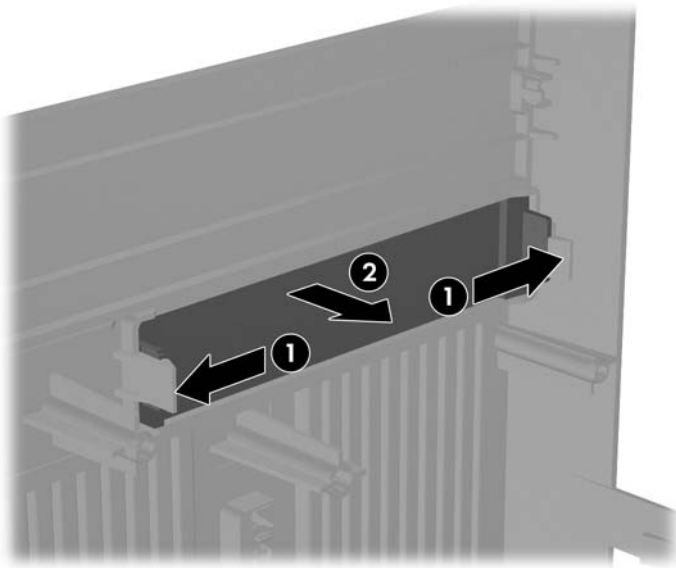
While facing the inside of the front bezel, press the two retaining tabs on the right toward the outer edge of the bezel (1) and pull the bezel blank inward (2) to remove it.




To install a bezel blank, reverse the removal procedure.

3.5-inch Drive Bezel Blank

While facing the inside of the front bezel, press outward on the retaining tabs on each side of the bezel blank (1) and pull the bezel blank inward to remove it.



 **NOTE:** To install a 3.5-inch bezel blank, press the blank inward from the inside of the front bezel so that it snaps into place.

Memory

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

△ **CAUTION:** DDR and DDR2 memory modules are not interchangeable.

DDR2-SDRAM DIMMs

The memory sockets on the system board can be populated with up to two 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 8 GB (4 x 2 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 and unbuffered PC2-6400 800 MHz-compliant
- 1.8 volt DDR2-SDRAM DIMMs

The DDR2-SDRAM DIMMs must also:

- support CAS latency 4 for PC2-5300 667 MHz and PC2-6400 800 MHz
- contain the mandatory JEDEC SPD information

In addition, the computer supports:

- 256Mbit, 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 start if you install unsupported DIMMs.

Installing Memory Modules

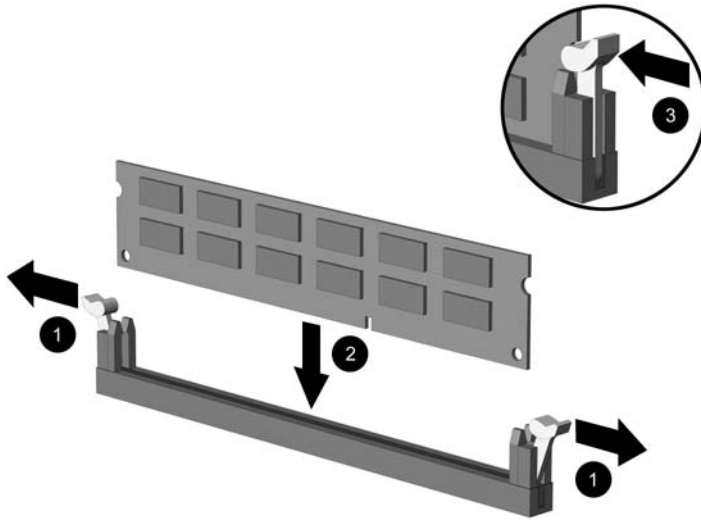
△ **CAUTION:** The memory module sockets have gold metal contacts. When upgrading the memory, it is important to use memory modules with gold metal contacts to prevent corrosion and/or oxidation resulting from having incompatible metals in contact with each other.


CAUTION: 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.

CAUTION: 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 56](#)).
2. Remove the access panel. ([Access Panel on page 57](#))

3. Open both latches of the memory module socket (1), and insert the memory module into the socket (2). Begin by installing a module into the socket nearest the pre-installed module, and install the modules following the numerical order of the sockets.



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

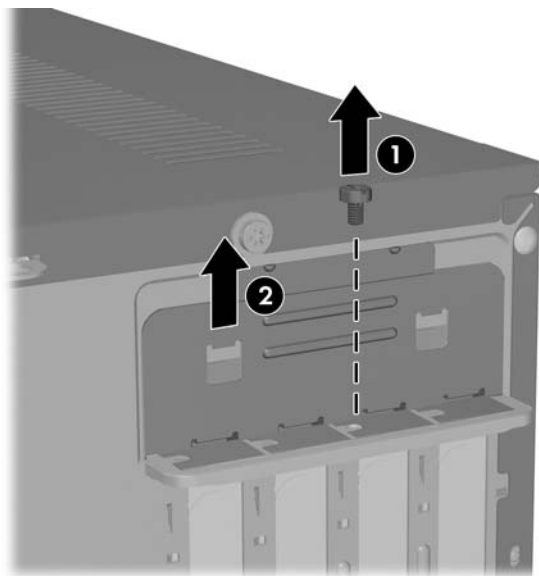
4. Push the module down into the socket, ensuring that the module is fully inserted and properly seated. Make sure the latches are in the closed position (3).
5. Repeat steps 3 and 4 for any additional modules that you want to install.

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.

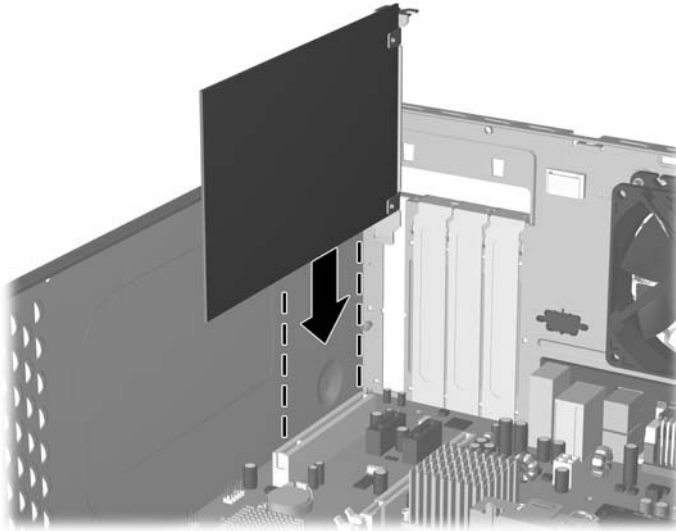
1. Prepare the computer for disassembly ([Preparation for Disassembly on page 56](#)).
2. Remove the access panel. ([Access Panel on page 57](#))
3. On the rear panel of the computer, remove the screw that secures the slot cover lock in place (1) and slide the slot cover lock up and away from the slots to remove it from the computer (2).




4. If you are installing an expansion card for the first time, 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.


Removable Shield	Expansion Card Type
Top shield	PCI Express x16
Second shield	PCI Express x1
Third shield	PCI Express x1
Bottom shield	PCI


5. Hold the expansion 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.

6. While holding the expansion card bracket against the chassis, slide the slot cover lock down toward the expansion card brackets and slot covers to secure them in place then replace the screw that secures the slot cover lock.
7. Connect external cables to the installed card, if needed. Connect internal cables to the system board, if needed.

 **NOTE:** To remove an expansion card, reverse the installation procedure.

 **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.

Cable Management

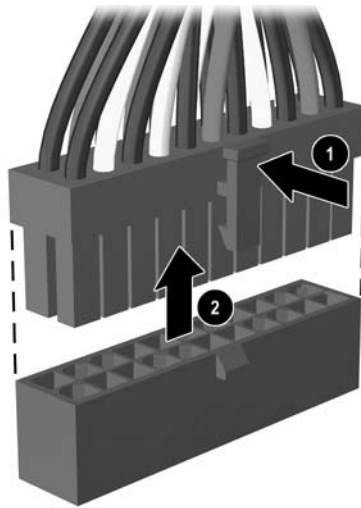
Always follow good cable management practices when working inside the computer.

- 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.
- When folding a flat ribbon cable, never fold to a sharp crease. Sharp creases may damage the wires.
- Some flat ribbon cables come prefolded. 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 cable from the P1 connector 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

Cable	To	Cable Designator
Power Supply	System board, 24-pin	P1
Power Supply	CPU power, 4-pin	P2
Power Supply	Not used	P3
Power Supply	Not used	P4
Power Supply	2nd SATA hard drive	P5
Power Supply	1st SATA hard drive	P6
Power Supply	Diskette drive	P7
Power Supply	1st Optical drive	P8
Power Supply	2nd Optical drive	P9

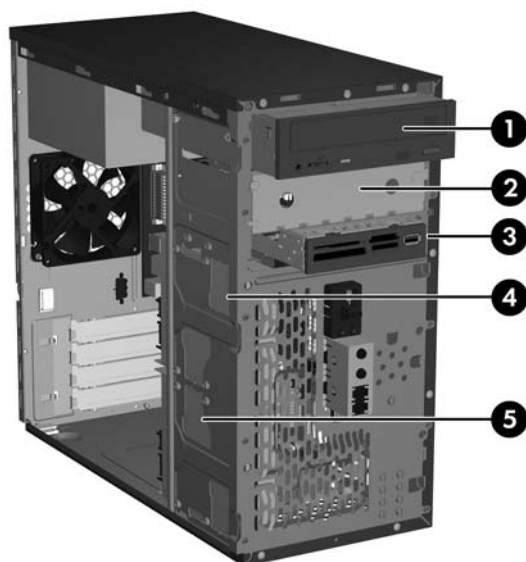
Cable	To	PCA Designator
Power supply, 24-pin	System board	PWR
Power supply, 4-pin	System board	PWRCPU
Diskette drive	System board	FLPY
1st SATA hard drive	System board	SATA1
2nd SATA hard drive	System board	SATA3
Primary ODD	System board	SATA2
Second ODD	System board	SATA4
Heatsink fan	System board	CPUFAN1
Chassis fan	System board	CHFAN1
Front power on button	System board	JFP1
Front I/O USB	System board	IUSB1
Speaker	System board	SPKR
Front audio	System board	AUDIO2
Second Serial Port	System board	COMB
Media Card Reader	System board	IUSB2

Drives

The computer supports up to five drives that may be installed in various configurations.

This section describes the procedure for replacing or upgrading the storage drives. A Torx T-15 screwdriver is needed to remove and install the guide screws on a drive.

Drive Positions

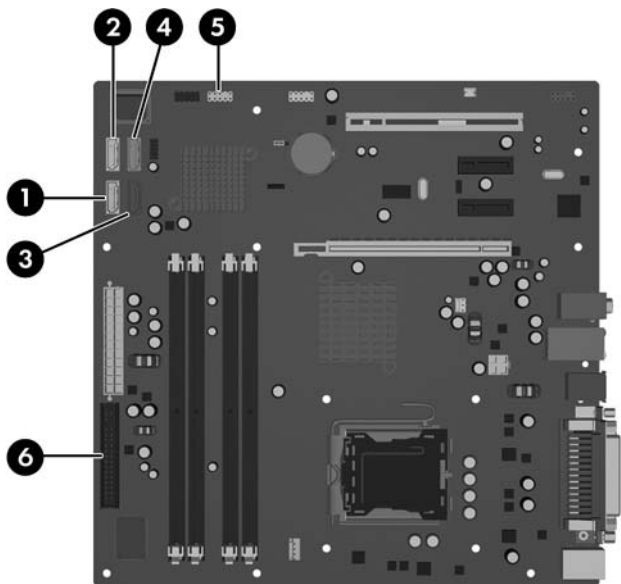


- | | |
|---|---|
| 1 | External 5.25-inch half-height optical drive bay |
| 2 | External 5.25-inch half-height option drive bay |
| 3 | External 3.5-inch option drive bay (media card reader shown) ¹ |
| 4 | Internal 3.5-inch bay for optional secondary hard drive |
| 5 | Internal 3.5-inch bay for primary hard drive |

¹ The external 3.5-inch option drive bay accommodates a diskette drive or a media card reader.

System Board Drive Connections

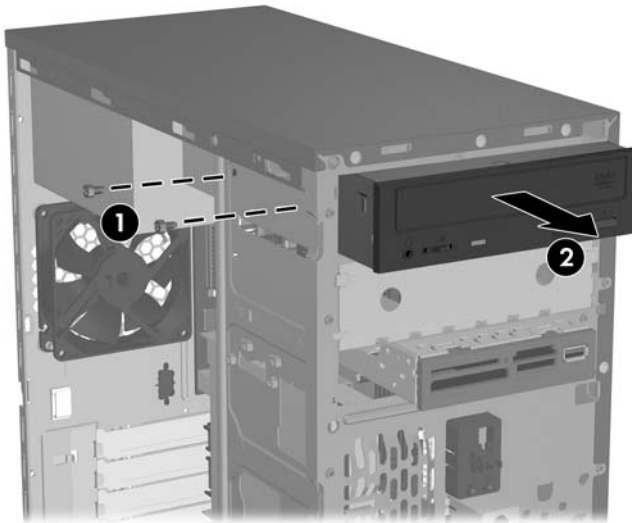
Follow the guidelines in the illustration and table below when connecting drives to the system board.




Drive Configuration	System Board Connectors
1 hard drive	primary hard drive: (1) SATA1
1 optical drive	optical drive: (2) SATA2
1 hard drive	primary hard drive: (1) SATA1
2 optical drives	first optical drive: (2) SATA2
	second optical drive: (4) SATA4
2 hard drives	primary hard drive: (1) SATA1
0 optical drives	secondary hard drive: (2) SATA2
2 hard drives	primary hard drive: (1) SATA1
1 optical drive	secondary hard drive: (3) SATA3
	optical drive: (2) SATA2
2 hard drives	primary hard drive: (1) SATA1
2 optical drives	secondary hard drive: (3) SATA3
	first optical drive: (2) SATA2
	second optical drive: (4) SATA4
media card reader	(5) USB connector (white)
diskette drive	(6) FDD connector (black)

5.25-inch Drive

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 56](#)).
2. Remove the access panel ([Access Panel on page 57](#)).
3. Remove the front bezel ([Front Bezel on page 58](#)).
4. Disconnect the power and data cables from the back of the drive.
5. Remove the two retainer screws that secure the drive to the bay (1), and then slide the drive forward and out of the bay (2).



To install a drive, reverse the removal procedure. Be sure to install a guide screw on the front right side of a new drive. The guide screw helps secure the drive in place.

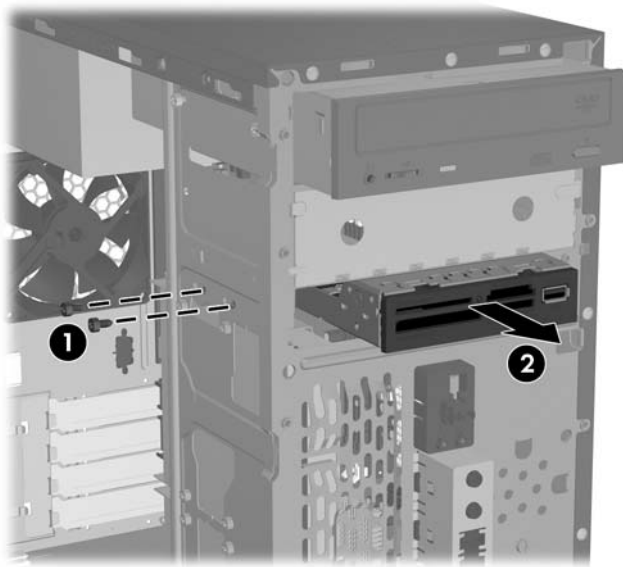
 **NOTE:** If you are installing a drive in the bottom 5.25-inch drive bay, remove the metal shield that covers the bay by pressing inward on the silver tab on the left side of the chassis then pulling the shield out from the front of the chassis.

There are a total of eight extra guide/retainer screws on the front of the chassis behind the bezel. Four have 6-32 standard threads and four have M3 metric threads. Standard screws are used for hard drives and have a silver finish. Metric screws are used for all other drives and have a black finish. Be sure to install the appropriate guide screws into the drive.

3.5-inch Drive


The 3.5-inch external drive bay may be populated with a diskette drive or a media card reader. The removal procedure is the same for both devices.

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 56](#))
2. Remove the access panel ([Access Panel on page 57](#))
3. Remove the front bezel ([Front Bezel on page 58](#))
4. If the device is a media card reader, disconnect the internal USB cable from the system board. If the device is a diskette drive, disconnect the power, and data cables from the back of the drive.
5. Remove the two retainer screws that secure the drive in the bay (1), and then slide the drive forward and out of the bay (2).



To install a drive, reverse the removal procedure. Refer to the table below for proper retainer and guide screw locations.

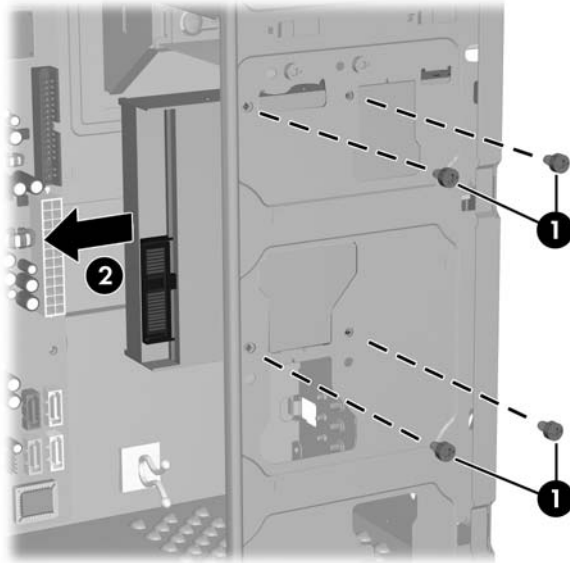
Device	Retainer Screws	Guide Screws
Diskette Drive	2 (labeled "FDD" on chassis)	1 (front left side of drive)
Media Card Reader	2 (labeled "CR" on chassis)	none

 **NOTE:** If you are installing a drive in the external 3.5-inch drive bay for the first time, use a flat blade screwdriver to pry out the metal shield covering the bay.

NOTE: There are a total of eight extra guide/retainer screws on the front of the chassis behind the bezel. Four have Unified Standard (US) #6-32 standard threads and four have M3 metric threads. US screws are used for hard drives and have a silver finish. Metric screws are used for all other drives and have a black finish. Be sure to install the appropriate guide screws into the drive.

3.5-inch Hard Drive

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 56](#)).
2. Remove the access panel ([Access Panel on page 57](#)).
3. Disconnect the power and data cables from the back the drive.
4. Remove the four retaining screws that secure the drive to the bay (1).
5. Slide the drive back and out of the bay (2).

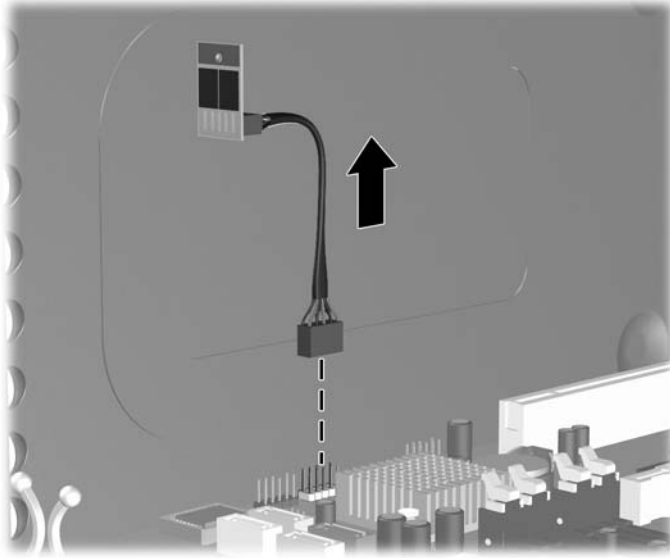


To install a new hard drive, reverse the removal procedure.

ReadyBoost Card

A ReadyBoost card is installed in the computer. The card is secured to the chassis, and a cable connects the card to the system board.

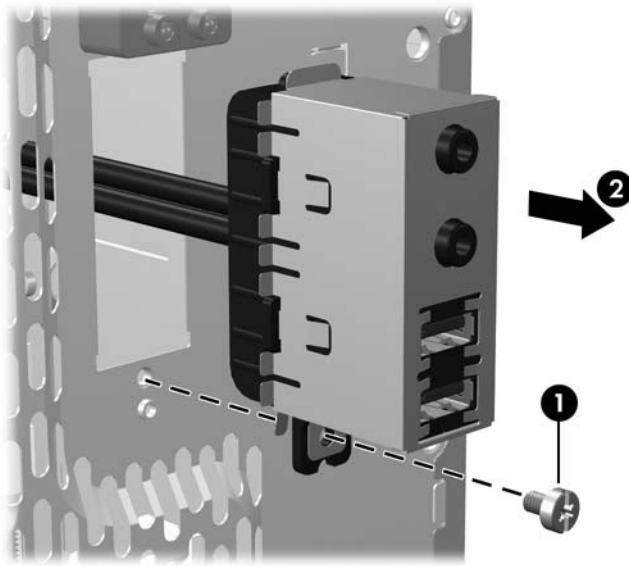
1. Prepare the computer for disassembly ([Preparation for Disassembly on page 56](#)).
2. Remove the access panel ([Access Panel on page 57](#)).
3. Unplug the ReadyBoost cable from the system board, and then lift the card assembly from the chassis.



