



# HP Compaq Business PC Hardware Reference Guide

Elite 8300 Series Convertible Minitower

Elite 8300 Series Microtower

Elite 8300 Series Small Form Factor

Elite 8300 Series Ultra-Slim Desktop

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Elite 8300 Series Convertible Minitower

Elite 8300 Series Microtower

Elite 8300 Series Small Form Factor


Elite 8300 Series Ultra-Slim Desktop


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## About This Book

This guide provides basic information for upgrading HP Compaq Business PCs.

 **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 Product Features


## Standard Configuration Features

Features may vary depending on the model. For a complete listing of the hardware and software installed in the computer, run the diagnostic utility (included on some computer models only).

**Figure 1-1** Convertible Minitower Configuration



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 **NOTE:** The HP Compaq Convertible Minitower computer can be easily converted to a desktop. For more information, see [Changing from a Minitower to a Desktop Configuration on page 45](#) in this guide.

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**Figure 1-2** Microtower Configuration



**Figure 1-3** Small Form Factor Configuration



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 **NOTE:** The Small Form Factor computer can also be used in a tower orientation. For more information, see [Changing from Desktop to Tower Configuration on page 95](#) in this guide.

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**Figure 1-4** Ultra-Slim Desktop Configuration



# Convertible Minitower (CMT) Front Panel Components

Drive configuration may vary by model. Some models have a bezel blank covering one or more drive bays.

Figure 1-5 Front Panel Components

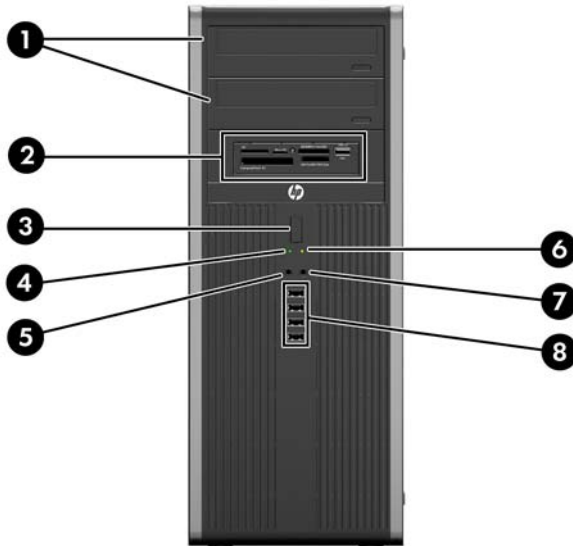


Table 1-1 Front Panel Components

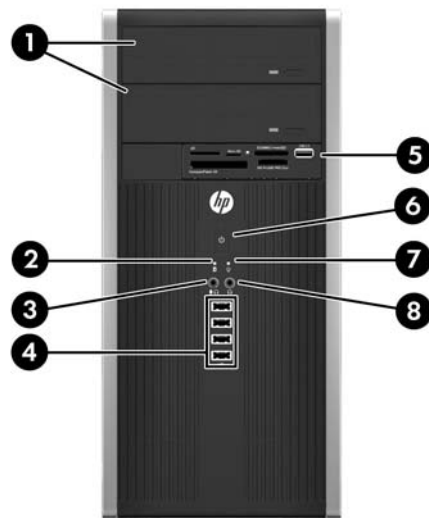
1	5.25-inch Optical Drives	5	Microphone/Headphone Connector
2	5.25-inch Media Card Reader (optional)	6	Power On Light
3	Dual-State Power Button	7	Headphone Connector
4	Hard Drive Activity Light	8	USB (Universal Serial Bus) Ports

**NOTE:** When a device is plugged into the Microphone/Headphone Connector, a dialog box will pop up asking if you want to use the connector for a microphone Line-In device or a headphone. You can reconfigure the connector at any time by double-clicking the Realtek HD Audio Manager icon in the Windows taskbar.

**NOTE:** The Power On Light is normally green when the power is on. If it is flashing red, there is a problem with the computer and it is displaying a diagnostic code. Refer to the *Maintenance and Service Guide* to interpret the code.

# Microtower (MT) Front Panel Components

Drive configuration may vary by model. Some models have a bezel blank covering one or more drive bays.



**Table 1-2 Front Panel Components**

1	5.25-inch Optical Drives	5	3.5-inch Media Card Reader (optional)
2	Hard Drive Activity Light	6	Dual-State Power Button
3	Microphone/Headphone Connector	7	Power On Light
4	USB (Universal Serial Bus) 2.0 Ports	8	Headphone Connector

**NOTE:** When a device is plugged into the Microphone/Headphone Connector, a dialog box will pop up asking if you want to use the connector for a microphone Line-In device or a headphone. You can reconfigure the connector at any time by double-clicking the Realtek HD Audio Manager icon in the Windows taskbar.

**NOTE:** The Power On Light is normally green when the power is on. If it is flashing red, there is a problem with the computer and it is displaying a diagnostic code. Refer to the *Maintenance and Service Guide* to interpret the code.

# Small Form Factor (SFF) Front Panel Components

Drive configuration may vary by model. Some models have a bezel blank covering one or more drive bays.

Figure 1-6 Front Panel Components

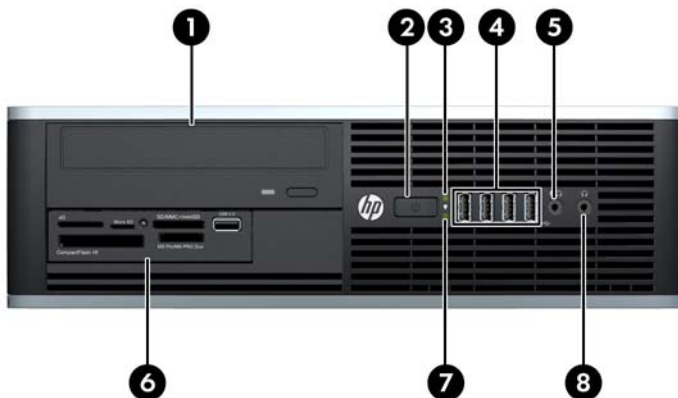


Table 1-3 Front Panel Components

1	5.25-inch Optical Drive	5	Microphone/Headphone Connector
2	Dual-State Power Button	6	3.5-inch Media Card Reader (optional)
3	Power On Light	7	Hard Drive Activity Light
4	USB (Universal Serial Bus) Ports	8	Headphone Connector

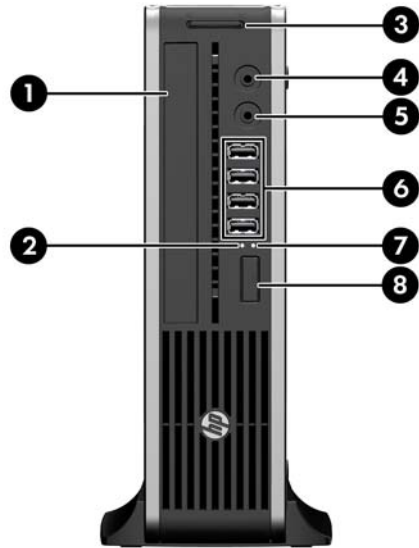
**NOTE:** When a device is plugged into the Microphone/Headphone Connector, a dialog box will pop up asking if you want to use the connector for a microphone Line-In device or a headphone. You can reconfigure the connector at any time by double-clicking the Realtek HD Audio Manager icon in the Windows taskbar.

**NOTE:** The Power On Light is normally green when the power is on. If it is flashing red, there is a problem with the computer and it is displaying a diagnostic code. Refer to the *Maintenance and Service Guide* to interpret the code.

# Ultra-Slim Desktop (USDT) Front Panel Components

Drive configuration may vary by model. Some models have a bezel blank covering the optical drive bay.

**Figure 1-7** Front Panel Components



**Table 1-4** Front Panel Components

1	Optical Drive	5	Microphone/Headphone Connector
2	Power On Light	6	USB (Universal Serial Bus) Ports
3	SD Media Card Reader (optional)	7	Hard Drive Activity Light
4	Headphone Connector	8	Dual-State Power Button

**NOTE:** When a device is plugged into the Microphone/Headphone Connector, a dialog box will pop up asking if you want to use the connector for a microphone Line-In device or a headphone. You can reconfigure the connector at any time by double-clicking the Realtek HD Audio Manager icon in the Windows taskbar.

**NOTE:** The Power On Light is normally green when the power is on. If it is flashing red, there is a problem with the computer and it is displaying a diagnostic code. Refer to the *Maintenance and Service Guide* to interpret the code.

# Convertible Minitower (CMT) Rear Panel Components

Figure 1-8 Rear Panel Components

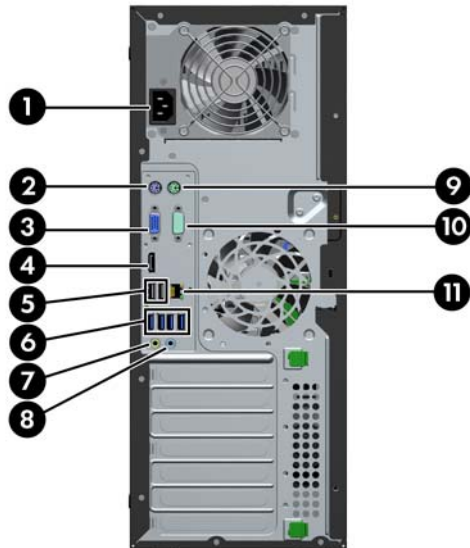












Table 1-5 Rear Panel Components

1	Power Cord Connector	7	 Line-Out Connector for powered audio devices (green)
2	 PS/2 Keyboard Connector (purple)	8	 Line-In Audio Connector (blue)
3	 VGA Monitor Connector	9	 PS/2 Mouse Connector (green)
4	 DisplayPort Monitor Connector	10	 Serial Connector
5	 USB 2.0 ports	11	 RJ-45 Network Connector
6	 USB 3.0 ports		

**NOTE:** An optional second serial port and an optional parallel port are available from HP.

When a device is plugged into the blue Line-In Audio Connector, a dialog box will pop up asking if you want to use the connector for a line-in device or a microphone. You can reconfigure the connector at any time by double-clicking the Realtek HD Audio Manager icon in the Windows taskbar.

The monitor connectors on the system board are inactive when a graphics card is installed in the computer.

If a graphics card is installed into one of the system board slots, the connectors on the graphics card and the system board may be used at the same time. Some settings may need to be changed in Computer Setup to use both connectors.

# Microtower (MT) Rear Panel Components

Figure 1-9 Rear Panel Components

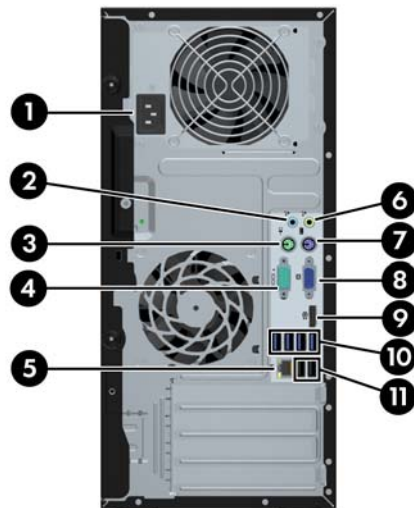









Table 1-6 Rear Panel Components

1	Power Cord Connector	6		Line-Out Connector for powered audio devices (green)
2	 Line-In Audio Connector (blue)	7		PS/2 Keyboard Connector (purple)
3	 PS/2 Mouse Connector (green)	8		VGA Monitor Connector
4	 Serial Connector	9		DisplayPort Monitor Connector
5	 RJ-45 Network Connector	10		USB 3.0 ports
		11		USB 2.0 ports

**NOTE:** An optional second serial port and an optional parallel port are available from HP.

When a device is plugged into the blue Line-In Audio Connector, a dialog box will pop up asking if you want to use the connector for a line-in device or a microphone. You can reconfigure the connector at any time by double-clicking the Realtek HD Audio Manager icon in the Windows taskbar.

The monitor connectors on the system board are inactive when a graphics card is installed in the computer.

If a graphics card is installed into one of the motherboard slots, the connectors on the graphics card and the system board may be used at the same time. Some settings may need to be changed in Computer Setup to use both connectors.



# Small Form Factor (SFF) Rear Panel Components

Figure 1-10 Rear Panel Components

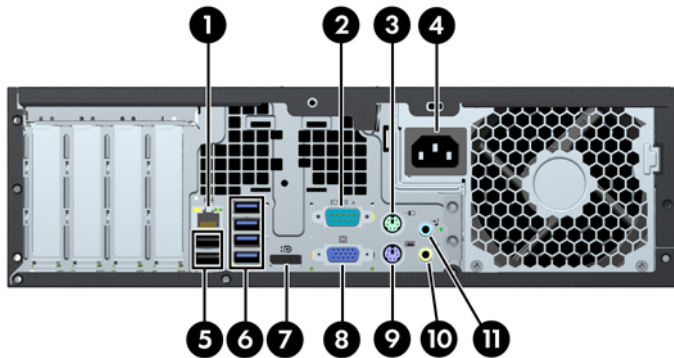


Table 1-7 Rear Panel Components

1	RJ-45 Network Connector	7	DisplayPort Monitor Connector
2	Serial Connector	8	VGA Monitor Connector
3	PS/2 Mouse Connector (green)	9	PS/2 Keyboard Connector (purple)
4	Power Cord Connector	10	Line-Out Connector for powered audio devices (green)
5	USB 2.0 ports	11	Line-In Audio Connector (blue)
6	USB 3.0 ports		

**NOTE:** An optional second serial port and an optional parallel port are available from HP.

When a device is plugged into the blue Line-In Audio Connector, a dialog box will pop up asking if you want to use the connector for a line-in device or a microphone. You can reconfigure the connector at any time by double-clicking the Realtek HD Audio Manager icon in the Windows taskbar.

The monitor connectors on the system board are inactive when a graphics card is installed in the computer.

If a graphics card is installed into one of the motherboard slots, the connectors on the graphics card and the system board may be used at the same time. Some settings may need to be changed in Computer Setup to use both connectors.

# Ultra-Slim Desktop (USDT) Rear Panel Components

Figure 1-11 Rear Panel Components

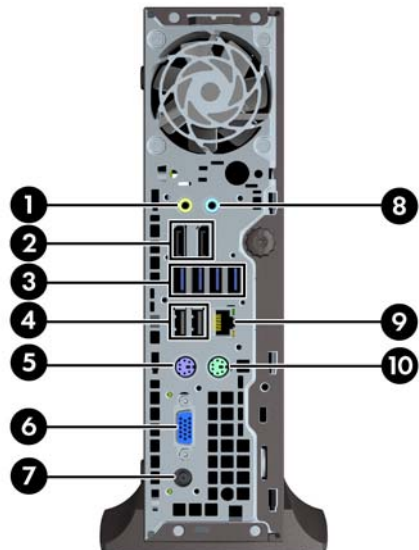


Table 1-8 Rear Panel Components

1		Line-Out Connector for powered audio devices (green)	6		VGA Monitor Connector
2		DisplayPort Monitor Connectors	7		Power Cord Connector
3		USB 3.0 ports	8		Line-In Audio Connector (blue)
4		USB 2.0 ports	9		RJ-45 Network Connector
5		PS/2 Keyboard Connector (purple)	10		PS/2 Mouse Connector (green)

**NOTE:** If an MXM graphics card is installed, all three monitor ports are active. The integrated graphics operate DisplayPort2 (top port). The MXM/ATI drivers operate DisplayPort1 (bottom port) and VGA. If the integrated graphics are disabled in the BIOS settings, DisplayPort2 (top port) will not be active.

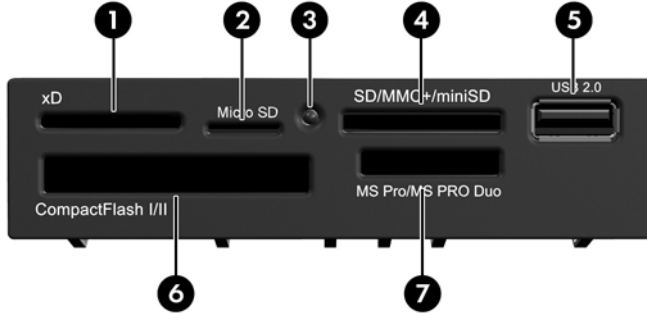
If an MXM graphics card is not installed, all three monitor ports are driven by the integrated graphics. Due to a limitation with the Intel integrated graphics, when a DisplayPort to DVI or HDMI adapter is installed, the VGA port will not be active.

When a device is plugged into the blue Line-In Audio Connector, a dialog box will pop up asking if you want to use the connector for a line-in device or a microphone. You can reconfigure the connector at any time by double-clicking the Realtek HD Audio Manager icon in the Windows taskbar.

# Media Card Reader Components

The media card reader is an optional device available on some models only. Refer to the following illustration and table to identify the media card reader components.

**Figure 1-12** Media Card Reader Components



**Table 1-9** Media Card Reader Components

No.	Slot	Media
1	<b>xD</b>	<ul style="list-style-type: none"> <li>xD-Picture Card (xD)</li> </ul>
2	<b>MicroSD</b>	<ul style="list-style-type: none"> <li>MicroSD (T-Flash)</li> <li>MicroSDHC</li> </ul>
3	<b>Media Card Reader Activity Light</b>	
4	<b>SD/MMC+/miniSD</b>	<ul style="list-style-type: none"> <li>Secure Digital (SD)</li> <li>Secure Digital High Capacity (SDHC)</li> <li>MiniSD</li> <li>MiniSDHC</li> <li>MultiMediaCard (MMC)</li> <li>Reduced Size MultiMediaCard (RS MMC)</li> <li>MultiMediaCard 4.0 (MMC Plus)</li> <li>Reduced Size MultiMediaCard 4.0 (MMC Mobile)</li> <li>MMC Micro (adapter required)</li> </ul>
5	<b>USB</b>	<ul style="list-style-type: none"> <li>USB (Universal Serial Bus) Port</li> </ul>
6	<b>CompactFlash I/II</b>	<ul style="list-style-type: none"> <li>CompactFlash Card Type 1</li> <li>CompactFlash Card Type 2</li> <li>MicroDrive</li> </ul>
7	<b>MS PRO/MS PRO DUO</b>	<ul style="list-style-type: none"> <li>Memory Stick (MS)</li> <li>MagicGate Memory Stick (MG)</li> <li>MagicGate Memory Stick Duo</li> <li>Memory Stick Select</li> <li>Memory Stick Duo (MS Duo)</li> <li>Memory Stick PRO (MS PRO)</li> <li>Memory Stick PRO Duo (MS PRO Duo)</li> <li>Memory Stick PRO-HG Duo</li> <li>Memory Stick Micro (M2) (adapter required)</li> </ul>

# Keyboard

Figure 1-13 Keyboard Components



Table 1-10 Keyboard Components

1	Function Keys	Perform special functions depending on the software application being used.
2	Editing Keys	Includes the following: Insert, Home, Page Up, Delete, End, and Page Down.
3	Status Lights	Indicate the status of the computer and keyboard settings (Num Lock, Caps Lock, and Scroll Lock).
4	Numeric Keys	Work like a calculator keypad.
5	Arrow Keys	Used to navigate through a document or Web site. These keys allow you to move left, right, up, and down, using the keyboard instead of the mouse.
6	Ctrl Keys	Used in combination with another key; their effect depends on the application software you are using.
7	Application Key <sup>1</sup>	Used (like the right mouse button) to open pop-up menus in a Microsoft Office application. May perform other functions in other software applications.
8	Windows Logo Keys <sup>1</sup>	Used to open the Start menu in Microsoft Windows. Used in combination with other keys to perform other functions.
9	Alt Keys	Used in combination with another key; their effect depends on the application software you are using.

<sup>1</sup> Keys available in select geographic regions.

## Using the Windows Logo Key

Use the Windows Logo key in combination with other keys to perform certain functions available in the Windows operating system. Refer to [Keyboard on page 12](#) to identify the Windows Logo key.

**Table 1-11 Windows Logo Key Functions**

The following Windows Logo Key functions are available in Microsoft Windows XP, Microsoft Windows Vista, and Microsoft Windows 7.	
Windows Logo Key	Displays or hides the Start menu
Windows Logo Key + <b>d</b>	Displays the Desktop
Windows Logo Key + <b>m</b>	Minimizes all open applications
<b>Shift</b> + Windows Logo Key + <b>m</b>	Undoes Minimize All
Windows Logo Key + <b>e</b>	Launches My Computer
Windows Logo Key + <b>f</b>	Launches Find Document
Windows Logo Key + <b>Ctrl</b> + <b>f</b>	Launches Find Computer
Windows Logo Key + <b>F1</b>	Launches Windows Help
Windows Logo Key + <b>l</b>	Locks the computer if you are connected to a network domain, or allows you to switch users if you are not connected to a network domain
Windows Logo Key + <b>r</b>	Launches the Run dialog box
Windows Logo Key + <b>u</b>	Launches the Utility Manager
Windows Logo Key + <b>Tab</b>	Windows XP - Cycles through the Taskbar buttons Windows Vista and Windows 7 - Cycles through programs on the Taskbar using the Windows Flip 3-D
In addition to the Windows Logo Key functions described above, the following functions are also available in Microsoft Windows Vista and Windows 7.	
<b>Ctrl</b> + Windows Logo Key + <b>Tab</b>	Use the arrow keys to cycle through programs on the Taskbar by using Windows Flip 3-D
Windows Logo Key + <b>Spacebar</b>	Brings all gadgets to the front and select Windows Sidebar
Windows Logo Key + <b>g</b>	Cycles through Sidebar gadgets
Windows Logo Key + <b>t</b>	Cycles through programs on the taskbar
Windows Logo Key + <b>u</b>	Launches Ease of Access Center
Windows Logo Key + <b>any number key</b>	Launches the Quick Launch shortcut that is in the position that corresponds to the number (for example, Windows Logo Key + <b>1</b> launches the first shortcut in the Quick Launch menu)
In addition to the Windows Logo Key functions described above, the following functions are also available in Microsoft Windows 7.	
Windows Logo Key + <b>Ctrl</b> + <b>b</b>	Switches to the program that displayed a message in the notification area
Windows Logo Key + <b>p</b>	Choose a presentation display mode
Windows Logo Key + <b>up arrow</b>	Maximizes the window
Windows Logo Key + <b>left arrow</b>	Snaps the window to the left side of the screen

**Table 1-11 Windows Logo Key Functions (continued)**

Windows Logo Key + <a href="#">right arrow</a>	Snaps the window to the right side of the screen
Windows Logo Key + <a href="#">down arrow</a>	Minimizes the window
Windows Logo Key + <a href="#">Shift</a> + <a href="#">up arrow</a>	Stretches the window to the top and bottom of the screen
Windows Logo Key + <a href="#">Shift</a> + <a href="#">left arrow</a> or <a href="#">right arrow</a>	Moves a window from one monitor to another
Windows Logo Key + <a href="#">+</a> (on numpad)	Zooms in
Windows Logo Key + <a href="#">-</a> (on numpad)	Zooms out

## Serial Number Location

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

**Figure 1-14** Convertible Minitower Serial Number and Product ID Location



**Figure 1-15** Microtower Serial Number and Product ID Location



**Figure 1-16** Small Form Factor Serial Number and Product ID Location



**Figure 1-17** Ultra-Slim Desktop (USD) Serial Number and Product ID Location





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## 2 Convertible Minitower (CMT) Hardware Upgrades

### Serviceability Features

The computer includes features that make it easy to upgrade and service. No tools are needed for most of the installation procedures described in this chapter.

### Warnings and Cautions

Before performing upgrades be sure to carefully read all of the applicable instructions, cautions, and warnings in this guide.

**⚠ WARNING!** To reduce the risk of personal injury from electrical shock, hot surfaces, or fire:

Disconnect the power cord from the wall outlet and allow the internal system components to cool before touching.

Do not plug telecommunications or telephone connectors into the network interface controller (NIC) receptacles.

Do not disable the power cord grounding plug. The grounding plug is an important safety feature.

Plug the power cord in a grounded (earthed) outlet that is easily accessible at all times.

To reduce the risk of serious injury, read the *Safety & Comfort Guide*. It describes proper workstation, setup, posture, and health and work habits for computer users, and provides important electrical and mechanical safety information. This guide is located on the Web at <http://www.hp.com/ergo>.

**⚠ WARNING!** Energized and moving parts inside.

Disconnect power to the equipment before removing the enclosure.

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

**⚠ CAUTION:** Static electricity can damage the electrical 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. See [Electrostatic Discharge on page 166](#) for more information.

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 damage to internal components.

---

## Removing the Computer Access Panel

To access internal components, you must remove the access panel:

1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
3. Turn off the computer properly through the operating system, then turn off any external devices.
4. Disconnect the power cord from the power outlet and disconnect any external devices.

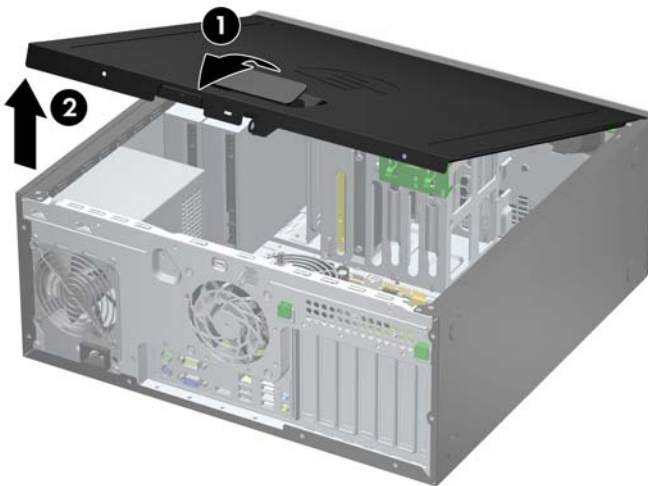
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**⚠ CAUTION:** Regardless of the power-on state, voltage is always present on the system board as long as the system is plugged into an active AC outlet. You must disconnect the power cord to avoid damage to the internal components of the computer.

---

5. Lift up on the access panel handle (1) then lift the access panel off the computer (2).

**Figure 2-1** Removing the Computer Access Panel



## Replacing the Computer Access Panel

Slide the lip on the front end of the access panel under the lip on the front of the chassis (1) then press the back end of the access panel onto the unit so that it locks into place (2).

**Figure 2-2** Replacing the Computer Access Panel



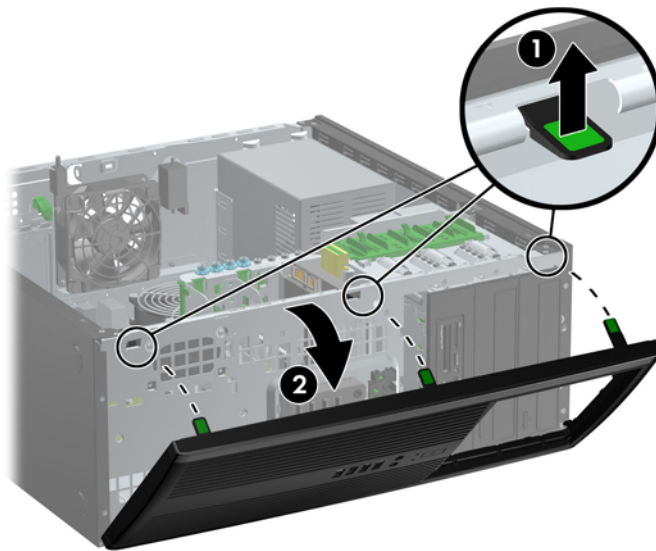
## Removing the Front Bezel

1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
3. Turn off the computer properly through the operating system, then turn off any external devices.
4. Disconnect the power cord from the power outlet and disconnect any external devices.

**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. You must disconnect the power cord to avoid damage to the internal components of the computer.

5. Remove the computer access panel.
6. Lift up the three tabs on the side of the bezel (1), then rotate the bezel off the chassis (2).

**Figure 2-3** Removing the Front Bezel



## Removing Bezel Blanks

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

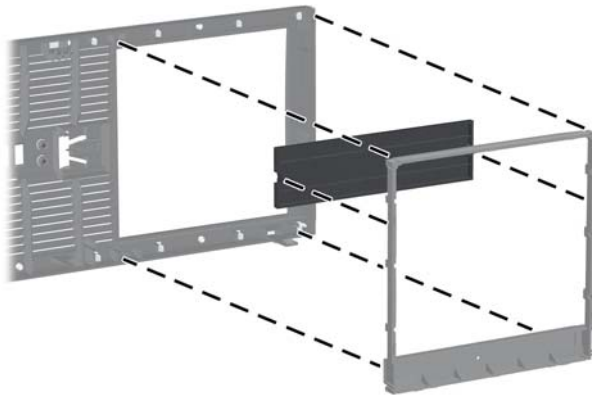
1. Remove the access panel and front bezel.
2. Gently pull the subpanel, with the bezel blanks secured in it, away from the front bezel, then remove the desired bezel blank.

---

**CAUTION:** Hold the subpanel straight when you pull it away from the front bezel. Pulling the subpanel away at an angle could damage the pins that align it within the front bezel.

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**Figure 2-4** Removing Bezel Blanks from the Subpanel (Desktop Shown)



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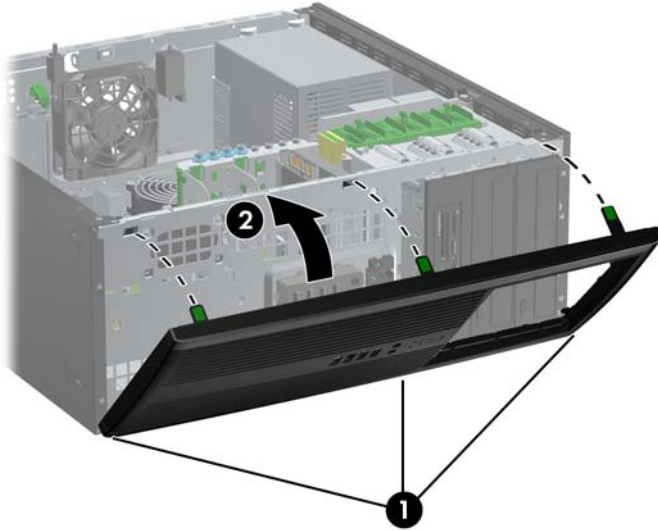
**NOTE:** When replacing the subpanel, ensure that the aligning pins and any remaining bezel blanks are in their proper orientation. The logo on the subpanel should be located at the bottom of the subpanel when properly oriented.

---

## Replacing the Front Bezel

Insert the three hooks on the bottom side of the bezel into the rectangular holes on the chassis (1) then rotate the top side of the bezel onto the chassis (2) and snap it into place.

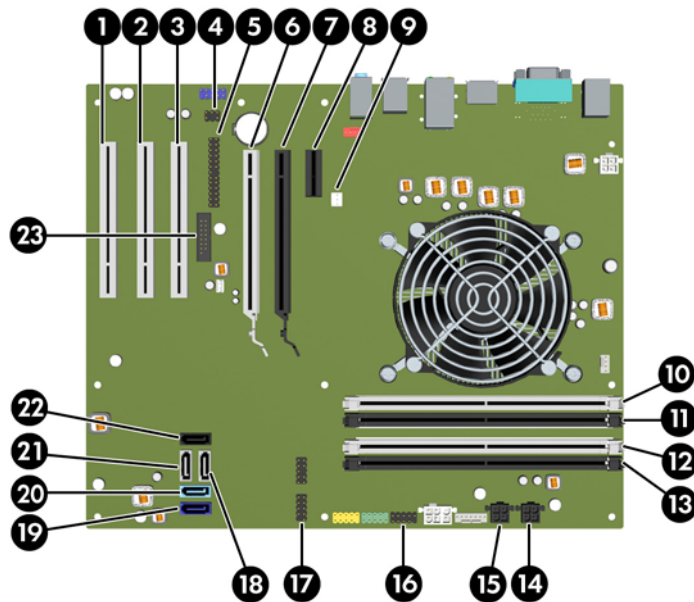
**Figure 2-5** Replacing the Front Bezel



# System Board Connections

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

**Figure 2-6** System Board Connections



**Table 2-1** System Board Connections

No.	System Board Connector	System Board Label	Color	Component
1	PCI	PCI3	white	Expansion Card
2	PCI	PCI2	white	Expansion Card
3	PCI	PCI1	white	Expansion Card
4	Hood Lock	HLCK	black	Hood Lock
5	Parallel Port	PAR	black	Parallel Port
6	PCI Express x16 downshifted to a x4	X4PCIEXP	white	Expansion Card
7	PCI Express x16	X16PCIEXP	black	Expansion Card
8	PCI Express x1	X1PCIEXP1	black	Expansion Card
9	Hood Sensor	HSENSE	white	Hood Sensor
10	DIMM4 (Channel A)	DIMM4	white	Memory Module
11	DIMM3 (Channel A)	DIMM3	black	Memory Module
12	DIMM2 (Channel B)	DIMM2	white	Memory Module
13	DIMM1 (Channel B)	DIMM1	black	Memory Module
14	Power	SATA PWR1	black	SATA Optical Drives
15	Power	SATA PWR0	black	SATA Hard Drives
16	USB	MEDIA	black	USB Device, such as a Media Card Reader

**Table 2-1 System Board Connections (continued)**

No.	System Board Connector	System Board Label	Color	Component
17	USB	MEDIA2	black	USB Device, such as a Media Card Reader
18	SATA 2.0	SATA2	white	3rd Hard Drive, or 1st Optical Drive if no 3rd Hard Drive
19	SATA 3.0	SATA0	dark blue	1st Hard Drive
20	SATA 3.0	SATA1	light blue	2nd Hard Drive
21	SATA 2.0	SATA3	white	2nd Optical Drive, or 1st Optical Drive if a 3rd Hard Drive exists
22	eSATA	ESATA	black	eSATA Adapter Cable, or 2nd Optical Drive if a 3rd Hard Drive exists
23	Serial Port	COMB	black	Serial Port

## Installing Additional Memory

The computer comes with double data rate 3 synchronous dynamic random access memory (DDR3-SDRAM) dual inline memory modules (DIMMs).

### 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 16-GB of memory configured in a high-performing dual channel mode.

### DDR3-SDRAM DIMMs

**CAUTION:** This product DOES NOT support DDR3 Ultra Low Voltage (DDR3U) memory. The processor is not compatible with DDR3U memory and if you plug DDR3U memory into the system board, it can cause the physical damage to the DIMM or invoke system malfunction.

For proper system operation, the DDR3-SDRAM DIMMs must be:

- industry-standard 240-pin
- unbuffered non-ECC PC3-12800 DDR3-1600 MHz-compliant
- 1.5 volt DDR3-SDRAM DIMMs

The DDR3-SDRAM DIMMs must also:

- support CAS latency 11 DDR3 1600 MHz (11-11-11 timing)
- contain the mandatory JEDEC SPD information



In addition, the computer supports:

- 512-Mbit, 1-Gbit, and 2-Gbit non-ECC memory technologies
- single-sided and double-sided DIMMs
- DIMMs constructed with x8 and x16 DDR devices; DIMMs constructed with x4 SDRAM are not supported



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

---

## Populating DIMM Sockets

There are four DIMM sockets on the system board, with two sockets per channel. The sockets are labeled DIMM1, DIMM2, DIMM3, and DIMM4. Sockets DIMM1 and DIMM2 operate in memory channel B. Sockets DIMM3 and DIMM4 operate in memory channel A.

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

- The system will operate in single channel mode if the DIMM sockets are populated in one channel only.
- The system will operate in a higher-performing dual channel mode if the total memory capacity of the DIMMs in Channel A is equal to the total memory capacity of the DIMMs in Channel B. The technology and device width can vary between the channels. For example, if Channel A is populated with two 1-GB DIMMs and Channel B is populated with one 2-GB DIMM, the system will operate in dual channel mode.
- The system will operate in flex mode if the total memory capacity of the DIMMs in Channel A is not equal to the total memory capacity of the DIMMs in Channel B. In flex mode, the channel populated with the least amount of memory describes the total amount of memory assigned to dual channel and the remainder is assigned to single channel. For optimal speed, the channels should be balanced so that the largest amount of memory is spread between the two channels. If one channel will have more memory than the other, the larger amount should be assigned to Channel A. For example, if you are populating the sockets with one 2-GB DIMM, and three 1-GB DIMMs, Channel A should be populated with the 2-GB DIMM and one 1-GB DIMM, and Channel B should be populated with the other two 1-GB DIMMs. With this configuration, 4-GB will run as dual channel and 1-GB will run as single channel.
- In any mode, the maximum operational speed is determined by the slowest DIMM in the system.

## Installing DIMMs

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**⚠ CAUTION:** You must disconnect the power cord and wait approximately 30 seconds for the power to drain before adding or removing memory modules. Regardless of the power-on state, voltage is always supplied to the memory modules as long as the computer is plugged into an active AC outlet. Adding or removing memory modules while voltage is present may cause irreparable damage to the memory modules or system board.

The memory module sockets have gold-plated metal contacts. When upgrading the memory, it is important to use memory modules with gold-plated 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. For more information, refer to [Electrostatic Discharge on page 166](#).

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

---

1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
3. Turn off the computer properly through the operating system, then turn off any external devices.
4. Disconnect the power cord from the power outlet and disconnect any external devices.

---

**⚠ CAUTION:** You must disconnect the power cord and wait approximately 30 seconds for the power to drain before adding or removing memory modules. Regardless of the power-on state, voltage is always supplied to the memory modules as long as the computer is plugged into an active AC outlet. Adding or removing memory modules while voltage is present may cause irreparable damage to the memory modules or system board.

