Hardware Reference Guide

HP EliteDesk 800 G1 Tower
HP EliteDesk 800 G1 Small Form Factor
HP EliteDesk 800 G1 Ultra-slim Desktop

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About this book

This guide provides basic information for upgrading HP EliteDesk 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.

Table of contents

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).

NOTE: All three computer models can be used in a tower orientation or a desktop orientation.

Tower (TWR)

Small Form Factor (SFF)

Ultra-slim Desktop (USDT)

Tower (TWR) front panel components

Drive configuration may vary by model. Some models have a bezel blank covering one or more drive bays.
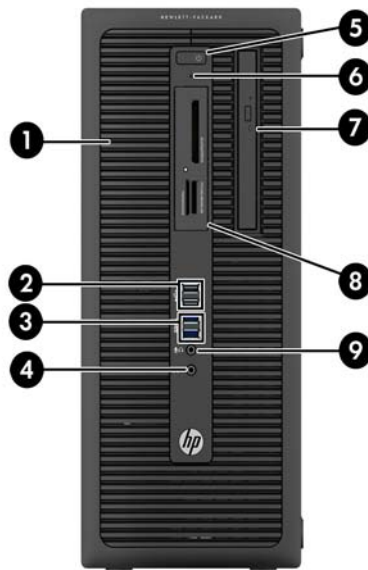
1	5.25-inch Half-Height Drive Bay (behind bezel)	6	Hard Drive Activity Light
2	USB 2.0 Ports (black)	7	Slim Optical Drive (optional)
3	USB 3.0 Ports (blue)	8	3.5-inch Media Card Reader (optional)
4	Headphone Connector	9	Microphone/Headphone Connector
5	Dual-State Power Button		

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 Audio Manager icon in the Windows taskbar.

NOTE: The Power On Light is normally white 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.
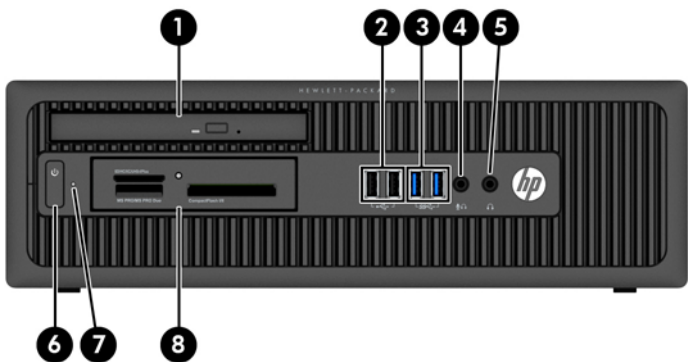
1	Slim Optical Drive (optional)	5	Headphone Connector
2	USB 2.0 Ports (black)	6	Dual-State Power Button
3	USB 3.0 Ports (blue)	7	Hard Drive Activity Light
4	Microphone/Headphone Connector	8	3.5-inch Media Card Reader (optional)

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 Audio Manager icon in the Windows taskbar.

NOTE: The Power On Light is normally white 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.
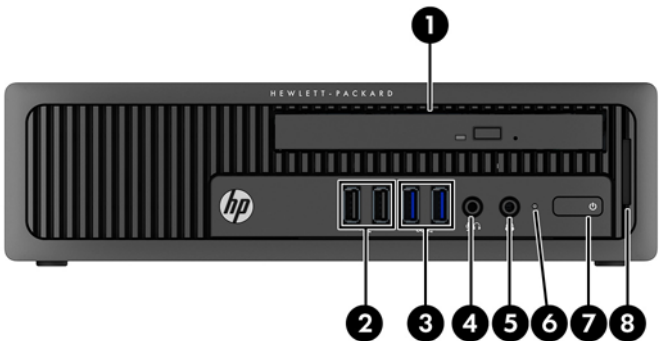
1	Slim Optical Drive (optional)	5	Headphone Connector
2	USB 2.0 Ports (black)	6	Hard Drive Activity Light
3	USB 3.0 Ports (blue)	7	Dual-State Power Button
4	Microphone/Headphone Connector	8	SD Media Card Reader (optional)

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 Audio Manager icon in the Windows taskbar.

NOTE: The Power On Light is normally white 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.

Tower (TWR) rear panel components
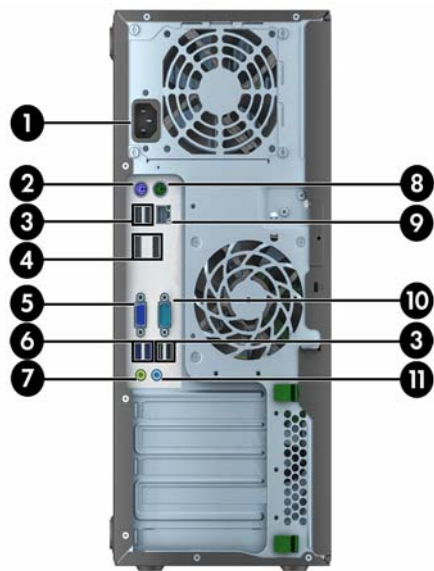
1		Power Cord Connector	7	↵♪	Line-Out Connector for powered audio devices (green)	
2	⌨	PS/2 Keyboard Connector (purple)	8	🖱	PS/2 Mouse Connector (green)	
3	•⟨⟩	USB 2.0 Ports (black)	9	모모	RJ-45 Network Connector	
4	‡Ɒ	DisplayPort Monitor Connectors	10	IOIOI A	Serial Connector	
5	▭	VGA Monitor Connector	11	→♪	Line-In Audio Connector (blue)	
6	SS⟨⟩	USB 3.0 Ports (blue)				

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 Audio Manager icon in the Windows taskbar.

When a graphics card is installed in one of the system board slots, the video connectors on the graphics card and the integrated graphics on the system board may be used at the same time. However, for such a configuration, only the display connected to the discrete graphics card will display POST messages.

The system board graphics can be disabled by changing settings in Computer Setup.

Small Form Factor (SFF) rear panel components
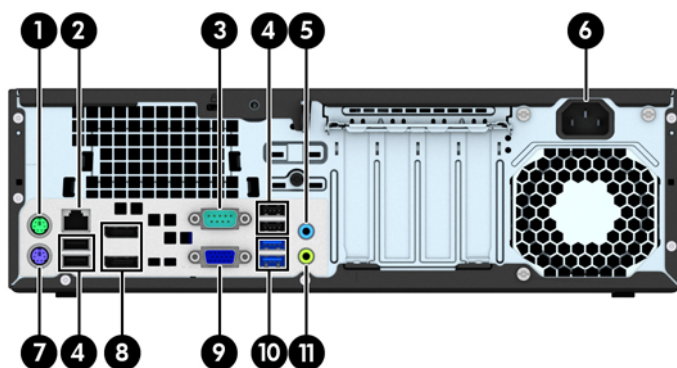
1		PS/2 Mouse Connector (green)	7		PS/2 Keyboard Connector (purple)
2		RJ-45 Network Connector	8		DisplayPort Monitor Connectors
3		Serial Connector	9		VGA Monitor Connector
4		USB 2.0 Ports (black)	10		USB 3.0 Ports (blue)
5		Line-In Audio Connector (blue)	11		Line-Out Connector for powered audio devices (green)
6		Power Cord Connector			

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 Audio Manager icon in the Windows taskbar.

When a graphics card is installed in one of the system board slots, the video connectors on the graphics card and the integrated graphics on the system board may be used at the same time. However, for such a configuration, only the display connected to the discrete graphics card will display POST messages.

The system board graphics can be disabled by changing settings in Computer Setup.

Ultra-slim Desktop (USDT) rear panel components
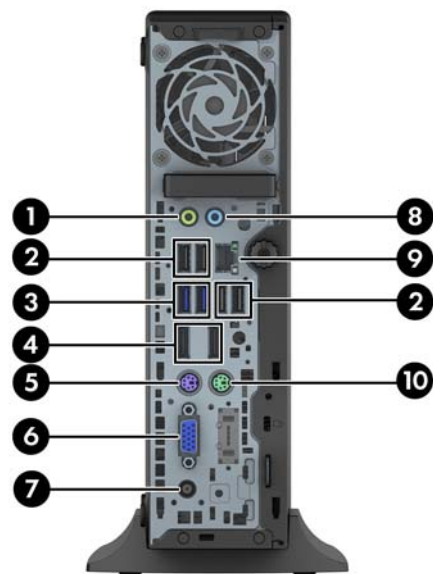
1	⬆♪	Line-Out Connector for powered audio devices (green)	6	▭	VGA Monitor Connector
2	•⟵	USB 2.0 Ports (black)	7		Power Cord Connector
3	SS⟵	USB 3.0 Ports (blue)	8	➡♪	Line-In Audio Connector (blue)
4	‡ⅅ	DisplayPort Monitor Connectors	9	뫂뫂	RJ-45 Network Connector
5	▦	PS/2 Keyboard Connector (purple)	10	🖱	PS/2 Mouse Connector (green)

NOTE: 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 Audio Manager icon in the Windows taskbar.

If an MXM graphics card is installed, all of the video connectors may be used at the same time. However, for such a configuration, only the display connected to the upper DisplayPort will display POST messages.

The system board graphics can be disabled by changing settings in Computer Setup.

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.