To install the ReadyBoost card, reverse the removal procedure.

Front I/O Panel Housing Assembly

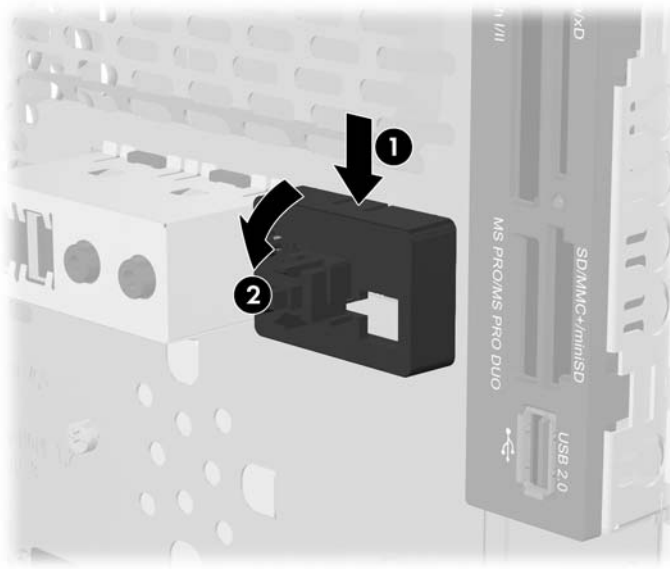
1. Prepare the computer for disassembly ([Preparation for Disassembly on page 56](#)).
2. Remove the access panel and rotate the computer so the system board is parallel to the table to make it easier to work on ([Access Panel on page 57](#)).
3. Remove the front bezel ([Front Bezel on page 58](#)).
4. Free the two cables from the cable tie that is attached to the chassis.
5. Unplug the two cables from the system board.
6. Remove the screw (1) that secures the housing to the chassis, and then rotate the housing toward the top of the chassis and pull the assembly out of the chassis (2) while guiding the cables through the hole in the chassis.



To install the housing assembly, reverse the removal procedures.

Power Switch Assembly

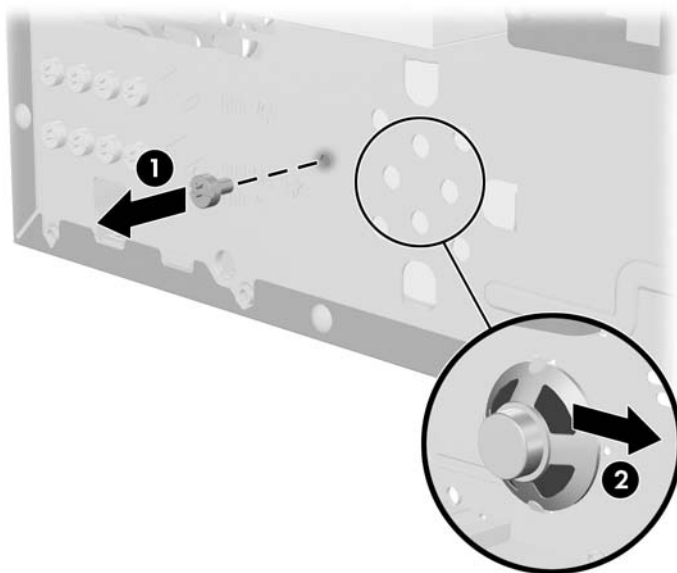
1. Prepare the computer for disassembly ([Preparation for Disassembly on page 56](#)).
2. Remove the access panel ([Access Panel on page 57](#)).
3. Remove the front bezel ([Front Bezel on page 58](#)).
4. Disconnect the braided cables from the system board.
5. Free the braided cables from the cable tie that is attached to the chassis.
6. Press down on the top of the switch holder (1), rotate the switch downward (2), and then pull it away from the chassis while guiding the wires through the hole in the chassis.



To install the power switch assembly, reverse the removal procedures.

Speaker

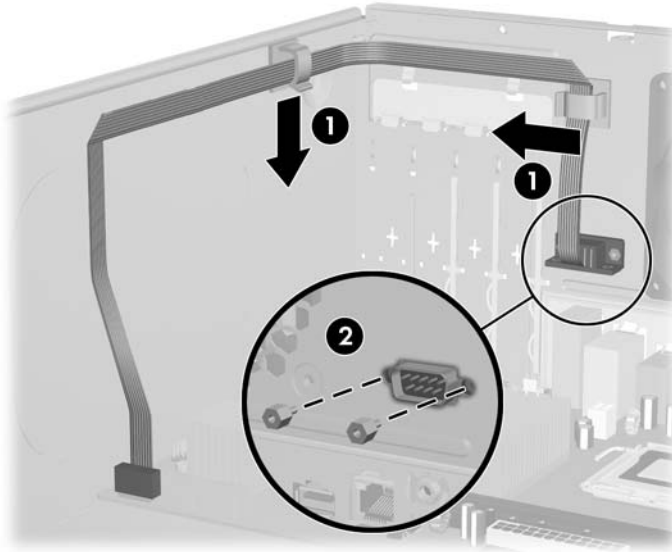
1. Prepare the computer for disassembly ([Preparation for Disassembly on page 56](#)).
2. Remove the access panel ([Access Panel on page 57](#)).
3. Remove the front bezel ([Front Bezel on page 58](#)).
4. Disconnect the speaker cable from the system board.
5. Free the cable from the cable tie that is attached to the chassis.
6. Remove the screw that secures the speaker to the inside of the chassis (1), and then remove the speaker by sliding it toward the bottom of the chassis and out of the retaining clips (2).



To install the speaker, reverse the removal procedure.

Second Serial Port

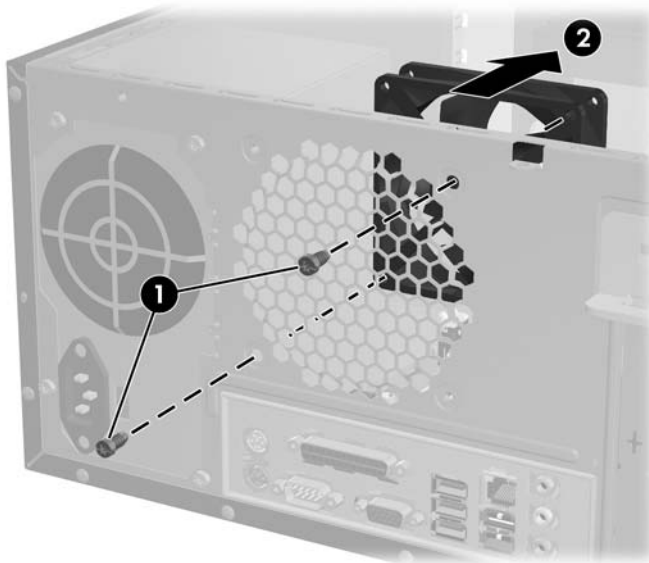
1. Prepare the computer for disassembly ([Preparation for Disassembly on page 56](#)).
2. Remove the access panel ([Access Panel on page 57](#)).
3. Disconnect the serial port cable from the system board.
4. Disconnect the serial port cable from the clip (1) mounted on the inside of the chassis.
5. Remove the two hex nuts from the outside of the chassis that secure the serial port to the chassis (2), and then remove the serial port.



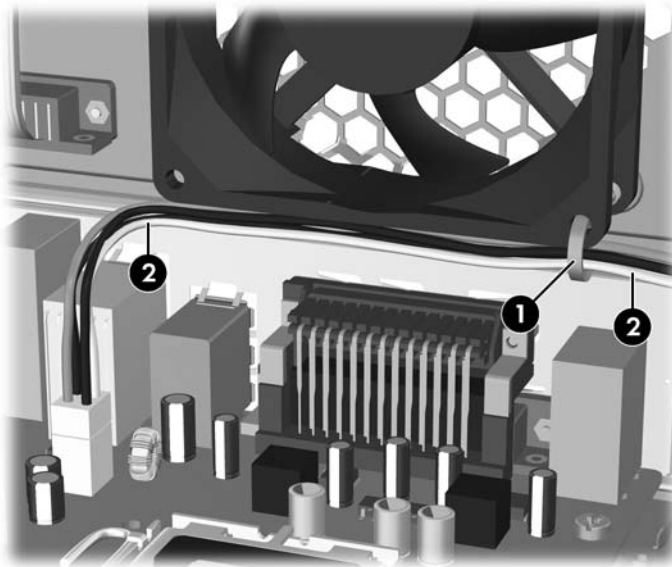
To install the serial port, reverse the removal procedure.

System Fan


1. Prepare the computer for disassembly ([Preparation for Disassembly on page 56](#)).
2. Remove the access panel ([Access Panel on page 57](#)).
3. Disconnect the cable that connects the system fan to the system board.
4. Remove the two screws that secure the fan to the chassis (1), and then remove the fan from the chassis (2).



5. Cut the tie-wrap (1) at the bottom of the fan that secures the CPU power cable (2) to the fan.

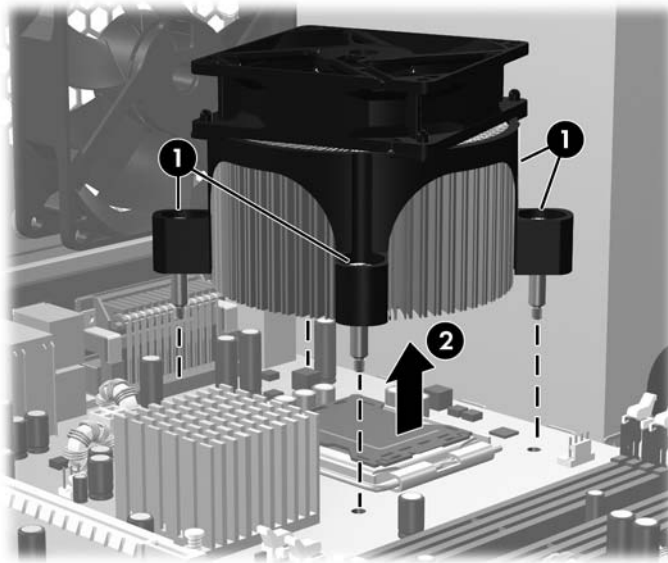


To install the fan, reverse the removal procedures.

 **NOTE:** When installing the fan, the CPU power cable must be plugged into the system board before securing the cable to the bottom of the fan cage. This will ensure that the cable is properly positioned.

Heatsink

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 56](#)).
2. Remove the access panel and lay the computer down on its side to make it easier to work on ([Access Panel on page 57](#)).
3. Disconnect the heatsink control cable from the system board.
4. Loosen the four captive screws that secure the heatsink to the system board (1).
5. Lift the heatsink from the processor (2) and set it on its side to keep from contaminating the work area with thermal grease.



When reinstalling an existing 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. New heatsinks come from the factory with fresh thermal grease already applied.

Position the heatsink so that fan wiring is closest to the power supply. Check to ensure that the heatsink mounting lugs do not rest on any electrical components before tightening the retaining screws.

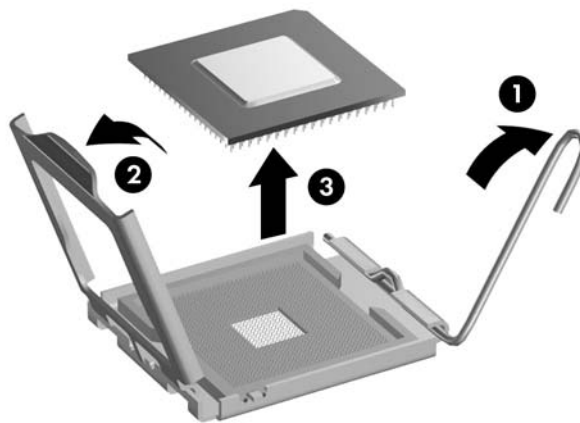
- △ **CAUTION:** Heatsink retaining screws should be tightened in diagonally opposite pairs (as in an X) to evenly seat the heatsink to the processor. This is especially important as the pins on the socket are very fragile and any damage to them may require replacing the system board.

Processor

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 56](#)).
2. Remove the access panel and lay the computer down on its side to make it easier to work on ([Access Panel on page 57](#)).
3. Disconnect the heatsink control cable from the system board and remove the heatsink ([Heatsink on page 78](#)).
4. Rotate the locking lever to its full open position (1).
5. Raise and rotate the microprocessor retainer to its full 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.

CAUTION: 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 6.
3. If reusing the existing heatsink, clean the bottom of the heatsink with the alcohol pad provided in the spares kit.
4. Apply the thermal grease provided in the spares kit to the top of the processor and install the heatsink atop the processor.

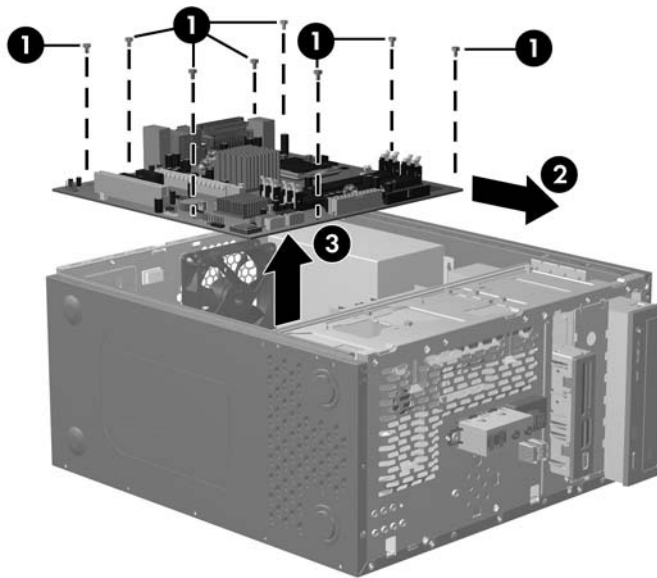
5. Go to step 7.
 6. If using a new heatsink, remove the protective covering from the bottom of the heatsink and place it in position atop the processor.
 7. Secure the heatsink to the system board and system board tray with the 4 captive screws and attach the heatsink control cable to the system board.
- △ **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 ROM BIOS can be found on the Web at: <http://h18000.www1.hp.com/support/files>.
-

System Board


1. Prepare the computer for disassembly ([Preparation for Disassembly on page 56](#)).
2. Remove the access panel ([Access Panel on page 57](#)).
3. Remove the front bezel and lay the computer down on its side to make it easier to work on ([Front Bezel on page 58](#)).
4. Disconnect the power, and data cables from the back of all installed drives.
5. Remove the system fan ([System Fan on page 77](#)).
6. Disconnect all cables from the system board.
7. Remove the heatsink from the system board ([Heatsink on page 78](#)).
8. Remove the eight screws that secure the system board to the chassis (1).

9. Slide the system board toward the front of the chassis (2), and then lift it up and out of the chassis (3).

 **NOTE:** The system board in the computer may look slightly different from the one shown here.




To install the system board, reverse the removal procedure.


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

NOTE: After installing a new 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 ROM BIOS can be found on the Web at: <http://h18000.www1.hp.com/support/files>.

Battery

The battery that comes with your computer provides power to the real-time clock and has a lifetime of about three years. When replacing the battery, use a battery equivalent to the battery originally installed on the computer. The computer comes with a 3-volt lithium coin cell battery.

 **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.

 **WARNING!** This 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/Compaq 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 the *Troubleshooting Guide* for information on backing up the CMOS settings.

📋 **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, its authorized partners, or its agents.

△ **CAUTION:** 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.

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 56](#)).

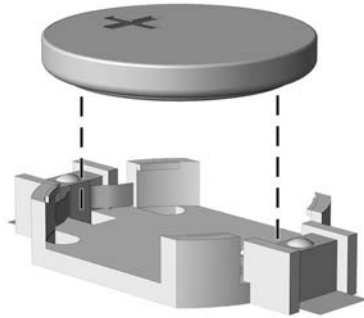
2. Remove the access panel ([Access Panel on page 57](#)).

📋 **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.

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.

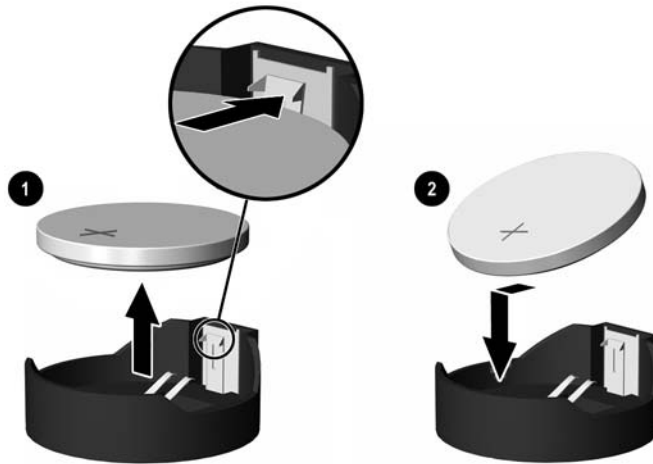
5. Plug in the computer and turn on power to the computer.

6. Reset the date and time, your passwords, and any special system setups, using Computer Setup. Refer to the *Computer Setup (F10) Utility Guide*.

Type 2 Battery Holder

1. To release the battery from its holder, squeeze the metal clamp that extends above one edge of the battery. When the battery pops up, lift it out (1).

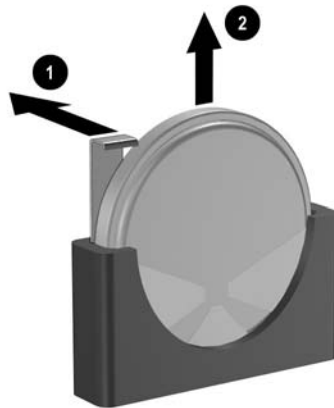
2. To insert the new battery, slide one edge of the replacement battery under the holder's lip with the positive side up (2). Push the other edge down until the clamp snaps over the other edge of the battery.



3. Replace the computer access panel.
4. Plug in the computer and turn on power to the computer.
5. Reset the date and time, your passwords, and any special system setups, using Computer Setup. Refer to the *Computer Setup (F10) Utility Guide*.

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.



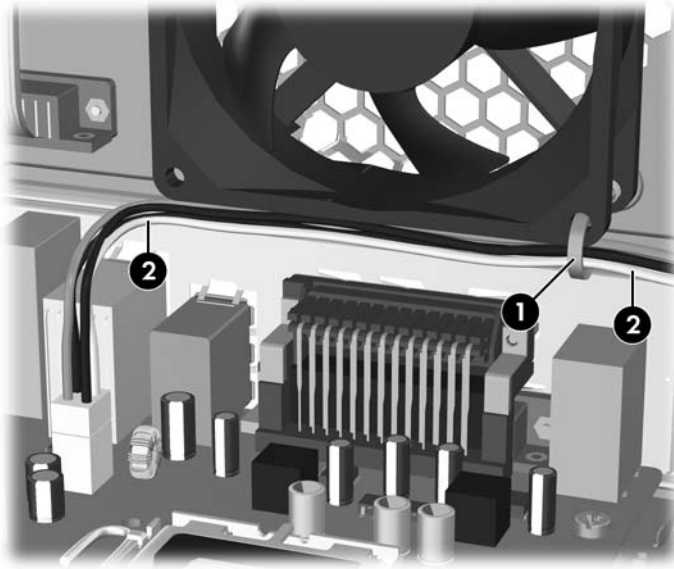
3. Replace the computer access panel.
4. Plug in the computer and turn on power to the computer.
5. Reset the date and time, your passwords, and any special system setups, using Computer Setup. Refer to the *Computer Setup (F10) Utility Guide*.

Power Supply

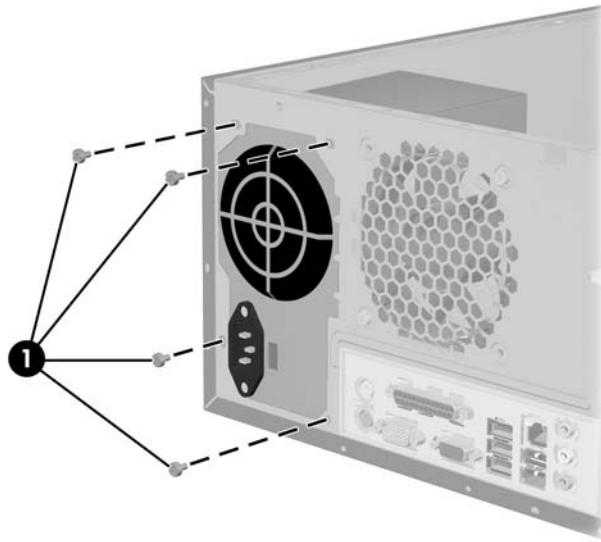
⚠ WARNING! Voltage is always present on the system board when the computer is plugged into an active AC outlet. To avoid possible personal injury and damage to the equipment the power cord should be disconnected from the computer and/or the AC outlet before opening the computer.