---

5. Remove the computer access panel.

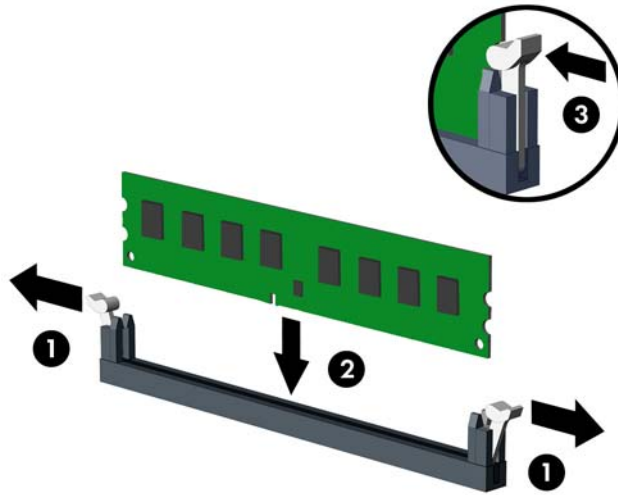
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**⚠ WARNING!** To reduce risk of personal injury from hot surfaces, allow the internal system components to cool before touching.


---

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

**Figure 2-7** Installing a DIMM



---

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

Populate the black DIMM sockets before the white DIMM sockets.

For maximum performance, populate the sockets so that the memory capacity is spread as equally as possible between Channel A and Channel B. Refer to [Populating DIMM Sockets on page 25](#) for more information.


---

7. 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).
8. Repeat steps 6 and 7 to install any additional modules.
9. Replace the computer access panel.
10. Reconnect the power cord and turn on the computer.
11. Lock any security devices that were disengaged when the access panel was removed.

The computer should automatically recognize the additional memory the next time you turn on the computer.

## Removing or Installing an Expansion Card


The computer has three standard full-height PCI expansion slots, one PCI Express x1 expansion slot, one PCI Express x16 expansion slot, and one PCI Express x16 expansion slot that is downshifted to a x4 slot.

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

For dual graphics card configurations, the first (primary) card must be installed in the PCI Express x16 slot that is NOT downshifted to a x4 slot.

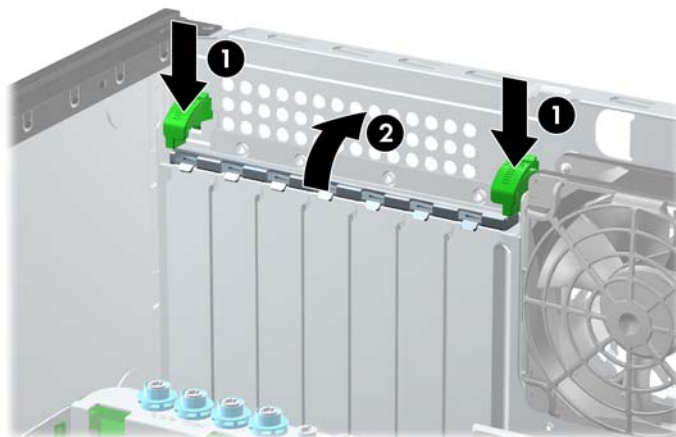
To remove, replace, or add an expansion card:

1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
3. Turn off the computer properly through the operating system, then turn off any external devices.
4. Disconnect the power cord from the power outlet and disconnect any external devices.


 **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. You must disconnect the power cord to avoid damage to the internal components of the computer.

5. Remove the computer access panel.
6. Locate the correct vacant expansion socket on the system board and the corresponding expansion slot on the back of the computer chassis.
7. Press straight down on the two green thumb tabs inside the chassis (1) and rotate the expansion card retention latch up (2).

**Figure 2-8** Opening the Expansion Slot Retainer

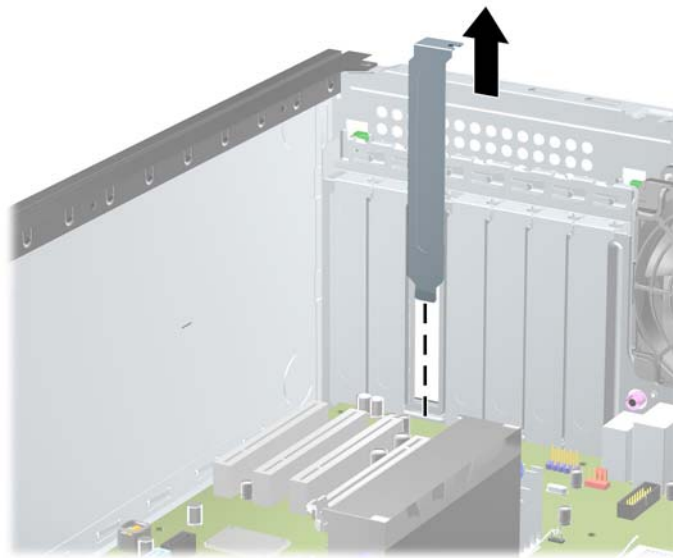


8. Before installing an expansion card, remove the expansion slot cover or the existing expansion card.

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

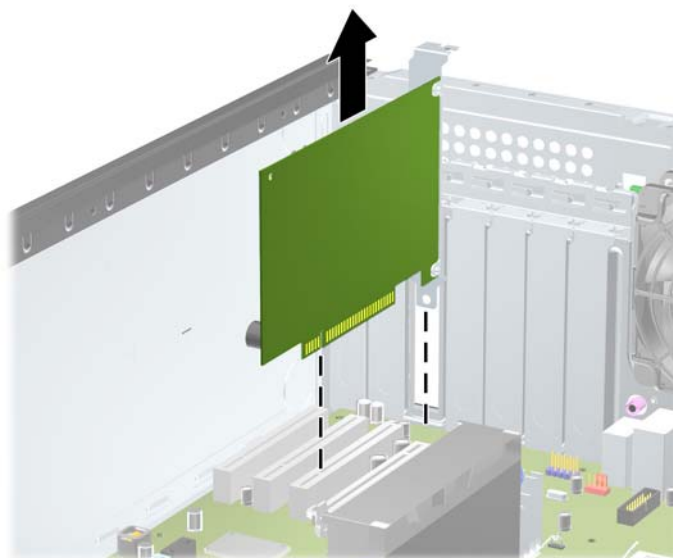
- a. If you are installing an expansion card in a vacant socket, remove the appropriate expansion slot cover on the back of the chassis. Lift the expansion slot cover from the expansion slot.

**Figure 2-9** Removing an Expansion Slot Cover



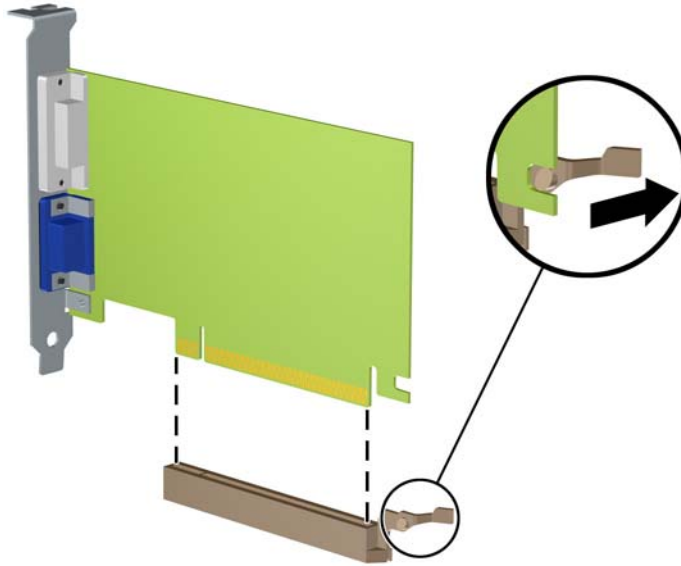
- b. If you are removing a standard PCI card or PCI Express x1 card, hold the card at each end and carefully rock it back and forth until the connectors pull free from the socket. Lift the card straight up to remove it. Be sure not to scrape the card against other components.

**Figure 2-10** Removing a Standard PCI Expansion Card



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

**Figure 2-11** Removing a PCI Express x16 Expansion Card



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

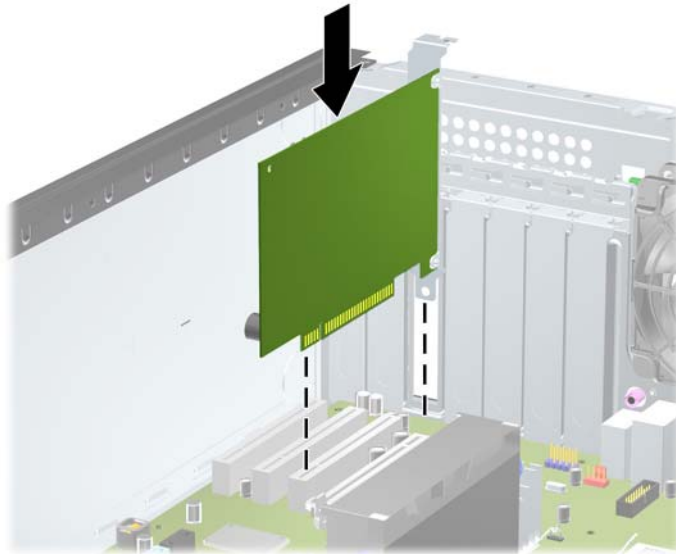
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**CAUTION:** After removing an expansion card, you must replace it with a new card or expansion slot cover for proper cooling of internal components during operation.


---

11. To install a new expansion card, slide the bracket on the end of the card down into the slot on the back of the chassis and press the card down firmly into the socket on the system board.

**Figure 2-12** Installing an Expansion Card



---

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

---

12. Close the expansion card retention latch, making sure that it snaps firmly into place.
13. Connect external cables to the installed card, if needed. Connect internal cables to the system board, if needed.
14. Replace the computer access panel.
15. Reconnect the power cord and turn on the computer.
16. Lock any security devices that were disengaged when the computer access panel was removed.
17. Reconfigure the computer, if necessary.

# Drive Positions

Figure 2-13 Drive Positions (Minitower Configuration Shown)

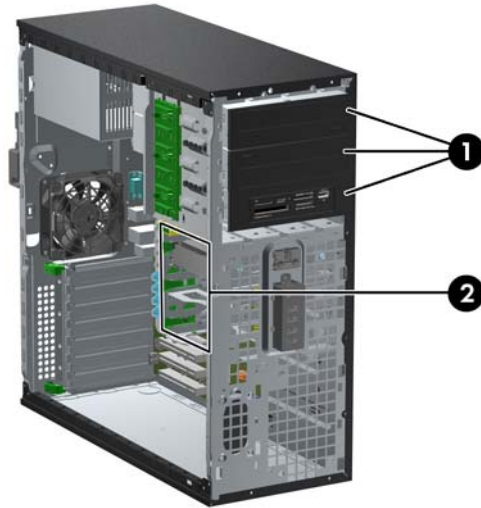


Table 2-2 Drive Positions

- |   |   |
|---|---|
| 1 | Three 5.25-inch drive bays for optional drives (optical drives and media card reader shown) |
| 2 | Three 3.5-inch internal hard drive bays   |

**NOTE:** The drive configuration on your computer may be different than the drive configuration shown above.

The bottom 5.25-inch drive bay has a shorter depth than the upper two bays. The bottom bay supports a half-height drive or other device that is no more than 14.5 cm (5.7 inches) in depth. Do not try to force a larger drive, such as an optical drive, into the bottom bay. This could cause damage to the drive and the system board. The use of unnecessary force when installing any drive into the drive bay may result in damage to the drive.

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



## Removing a Drive from a Drive Bay

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

1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
3. Turn off the computer properly through the operating system, then turn off any external devices.
4. Disconnect the power cord from the power outlet and disconnect any external devices.

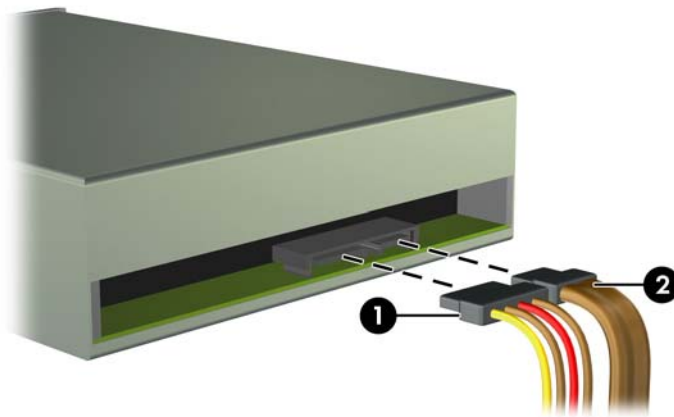
**⚠ CAUTION:** Regardless of the power-on state, voltage is always present on the system board as long as the system is plugged into an active AC outlet. You must disconnect the power cord to avoid damage to the internal components of the computer.

5. Remove the access panel and front bezel.
6. Disconnect the drive cables, as indicated in the following illustrations:

**⚠ CAUTION:** When removing the cables, pull the tab or connector instead of the cable itself to avoid damaging the cable.

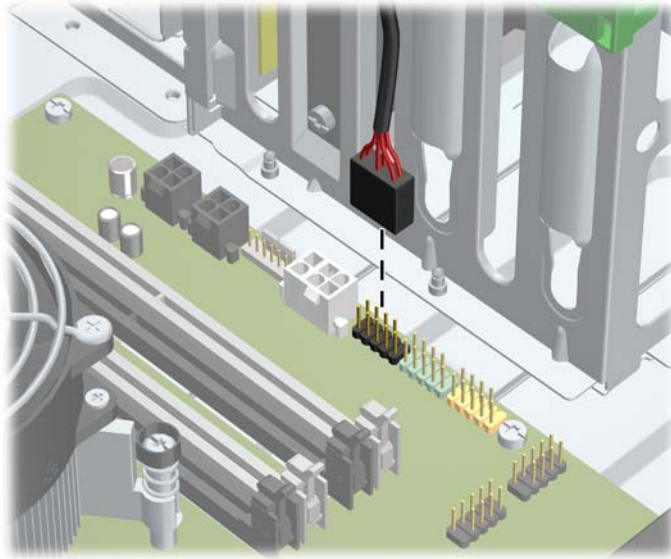
- If you are removing an optical drive, disconnect the power cable (1) and data cable (2) from the back of the drive.

**Figure 2-14** Disconnecting the Optical Drive Cables



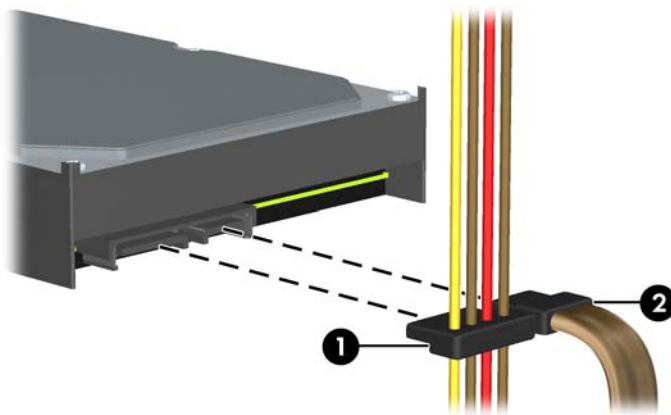
- If you are removing a media card reader, disconnect the USB cable from the system board.

**Figure 2-15** Disconnecting the Media Card Reader USB Cable



- If you are removing a hard drive, disconnect the power cable (1) and data cable (2) from the back of the drive.

**Figure 2-16** Disconnecting the Hard Drive Cables

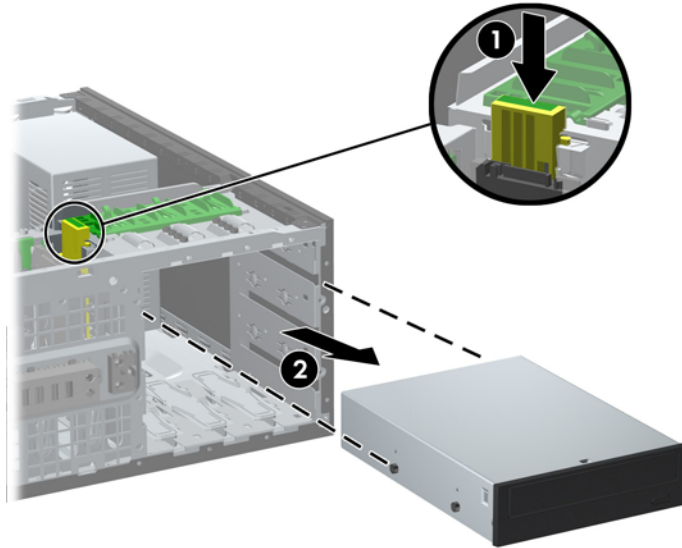


7. Remove the drive from the drive bay as follows:

- To remove a 5.25-inch drive in the desktop configuration, press down on the yellow drivelock mechanism (1) and slide the drive from the drive bay (2).

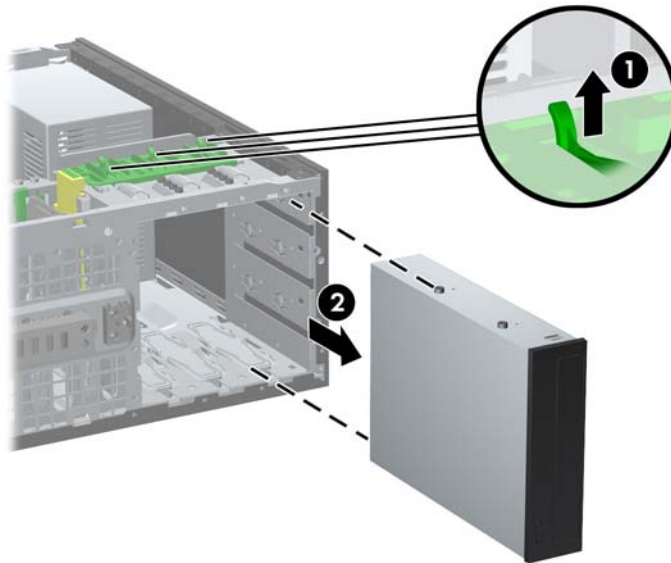
**⚠ CAUTION:** When the yellow drivelock is pressed, all the 5.25-inch drives are released so do not tilt the unit and allow the drives to fall out.

**Figure 2-17** Removing a 5.25-inch Drive in the Desktop Configuration (Optical Drive shown)



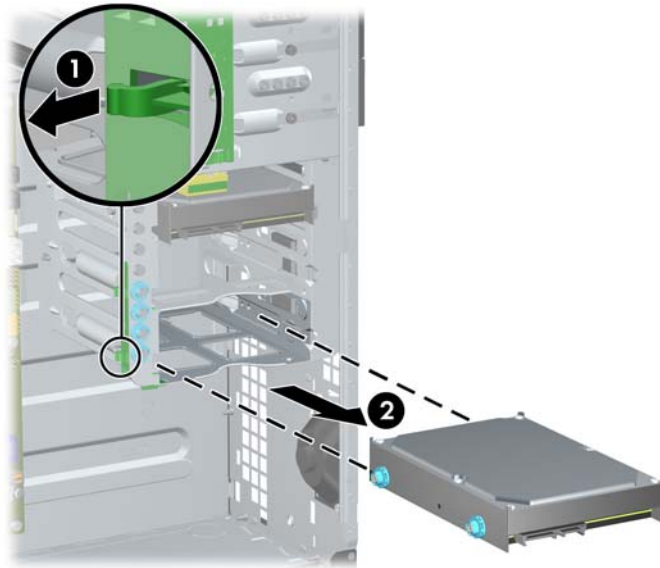
- To remove a 5.25-inch drive in the minitower configuration, pull up on the green drivelock mechanism (1) for that specific drive and slide the drive from the drive bay (2).

**Figure 2-18** Removing a 5.25-inch Drive in the Minitower Configuration (Optical Drive shown)



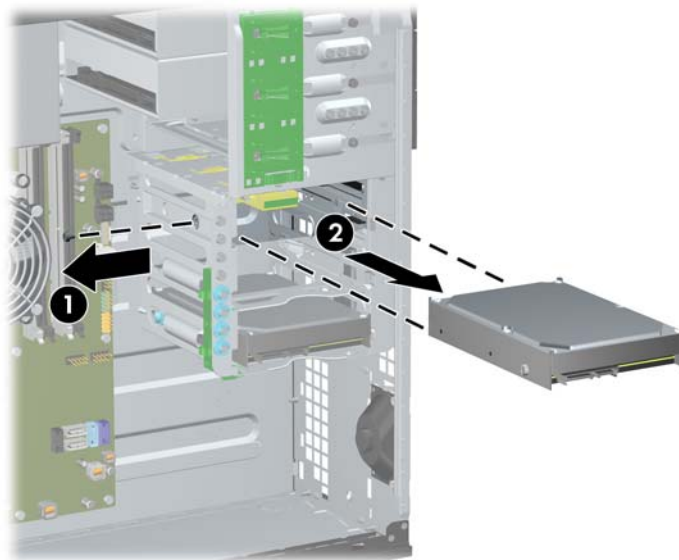
- To remove a hard drive from one of the two lower internal hard drive bays, pull up on the green hard drive drivelock mechanism (1) for that drive and slide the drive from the drive bay (2).

**Figure 2-19** Removing a Hard Drive from the Lower Two Bays



- To remove a hard drive from the upper internal hard drive bay, remove the screw on the side of the bay that secures the drive in place (1), then slide the drive out of the bay (2).

**Figure 2-20** Removing a Hard Drive from the Upper Bay

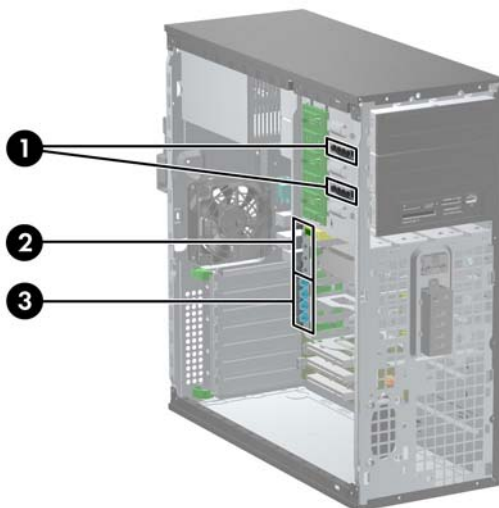


# Installing Drives

When installing drives, follow these guidelines:

- The primary Serial ATA (SATA) hard drive must be connected to the dark blue SATA connector on the system board labeled SATA0. If you are adding a second hard drive, connect it to the light blue SATA1 connector.
- Connect the first SATA optical drive to the white SATA connector on the system board labeled SATA2. If you are adding a second optical drive, connect it to the white SATA3 connector.
- Connect an optional eSATA adapter cable to the black SATA connector on the system board labeled ESATA.
- Connect a media card reader USB cable to the USB connector on the system board labeled MEDIA.
- The power cable for the SATA optical drives is a two-headed cable this is plugged into the system board with the first connector routed to the middle 5.25-inch bay and the second connector routed to the top 5.25-inch bay.
- The power cable for the SATA hard drives is a three-headed cable this is plugged into the system board with the first connector routed to the bottom 3.5-inch bay, the second connector routed to the middle 3.5-inch bay, and the third connector routed to the top 3.5-inch bay.
- The system does not support Parallel ATA (PATA) optical drives or PATA hard drives.
- You must install guide screws to ensure the drive will line up correctly in the drive cage and lock in place. HP has provided extra guide screws installed on the chassis. The hard drive uses 6-32 isolation mounting guide screws in the lower two bays and standard 6-32 screws in the upper bay. Four of each are installed on the hard drive bracket under the access panel. All other drives use M3 metric screws, eight of which are installed on the optical drive bracket under the access panel. The HP-supplied metric guide screws are black. The HP-supplied 6-32 isolation mounting guide screws are silver and blue. The HP-supplied standard 6-32 screws are silver. If you are replacing the primary hard drive, you must remove the four silver and blue 6-32 isolation mounting guide screws from the old hard drive and install them in the new hard drive.


**Figure 2-21** Extra Guide Screw Locations



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No.	Guide Screw	Device
1	Black M3 Metric Screws	5.25-inch Drives
2	Silver 6-32 Standard Screws	3.5-inch Hard Drive in the Top Drive Bay (Bay 4)
3	Silver and Blue 6-32 Isolation Mounting Screws	3.5-inch Hard Drives in the Middle and Bottom Drive Bays (Bays 5 and 6)

---

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

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

Before handling a drive, ensure that you are discharged of static electricity. While handling a drive, avoid touching the connector. For more information about preventing electrostatic damage, refer to [Electrostatic Discharge on page 166](#).

Handle a drive carefully; do not drop it.

Do not use excessive force when inserting a drive.


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

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

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## Installing a 5.25-inch Drive into a Drive Bay


1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
3. Turn off the computer properly through the operating system, then turn off any external devices.
4. Disconnect the power cord from the power outlet and disconnect any external devices.


 **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. You must disconnect the power cord to avoid damage to the internal components of the computer.

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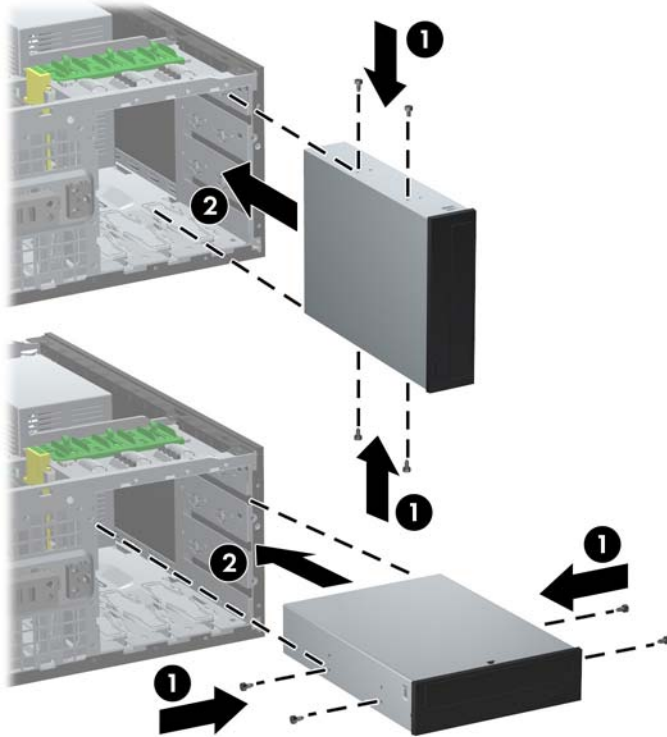
5. Remove the computer access panel.
6. Remove the front bezel. If you are installing a drive in a bay covered by a bezel blank, remove the bezel blank. See [Removing Bezel Blanks on page 21](#) for more information.

7. Install four M3 metric guide screws in the lower holes on each side of the drive (1). HP has provided four extra M3 metric guide screws on the 5.25-inch drive bracket under the access panel. The M3 metric guide screws are black. Refer to [Installing Drives on page 37](#) for an illustration of the extra M3 metric guide screws location.


 **NOTE:** When replacing the drive, transfer the four M3 metric guide screws from the old drive to the new one.

 **CAUTION:** Use only 5-mm long screws as guide screws. Longer screws can damage the internal components of the drive.


**Figure 2-22** Installing a 5.25-Inch Drive in a Minitower (top) and Desktop (bottom)



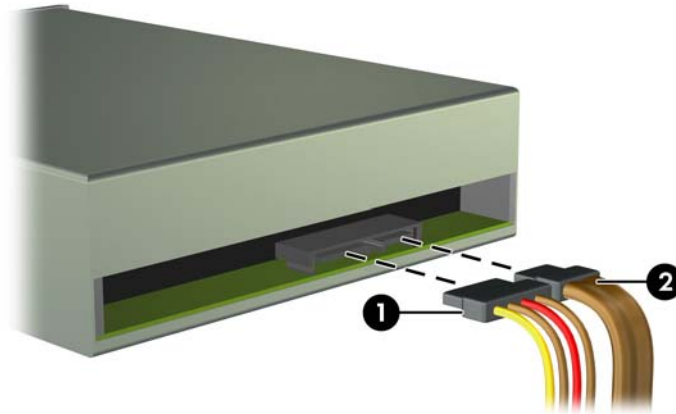
8. Install the drive in the desired drive bay by sliding it all the way into the front of the drive cage until it locks (2). The drivelock automatically secures the drive in the bay.

 **CAUTION:** The bottom 5.25-inch drive bay has a shorter depth than the upper two bays. The bottom bay supports a half-height drive or other device that is no more than 14.5 cm (5.7 inches) in depth. Do not try to force a larger drive, such as an optical drive, into the bottom bay. This could cause damage to the drive and the system board. The use of unnecessary force when installing any drive into the drive bay may result in damage to the drive.

9. Connect the power and data cables to the drive as indicated in the following illustrations.
  - a. If you are installing an optical drive, connect the power cable (1) and data cable (2) to the back of the drive.

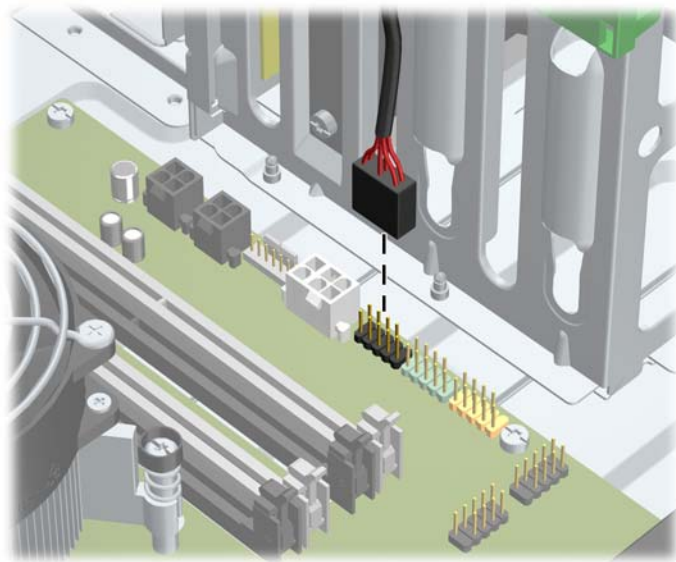
 **NOTE:** The power cable for the optical drives is a two-headed cable that is routed from the system board to the rear of the optical drive bays.

**Figure 2-23** Connecting the Optical Drive Cables




- b. If you are installing a media card reader, connect the USB cable to the USB system board connector labeled MEDIA.

**Figure 2-24** Connecting the Media Card Reader USB Cable



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


 **NOTE:** If you are installing a new SATA optical drive, connect the data cable for the first optical drive to the white SATA connector on the system board labeled SATA2. Connect the data cable for a second optical drive to the white SATA connector on the system board labeled SATA3.

Refer to [System Board Connections on page 23](#) for an illustration of the system board drive connectors.



11. Replace the front bezel and computer access panel.
12. Reconnect the power cord and turn on the computer.
13. Lock any security devices that were disengaged when the computer access panel was removed.


## Installing a Hard Drive into an Internal Drive Bay

 **NOTE:** The system does not support Parallel ATA (PATA) hard drives.


Before you remove the old hard drive, be sure to back up the data from the old hard drive so that you can transfer the data to the new hard drive.

To install a hard drive in a 3.5-inch internal drive bay:

1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
3. Turn off the computer properly through the operating system, then turn off any external devices.
4. Disconnect the power cord from the power outlet and disconnect any external devices.

 **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. You must disconnect the power cord to avoid damage to the internal components of the computer.

5. Remove the computer access panel.
6. Install guide screws on the sides of the drive. The type of screws used depends on which drive bay is being used to house the drive. If you are installing a 2.5-inch drive, you must install the drive in an adapter bracket.

 **NOTE:** Extra guide screws are installed on the hard drive bracket under the access panel. Refer to [Installing Drives on page 37](#) for an illustration of the extra guide screw locations.

If you are replacing a drive, transfer the guides screws from the old drive to the new one.

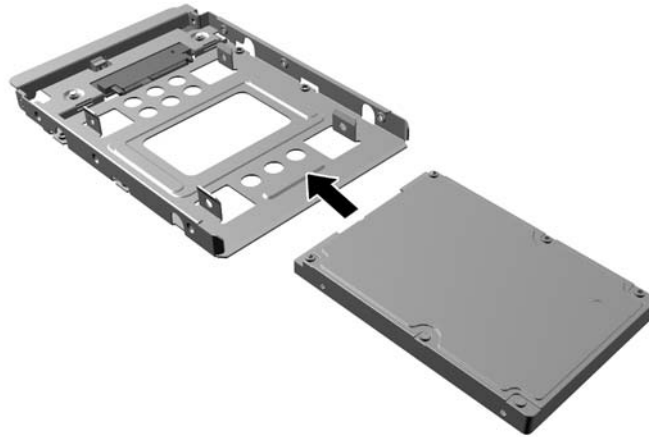
- If you are installing a 3.5-inch drive in either of the lower two bays (bays 5 and 6), install four 6-32 silver and blue isolation mounting guide screws (two on each side of the drive).

**Figure 2-25** Installing Isolation Mounting Guide Screws in a 3.5-inch Hard Drive



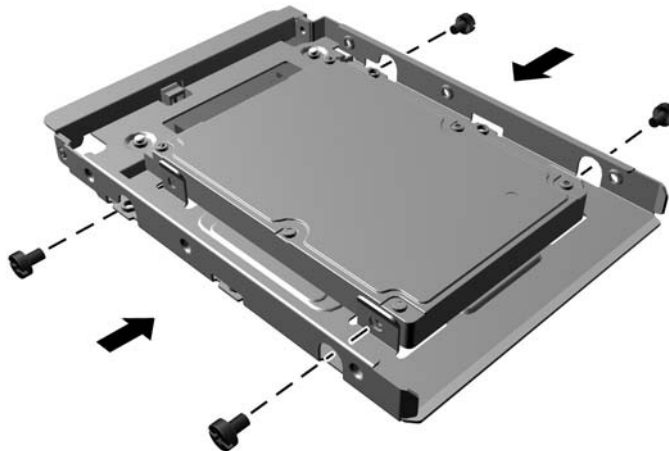
- If you are installing a 2.5-inch hard drive into either of the lower two bays (bays 5 and 6), do the following:
  - Slide the drive into the bay adapter bracket, ensuring the connector on the drive is fully inserted into the connector on the adapter bracket.

**Figure 2-26** Sliding the 2.5-inch Drive in the Adapter Bracket



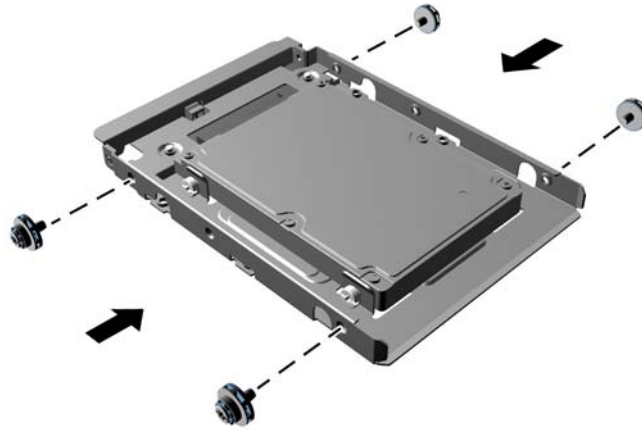
- Secure the drive to the bay adapter bracket by installing four black M3 adapter bracket screws through the sides of the bracket into the drive.

**Figure 2-27** Securing the Drive in the Adapter Bracket



- Install four 6-32 silver and blue isolation mounting guide screws in the adapter bracket (two on each side of the bracket).

**Figure 2-28** Installing Isolation Mounting Guide Screws in the Adapter Bracket



- If you are installing the drive in the upper bay (bay 4), install three standard 6-32 silver guide screws (two on the right side and one on the left side in the screw hole closest to the power and data connectors).

**Figure 2-29** Installing Standard Guide Screws

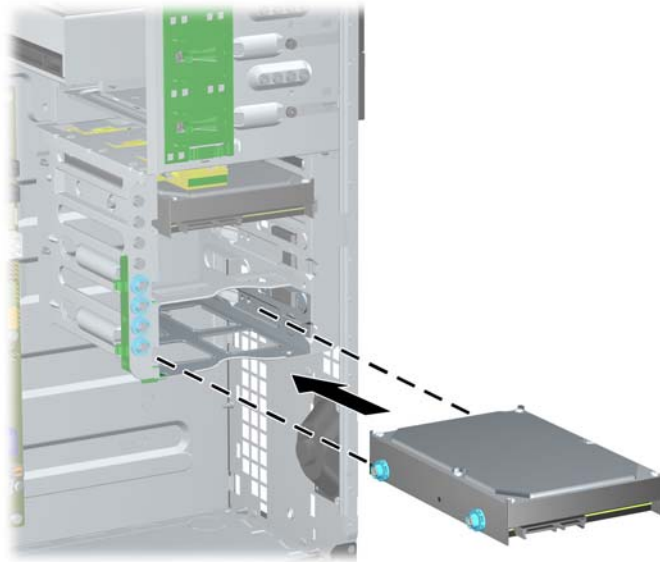


7. Insert the hard drive into the bay as follows:

**CAUTION:** Make sure the guide screws line up with the guide slots in the drive cage. The use of unnecessary force when installing any drive into the drive bay may result in damage to the drive.