No.	Slot	Media					
1	**SD/HC/XC/UHS-1/Plus**	●	Secure Digital (SD)	●	Secure Digital High Capacity (SDHC)	●	Secure Digital Extended Capacity Memory Card (SDXC)
2	**Media Card Reader Activity Light**						
3	**CompactFlash I/II**	●	CompactFlash Card Type 1	●	CompactFlash Card Type 2	●	MicroDrive
4	**MS PRO/MS PRO Duo**	●	Memory Stick (MS)	●	Memory Stick MagicGate	●	Memory Stick MagicGate Duo
		●	Memory Stick Select	●	Memory Stick Duo (MS Duo)	●	Memory Stick PRO-HG Duo
		●	Memory Stick PRO (MS PRO)	●	Memory Stick PRO Duo (MS PRO Duo)		

Keyboard
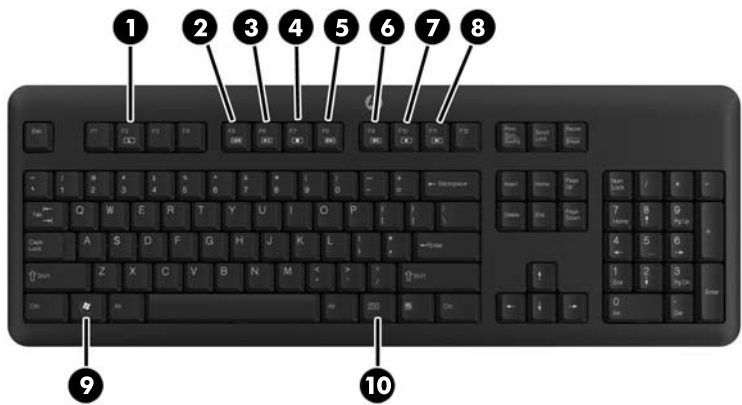
Component		Component	
1	Sleep	6	Mute volume
2	Fast reverse	7	Decrease volume
3	Play/pause	8	Increase volume
4	Stop	9	Windows logo key
5	Fast forward	10	Function

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.

Windows Logo Key +	Windows 7	Windows 8
no other key	Displays the Start menu	Displays the Start screen
c		Opens charms
d	Displays the Desktop	Displays the Desktop
e	Launches My Computer	Opens Windows Explorer
f	Launches Find Document	Goes to files in Search charm
Ctrl + f	Launches Find Computer	Launches Find Computer
g	Cycles through gadgets	Cycles through gadgets
h		Goes to Share charm
i		Goes to Settings charm
k		Goes to Devices charm

Windows Logo Key +	Windows 7	Windows 8
l	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	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
m	Minimizes all open applications	Minimizes all open applications
o		Locks screen orientation
p	Choose a presentation display mode	Opens projection options
q		Goes to Search charm
r	Launches the Run dialog box	Launches the Run dialog box
t	Cycles through programs on the taskbar	Cycles through programs on the taskbar
u	Launches Ease of Access Center	Launches Ease of Access Center
v		Cycles through notifications
w		Goes to Settings in Search charm
x	Opens Windows Mobility Center if present	Opens Windows Mobility Center if present
z		Opens applications bar
F1	Launches Windows Help	Launches Windows Help
Tab	Cycles through programs on the Taskbar using the Windows Flip 3-D	Cycles through metro application history
Ctrl + Tab	Use the arrow keys to cycle through programs on the Taskbar by using Windows Flip 3-D	Use the arrow keys to cycle through metro application history
Spacebar	Brings all gadgets to the front and select Windows Sidebar	Switches input language and keyboard layout
any number key	Goes to the application at the given position on the taskbar	Goes to the application at the given position on the taskbar
up arrow	Maximizes the window	Maximizes the desktop window
left arrow	Snaps the window to the left side of the screen	Snaps the desktop window to the left side of the screen
right arrow	Snaps the window to the right side of the screen	Snaps the desktop window to the right side of the screen
down arrow	Minimizes the window	Minimizes the desktop window
Shift + left arrow or right arrow	Moves a window from one monitor to another	Moves a window from one monitor to another
, (comma)		Peeks at the desktop
. (period)		Snap a metro application to the right
Shift + . (period)		Snap a metro application to the left
Enter		Launches Narrator
Esc		Exits Magnifier
+ (on numpad)	Zooms in	Zooms in (Magnifier)

Windows Logo Key +	Windows 7	Windows 8
- (on numpad)	Zooms out	Zooms out (Magnifier)
Home	Minimizes non-active desktop windows	Minimizes non-active desktop windows
Break	Displays System Properties	Displays System Properties
PgUp		Moves Start screen to left monitor
PgDn		Moves Start screen to right monitor

Serial number location

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

Tower (TWR)

Small Form Factor (SFF)

Ultra-slim Desktop (USDT)

2   Tower (TWR) 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 132 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. Lift up on the access panel handle (1) then lift the access panel off the computer (2).

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).

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).
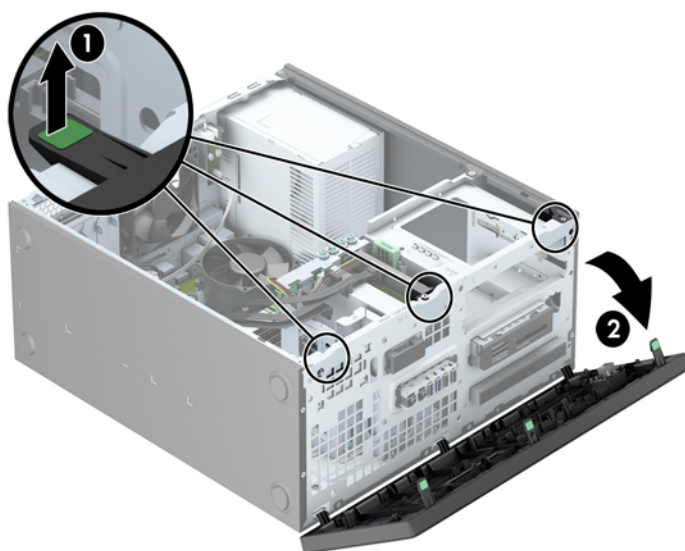
Removing bezel blanks

On some models, there are bezel blanks covering one or more 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. Remove the bezel blank for the appropriate drive:

    ●   To remove a 5.25-inch bezel blank, press inward on the retaining tabs that hold the bezel blank in place (1) then pull the bezel blank from the front bezel (2).
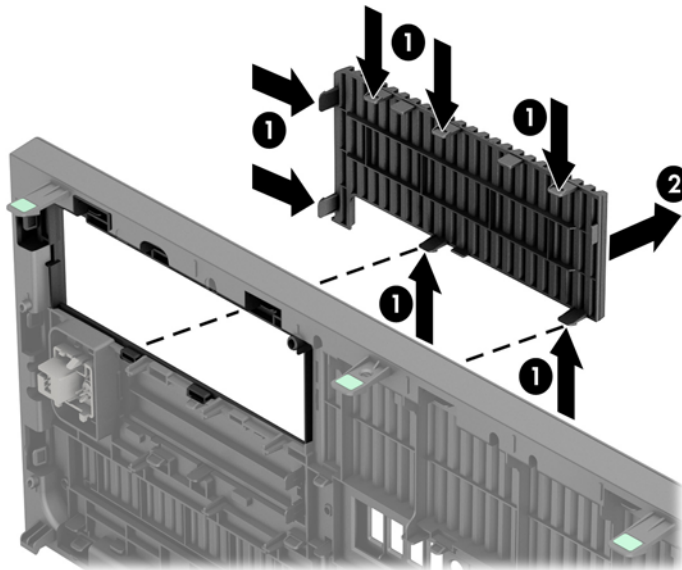
> **NOTE:** After removing the 5.25-inch drive bezel blank and installing a drive, you can install an optional bezel trim piece (available from HP) that surrounds the front of the drive.

    ●   To remove a 3.5-inch bezel blank, press outward on the two retaining tabs that hold the bezel blank in place (1) and rotate the bezel blank back and to the right to remove it (2).
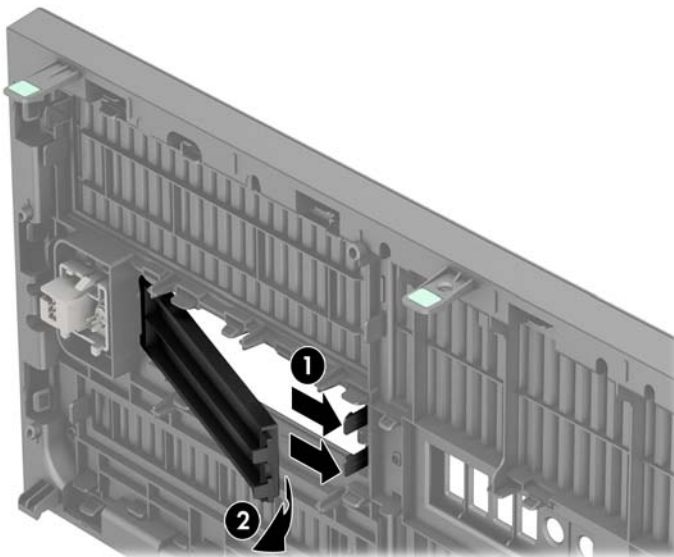
- To remove a slim optical drive bezel blank, press inward on the retaining tabs that hold the bezel blank in place (1) then pull the bezel blank from the front bezel (2).

NOTE: After removing the slim optical drive bezel blank and installing a slim optical drive, you can install an optional bezel trim piece (available from HP) that surrounds the front of the slim optical drive.

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.