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 56](#)).
2. Remove the access panel ([Access Panel on page 57](#)).
3. Disconnect all power cables from the mass storage devices and from the system board.
4. Cut the tie wrap (1) at the bottom of the fan that secures the CPU power cable (2) to the fan cage.

📝 NOTE: If necessary, remove the fan to cut this tie.




5. Remove the four screws (1) that secure the power supply to the chassis.



6. Slide the power supply toward the front of the computer, then lift it out of the computer.


To install the power supply, reverse the removal procedure.

 **NOTE:** When attaching the CPU power cable to the system board, use the tie-wrap provided in the spares kit to secure the cable to the lower right corner of the fan cage. This will prevent the wire bundle from interfering with the system fan blades.

Installing a Security Lock

An optional security lock can be installed on the rear panel of the computer to provide physical computer security.



 **NOTE:** The security lock slot may be in a different location on your computer model.

8 Removal and Replacement Procedures Small Form Factor (SFF) 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.

Preparation for Disassembly

1. Close any open software applications.
2. Exit the operating system.
3. Remove any diskette or compact disc from the computer.
4. 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.

5. Disconnect the power cord from the electrical outlet and then from the computer.
6. Disconnect all peripheral device cables from the computer.

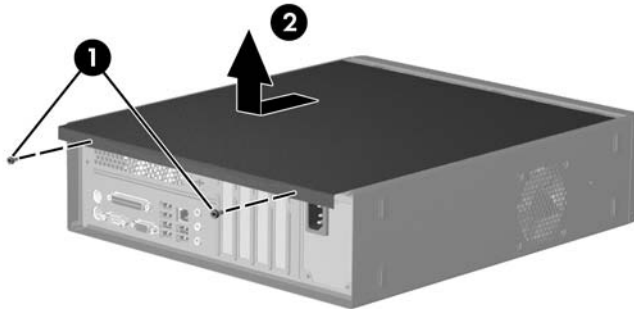


NOTE: During disassembly, label each cable as you remove it, noting its position and routing.

△ **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.

Access Panel

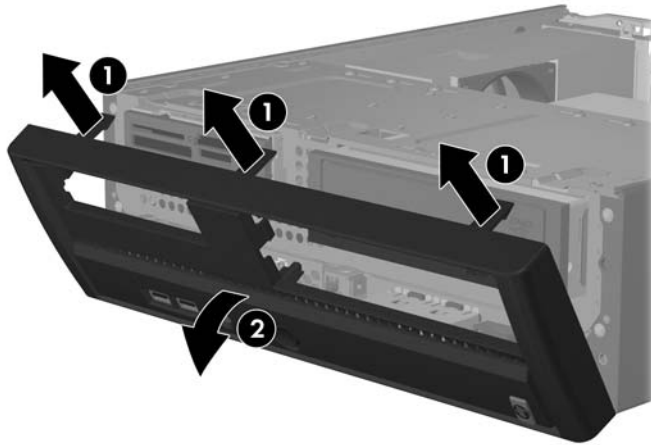
1. Prepare the computer for disassembly ([Preparation for Disassembly on page 87](#)).
2. Remove the two screws that secure the access panel to the computer chassis (1).
3. Slide the access panel back about 1.25 cm (1/2 inch), then lift it away from and off the unit (2).



To install the access panel, reverse the removal procedure.

Front Bezel

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 87](#)).
2. Remove the access panel ([Access Panel on page 88](#)).
3. Pull up on each of the three tabs on the top of the bezel (1) to release them, and then rotate the bezel down and off the chassis (2).



To install the front bezel, reverse the removal procedure.

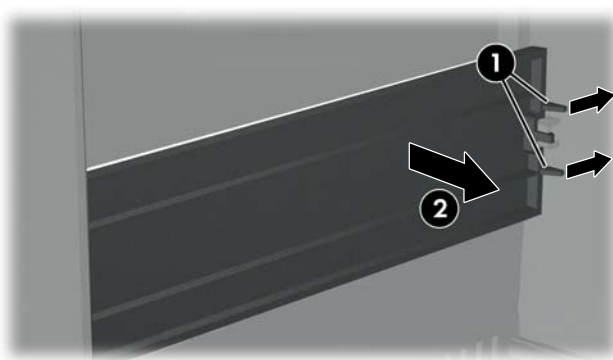
Bezel Blanks


1. Prepare the computer for disassembly ([Preparation for Disassembly on page 87](#)).
2. Remove the access panel ([Access Panel on page 88](#)).
3. Remove the front bezel ([Front Bezel on page 89](#)).

5.25-inch Drive Bezel Blank

If the computer was not shipped with a drive in the 5.25-inch option bay, the bay will be covered by a bezel blank. If you add a drive to the option bay, you must first remove the bezel blank.

- ☐ While facing the inside of the front bezel, press the two retaining tabs on the right towards the outer edge of the bezel (1) and pull the bezel blank inwards to remove it (2).

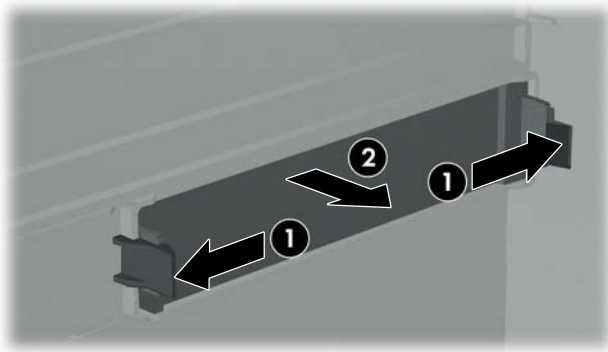



 **NOTE:** To install a 5.25-inch bezel blank, slide the left side of the blank into the two retainer slots on the left side of the front bezel then snap the right side of the blank into place.

3.5-inch Drive Bezel Blank

If the computer was not shipped with a device in the 3.5-inch bay, the bay will be covered by a bezel blank. If you install a device in the 3.5-inch bay, you must first remove the bezel blank.

- ☐ While facing the inside of the front bezel, press outward on the two retaining tabs on each side of the bezel blank (1) and pull the bezel blank inwards to remove it (2).



 **NOTE:** To install a 3.5-inch bezel blank, press the blank inward from inside the front bezel so that it snaps into place.

Cable Management

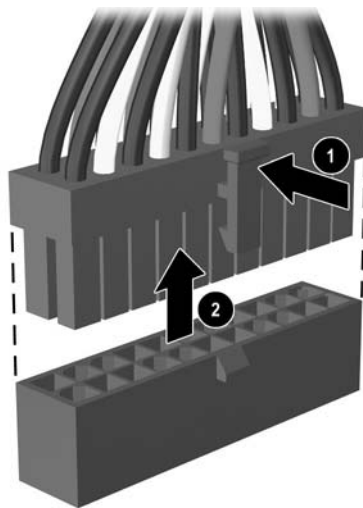
The Small Form Factor chassis is a very compact computer and proper routing of the internal cables is critical to the operation of the computer. Follow good cable management practices when working inside the computer.

- 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 movable or rotating parts like the power supply and drive cage to prevent them from being cut or crimped when the component is lowered into its normal position.
- When folding a flat ribbon cable, never fold to a sharp crease. Sharp creases may damage the wires.
- Some flat ribbon cables come prefolded. 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 access panel 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 connector 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.

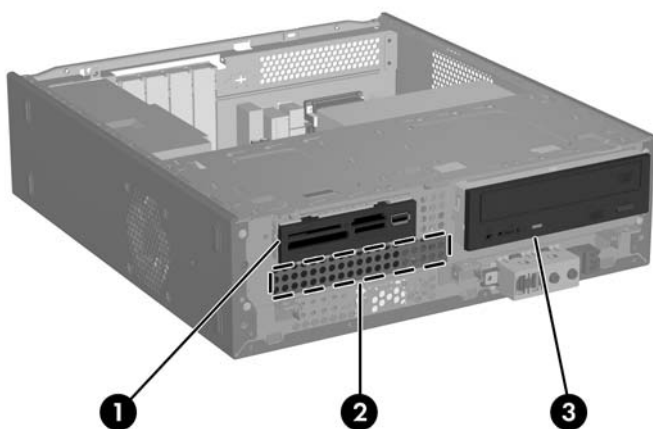
Cable	To	Cable Designator
Power Supply	Main power, 24-pin	P1
Power Supply	CPU power, 4-pin	P3
Power Supply	SATA Hard drive	P4
Power Supply	SATA Optical drive	P5
Power Supply	Diskette drive	P7

Cable	To	PCA Designator
Front LED/Power	System board	JFP1
Speaker	System board	SPKR
Diskette drive	System board	FLPY
Front audio	System board	AUDIO2, (Green)
Front I/O USB	System board	IUSB1 (Yellow)
Serial port B	System board	COM B
SATA HDD	System board	SATA1 (Dark Blue)
SATA ODD	System board	SATA2 (White)
CPU fan	System board	CPUFAN1
Media card reader	System board	IUSB2

Drives

A Torx T-15 screwdriver is needed to remove and install the guide screws on a drive.

Drive Positions

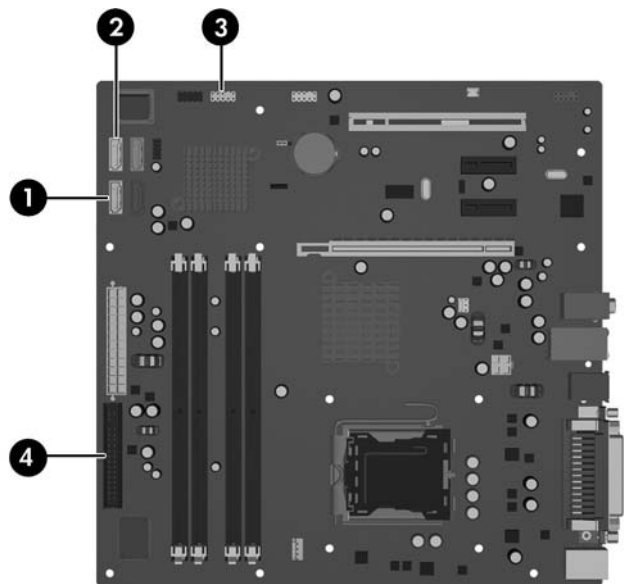


-
- | | |
|-----|--|
| (1) | External 3.5-inch option drive bay for media card reader or diskette drive |
|-----|--|
-
- | | |
|-----|--------------------------------------|
| (2) | Internal 3.5-inch bay for hard drive |
|-----|--------------------------------------|
-
- | | |
|-----|--------------------------------------|
| (3) | External 5.25-inch optical drive bay |
|-----|--------------------------------------|
-

To verify the type and size of the storage device installed in the computer, run Computer Setup.

System Board Drive Connections

Follow the guidelines in the illustration and table below when connecting drives to the system board.



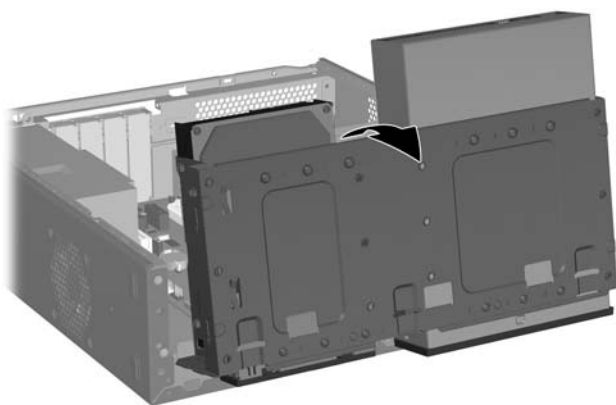
Drive Configuration	System Board Connectors
1 hard drive	(1) SATA1 hard drive
1 optical drive	(2) SATA2 optical drive
media card reader	(3) USB connector (white)
diskette drive	(4) FDD connector (black)

Optical Drive

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

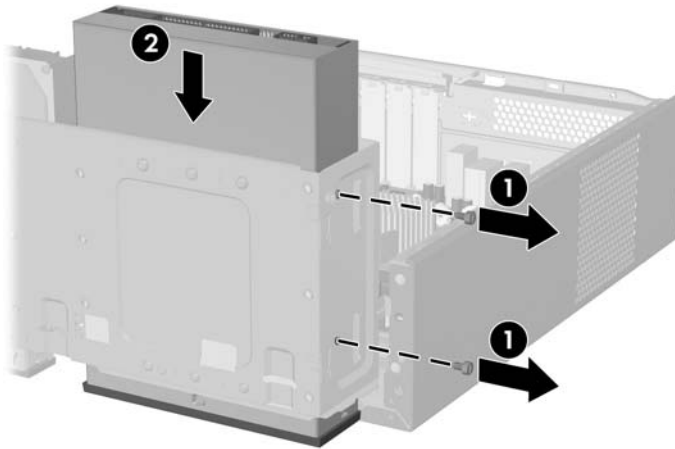
📝 **NOTE:** An optical drive is a CD-ROM, CD-R/RW, DVD-ROM, DVD+R/RW, or CD-RW/DVD Combo drive.


1. Prepare the computer for disassembly ([Preparation for Disassembly on page 87](#)).
2. Remove the access panel ([Access Panel on page 88](#)).
3. Remove the front bezel ([Front Bezel on page 89](#)).
4. Rotate the drive cage to the upright position.



5. Disconnect the power and data cables from the back of the hard drive.
6. Remove the SATA cable from the clip on the bottom of the drive cage.

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



 **NOTE:** When replacing the drive, transfer the guide screws from the old drive to the new one.

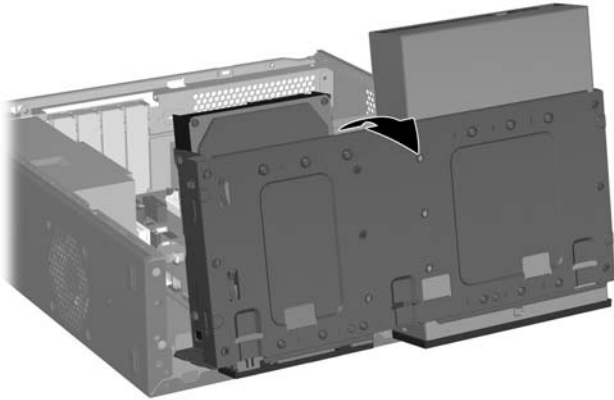
To install a drive, reverse the removal procedure.

External 3.5-inch Media Card Reader or Diskette Drive

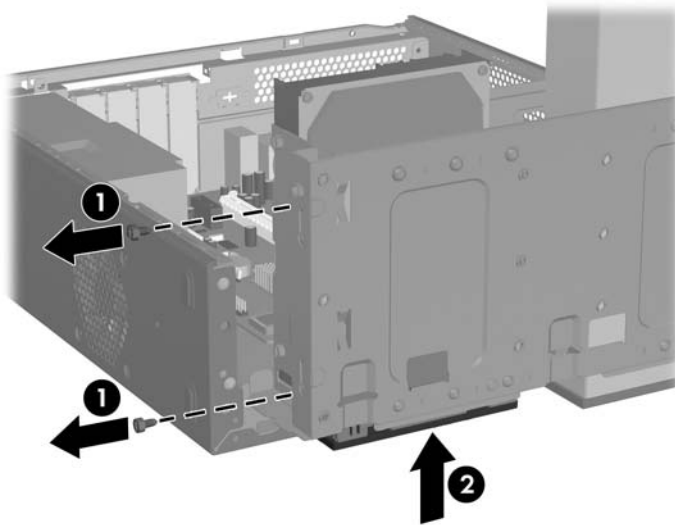
The 3.5-inch external drive bay may be populated with a media card reader or diskette drive. The removal procedure is very similar for both devices.

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 87](#)).
2. Remove the access panel ([Access Panel on page 88](#)).
3. Remove the front bezel ([Front Bezel on page 89](#)).


4. Rotate the drive cage to the upright position.



5. If the device is a media card reader, disconnect the internal USB cable from the system board. If the device is a diskette drive, disconnect the power and data cables from the back of the drive.
6. Remove the two retainer screws that secure the drive to the bay (1), and then slide the drive forward and out of the bay (2).



To replace the drive, reverse the removal procedure.

 **NOTE:** If you are installing a drive in the external 3.5-inch drive bay for the first time, use a flat-blade screwdriver to pry out the metal shield covering the bay.

Hard Drive

A Torx T-15 screwdriver is needed to remove and install the guide screws on a hard drive.

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

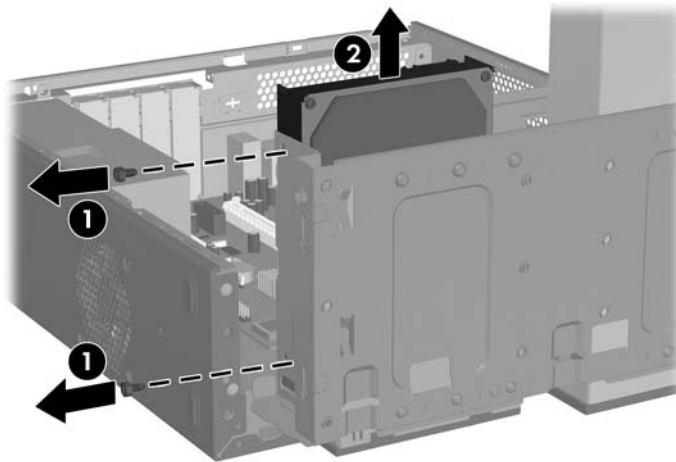
Before handling a drive, ensure that you are discharged of static electricity. While handling a drive, avoid touching the connector.

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.

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 87](#)).
2. Remove the access panel ([Access Panel on page 88](#)).
3. Remove the front bezel ([Front Bezel on page 89](#)).
4. Rotate the drive cage to the upright position.
5. Disconnect the power and data cables from the back of the hard drive.
6. Remove the two retainer screws that secure the drive to the bay (1), and then slide the drive back and out of the bay (2).



To install a hard drive, reverse the above procedure.

📝 **NOTE:** When replacing a drive, transfer the guide screw from the old drive to the new one.

Memory

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

△ **CAUTION:** DDR and DDR2 memory modules are not interchangeable.

DDR2-SDRAM 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 8 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 and unbuffered PC2-6400 800 MHz-compliant
- 1.8 volt DDR2-SDRAM DIMMs

The DDR2-SDRAM DIMMs must also:

- support CAS latency 4 (CL = 4) for PC2-5300 667 MHz-compliant and PC2-6400 800 MHz
- contain the mandatory JEDEC SPD information

In addition, the computer supports:

- 256Mbit, 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 start if you install unsupported DIMMs.

Replacing Memory

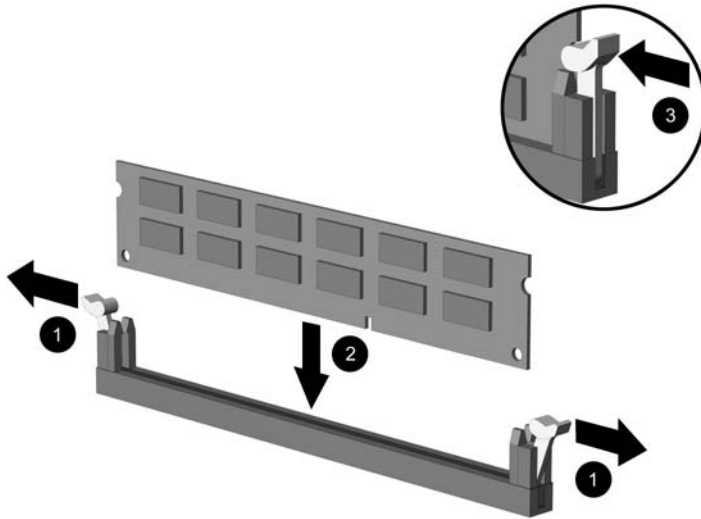
△ **CAUTION:** The memory module sockets have gold metal contacts. When upgrading the memory, it is important to use memory modules with gold metal contacts to prevent corrosion and/or oxidation resulting from having incompatible metals in contact with each other.


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.

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 87](#)).
2. Remove the access panel ([Access Panel on page 88](#)).
3. Rotate the drive cage to its upright position.