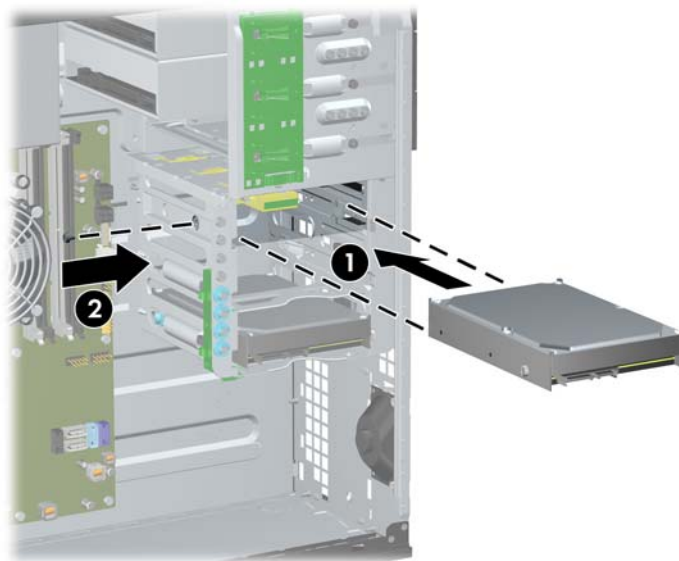
- If you are installing a hard drive into one of the lower two bays (bays 5 and 6), slide the hard drive into the drive bay until it locks. The drivelock automatically secures the drive in the bay.

**Figure 2-30** Installing a Hard Drive into the Lower Two Bays




- If you are installing a hard drive into the upper bay (bay 4), slide the hard drive into the drive bay (1) then secure the drive in place with a standard 6-32 screw (2).

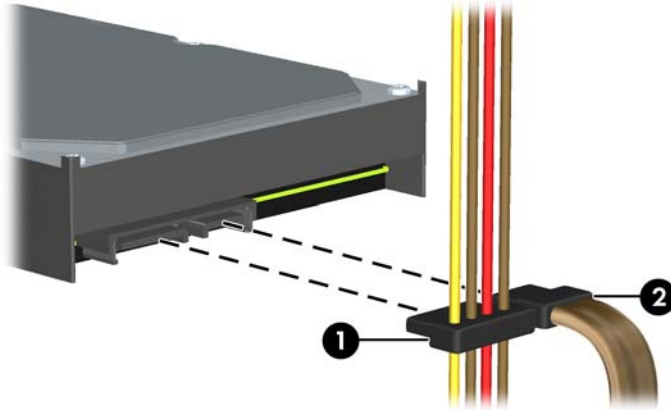
**Figure 2-31** Installing a Hard Drive into the Upper Bay




8. Connect the power cable (1) and data cable (2) to the rear of the hard drive.

 **NOTE:** The power cable for the hard drives is a three-headed cable that is routed from the system board to the rear of the hard drive bays.

**Figure 2-32** Connecting the Power Cable and Data Cable to a SATA Hard Drive




9. Connect the opposite end of the data cable to the appropriate system board connector.

 **NOTE:** If your system has only one SATA hard drive, you must connect the hard drive data cable to the dark blue connector labeled SATA0 to avoid any hard drive performance problems. If you are adding a second hard drive, connect the data cable to the light blue connector labeled SATA1.

10. Replace the computer access panel.
11. Reconnect the power cord and turn on the computer.
12. Lock any security devices that were disengaged when the computer access panel was removed.

## Changing from a Minitower to a Desktop Configuration

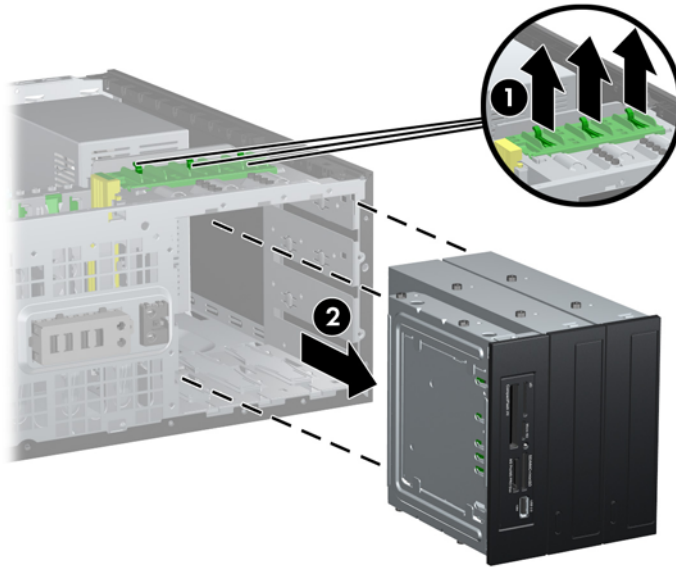
1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
3. Turn off the computer properly through the operating system, then turn off any external devices.
4. Disconnect the power cord from the power outlet and disconnect any external devices.

 **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. You must disconnect the power cord to avoid damage to the internal components of the computer.

5. Remove the computer access panel.
6. Remove the front bezel.
7. Disconnect all power and data cables from the back of the drives in the 5.25-inch drive bays.

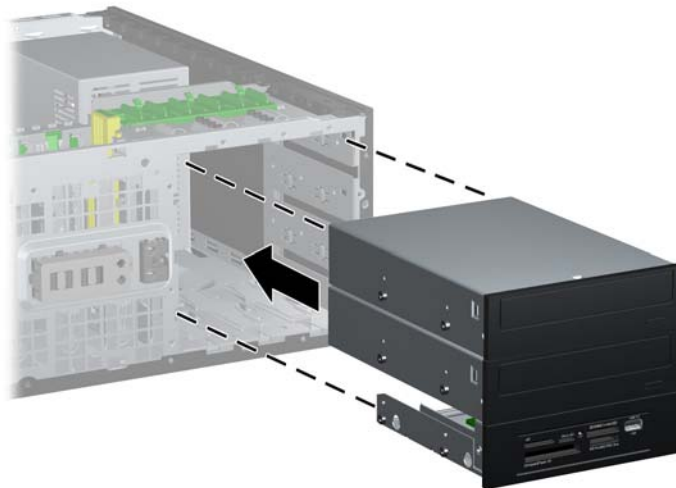
- To release the drives from the 5.25-inch drive bay, lift the release tab on the green latch drive bracket for the drive (1). While lifting the release tab, slide the drive from its drive bay (2). Repeat this step for each 5.25-inch drive.

**Figure 2-33** Releasing the 5.25-inch Drives from the Drive Bays (Minitower)



- Gently slide the drive into the uppermost available bay until it snaps into place. When the drive is properly inserted, the drivelock will secure it. Repeat this step for each drive.

**Figure 2-34** Installing a Drive in the Desktop Configuration



**CAUTION:** The bottom 5.25-inch drive bay has a shorter depth than the upper two bays. The bottom bay supports a half-height drive or other device that is no more than 14.5 cm (5.7 inches) in depth. Do not try to force a larger drive, such as an optical drive, into the bottom bay. This could cause damage to the drive and the system board. The use of unnecessary force when installing any drive into the drive bay may result in damage to the drive.

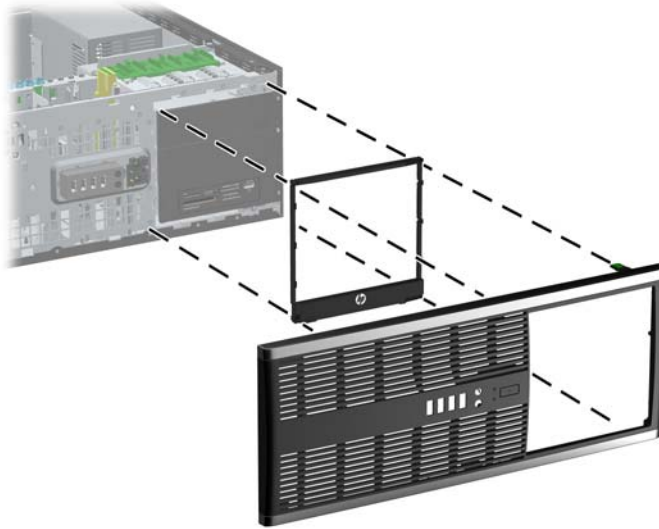
- Reconnect all power and data cables to the drives in the 5.25-inch drive bays.

11. Remove the bezel subpanel as described in [Removing Bezel Blanks on page 21](#).

**⚠ CAUTION:** Hold the subpanel straight when you pull it away from the front bezel. Pulling the subpanel away at an angle could damage the pins that align it within the front bezel.

12. Reposition the bezel blanks within the subpanel in the proper orientation for the desktop configuration.
13. Reposition the subpanel (rotate it 90°) with the logo at the bottom, then snap it back into the bezel.

**Figure 2-35** Changing from a Minitower to a Desktop Configuration



14. Replace the front bezel and computer access panel.
15. Reconnect the power cord and turn on the computer.
16. Lock any security devices that were disengaged when the computer access panel was removed.

## Changing from a Desktop to a Minitower Configuration

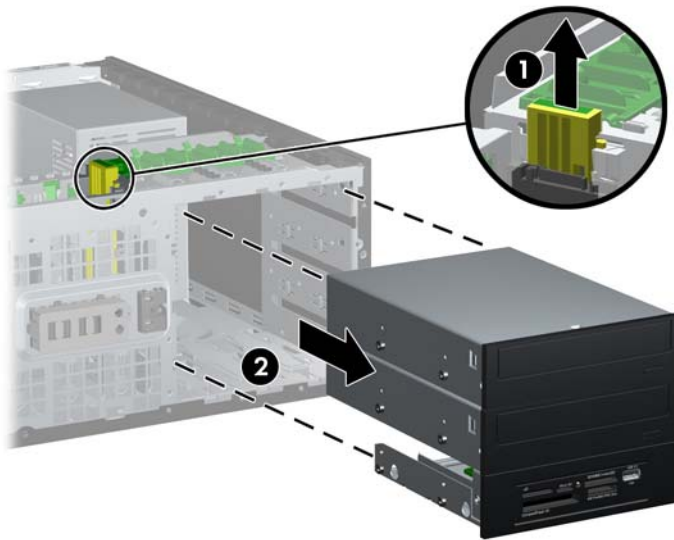
1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
3. Turn off the computer properly through the operating system, then turn off any external devices.
4. Disconnect the power cord from the power outlet and disconnect any external devices.

**⚠ 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. You must disconnect the power cord to avoid damage to the internal components of the computer.

5. Remove the computer access panel.
6. Remove the front bezel.
7. Disconnect all power and data cables from the back of the drives in the 5.25-inch drive bays.

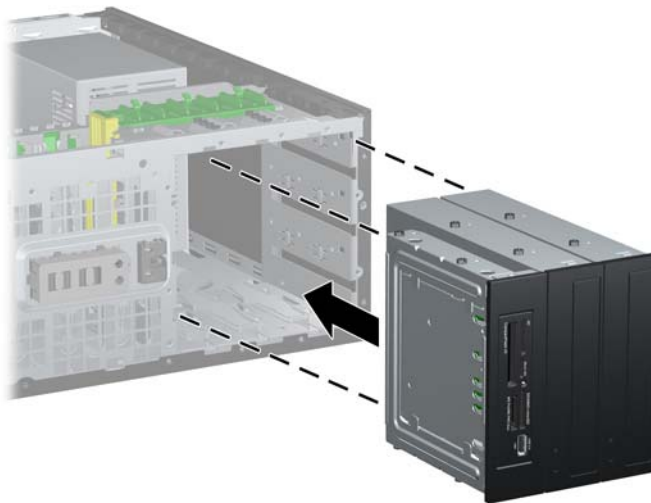
8. To release the drives from the 5.25-inch drive bay, press down on the short yellow drivelock as shown (1). While pressing the drivelock, pull the drives out of the drive bay (2).

**Figure 2-36** Releasing the 5.25-inch Drives from the Drive Bays (Desktop)



9. Gently slide the drive into the uppermost available bay until it snaps into place. When the drive is properly inserted, the drivelock will secure it. Repeat this step for each drive.

**Figure 2-37** Installing a Drive in the Minitower Configuration



**CAUTION:** The bottom 5.25-inch drive bay has a shorter depth than the upper two bays. The bottom bay supports a half-height drive or other device that is no more than 14.5 cm (5.7 inches) in depth. Do not try to force a larger drive, such as an optical drive, into the bottom bay. This could cause damage to the drive and the system board. The use of unnecessary force when installing any drive into the drive bay may result in damage to the drive.

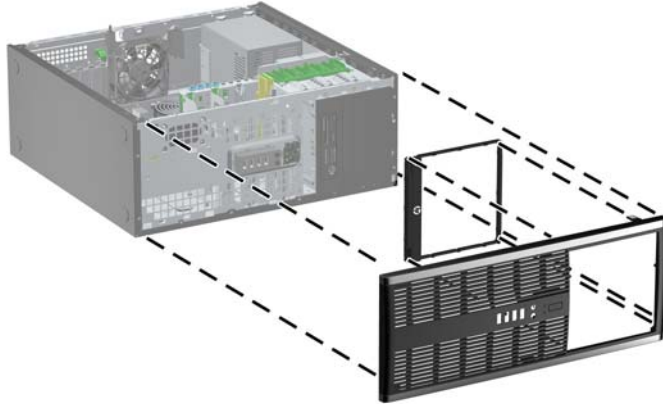
10. Reconnect all power and data cables to the drives in the 5.25-inch drive bays.
11. Remove the bezel subpanel as described in the [Removing Bezel Blanks on page 21](#) section.

**CAUTION:** Hold the subpanel straight when you pull it away from the front bezel. Pulling the subpanel away at an angle could damage the pins that align it within the front bezel.



12. Reposition the bezel blanks within the subpanel in the proper orientation for the minitower configuration.
13. Reposition the subpanel (rotate it 90°) with the logo at the bottom, then snap it back into the bezel.

**Figure 2-38** Changing from a Desktop to a Minitower Configuration



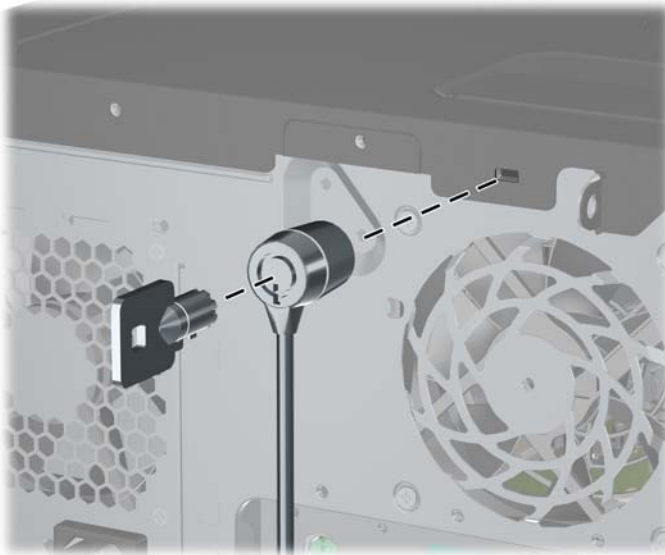
14. Replace the front bezel and computer access panel.
15. Reconnect the power cord and turn on the computer.
16. Lock any security devices that were disengaged when the computer access panel was removed.

## Installing a Security Lock

The security locks displayed below and on the following page can be used to secure the computer.

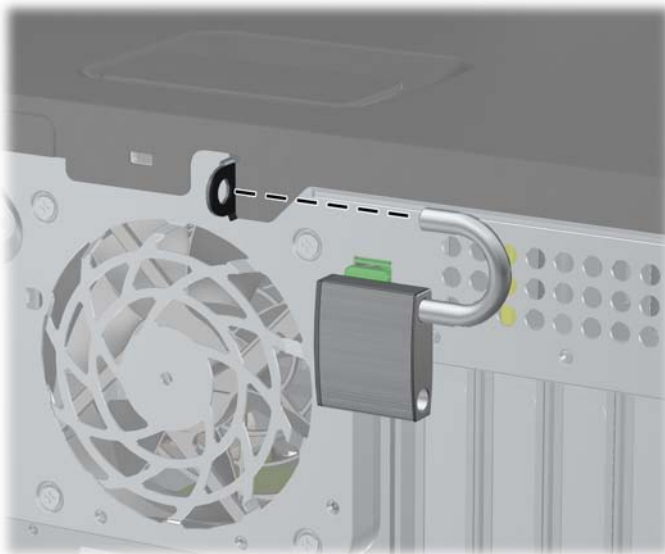
### Cable Lock

**Figure 2-39** Installing a Cable Lock



### Padlock

**Figure 2-40** Installing a Padlock



## HP Business PC Security Lock

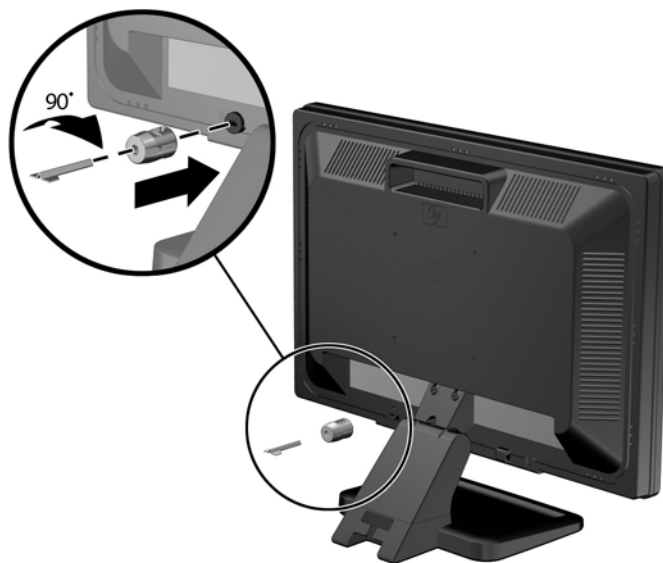
1. Fasten the security cable by looping it around a stationary object.

**Figure 2-41** Securing the Cable to a Fixed Object



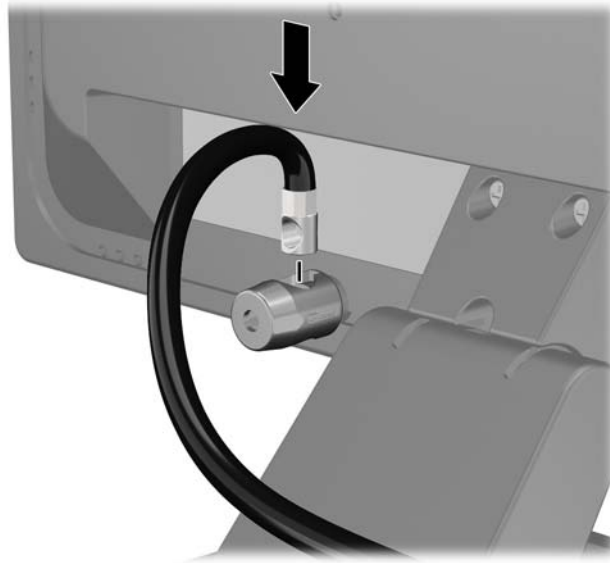
2. Insert the cable lock into the cable lock slot on the back of the monitor and secure the lock to the monitor by inserting the key into the key hole on the rear of the lock and rotating the key 90 degrees.

**Figure 2-42** Installing the Cable Lock on the Monitor



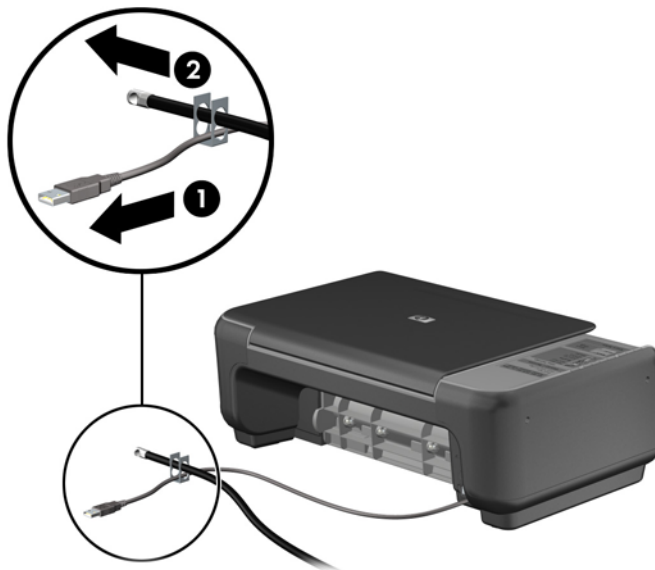
3. Slide the security cable through the hole in the cable lock on the rear of the monitor.

**Figure 2-43** Securing the Monitor



4. Use the bracket provided in the kit to secure other peripheral devices by laying the device cable across the center of the bracket (1) and inserting the security cable through one of the two holes in the bracket (2). Use the hole in the bracket that best secures the peripheral device cable.

**Figure 2-44** Securing Peripheral Devices (Printer Shown)



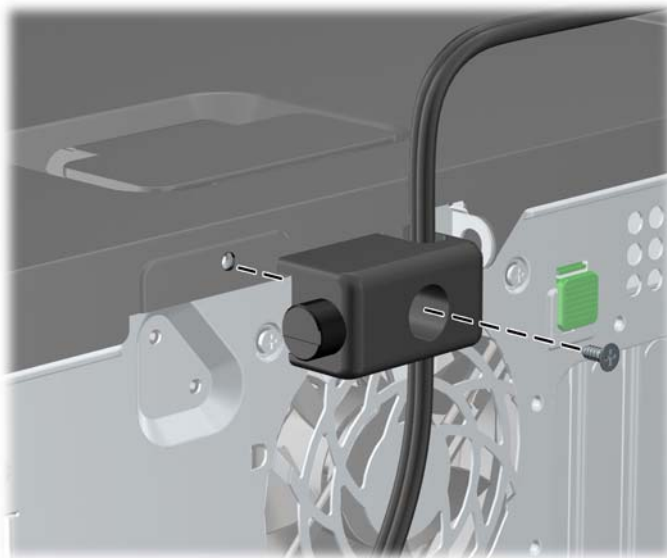
5. Thread the keyboard and mouse cables through the computer chassis lock.

**Figure 2-45** Threading the Keyboard and Mouse Cables



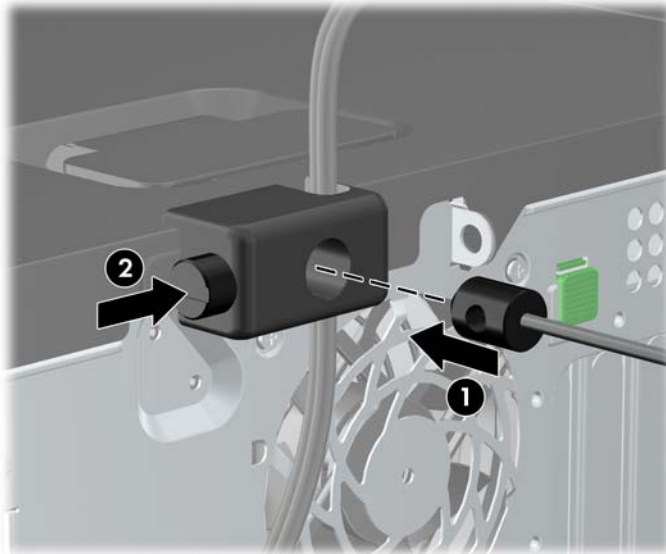
6. Screw the lock to the chassis in the thumbscrew hole using the screw provided.

**Figure 2-46** Attaching the Lock to the Chassis



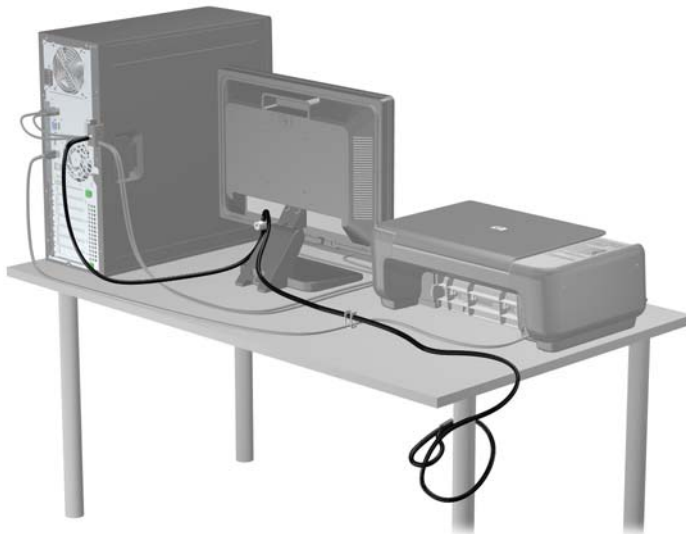
7. Insert the plug end of the security cable into the lock (1) and push the button in (2) to engage the lock. Use the key provided to disengage the lock.

**Figure 2-47** Engaging the Lock



8. When complete, all devices in your workstation will be secured.

**Figure 2-48** Secured Workstation



## Front Bezel Security

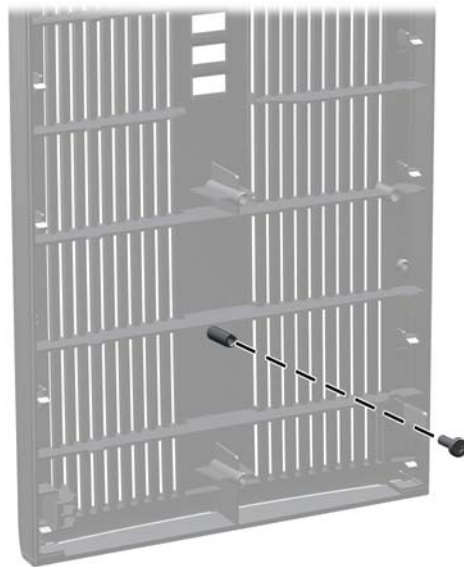
The front bezel can be locked in place by installing a security screw provided by HP. To install the security screw:

1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
3. Turn off the computer properly through the operating system, then turn off any external devices.
4. Disconnect the power cord from the power outlet and disconnect any external devices.

**⚠ 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. You must disconnect the power cord to avoid damage to the internal components of the computer.

5. Remove the access panel and front bezel.
6. Remove the security screw from the inside of the front bezel.

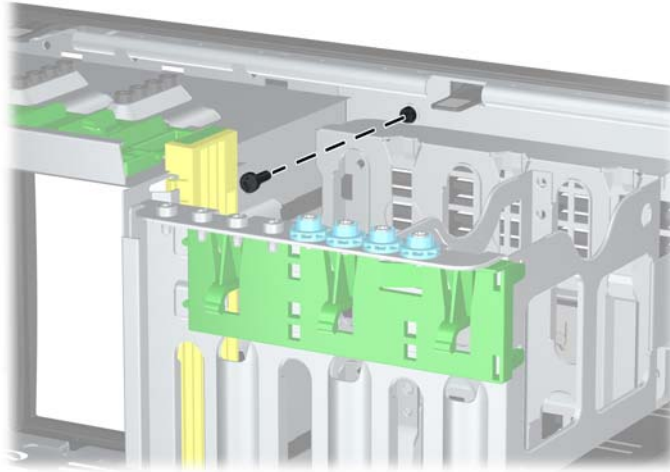
**Figure 2-49** Retrieving the Front Bezel Security Screw



7. Replace the front bezel.

8. Install the screw through the interior of the front of the chassis into the front bezel. The screw hole is located on the left edge of the chassis next to the top hard drive bay.

**Figure 2-50** Installing the Front Bezel Security Screw



9. Replace the access panel.
10. Reconnect the power cord and turn on the computer.
11. Lock any security devices that were disengaged when the access panel was removed.



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# 3 Microtower (MT) Hardware Upgrades

## Serviceability Features

The computer includes features that make it easy to upgrade and service. No tools are needed for most of the installation procedures described in this chapter.

## Warnings and Cautions

Before performing upgrades be sure to carefully read all of the applicable instructions, cautions, and warnings in this guide.

---

**⚠ WARNING!** To reduce the risk of personal injury from electrical shock, hot surfaces, or fire:

Disconnect the power cord from the wall outlet and allow the internal system components to cool before touching.

Do not plug telecommunications or telephone connectors into the network interface controller (NIC) receptacles.

Do not disable the power cord grounding plug. The grounding plug is an important safety feature.

Plug the power cord in a grounded (earthed) outlet that is easily accessible at all times.

To reduce the risk of serious injury, read the *Safety & Comfort Guide*. It describes proper workstation, setup, posture, and health and work habits for computer users, and provides important electrical and mechanical safety information. This guide is located on the Web at <http://www.hp.com/ergo>.

**⚠ WARNING!** Energized and moving parts inside.

Disconnect power to the equipment before removing the enclosure.

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

**⚠ CAUTION:** Static electricity can damage the electrical 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. See [Electrostatic Discharge on page 166](#) for more information.

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 damage to internal components.

---

## Removing the Computer Access Panel

To access internal components, you must remove the access panel:

1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
3. Turn off the computer properly through the operating system, then turn off any external devices.
4. Disconnect the power cord from the power outlet and disconnect any external devices.

---

**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. You must disconnect the power cord to avoid damage to the internal components of the computer.

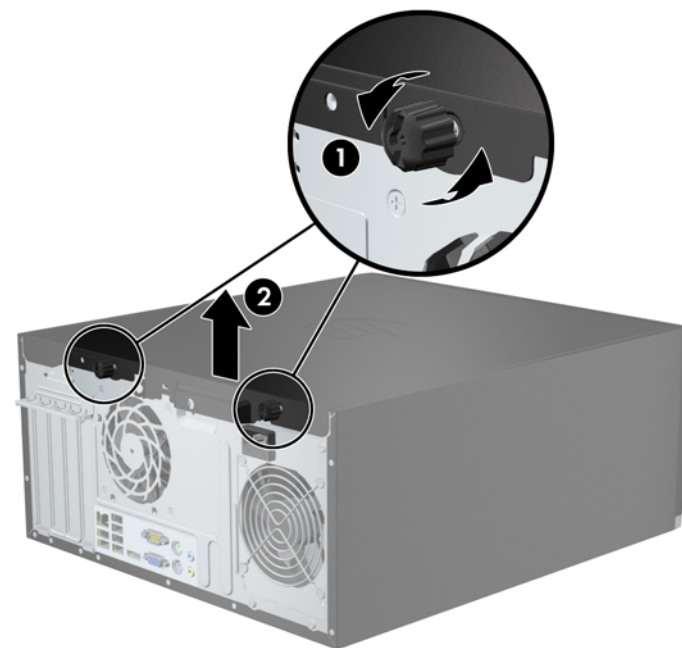
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5. Loosen the two captive thumbscrews (1) that secure the access panel to the computer chassis.
6. Use the handle located between the thumbscrews to lift the access panel off the unit (2).

---

**NOTE:** You may want to lay the computer on its side to install internal parts. Be sure the side with the access panel is facing up.

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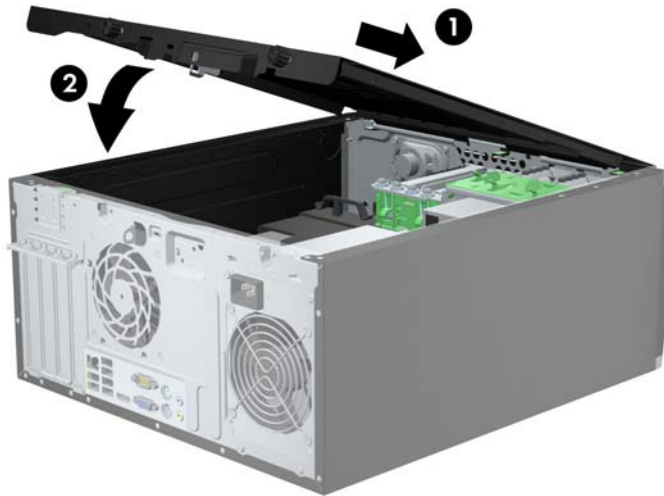


**Figure 3-1** Removing the Computer Access Panel

## Replacing the Computer Access Panel

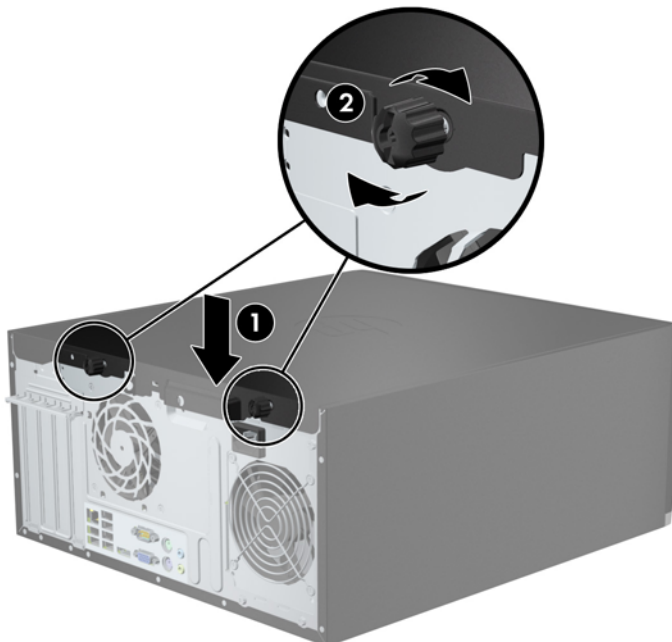
1. Slide the lip on the front end of the access panel under the lip on the front of the chassis (1) then press the back end of the access panel onto the unit (2).

**Figure 3-2** Replacing the Computer Access Panel



2. Ensure that the panel is completely closed (1) and tighten the two thumbscrews that secure the access panel to the chassis (2).

**Figure 3-3** Tightening the Access Panel Thumbscrews



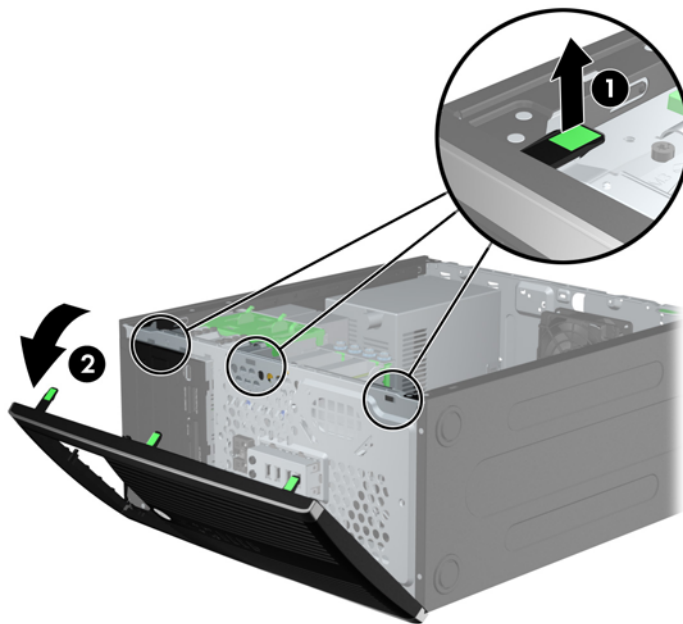
## Removing the Front Bezel

1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
3. Turn off the computer properly through the operating system, then turn off any external devices.
4. Disconnect the power cord from the power outlet and disconnect any external devices.

**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. You must disconnect the power cord to avoid damage to the internal components of the computer.

5. Remove the computer access panel.
6. Lift up the three tabs on the side of the bezel (1), then rotate the bezel off the chassis (2).

**Figure 3-4** Removing the Front Bezel



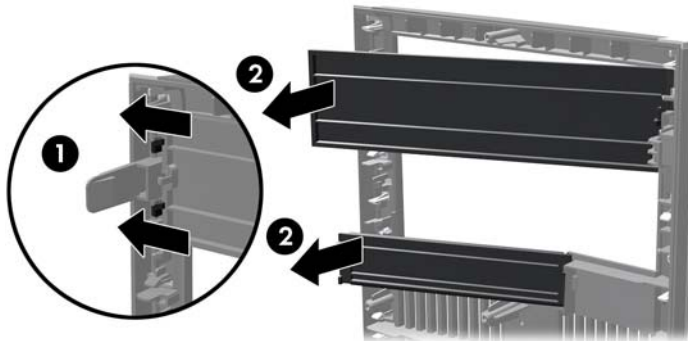
## Removing Bezel Blanks

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

1. Remove the access panel and front bezel.

2. To remove a bezel blank, push the two retaining tabs that hold the bezel blank in place towards the outer right edge of the bezel (1) and slide the bezel blank back and to the right to remove it (2).

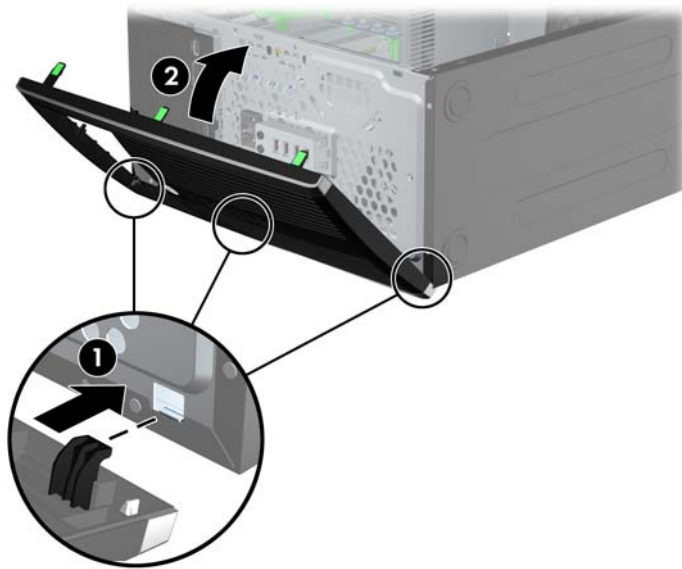
**Figure 3-5** Removing a Bezel Blank



## Replacing the Front Bezel

Insert the three hooks on the left side of the bezel into the rectangular holes on the chassis (1) then rotate the right side of the bezel onto the chassis (2) and snap it into place.