System board connections

Refer to the following illustration and table to identify the system board connectors.
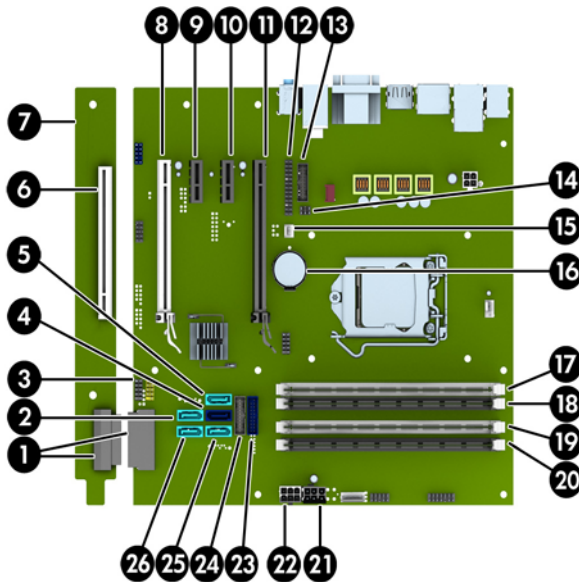
No.	System Board Connector	System Board Label	Color	Component
1	System Board PCI Extender Connectors	EXT	black	System Board PCI Extender (optional, shown installed)
2	SATA 3.0	SATA1	light blue	Any SATA Device other than the Primary Hard Drive
3	USB 2.0	MEDIA	black	USB 2.0 Device, such as a USB 2.0 Media Card Reader
4	SATA 3.0	SATA0	dark blue	Primary Hard Drive
5	SATA 3.0	SATA2	light blue	Any SATA Device other than the Primary Hard Drive
6	PCI (optional)	PCI1	white	Expansion Card
7	System Board PCI Extender (optional)	(not applicable)	(not applicable)	Expansion Card
8	PCI Express x16 downshifted to a x4	X4PCIEXP	white	Expansion Card
9	PCI Express x1	X1PCIEXP2	black	Expansion Card
10	PCI Express x1	X1PCIEXP1	black	Expansion Card
11	PCI Express x16	X16PCIEXP	black	Expansion Card
12	Parallel Port	PAR	black	Parallel Port
13	Serial Port	COMB	black	Serial Port
14	Hood Lock	HLCK	black	Hood Lock
15	Hood Sensor	HSENSE	white	Hood Sensor
16	Battery	BAT	black	Battery

No.	System Board Connector	System Board Label	Color	Component
17	DIMM4 (Channel A)	DIMM4	white	Memory Module
18	DIMM3 (Channel A)	DIMM3	black	Memory Module
19	DIMM2 (Channel B)	DIMM2	white	Memory Module
20	DIMM1 (Channel B)	DIMM1	black	Memory Module
21	Power	SATA PWR0	black	SATA Drives
22	Power	PWR	white	System Board
23	USB 3.0	FRONT USB3.0	blue	Front USB 3.0 Ports
24	USB 3.0	MEDIA3.0	black	USB 3.0 Device, such as a USB 3.0 Media Card Reader
25	SATA 3.0	SATA3	light blue	Any SATA Device other than the Primary Hard Drive
26	SATA 3.0	SATA5	light blue	Any SATA Device other than the Primary Hard Drive

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

DDR3-SDRAM DIMMs

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

● industry-standard 240-pin

● unbuffered non-ECC PC3-12800 DDR3-1600 MHz-compliant

● 1.35 volt or 1.5 volt DDR3/DDR3L-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.

NOTE: Single channel and unbalanced dual channel memory configurations will result in inferior graphics performance.

- 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

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 132.

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.

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).
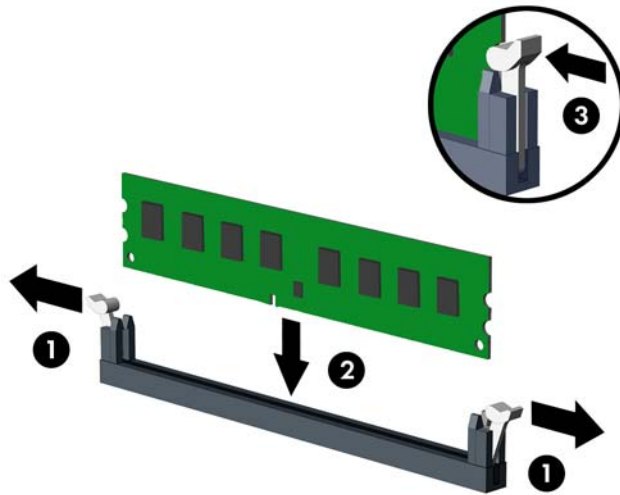
> **NOTE:** A memory module can be installed in only one way. Match the notch on the module with the tab on the memory socket.
>
> Populate the black DIMM sockets before the white DIMM sockets.
>
> For maximum performance, populate the sockets so that the memory capacity is spread as equally as possible between Channel A and Channel B. Refer to Populating DIMM sockets on page 22 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 two PCI Express x1 expansion slots, one PCI Express x16 expansion slot, and one PCI Express x16 expansion slot that is downshifted to a x4 slot. Some models also have an optional standard PCI expansion 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.

You can add the optional standard PCI expansion slot to the system board by purchasing a PCI extender board from HP.

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 on the exterior of the chassis (1) and rotate the expansion card retention latch open (2).
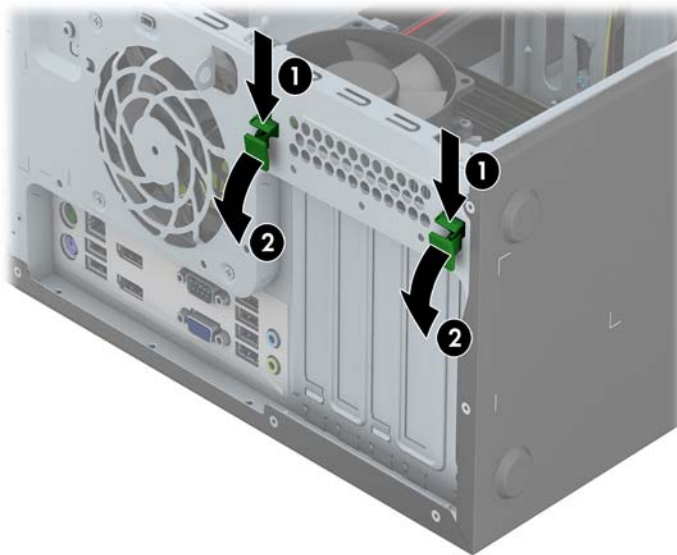
8. Before installing an expansion card, remove the expansion slot cover or the existing expansion card.

> **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.
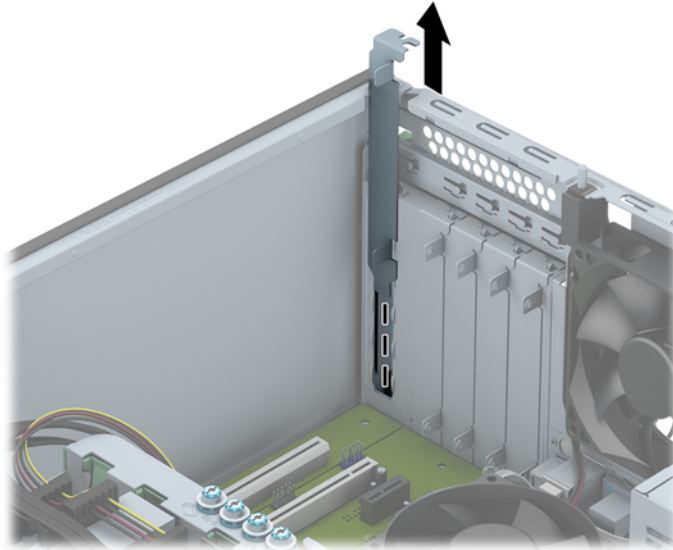
b. If you are removing a standard PCI card or PCI Express x1 card, hold the card at each end and carefully rock it back and forth until the connectors pull free from the socket. Lift the card straight up to remove it. Be sure not to scrape the card against other components.
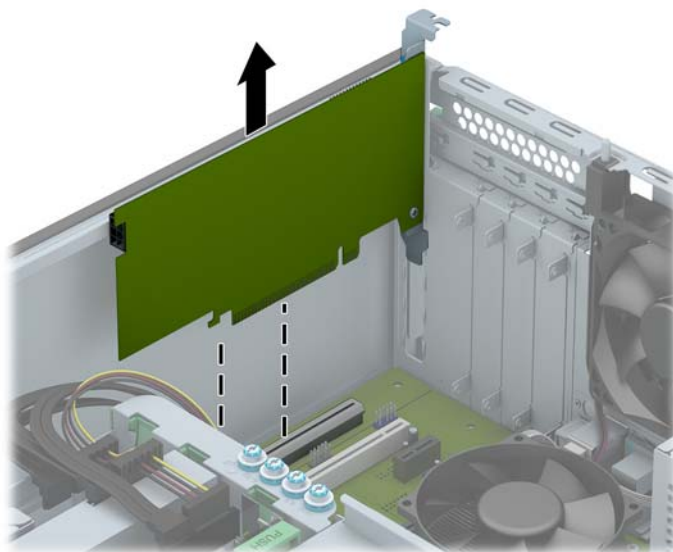
c. If you are removing a PCI Express x16 card, pull the retention arm on the back of the expansion socket away from the card and carefully rock the card back and forth until the connectors pull free from the socket. Lift the card straight up to remove it. Be sure not to scrape the card against other components.
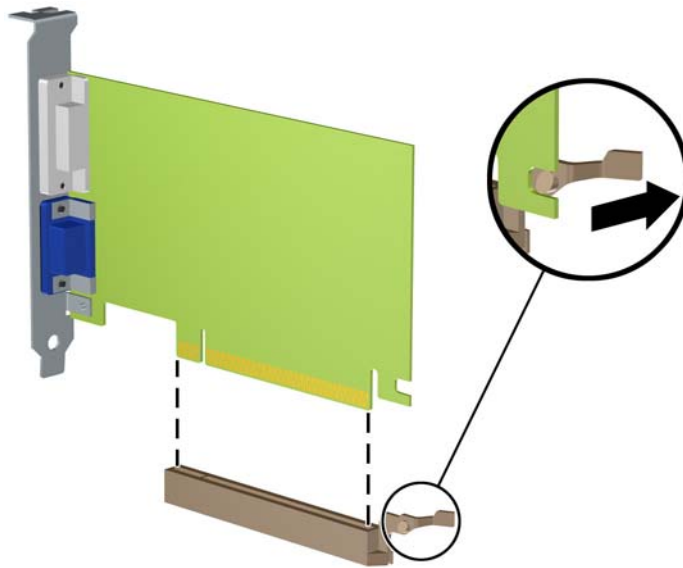
9. Store the removed card in anti-static packaging.