4. Open both latches of the memory module socket (1), and insert the memory module into the socket (2).



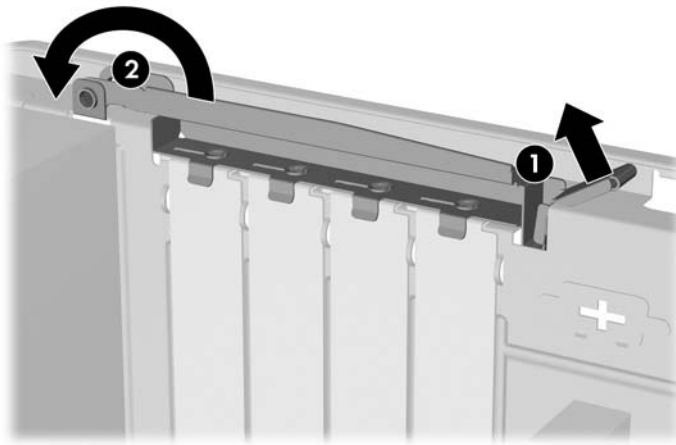
 **NOTE:** A memory module can be installed in only one way. Match the notch on the module with the tab on the memory socket.

5. Push the module down into the socket, ensuring that the module is fully inserted and properly seated. Make sure the latches are in the closed position (3).
6. Repeat steps 4 and 5 for any additional modules that you want to install.

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

Expansion Card

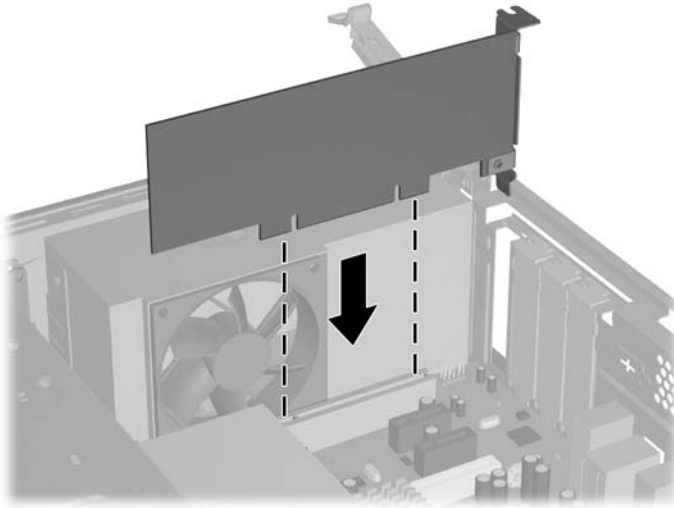
1. Prepare the computer for disassembly ([Preparation for Disassembly on page 87](#)).
2. Remove the access panel ([Access Panel on page 88](#)).
3. Move the serial port cable off the slot cover.
4. On the rear panel of the computer lift the slot cover latch (1), and then rotate slot cover up and away from the slots (2).




5. If you are installing an expansion card for the first time, you must use a flat-blade 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.

Removable Shield	Expansion Card Type
Top shield	PCI Express x16
Second shield	PCI Express x1
Third shield	PCI Express x1
Bottom shield	PCI

6. Hold the expansion 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.

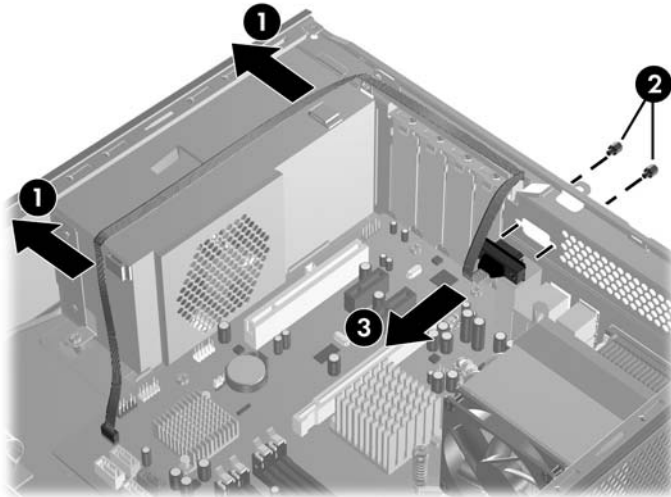


 **NOTE:** When installing an expansion card, press firmly on the card so that the whole connector seats properly in the expansion card slot.

7. While holding the expansion card bracket against the chassis, rotate the slot cover lock over the expansion card brackets and slot covers. Push the slot cover lock down to latch it and secure the card brackets.
8. Connect external cables to the installed card, if needed. Connect internal cables to the system board, if needed.

Serial Port

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 87](#)).
2. Remove the access panel ([Access Panel on page 88](#)).
3. Remove the cable from the clips on top of the power supply (1).
4. Remove the two hex nuts that secure the port to the chassis (2), and then remove the serial port from the chassis (3).

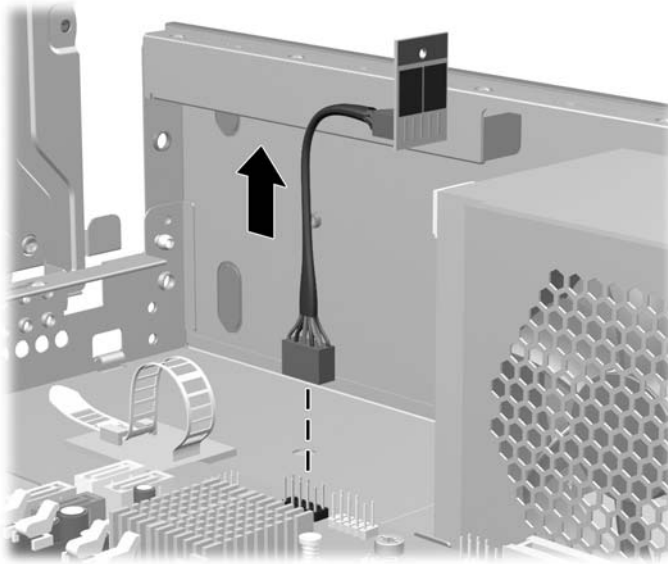


To install the serial port, reverse the removal procedures.

ReadyBoost Card

A ReadyBoost card is installed in the computer. The card is secured to the chassis, and a cable connects the card to the system board.

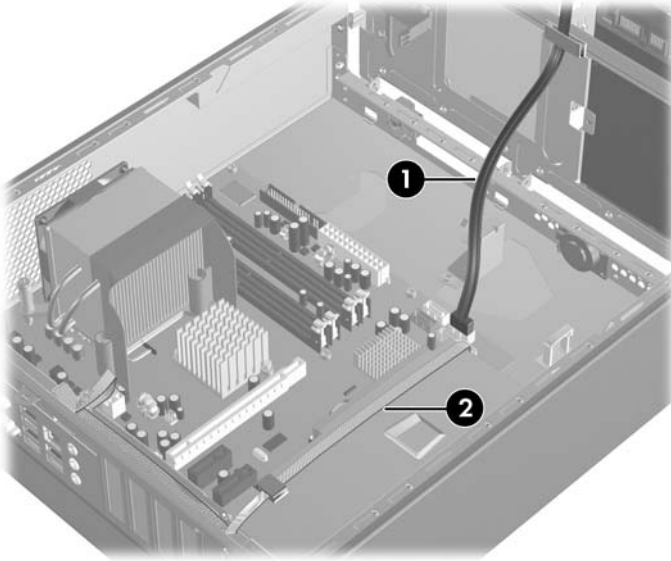
1. Prepare the computer for disassembly ([Preparation for Disassembly on page 87](#)).
2. Remove the access panel ([Access Panel on page 88](#)).
3. Unplug the ReadyBoost cable from the system board, and then lift the card assembly from the chassis.



To install the ReadyBoost card, reverse the removal procedure.

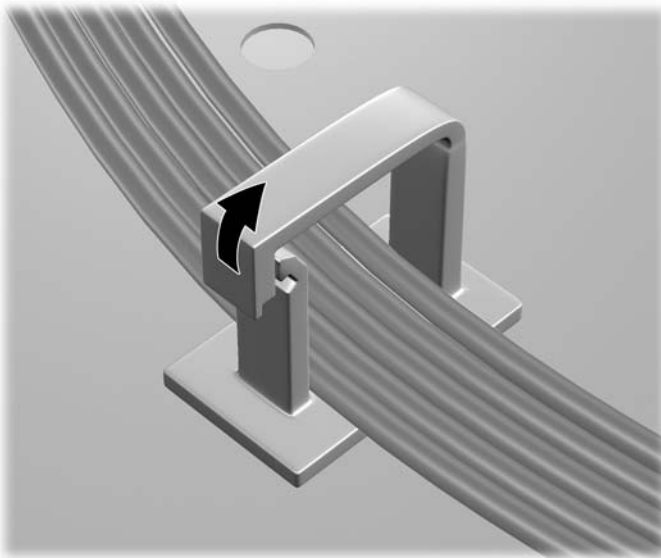
Plastic Wire/Cable Fastener and Clips

Two different plastic wire fasteners under the drive cage secure many of the system wires. You have to loosen these fasteners to gain access to the wires for several computer components. Additionally, many wires are routed through clips below the drive cage and on the power supply. See the following illustration for proper routing of these wires.



To loosen the fastener on the chassis floor:


1. Prepare the computer for disassembly ([Preparation for Disassembly on page 87](#)).
2. Remove the access panel ([Access Panel on page 88](#)).
3. Rotate the drive cage to its upright position.
4. Pull up on the top of the fastener to open it. Opening the fastener may require significant force.

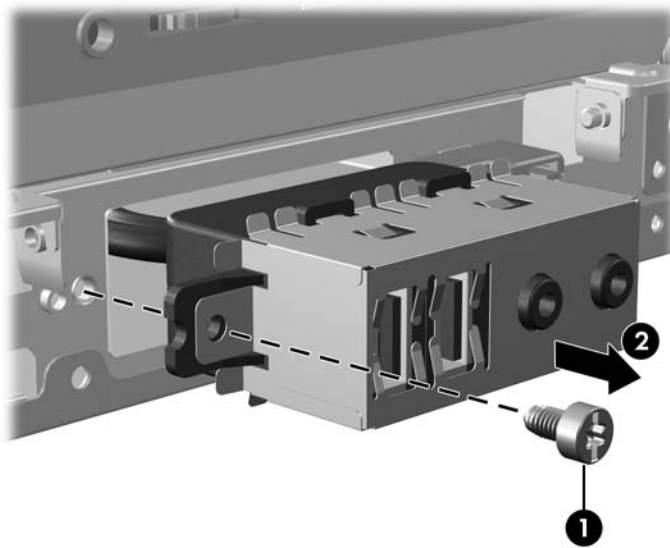


To close the fastener, reverse the loosening procedure.

Front I/O Device

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 87](#)).
2. Remove the access panel ([Access Panel on page 88](#)).
3. Remove the front bezel ([Front Bezel on page 89](#)).
4. Rotate the drive cage to its upright position.
5. Unplug the audio and USB cables from the system board.
6. Rotate the drive cage back down.
7. Remove the screw that secures the front I/O device to the chassis (1).
8. Rotate the device toward the right side of the chassis (when viewed from the front), and then pull the device from the chassis (2) while threading the wires through the hole in the chassis.

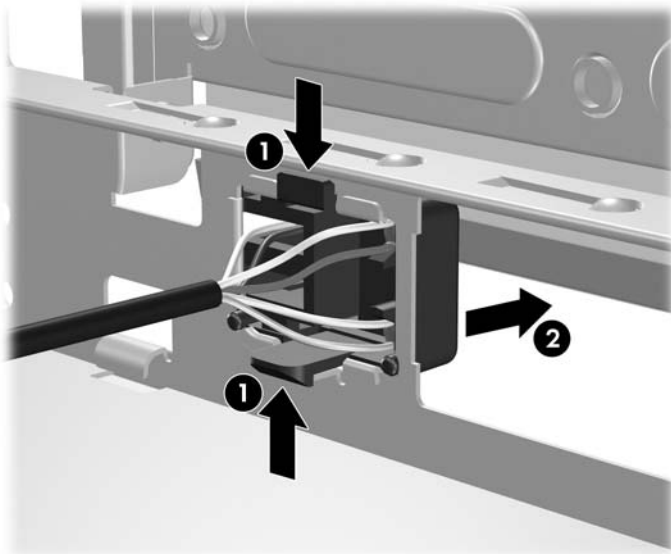
 **NOTE:** If necessary, rotate the drive cage back up to better access the hole you thread the cables through.



To install the front I/O device, reverse the removal procedures.

Power Switch Assembly

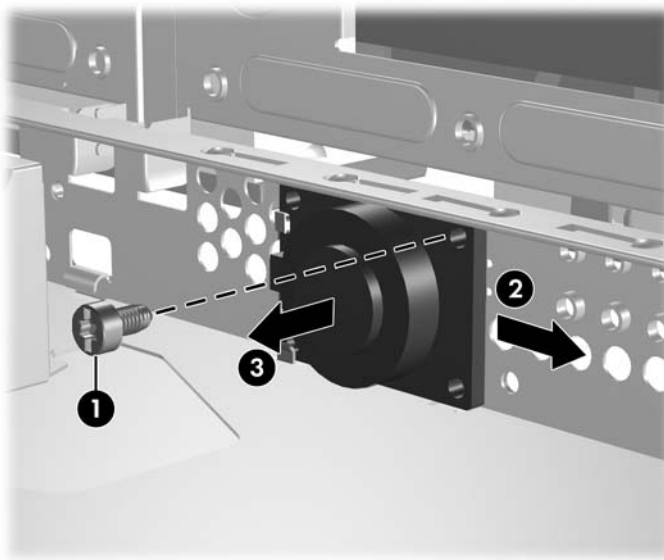
1. Prepare the computer for disassembly ([Preparation for Disassembly on page 87](#)).
2. Remove the access panel ([Access Panel on page 88](#)).
3. Remove the front bezel ([Front Bezel on page 89](#)).
4. Rotate the drive cage to its upright position.
5. Disconnect the power switch wires from the system board.
6. From the inside of the chassis, press the tab on the bottom of power button assembly to loosen the assembly (1).
7. If necessary, rotate the drive cage back down to gain access to the wires.
8. Pull the assembly out through front of unit (2) while threading the wires through the hole in the chassis.



To install the power switch assembly, reverse the removal procedure.

Speaker

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 87](#)).
2. Remove the access panel ([Access Panel on page 88](#)).
3. Rotate the drive cage to its upright position.
4. Loosen the plastic fastener to gain access to the speaker wire.
5. Disconnect the speaker wire from the system board.
6. If necessary, remove expansion cards to gain access to the speaker.
7. Remove the screw that secures the speaker to the inside of the chassis (1), slide the speaker to the right (2), and then remove it from the chassis (3).



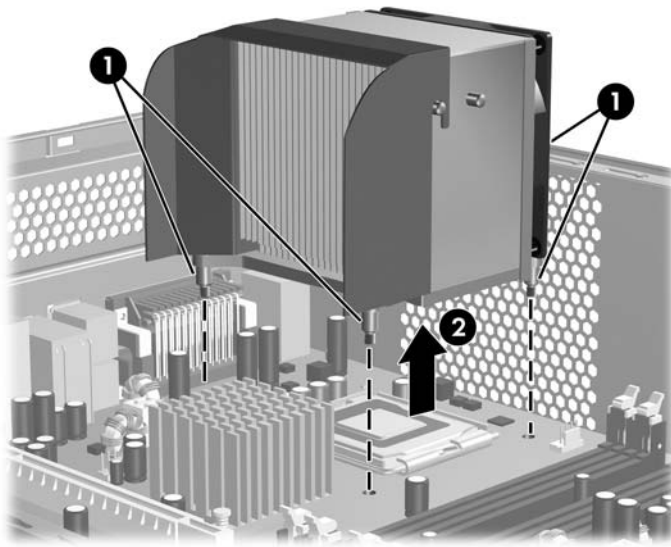
To install the speaker, reverse the removal procedures.

Heatsink

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 87](#)).
2. Remove the access panel ([Access Panel on page 88](#)).
3. Unplug the fan wire from the system board.
4. Loosen the four captive screws (1) that secure the heatsink to the system board tray.

△ **CAUTION:** Heatsink retaining screws should be removed in diagonally opposite pairs (as in an X) to even the downward forces 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.

5. Lift the heatsink from atop the processor (2) and set it on its side to keep from contaminating the work area with thermal grease.



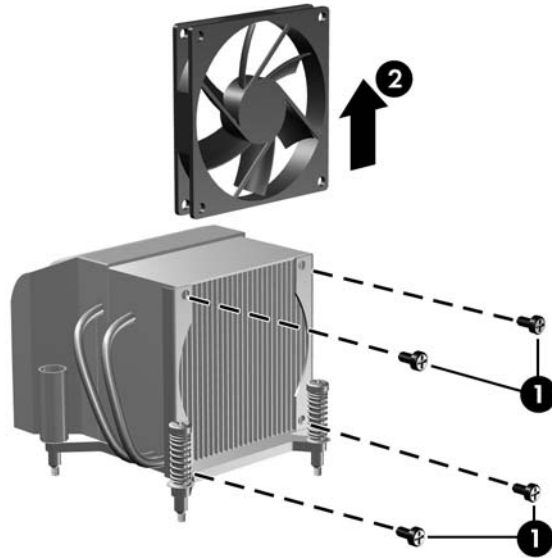
When reinstalling the heatsink, make sure that its bottom has been cleaned with an alcohol wipe and fresh thermal grease has been applied to the top of the processor.

- △ **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.

Failure to install the fan shroud may cause the computer to overheat.

Heatsink Fan

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 87](#)).
2. Remove the access panel ([Access Panel on page 88](#)).
3. Remove the heatsink ([Heatsink on page 109](#)).
4. Disconnect the heatsink fan cable from the system board.
5. Remove the four screws that secure the fan to the front of the heatsink (1), and then remove the fan from the heatsink (2).



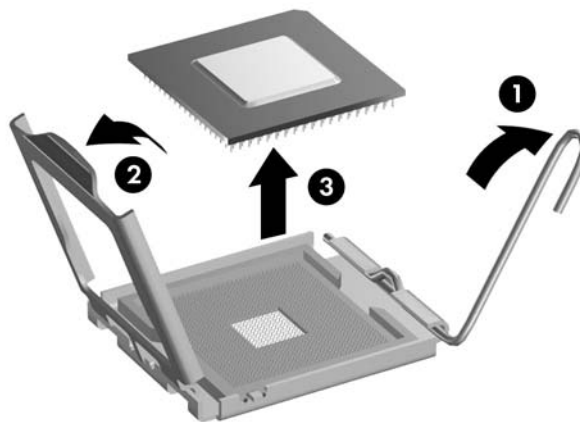
To install the heatsink fan, reverse the removal procedure.

Processor

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 87](#)).
2. Remove the access panel ([Access Panel on page 88](#)).
3. Remove the heatsink ([Heatsink on page 109](#)).
4. Raise the locking lever to its fully 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 6.
 3. If reusing the existing heatsink, clean the bottom of the heatsink with the alcohol pad provided in the spares kit.
- △ **CAUTION:** Before reinstalling the heatsink you must clean the top of the processor and the bottom of the heatsink with an alcohol pad supplied in the spares kit. After the alcohol has evaporated, apply thermal grease to the top of the processor from the syringe supplied in the spares kit.
4. Apply the thermal grease provided in the spares kit to the top of the processor and install the heatsink atop the processor.

5. Go to step 7.
6. If using a new heatsink, remove the protective covering from the bottom of the heatsink and place it in position atop the processor.
7. 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.

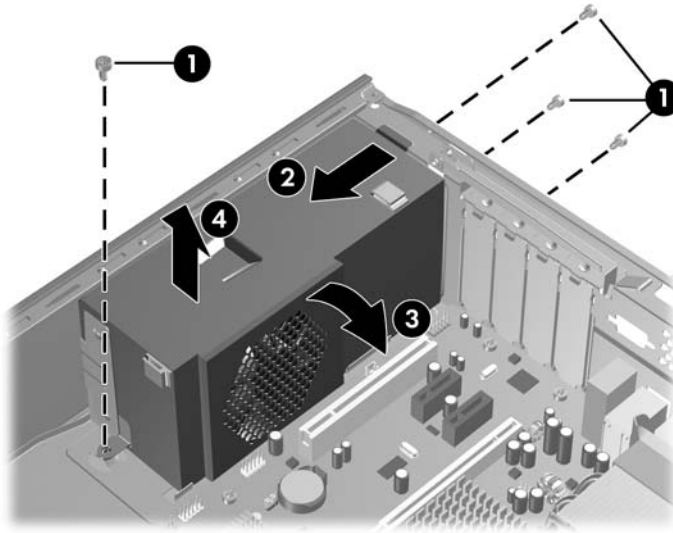
△ **CAUTION:** Heatsink retaining screws should be tightened in diagonally opposite pairs (as in an X) to evenly seat the heatsink on the processor. This is especially important as the pins on the socket are very fragile and any damage to them may require replacing the system board.