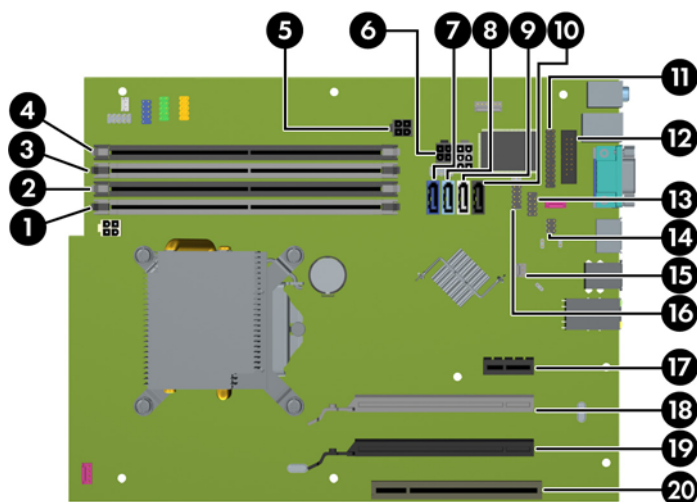
**Figure 3-6** Replacing the Front Bezel



# System Board Connections

Refer to the following illustrations and tables to identify the system board connectors for your model.

**Figure 3-7** System Board Connections



**Table 3-1** System Board Connections

No.	System Board Connector	System Board Label	Color	Component
1	DIMM4 (Channel A)	DIMM4	white	Memory Module
2	DIMM3 (Channel A)	DIMM3	black	Memory Module
3	DIMM2 (Channel B)	DIMM2	white	Memory Module
4	DIMM1 (Channel B)	DIMM1	black	Memory Module
5	Power	SATAPWR1	black	SATA Optical Drives
6	Power	SATAPWR0	black	SATA Hard Drives
7	SATA 3.0	SATA0	dark blue	1st Hard Drive
8	SATA 3.0	SATA1	light blue	2nd Hard Drive, or 2nd Optical Drive if an eSATA Adapter Cable exists
9	SATA 2.0	SATA2	white	1st Optical Drive
10	eSATA	ESATA	black	eSATA Adapter Cable, or 2nd Optical Drive
11	Parallel Port	PAR	black	Parallel Port
12	Serial Port	COMB	black	Serial Port
13	USB	MEDIA	black	USB Device, such as a Media Card Reader
14	Hood Lock	HLCK	black	USB Device, such as a Media Card Reader
15	Hood Sensor	HSENSE	white	Hood Sensor
16	USB	MEDIA2	black	Second Media Card Reader
17	PCI Express x1	X1PCIEXP1	black	Expansion Card

**Table 3-1 System Board Connections (continued)**

No.	System Board Connector	System Board Label	Color	Component
18	PCI Express x16 downshifted to a x4	X4PCIEXP	white	Expansion Card
19	PCI Express x16	X16PCIEXP	black	Expansion Card
20	PCI	PCI1	white	Expansion Card

## Installing Additional Memory

The computer comes with double data rate 3 synchronous dynamic random access memory (DDR3-SDRAM) dual inline memory modules (DIMMs).

### 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 16-GB of memory configured in a high-performing dual channel mode.

### DDR3-SDRAM DIMMs

**CAUTION:** This product DOES NOT support DDR3 Ultra Low Voltage (DDR3U) memory. The processor is not compatible with DDR3U memory and if you plug DDR3U memory into the system board, it can cause the physical damage to the DIMM or invoke system malfunction.

For proper system operation, the DDR3-SDRAM DIMMs must be:

- industry-standard 240-pin
- unbuffered non-ECC PC3-12800 DDR3-1600 MHz-compliant
- 1.5 volt DDR3-SDRAM DIMMs

The DDR3-SDRAM DIMMs must also:

- support CAS latency 11 DDR3 1600 MHz (11-11-11 timing)
- contain the mandatory JEDEC SPD information

In addition, the computer supports:

- 512-Mbit, 1-Gbit, and 2-Gbit non-ECC memory technologies
- single-sided and double-sided DIMMs
- DIMMs constructed with x8 and x16 DDR devices; DIMMs constructed with x4 SDRAM are not supported

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

### Populating DIMM Sockets

There are four DIMM sockets on the system board, with two sockets per channel. The sockets are labeled DIMM1, DIMM2, DIMM3, and DIMM4. Sockets DIMM1 and DIMM2 operate in memory channel B. Sockets DIMM3 and DIMM4 operate in memory channel A.

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

- The system will operate in single channel mode if the DIMM sockets are populated in one channel only.
- The system will operate in a higher-performing dual channel mode if the total memory capacity of the DIMMs in Channel A is equal to the total memory capacity of the DIMMs in Channel B. The technology and device width can vary between the channels. For example, if Channel A is populated with two 1-GB DIMMs and Channel B is populated with one 2-GB DIMM, the system will operate in dual channel mode.
- The system will operate in flex mode if the total memory capacity of the DIMMs in Channel A is not equal to the total memory capacity of the DIMMs in Channel B. In flex mode, the channel populated with the least amount of memory describes the total amount of memory assigned to dual channel and the remainder is assigned to single channel. For optimal speed, the channels should be balanced so that the largest amount of memory is spread between the two channels. If one channel will have more memory than the other, the larger amount should be assigned to Channel A. For example, if you are populating the sockets with one 2-GB DIMM, and three 1-GB DIMMs, Channel A should be populated with the 2-GB DIMM and one 1-GB DIMM, and Channel B should be populated with the other two 1-GB DIMMs. With this configuration, 4-GB will run as dual channel and 1-GB will run as single channel.
- In any mode, the maximum operational speed is determined by the slowest DIMM in the system.

## Installing DIMMs

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**⚠ CAUTION:** You must disconnect the power cord and wait approximately 30 seconds for the power to drain before adding or removing memory modules. Regardless of the power-on state, voltage is always supplied to the memory modules as long as the computer is plugged into an active AC outlet. Adding or removing memory modules while voltage is present may cause irreparable damage to the memory modules or system board.

The memory module sockets have gold-plated metal contacts. When upgrading the memory, it is important to use memory modules with gold-plated 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. For more information, refer to [Electrostatic Discharge on page 166](#).

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

- 
1. Remove/disengage any security devices that prohibit opening the computer.
  2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
  3. Turn off the computer properly through the operating system, then turn off any external devices.
  4. Disconnect the power cord from the power outlet and disconnect any external devices.

---

**⚠ CAUTION:** You must disconnect the power cord and wait approximately 30 seconds for the power to drain before adding or removing memory modules. Regardless of the power-on state, voltage is always supplied to the memory modules as long as the computer is plugged into an active AC outlet. Adding or removing memory modules while voltage is present may cause irreparable damage to the memory modules or system board.

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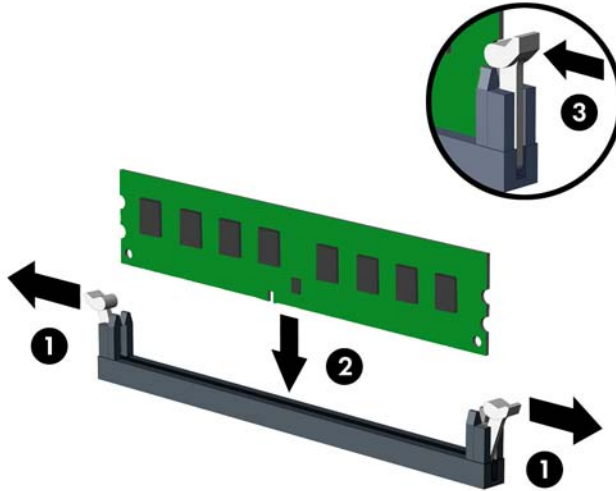


5. Remove the computer access panel.

**⚠ WARNING!** To reduce risk of personal injury from hot surfaces, allow the internal system components to cool before touching.

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

**Figure 3-8** Installing a DIMM



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

Populate the black DIMM sockets before the white DIMM sockets.


For maximum performance, populate the sockets so that the memory capacity is spread as equally as possible between Channel A and Channel B. Refer to [Populating DIMM Sockets on page 63](#) for more information.

7. 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).
8. Repeat steps 6 and 7 to install any additional modules.
9. Replace the computer access panel.
10. Reconnect the power cord and turn on the computer.
11. Lock any security devices that were disengaged when the access panel was removed.

The computer should automatically recognize the additional memory the next time you turn on the computer.

## Removing or Installing an Expansion Card


The computer has one PCI expansion slot, one PCI Express x1 expansion slot, one PCI Express x16 expansion slot, and one PCI Express x16 expansion slot that is downshifted to a x4 slot.

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

For dual graphics card configurations, the first (primary) card must be installed in the PCI Express x16 slot that is NOT downshifted to a x4 slot.

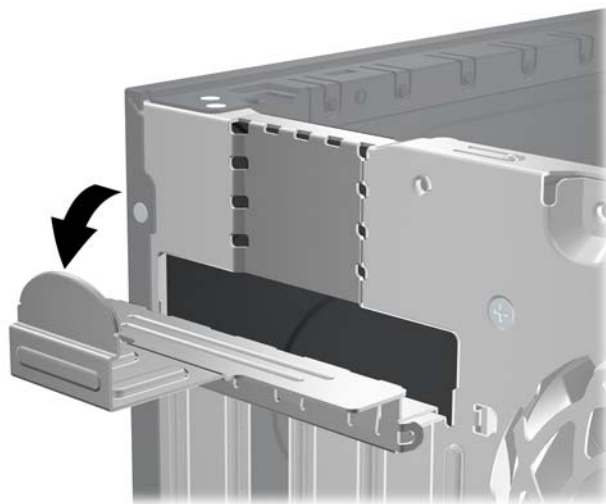
To remove, replace, or add an expansion card:

1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
3. Turn off the computer properly through the operating system, then turn off any external devices.
4. Disconnect the power cord from the power outlet and disconnect any external devices.

 **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. You must disconnect the power cord to avoid damage to the internal components of the computer.


5. Remove the computer access panel.
6. Locate the correct vacant expansion socket on the system board and the corresponding expansion slot on the back of the computer chassis.
7. Release the slot cover retention latch that secures the PCI slot covers by lifting the green tab on the latch and rotating the latch to the open position.

**Figure 3-9** Opening the Expansion Slot Retainer



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

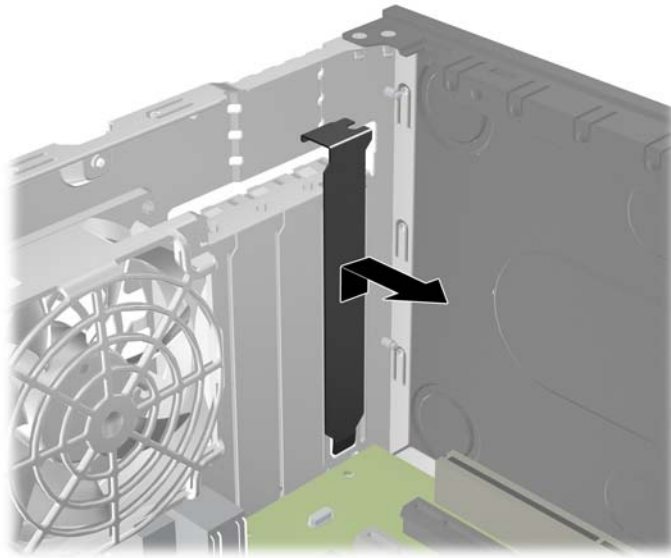
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 **NOTE:** Before removing an installed expansion card, disconnect any cables that may be attached to the expansion card.

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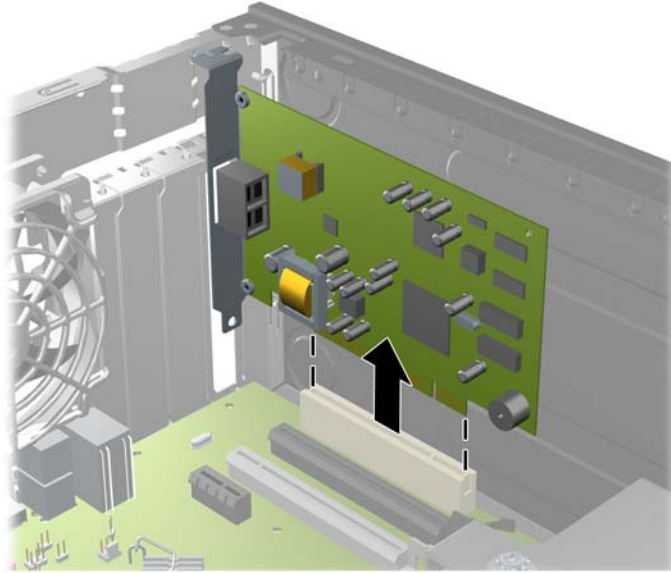
- a. If you are installing an expansion card in a vacant socket, remove the appropriate expansion slot cover on the back of the chassis. Pull the slot cover straight up then away from the inside of the chassis.

**Figure 3-10** Removing an Expansion Slot Cover



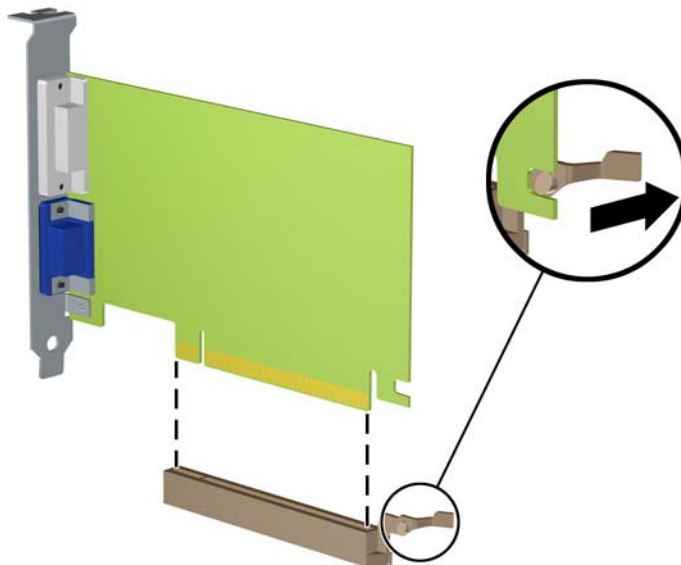
- b. If you are removing a standard PCI card or PCI Express x1 card, hold the card at each end, and carefully rock it back and forth until the connectors pull free from the socket. Pull the expansion card straight up from the socket then away from the inside of the chassis to release it from the chassis frame. Be sure not to scrape the card against the other components.

**Figure 3-11** Removing a Standard PCI Expansion Card



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

**Figure 3-12** Removing a PCI Express x16 Expansion Card



9. Store the removed card in anti-static packaging.

10. If you are not installing a new expansion card, install an expansion slot cover to close the open slot.

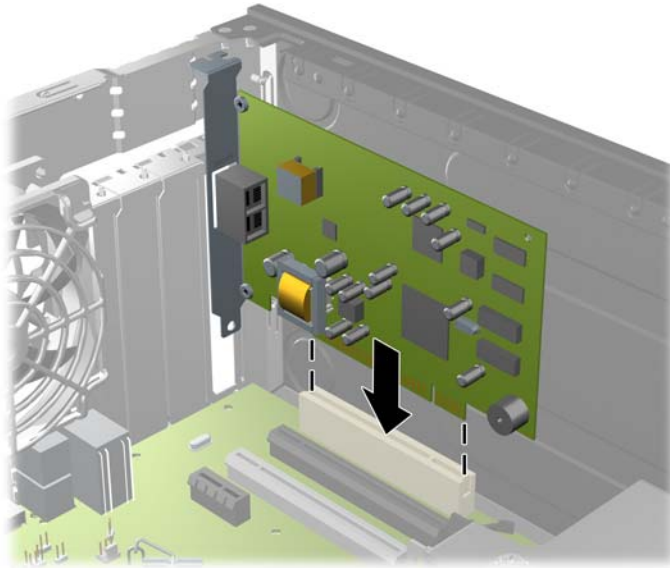
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**CAUTION:** After removing an expansion card, you must replace it with a new card or expansion slot cover for proper cooling of internal components during operation.

---

11. To install a new expansion card, hold the card just above the expansion socket on the system board then move the card toward the rear of the chassis so that the bracket on the card is aligned with the open slot on the rear of the chassis. Press the card straight down into the expansion socket on the system board.

**Figure 3-13** Installing an Expansion Card



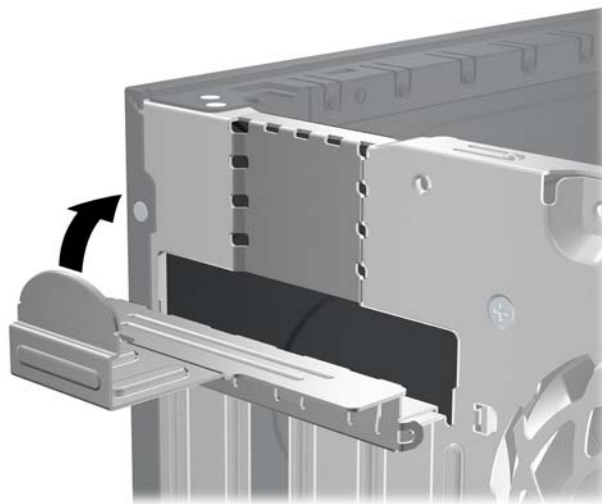
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**NOTE:** When installing an expansion card, press firmly on the card so that the whole connector seats properly in the expansion card slot.

---

12. Rotate the slot cover retention latch back in place to secure the expansion card.

**Figure 3-14** Closing the Expansion Slot Retainer



13. Connect external cables to the installed card, if needed. Connect internal cables to the system board, if needed.

14. Replace the computer access panel.
15. Reconnect the power cord and turn on the computer.
16. Lock any security devices that were disengaged when the access panel was removed.
17. Reconfigure the computer, if necessary.

## Drive Positions

Figure 3-15 Drive Positions

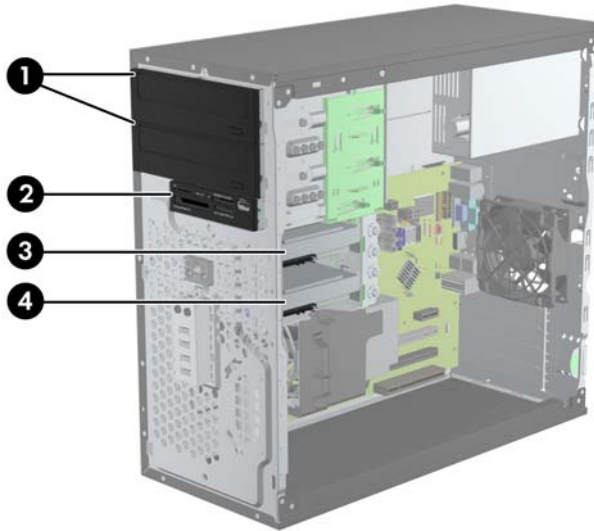


Table 3-2 Drive Positions

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

**NOTE:** The drive configuration on your computer may be different than the drive configuration shown above.

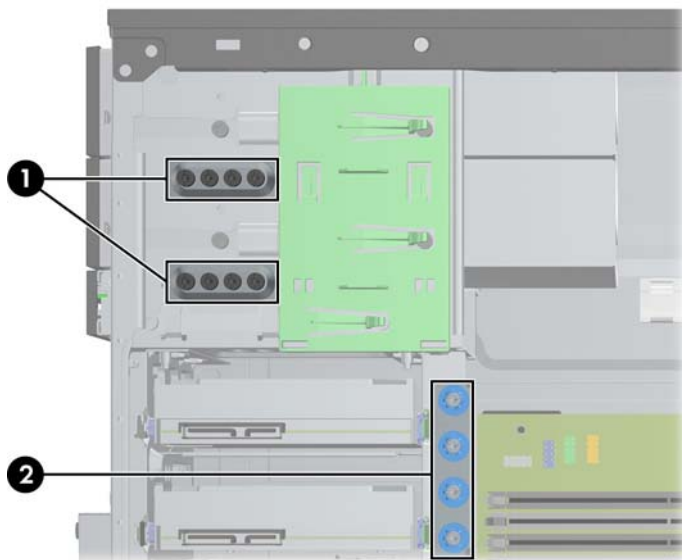
To verify the type and size of the storage devices installed in the computer, run Computer Setup.

# Installing and Removing Drives

When installing drives, follow these guidelines:

- The primary Serial ATA (SATA) hard drive must be connected to the dark blue primary SATA connector on the system board labeled SATA0. If you are adding a second hard drive, connect it to the light blue connector on the system board labeled SATA1.
- Connect the first SATA optical drive to the white SATA connector on the system board labeled SATA2. If you are adding a second optical drive connect it to the black SATA connector on the system board labeled ESATA. If the ESATA connector is already populated, connect the second optical drive to the light blue connector on the system board labeled SATA1.
- Connect an optional eSATA adapter cable to the black SATA connector on the system board labeled ESATA.
- Connect a media card reader USB cable to the USB connector on the system board labeled MEDIA.
- The power cable for the SATA optical drives is a two-headed cable this is plugged into the system board with the first connector routed to the top 5.25-inch bay and the second connector routed to the bottom 5.25-inch bay.
- The power cable for the SATA hard drives is a two-headed cable this is plugged into the system board with the first connector routed to the bottom 3.5-inch bay and the second connector routed to the top 3.5-inch bay.
- The system does not support Parallel ATA (PATA) optical drives or PATA hard drives.
- You must install guide screws to ensure the drive will line up correctly in the drive cage and lock in place. HP has provided extra guide screws for the drive bays (four 6-32 isolation mounting guide screws and eight M3 metric guide screws), installed on the side of the drive bays. The 6-32 isolation mounting screws are required for a secondary hard drive. All other drives (except the primary hard drive) use M3 metric screws. The HP-supplied metric screws are black and the HP-supplied isolation mounting screws are silver and blue. If you are replacing the primary hard drive, you must remove the four silver and blue 6-32 isolation mounting guide screws from the old hard drive and install them in the new hard drive.

**Figure 3-16** Extra Guide Screw Locations



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No.	Guide Screw	Device
1	Black M3 Metric Screws	All Drives (except hard drives)
2	Silver and Blue 6-32 Isolation Mounting Screws	Secondary Hard Drive

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

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

Before handling a drive, ensure that you are discharged of static electricity. While handling a drive, avoid touching the connector. For more information about preventing electrostatic damage, refer to [Electrostatic Discharge on page 166](#).

Handle a drive carefully; do not drop it.

Do not use excessive force when inserting a drive.

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

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

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## Removing a 5.25-inch or 3.5-inch Drive from a Drive Bay

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

1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
3. Turn off the computer properly through the operating system, then turn off any external devices.
4. Disconnect the power cord from the power outlet and disconnect any external devices.

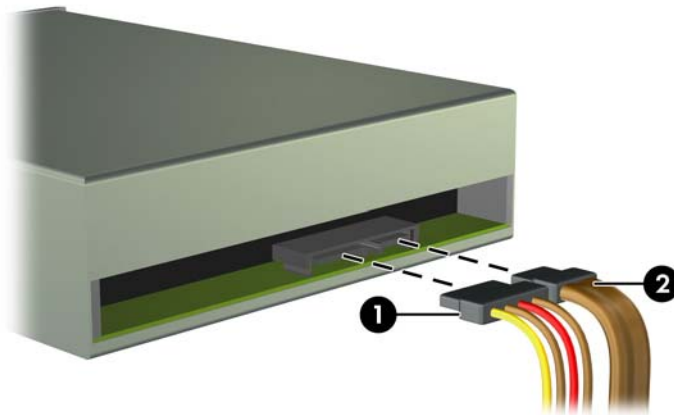
**⚠ CAUTION:** Regardless of the power-on state, voltage is always present on the system board as long as the system is plugged into an active AC outlet. You must disconnect the power cord to avoid damage to the internal components of the computer.

5. Remove the access panel and front bezel.
6. Disconnect the drive cables, as indicated in the following illustrations.

**⚠ CAUTION:** When removing the cables, pull the tab or connector instead of the cable itself to avoid damaging the cable.

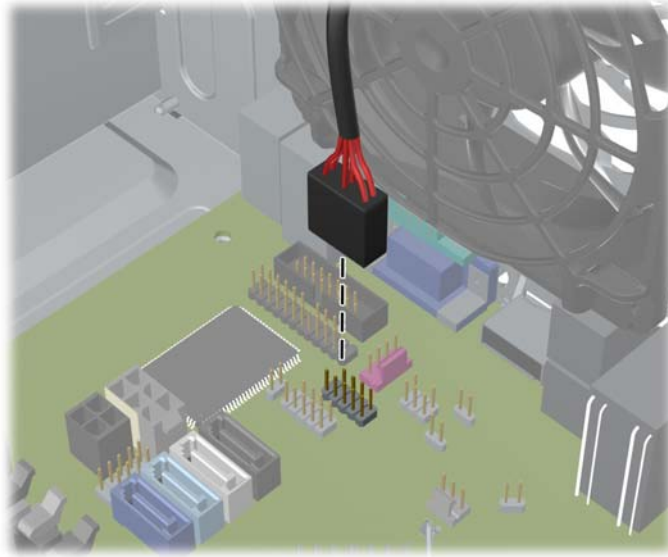
- a. If you are removing an optical drive, disconnect the power cable (1) and data cable (2) from the back of the drive.

**Figure 3-17** Disconnecting the Optical Drive Cables



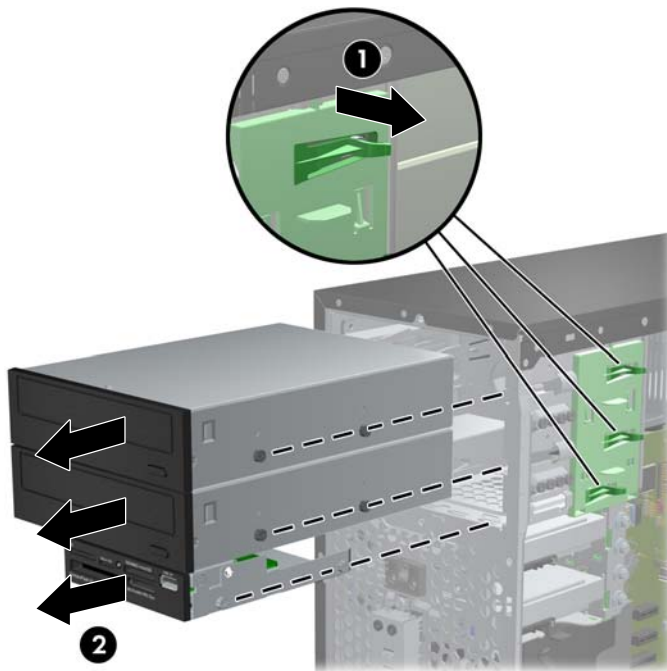
- b. If you are removing a media card reader, disconnect the USB cable from the system board.

**Figure 3-18** Disconnecting the Media Card Reader USB Cable



- 7. A latch drive bracket with release tabs secures the drives in the drive bay. Lift the release tab on the latch drive bracket (1) for the drive you want to remove, then slide the drive from its drive bay (2).

**Figure 3-19** Removing the Drives



## Installing a 5.25-inch or 3.5-inch Drive into a Drive Bay

1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
3. Turn off the computer properly through the operating system, then turn off any external devices.
4. Disconnect the power cord from the power outlet and disconnect any external devices.

**⚠ 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. You must disconnect the power cord to avoid damage to the internal components of the computer.

5. Remove the computer access panel.
6. Remove the front bezel. If you are installing a drive in a bay covered by a bezel blank, remove the bezel blank. See [Removing Bezel Blanks on page 60](#) for more information.
7. Install four M3 metric guide screws in the lower holes on each side of the drive. HP has provided eight extra M3 metric guide screws on the front of the chassis, under the front bezel. The M3 metric guide screws are black. Refer to [Installing and Removing Drives on page 71](#) for an illustration of the extra M3 metric guide screws location.

**📝 NOTE:** When replacing the drive, transfer the four M3 metric guide screws from the old drive to the new one.

**⚠ CAUTION:** Use only 5-mm long screws as guide screws. Longer screws can damage the internal components of the drive.

**Figure 3-20** Installing Guide Screws (Optical Drive Shown)



8. Slide the drive into the drive bay, making sure to align the guide screws with the guide slots, until the drive snaps into place.

**Figure 3-21** Sliding the Drives into the Drive Cage

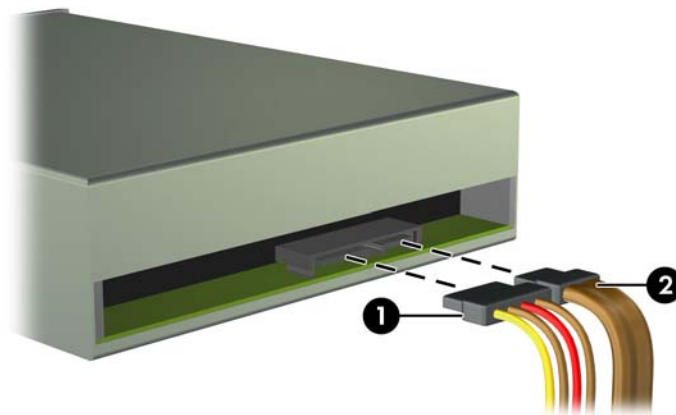


9. Connect the power and data cables to the drive as indicated in the following illustrations.
  - a. If you are installing an optical drive, connect the power cable (1) and data cable (2) to the back of the drive.



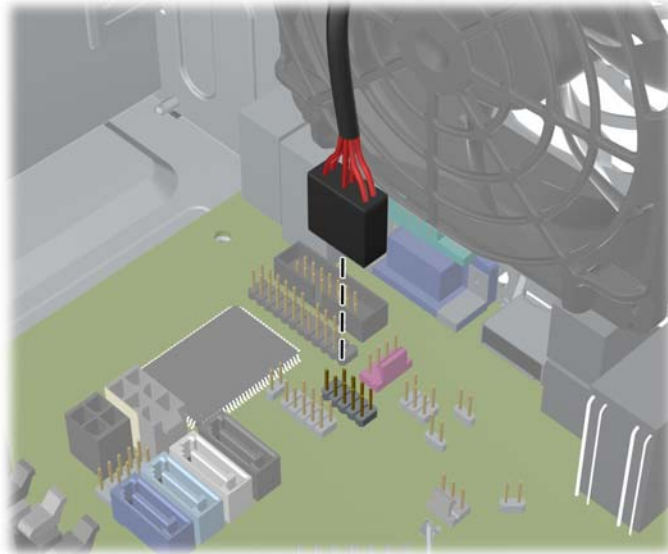
**NOTE:** The power cable for the optical drives is a two-headed cable that is routed from the system board to the rear of the optical drive bays.

**Figure 3-22** Connecting the Optical Drive Cables




- b. If you are installing a media card reader, connect the USB cable to the USB system board connector labeled MEDIA.

**Figure 3-23** Connecting the Media Card Reader USB Cable




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

 **NOTE:** If you are installing a new SATA optical drive, connect the data cable for the first optical drive to the white SATA connector on the system board labeled SATA2. Connect the data cable for a second optical drive to the black SATA connector on the system board labeled ESATA. If the ESATA connector is already populated, connect the second optical drive to the light blue connector labeled SATA1.


Refer to [System Board Connections on page 62](#) for an illustration of the system board drive connectors.

11. Replace the front bezel and computer access panel.
12. Reconnect the power cord and any external devices, then turn on the computer.
13. Lock any security devices that were disengaged when the access panel was removed.

## Removing a Hard Drive from a Drive Bay

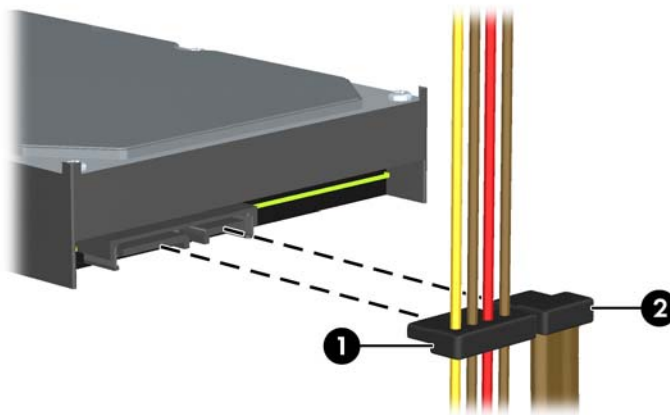
 **NOTE:** Before you remove the old hard drive, be sure to back up the data from the old hard drive so that you can transfer the data to the new hard drive.

1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
3. Turn off the computer properly through the operating system, then turn off any external devices.
4. Disconnect the power cord from the power outlet and disconnect any external devices.

 **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. You must disconnect the power cord to avoid damage to the internal components of the computer.

5. Remove the computer access panel.
6. Disconnect the power cable (1) and data cable (2) from the back of the hard drive.

**Figure 3-24** Disconnecting the Hard Drive Cables




7. Release the drive by pulling the release tab away from the drive (1) and sliding the drive out of the bay (2).

**Figure 3-25** Removing a Hard Drive




8. Remove the four guide screws (two on each side) from the old drive. You will need these screws to install a new drive.

## Installing a Hard Drive into an Internal Drive Bay


 **NOTE:** The system does not support Parallel ATA (PATA) hard drives.

1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
3. Turn off the computer properly through the operating system, then turn off any external devices.
4. Disconnect the power cord from the power outlet and disconnect any external devices.

 **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. You must disconnect the power cord to avoid damage to the internal components of the computer.

5. Remove the access panel.

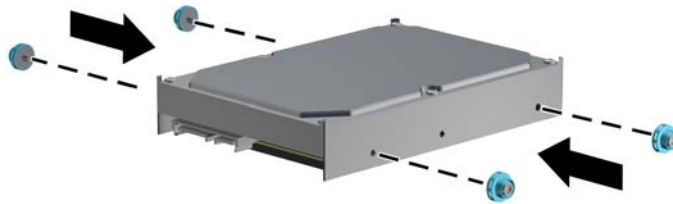
6. Install guide screws on the sides of the drive. If you are installing a 2.5-inch drive, you must install the drive in an adapter bracket.

 **NOTE:** The hard drive uses 6-32 isolation mounting guide screws. Four extra guide screws are installed on the exterior of the hard drive bays. The HP-supplied isolation mounting guide screws are silver and blue. Refer to [Installing and Removing Drives on page 71](#) for an illustration of the extra 6-32 isolation mounting guide screws location.

If you are replacing a drive, transfer the guides screws from the old drive to the new one.

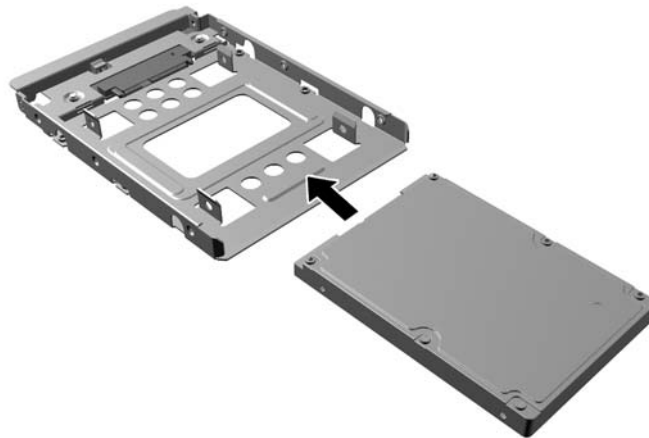
- If you are installing a 3.5-inch hard drive, install four isolation mounting guide screws (two on each side of the drive).

**Figure 3-26** Installing Isolation Mounting Guide Screws in a 3.5-inch Drive



- If you are installing a 2.5-inch hard drive:
  - Slide the drive into the bay adapter bracket, ensuring the connector on the drive is fully inserted into the connector on the adapter bracket.

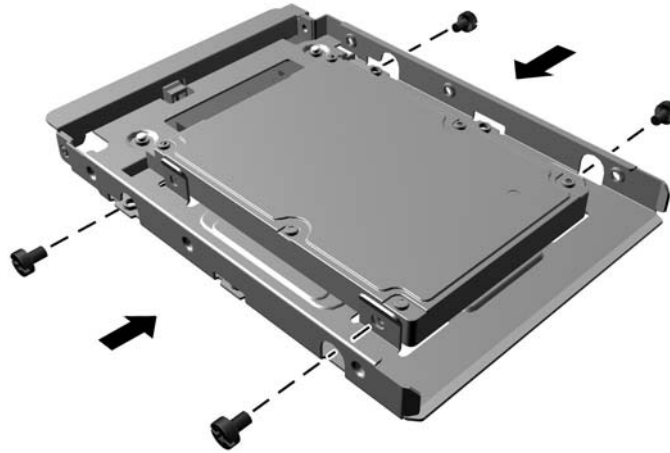
**Figure 3-27** Sliding the 2.5-inch Drive in the Adapter Bracket





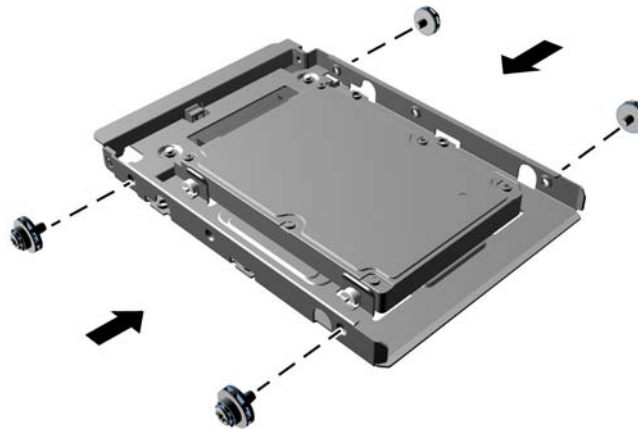
- Secure the drive to the bay adapter bracket by installing four black M3 adapter bracket screws through the sides of the bracket into the drive.