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

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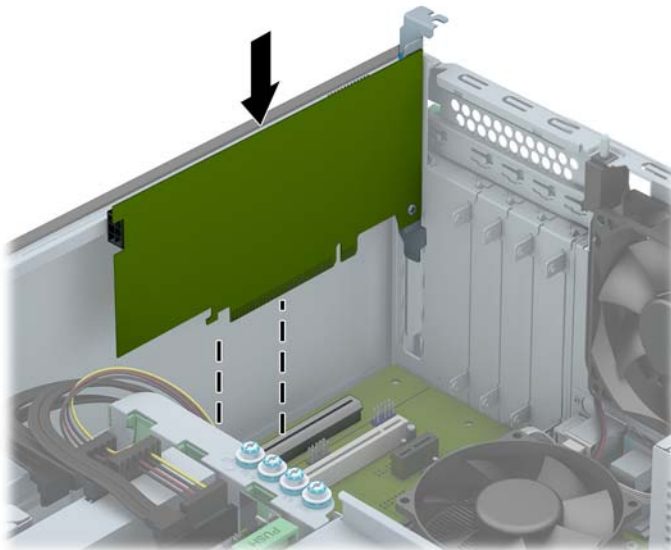
📝 **NOTE:** When installing an expansion card, press firmly on the card so that the whole connector seats properly in the expansion card slot.

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
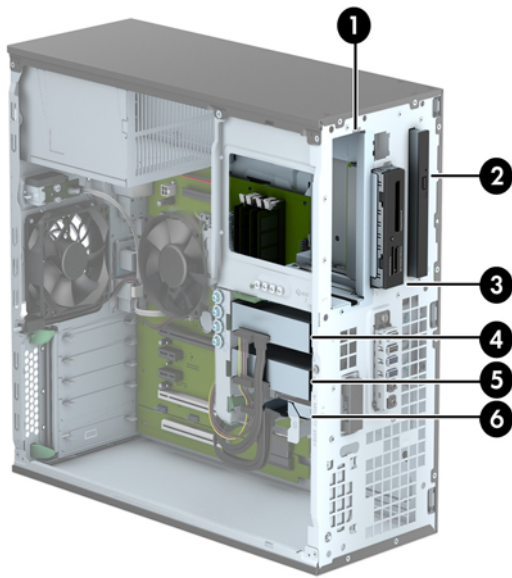
1	5.25-inch half-height drive bay
2	Slim optical drive bay
3	3.5-inch drive bay for optional drive (such as a media card reader)
4	Primary 3.5-inch internal hard drive bay
5	Secondary 3.5-inch internal hard drive bay
6	Secondary 2.5-inch internal hard drive bay

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.

- Connect secondary hard drives and optical drives to any of the light blue SATA connectors on the system board (labeled SATA1, SATA2, SATA3, and SATA5).

- Connect a media card reader USB 3.0 cable to the USB connector on the system board labeled MEDIA3.0.

- The power cable for the drives has two branches coming off the system board connector. The first branch is a three-headed cable with the first connector routed to the 5.25-inch bay, the second connector routed to the 3.5-inch bay, and the third (two-wire) connector routed to the slim optical drive bay. The second branch is a three-headed cable with the first connector routed to the bottom 2.5-inch hard drive bay, the second connector routed to the middle 3.5-inch hard drive bay, and the third connector routed to the top 3.5-inch hard drive bay.

- 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 (four 6-32 silver and blue isolation mounting guide screws and four silver 6-32 standard guide screws) installed on the side of the drive bays. The 6-32 isolation mounting screws are required for 3.5-inch hard drives installed in the 3.5-inch hard drive bays. The 6-32 standard guide screws are required for a USB 3.0 media card reader installed in the 3.5-inch optional drive bay. M3 metric guide screws for 5.25-inch optical drives and M3 isolation mounting guide screws for 2.5-inch hard drives are not provided. If you are replacing a drive, remove the guide screws from the old drive and install them in the new drive.
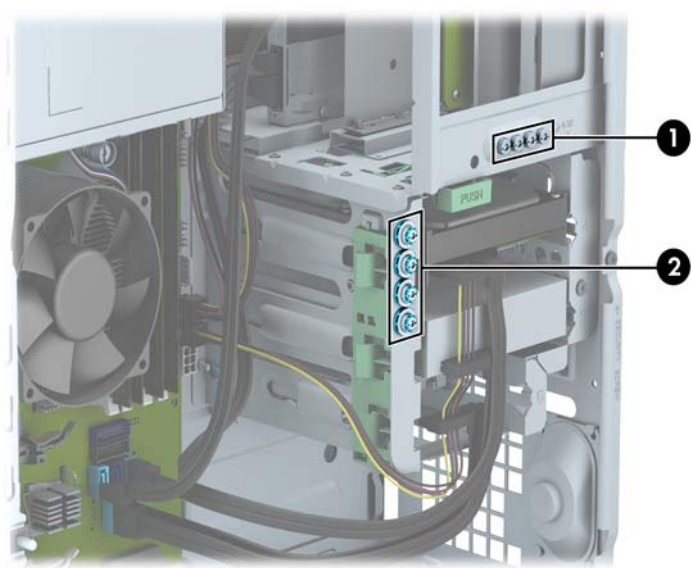
No.	Guide Screw	Device
1	Silver Standard 6-32 Guide Screws	USB 3.0 Media Card Reader
2	Silver and Blue 6-32 Isolation Mounting Screws	Secondary Hard Drive in 3.5-inch Hard Drive Bay

⚠ **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 132.

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."

Removing a 5.25-inch drive

📝 **NOTE:** HP does not offer a 5.25-inch optical drive for this computer model. A 5.25-inch optical drive may have been installed by the user or third-party vendor.

⚠ **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 power cable (1) and data cable (2) from the back of the drive.

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

7. Press down on the green drivelock mechanism (1) and slide the drive from the drive bay (2).
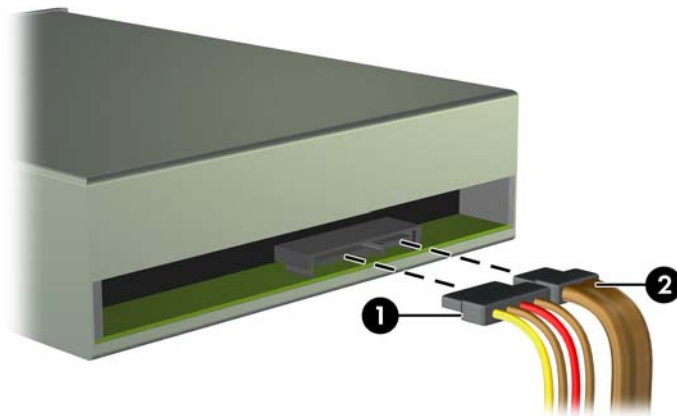

Installing a 5.25-inch drive

NOTE: HP does not offer a 5.25-inch optical drive for this computer model. A 5.25-inch optical drive can be purchased through a third-party vendor.

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.

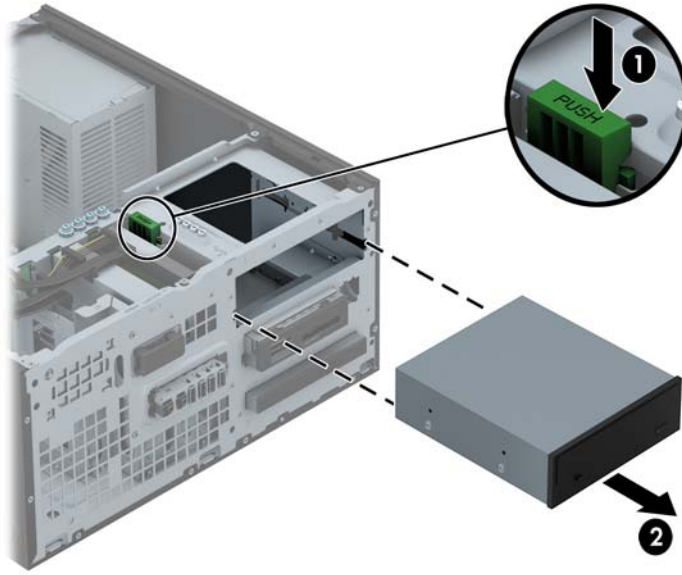4. Disconnect the power cord from the power outlet and disconnect any external devices.

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 18 for more information.

7.   If you are installing an optical drive, install four M3 metric guide screws (not provided) in the lower holes on each side of the drive.

📝 **NOTE:**   When replacing an optical 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.
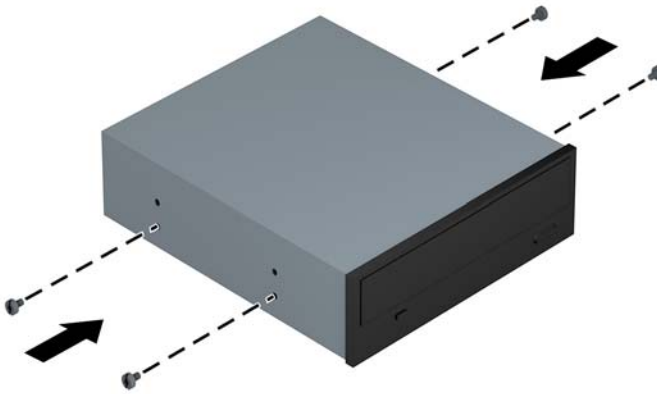
8.   Slide the drive into the drive bay, making sure to align the guide screws with the guide slots, until the drive snaps into place.