 **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>.

Power Supply

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 87](#)).
2. Remove the access panel ([Access Panel on page 88](#)).
3. Remove the front bezel ([Front Bezel on page 89](#)).
4. Rotate the drive cage to its upright position.
5. Loosen the plastic cable fastener ([Plastic Wire/Cable Fastener and Clips on page 105](#)) and smaller plastic fastener.
6. Unplug all power supply wires from the system board.
7. Remove the three screws that secure the power supply to the back of the chassis (1).
8. Remove the one screw in front of the power supply that secures the power supply to the chassis base (1).
9. Remove the serial port wire from on top of the power supply.

10. Slide the power supply about 1.25 cm (1/2-inch) toward the front of the chassis (2), rotate the power supply toward the heatsink so it clears the lip at the top of the chassis (3), and then lift the power supply out of the chassis (4).



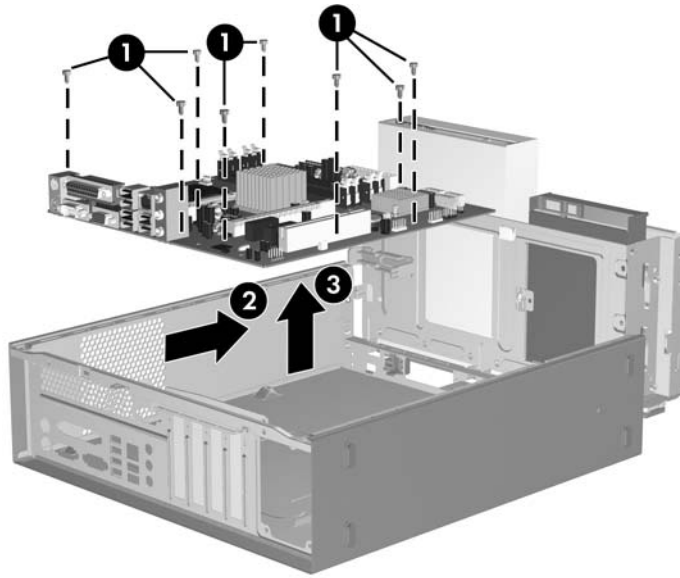
To install the system board, reverse the removal procedure.

- △ **CAUTION:** Before reinstalling the heatsink you must clean the top of the processor and the bottom of the heatsink with an alcohol pad supplied in the spares kit. After the alcohol has evaporated, apply thermal grease to the top of the processor from the syringe supplied in the spares kit.
- 📝 **NOTE:** When reinstalling the system board it is important to secure the system board and tray to the chassis with the long retaining screw before performing any subsequent steps.
- △ **CAUTION:** When reconnecting the cables it is important that they be positioned so they do not interfere with the rotation of the drive cage or power supply.

System Board

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 87](#)).
2. Remove the access panel ([Access Panel on page 88](#)).
3. Remove all PCI and PCI Express expansion boards ([Expansion Card on page 101](#)).
4. Remove the optical drive ([Optical Drive on page 95](#)).
5. Remove all memory modules ([Replacing Memory on page 99](#)).
6. Loosen the plastic cable fastener ([Plastic Wire/Cable Fastener and Clips on page 105](#)).
7. Disconnect all data and power cables from the system board.
8. Remove the power supply ([Power Supply on page 112](#)).

9. Remove the eight screws that secure the system board to the chassis (1), slide the board about 1.25 cm (1/2 inch) toward the front of the chassis (2), and then lift the board out of the chassis (3).





To install the system board, reverse the removal procedure.

- △ **CAUTION:** Before reinstalling the heatsink you must clean the top of the processor and the bottom of the heatsink with an alcohol pad supplied in the spares kit. After the alcohol has evaporated, apply thermal grease to the top of the processor from the syringe supplied in the spares kit.
- 📝 **NOTE:** When reinstalling the system board it is important to secure the system board and tray to the chassis with the long retaining screw before performing any subsequent steps.
- △ **CAUTION:** When reconnecting the cables it is important that they be positioned so they do not interfere with the rotation of the drive cage or power supply.
- 📝 **NOTE:** When replacing the system board, you must also change the chassis serial number in the BIOS.

Battery

The battery that comes with your computer provides power to the real-time clock and has a lifetime of about three years. When replacing the battery, use a battery equivalent to the battery originally installed on the computer. The computer comes with a 3-volt lithium coin cell battery.

 **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.


 **WARNING!** This 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 140°F (60°C).

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 the *Computer Setup (F10) Utility Guide* for information on backing up the CMOS settings.

 **NOTE:** 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>.

 **CAUTION:** 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.

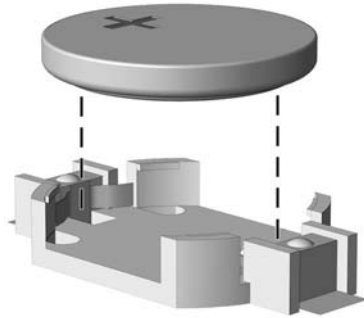
1. Prepare the computer for disassembly ([Preparation for Disassembly on page 87](#)).
2. Remove the computer access panel ([Access Panel on page 88](#)).

 **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. Carefully pull the cable bundle out of the way to access the battery.
5. Depending on the type of battery holder on your system board, complete the following instructions to replace the battery:

Type 1 Battery Holder

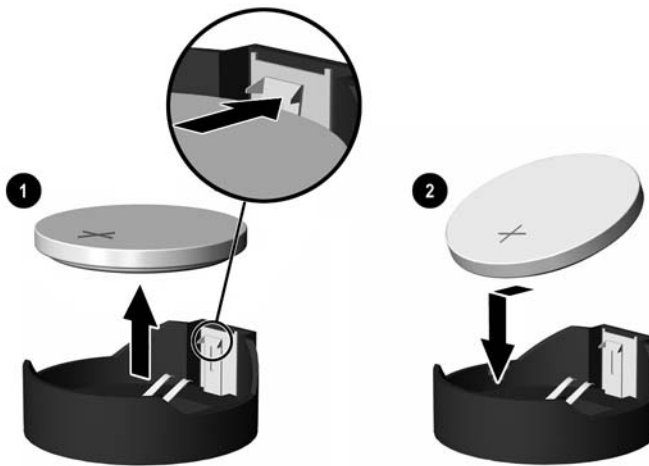
1. Lift the battery out of its holder.



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, your passwords, and any special system setups, using Computer Setup. Refer to the *Computer Setup (F10) Utility Guide*.

Type 2 Battery Holder

1. To release the battery from its holder, squeeze the metal clamp that extends above one edge of the battery. When the battery pops up, lift it out (1).
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.

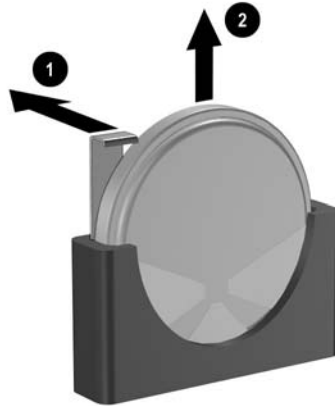


3. Replace the computer access panel.

4. Plug in the computer and turn on power to the computer.
5. Reset the date and time, your passwords, and any special system setups, using Computer Setup. Refer to the *Computer Setup (F10) Utility Guide*.

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, your passwords, and any special system setups, using Computer Setup. Refer to the *Computer Setup (F10) Utility Guide*.

Installing a Security Lock

An optional security lock can be installed on the rear panel of the computer to provide physical computer security.


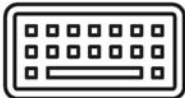


NOTE: The security lock slot may be in a different location on your computer model.



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.


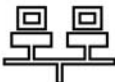
Keyboard

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


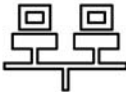
Mouse

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

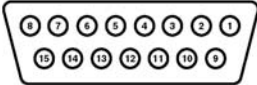
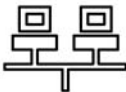
Ethernet BNC

Connector and Icon	Pin	Signal
 	1	Data
	2	Ground

Ethernet RJ-45

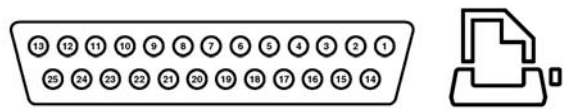
Connector and Icon		Pin	Signal
 		1	(+) Transmit Data
		2	(-) Transmit Data
		3	(+) Receive Data
		4	Unused
		5	Unused
		6	(-) Receive Data
		7	Unused
		8	Unused

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

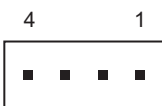


Connector and Icon	Pin	Signal
	1	Carrier Detect (12V if powered)
	2	Receive Data
	3	Transmit Data
	4	Data Terminal Ready
	5	Signal Ground
	6	Data Set Ready
	7	Request to Send
	8	Clear to Send
	9	Ring Indicator (5V if powered)

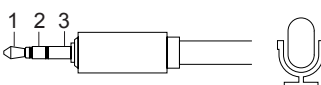
USB

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

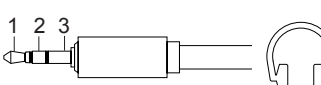
Diskette Drive Power

Connector and Icon	Pin	Signal
	1	+5 VDC
	2	Ground
	3	Ground
	4	Reserved (+12 Volts)

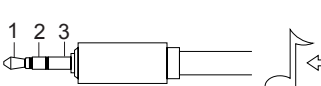
Microphone

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

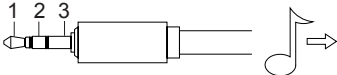
Headphone

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

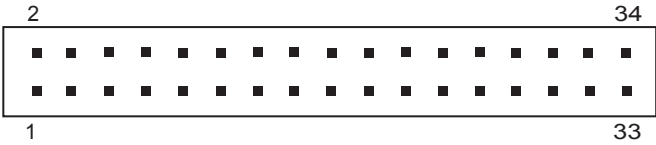
Connector and Icon	Pin	Signal
	1	Transmit
	2	Receive
	3	Ground
	4	5V
	5	Mode
	6	Not Used
	7	Not Used
	8	Not Used

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		

Diskette Drive Standard Data Cable

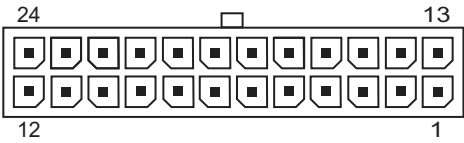
Connector



Pin	Signal	Pin	Signal	Pin	Signal
1	Ground	13	Ground	25	Ground
2	Low density	14	Reserved	26	Track 00
3	Key	15	Ground	27	Ground
4	Media — ID	16	Motor On	28	Write Protect
5	Ground	17	Ground	29	Ground
6	No Signal	18	Direction In	30	Read Data
7	Ground	19	Ground	31	Ground
8	Index	20	Step	32	Side 1 Select
9	Ground	21	Ground	33	Ground
10	Reserved	22	Write data	34	Disk Change
11	Ground	23	Ground		
12	Drive Select	24	Write Gate		

24-Pin Power

Connector

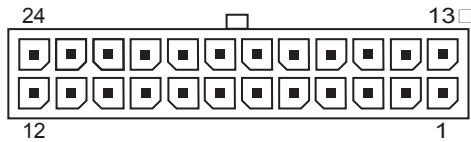


Front

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

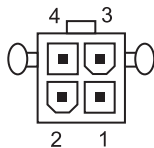
Connector



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
							-12V

4-Pin Power (for CPU)

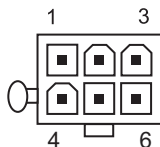
Connector and Icon



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

6-Pin Power (for CPU)

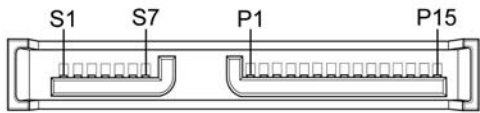
Connector and Icon



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	PRSENT1	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								

Pin B information is on the next page

NOTE: x1 PCI Express uses pins 1-18

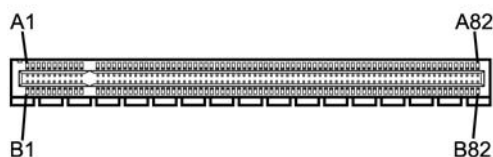
x4 PCI Express uses pins 1-32

x8 PCI Express uses pins 1-49

x16 PCI Express uses pins 1-8

PCI Express

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	PETp1	23	PETp2
4	GND	9	JTAG1	14	PETp0	19	PETn1	24	PETn2
5	SMCLK	10	3.3vAux	15	PETn0	20		25	GND
26	GND	31	PRSENT2#	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	PRSENT2#
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								

Pin B information is on the next page

NOTE: x1 PCI Express uses pins 1-18

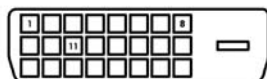
x4 PCI Express uses pins 1-32

x8 PCI Express uses pins 1-49

x16 PCI Express uses pins 1-8

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 Plug 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 POST Error Messages

This appendix lists the error codes, error messages, and the various indicator light and audible sequences that you may encounter during Power-On Self-Test (POST) or computer restart, the probable source of the problem, and steps you can take to resolve the error condition.

POST Message Disabled suppresses most system messages during POST, such as memory count and non-error text messages. If a POST error occurs, the screen will display the error message. To manually switch to the POST Messages Enabled mode during POST, press any key (except **F10** or **F12**). The default mode is POST Message Disabled.

The speed at which the computer loads the operating system and the extent to which it is tested are determined by the POST mode selection.

Quick Boot is a fast startup process that does not run all of the system level tests, such as the memory test. Full Boot runs all of the ROM-based system tests and takes longer to complete.

Full Boot may also be enabled to run every 1 to 30 days on a regularly scheduled basis. To establish the schedule, reconfigure the computer to the Full Boot Every x Days mode, using Computer Setup.



NOTE: For more information on Computer Setup, see the *Computer Setup (F10) Utility Guide*.

POST Numeric Codes and Text Messages

This section covers those POST errors that have numeric codes associated with them. The section also includes some text messages that may be encountered during POST.


 **NOTE:** The computer will beep once after a POST text message is displayed on the screen.

Table C-1 Numeric Codes and Text Messages

Control panel message	Description	Recommended action
101-Option ROM Checksum Error	System ROM or expansion board option ROM checksum.	<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.
103-System Board Failure	DMA or timers.	<ol style="list-style-type: none">1. Clear CMOS.2. Remove expansion boards.3. Replace the system board.
110-Out of Memory Space for Option ROMs	Recently added PCI expansion card contains an option ROM too large to download during POST.	<ol style="list-style-type: none">1. If a PCI expansion card was recently added, remove it to see if the problem remains.2. In Computer Setup, set Advanced > Device Options > NIC PXE Option ROM Download to DISABLE to prevent PXE option ROM for the internal NIC from being downloaded during POST to free more memory for an expansion card's option ROM. Internal PXE option ROM is used for booting from the NIC to a PXE server.3. Ensure the ACPI/USB Buffers @ Top of Memory setting in Computer Setup is enabled.
162-System Options Not Set	Configuration incorrect. RTC (real-time clock) battery may need to be replaced.	Run Computer Setup and check the configuration in Advanced > Onboard Devices . Reset the date and time under Control Panel . 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.
163-Time & Date Not Set	Invalid time or date in configuration memory. RTC (real-time clock) battery may need to be replaced.	Reset the date and time under Control Panel (Computer Setup can also be used). If the problem persists, replace the RTC battery. See the <i>Hardware Reference Guide</i> for instructions on installing a new battery, or

Table C-1 Numeric Codes and Text Messages (continued)

Control panel message	Description	Recommended action
		contact an authorized dealer or reseller for RTC battery replacement.
163-Time & Date Not Set	CMOS jumper may not be properly installed.	Check for proper placement of the CMOS jumper if applicable.
164-MemorySize Error	Memory amount has changed since the last boot (memory added or removed).	Press the F1 key to save the memory changes.
164-MemorySize Error	Memory configuration incorrect.	<ol style="list-style-type: none"> 1. Run Computer Setup or Windows utilities. 2. Make sure the memory module(s) are installed properly. 3. If third-party memory has been added, test using HP-only memory. 4. Verify proper memory module type.
201-Memory Error	RAM failure.	<ol style="list-style-type: none"> 1. Run Computer Setup or Windows utilities. 2. Ensure memory modules are correctly installed. 3. Verify proper memory module type. 4. Remove and replace the identified faulty memory module(s). 5. If the error persists after replacing memory modules, replace the system board.
213-Incompatible Memory Module in Memory Socket(s) X, X, ...	A memory module in memory socket identified in the error message is missing critical SPD information, or is incompatible with the chipset.	<ol style="list-style-type: none"> 1. Verify proper memory module type. 2. Try another memory socket. 3. Replace DIMM with a module conforming to the SPD standard.
214-DIMM Configuration Warning	Populated DIMM Configuration is not optimized.	Rearrange the DIMMs so that each channel has the same amount of memory.
219-ECC Memory Module Detected ECC Modules not supported on this Platform	Recently added memory module(s) support ECC memory error correction.	<ol style="list-style-type: none"> 1. If additional memory was recently added, remove it to see if the problem remains. 2. Check product documentation for memory support information.
301-Keyboard Error	Keyboard failure.	<ol style="list-style-type: none"> 1. Reconnect keyboard with computer turned off. 2. Check connector for bent or missing pins. 3. Ensure that none of the keys are depressed. 4. Replace keyboard.

Table C-1 Numeric Codes and Text Messages (continued)

Control panel message	Description	Recommended action
303-Keyboard Controller Error	I/O board keyboard controller.	<ol style="list-style-type: none"> 1. Reconnect keyboard with computer turned off. 2. Replace the system board.
304-Keyboard or System Unit Error	Keyboard failure.	<ol style="list-style-type: none"> 1. Reconnect the keyboard with computer turned off. 2. Ensure that none of the keys are depressed. 3. Replace the keyboard. 4. Replace the system board.
404-Parallel Port Address Conflict Detected	Both external and internal ports are assigned to parallel port X.	<ol style="list-style-type: none"> 1. Remove any parallel port expansion cards. 2. Clear CMOS. 3. Reconfigure card resources and/or run Computer Setup.
410-Audio Interrupt Conflict	IRQ address conflicts with another device.	Enter Computer Setup and reset the IRQ in Advanced > Onboard Devices .
411-Network Interface Card Interrupt Conflict	IRQ address conflicts with another device.	Enter Computer Setup and reset the IRQ in Advanced > Onboard Devices .
501-Display Adapter Failure	Graphics display controller.	<ol style="list-style-type: none"> 1. Reseat the graphics card (if applicable). 2. Clear CMOS. 3. Verify monitor is attached and turned on. 4. Replace the graphics card (if possible).
510-Flash Screen Image Corrupted	Flash Screen image has errors.	Reflash the system ROM with the latest BIOS image.
511-CPU, CPUA, or CPUB Fan not Detected	CPU fan is not connected or may have malfunctioned.	<ol style="list-style-type: none"> 1. Reseat CPU fan. 2. Reseat fan cable. 3. Replace CPU fan.
512-Chassis, Rear Chassis, or Front Chassis Fan not Detected	Chassis, rear chassis, or front chassis fan is not connected or may have malfunctioned.	<ol style="list-style-type: none"> 1. Reseat chassis, rear chassis, or front chassis fan. 2. Reseat fan cable. 3. Replace chassis, rear chassis, or front chassis fan.
514-CPU or Chassis Fan not Detected	CPU or chassis fan is not connected or may have malfunctioned.	<ol style="list-style-type: none"> 1. Reseat CPU or chassis fan. 2. Reseat fan cable. 3. Replace CPU or chassis fan.
601-Diskette Controller Error	Diskette controller circuitry or floppy drive circuitry incorrect.	<ol style="list-style-type: none"> 1. Run Computer Setup. 2. Check and/or replace cables. 3. Clear CMOS.