**Figure 3-28** Securing the Drive in the Adapter Bracket



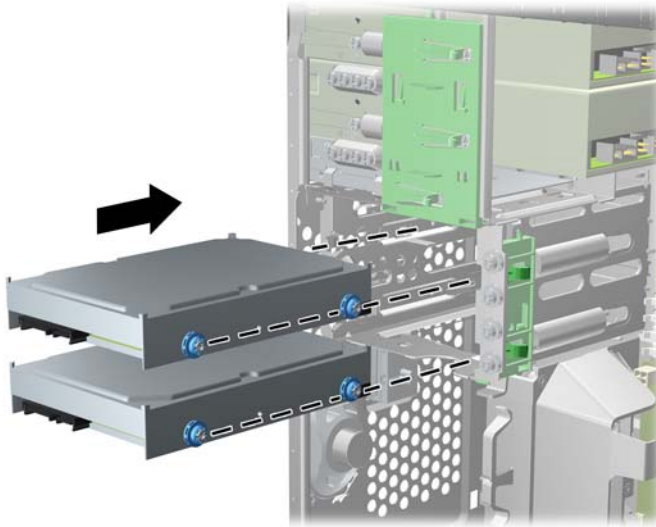
- Install four 6-32 silver and blue isolation mounting guide screws in the adapter bracket (two on each side of the bracket).

**Figure 3-29** Installing Isolation Mounting Guide Screws in the Adapter Bracket




- Slide the drive into the drive bay, making sure to align the guide screws with the guide slots, until the drive snaps into place. The bottom bay is for the primary hard drive. The upper bay is for an optional secondary hard drive.

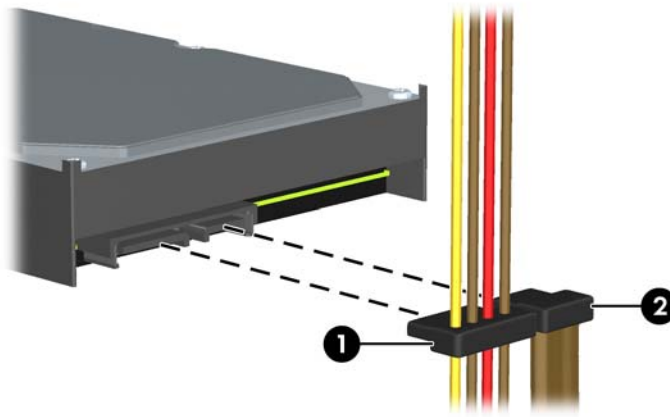
**Figure 3-30** Sliding a Hard Drive into the Drive Bay




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

 **NOTE:** The power cable for the hard drives is a two-headed cable that is routed from the system board to the rear of the hard drive bays.

**Figure 3-31** Connecting the Hard Drive Cables



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

 **NOTE:** If your system has only one SATA hard drive, you must connect the hard drive data cable to the dark blue connector labeled SATA0 to avoid any hard drive performance problems. If you are adding a second hard drive, connect the data cable to the light blue connector labeled SATA1.

- Route the power and data cables in their cable retainers.
- Replace the computer access panel.

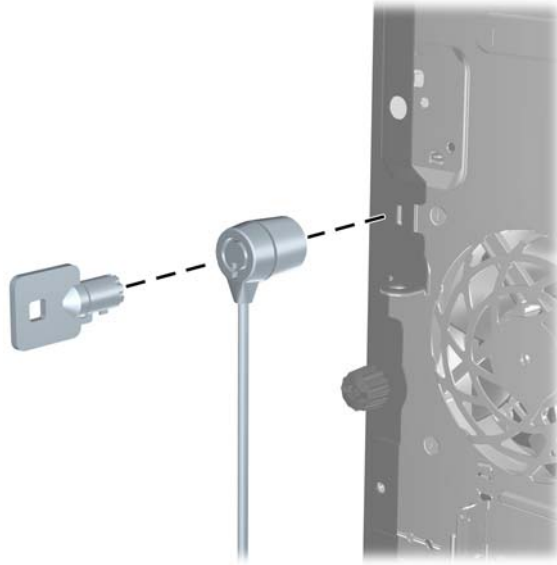
12. Reconnect the power cord and any external devices, then turn on the computer.
13. Lock any security devices that were disengaged when the access panel was removed.

## Installing a Security Lock

The security locks displayed below and on the following pages can be used to secure the computer.

### Cable Lock

**Figure 3-32** Installing a Cable Lock



### Padlock

**Figure 3-33** Installing a Padlock



## HP Business PC Security Lock

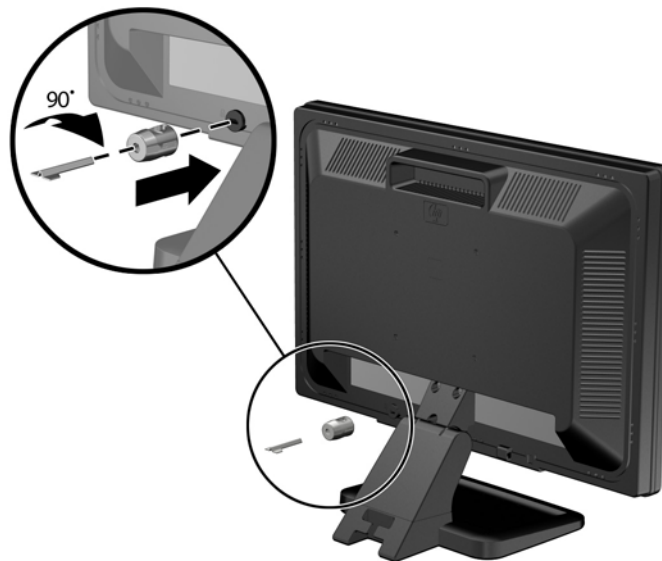
1. Fasten the security cable by looping it around a stationary object.

**Figure 3-34** Securing the Cable to a Fixed Object



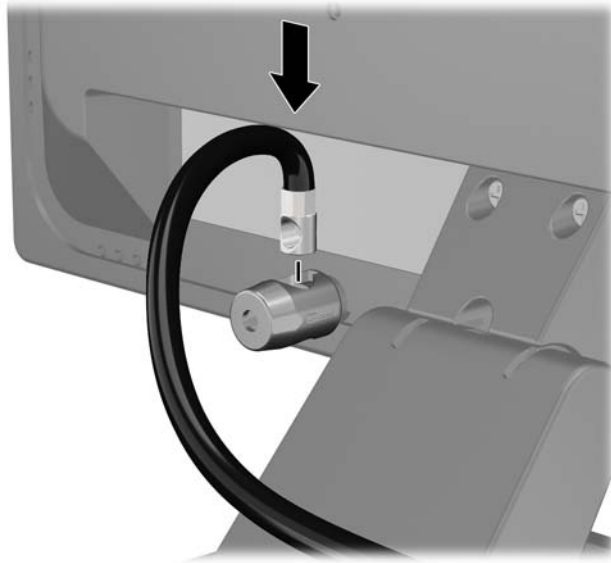
2. Insert the cable lock into the cable lock slot on the back of the monitor and secure the lock to the monitor by inserting the key into the key hole on the rear of the lock and rotating the key 90 degrees.

**Figure 3-35** Installing the Cable Lock on the Monitor



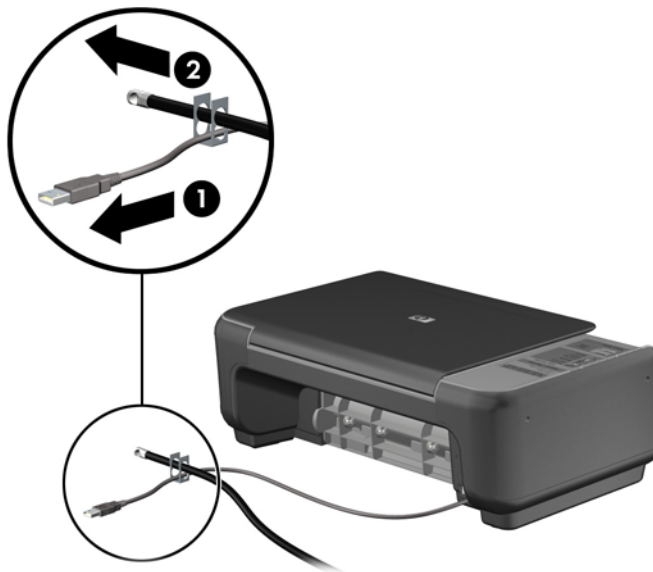
3. Slide the security cable through the hole in the cable lock on the rear of the monitor.

**Figure 3-36** Securing the Monitor



4. Use the bracket provided in the kit to secure other peripheral devices by laying the device cable across the center of the bracket (1) and inserting the security cable through one of the two holes in the bracket (2). Use the hole in the bracket that best secures the peripheral device cable.

**Figure 3-37** Securing Peripheral Devices (Printer Shown)



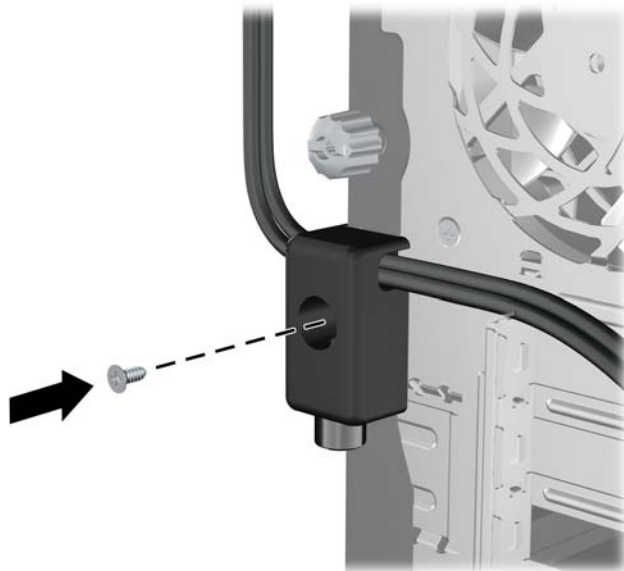
5. Thread the keyboard and mouse cables through the computer chassis lock.

**Figure 3-38** Threading the Keyboard and Mouse Cables



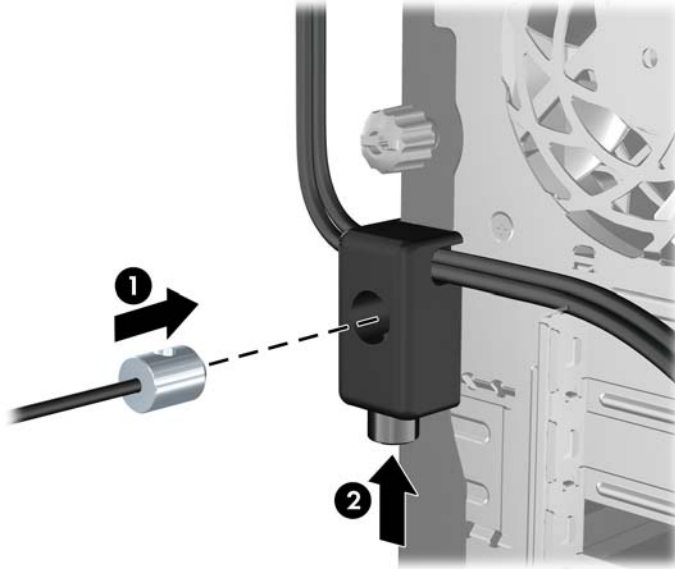
6. Screw the lock to the chassis in the thumbscrew hole using the screw provided.

**Figure 3-39** Attaching the Lock to the Chassis



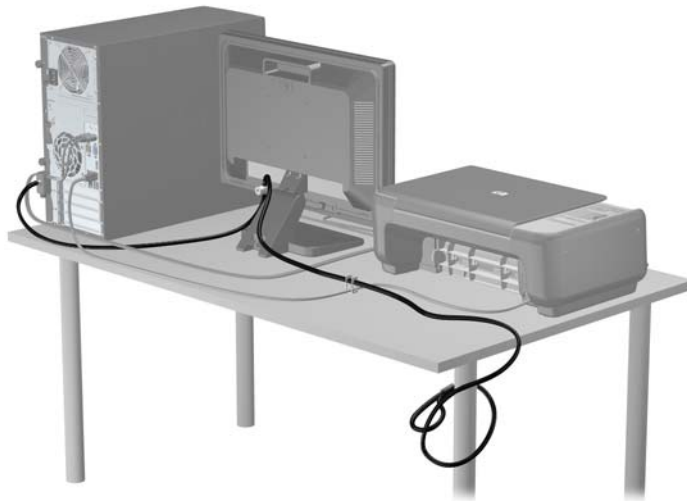
7. Insert the plug end of the security cable into the lock (1) and push the button in (2) to engage the lock. Use the key provided to disengage the lock.

**Figure 3-40** Engaging the Lock



8. When complete, all devices in your workstation will be secured.

**Figure 3-41** Secured Workstation



## Front Bezel Security

The front bezel can be locked in place by installing a security screw provided by HP. To install the security screw:

1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
3. Turn off the computer properly through the operating system, then turn off any external devices.
4. Disconnect the power cord from the power outlet and disconnect any external devices.

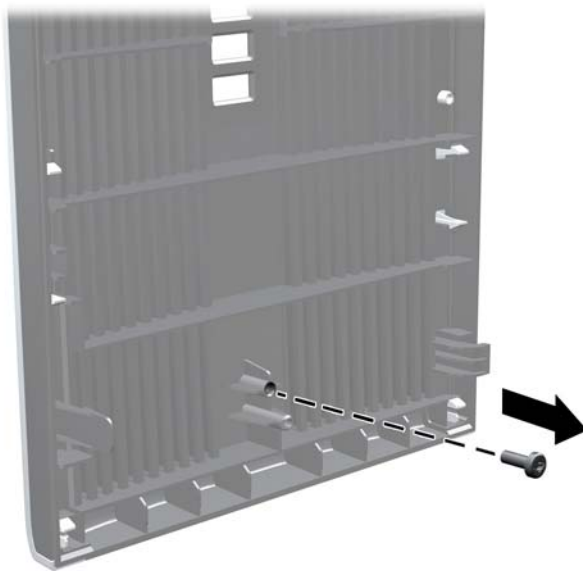
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**⚠ CAUTION:** Regardless of the power-on state, voltage is always present on the system board as long as the system is plugged into an active AC outlet. You must disconnect the power cord to avoid damage to the internal components of the computer.

---

5. Remove the access panel and front bezel.
6. Remove the security screw from the inside of the front bezel.

**Figure 3-42** Retrieving the Front Bezel Security Screw



7. Replace the front bezel.



8. Install the screw through the interior of the front of the chassis into the front bezel. The screw hole is located toward the middle of the right edge of the chassis between the hard drive bay and speaker.

**Figure 3-43** Installing the Front Bezel Security Screw



9. Replace the access panel.
10. Reconnect the power cord and turn on the computer.
11. Lock any security devices that were disengaged when the access panel was removed.

---

# 4 Small Form Factor (SFF) Hardware Upgrades

## Serviceability Features

The computer includes features that make it easy to upgrade and service. No tools are needed for most of the installation procedures described in this chapter.

## Warnings and Cautions

Before performing upgrades be sure to carefully read all of the applicable instructions, cautions, and warnings in this guide.

---

**⚠ WARNING!** To reduce the risk of personal injury from electrical shock, hot surfaces, or fire:

Disconnect the power cord from the wall outlet and allow the internal system components to cool before touching.

Do not plug telecommunications or telephone connectors into the network interface controller (NIC) receptacles.

Do not disable the power cord grounding plug. The grounding plug is an important safety feature.

Plug the power cord in a grounded (earthed) outlet that is easily accessible at all times.

To reduce the risk of serious injury, read the *Safety & Comfort Guide*. It describes proper workstation, setup, posture, and health and work habits for computer users, and provides important electrical and mechanical safety information. This guide is located on the Web at <http://www.hp.com/ergo>.

**⚠ WARNING!** Energized and moving parts inside.

Disconnect power to the equipment before removing the enclosure.

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

**⚠ CAUTION:** Static electricity can damage the electrical 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. See [Electrostatic Discharge on page 166](#) for more information.

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 damage to internal components.

---

## Removing the Computer Access Panel

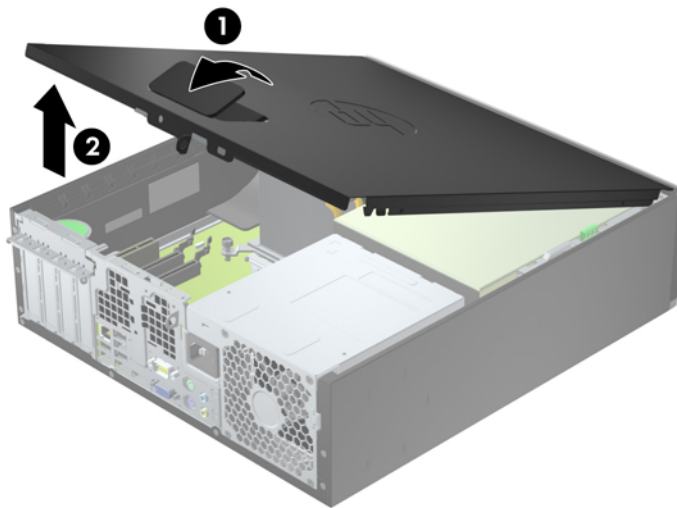
To access internal components, you must remove the access panel:

1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
3. Turn off the computer properly through the operating system, then turn off any external devices.
4. Disconnect the power cord from the power outlet and disconnect any external devices.

**⚠ 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. You must disconnect the power cord to avoid damage to the internal components of the computer.

5. If the computer is on a stand, remove the computer from the stand and lay the computer down.
6. Lift up on the access panel handle (1) then lift the access panel off the computer (2).

**Figure 4-1** Removing the Computer Access Panel



## Replacing the Computer Access Panel

Slide the lip on the front end of the access panel under the lip on the front of the chassis (1) then press the back end of the access panel onto the unit so that it locks into place (2).

**Figure 4-2** Replacing the Computer Access Panel



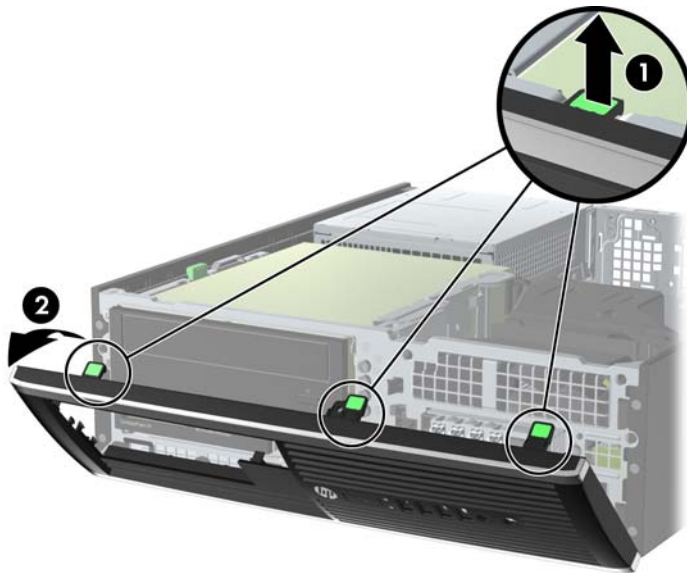
## Removing the Front Bezel

1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
3. Turn off the computer properly through the operating system, then turn off any external devices.
4. Disconnect the power cord from the power outlet and disconnect any external devices.

**⚠ 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. You must disconnect the power cord to avoid damage to the internal components of the computer.

5. If the computer is on a stand, remove the computer from the stand and lay the computer down.
6. Remove the computer access panel.
7. Lift up the three tabs on the side of the bezel (1), then rotate the bezel off the chassis (2).

**Figure 4-3** Removing the Front Bezel



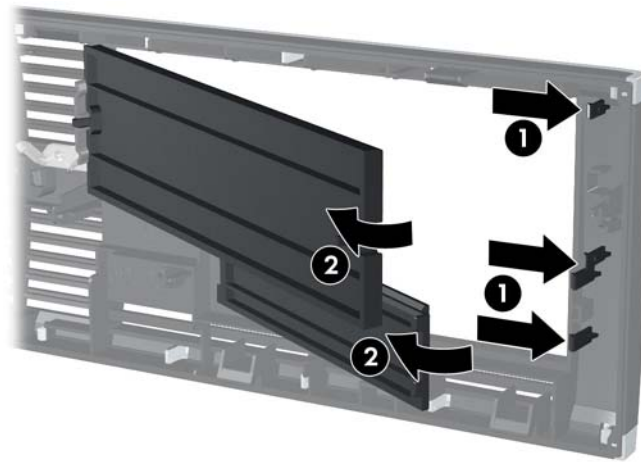
## Removing Bezel Blanks

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

1. Remove the access panel and front bezel.

2. To remove a bezel blank, push the two retaining tabs that hold the bezel blank in place towards the outer right edge of the bezel (1) and slide the bezel blank back and to the right to remove it (2).

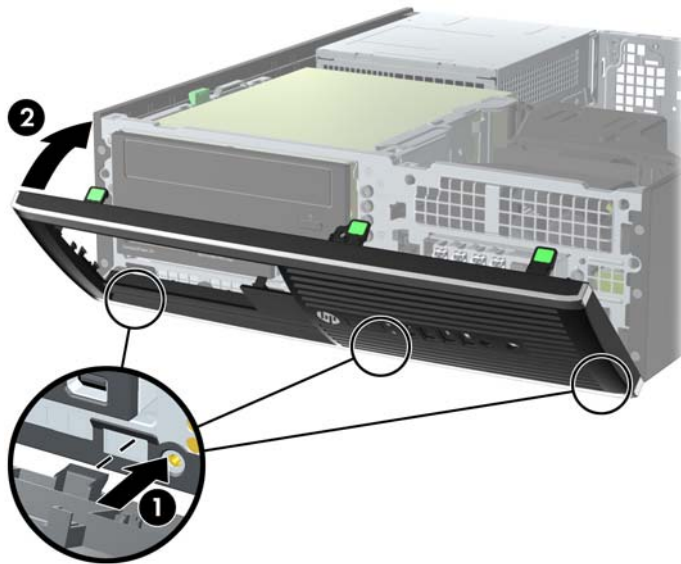
**Figure 4-4** Removing a Bezel Blank



## Replacing the Front Bezel

Insert the three hooks on the bottom side of the bezel into the rectangular holes on the chassis (1) then rotate the top side of the bezel onto the chassis (2) and snap it into place.

**Figure 4-5** Replacing the Front Bezel



## Changing from Desktop to Tower Configuration

The Small Form Factor computer can be used in a tower orientation with an optional tower stand that can be purchased from HP.

1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
3. Turn off the computer properly through the operating system, then turn off any external devices.
4. Disconnect the power cord from the power outlet and disconnect any external devices.

---

**⚠ 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. You must disconnect the power cord to avoid damage to the internal components of the computer.

---

5. Orient the computer so that its right side is facing down and place the computer in the optional stand.

**Figure 4-6** Changing from Desktop to Tower Orientation



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**📝 NOTE:** To stabilize the computer in a tower orientation, HP recommends the use of the optional tower stand.

---

6. Reconnect the power cord and any external devices, then turn on the computer.

---

**📝 NOTE:** Ensure at least 10.2 centimeters (4 inches) of space on all sides of the computer remains clear and free of obstructions.

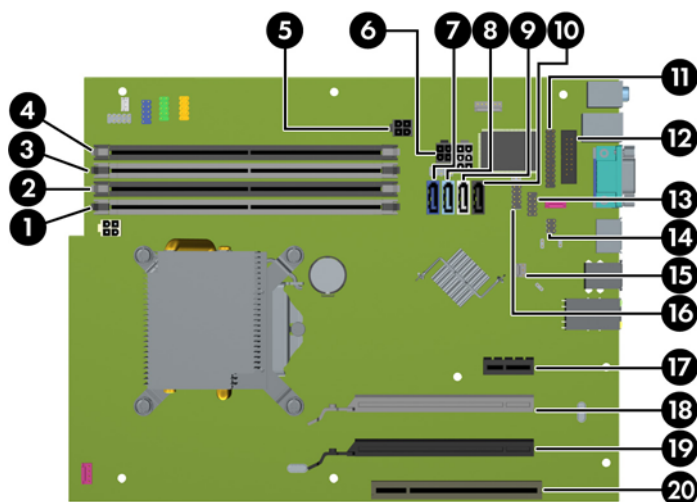
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7. Lock any security devices that were disengaged when the access panel was removed.

# System Board Connections

Refer to the following illustration and table to identify the system board connectors for your model.

**Figure 4-7** System Board Connections



**Table 4-1** System Board Connections

No.	System Board Connector	System Board Label	Color	Component
1	DIMM4 (Channel A)	DIMM4	white	Memory Module
2	DIMM3 (Channel A)	DIMM3	black	Memory Module
3	DIMM2 (Channel B)	DIMM2	white	Memory Module
4	DIMM1 (Channel B)	DIMM1	black	Memory Module
5	Power	SATAPWR1	black	(unused)
6	Power	SATAPWR0	black	SATA Optical and Hard Drives
7	SATA 3.0	SATA0	dark blue	1st Hard Drive
8	SATA 3.0	SATA1	light blue	2nd Hard Drive, or 2nd Optical Drive if an eSATA Adapter Cable exists
9	SATA 2.0	SATA2	white	1st Optical Drive
10	eSATA	ESATA	black	eSATA Adapter Cable, or 2nd Optical Drive
11	Parallel Port	PAR	black	Parallel Port
12	Serial Port	COMB	black	Serial Port
13	USB	MEDIA	black	USB Device, such as a Media Card Reader
14	Hood Lock	HLCK	black	Hood Lock
15	Hood Sensor	HSENSE	white	Hood Sensor
16	USB	MEDIA2	black	USB Device, such as a Media Card Reader
17	PCI Express x1	X1PCIEXP1	black	Expansion Card



**Table 4-1 System Board Connections (continued)**

No.	System Board Connector	System Board Label	Color	Component
18	PCI Express x16 downshifted to a x4	X4PCIEXP	white	Expansion Card
19	PCI Express x16	X16PCIEXP	black	Expansion Card
20	PCI	PCI1	white	Expansion Card

## Installing Additional Memory

The computer comes with double data rate 3 synchronous dynamic random access memory (DDR3-SDRAM) dual inline memory modules (DIMMs).

### 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 16-GB of memory configured in a high-performing dual channel mode.

### DDR3-SDRAM DIMMs

**CAUTION:** This product DOES NOT support DDR3 Ultra Low Voltage (DDR3U) memory. The processor is not compatible with DDR3U memory and if you plug DDR3U memory into the system board, it can cause the physical damage to the DIMM or invoke system malfunction.

For proper system operation, the DDR3-SDRAM DIMMs must be:

- industry-standard 240-pin
- unbuffered non-ECC PC3-12800 DDR3-1600 MHz-compliant
- 1.5 volt DDR3-SDRAM DIMMs

The DDR3-SDRAM DIMMs must also:

- support CAS latency 11 DDR3 1600 MHz (11-11-11 timing)
- contain the mandatory JEDEC SPD information

In addition, the computer supports:

- 512-Mbit, 1-Gbit, and 2-Gbit non-ECC memory technologies
- single-sided and double-sided DIMMs
- DIMMs constructed with x8 and x16 DDR devices; DIMMs constructed with x4 SDRAM are not supported

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

### Populating DIMM Sockets

There are four DIMM sockets on the system board, with two sockets per channel. The sockets are labeled DIMM1, DIMM2, DIMM3, and DIMM4. Sockets DIMM1 and DIMM2 operate in memory channel B. Sockets DIMM3 and DIMM4 operate in memory channel A.

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

- The system will operate in single channel mode if the DIMM sockets are populated in one channel only.
- The system will operate in a higher-performing dual channel mode if the total memory capacity of the DIMMs in Channel A is equal to the total memory capacity of the DIMMs in Channel B. The technology and device width can vary between the channels. For example, if Channel A is populated with two 1-GB DIMMs and Channel B is populated with one 2-GB DIMM, the system will operate in dual channel mode.
- The system will operate in flex mode if the total memory capacity of the DIMMs in Channel A is not equal to the total memory capacity of the DIMMs in Channel B. In flex mode, the channel populated with the least amount of memory describes the total amount of memory assigned to dual channel and the remainder is assigned to single channel. For optimal speed, the channels should be balanced so that the largest amount of memory is spread between the two channels. If one channel will have more memory than the other, the larger amount should be assigned to Channel A. For example, if you are populating the sockets with one 2-GB DIMM, and three 1-GB DIMMs, Channel A should be populated with the 2-GB DIMM and one 1-GB DIMM, and Channel B should be populated with the other two 1-GB DIMMs. With this configuration, 4-GB will run as dual channel and 1-GB will run as single channel.
- In any mode, the maximum operational speed is determined by the slowest DIMM in the system.

## Installing DIMMs

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**⚠ CAUTION:** You must disconnect the power cord and wait approximately 30 seconds for the power to drain before adding or removing memory modules. Regardless of the power-on state, voltage is always supplied to the memory modules as long as the computer is plugged into an active AC outlet. Adding or removing memory modules while voltage is present may cause irreparable damage to the memory modules or system board.

The memory module sockets have gold-plated metal contacts. When upgrading the memory, it is important to use memory modules with gold-plated 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. For more information, refer to [Electrostatic Discharge on page 166](#).

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

- 
1. Remove/disengage any security devices that prohibit opening the computer.
  2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
  3. Turn off the computer properly through the operating system, then turn off any external devices.
  4. Disconnect the power cord from the power outlet and disconnect any external devices.

---

**⚠ CAUTION:** You must disconnect the power cord and wait approximately 30 seconds for the power to drain before adding or removing memory modules. Regardless of the power-on state, voltage is always supplied to the memory modules as long as the computer is plugged into an active AC outlet. Adding or removing memory modules while voltage is present may cause irreparable damage to the memory modules or system board.

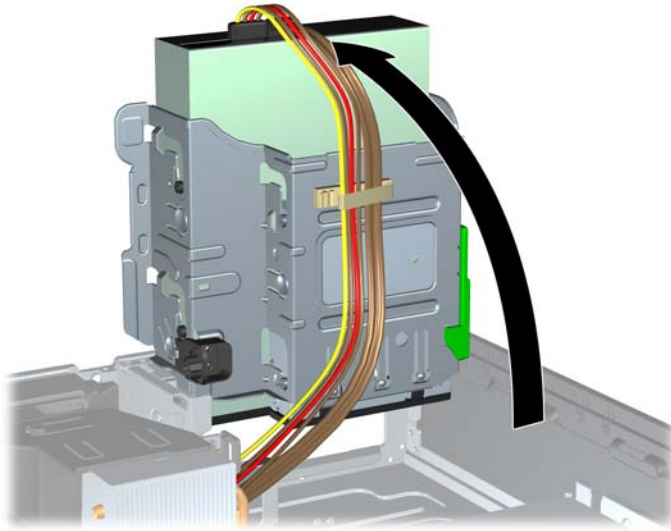
5. If the computer is on a stand, remove the computer from the stand.

6. Remove the computer access panel.

**⚠ WARNING!** To reduce risk of personal injury from hot surfaces, allow the internal system components to cool before touching.

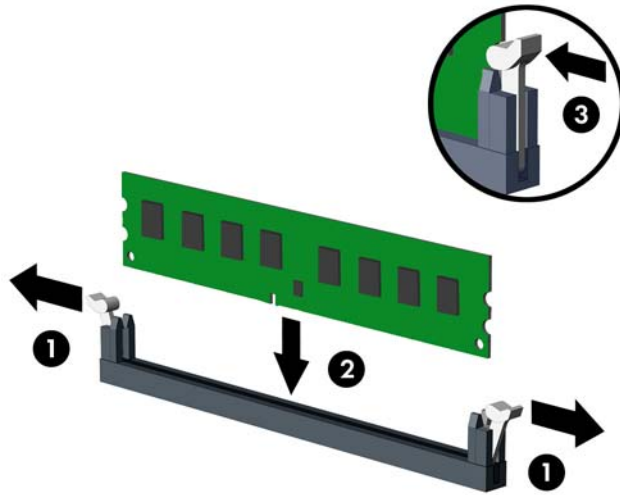
7. Rotate up the internal drive bay housing to access the memory module sockets on the system board.

**Figure 4-8** Rotating the Drive Cage Up




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

**Figure 4-9** Installing a DIMM



---

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

Populate the black DIMM sockets before the white DIMM sockets.

For maximum performance, populate the sockets so that the memory capacity is spread as equally as possible between Channel A and Channel B. Refer to [Populating DIMM Sockets on page 97](#) for more information.


---

9. 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).
10. Repeat steps 8 and 9 to install any additional modules.
11. Replace the access panel.
12. If the computer was on a stand, replace the stand.
13. Reconnect the power cord and turn on the computer.
14. Lock any security devices that were disengaged when the access panel was removed.

The computer should automatically recognize the additional memory the next time you turn on the computer.

# Removing or Installing an Expansion Card

The computer has one PCI expansion slot, one PCI Express x1 expansion slot, one PCI Express x16 expansion slot, and one PCI Express x16 expansion slot that is downshifted to a x4 slot.


 **NOTE:** The PCI and PCI Express slots support only low profile cards.

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

For dual graphics card configurations, the first (primary) card must be installed in the PCI Express x16 slot that is NOT downshifted to a x4.

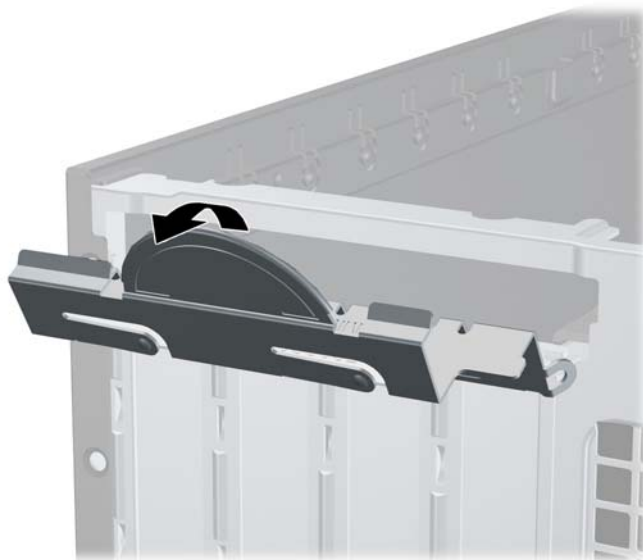
To remove, replace, or add an expansion card:

1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
3. Turn off the computer properly through the operating system, then turn off any external devices.
4. Disconnect the power cord from the power outlet and disconnect any external devices.


 **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. You must disconnect the power cord to avoid damage to the internal components of the computer.

5. If the computer is on a stand, remove the computer from the stand.
6. Remove the computer access panel.
7. Locate the correct vacant expansion socket on the system board and the corresponding expansion slot on the back of the computer chassis.
8. Release the slot cover retention latch that secures the PCI slot covers by lifting the green tab on the latch and rotating the latch to the open position.

**Figure 4-10** Opening the Expansion Slot Retainer

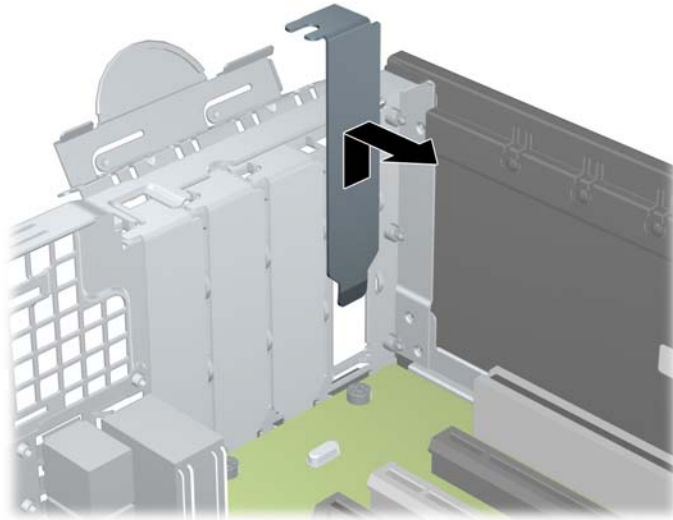


9. Before installing an expansion card, remove the expansion slot cover or the existing expansion card.

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

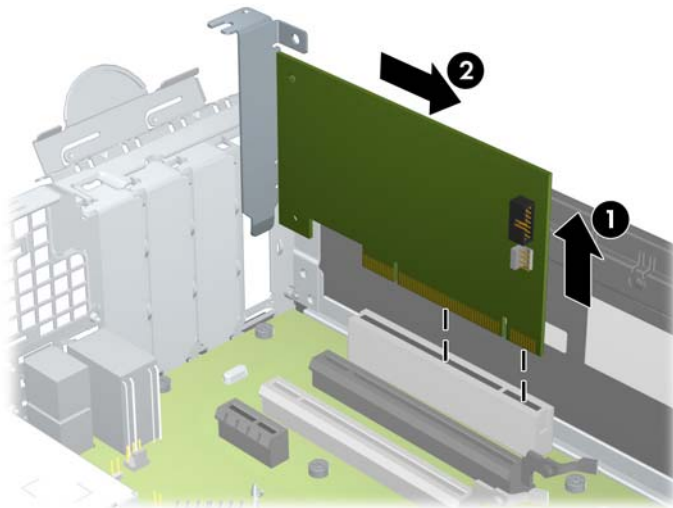
- a. If you are installing an expansion card in a vacant socket, remove the appropriate expansion slot cover on the back of the chassis. Pull the slot cover straight up then away from the inside of the chassis.