9. Connect the power cable (1) and data cable (2) to the rear of the optical drive.
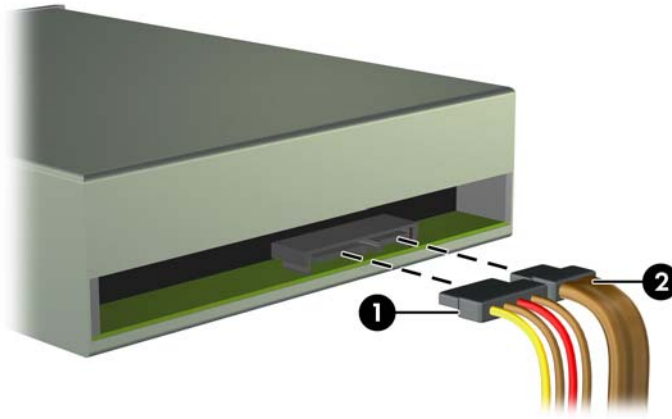
10. Connect the opposite end of the data cable to one of the light blue SATA connectors on the system board.

> **NOTE:** Refer to System board connections on page 20 for an illustration of the system board drive connectors.

11. Replace the front bezel.

> **NOTE:** An optional bezel trim piece that surrounds the front of the 5.25-inch drive is available from HP. Install the bezel trim piece in the front bezel before replacing the front bezel.

12. Replace the computer access panel.

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

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

Removing a 3.5-inch device

⚠ **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 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.

7. Press the release lever at the rear of the drive away from the drive (1) and slide the drive from the drive bay (2).

Installing a 3.5-inch device

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 18 for more information.

7. Install 6-32 guide screws in the holes on each side of the drive.

   NOTE: HP has supplied four extra 6-32 guide screws on top of the drive cage. Refer to Installing and removing drives on page 73 for an illustration of the extra guide screws location.

   When replacing a drive, transfer the four 6-32 guide screws from the old drive to the new one.

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.
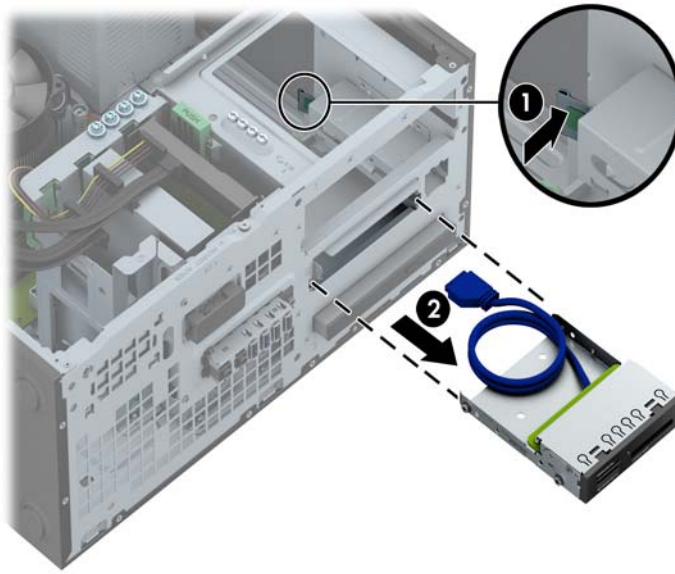

9. If installing a USB 3.0 media card reader, connect the USB cable from the media card reader to the USB 3.0 connector on the system board labeled MEDIA3.0.

📝 **NOTE:** Refer to System board connections on page 64 for an illustration of the system board drive connectors.

10. Replace the front bezel.

11. 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.

Removing a slim 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. Remove the access panel and front bezel.

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

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

7. Push the green release lever on the right rear side of the drive toward the center of the drive (1), then slide the drive forward and out of the bay (2).

Installing a slim 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.

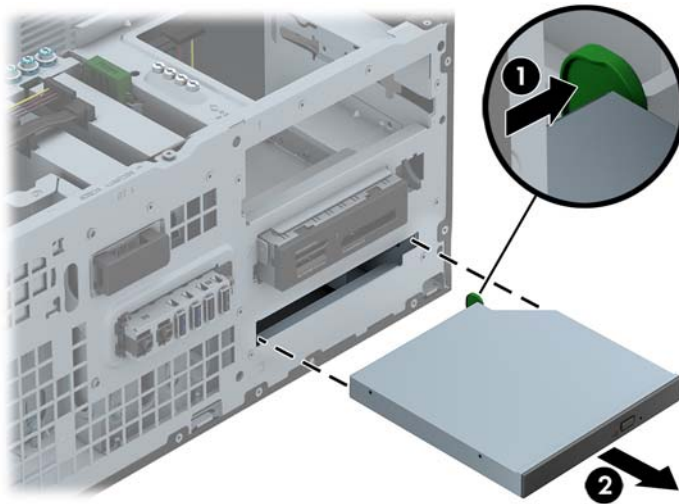4. Disconnect the power cord from the power outlet and disconnect any external devices.

   ⚠ **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. 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 18 for more information.

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

   a. Peel the backing off the adhesive on the release latch.

   b. 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.

   c. Insert the pin at the front of the optical drive into the hole at the end of the release latch, and press firmly.

d. Insert the second pin, and press the entire release latch firmly to fasten the latch securely to the optical drive.
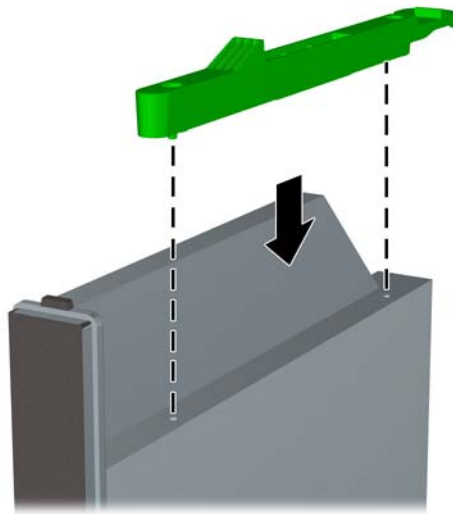
8. Slide the optical drive through the front bezel all the way into the bay so that it locks in place.

9. Connect the power cable (1) and data cable (2) to the rear of the optical drive.
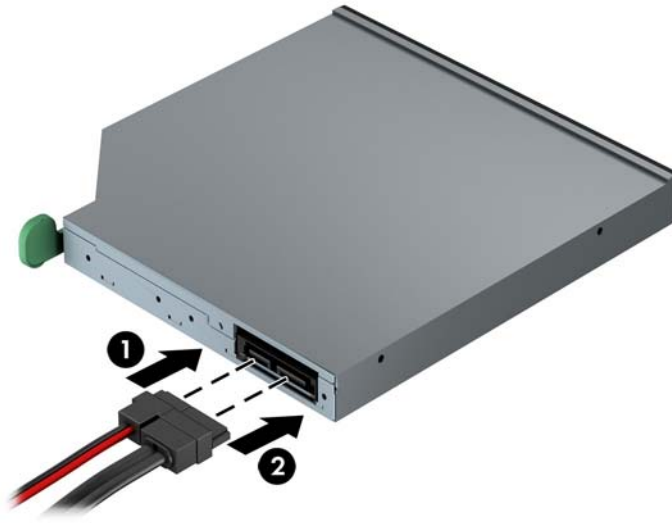
10. Connect the opposite end of the data cable to one of the light blue SATA connectors on the system board.

> **NOTE:** Refer to System board connections on page 20 for an illustration of the system board drive connectors.

11. Replace the front bezel.

> **NOTE:** An optional bezel trim piece that surrounds the front of the slim optical drive is available from HP. Install the bezel trim piece in the front bezel before replacing the front bezel.

12. Replace the computer access panel.

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

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

Removing a 3.5-inch or 2.5-inch hard drive

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

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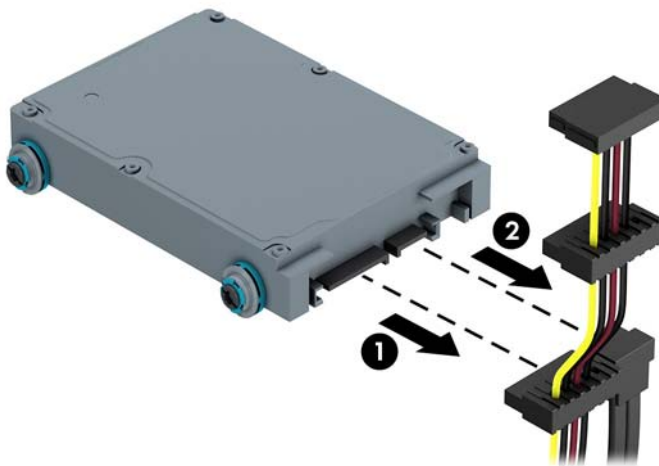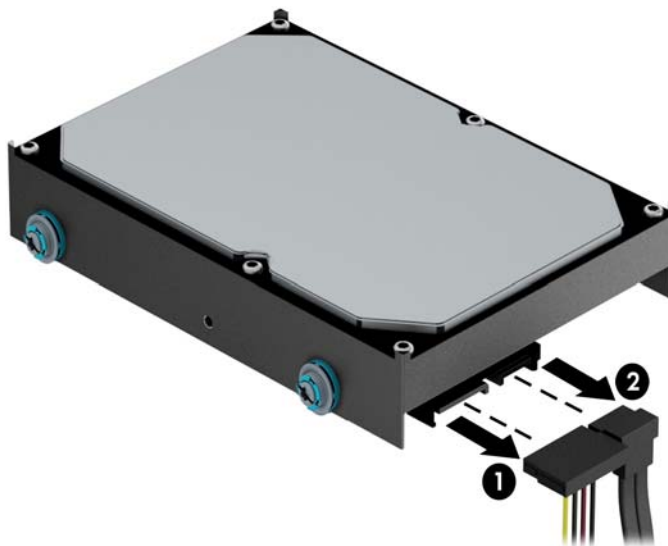
7. Release the drive by pulling the release tab away from the drive (1) and sliding the drive out of the bay (2).