Table C-1 Numeric Codes and Text Messages (continued)

Control panel message	Description	Recommended action
		<ol style="list-style-type: none"> Replace diskette drive. Replace the system board.
605-Diskette Drive Type Error	Mismatch in drive type.	<ol style="list-style-type: none"> Run Computer Setup. Disconnect any other diskette controller devices (tape drives). Clear CMOS.
610-External Storage Device Failure	External tape drive not connected.	Reinstall tape drive or press F1 and allow system to reconfigure without the drive.
611-Primary Floppy Port Address Assignment Conflict	Configuration error.	Run Computer Setup and check the configuration in Advanced > Onboard Devices .
660-Display cache is detected unreliable	Integrated graphics controller display cache is not working properly and will be disabled.	Replace system board if minimal graphics degrading is an issue.
912-Computer Cover Has Been Removed Since Last System Startup	Computer cover was removed since last system startup.	No action required.
917-Front Audio Not Connected	Front audio harness has been detached or unseated from motherboard.	Reconnect or replace front audio harness.
918-Front USB Not Connected	Front USB harness has been detached or unseated from motherboard.	Reconnect or replace front USB harness.
921-Device in PCI Express slot failed to initialize	There is an incompatibility/problem with this device and the system or PCI Express Link could not be retrained to an x1.	Try rebooting the system. If the error reoccurs, the device may not work with this system
1151-Serial Port A Address Conflict Detected	Both external and internal serial ports are assigned to COM1.	<ol style="list-style-type: none"> Remove any serial port expansion cards. Clear CMOS. Reconfigure card resources and/or run Computer Setup or Windows utilities.
1152-Serial Port B Address Conflict Detected	Both external and internal serial ports are assigned to COM2.	<ol style="list-style-type: none"> Remove any serial port expansion cards. Clear CMOS. Reconfigure card resources and/or run Computer Setup or Windows utilities.
1155-Serial Port Address Conflict Detected	Both external and internal serial ports are assigned to same IRQ.	<ol style="list-style-type: none"> Remove any serial port expansion cards. Clear CMOS. Reconfigure card resources and/or run Computer Setup or Windows utilities.
1201-System Audio Address Conflict Detected	Device IRQ address conflicts with another device.	Enter Computer Setup and reset the IRQ in Advanced > Onboard Devices .
1202-MIDI Port Address Conflict Detected	Device IRQ address conflicts with another device.	Enter Computer Setup and reset the IRQ in Advanced > Onboard Devices .
1203-Game Port Address Conflict Detected	Device IRQ address conflicts with another device.	Enter Computer Setup and reset the IRQ in Advanced > Onboard Devices .

Table C-1 Numeric Codes and Text Messages (continued)

Control panel message	Description	Recommended action
1720-SMART Hard Drive Detects Imminent Failure	Hard drive is about to fail. (Some hard drives have a hard drive firmware patch that will fix an erroneous error message.)	<ol style="list-style-type: none"> 1. Determine if hard drive is giving correct error message. Enter Computer Setup and run the Drive Protection System test under Storage > DPS Self-test. 2. Apply hard drive firmware patch if applicable. (Available at http://www.hp.com/support.) 3. Back up contents and replace hard drive.
1796-SATA Cabling Error	One or more SATA devices are improperly attached. For optimal performance, the SATA 0 and SATA 1 connectors must be used before SATA 2 and SATA 3.	Ensure SATA connectors are used in ascending order. For one device, use SATA 0. For two devices, use SATA 0 and SATA 1. For three devices, use SATA 0, SATA1, and SATA 2.
1797-SATA Drivelock is not supported in RAID mode.	Drivelock is enabled on one or more SATA hard drives, and they cannot be accessed while the system is configured for RAID mode.	Either remove the Drivelocked SATA device or disable the Drivelock feature. To disable the Drivelock feature, enter Computer Setup, change Storage > Storage Options > SATA Emulation to IDE , and select File > Save Changes and Exit . Reenter Computer Setup and select Security > Drivelock . For each listed Drivelock-capable SATA device, ensure Drivelock is Disabled . Lastly, change Storage > Storage Options > SATA Emulation back to RAID and select File > Save Changes and Exit .
1801-Microcode Patch Error	Processor is not supported by ROM BIOS.	<ol style="list-style-type: none"> 1. Upgrade BIOS to proper version. 2. Change the processor.
2200-PMM Allocation Error during MEBx Download	Memory error during POST execution of the Management Engine (ME) BIOS Extensions option ROM	<ol style="list-style-type: none"> 1. Reboot the computer. 2. Unplug the power cord, re-seat the memory modules, and reboot the computer. 3. If the memory configuration was recently changed, unplug the computer, restore the original memory configuration, and reboot the computer. 4. If the error persists, replace the system board.
2201-MEBx Module did not checksum correctly	Memory error during POST execution of the Management Engine (ME) BIOS Extensions option ROM	<ol style="list-style-type: none"> 1. Reboot the computer. 2. Unplug the power cord, re-seat the memory modules, and reboot the computer. 3. If the memory configuration was recently changed, unplug the power cord, restore the original memory configuration, and reboot the computer. 4. If the error persists, replace the system board.

Table C-1 Numeric Codes and Text Messages (continued)

Control panel message	Description	Recommended action
2202-PMM Deallocation Error during MEBx cleanup	Memory error during POST execution of the Management Engine (ME) BIOS Extensions option ROM	<ol style="list-style-type: none"> 1. Reboot the computer. 2. Unplug the power cord, re-seat the memory modules, and reboot the computer. 3. If the memory configuration was recently changed, unplug the power cord, restore the original memory configuration, and reboot the computer. 4. If the error persists, replace the system board.
2203-Setup error during MEBx execution	MEBx selection or exit resulted in a setup failure.	<ol style="list-style-type: none"> 1. Reboot the computer. 2. Unplug the power cord, re-seat the memory modules, and reboot the computer. 3. If the memory configuration was recently changed, unplug the power cord, restore the original memory configuration, and reboot the computer. 4. If the error persists, replace the system board.
2204-Inventory error during MEBx execution	BIOS information passed to the MEBx resulted in a failure.	<ol style="list-style-type: none"> 1. Reboot the computer. 2. If the error persists, update to the latest BIOS version. 3. If the error still persists, replace the system board.
2205-Interface error during MEBx execution	MEBx operation experienced a hardware error during communication with ME.	<ol style="list-style-type: none"> 1. Reboot the computer. 2. If the error persists, update to the latest BIOS version. 3. If the error still persists, replace the system board.
2211-Memory not configured correctly for proper MEBx execution.	DIMM1 is not installed.	Make sure there is a memory module in the black DIMM1 socket and that it is properly seated.
Invalid Electronic Serial Number	Electronic serial number is missing.	Enter the correct serial number in Computer Setup.
Network Server Mode Active and No Keyboard Attached	Keyboard failure while Network Server Mode enabled.	<ol style="list-style-type: none"> 1. Reconnect keyboard with computer turned off. 2. Check connector for bent or missing pins. 3. Ensure that none of the keys are depressed. 4. Replace keyboard.

Table C-1 Numeric Codes and Text Messages (continued)

Control panel message	Description	Recommended action
Parity Check 2	Parity RAM failure.	Run Computer Setup and Diagnostic utilities.
System will not boot without fan	CPU fan not installed or disconnected in VSFF chassis.	<ol style="list-style-type: none"> 1. Remove the computer cover, press the power button, and see if the processor fan spins. If the processor fan is not spinning, make sure the fan's cable is plugged onto the system board header. Ensure the heatsink is properly seated and installed. 2. If the fan is plugged in and the heatsink is properly seated but the fan does not spin, then replace the heatsink-fan assembly.

Interpreting POST Diagnostic Front Panel LEDs and Audible Codes

This section covers the front panel LED codes as well as 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.

📝 NOTE: If you see flashing LEDs on a PS/2 keyboard, look for flashing LEDs on the front panel of the computer and refer to the following table to determine the front panel LED codes.

Recommended actions in the following table are listed in the order in which they should be performed.

Not all diagnostic lights and audible codes are available on all models.

Table C-2 Diagnostic Front Panel LEDs and Audible Codes

Activity	Beeps	Possible Cause	Recommended Action
Green Power LED On.	None	Computer on.	None
Green Power LED flashes every two seconds.	None	Computer in Suspend to RAM mode (some models only) or normal Suspend mode.	None required. Press any key or move the mouse to wake the computer.
Red Power LED flashes two times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	2	<p>Processor thermal protection activated:</p> <p>A fan may be blocked or not turning.</p> <p>OR</p> <p>The heatsink/fan assembly is not properly attached to the processor.</p>	<ol style="list-style-type: none"> 1. Ensure that the computer air vents are not blocked and the processor cooling fan is running. 2. Open hood, press power button, and see if the processor fan spins. If the processor fan is not spinning, make sure the fan's cable is plugged onto the system board header. 3. If fan is plugged in, but is not spinning, then replace heatsink/fan assembly. 4. Contact an authorized reseller or service provider.

Table C-2 Diagnostic Front Panel LEDs and Audible Codes (continued)

Activity	Beeps	Possible Cause	Recommended Action
Red Power LED flashes three times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	3	Processor not installed (not an indicator of bad processor).	<ol style="list-style-type: none"> 1. Check to see that the processor is present. 2. Reseat the processor.
Red Power LED flashes four times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	4	Power failure (power supply is overloaded). OR The incorrect external power supply adapter is being used on the USDT.	<ol style="list-style-type: none"> 1. Open the hood and ensure the 4 or 6-wire power supply cable is seated into the connector on the system board. 2. Check if a device is causing the problem by removing ALL attached devices (such as hard, diskette, or optical drives, and expansion cards). Power on the system. If the system enters the POST, then power off and replace one device at a time and repeat this procedure until failure occurs. Replace the device that is causing the failure. Continue adding devices one at a time to ensure all devices are functioning properly. 3. Replace the power supply. 4. Replace the system board. <p>OR</p> <p>The USDT power supply adapter must be at 135W and use the Smart ID technology before the system will power up. Replace the power supply adapter with the HP-supplied USDT power supply adapter.</p>
Red Power LED flashes five times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	5	Pre-video memory error.	<p>CAUTION: To avoid damage to the DIMMs or the system board, you must unplug the computer power cord before attempting to reseat, install, or remove a DIMM module.</p> <ol style="list-style-type: none"> 1. Reseat DIMMs. 2. Replace DIMMs one at a time to isolate the faulty module. 3. Replace third-party memory with HP memory. 4. Replace the system board.
Red Power LED flashes six times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	6	Pre-video graphics error.	<p>For systems with a graphics card:</p> <ol style="list-style-type: none"> 1. Reseat the graphics card. 2. Replace the graphics card. 3. Replace the system board. <p>For systems with integrated graphics, replace the system board.</p>
Red Power LED flashes seven times, once every second, followed by a two second pause. Beeps stop after fifth	7	System board failure (ROM detected failure prior to video).	Replace the system board.

Table C-2 Diagnostic Front Panel LEDs and Audible Codes (continued)


Activity	Beeps	Possible Cause	Recommended Action
iteration but LEDs continue until problem is solved.			
Red Power LED flashes eight times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	8	Invalid ROM based on bad checksum.	<ol style="list-style-type: none"> 1. Reflash the system ROM with the latest BIOS image. See the “Boot Block Emergency Recovery Mode” section of the <i>Desktop Management Guide</i> for more information. 2. Replace the system board.
Red Power LED flashes nine times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	9	System powers on but is unable to boot.	<ol style="list-style-type: none"> 1. Check that the voltage selector, located on the rear of the power supply (some models), is set to the appropriate voltage. Proper voltage setting depends on your region. 2. Unplug the AC power cord from the computer, wait 30 seconds, then plug the power cord back in to the computer. 3. Replace the system board. 4. Replace the processor.
Red Power LED flashes ten times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	10	Bad option card.	<ol style="list-style-type: none"> 1. Check each option card by removing the card (one at a time if multiple cards), then power on the system to see if fault goes away. 2. Once a bad card is identified, remove and replace the bad option card. 3. Replace the system board.
Red Power LED flashes eleven times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	11	The current processor does not support a feature previously enabled on this system.	<ol style="list-style-type: none"> 1. Install a TXT capable processor. 2. Disable TXT in the Computer Setup (F10) utility. 3. Reinstall the original processor.
System does not power on and LEDs are not flashing.	None	System unable to power on.	<p>Press and hold the power button for less than 4 seconds. If the hard drive LED turns green, the power button is working correctly. Try the following:</p> <ol style="list-style-type: none"> 1. Check that the voltage selector (some models), located on the rear of the power supply, is set to the appropriate voltage. Proper voltage setting depends on your region. 2. Replace the system board. <p>OR</p> <p>Press and hold the power button for less than 4 seconds. If the hard drive LED does not turn on green then:</p> <ol style="list-style-type: none"> 1. Check that the unit is plugged into a working AC outlet. 2. Open hood and check that the power button harness is properly connected to the system board.

Table C-2 Diagnostic Front Panel LEDs and Audible Codes (continued)


Activity	Beeps	Possible Cause	Recommended Action
			<ol style="list-style-type: none">3. Check that both power supply cables are properly connected to the system board.4. Check to see if the 5V_aux light on the system board is turned on. If it is turned on, then replace the power button harness. If the problem persists, replace the system board.5. If the 5V_aux light on the system board is not turned on, remove the expansion cards one at a time until the 5V_aux light on the system board turns on. If the problem persists, replace the power supply.

D Troubleshooting Without Diagnostics

This chapter provides information on how to identify and correct minor problems, such as diskette drive, hard drive, optical drive, graphics, audio, memory, and software problems. If you encounter problems with the computer, refer to the tables in this chapter for probable causes and recommended solutions.

 **NOTE:** For information on specific error messages that may appear on the screen during Power-On Self-Test (POST) at startup, refer to [POST Error Messages on page 131](#).

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* at <http://www.hp.com/ergo> for more information on choosing a workspace and creating a safe and comfortable work environment. This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. For more information, refer to the *Safety & Regulatory Information* guide.

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 diagnostics utility. Refer to Chapter 1, [HP Insight Diagnostics on page 12](#) for more information.
- Run the Drive Protection System (DPS) Self-Test in Computer Setup. Refer to the *Computer Setup (F10) Utility Guide* for more information.
- Check the Power LED on the front of the computer to see if it is flashing red. The flashing lights are error codes that will help you diagnose the problem. Refer to [POST Error Messages on page 131](#) for more information.
- 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 the following [Helpful Hints on page 143](#) section in this guide.

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.
- Restore the system from the Recovery Disc Set that you created or restore the system to its original factory condition in HP Backup and Recovery Manager.

△ **CAUTION:** Restoring the system will erase all data on the hard drive. Be sure to back up all data files before running the restore process.

📝 **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 green power light is on.
- Check to see that the monitor is turned on and the green monitor light is on.
- Check the Power LED on the front of the computer to see if it is flashing red. The flashing lights are error codes that will help you diagnose the problem. Refer to [POST Error Messages on page 131](#) for more information.
- 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, 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 the computer after installing a non–plug and play expansion board or other option. See [Solving Hardware Installation Problems on page 163](#) for instructions.
 - 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 (embedded video on some models only) 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 general 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 an authorized dealer or reseller.

- ⚠ **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.

Table D-1 Solving General Problems

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
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.
System has locked up.	Restart computer.

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.

Table D-1 Solving General Problems (continued)**There is no sound or sound volume is too low.**

Cause	Solution
System volume may be set low or muted.	<ol style="list-style-type: none"> 1. Check the F10 BIOS settings to make sure the internal system speaker is not muted (this setting does not affect the external speakers). 2. Make sure the external speakers are properly connected and powered on and that the speakers' volume control is set correctly. 3. Use the system volume control available in the operating system to make sure the speakers are not muted or to increase the volume.

Cannot remove computer cover or access panel.

Cause	Solution
Smart Cover Lock, featured on some computers, is locked.	<p>Unlock the Smart Cover Lock using Computer Setup.</p> <p>The Smart Cover FailSafe Key, a device for manually disabling the Smart Cover Lock, is available from HP. You will need the FailSafe Key in case of forgotten password, power loss, or computer malfunction. Order PN 166527-001 for the wrench-style key or PN 166527-002 for the screwdriver bit key.</p>

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.
Too many applications running.	<ol style="list-style-type: none"> 1. Close unnecessary applications to free up memory. 2. Add more 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 (Windows XP) or Start > Accessories > Run

Table D-1 Solving General Problems (continued)**Poor performance is experienced.**

Cause	Solution
	(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.
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.

Computer powered off automatically and the Power LED flashes Red two times, once every second, followed by a two second pause, and the computer beeps two times. (Beeps stop after fifth iteration but LEDs continue flashing).

Cause	Solution
Processor thermal protection activated: A fan may be blocked or not turning. OR The heatsink is not properly attached to the processor.	<ol style="list-style-type: none"> 1. Ensure that the computer air vents are not blocked and the processor cooling fan is running. 2. Open hood, press power button, and see if the processor fan spins. If the processor fan is not spinning, make sure the fan's cable is plugged onto the system board header. 3. If fan is plugged in, but is not spinning, then replace the heatsink/fan assembly. 4. Contact an authorized reseller or service provider.

System does not power on and the LEDs on the front of the computer are not flashing.

Cause	Solution
System unable to power on.	<p>Press and hold the power button for less than 4 seconds. If the hard drive LED turns green, then:</p> <ol style="list-style-type: none"> 1. Check that the voltage selector, located on the rear of the power supply on some models, is set to the appropriate voltage. Proper voltage setting depends on your region. 2. Remove the expansion cards one at a time until the 5V_aux light on the system board turns on. 3. Replace the system board. <p>OR</p> <p>Press and hold the power button for less than 4 seconds. If the hard drive LED does not turn on green then:</p> <ol style="list-style-type: none"> 1. Check that the unit is plugged into a working AC outlet. 2. Open hood and check that the power button harness is properly connected to the system board.

Table D-1 Solving General Problems (continued)**System does not power on and the LEDs on the front of the computer are not flashing.**

Cause	Solution
	<ol style="list-style-type: none"> 3. Check that both power supply cables are properly connected to the system board. 4. Check to see if the 5V_aux light on the system board is turned on. If it is turned on, then replace the power button harness. 5. If the 5V_aux light on the system board is off, then replace the power supply. 6. Replace the system board.

Solving Power Problems

Common causes and solutions for power problems are listed in the following table.

Table D-2 Solving Power Problems**Power supply shuts down intermittently.**

Cause	Solution
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.
Power supply will not turn on because of internal power supply fault.	Contact an authorized service provider to replace the power supply.

Computer powered off automatically and the Power LED flashes Red two times, once every second, followed by a two second pause, and the computer beeps two times. (Beeps stop after fifth iteration but LEDs continue flashing.)

Cause	Solution
Processor thermal protection activated: A fan may be blocked or not turning. OR The heatsink is not properly attached to the processor.	<ol style="list-style-type: none"> 1. Ensure that the computer air vents are not blocked and the processor cooling fan is running. 2. Open hood, press power button, and see if the processor fan spins. If the processor fan is not spinning, make sure the fan's cable is plugged onto the system board header. 3. If fan is plugged in, but is not spinning, then replace the heatsink/fan assembly. 4. Contact an authorized reseller or service provider.

Table D-2 Solving Power Problems (continued)

Power LED flashes Red four times, once every second, followed by a two second pause, and the computer beeps four times. (Beeps stop after fifth iteration but LEDs continue flashing.)

Cause	Solution
Power failure (power supply is overloaded).	<ol style="list-style-type: none"> 1. Check that the voltage selector, located on the rear of the power supply (some models), is set to the appropriate voltage. Proper voltage setting depends on your region. 2. Open the hood and ensure the 4- or 6-wire power supply cable is seated into the connector on the system board. 3. Check if a device is causing the problem by removing ALL attached devices (such as hard, diskette, or optical drives, and expansion cards). Power on the system. If the system enters the POST, then power off and replace one device at a time and repeat this procedure until failure occurs. Replace the device that is causing the failure. Continue adding devices one at a time to ensure all devices are functioning properly. 4. Replace the power supply. 5. Replace the system board.
The incorrect external power supply adapter is being used on the USDT.	The USDT power supply adapter must be at 135W and use the Smart ID technology before the system will power up. Replace the power supply adapter with the HP-supplied USDT power supply adapter.

Solving Diskette Problems

Common causes and solutions for diskette problems are listed in the following table.



NOTE: You may need to reconfigure the computer when you add or remove hardware, such as an additional diskette drive. See [Solving Hardware Installation Problems on page 163](#) for instructions.

Table D-3 Solving Diskette Problems

Diskette drive light stays on.

Cause	Solution
Diskette is damaged.	<p>In Microsoft Windows XP, right-click Start, click Explore, and select a drive. Select File > Properties > Tools. Under Error-checking click Check Now.</p> <p>In Microsoft Windows Vista, right-click Start, click Explore, and right-click on a drive. Select Properties then select the Tools tab. Under Error-checking click Check Now.</p>
Diskette is incorrectly inserted.	Remove diskette and reinsert.
Drive cable is not properly connected.	Reconnect drive cable. Ensure that all four pins on the diskette power cable are connected to the drive.

Table D-3 Solving Diskette Problems (continued)**Drive not found.**

Cause	Solution
Cable is loose.	Reseat diskette drive data and power cable.
Removable drive is not seated properly.	Reseat the drive.
The device has been hidden in Computer Setup.	Run the Computer Setup utility and ensure Device Available is selected for the Legacy Diskette in Security > Device Security .

Diskette drive cannot write to a diskette.

Cause	Solution
Diskette is not formatted.	Format the diskette. <ol style="list-style-type: none"> 1. From Windows Explorer select the disk (A) drive. 2. Right-click the drive letter and select Format. 3. Select the desired options, and click Start to begin formatting the diskette.
Diskette is write-protected.	Use another diskette or remove the write protection.
Writing to the wrong drive.	Check the drive letter in the path statement.
Not enough space is left on the diskette.	<ol style="list-style-type: none"> 1. Use another diskette. 2. Delete unneeded files from diskette.
Legacy diskette writes are disabled in Computer Setup.	Enter Computer Setup and enable Legacy Diskette Write in Storage > Storage Options .
Diskette is damaged.	Replace the damaged disk.