**Figure 4-11** Removing an Expansion Slot Cover



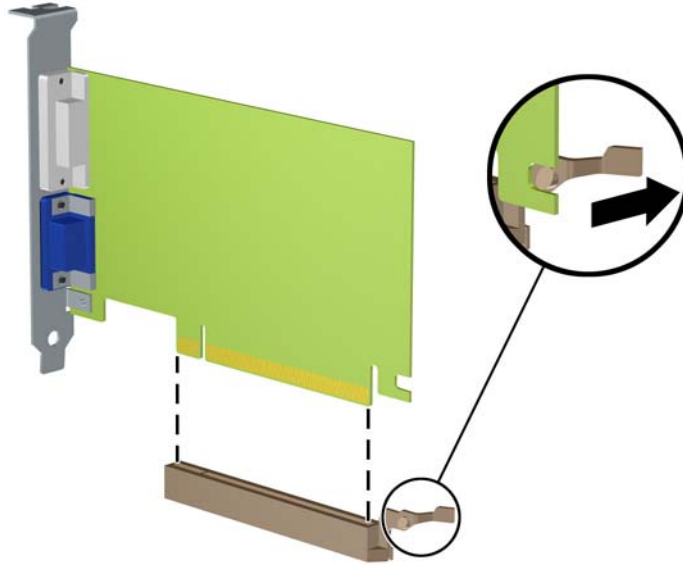
- b. If you are removing a standard PCI card or PCI Express x1 card, hold the card at each end, and carefully rock it back and forth until the connectors pull free from the socket. Pull the expansion card straight up from the socket (1) then away from the inside of the chassis to release it from the chassis frame (2). Be sure not to scrape the card against the other components.

**Figure 4-12** Removing a Standard PCI Expansion Card



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

**Figure 4-13** Removing a PCI Express x16 Expansion Card



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

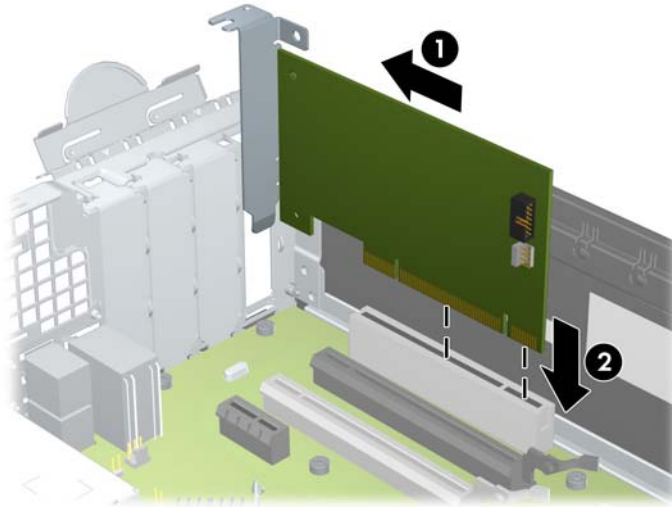
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**⚠ CAUTION:** After removing an expansion card, you must replace it with a new card or expansion slot cover for proper cooling of internal components during operation.


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12. To install a new expansion card, hold the card just above the expansion socket on the system board then move the card toward the rear of the chassis (1) so that the bracket on the card is aligned with the open slot on the rear of the chassis. Press the card straight down into the expansion socket on the system board (2).

**Figure 4-14** Installing an Expansion Card



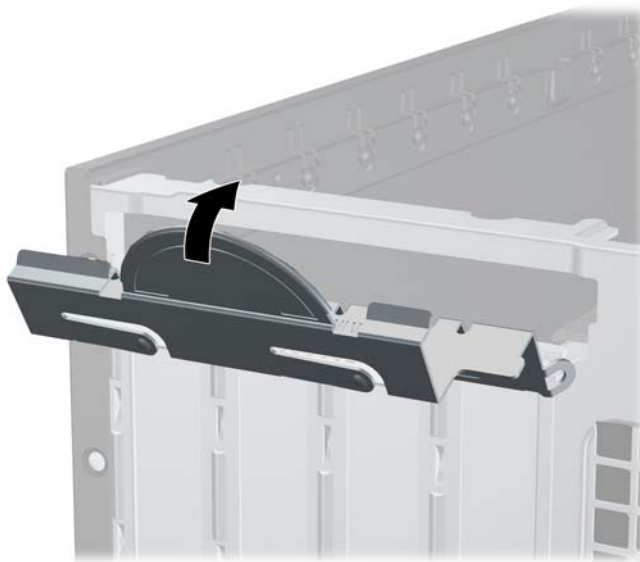
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 **NOTE:** When installing an expansion card, press firmly on the card so that the whole connector seats properly in the expansion card slot.

---

13. Rotate the slot cover retention latch back in place to secure the expansion card.

**Figure 4-15** Closing the Expansion Slot Retainer



14. Connect external cables to the installed card, if needed. Connect internal cables to the system board, if needed.
15. Replace the computer access panel.
16. If the computer was on a stand, replace the stand.
17. Reconnect the power cord and turn on the computer.



18. Lock any security devices that were disengaged when the access panel was removed.
19. Reconfigure the computer, if necessary.

## Drive Positions

Figure 4-16 Drive Positions

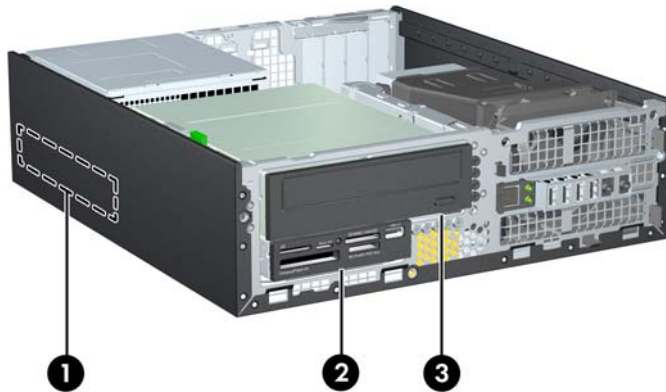


Table 4-2 Drive Positions

1	3.5-inch internal hard drive bay
2	3.5-inch drive bay for optional drives (media card reader shown)
3	5.25-inch drive bay for optional drives (optical drive shown)

**NOTE:** The drive configuration on your computer may be different than the drive configuration shown above.

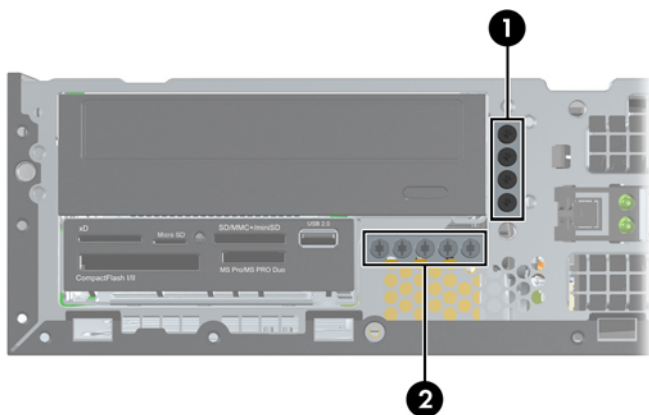
To verify the type and size of the storage devices installed in the computer, run Computer Setup.

# Installing and Removing Drives

When installing drives, follow these guidelines:

- The primary Serial ATA (SATA) hard drive must be connected to the dark blue primary SATA connector on the system board labeled SATA0. If you are adding a second hard drive, connect it to the light blue connector on the system board labeled SATA1.
- Connect a SATA optical drive to the white SATA connector on the system board labeled SATA2.
- Connect an optional eSATA adapter cable to the black SATA connector on the system board labeled ESATA.
- Connect a media card reader USB cable to the USB connector on the system board labeled MEDIA.
- The power cable for the SATA drives is a three-headed cable that is plugged into the system board with the first connector routed to the rear of the hard drive, the second connector routed to the rear of the 3.5" drive, and the third connector routed to the rear of the 5.25" optical drive.
- The system does not support Parallel ATA (PATA) optical drives or PATA hard drives.
- You must install guide screws to ensure the drive will line up correctly in the drive cage and lock in place. HP has provided extra guide screws for the drive bays (five 6-32 standard screws and four M3 metric screws), installed in the front of the chassis, under the front bezel. The 6-32 standard screws are required for a secondary hard drive. All other drives (except the primary hard drive) use M3 metric screws. The HP-supplied metric screws are black and the HP-supplied standard screws are silver. If you are replacing the primary hard drive, you must remove the four silver and blue 6-32 isolation mounting guide screws from the old hard drive and install them in the new hard drive.


**Figure 4-17** Extra Guide Screw Locations



No.	Guide Screw	Device
1	Black M3 Metric Screws	All Drives (except primary and secondary hard drives)
2	Silver 6-32 Standard Screws	Secondary Hard Drive

There are a total of five extra silver 6-32 standard screws. Four are used as guide screws for a secondary hard drive. The fifth is used for bezel security (see [Front Bezel Security on page 126](#) for more information).

---

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

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

Before handling a drive, ensure that you are discharged of static electricity. While handling a drive, avoid touching the connector. For more information about preventing electrostatic damage, refer to [Electrostatic Discharge on page 166](#).

Handle a drive carefully; do not drop it.

Do not use excessive force when inserting a drive.

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

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

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## Removing a 5.25-inch Drive from a Drive Bay

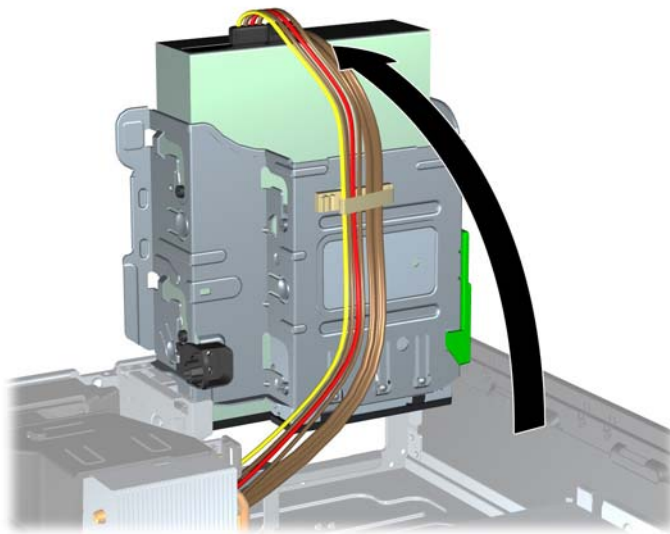
**CAUTION:** All removable media should be taken out of a drive before removing the drive from the computer.

1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
3. Turn off the computer properly through the operating system, then turn off any external devices.
4. Disconnect the power cord from the power outlet and disconnect any external devices.

**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. You must disconnect the power cord to avoid damage to the internal components of the computer.

5. If the computer is on a stand, remove the computer from the stand.
6. Remove the computer access panel.
7. Rotate the drive cage to its upright position.

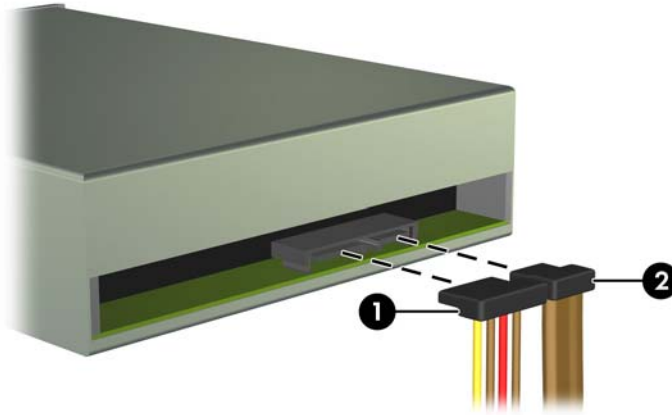
**Figure 4-18** Rotating the Drive Cage Up



8. If removing an optical drive, disconnect the power cable (1) and data cable (2) from the rear of the optical drive.

**CAUTION:** When removing the cables, pull the tab or connector instead of the cable itself to avoid damaging the cable.

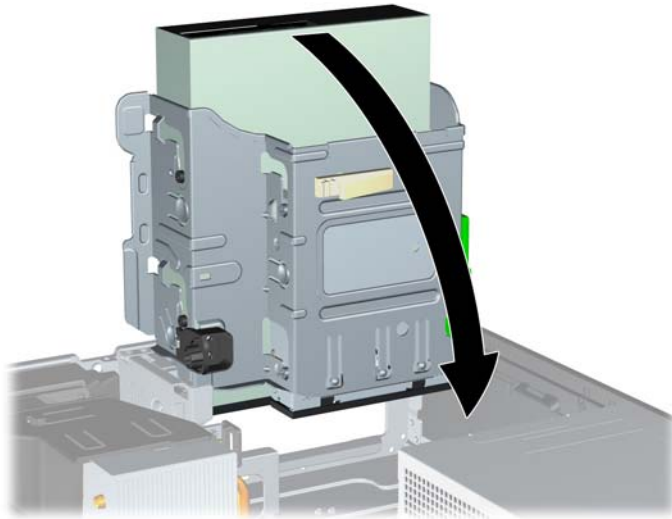
**Figure 4-19** Disconnecting the Power and Data Cables



9. Rotate the drive cage back down to its normal position.

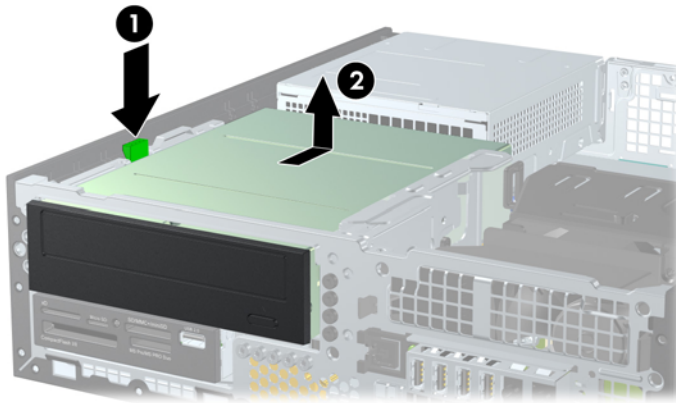
**CAUTION:** Be careful not to pinch any cables or wires when rotating the drive cage down.

**Figure 4-20** Rotating the Drive Cage Down



10. Press down on the green drive retainer button located on the left side of the drive to disengage the drive from the drive cage (1). While pressing the drive retainer button, slide the drive back until it stops, then lift it up and out of the drive cage (2).

**Figure 4-21** Removing the 5.25-inch Drive




## Installing a 5.25-inch Drive into a Drive Bay


1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
3. Turn off the computer properly through the operating system, then turn off any external devices.
4. Disconnect the power cord from the power outlet and disconnect any external devices.

**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. You must disconnect the power cord to avoid damage to the internal components of the computer.

5. If the computer is on a stand, remove the computer from the stand.
6. Remove the computer access panel.
7. If you are installing a drive in a bay covered by a bezel blank, remove the front bezel then remove the bezel blank. See [Removing Bezel Blanks on page 93](#) for more information.

8. Install four M3 metric guide screws in the lower holes on each side of the drive. HP has provided four extra M3 metric guide screws on the front of the chassis, under the front bezel. The M3 metric guide screws are black. Refer to [Installing and Removing Drives on page 106](#) for an illustration of the extra M3 metric guide screws location.

 **NOTE:** When replacing the drive, transfer the four M3 metric guide screws from the old drive to the new one.

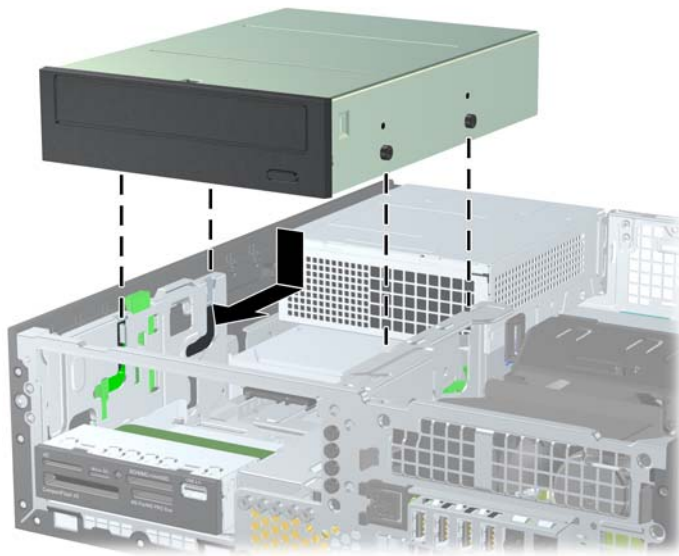
 **CAUTION:** Use only 5-mm long screws as guide screws. Longer screws can damage the internal components of the drive.

**Figure 4-22** Installing Guide Screws in the Optical Drive



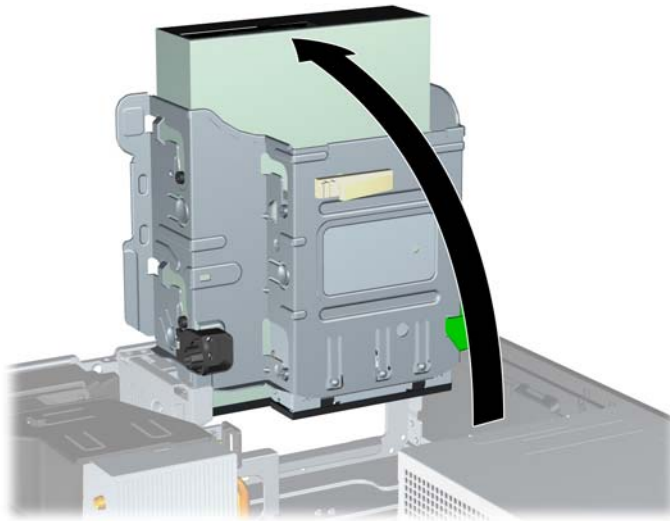
9. Position the guide screws on the drive into the J-slots in the drive bay. Then slide the drive toward the front of the computer until it locks into place.

**Figure 4-23** Installing the Optical Drive



10. Rotate the drive cage to its upright position.

**Figure 4-24** Rotating the Drive Cage Up



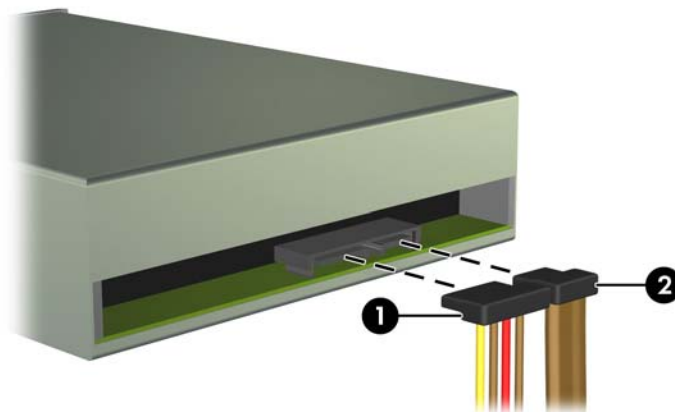
11. Connect the SATA data cable to the white SATA system board connector labeled SATA2.
12. Route the data cable through the cable guides.

**CAUTION:** There are two cable guides that keep the data cable from being pinched by the drive cage when raising or lowering it. One is located on the bottom side of the drive cage. The other is located on the chassis frame under the drive cage. Ensure that the data cable is routed through these guides before connecting it to the optical drive.

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

**NOTE:** The power cable for the optical drive is a three-headed cable that is routed from the system board to the hard drive, then to the rear of the optical drive.

**Figure 4-25** Connecting the Power and Data Cables

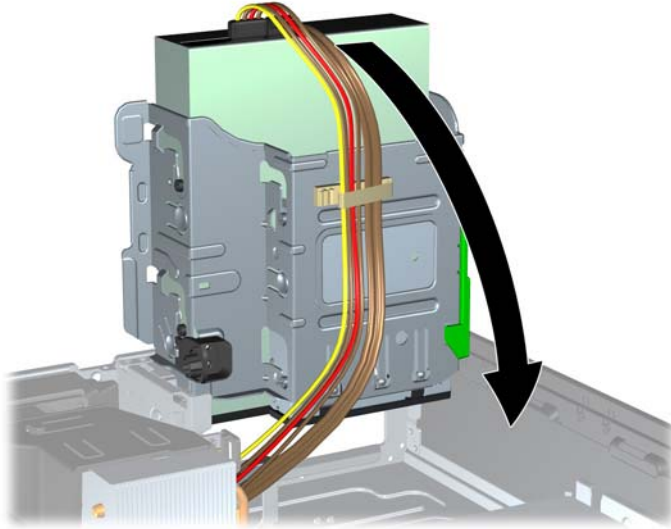




14. Rotate the drive cage back down to its normal position.

**CAUTION:** Be careful not to pinch any cables or wires when rotating the drive cage down.

**Figure 4-26** Rotating the Drive Cage Down



15. Replace the front bezel (if removed) and access panel.
16. If the computer was on a stand, replace the stand.
17. Reconnect the power cord and turn on the computer.
18. Lock any security devices that were disengaged when the access panel was removed.

## Removing a 3.5-inch Drive from a Drive Bay

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

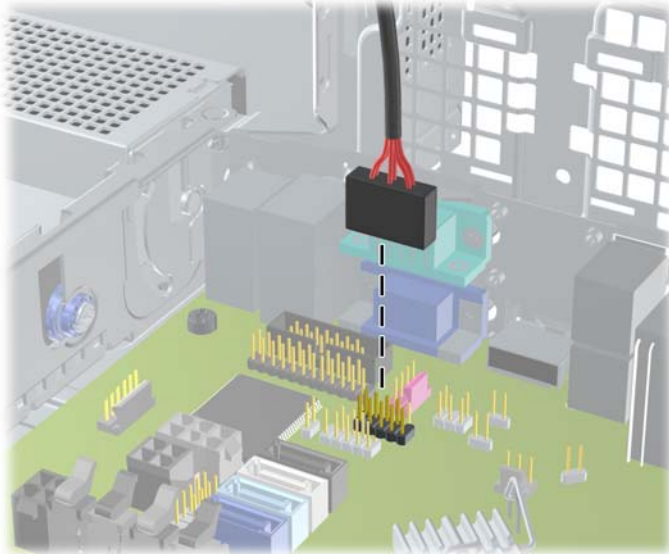
The 3.5-inch drive is located underneath the 5.25-inch drive. You must remove the 5.25-inch drive before removing the 3.5-inch drive.

1. Follow the procedure in [Removing a 5.25-inch Drive from a Drive Bay on page 108](#) to remove the 5.25-inch drive and access the 3.5-inch drive.

**CAUTION:** Ensure that the computer is turned off and that the power cord is disconnected from the electrical outlet before proceeding.

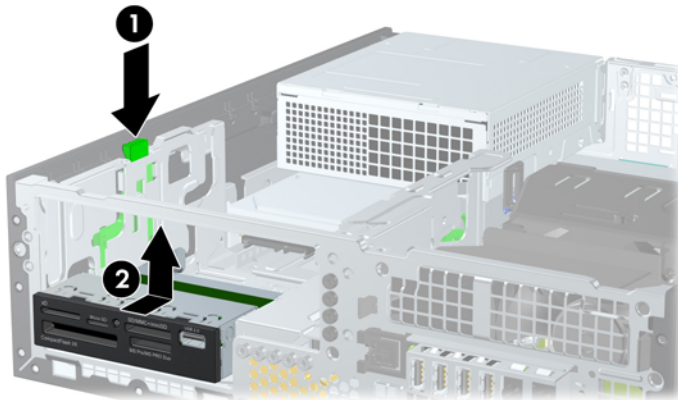
2. Disconnect the drive cables from the rear of the drive, or, if you are removing a media card reader, disconnect the USB cable from the system board as indicated in the following illustration.

**Figure 4-27** Disconnecting the Media Card Reader USB Cable




3. Press down on the green drive retainer button located on the left side of the drive to disengage the drive from the drive cage (1). While pressing the drive retainer button, slide the drive back until it stops, then lift it up and out of the drive cage (2).

**Figure 4-28** Removing a 3.5-inch Drive (Media Card Reader Shown)




## Installing a 3.5-inch Drive into a Drive Bay

The 3.5-inch bay is located underneath the 5.25-inch drive. To install a drive into the 3.5-inch bay:

 **NOTE:** Install guide screws to ensure the drive will line up correctly in the drive cage and lock in place. HP has provided extra guide screws for the drive bays (four 6-32 standard screws and four M3 metric screws), installed in the front of the chassis, under the front bezel. A secondary hard drive uses 6-32 standard screws. All other drives (except the primary hard drive) use M3 metric screws. The HP-supplied M3 metric screws are black and the HP-supplied 6-32 standard screws are silver. Refer to [Installing and Removing Drives on page 106](#) for illustrations of the guide screw locations.

1. Follow the procedure in [Removing a 5.25-inch Drive from a Drive Bay on page 108](#) to remove the 5.25-inch drive and access the 3.5-inch drive bay.

 **CAUTION:** Ensure that the computer is turned off and that the power cord is disconnected from the electrical outlet before proceeding.

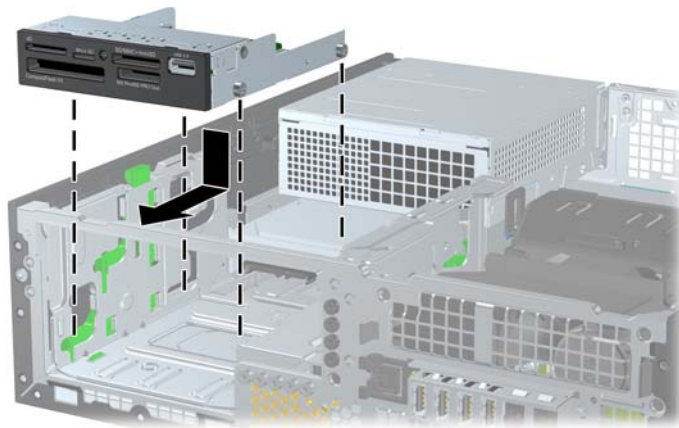
2. If you are installing a drive in a bay covered by a bezel blank, remove the front bezel then remove the bezel blank. See [Removing Bezel Blanks on page 93](#) for more information.
3. Install guide screws in the holes on each side of the drive.

**Figure 4-29** Installing Guide Screws (Media Card Reader Shown)



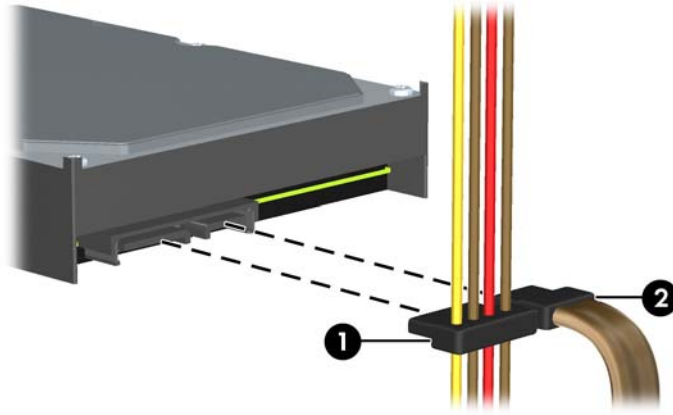
4. Position the guide screws on the drive into the J-slots in the drive bay. Then slide the drive toward the front of the computer until it locks into place.

**Figure 4-30** Installing a Drive into the 3.5-inch Drive Bay (Media Card Reader Shown)



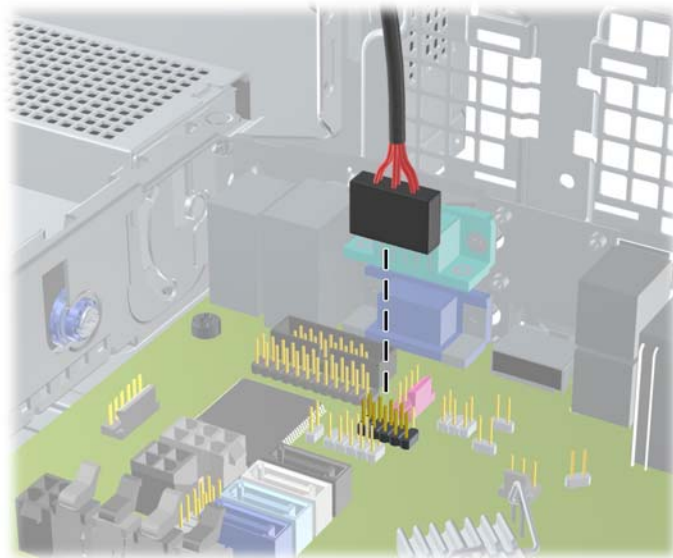
5. Connect the appropriate drive cables:
  - a. If installing a second hard drive, connect the power cable (1) and data cable (2) to the rear of the drive and connect the other end of the data cable to the light blue connector on the system board labeled SATA1.

**Figure 4-31** Connecting the Secondary Hard Drive Power Cable and Data Cable



- b. If installing a media card reader, connect the USB cable from the media card reader to the USB connector on the system board labeled MEDIA.

**Figure 4-32** Connecting the Media Card Reader USB Cable




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 **NOTE:** Refer to [System Board Connections on page 96](#) for an illustration of the system board drive connectors.

---


6. Replace the 5.25-inch drive.
7. Replace the front bezel (if removed) and access panel.
8. If the computer was on a stand, replace the stand.
9. Reconnect the power cord and turn on the computer.
10. Lock any security devices that were disengaged when the access panel was removed.

## Removing and Replacing the Primary 3.5-inch Internal Hard Drive

 **NOTE:** Before you remove the old hard drive, be sure to back up the data from the old hard drive so that you can transfer the data to the new hard drive.

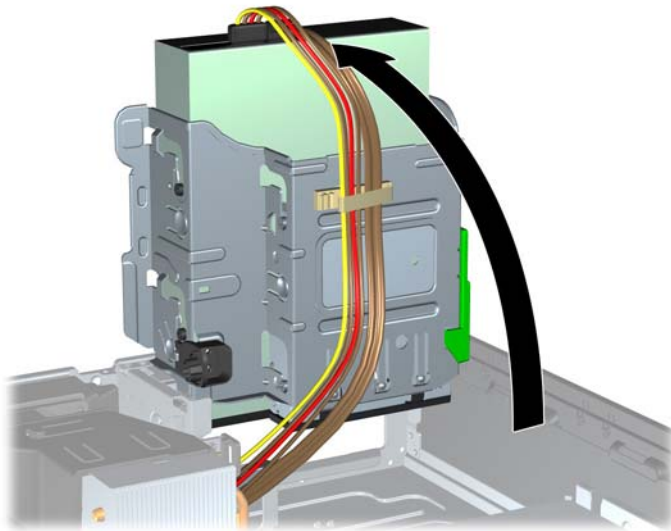
The preinstalled 3.5-inch hard drive is located under the power supply. To remove and replace the hard drive:

1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
3. Turn off the computer properly through the operating system, then turn off any external devices.
4. Disconnect the power cord from the power outlet and disconnect any external devices.

 **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. You must disconnect the power cord to avoid damage to the internal components of the computer.

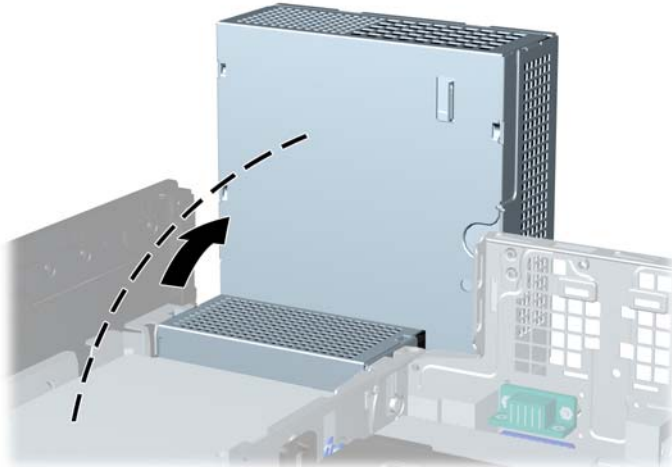
5. If the computer is on a stand, remove the computer from the stand.
6. Remove the computer access panel.
7. Rotate the drive cage for internal drives to its upright position.

**Figure 4-33** Rotating the Drive Cage Up



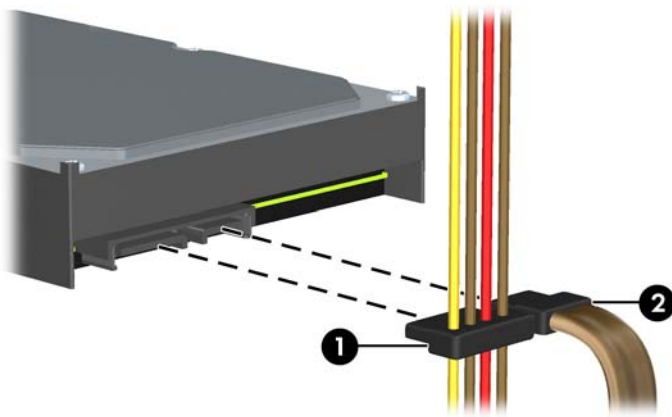
8. Rotate the power supply to its upright position. The hard drive is located beneath the power supply.

**Figure 4-34** Raising the Power Supply



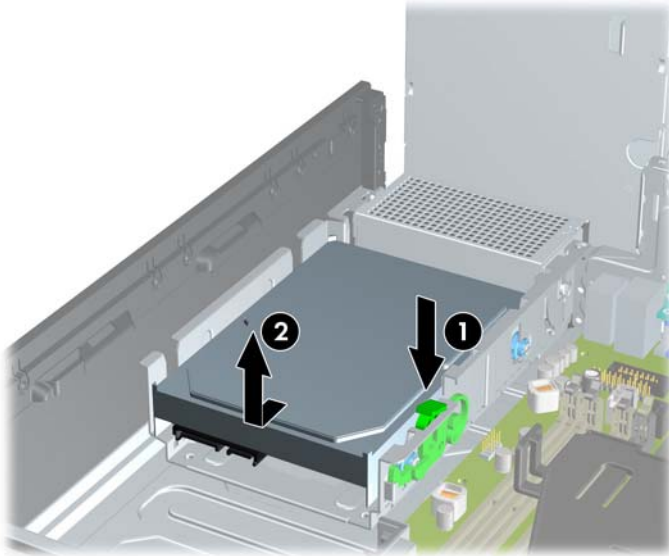
9. Disconnect the power cable (1) and data cable (2) from the back of the hard drive.

**Figure 4-35** Disconnecting the Hard Drive Cables



10. Press down on the green release latch next to the hard drive (1). While holding the latch down, slide the drive forward until it stops, then lift the drive up and out of the bay (2).

**Figure 4-36** Removing the Hard Drive



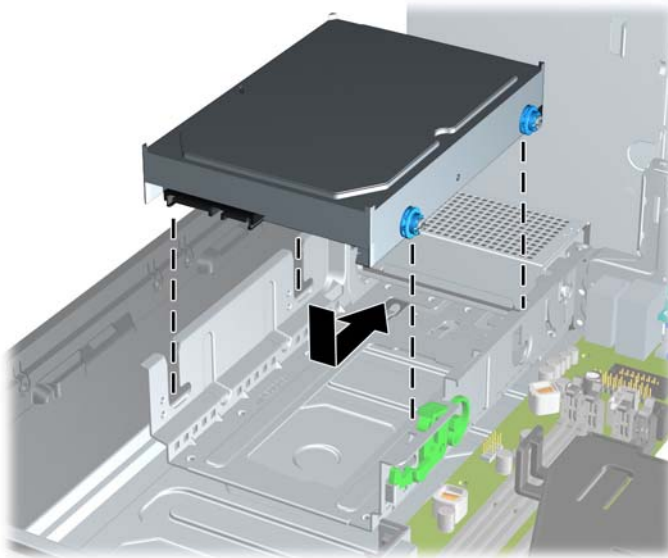
11. To install a hard drive, you must transfer the silver and blue isolation mounting guide screws from the old hard drive to the new hard drive.

**Figure 4-37** Installing Hard Drive Guide Screws




- Align the guide screws with the slots on the chassis drive cage, press the hard drive down into the bay, then slide it back until it stops and locks in place.

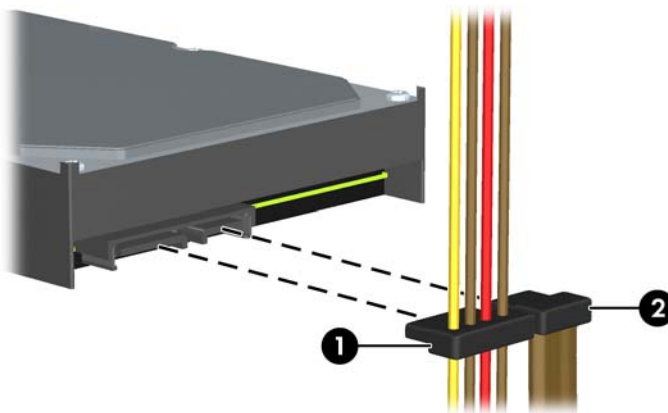
**Figure 4-38** Installing the Hard Drive



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

 **NOTE:** If the system has only one SATA hard drive, the data cable must be connected to the dark blue connector labeled SATA0 on the system board to avoid any hard drive performance problems.