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 3.5-inch or 2.5-inch 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.

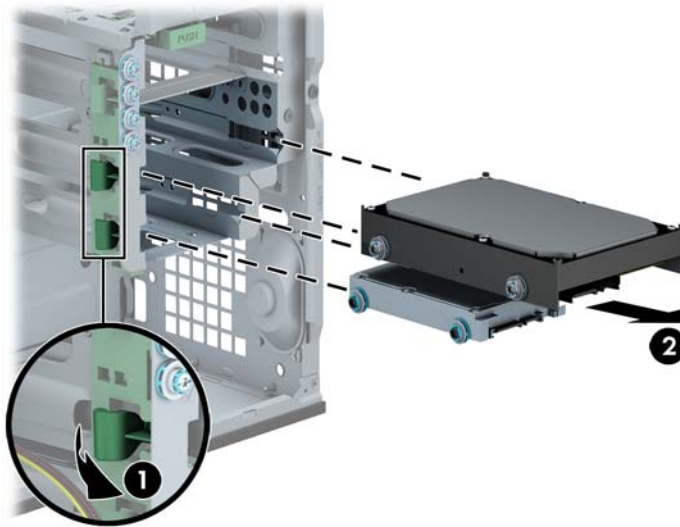**4.** Disconnect the power cord from the power outlet and disconnect any external devices.

⚠ **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 access panel.

6. Install guide screws on the sides of the drive. 3.5-inch hard drives use standard 6-32 silver and blue isolation mounting screws. 2.5-inch hard drives use metric M3 black and blue isolation mounting screws.

NOTE: Four extra 6-32 isolation mounting guide screws for 3.5-inch hard drives are installed on the exterior of the hard drive bays. Extra guide screws for 2.5-inch hard drives are not provided on the chassis but can be purchased from HP. Refer to Installing and removing drives on page 30 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 silver and blue 6-32 isolation mounting guide screws (two on each side of the drive).
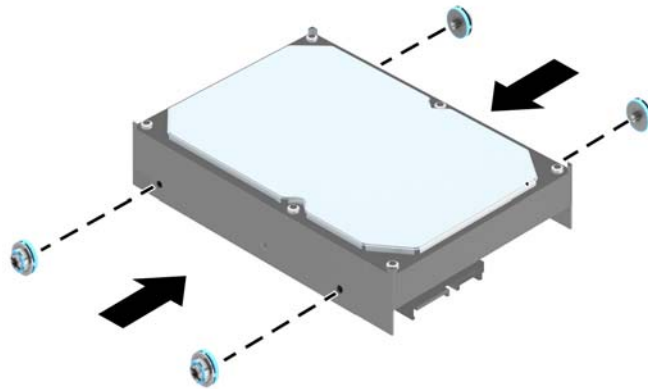
● If you are installing a 2.5-inch hard drive, install four black and blue M3 isolation mounting guide screws (two on each side of the drive).
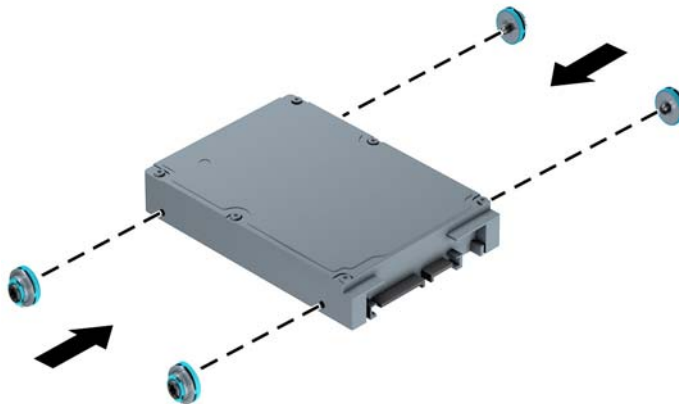
● You can also install a 2.5-inch hard drive into a 3.5-inch drive bay using an adapter bracket similar to the example shown below.

◦ Slide the drive into the bay adapter bracket, ensuring the connector on the drive is fully inserted into the connector on the adapter bracket.
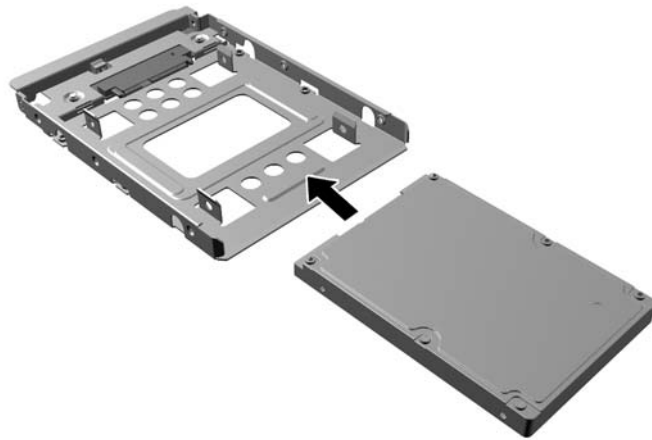
◦ Secure the drive to the bay adapter bracket by installing four black M3 adapter bracket screws through the sides of the bracket into the drive.
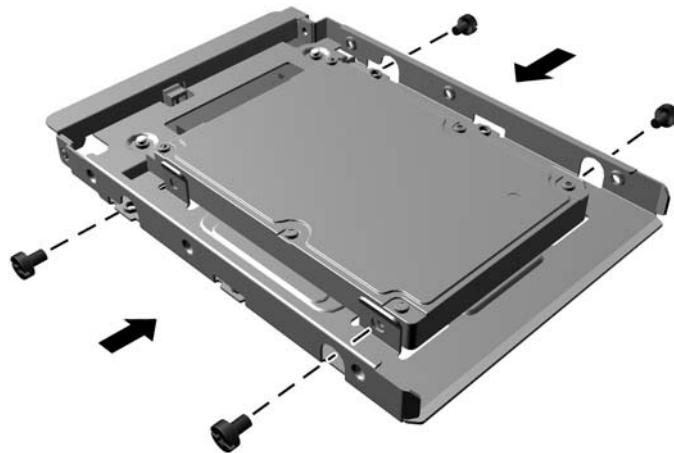
◦ Install four 6-32 silver and blue isolation mounting guide screws in the adapter bracket (two on each side of the bracket).
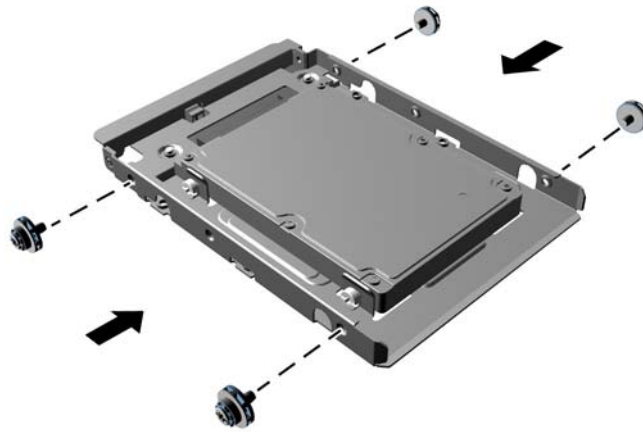
7. Slide the drive into the drive bay, making sure to align the guide screws with the guide slots, until the drive snaps into place.
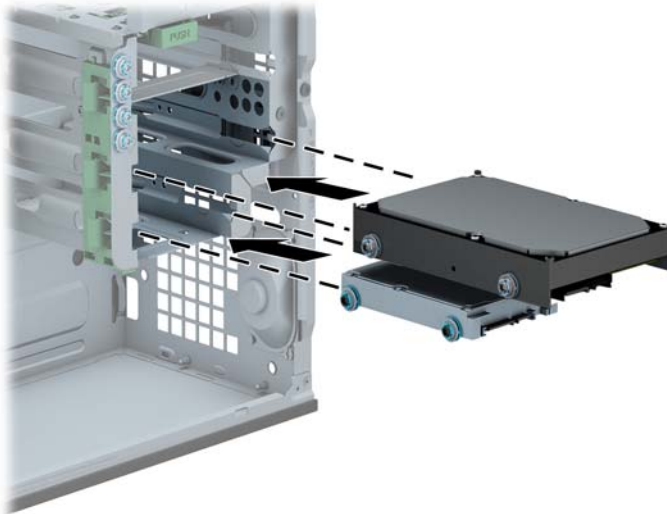
8. Connect the power cable (1) and data cable (2) to the back of the hard drive.