Cannot format diskette.

Cause	Solution
Invalid media reported.	When formatting a disk in MS-DOS, you may need to specify diskette capacity. For example, to format a 1.44-MB diskette, type the following command at the MS-DOS prompt: FORMAT A: /F:1440
Disk may be write-protected.	Open the locking device on the diskette.
Legacy diskette writes are disabled in Computer Setup.	Enter Computer Setup and enable Legacy Diskette Write in Storage > Storage Options .

Table D-3 Solving Diskette Problems (continued)**A problem has occurred with a disk transaction.**

Cause	Solution
The directory structure is bad, or there is a problem with a file.	<p>In Microsoft Windows XP, right-click Start, click Explore, and select a drive. Select File > Properties > Tools. Under Error-checking, click Check Now.</p> <p>In Microsoft Windows Vista, right-click Start, click Explore, and right-click on a drive. Select Properties then select the Tools tab. Under Error-checking click Check Now.</p>

Diskette drive cannot read a diskette.

Cause	Solution
You are using the wrong diskette type for the drive type.	Check the type of drive that you are using and use the correct diskette type.
You are reading the wrong drive.	Check the drive letter in the path statement.
Diskette is damaged.	Replace the diskette with a new one.

“Invalid system disk” message is displayed.

Cause	Solution
A diskette that does not contain the system files needed to start the computer has been inserted in the drive.	When drive activity stops, remove the diskette and press the Spacebar . The computer should start up.
Diskette error has occurred.	Restart the computer by pressing the power button.

Cannot Boot to Diskette.

Cause	Solution
Diskette is not bootable.	Replace with a bootable diskette.
Diskette boot has been disabled in Computer Setup.	<ol style="list-style-type: none"> 1. Run Computer Setup and enable diskette boot in Storage > Boot Order. 2. Run Computer Setup and enable diskette boot in Storage > Storage Options > Removable Media Boot. <p>NOTE: Both steps should be used as the Removable Media Boot function in Computer Setup overrides the Boot Order enable command.</p>
Network server mode is enabled in Computer Setup.	Run Computer Setup and disable Network Server Mode in Security > Password Options .
Removable media boot has been disabled in Computer Setup.	Run Computer Setup and enable Removable Media Boot in Storage > Storage Options > Removable Media Boot .

Solving Hard Drive Problems

Table D-4 Solving Hard Drive Problems

Hard drive error occurs.

Cause	Solution
Hard disk has bad sectors or has failed.	<ol style="list-style-type: none">1. In Microsoft Windows XP, right-click Start, click Explore, and select a drive. Select File > Properties > Tools. Under Error-checking, click Check Now. In Microsoft Windows Vista, right-click Start, click Explore, and right-click on a drive. Select Properties then select the Tools tab. Under Error-checking click Check Now.2. Use a utility to locate and block usage of bad sectors. If necessary, reformat the hard disk.

Disk transaction problem.

Cause	Solution
Either the directory structure is bad or there is a problem with a file.	<p>In Microsoft Windows XP, right-click Start, click Explore, and select a drive. Select File > Properties > Tools. Under Error-checking, click Check Now.</p> <p>In Microsoft Windows Vista, right-click Start, click Explore, and right-click on a drive. Select Properties then select the Tools tab. Under Error-checking click Check Now.</p>

Drive not found (identified).

Cause	Solution
Cable could be loose.	Check cable connections.
The system may not have automatically recognized a newly installed device.	<p>See reconfiguration directions in the Solving Hardware Installation Problems on page 163 section. If the system still does not recognize the new device, check to see if the device is listed within Computer Setup. If it is listed, the probable cause is a driver problem. If it is not listed, the probable cause is a hardware problem.</p> <p>If this is a newly installed drive, run the Computer Setup utility and try adding a POST delay under Advanced > Power-On.</p>
The device is attached to a SATA port that has been hidden in Computer Setup.	Run the Computer Setup utility and ensure Device Available is selected for the device's SATA port in Security > Device Security .
Drive responds slowly immediately after power-up.	Run Computer Setup and increase the POST Delay in Advanced > Power-On Options .

Table D-4 Solving Hard Drive Problems (continued)**Nonsystem disk/NTLDR missing message.**

Cause	Solution
The system is trying to start from a diskette that is not bootable.	Remove the diskette from the diskette drive.
The system is trying to start from the hard drive but the hard drive may have been damaged.	<ol style="list-style-type: none"> 1. Insert a bootable diskette into the diskette drive and restart the computer. 2. Check the hard drive format using fdisk: If NTFS formatting, use a third party reader to evaluate the drive. If FAT32 formatting, the hard drive cannot be accessed.
System files missing or not properly installed.	<ol style="list-style-type: none"> 1. Insert a bootable diskette into the diskette drive and restart the computer. 2. Check the hard drive format using Fdisk: If NTFS formatting, use a third party reader to evaluate the drive. If FAT32 formatting, the hard drive cannot be accessed. 3. Install system files for the appropriate operating system.
Hard drive boot has been disabled in Computer Setup.	Run the Computer Setup utility and enable the hard drive entry in the Storage > Boot Order list.
Bootable hard drive is not attached as first in a multi-hard drive configuration.	If attempting to boot from a hard drive, ensure it is attached to the system board connector labeled P60 SATA 0.
Bootable hard drive's controller is not listed first in the Boot Order.	Run the Computer Setup utility and select Storage > Boot Order and ensure the bootable hard drive's controller is listed immediately under the Hard Drive entry.

Computer will not boot from hard drive.

Cause	Solution
The device is attached to a SATA port that has been hidden in Computer Setup.	Run the Computer Setup utility and ensure Device Available is selected for the device's SATA port in Security > Device Security .
Boot order is not correct.	Run the Computer Setup utility and change boot sequence in Storage > Boot Order .
Hard Drive's "Emulation Type" is set to "None."	Run the Computer Setup utility and change the "Emulation Type" to "Hard Disk" in the device's details under Storage > Device Configuration .
Hard drive is damaged.	<p>Observe if the front panel Power LED is blinking RED and if any beeps are heard. See POST Error Messages on page 131 to determine possible causes for the blinking red and beep codes.</p> <p>See the Worldwide Limited Warranty for terms and conditions.</p>

Computer seems to be locked up.

Cause	Solution
Program in use has stopped responding to commands.	Attempt the normal Windows "Shut Down" procedure. If this fails, press the power button for four or more seconds to turn

Table D-4 Solving Hard Drive Problems (continued)**Computer seems to be locked up.**

Cause	Solution
	off the power. To restart the computer, press the power button again.

The removable hard drive has no power to the hard drive enclosure.

Cause	Solution
The lock on the enclosure is not turned to the "ON" position.	Insert the key and turn the lock clockwise 90 degrees. The green LED on the front of the enclosure should be on.
Power cable from the computer power supply to the enclosure frame is not properly connected.	Check the power supply to make sure it is properly connected to the rear of the enclosure frame.

The removable hard drive is not recognized by the computer.

Cause	Solution
The removable hard drive carrier is not fully seated in the enclosure frame or the hard drive is not fully seated in the carrier.	Push the carrier into the enclosure frame so that the connector on the rear of the frame is properly seated. If this does not solve the problem, turn off the computer, remove the carrier, and check to see if the connector on the hard drive is properly seated in the carrier.

The removable hard drive enclosure is beeping and the green LED is flashing.

Cause	Solution
Fan failure alarm on the removable hard drive enclosure has been activated.	Shut down the computer and contact HP for a replacement enclosure.

Solving Media Card Reader Problems

Table D-5 Solving Media Card Reader Problems**Media card will not work in a digital camera after formatting it in Microsoft Windows XP or Microsoft Windows Vista.**

Cause	Solution
By default, Windows XP and Windows Vista will format any media card with a capacity greater than 32MB with the FAT32 format. Most digital cameras use the FAT (FAT16 & FAT12) format and can not operate with a FAT32 formatted card.	Either format the media card in the digital camera or select FAT file system to format the media card in a computer with Windows XP or Windows Vista.

Table D-5 Solving Media Card Reader Problems (continued)

A write-protected or locked error occurs when attempting to write to the media card.

Cause	Solution
Media card is locked. Locking the media card is a safety feature that prevents writing to and deleting from an SD/Memory Stick/PRO card.	If using an SD card, make sure that the lock tab located on the right of the SD card is not in the locked position. If using a Memory Stick/PRO card, make sure that the lock tab located on the bottom of the Memory Stick/PRO card is not in the locked position.

Can not write to the media card.

Cause	Solution
The media card is a read-only memory (ROM) card.	Check the manufacturer's documentation included with your card to see if it writable. Refer to the previous section for a list of compatible cards.

Unable to access data on the media card after inserting it into a slot.

Cause	Solution
The media card is not inserted properly, is inserted in the wrong slot, or is not supported.	Ensure that the card is inserted properly with the gold contact on the correct side. The green LED will light if inserted properly.

Do not know how to remove a media card correctly.

Cause	Solution
The computer's software is used to safely eject the card.	Open My Computer (Windows XP) or Computer (Windows Vista), right-click on the corresponding drive icon, and select Eject . Then pull the card out of the slot. NOTE: Never remove the card when the green LED is flashing

After installing the media card reader and booting to Windows, the reader and the inserted cards are not recognized by the computer.

Cause	Solution
The operating system needs time to recognize the device if the reader was just installed into the computer and you are turning the PC on for the first time.	Wait a few seconds so that the operating system can recognize the reader and the available ports, and then recognize whatever media is inserted in the reader.

After inserting a media card in the reader, the computer attempts to boot from the media card.

Cause	Solution
The inserted media card has boot capability.	If you do not want to boot from the media card, remove it during boot or do not select the option to boot from the inserted media card during the boot process.

Solving Display Problems

If you encounter display problems, see the documentation that came with the monitor and to the common causes and solutions listed in the following table.

Table D-6 Solving Display Problems

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.
Bad monitor.	Try a different monitor.
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.
System ROM is corrupted; system is running in Boot Block Emergency Recovery Mode (indicated by eight beeps).	Reflash the system ROM with the latest BIOS image. See the "Boot Block Emergency Recovery Mode" section of the <i>Desktop Management Guide</i> for more information.
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.
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.
Monitor cable is plugged into the wrong connector.	If the computer system has both an integrated graphics connector and an add-in graphics card connector, plug the monitor cable into the graphics card connector on the back of the computer.
Monitor settings in the computer are not compatible with the monitor.	<ol style="list-style-type: none"> In Windows XP Control Panel, double-click the Display icon and select the Settings tab. In Windows Vista Control Panel, under Appearance and Personalization, select Adjust screen resolution. Use the sliding control to reset the resolution.

Cannot enable integrated graphics after installing a PCI Express graphics card.

Cause	Solution
On systems with Intel integrated graphics, the integrated graphics cannot be enabled after installing a PCI Express x16.	The integrated graphics can be enabled in Computer Setup if a PCI or PCI Express x1 graphics card is installed, but it cannot be enabled if there is a graphics card in the PCI Express x16 slot.

Table D-6 Solving Display Problems (continued)

Blank screen and the power LED flashes Red five times, once every second, followed by a two second pause, and the computer beeps five times. (Beeps stop after fifth iteration but LEDs continue flashing.)

Cause	Solution
Pre-video memory error.	<ol style="list-style-type: none">1. Reseat DIMMs. Power on the system.2. Replace DIMMs one at a time to isolate the faulty module.3. Replace third-party memory with HP memory.4. Replace the system board.

Blank screen and the power LED flashes Red six times, once every second, followed by a two second pause, and the computer beeps six times. (Beeps stop after fifth iteration but LEDs continue flashing.)

Cause	Solution
Pre-video graphics error.	<p>For systems with a graphics card:</p> <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. <p>For systems with integrated graphics, replace the system board.</p>

Blank screen and the power LED flashes Red seven times, once every second, followed by a two second pause, and the computer beeps seven times. (Beeps stop after fifth iteration but LEDs continue flashing.)

Cause	Solution
System board failure (ROM detected failure prior to video).	Replace the system board.

Monitor does not function properly when used with energy saver features.

Cause	Solution
Monitor without energy saver capabilities is being used with energy saver features enabled.	Disable monitor energy saver feature.

Dim characters.

Cause	Solution
The brightness and contrast controls are not set properly.	Adjust the monitor brightness and contrast controls.
Cables are not properly connected.	Check that the graphics cable is securely connected to the graphics card and the monitor.

Table D-6 Solving Display Problems (continued)**Blurry video or requested resolution cannot be set.**

Cause	Solution
If the graphics controller was upgraded, the correct graphics drivers may not be loaded.	Install the video drivers included in the upgrade kit.
Monitor is not capable of displaying requested resolution.	Change requested resolution.
Graphics card is bad.	Replace the graphics card.

The picture is broken up, rolls, jitters, or flashes.

Cause	Solution
The monitor connections may be incomplete or the monitor may be incorrectly adjusted.	<ol style="list-style-type: none"> 1. Be sure the monitor cable is securely connected to the computer. 2. In a two-monitor system or if another monitor is in close proximity, be sure the monitors are not interfering with each other's electromagnetic field by moving them apart. 3. Fluorescent lights or fans may be too close to the monitor.
Monitor needs to be degaussed.	Degauss the monitor. Refer to the documentation that came with the monitor for instructions.

Image is not centered.

Cause	Solution
Position may need adjustment.	Press the monitor's Menu button to access the OSD menu. Select ImageControl/ Horizontal Position or Vertical Position to adjust the horizontal or vertical position of the image.

"No Connection, Check Signal Cable" displays on screen.

Cause	Solution
Monitor video cable is disconnected.	<p>Connect the video cable between the monitor and computer.</p> <p>CAUTION: Ensure that the computer power is off while connecting the video cable.</p>

"Out of Range" displays on screen.

Cause	Solution
Video resolution and refresh rate are set higher than what the monitor supports.	Restart the computer and enter Safe Mode. Change the settings to a supported setting then restart the computer so that the new settings take effect.

Table D-6 Solving Display Problems (continued)**Vibrating or rattling noise coming from inside a CRT monitor when powered on.**

Cause	Solution
Monitor degaussing coil has been activated.	None. It is normal for the degaussing coil to be activated when the monitor is powered on.

Clicking noise coming from inside a CRT monitor.

Cause	Solution
Electronic relays have been activated inside the monitor.	None. It is normal for some monitors to make a clicking noise when turned on and off, when going in and out of standby mode, and when changing resolutions.

High pitched noise coming from inside a flat panel monitor.

Cause	Solution
Brightness and/or contrast settings are too high.	Lower brightness and/or contrast settings.

Fuzzy focus; streaking, ghosting, or shadowing effects; horizontal scrolling lines; faint vertical bars; or unable to center the picture on the screen (flat panel monitors using an analog VGA input connection only).

Cause	Solution
Flat panel monitor's internal digital conversion circuits may be unable to correctly interpret the output synchronization of the graphics card.	<ol style="list-style-type: none"> 1. Select the monitor's Auto-Adjustment option in the monitor's on-screen display menu. 2. Manually synchronize the Clock and Clock Phase on-screen display functions. To download a SoftPaq that will assist you with the synchronization, go to the following Web site, select the appropriate monitor, and download either SP32347 or SP32202: http://www.hp.com/support
Graphics card is not seated properly or is bad.	<ol style="list-style-type: none"> 1. Reseat the graphics card. 2. Replace the graphics card.

Certain typed symbols do not appear correct.

Cause	Solution
The font you are using does not support that particular symbol.	Use the Character Map to locate the and select the appropriate symbol. Click Start > All Programs > Accessories > System Tools > Character Map . You can copy the symbol from the Character Map into a document.

Solving Audio Problems

If the computer has audio features and you encounter audio problems, see the common causes and solutions listed in the following table.

Table D-7 Solving Audio Problems**Sound cuts in and out.**

Cause	Solution
Processor resources are being used by other open applications.	Shut down all open processor-intensive applications.
Direct sound latency, common in many media player applications.	<p>In Windows XP only:</p> <ol style="list-style-type: none"> 1. From the Control Panel, select Sounds and Audio Devices. 2. On the Audio tab, select a device from the Sound Playback list. 3. Click the Advanced button and select the Performance tab. 4. Set the Hardware acceleration slider to None and the Sample rate conversion quality slider to Good and retest the audio. 5. Set the Hardware acceleration slider to Full and the Sample rate conversion quality slider to Best and retest the audio.

Sound does not come out of the speaker or headphones.

Cause	Solution
Software volume control is turned down or muted.	Double-click the Speaker icon on the taskbar, then make sure that Mute is not selected and use the volume slider to adjust the volume.
Audio is hidden in Computer Setup.	Enable the audio in Computer Setup: Security > Device Security > Audio .
The external speakers are not turned on.	Turn on the external speakers.
The audio device may be connected to the wrong jack.	Ensure that the device is connected to the correct jack on the computer. The speakers should be plugged into the rear line-out jack and the headphones should be plugged into the front headphone jack.
External speakers plugged into the wrong audio jack on a recently installed sound card.	See the sound card documentation for proper speaker connection.
Digital CD audio is not enabled.	Enable digital CD audio. In the Device Manager, right-click on the CD/DVD device and select Properties . Make sure Enable digital CD audio for this CD-ROM device is checked.
Headphones or devices connected to the line-out connector mute the internal speaker.	Turn on and use headphones or external speakers, if connected, or disconnect headphones or external speakers.
Computer is in standby mode.	<p>Press the power button to resume from standby mode.</p> <p>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.</p>
Internal speaker is disabled in Computer Setup.	Enable the internal speaker in Computer Setup. Select Advanced > Device Options > Internal Speaker .

Table D-7 Solving Audio Problems (continued)**Sound from headphones is not clear or muffled.**

Cause	Solution
Headphones are plugged into the rear audio output connector. The rear audio output connector is for powered audio devices and is not designed for headphone use.	Plug the headphones into the headphone connector on the front of the computer.

Computer appears to be locked up while recording audio.

Cause	Solution
The hard disk may be full.	Before recording, make sure there is enough free space on the hard disk. You can also try recording the audio file in a compressed format.

Line-in jack is not functioning properly.

Cause	Solution
Jack has been reconfigured in the audio driver or application software.	In the audio driver or application software, reconfigure the jack or set the jack to its default value.

Solving Printer Problems

If you encounter printer problems, see the documentation that came with the printer and to the common causes and solutions listed in the following table.

Table D-8 Solving Printer Problems**Printer will not print.**

Cause	Solution
Printer is not turned on and online.	Turn the printer on and make sure it is online.
The correct printer drivers for the application are not installed.	<ol style="list-style-type: none"> 1. Install the correct printer driver for the application. 2. Try printing using the MS-DOS command: <code>DIR C:\ > [printer port]</code> where [printer port] is the address of the printer being used. If the printer works, reload the printer driver.
If you are on a network, you may not have made the connection to the printer.	Make the proper network connections to the printer.
Printer may have failed.	Run printer self-test.

Printer will not turn on.

Cause	Solution
The cables may not be connected properly.	Reconnect all cables and check the power cord and electrical outlet.

Table D-8 Solving Printer Problems (continued)**Printer prints garbled information.**

Cause	Solution
The correct printer driver for the application is not installed.	Install the correct printer driver for the application.
The cables may not be connected properly.	Reconnect all cables.
Printer memory may be overloaded.	Reset the printer by turning it off for one minute, then turn it back on.

Printer is offline.

Cause	Solution
The printer may be out of paper.	Check the paper tray and refill it if it is empty. Select online.

Solving Keyboard and Mouse Problems

If you encounter keyboard or mouse problems, see the documentation that came with the equipment and to the common causes and solutions listed in the following table.

Table D-9 Solving Keyboard Problems**Keyboard commands and typing are not recognized by the computer.**

Cause	Solution
Keyboard connector is not properly connected.	<ol style="list-style-type: none"> On the Windows XP Desktop, click Start > Shut Down. On the Windows Vista Desktop, click Start, click the arrow on the lower right corner of the Start menu, then select Shut Down. After the shutdown is complete, reconnect the keyboard to the back of the computer and restart the computer.
Program in use has stopped responding to commands.	Shut down your computer using the mouse and then restart the computer.
Keyboard needs repairs.	See the Worldwide Limited Warranty for terms and conditions.
Wireless device error.	<ol style="list-style-type: none"> Check the software, if available, for device status. Check/replace device batteries. Reset receiver and keyboard.
Computer is in standby mode.	<p>Press the power button to resume from standby mode.</p> <p>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.</p>

Table D-9 Solving Keyboard Problems (continued)**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.