**Figure 4-39** Connecting the Hard Drive Cables



- Rotate the drive cage for internal drives and the power supply down to their normal positions.
- Replace the access panel.
- If the computer was on a stand, replace the stand.
- Reconnect the power cord and turn on the computer.
- Lock any security devices that were disengaged when the access panel was removed.



## Installing a Security Lock

The security locks displayed below and on the following pages can be used to secure the computer.

### Cable Lock

**Figure 4-40** Installing a Cable Lock



### Padlock

**Figure 4-41** Installing a Padlock



## HP Business PC Security Lock

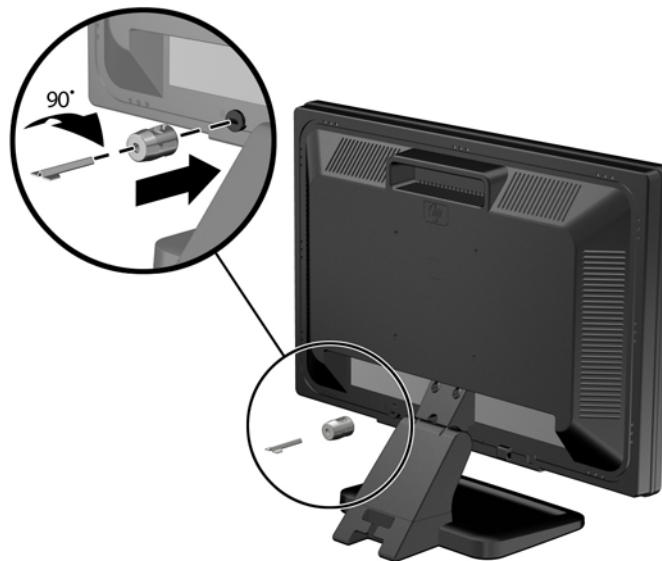
1. Fasten the security cable by looping it around a stationary object.

**Figure 4-42** Securing the Cable to a Fixed Object



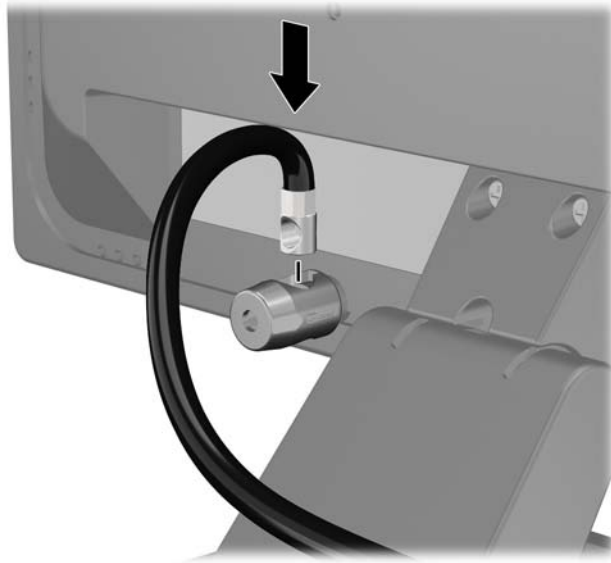
2. Insert the cable lock into the cable lock slot on the back of the monitor and secure the lock to the monitor by inserting the key into the key hole on the rear of the lock and rotating the key 90 degrees.

**Figure 4-43** Installing the Cable Lock on the Monitor



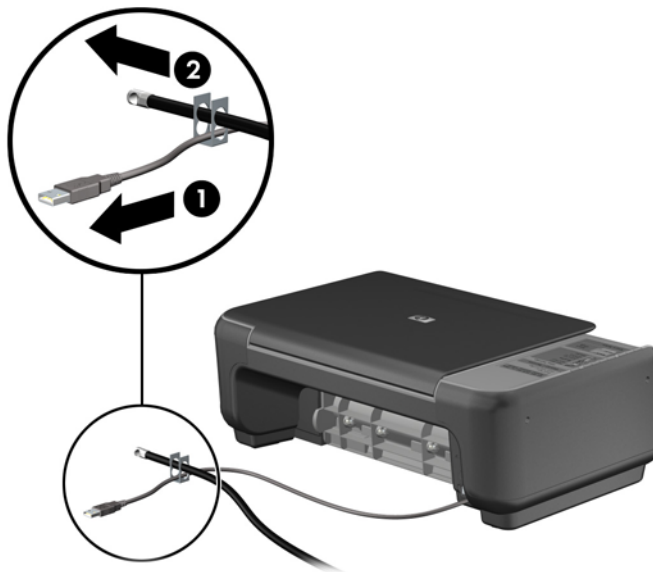
3. Slide the security cable through the hole in the cable lock on the rear of the monitor.

**Figure 4-44** Securing the Monitor



4. Use the bracket provided in the kit to secure other peripheral devices by laying the device cable across the center of the bracket (1) and inserting the security cable through one of the two holes in the bracket (2). Use the hole in the bracket that best secures the peripheral device cable.

**Figure 4-45** Securing Peripheral Devices (Printer Shown)



5. Thread the keyboard and mouse cables through the computer chassis lock.

**Figure 4-46** Threading the Keyboard and Mouse Cables



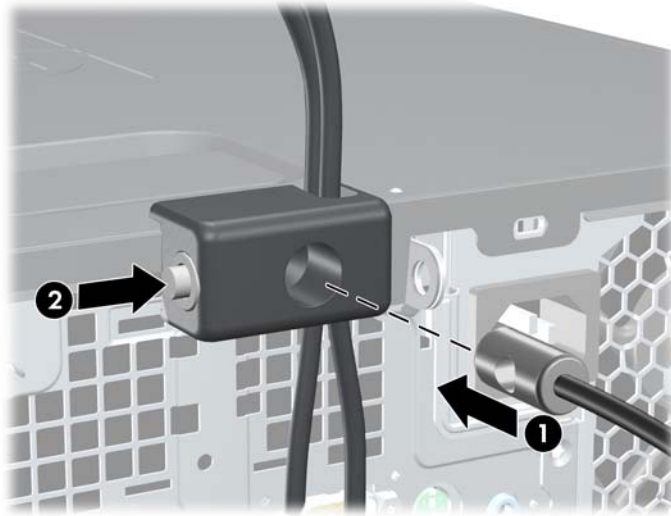
6. Screw the lock to the chassis in the thumbscrew hole using the screw provided.

**Figure 4-47** Attaching the Lock to the Chassis



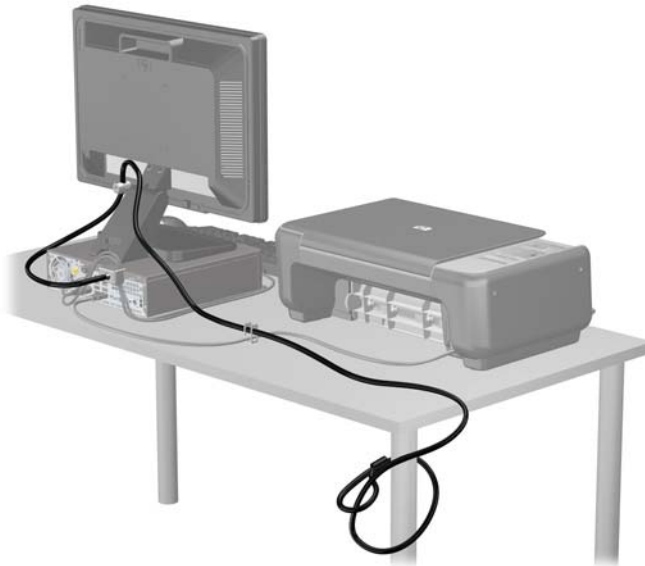
7. Insert the plug end of the security cable into the lock (1) and push the button in (2) to engage the lock. Use the key provided to disengage the lock.

**Figure 4-48** Engaging the Lock



8. When complete, all devices in your workstation will be secured.

**Figure 4-49** Secured Workstation



## Front Bezel Security

The front bezel can be locked in place by installing a security screw provided by HP. To install the security screw:

1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
3. Turn off the computer properly through the operating system, then turn off any external devices.
4. Disconnect the power cord from the power outlet and disconnect any external devices.

---

**⚠ 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. You must disconnect the power cord to avoid damage to the internal components of the computer.

---

5. If the computer is on a stand, remove the computer from the stand.
6. Remove the access panel and front bezel.
7. Remove one of the five silver 6-32 standard screws located on the front of the chassis behind the bezel.

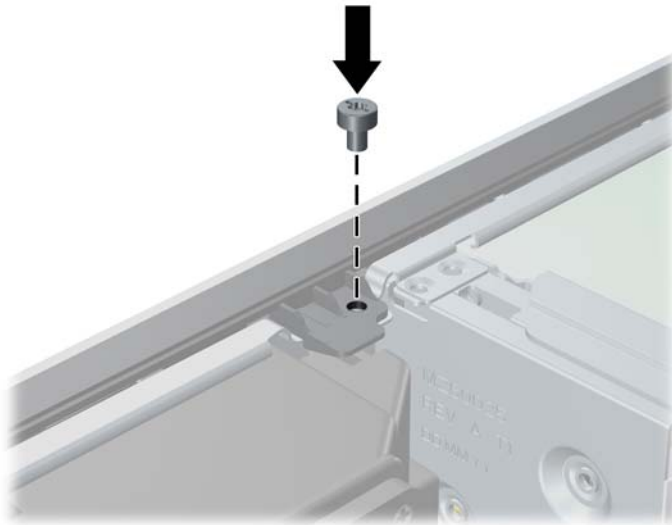
**Figure 4-50** Retrieving the Front Bezel Security Screw



8. Replace the front bezel.

9. Install the security screw next to the middle front bezel release tab to secure the front bezel in place.

**Figure 4-51** Installing the Front Bezel Security Screw



10. Replace the access panel.
11. If the computer was on a stand, replace the stand.
12. Reconnect the power cord and turn on the computer.
13. Lock any security devices that were disengaged when the access panel was removed.

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# 5 Ultra-Slim Desktop (USDT) Hardware Upgrades

## Serviceability Features

The computer includes features that make it easy to upgrade and service. No tools are needed for most of the installation procedures described in this chapter.

## Warnings and Cautions

Before performing upgrades be sure to carefully read all of the applicable instructions, cautions, and warnings in this guide.

**⚠ WARNING!** To reduce the risk of personal injury or equipment damage from electrical shock, hot surfaces, or fire:

Disconnect the power cord from the power outlet and allow the internal system components to cool before touching.

Do not plug telecommunications or telephone connectors into the network interface controller (NIC) receptacles.

Do not disable the power cord grounding plug. The grounding plug is an important safety feature.

Plug the power cord in a grounded (earthed) outlet that is easily accessible at all times.

To reduce the risk of serious injury, read the *Safety & Comfort Guide*. It describes proper workstation, setup, posture, and health and work habits for computer users, and provides important electrical and mechanical safety information. This guide is located on the Web at <http://www.hp.com/ergo>.

**⚠ WARNING!** Energized and moving parts inside.

Disconnect power to the equipment before removing the enclosure.

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

**⚠ CAUTION:** Static electricity can damage the electrical 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. See [Electrostatic Discharge on page 166](#) for more information.

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 damage to internal components.

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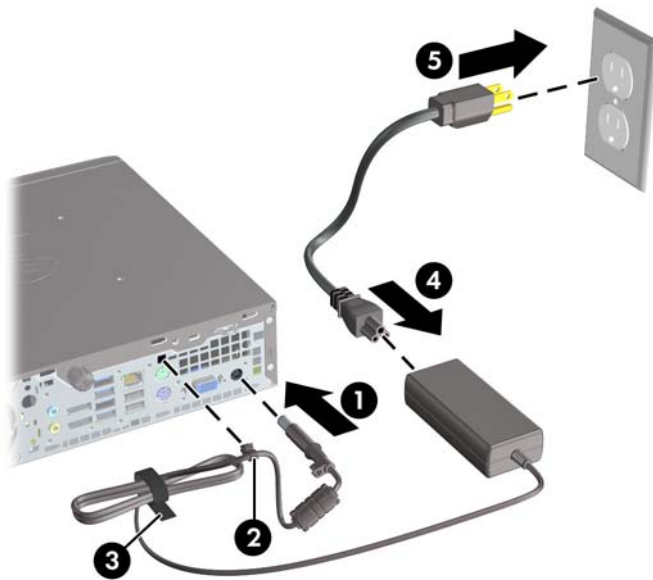


## Connecting the Power Cord

When connecting the power supply, it is important to follow the steps below to ensure the power cord does not pull free from the computer.

1. Connect the round end of the power cord to the power supply connector on the rear of the computer (1).
2. Insert the power cord retainer clip into a slot on the air vent to prevent the cord from becoming disconnected from the computer (2).
3. Bundle any excess power cord with the supplied strap (3).
4. Plug the female end of the other power cord into the power supply brick (4).
5. Connect the other end of the power cord to an electrical outlet (5).

**Figure 5-1** Connecting the Power Cord



**CAUTION:** Failure to secure the power cable with the retainer clip may result in the power cord becoming disconnected and loss of data.

## Removing the Computer Access Panel

To access internal components, you must remove the access panel:

1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
3. Turn off the computer properly through the operating system, then turn off any external devices.
4. Disconnect the power cord from the power outlet and disconnect any external devices.

**⚠ 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. You must disconnect the power cord to avoid damage to the internal components of the computer.

5. If the computer is on a stand, remove the computer from the stand and lay the computer down.
6. Loosen the thumbscrew on the rear of the computer (1), slide the access panel toward the rear of the computer, then lift it off (2).

**Figure 5-2** Removing the Computer Access Panel



## Replacing the Computer Access Panel

1. Align the tabs on the panel with the slots on the chassis then slide the panel towards the front of the chassis until it stops (1).
2. Tighten the thumbscrew to secure the access panel (2).

**Figure 5-3** Replacing the Computer Access Panel



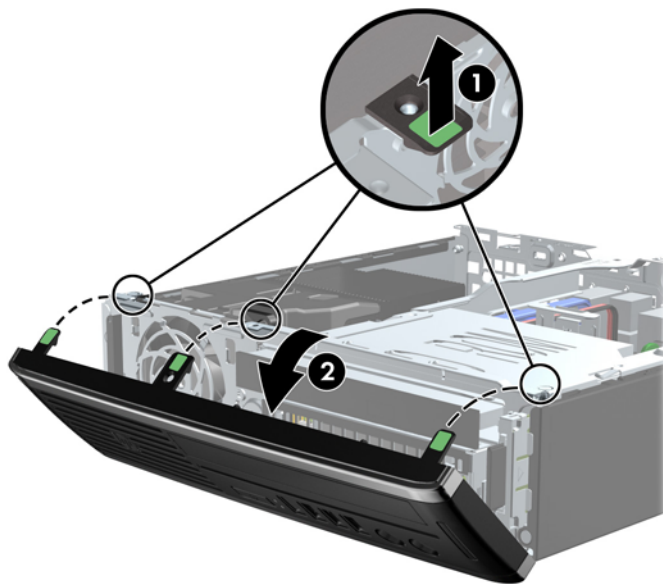
## Removing the Front Bezel

1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
3. Turn off the computer properly through the operating system, then turn off any external devices.
4. Disconnect the power cord from the power outlet and disconnect any external devices.

**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. You must disconnect the power cord to avoid damage to the internal components of the computer.

5. If the computer is on a stand, remove the computer from the stand and lay the computer down.
6. Remove the computer access panel.
7. Lift up the three tabs on the side of the bezel (1), then rotate the bezel off the chassis (2).

**Figure 5-4** Removing the Front Bezel

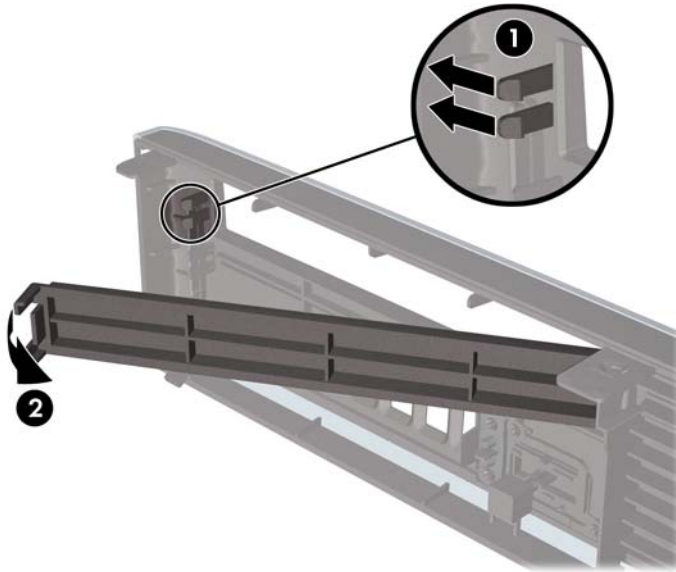


## Removing a Bezel Blank

On some models, there is a bezel blank covering the internal drive bay that needs to be removed before installing a drive. To remove a bezel blank:

1. Remove the access panel and front bezel.
2. To remove the bezel blank, push the two retaining tabs that hold the bezel blank in place towards the outer left edge of the bezel (1) and pull the bezel blank inwards to remove it (2).

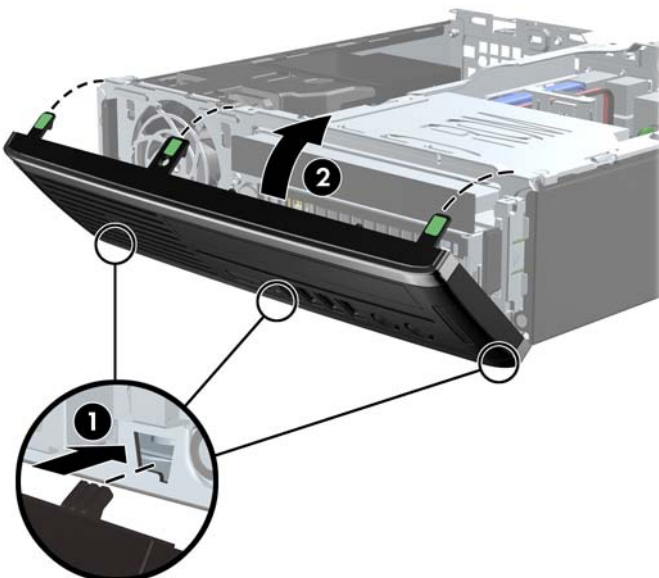
**Figure 5-5** Removing a Bezel Blank



## Replacing the Front Bezel

Insert the three hooks on the bottom side of the bezel into the rectangular holes on the chassis (1) then rotate the top side of the bezel onto the chassis (2) and snap it into place.

**Figure 5-6** Replacing the Front Bezel



## Changing from Desktop to Tower Configuration

The Ultra-Slim Desktop can be used in a tower orientation with the tower stand included with the computer.

1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
3. Turn off the computer properly through the operating system, then turn off any external devices.
4. Disconnect the power cord from the power outlet and disconnect any external devices.

---

**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. You must disconnect the power cord to avoid damage to the internal components of the computer.

---

5. Orient the computer so that its left side is facing down and place the computer firmly down into the stand.

**Figure 5-7** Placing the Computer on the Stand



6. Reconnect the external equipment, plug the power cord into a power outlet, and turn the computer on.

---

**NOTE:** Ensure at least 10.2 centimeters (4 inches) of space on all sides of the computer remains clear and free of obstructions.

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

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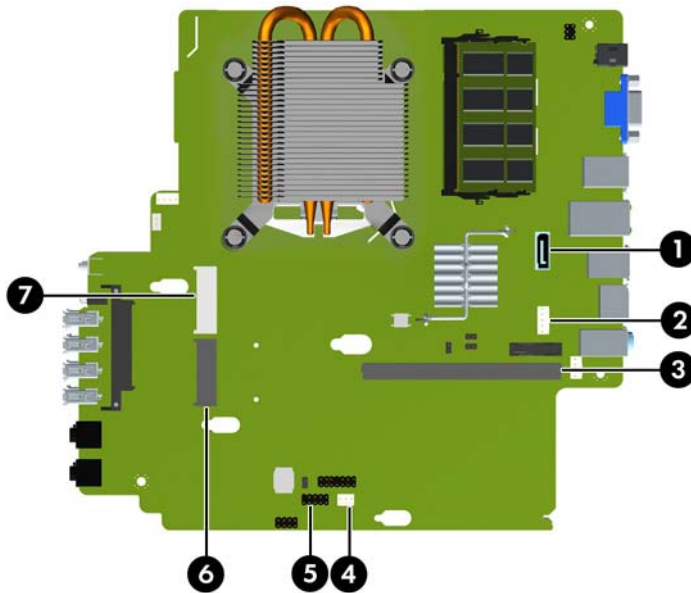
**NOTE:** An optional Quick Release mounting bracket is available from HP for mounting the computer to a wall, desk, or swing arm.

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# System Board Connections

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

**Figure 5-8** System Board Connections



No.	System Board Connector	System Board Label	Color	Component
1	SATA 3.0	SATA1	light blue	Optical Drive
2	Power	SATA PWR1	white	Optical Drive
3	Mobile PCI Express Module	MXM	black	Graphics Card
4	Hood Sensor	HSENSE	white	Hood Sensor
5	USB	MEDIA	black	SD Media Card Reader
6	Mini PCI Express x1	X1PCIEXP1	black	Expansion Card (for example, WLAN card)
7	Mini-SATA	mSATA	white	Ultra-Small SSD

# Installing Additional Memory


The computer comes with double data rate 3 synchronous dynamic random access memory (DDR3-SDRAM) small outline dual inline memory modules (SODIMMs).

## SODIMMs

The memory sockets on the system board can be populated with up to two industry-standard SODIMMs. These memory sockets are populated with at least one preinstalled SODIMM. To achieve the maximum memory support, you can populate the system board with up to 8-GB of memory.

## DDR3-SDRAM SODIMMs

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 **CAUTION:** This product DOES NOT support DDR3 Ultra Low Voltage (DDR3U) memory. The processor is not compatible with DDR3U memory and if you plug DDR3U memory into the system board, it can cause the physical damage to the SODIMM or invoke system malfunction.

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For proper system operation, the SODIMMs must be:

- industry-standard 204-pin
- unbuffered non-ECC PC3-12800 DDR3-1600 MHz-compliant
- 1.5 volt DDR3-SDRAM SODIMMs

The DDR3-SDRAM SODIMMs must also:

- support CAS latency 11 DDR3 1600 MHz (11-11-11 timing)
- contain the mandatory Joint Electronic Device Engineering Council (JEDEC) specification

In addition, the computer supports:

- 512-Mbit, 1-Gbit, and 2-Gbit non-ECC memory technologies
- single-sided and double-sided SODIMMS
- SODIMMs constructed with x8 and x16 devices; SODIMMs constructed with x4 SDRAM are not supported

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

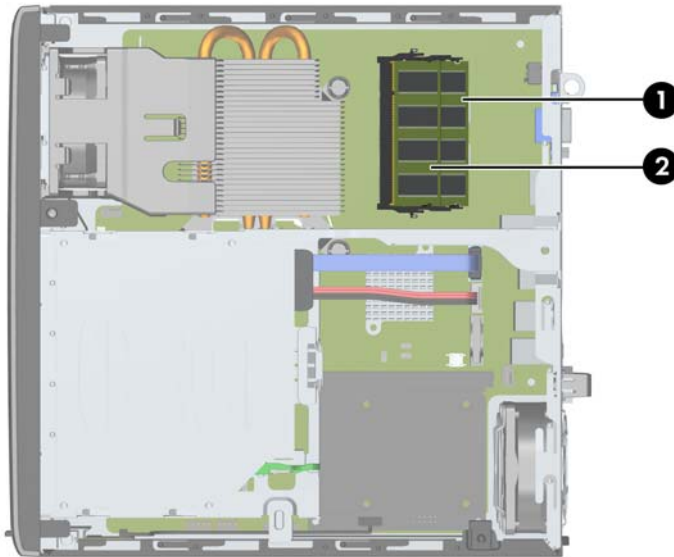
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## Populating SODIMM Sockets

There are two SODIMM sockets on the system board, with one socket per channel. The sockets are labeled XMM1 and XMM3. The XMM1 socket operates in memory channel A. The XMM3 socket operates in memory channel B.

**Figure 5-9** SODIMM Socket Locations



**Table 5-1** SODIMM Socket Locations

Item	Description	System Board Label	Socket Color
1	SODIMM1 socket, Channel B	XMM1	Black
2	SODIMM3 socket, Channel A	XMM3	Black

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

- The system will operate in single channel mode if the SODIMM sockets are populated in one channel only.
- The system will operate in a higher-performing dual channel mode if the memory capacity of the SODIMM in Channel A is equal to the memory capacity of the SODIMM in Channel B.
- The system will operate in flex mode if the memory capacity of the SODIMM in Channel A is not equal to the memory capacity of the SODIMM in Channel B. In flex mode, the channel populated with the least amount of memory describes the total amount of memory assigned to dual channel and the remainder is assigned to single channel. If one channel will have more memory than the other, the larger amount should be assigned to channel A.
- In any mode, the maximum operational speed is determined by the slowest SODIMM in the system.

## Installing SODIMMs

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**⚠ CAUTION:** You must disconnect the power cord and wait approximately 30 seconds for the power to drain before adding or removing memory modules. Regardless of the power-on state, voltage is always supplied to the memory modules as long as the computer is plugged into an active AC outlet. Adding or removing memory modules while voltage is present may cause irreparable damage to the memory modules or system board.

The memory module sockets have gold-plated metal contacts. When upgrading the memory, it is important to use memory modules with gold-plated 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. For more information, refer to [Electrostatic Discharge on page 166](#).

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

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1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
3. Turn off the computer properly through the operating system, then turn off any external devices.
4. Disconnect the power cord from the power outlet and disconnect any external devices.

---

**⚠ CAUTION:** You must disconnect the power cord and wait approximately 30 seconds for the power to drain before adding or removing memory modules. Regardless of the power-on state, voltage is always supplied to the memory modules as long as the computer is plugged into an active AC outlet. Adding or removing memory modules while voltage is present may cause irreparable damage to the memory modules or system board.

---

5. If the computer is on a stand, remove the computer from the stand and lay the computer down.
6. Remove the computer access panel.
7. Locate the memory module sockets on the system board.

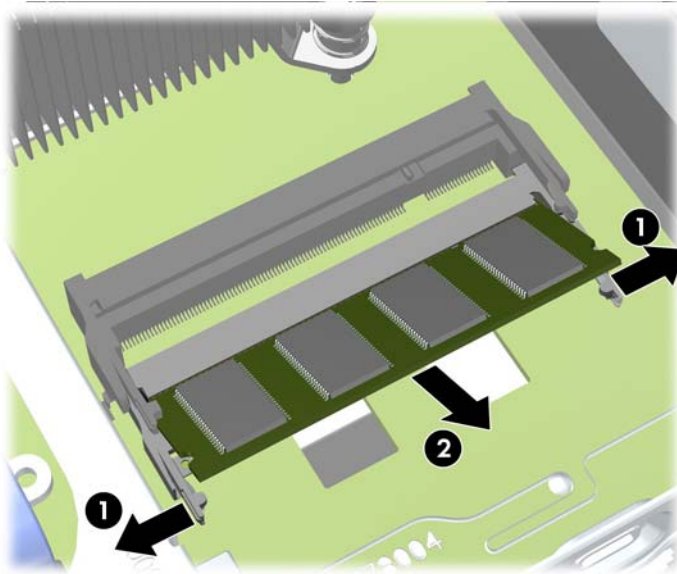
---

**⚠ WARNING!** To reduce risk of personal injury from hot surfaces, allow the internal system components to cool before touching.

---

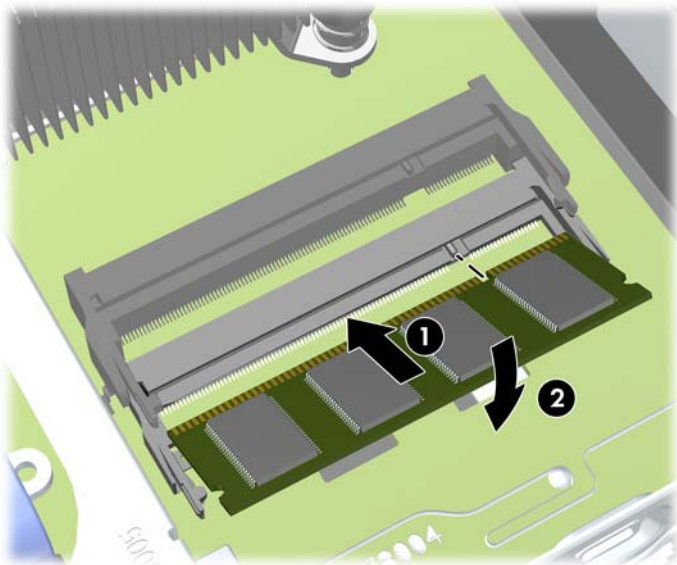
8. To remove a SODIMM, press outward on the two latches on each side of the SODIMM (1) then pull the SODIMM out of the socket (2).

**Figure 5-10** Removing a SODIMM



9. Slide the new SODIMM into the socket at approximately a 30° angle (1) then press the SODIMM down (2) so that the latches lock it in place.

**Figure 5-11** Installing a SODIMM



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

10. Replace the access panel.
11. If the computer was on a stand, replace the stand.
12. Reconnect the power cord and turn on the computer.
13. Lock any security devices that were disengaged when the computer cover or access panel was removed.

The computer automatically recognizes the additional memory when you turn on the computer.

## Replacing the Optical Drive

The Ultra-Slim Desktop uses a slimline Serial ATA (SATA) optical drive.

### Removing the Optical Drive

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

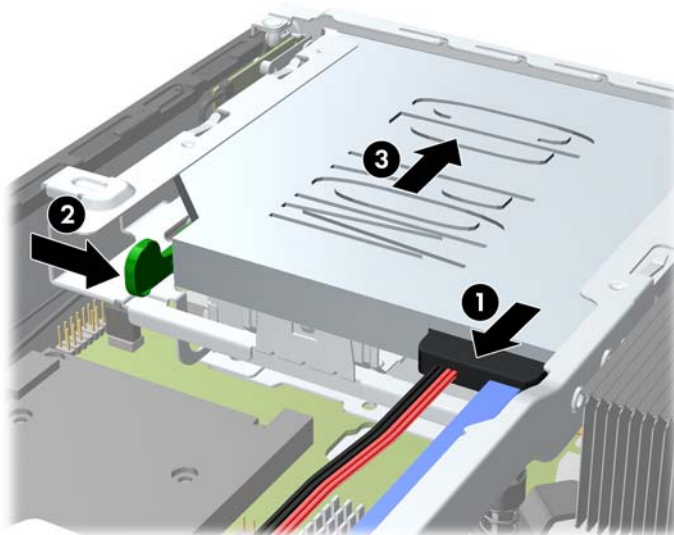
1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
3. Turn off the computer properly through the operating system, then turn off any external devices.
4. Disconnect the power cord from the power outlet and disconnect any external devices.

**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. You must disconnect the power cord to avoid damage to the internal components of the computer.

5. If the computer is on a stand, remove the computer from the stand and lay the computer down.
6. Remove the computer access panel and front bezel.
7. Disconnect the cables on the rear of the optical drive (1), push the green release latch on the right rear side of the drive toward the center of the drive (2), then slide the drive forward and out of the bay through the front bezel (3).

**CAUTION:** When removing the cables, pull the tab or connector instead of the cable itself to avoid damaging the cable.

**Figure 5-12** Removing the Optical Drive

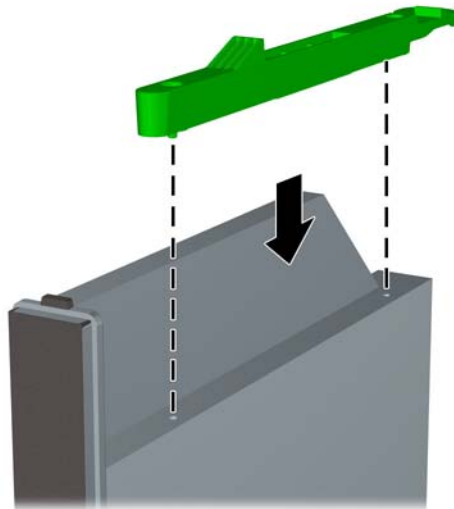


## Preparing the New Optical Drive


Before the new optical drive can be used, the release latch must be attached.

1. Peel the backing off the adhesive on the release latch.
2. Without allowing the release latch to touch the optical drive, carefully align the holes on the release latch with the pins on the side of the optical drive. Make sure the release latch is oriented properly.
3. Insert the pin at the front of the optical drive into the hole at the end of the release latch, and press firmly.
4. Insert the second pin, and press the entire release latch firmly to fasten the latch securely to the optical drive.

**Figure 5-13** Aligning the Release Latch

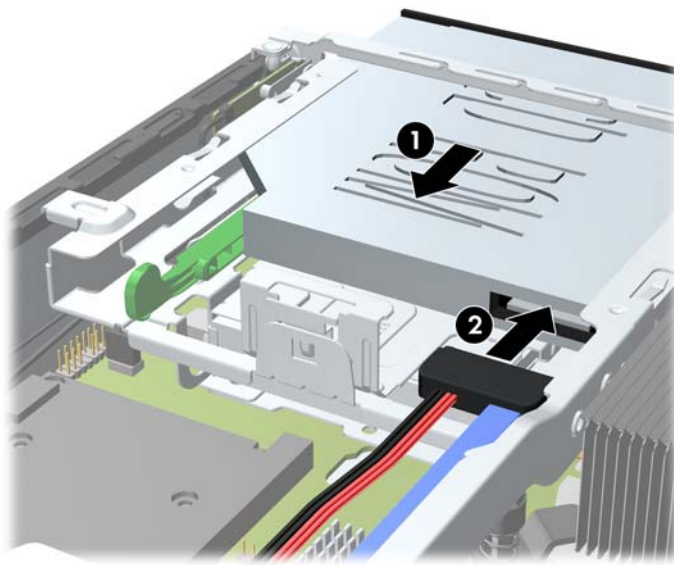


## Installing the New Optical Drive

 **NOTE:** If you are installing an optical drive in a bay that did not previously have a drive in it, you must remove the access panel and the bezel blank covering the opening of the bay before proceeding. Follow the procedures in [Removing the Computer Access Panel on page 130](#) and [Removing a Bezel Blank on page 133](#).


1. Follow the instructions for removing the optical drive. Refer to [Removing the Optical Drive on page 140](#).
2. Attach the release latch to the new optical drive. Refer to [Preparing the New Optical Drive on page 141](#).
3. With the back of the optical drive facing the computer and the release latch on the inner side of the drive, align the drive with the opening in the front bezel.
4. Slide the optical drive through the front bezel all the way into the bay so that it locks in place (1), then connect the cable to the rear of the drive (2).

**Figure 5-14** Installing the Optical Drive



5. Replace the front bezel and access panel.
6. If the computer was on a stand, replace the stand.
7. Reconnect the power cord and turn on the computer.
8. Lock any security devices that were disengaged when the computer cover or access panel was removed.


# Replacing the Hard Drive

 **NOTE:** The Ultra-Slim Desktop supports only 2.5-inch Serial ATA (SATA) internal hard drives.

Before you remove the old hard drive, be sure to back up the data from the old hard drive so that you can transfer the data to the new hard drive.

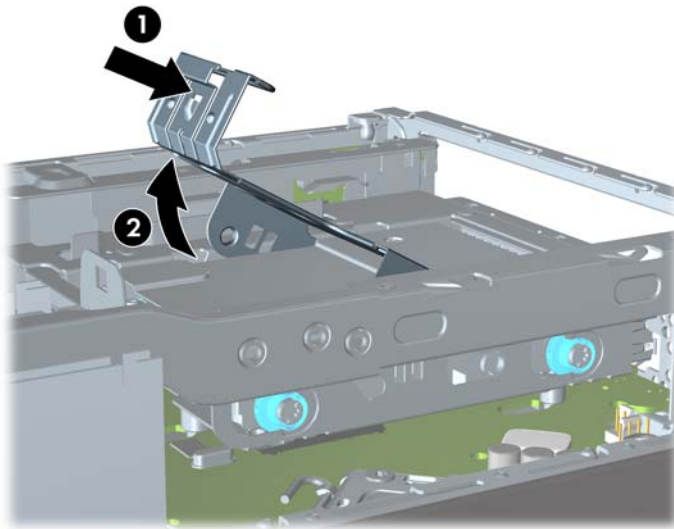
The 2.5-inch hard drive is enclosed in a carrier under the optical drive.

1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
3. Turn off the computer properly through the operating system, then turn off any external devices.
4. Disconnect the power cord from the power outlet and disconnect any external devices.

 **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. You must disconnect the power cord to avoid damage to the internal components of the computer.