> **NOTE:** The power cable for the hard drives is a three-headed cable that is routed from the system board to the rear of the hard drive bays.
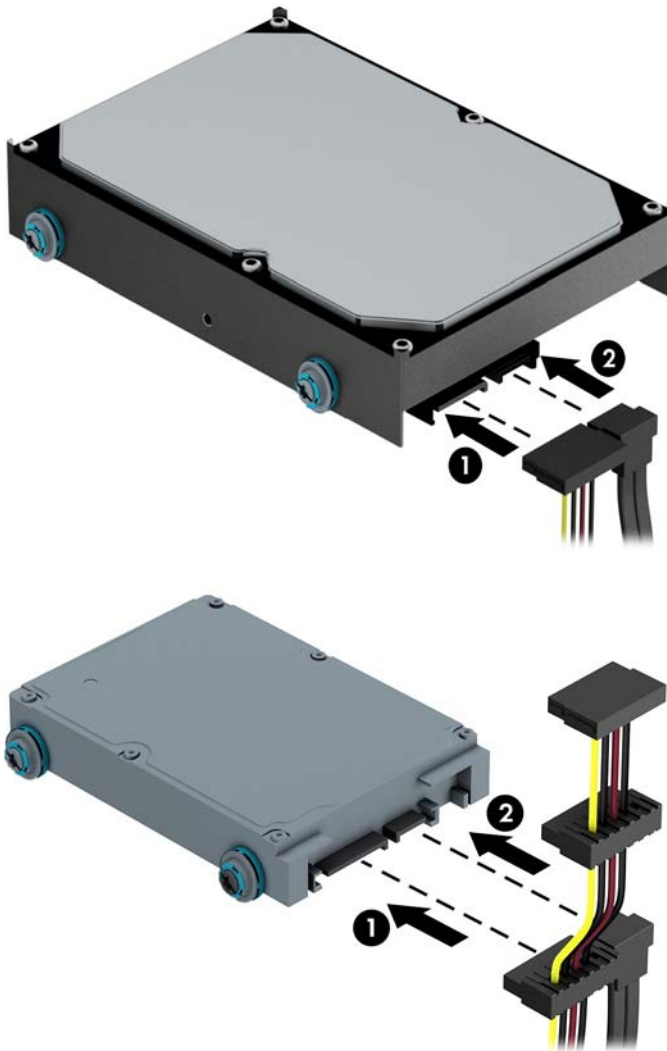
9. If installing a new drive, connect the opposite end of the data cable to the appropriate system board connector.

> **NOTE:** You must connect the primary 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 one of the light blue SATA connectors.

10. Replace the computer access panel.

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

12. 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 page can be used to secure the computer.

Cable lock

Padlock

HP business PC security lock

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

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

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

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

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.

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

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 computer access panel.

6. Remove the security screw from the side of the hard drive bay just behind the front panel.
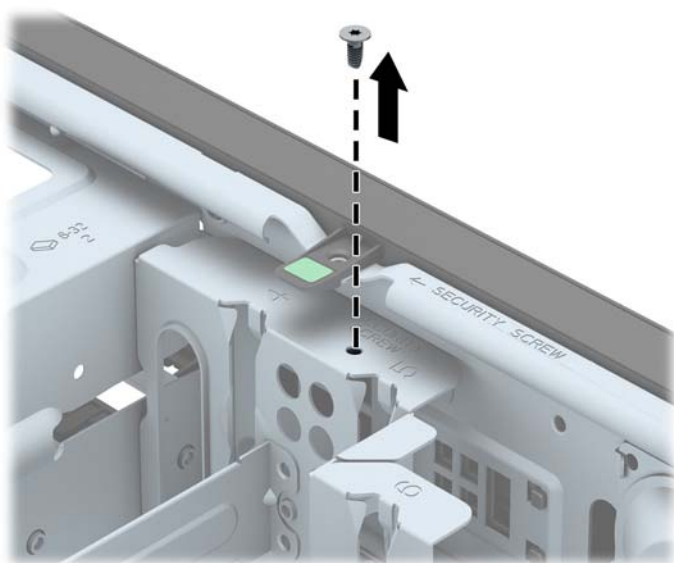
7. Install the security screw through the middle front bezel release tab to secure the front bezel in place.
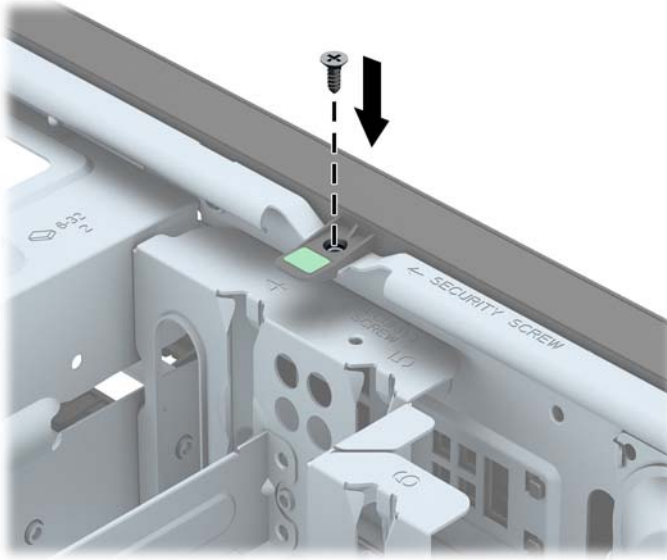
8. Replace the access panel.

9. Reconnect the power cord and turn on the computer.

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

3 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 132 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).

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).

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).

Removing bezel blanks

On some models, there are bezel blanks covering the 3.5-inch and slim optical 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 3.5-inch bezel blank, press inward on the five retaining tabs (1) and pull the blank off the front bezel (2).

   To remove a slim optical drive bezel blank, press the two retaining tabs that hold the bezel blank in place towards the outer right edge of the bezel (3) and slide the bezel blank back and to the right to remove it (4).
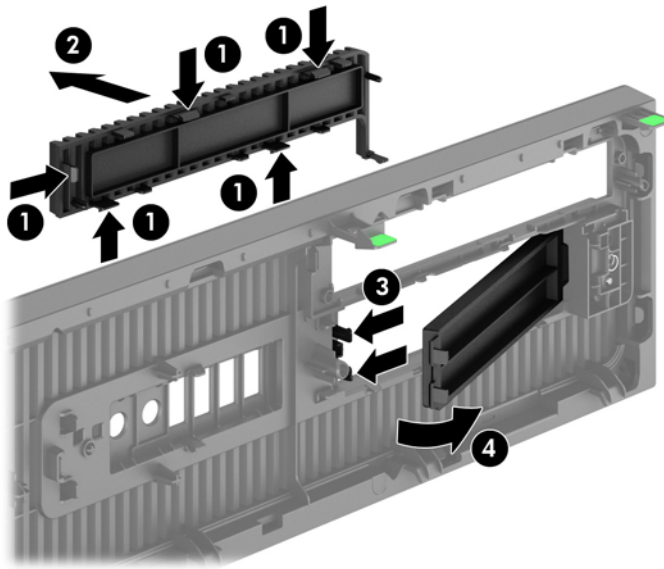
NOTE: After removing the slim optical drive bezel blank and installing a slim optical drive, you can install an optional bezel trim piece (available from HP) that surrounds the front of the slim optical drive.

Replacing the front bezel

Insert the four 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.
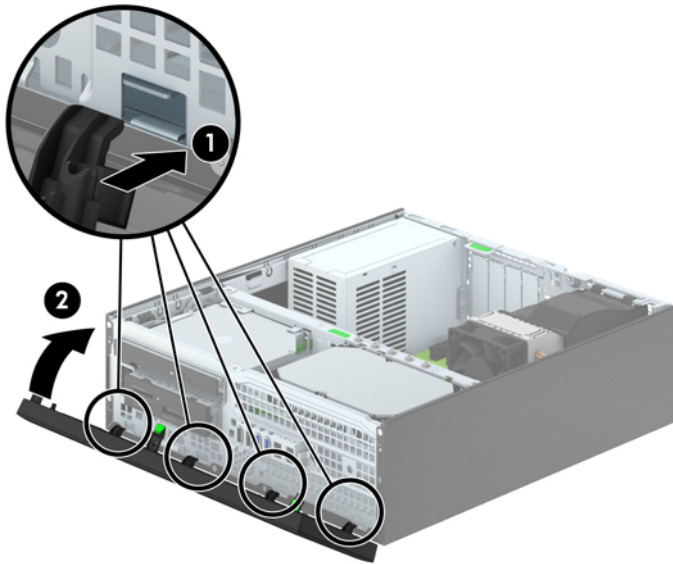
Changing from desktop to tower configuration

The Small Form Factor computer can be used in a tower orientation with an optional tower stand that can be purchased from HP.
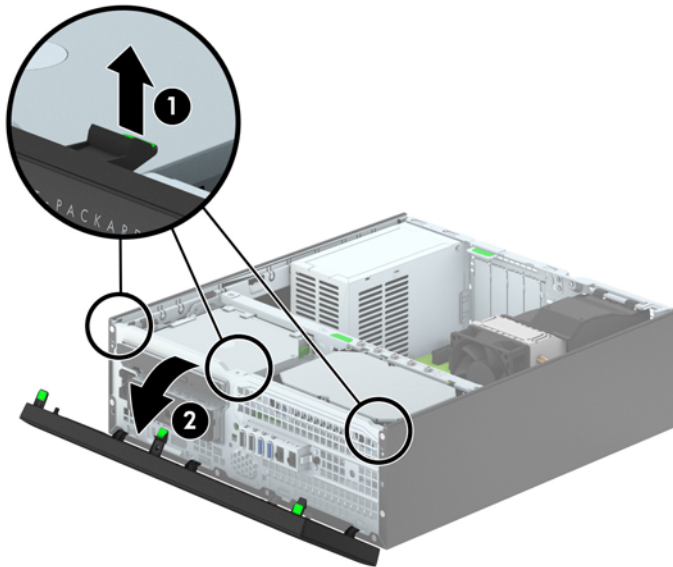
1. Remove/disengage any security devices that prohibit opening the computer.