Table D-10 Solving Mouse Problems**Mouse does not respond to movement or is too slow.**

Cause	Solution
Mouse connector is not properly plugged into the back of the computer.	Shut down the computer using the keyboard. <ol style="list-style-type: none"> 1. Press the Ctrl and Esc keys at the same time (or press the Windows logo key) to display the Start menu. 2. Use the arrow keys to select Shut Down and then press the Enter key. 3. After the shutdown is complete, plug the mouse connector into the back of the computer (or the keyboard) and restart.
Program in use has stopped responding to commands.	Shut down the computer using the keyboard then restart the computer.
Mouse may need cleaning.	Remove the roller ball cover on the mouse and clean the internal components.
Mouse may need repair.	See the Worldwide Limited Warranty for terms and conditions.
Wireless device error.	<ol style="list-style-type: none"> 1. Check the software, if available, for device status. 2. Check/replace device batteries. 3. Reset receiver and mouse.
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.

Mouse will only move vertically, horizontally, or movement is jerky.

Cause	Solution
Mouse roller ball or the rotating encoder shafts that make contact with the ball are dirty.	Remove roller ball cover from the bottom of the mouse and clean the internal components with a mouse cleaning kit available from most computer stores.

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, Windows 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 Windows, 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 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.

Table D-11 Solving Hardware Installation Problems

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 resource 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. <p>NOTE: DIMM 1 must always be installed.</p> <ol style="list-style-type: none"> 2. Observe the beeps and LED lights on the front of the computer. Beeps and flashing LEDs are codes for specific problems. 3. If you still cannot resolve the issue, contact Customer Support.

Power LED flashes Red five times, once every second, followed by a two second pause, and the computer beeps five times. (Beeps stop after fifth iteration but LEDs continue flashing.)

Cause	Solution
Memory is installed incorrectly or is bad.	CAUTION: To avoid damage to the DIMMs or the system board, you must unplug the computer power cord before attempting to reseat, install, or remove a DIMM module.

Table D-11 Solving Hardware Installation Problems (continued)

Power LED flashes Red five times, once every second, followed by a two second pause, and the computer beeps five times. (Beeps stop after fifth iteration but LEDs continue flashing.)

Cause	Solution
	<ol style="list-style-type: none">1. Reseat DIMMs. Power on the system.2. Replace DIMMs one at a time to isolate the faulty module. <p>NOTE: DIMM 1 must always be installed.</p> <ol style="list-style-type: none">3. Replace third-party memory with HP memory.4. Replace the system board.

Power LED flashes Red six times, once every second, followed by a two second pause, and the computer beeps six times. (Beeps stop after fifth iteration but LEDs continue flashing.)

Cause	Solution
Graphics card is not seated properly or is bad, or system board is bad.	<p>For systems with a graphics card:</p> <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. <p>For systems with integrated graphics, replace the system board.</p>

Power LED flashes Red ten times, once every second, followed by a two second pause, and the computer beeps ten times. (Beeps stop after fifth iteration but LEDs continue flashing.)

Cause	Solution
Bad option card.	<ol style="list-style-type: none">1. Check each option card by removing the cards one at time (if multiple cards), then power on the system to see if fault goes away.2. Once bad card is identified, remove and replace bad option card.3. Replace the system board.

Solving Network Problems

Some common causes and solutions for network problems are listed in the following table. These guidelines do not discuss the process of debugging the network cabling.

Table D-12 Solving Network Problems**Wake-on-LAN feature is not functioning.**

Cause	Solution
Wake-on-LAN is not enabled.	<p>To enable Wake-on-LAN in Windows XP:</p> <ol style="list-style-type: none"> 1. Select Start > Control Panel. 2. Double-click Network Connections. 3. Double-click Local Area Connection. 4. Click Properties. 5. Click Configure. 6. Click the Power Management tab, then select the check box to Allow this device to bring the computer out of standby. <p>To enable Wake-on-LAN in Windows Vista:</p> <ol style="list-style-type: none"> 1. Select Start > Control Panel. 2. Under Network and Internet, select View network status and tasks. 3. In the Tasks list, select Manage network connections. 4. Double-click Local Area Connection. 5. Click the Properties button. 6. Click the Configure button. 7. Click the Power Management tab, then select the check box to Allow this device to wake the computer.

Network driver does not detect network controller.

Cause	Solution
Network controller is disabled.	<ol style="list-style-type: none"> 1. Run Computer Setup and enable network controller. 2. Enable the network controller in the operating system via Device Manager.
Incorrect network driver.	Check the network controller documentation for the correct driver or obtain the latest driver from the manufacturer's Web site.

Network status link light never flashes.**NOTE:** The network status light is supposed to flash when there is network activity.

Cause	Solution
No active network is detected.	Check cabling and network equipment for proper connection.

Table D-12 Solving Network Problems (continued)**Network status link light never flashes.****NOTE:** The network status light is supposed to flash when there is network activity.

Cause	Solution
Network controller is not set up properly.	Check for the device status within Windows, such as Device Manager for driver load and the Network Connections applet within Windows for link status.
Network controller is disabled.	<ol style="list-style-type: none">1. Run Computer Setup and enable network controller.2. Enable the network controller in the operating system via Device Manager.
Network driver is not properly loaded.	Reinstall network drivers.
System cannot autosense the network.	Disable auto-sensing capabilities and force the system into the correct operating mode.

Diagnostics reports a failure.

Cause	Solution
The cable is not securely connected.	Ensure that the cable is securely attached to the network connector and that the other end of the cable is securely attached to the correct device.
The cable is attached to the incorrect connector.	Ensure that the cable is attached to the correct connector.
There is a problem with the cable or a device at the other end of the cable.	Ensure that the cable and device at the other end are operating correctly.
Network controller interrupt is shared with an expansion board.	Under the Computer Setup Advanced menu, change the resource settings for the board.
The network controller is defective.	Contact an authorized service provider.

Diagnostics passes, but the computer does not communicate with the network.

Cause	Solution
Network drivers are not loaded, or driver parameters do not match current configuration.	Make sure the network drivers are loaded and that the driver parameters match the configuration of the network controller. Make sure the correct network client and protocol is installed.
The network controller is not configured for this computer.	Select the Network icon in the Control Panel and configure the network controller.

Network controller stopped working when an expansion board was added to the computer.

Cause	Solution
Network controller interrupt is shared with an expansion board.	Under the Computer Setup Advanced menu, change the resource settings for the board.

Table D-12 Solving Network Problems (continued)**Network controller stopped working when an expansion board was added to the computer.**

Cause	Solution
The network controller requires drivers.	Verify that the drivers were not accidentally deleted when the drivers for a new expansion board were installed.
The expansion board installed is a network card (NIC) and conflicts with the embedded NIC.	Under the Computer Setup Advanced menu, change the resource settings for the board.

Network controller stops working without apparent cause.

Cause	Solution
The files containing the network drivers are corrupted.	Reinstall the network drivers, using the Recovery Disc Set created from the hard drive's Recovery Partition.
The cable is not securely connected.	Ensure that the cable is securely attached to the network connector and that the other end of the cable is securely attached to the correct device.
The network controller is defective.	Contact an authorized service provider.

New network card will not boot.

Cause	Solution
New network card may be defective or may not meet industry-standard specifications.	Install a working, industry-standard NIC, or change the boot sequence to boot from another source.

Cannot connect to network server when attempting Remote System Installation.

Cause	Solution
The network controller is not configured properly.	Verify Network Connectivity, that a DHCP Server is present, and that the Remote System Installation Server contains the NIC drivers for your NIC.

System setup utility reports unprogrammed EEPROM.

Cause	Solution
Unprogrammed EEPROM.	Contact an authorized service provider.

Solving Memory Problems

If you encounter memory problems, some common causes and solutions are listed in the following table.

- △ **CAUTION:** Power may still be supplied to the DIMMs when the computer is turned off (depending on the Management Engine (ME) settings). To avoid damage to the DIMMs or the system board, you must unplug the computer power cord before attempting to reseat, install, or remove a DIMM module.

For those systems that support ECC memory, HP does not support mixing ECC and non-ECC memory. Otherwise, the computer will not boot the operating system.


-  **NOTE:** The memory count will be affected by configurations with the Management Engine (ME) enabled. The ME uses 8MB of system memory in single channel mode or 16MB of memory in dual-channel mode to download, decompress, and execute the ME firmware for Out-of-Band (OOB), third-party data storage, and other management functions.

Table D-13 Solving Memory Problems

System will not boot or does not function properly after installing additional memory modules.

Cause	Solution
A memory module is not installed in the XMM1 (or DIMM1) socket.	Ensure that a memory module is installed in the black XMM1 (or DIMM1) socket on the system board. This socket must be populated with a memory module.
Memory module is not the correct type or speed grade for the system or the new memory module is not seated properly.	Replace module with the correct industry-standard device for the computer. On some models, ECC and non-ECC memory modules cannot be mixed.

Out of memory error.

Cause	Solution
Memory configuration may not be set up correctly.	Use the Device Manager to check memory configuration.
You have run out of memory to run the application.	Check the application documentation to determine the memory requirements.

Memory count during POST is wrong.

Cause	Solution
The memory modules may not be installed correctly.	Check that the memory modules have been installed correctly and that proper modules are used.
Integrated graphics may use system memory.	No action required.

Insufficient memory error during operation.

Cause	Solution
Too many Terminate and Stay Resident programs (TSRs) are installed.	Delete any TSRs that you do not need.
You have run out of memory for the application.	Check the memory requirements for the application or add more memory to the computer.

Table D-13 Solving Memory Problems (continued)

Power LED flashes Red five times, once every second, followed by a two second pause, and the computer beeps five times. (Beeps stop after fifth iteration but LEDs continue flashing.)

Cause	Solution
Memory is installed incorrectly or is bad.	<ol style="list-style-type: none">1. Reseat DIMMs. Power on the system.2. Replace DIMMs one at a time to isolate the faulty module.3. Replace third-party memory with HP memory.4. Replace the system board.

Solving Processor Problems

If you encounter processor problems, common causes and solutions are listed in the following table.

Table D-14 Solving Processor Problems

Poor performance is experienced.

Cause	Solution
Processor is hot.	<ol style="list-style-type: none">1. Make sure the airflow to the computer is not blocked.2. Make sure the fans are connected and working properly (some fans only operate when needed).3. Make sure the processor heatsink is installed properly.

Power LED flashes Red three times, once every second, followed by a two second pause.

Cause	Solution
Processor is not seated properly or not installed.	<ol style="list-style-type: none">1. Check to see that the processor is present.2. Reseat the processor.

Power LED flashes Red eleven times, once every second, followed by a two second pause.

Cause	Solution
The current processor does not support a feature previously enabled on this system.	<ol style="list-style-type: none">1. Install a TXT capable processor.2. Disable TXT in the Computer Setup (F10) utility.3. Reinstall the original processor.

Solving CD-ROM and DVD Problems

If you encounter CD-ROM or DVD problems, see the common causes and solutions listed in the following table or to the documentation that came with the optional device.

Table D-15 Solving CD-ROM and DVD Problems**System will not boot from CD-ROM or DVD drive.**

Cause	Solution
The device is attached to a SATA port that has been hidden in the Computer Setup utility.	Run the Computer Setup utility and ensure Device Available is selected for the device's SATA port in Security > Device Security .
Removable Media Boot is disabled in the Computer Setup utility.	Run the Computer Setup utility and enable booting to removable media in Storage > Storage Options . Ensure CD-ROM is enabled in Storage > Boot Order .
Network Server Mode is enabled in Computer Setup.	Run the Computer Setup utility and disable Network Server Mode in Security > Password Options .
Non-bootable CD in drive.	Try a bootable CD in the drive.
Boot order not correct.	Run the Computer Setup utility and change boot sequence in Storage > Boot Order .

Drive not found (identified).

Cause	Solution
Cable could be loose.	Check cable connections.
The system may not have automatically recognized a newly installed device.	See reconfiguration directions in the Solving Hardware Installation Problems on page 163 section. If the system still does not recognize the new device, check to see if the device is listed within Computer Setup. If it is listed, the probable cause is a driver problem. If it is not listed, the probable cause is a hardware problem. If this is a newly installed drive, run the Computer Setup utility and try adding a POST delay under Advanced > Power-On .
The device is attached to a SATA port that has been hidden in Computer Setup.	Run the Computer Setup utility and ensure Device Available is selected for the device's SATA port in Security > Device Security .
Drive responds slowly immediately after power-up.	Run Computer Setup and increase the POST Delay in Advanced > Power-On Options .

CD-ROM or DVD devices are not detected or driver is not loaded.

Cause	Solution
Drive is not connected properly or not properly configured.	See the documentation that came with the optional device.

Movie will not play in the DVD drive.

Cause	Solution
Movie may be regionalized for a different country.	See the documentation that came with the DVD drive.
Decoder software is not installed.	Install decoder software.
Damaged media.	Replace media.

Table D-15 Solving CD-ROM and DVD Problems (continued)**Movie will not play in the DVD drive.**

Cause	Solution
Movie rating locked out by parental lock.	Use DVD software to remove parental lock.
Media installed upside down.	Reinstall media.

Cannot eject compact disc (tray-load unit).

Cause	Solution
Disc not properly seated in the drive.	Turn off the computer and insert a thin metal rod into the emergency eject hole and push firmly. Slowly pull the tray out from the drive until the tray is fully extended, then remove the disc.

CD-ROM, CD-RW, DVD-ROM, or DVD-R/RW drive cannot read a disc or takes too long to start.

Cause	Solution
Media has been inserted upside down.	Re-insert the Media with the label facing up.
The DVD-ROM drive takes longer to start because it has to determine the type of media played, such as audio or video.	Wait at least 30 seconds to let the DVD-ROM drive determine the type of media being played. If the disc still does not start, read the other solutions listed for this topic.
CD or DVD disc is dirty.	Clean CD or DVD with a CD cleaning kit, available from most computer stores.
Windows does not detect the CD-ROM or DVD-ROM drive.	<ol style="list-style-type: none"> 1. Use Device Manager to remove or uninstall the device. 2. Restart the computer and let Windows detect the CD or DVD driver.

Recording or copying CDs is difficult or impossible.

Cause	Solution
Wrong or poor quality media type.	<ol style="list-style-type: none"> 1. Try using a slower speed when recording. 2. Verify that you are using the correct media for the drive. 3. Try a different brand of media. Quality varies widely between manufacturers.

USDT computer boots too slow after removing a CD-ROM or DVD drive.

Cause	Solution
The system is searching for the drive during boot because the drive cable is still attached to the system board.	Disconnect the drive cable from the system board.

Solving Drive Key Problems

If you encounter Drive Key problems, common causes and solutions are listed in the following table.

Table D-16 Solving Drive Key Problems

USB Drive Key is not seen as a drive letter in Windows.

Cause	Solution
The drive letter after the last physical drive is not available.	Change the default drive letter for the Drive Key in Windows.

USB Drive Key not found (identified).

Cause	Solution
The device is attached to a USB port that has been hidden in Computer Setup.	Run the Computer Setup utility and ensure that "Device available" is selected for "All USB Ports" and "Front USB Ports" under Security > Device Security .
The device was not properly seated before power-up.	Ensure the device is fully inserted into the USB port before applying power to the system

System will not boot from USB Drive Key.

Cause	Solution
Boot order is not correct.	Run the Computer Setup utility and change boot sequence in Storage > Boot Order .
Removable Media Boot is disabled in the Computer Setup utility.	Run the Computer Setup utility and enable booting to removable media in Storage > Storage Options . Ensure USB is enabled in Storage > Boot Order .
The image on the device is not bootable.	Follow the procedures described in the "ROM Flash: Replicating the Setup: Creating a Bootable Device: Supported USB Flash Media Device" section of the <i>Service Reference Guide</i> .

The computer boots to DOS after making a bootable Drive Key.

Cause	Solution
Drive Key is bootable.	Install the Drive Key only after the operating system boots.

Solving Front Panel Component Problems

If you encounter problems with devices connected to the front panel, refer to the common causes and solutions listed in the following table.

Table D-17 Solving Front Panel Component Problems**A USB device, headphone, or microphone is not recognized by the computer.**

Cause	Solution
Device is not properly connected.	<ol style="list-style-type: none"> 1. Turn off the computer. 2. Reconnect the device to the front of the computer and restart the computer.
The device does not have power.	If the USB device requires AC power, be sure one end is connected to the device and one end is connected to a live outlet.
The correct device driver is not installed.	<ol style="list-style-type: none"> 1. Install the correct driver for the device. 2. You might need to reboot the computer.
The cable from the device to the computer does not work.	<ol style="list-style-type: none"> 1. If possible, replace the cable. 2. Restart the computer.
The device is not working.	<ol style="list-style-type: none"> 1. Replace the device. 2. Restart the computer.
USB ports on the computer are disabled in Computer Setup.	Enter Computer Setup (F10) and enable the USB ports.

Solving Internet Access Problems

If you encounter Internet access problems, consult your Internet Service Provider (ISP) or refer to the common causes and solutions listed in the following table.

Table D-18 Solving Internet Access Problems**Unable to connect to the Internet.**

Cause	Solution
Internet Service Provider (ISP) account is not set up properly.	Verify Internet settings or contact your ISP for assistance.
Modem is not set up properly.	Reconnect the modem. Verify the connections are correct using the quick setup documentation.
Web browser is not set up properly.	Verify that the Web browser is installed and set up to work with your ISP.
Cable/DSL modem is not plugged in.	Plug in cable/DSL modem. You should see a "power" LED light on the front of the cable/DSL modem.
Cable/DSL service is not available or has been interrupted due to bad weather.	Try connecting to the Internet at a later time or contact your ISP. (If the cable/DSL service is connected, the "cable" LED light on the front of the cable/DSL modem will be on.)
The CAT5 UTP cable is disconnected.	Connect the CAT5 UTP cable between the cable modem and the computer's RJ-45 connector. (If the connection is good, the "PC" LED light on the front of the cable/DSL modem will be on.)

Table D-18 Solving Internet Access Problems (continued)**Unable to connect to the Internet.**

Cause	Solution
IP address is not configured properly.	Contact your ISP for the correct IP address.
Cookies are corrupted. (A “cookie” is a small piece of information that a Web server can store temporarily with the Web browser. This is useful for having the browser remember some specific information that the Web server can later retrieve.)	<p>Windows Vista</p> <ol style="list-style-type: none"> 1. Select Start > Control Panel. 2. Click Network and Internet. 3. Click Internet Options. 4. In the Browsing history section on the General tab, click the Delete button. 5. Click the Delete cookies button. <p>Windows XP</p> <ol style="list-style-type: none"> 1. Select Start > Control Panel. 2. Double-click Internet Options. 3. On the General tab, click the Delete Cookies button.

Cannot automatically launch Internet programs.

Cause	Solution
You must log on to your ISP before some programs will start.	Log on to your ISP and launch the desired program.

Internet takes too long to download Web sites.

Cause	Solution
Modem is not set up properly.	<p>Verify that the modem is connected and communicating properly.</p> <p>Windows XP</p> <ol style="list-style-type: none"> 1. Select Start > Control Panel. 2. Double-click System. 3. Click the Hardware tab. 4. In the Device Manager area, click the Device Manager button. 5. Double-click Modems. 6. Double-click Agere Systems PCI-SV92PP Soft Modem. 7. On the General tab, click Diagnostics. 8. Click Query Modem. A “Success” response indicates the modem is connected and working properly. <p>Windows Vista</p>

Table D-18 Solving Internet Access Problems (continued)**Internet takes too long to download Web sites.**

Cause	Solution
	<ol style="list-style-type: none"> 1. Select Start > Control Panel. 2. Click on System and Maintenance. 3. Click on System. 4. In the Tasks list, select Device Manager. 5. Double-click Modems. 6. Double-click Agere Systems PCI-SV92PP Soft Modem. 7. On the General tab, click Diagnostics. 8. Click Query Modem. A "Success" response indicates the modem is connected and working properly.

Solving Software Problems

Most software problems occur as a result of the following:

- The application was not installed or configured correctly.
- There is insufficient memory available to run the application.
- There is a conflict between applications.
- Be sure that all the needed device drivers have been installed.
- If you have installed an operating system other than the factory-installed operating system, check to be sure it is supported on the system.

If you encounter software problems, see the applicable solutions listed in the following table.

Table D-19 Solving Software Problems**Computer will not continue and no HP logo screen has appeared.**

Cause	Solution
POST error has occurred.	<p>Observe the beeps and LED lights on the front of the computer. See POST Error Messages on page 131 to determine possible causes.</p> <p>See the Restore Kit or the Worldwide Limited Warranty for terms and conditions.</p>

Computer will not continue after HP logo screen has appeared.

Cause	Solution
System files may be damaged.	Use recovery diskette to scan hard drive for errors.

Table D-19 Solving Software Problems (continued)

"Illegal Operation has Occurred" error message is displayed.

Cause	Solution
Software being used is not Microsoft-certified for your version of Windows.	Verify that the software is certified by Microsoft for your version of Windows (see program packaging for this information).
Configuration files are corrupt.	If possible, save all data, close all programs, and restart the computer.

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.

E 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

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