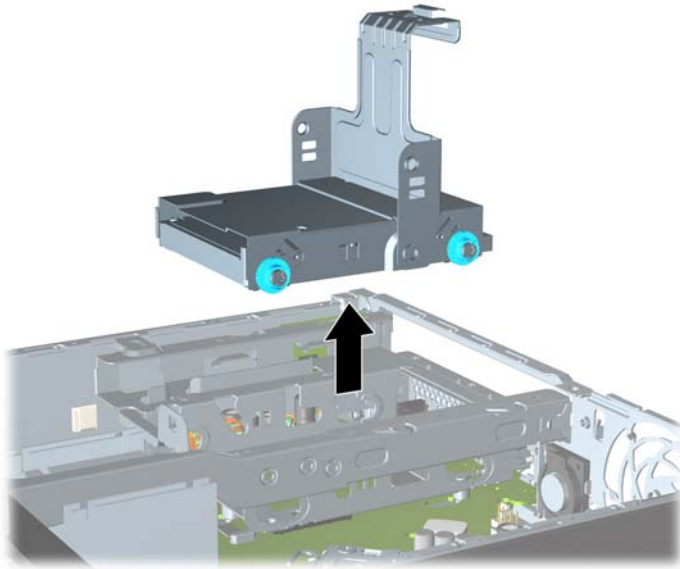
5. If the computer is on a stand, remove the computer from the stand and lay the computer down.
6. Remove the computer access panel.
7. Remove the optical drive. Refer to [Removing the Optical Drive on page 140](#) for instructions.
8. Press in the release latch on the left side of the hard drive carrier (1) then rotate the carrier handle to the right (2).

**Figure 5-15** Unlocking the Hard Drive Carrier



9. Lift the hard drive carrier straight up and out of the chassis.

**Figure 5-16** Removing the Hard Drive Carrier



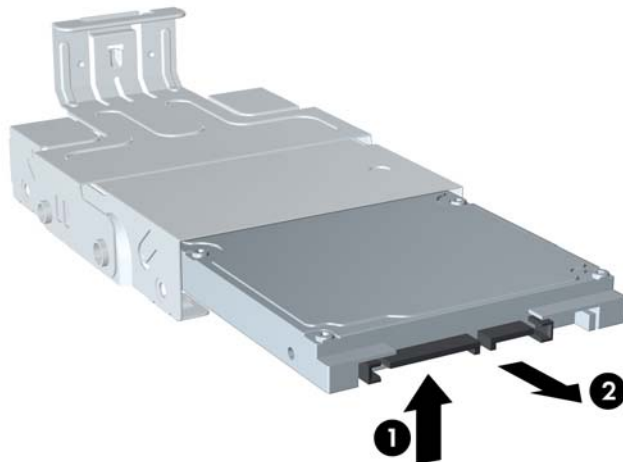
10. Remove the four guide screws from the sides of the hard drive carrier.

**Figure 5-17** Removing the Guide Screws



11. Lift the hard drive up to the top of the carrier (1) and slide the drive out of the carrier (2).

**Figure 5-18** Removing the Hard Drive from the Carrier

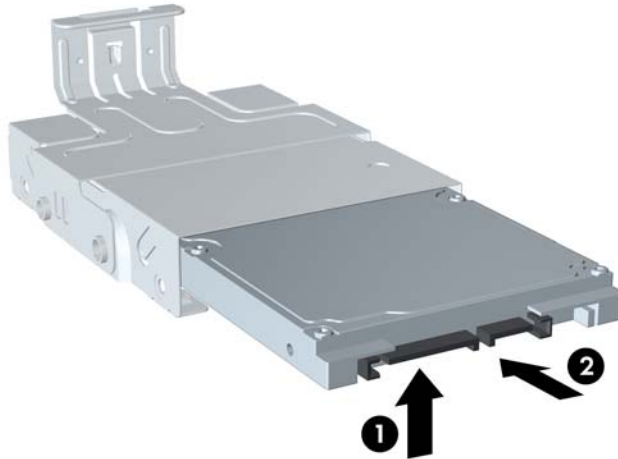




12. Position the hard drive so that the top of the hard drive is up against the top of the carrier (1) so that the circuit board on the bottom of the hard drive does not come in contact with the tabs on the bottom of the carrier, then slide the new hard drive into the carrier (2).

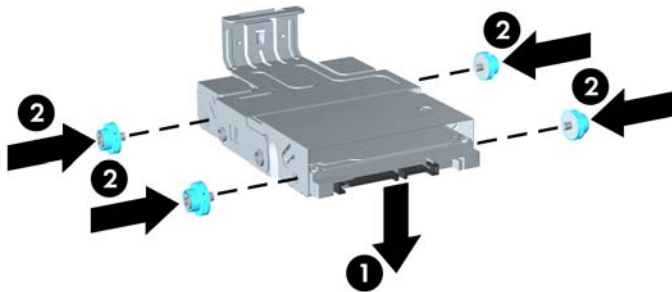
**⚠ CAUTION:** Do not allow the circuit board on the bottom of the hard drive to scrape along the tabs on the bottom of the carrier when sliding the hard drive into the carrier. Doing so can cause irreparable damage to the hard drive.

**Figure 5-19** Sliding the Hard Drive into the Carrier



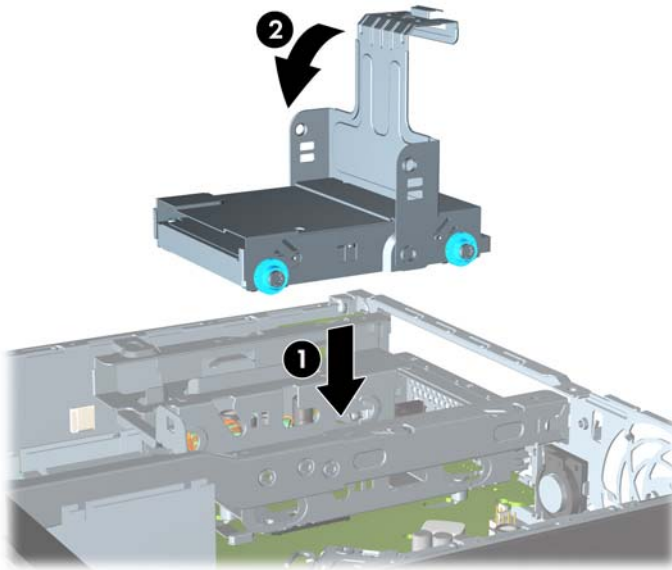
13. Set the hard drive down into the bottom of the carrier (1), then replace the four guide screws on the sides of the carrier to secure the drive in the carrier (2).

**Figure 5-20** Lowering the Hard Drive and Replacing the Guide Screws




14. To place the hard drive carrier back in the chassis, align the guide screws with the slots on the drive bay, drop the carrier straight down into the drive bay (1), and press the handle on the carrier all the way down (2) so that the drive is properly seated and locked in place.

**Figure 5-21** Installing the Hard Drive Carrier



15. Replace the optical drive and reconnect the cable on the back of the optical drive.
16. Replace the computer access panel.
17. If the computer was on a stand, replace the stand.
18. Reconnect the power cord and turn on the computer.
19. Lock any security devices that were disengaged when the computer cover or access panel was removed.

---

 **NOTE:** No configuration of the SATA hard drive is necessary; the computer automatically recognizes it the next time you turn on the computer.

---

# Installing and Removing a Port Cover

An optional rear port cover is available for the computer.

To install the port cover:

1. Thread the cables through the bottom hole on the port cover (1) and connect the cables to the rear ports on the computer.
2. Insert the hooks on the port cover into the slots on the rear of the chassis, then slide the cover to the right to secure it in place (2).

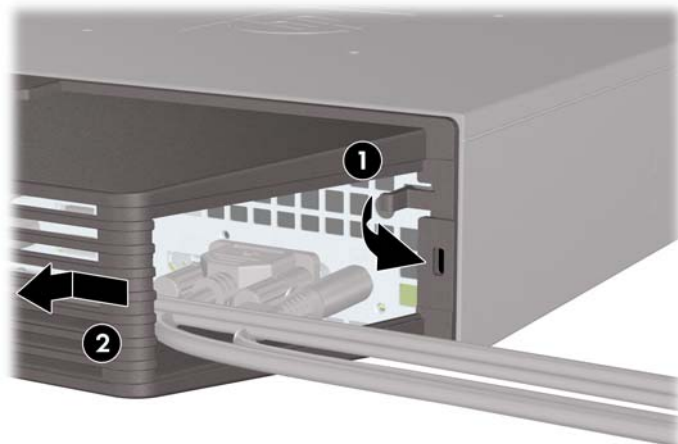
**Figure 5-22** Installing a Port Cover



**NOTE:** For security purposes, you can install an optional cable lock to the chassis that locks the port cover and secures the computer. See [Installing a Security Lock on page 148](#).

The port cover is secured in place by a retention lever just inside the port cover opening. To remove the port cover, pull the lever back towards the port cover opening (1), then slide the cover to the left and off the computer (2).

**Figure 5-23** Removing a Port Cover



# Installing a Security Lock

## Cable Lock

There are two cable lock slots on the rear of the computer. The slot next to the thumbscrew should be used when there is no port cover. The slot on the far right should be used when a port cover is installed.

**Figure 5-24** Installing a Cable Lock with No Port Cover



**Figure 5-25** Installing a Cable with a Port Cover Installed



## Padlock

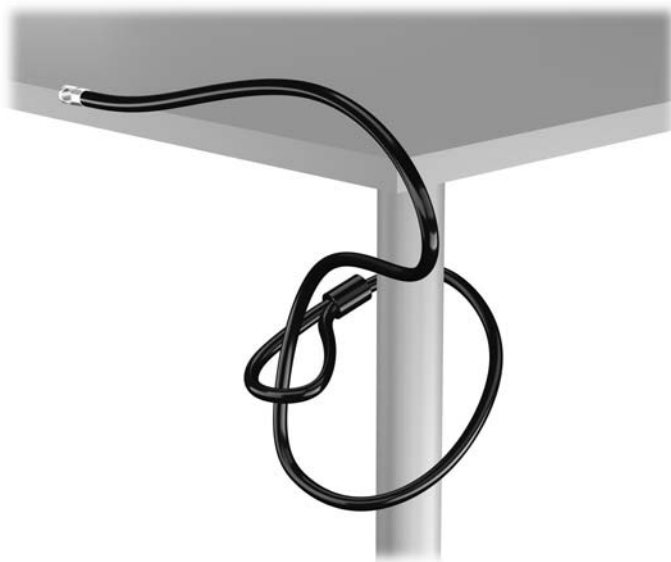
**Figure 5-26** Installing a Padlock



## HP Business PC Security Lock

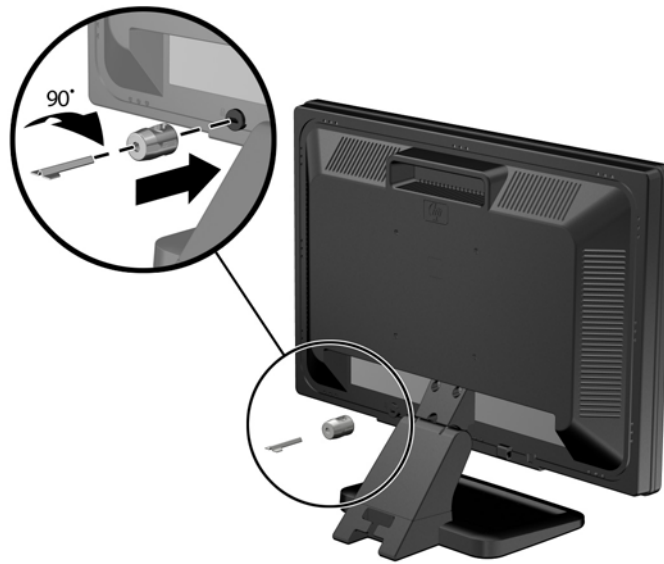
1. Fasten the security cable by looping it around a stationary object.

**Figure 5-27** Securing the Cable to a Fixed Object



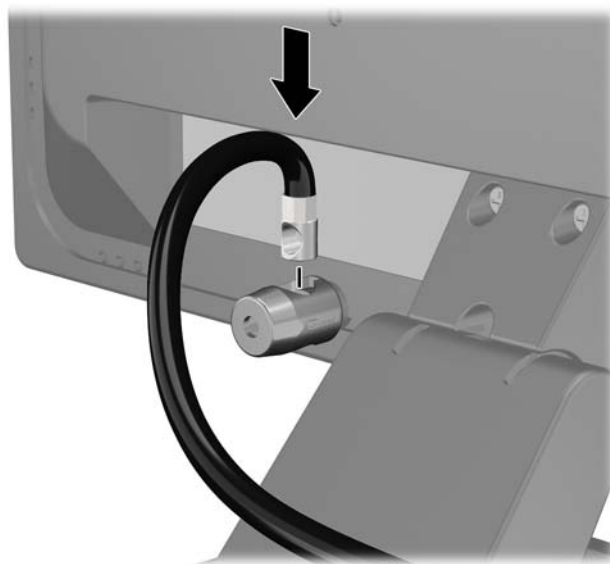
2. Insert the cable lock into the cable lock slot on the back of the monitor and secure the lock to the monitor by inserting the key into the key hole on the rear of the lock and rotating the key 90 degrees.

**Figure 5-28** Installing the Cable Lock on the Monitor



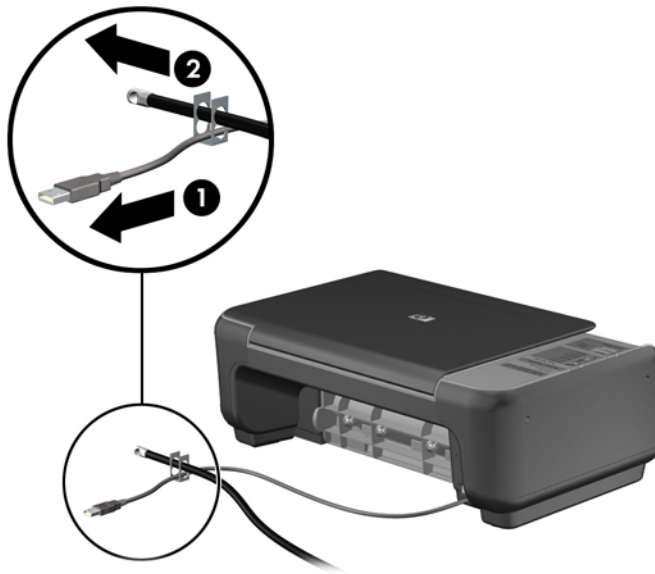
3. Slide the security cable through the hole in the cable lock on the rear of the monitor.

**Figure 5-29** Securing the Monitor



4. Use the bracket provided in the kit to secure other peripheral devices by laying the device cable across the center of the bracket (1) and inserting the security cable through one of the two holes in the bracket (2). Use the hole in the bracket that best secures the peripheral device cable.

**Figure 5-30** Securing Peripheral Devices (Printer Shown)



5. Thread the keyboard and mouse cables through the computer chassis lock.

**Figure 5-31** Threading the Keyboard and Mouse Cables



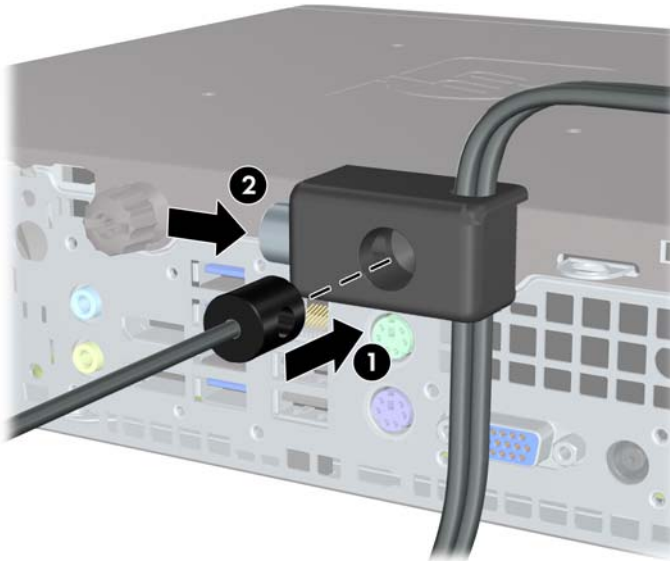
6. Screw the lock to the chassis in the thumbscrew hole using the screw provided.

**Figure 5-32** Attaching the Lock to the Chassis



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

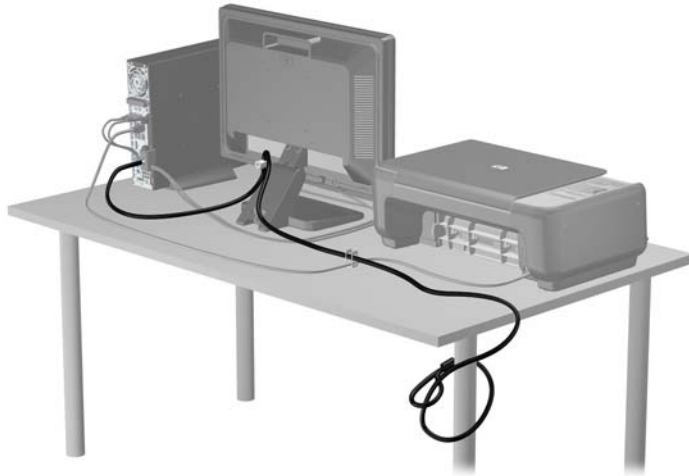
**Figure 5-33** Engaging the Lock





8. When complete, all devices in your workstation will be secured.

**Figure 5-34** Secured Workstation



## Front Bezel Security

The front bezel can be locked in place by installing a security screw provided by HP. To install the security screw:

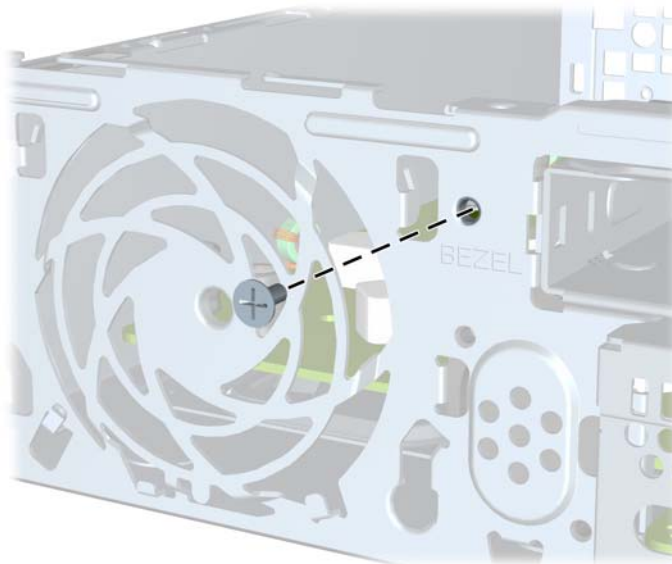
1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
3. Turn off the computer properly through the operating system, then turn off any external devices.
4. Disconnect the power cord from the power outlet and disconnect any external devices.

**⚠ 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. You must disconnect the power cord to avoid damage to the internal components of the computer.

5. If the computer is on a stand, remove the computer from the stand.
6. Remove the access panel and front bezel.

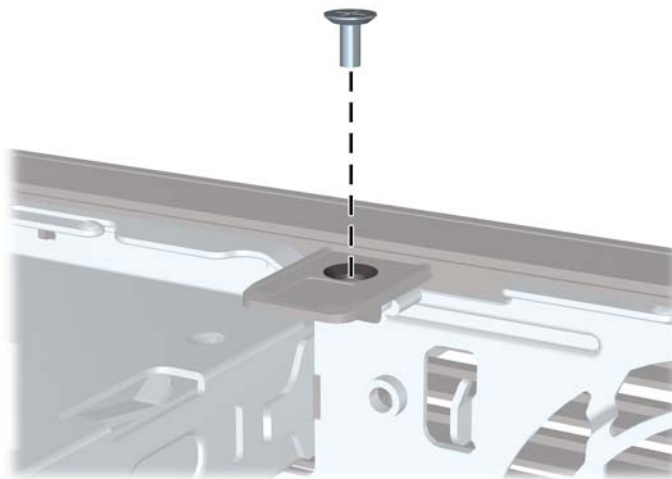
7. Remove the black screw on the front of the chassis behind the bezel. The screw is located next to the optical drive and is labeled "BEZEL."

**Figure 5-35** Retrieving the Front Bezel Security Screw



8. Replace the front bezel.
9. Install the security screw through the middle front bezel release tab and into the chassis to secure the front bezel in place.

**Figure 5-36** Installing the Front Bezel Security Screw




10. Replace the access panel.
11. If the computer was on a stand, replace the stand.
12. Reconnect the power cord and turn on the computer.
13. Lock any security devices that were disengaged when the access panel was removed.

---

# A Battery Replacement

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


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

Do not attempt to recharge the battery.


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

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

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


 **CAUTION:** Before replacing the battery, it is important to back up the computer CMOS settings. When the battery is removed or replaced, the CMOS settings will be cleared.

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


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

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

1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
3. Turn off the computer properly through the operating system, then turn off any external devices.
4. Disconnect the power cord from the power outlet and disconnect any external devices.

 **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. You must disconnect the power cord to avoid damage to the internal components of the computer.

5. Remove the computer access panel.
6. Locate the battery and battery holder on the system board.

 **NOTE:** On some computer models, it may be necessary to remove an internal component to gain access to the battery.

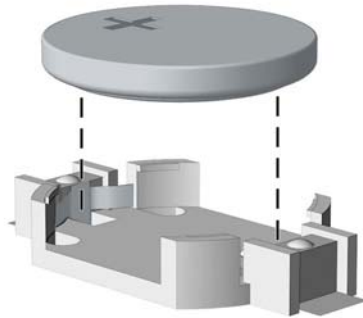
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7. Depending on the type of battery holder on the system board, complete the following instructions to replace the battery.

#### Type 1

- a. Lift the battery out of its holder.

**Figure A-1** Removing a Coin Cell Battery (Type 1)

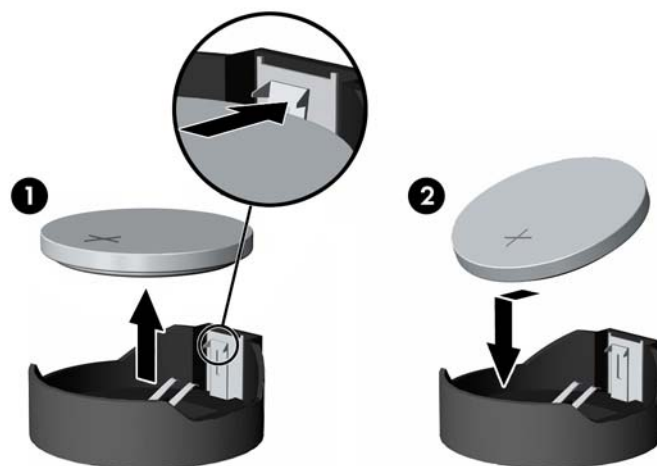


- b. Slide the replacement battery into position, positive side up. The battery holder automatically secures the battery in the proper position.

#### Type 2

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

**Figure A-2** Removing and Replacing a Coin Cell Battery (Type 2)

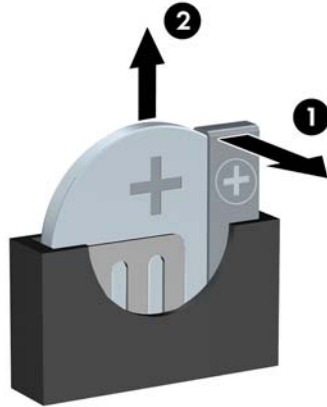


#### Type 3


- a. Pull back on the clip (1) that is holding the battery in place, and remove the battery (2).

- b. Insert the new battery and position the clip back into place.

**Figure A-3** Removing a Coin Cell Battery (Type 3)



---

 **NOTE:** After the battery has been replaced, use the following steps to complete this procedure.


---

8. Replace the computer access panel.
9. Plug in the computer and turn on power to the computer.
10. Reset the date and time, your passwords, and any special system setups using Computer Setup.
11. Lock any security devices that were disengaged when the computer access panel was removed.

---

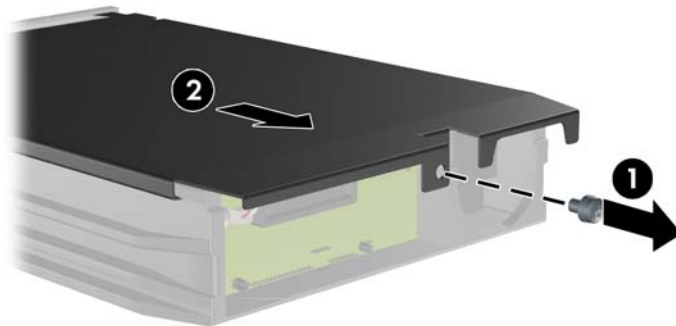
## B Removing and Replacing a Removable 3.5-inch SATA Hard Drive

Some models are equipped with a Removable SATA Hard Drive Enclosure in the 5.25-inch internal drive bay. The hard drive is housed in a carrier that can be quickly and easily removed from the drive bay. To remove and replace a drive in the carrier:

 **NOTE:** Before you remove the old hard drive, be sure to back up the data from the old hard drive so that you can transfer the data to the new hard drive.

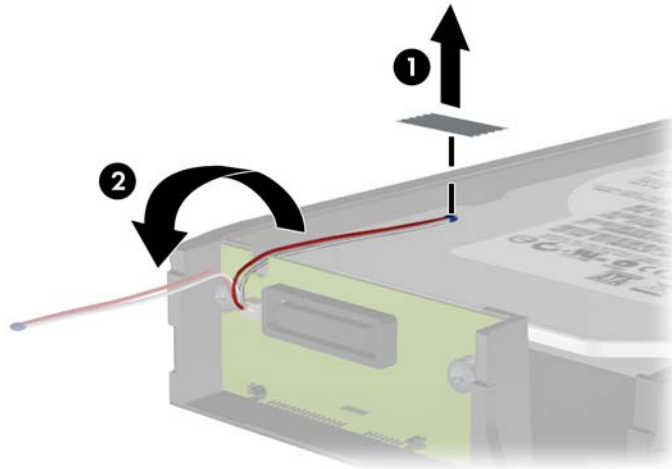
1. Unlock the hard drive carrier with the key provided and slide the carrier out of the enclosure.
2. Remove the screw from the rear of the carrier (1) and slide the top cover off the carrier (2).

**Figure B-1** Removing the Carrier Cover



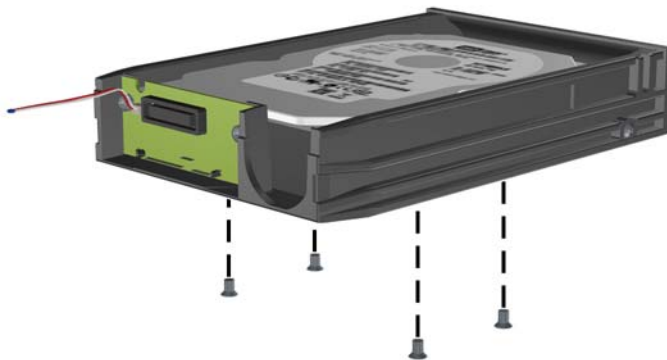
3. Remove the adhesive strip that secures the thermal sensor to the top of the hard drive (1) and move the thermal sensor away from the carrier (2).

**Figure B-2** Removing the Thermal Sensor



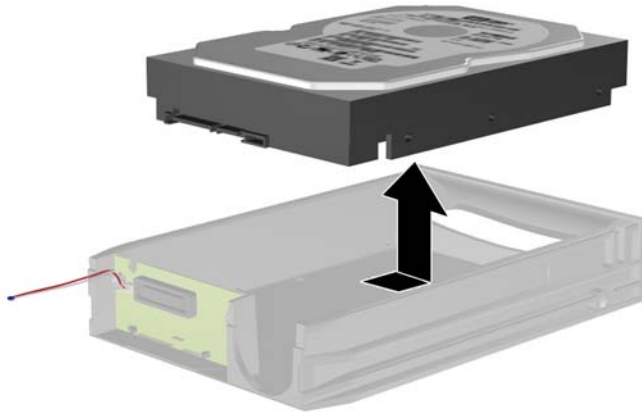
4. Remove the four screws from the bottom of the hard drive carrier.

**Figure B-3** Removing the Security Screws



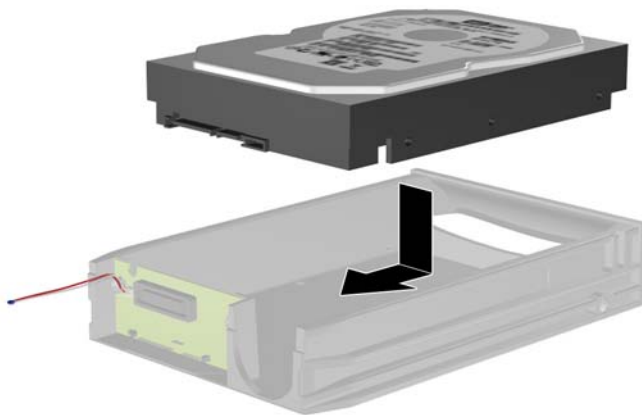
5. Slide the hard drive back to disconnect it from the carrier then lift it up and out of the carrier.

**Figure B-4** Removing the Hard Drive



6. Place the new hard drive in the carrier then slide the hard drive back so that it seats in the SATA connector on the carrier's circuit board. Be sure the connector on the hard drive is pressed all the way into the connector on the carrier's circuit board.

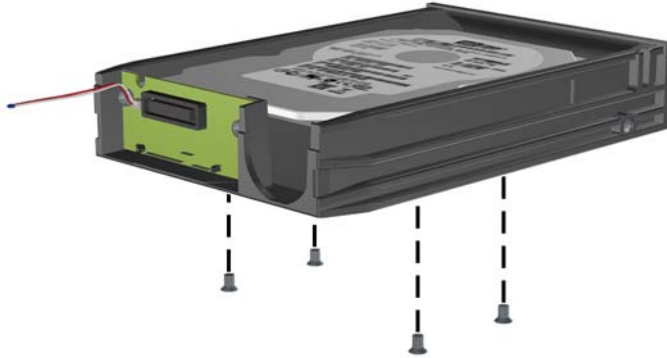
**Figure B-5** Replacing the Hard Drive





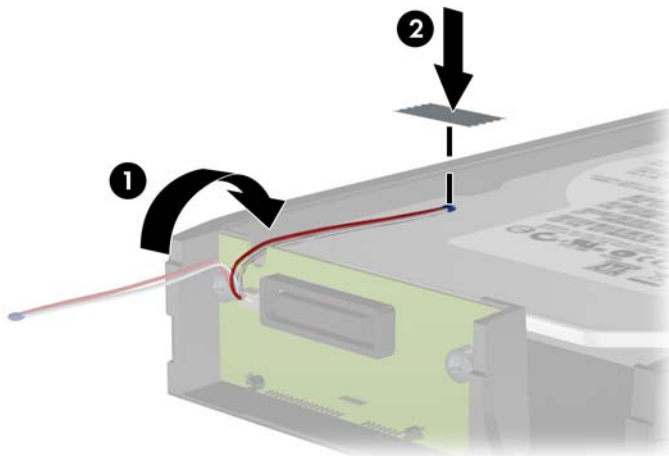
7. Replace the four screws in the bottom of the carrier to hold the drive securely in place.

**Figure B-6** Replacing the Security Screws



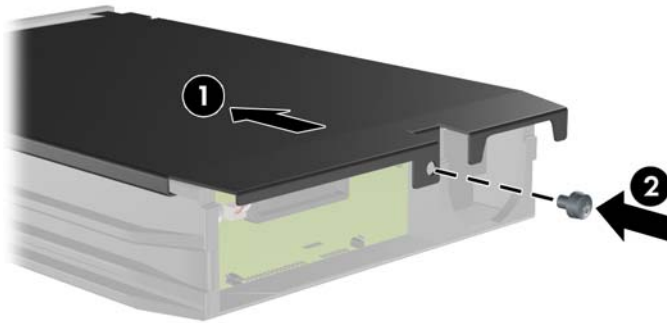
8. Place the thermal sensor on top of the hard drive in a position that does not cover the label (1) and attach the thermal sensor to the top of the hard drive with the adhesive strip (2).

**Figure B-7** Replacing the Thermal Sensor



- Slide the cover on the carrier (1) and replace the screw on the rear of the carrier to secure the cover in place (2).

**Figure B-8** Replacing the Carrier Cover



- Slide the hard drive carrier into the enclosure on the computer and lock it with the key provided.




**NOTE:** The carrier must be locked for power to be supplied to the hard drive.

---

# C Unlocking the Smart Cover Lock

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 **NOTE:** The Smart Cover Lock is an optional feature included on some models only.

---


The Smart Cover Lock is a software-controllable cover lock, controlled by the setup password. This lock prevents unauthorized access to the internal components. The computer ships with the Smart Cover Lock in the unlocked position. For more information about locking the Smart Cover Lock, refer to the *Desktop Management Guide*.

## Smart Cover FailSafe Key

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

- Power outage
- Startup failure
- PC component (for example, processor or power supply) failure
- Forgotten password

---

 **NOTE:** The Smart Cover FailSafe Key is a specialized tool available from HP. Be prepared; order this key before you need it.

---

To obtain a FailSafe Key:

- Contact an authorized HP reseller or service provider. Order PN 166527-001 for the wrench-style key or PN 166527-002 for the screwdriver bit key.
- Refer to the HP Web site (<http://www.hp.com>) for ordering information.
- Call the appropriate number listed in the warranty or in the *Support Telephone Numbers* guide.

## Using the Smart Cover FailSafe Key to Remove the Smart Cover Lock

To open the access panel with the Smart Cover Lock engaged:

1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
3. Turn off the computer properly through the operating system, then turn off any external devices.

4. Disconnect the power cord from the power outlet and disconnect any external devices.

**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. You must disconnect the power cord to avoid damage to the internal components of the computer.

5. Use the Smart Cover FailSafe Key to remove the two tamper-proof screws that secure the Smart Cover Lock to the chassis.

**Figure C-1** Removing the Smart Cover Lock Screws from the Convertible Minitower



**Figure C-2** Removing the Smart Cover Lock Screws from the Microtower



**Figure C-3** Removing the Smart Cover Lock Screws from the Small Form Factor



You can now remove the access panel.

To reattach the Smart Cover Lock, secure the lock in place with the tamper-proof screws.

---

# D Electrostatic Discharge

A discharge of static electricity from a finger or other conductor may damage system boards or other static-sensitive devices. This type of damage may reduce the life expectancy of the device.

## Preventing Electrostatic Damage

To prevent electrostatic damage, observe the following precautions:

- Avoid hand contact by transporting and storing products in static-safe containers.
- Keep electrostatic-sensitive parts in their containers until they arrive at static-free workstations.
- Place parts on a grounded surface before removing them from their containers.
- Avoid touching pins, leads, or circuitry.
- Always be properly grounded when touching a static-sensitive component or assembly.

## Grounding Methods

There are several methods for grounding. Use one or more of the following methods when handling or installing electrostatic-sensitive parts:

- Use a wrist strap connected by a ground cord to a grounded workstation or computer chassis. Wrist straps are flexible straps with a minimum of 1 megohm +/- 10 percent resistance in the ground cords. To provide proper ground, wear the strap snug against the skin.
- Use heelstraps, toestraps, or bootstraps at standing workstations. Wear the straps on both feet when standing on conductive floors or dissipating floor mats.
- Use conductive field service tools.
- Use a portable field service kit with a folding static-dissipating work mat.

If you do not have any of the suggested equipment for proper grounding, contact an HP authorized dealer, reseller, or service provider.



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**NOTE:** For more information on static electricity, contact an HP authorized dealer, reseller, or service provider.

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# E Computer Operating Guidelines, Routine Care and Shipping Preparation

## Computer Operating Guidelines and Routine Care

Follow these guidelines to properly set up and care for the computer and monitor:

- 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.
- Never operate the computer with the access panel or any of the expansion card slot covers removed.
- Do not stack computers on top of each other or place computers so near each other that they are subject to each other's re-circulated or preheated air.
- If the computer is to be operated within a separate enclosure, intake and exhaust ventilation must be provided on the enclosure, and the same operating guidelines listed above will still apply.
- Keep liquids away from the computer and keyboard.
- Never cover the ventilation slots on the monitor with any type of material.
- Install or enable power management functions of the operating system or other software, including sleep states.
- Turn off the computer before you do either of the following:
  - Wipe the exterior of the computer with a soft, damp cloth as needed. Using cleaning products may discolor or damage the finish.
  - 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.

# Optical Drive Precautions

Be sure to observe the following guidelines while operating or cleaning the optical drive.

## Operation

- Do not move the drive during operation. This may cause it to malfunction during reading.
- Avoid exposing the drive to sudden changes in temperature, as condensation may form inside the unit. If the temperature suddenly changes while the drive is on, wait at least one hour before you turn off the power. If you operate the unit immediately, it may malfunction while reading.
- Avoid placing the drive in a location that is subject to high humidity, extreme temperatures, mechanical vibration, or direct sunlight.

## Cleaning

- Clean the panel and controls with a soft, dry cloth or a soft cloth lightly moistened with a mild detergent solution. Never spray cleaning fluids directly on the unit.
- Avoid using any type of solvent, such as alcohol or benzene, which may damage the finish.

## Safety

If any object or liquid falls into the drive, immediately unplug the computer and have it checked by an authorized HP service provider.

# Shipping Preparation

Follow these suggestions when preparing to ship the computer:

1. Back up the hard drive files on PD discs, tape cartridges, CDs, or USB flash drives. Be sure that the backup media is not exposed to electrical or magnetic impulses while stored or in transit.



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**NOTE:** The hard drive locks automatically when the system power is turned off.

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2. Remove and store all removable media.
3. Turn off the computer and external devices.
4. Disconnect the power cord from the electrical outlet, then from the computer.
5. Disconnect the system components and external devices from their power sources, then from the computer.



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**NOTE:** Ensure that all boards are seated properly and secured in the board slots before shipping the computer.

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6. Pack the system components and external devices in their original packing boxes or similar packaging with sufficient packing material to protect them.



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