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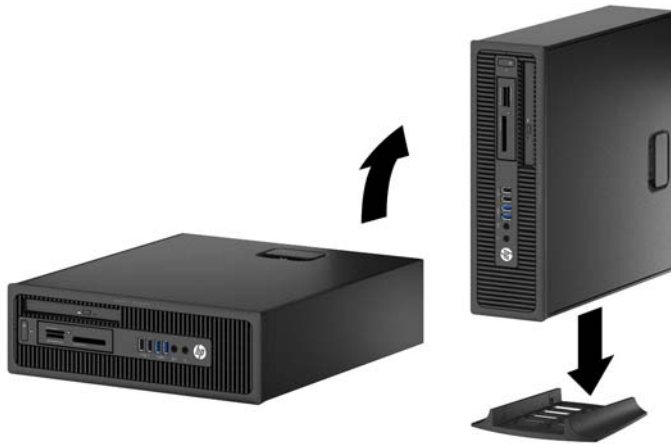
   📝 **NOTE:** To stabilize the computer in a tower orientation, HP recommends the use of the optional tower stand.

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.

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.
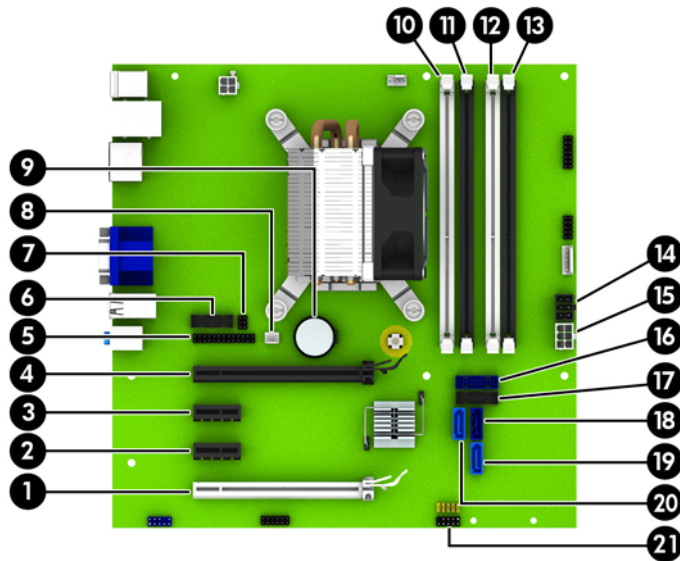
No.	System Board Connector	System Board Label	Color	Component
1	PCI Express x16 downshifted to a x4	X4PCIEXP	white	Expansion Card
2	PCI Express x1	X1PCIEXP2	black	Expansion Card
3	PCI Express x1	X1PCIEXP1	black	Expansion Card
4	PCI Express x16	X16PCIEXP	black	Expansion Card
5	Parallel Port	PAR	black	Parallel Port
6	Serial Port	COMB	black	Serial Port
7	Hood Lock	HLCK	black	Hood Lock
8	Hood Sensor	HSENSE	white	Hood Sensor
9	Battery	BAT	black	Battery
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	SATAPWR0	black	SATA Drives
15	Power	PWR	white	System Board
16	USB 3.0	FRONT USB3.0	blue	Front USB 3.0 Ports
17	USB 3.0	MEDIA3.0	black	USB 3.0 Device, such as a USB 3.0 Media Card Reader
18	SATA 3.0	SATA0	dark blue	Primary Hard Drive

No.	System Board Connector	System Board Label	Color	Component
19	SATA 3.0	SATA1	light blue	Any SATA Device other than the Primary Hard Drive
20	SATA 3.0	SATA2	light blue	Any SATA Device other than the Primary Hard Drive
21	USB 2.0	MEDIA	black	USB 2.0 Device, such as a USB 2.0 Media Card Reader

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

DDR3-SDRAM DIMMs

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

- industry-standard 240-pin

- unbuffered non-ECC PC3-12800 DDR3-1600 MHz-compliant

- 1.35 volt or 1.5 volt DDR3/DDR3L-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.

NOTE: Single channel and unbalanced dual channel memory configurations will result in inferior graphics performance.

- 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

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 132.

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. Open both latches of the memory module socket (1), and insert the memory module into the socket (2).
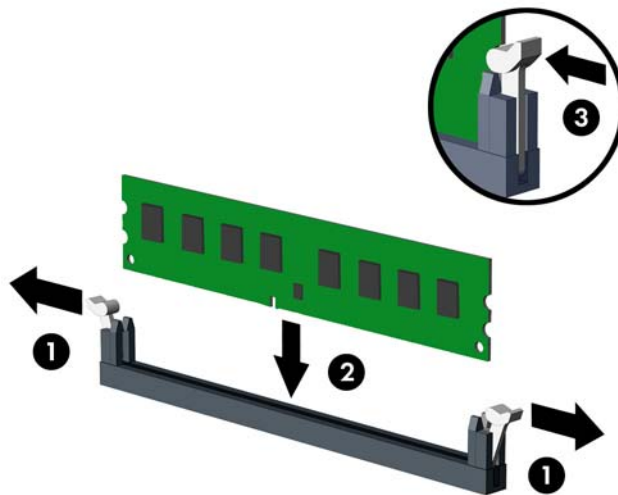
📝 **NOTE:** A memory module can be installed in only one way. Match the notch on the module with the tab on the memory socket.

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 65 for more information.

8. 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).

9. Repeat steps 7 and 8 to install any additional modules.

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.

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 two PCI Express x1 expansion slots, one PCI Express x16 expansion slot, and one PCI Express x16 expansion slot that is downshifted to a x4 slot.

NOTE: The 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 slot covers by lifting the green tab on the latch and rotating the latch to the open position.
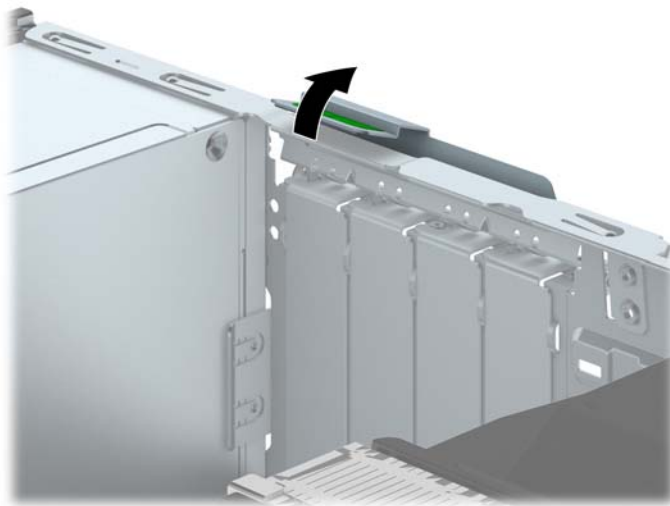
9. Before installing an expansion card, remove the expansion slot cover or the existing expansion card.

NOTE: Before removing an installed expansion card, disconnect any cables that may be attached to the expansion card.
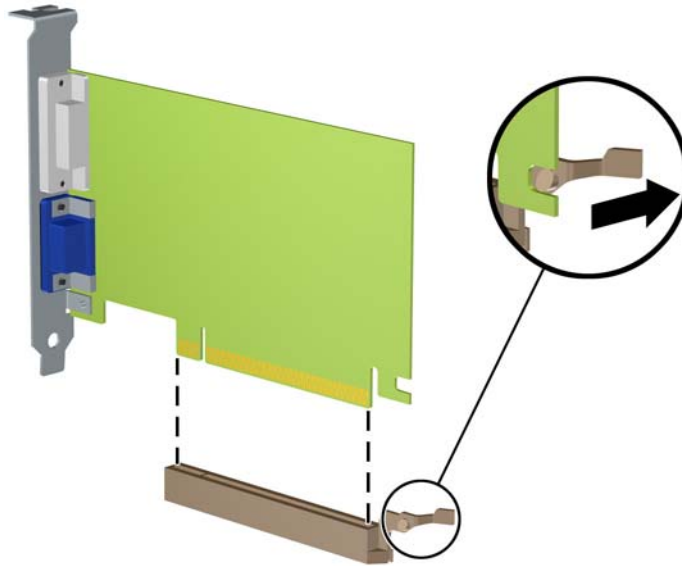
a. If you are installing an expansion card in a vacant socket, remove the appropriate expansion slot cover on the back of the chassis. Pull the slot cover straight up then away from the inside of the chassis.
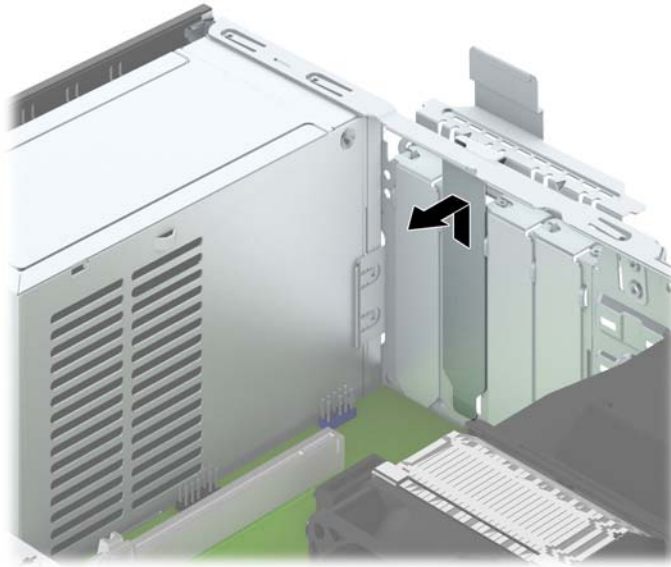
b. If you are removing a PCI Express x1 card, hold the card at each end, and carefully rock it back and forth until the connectors pull free from the socket. Pull the expansion card straight up from the socket (1) then away from the inside of the chassis to release it from the chassis frame (2). Be sure not to scrape the card against the other components.
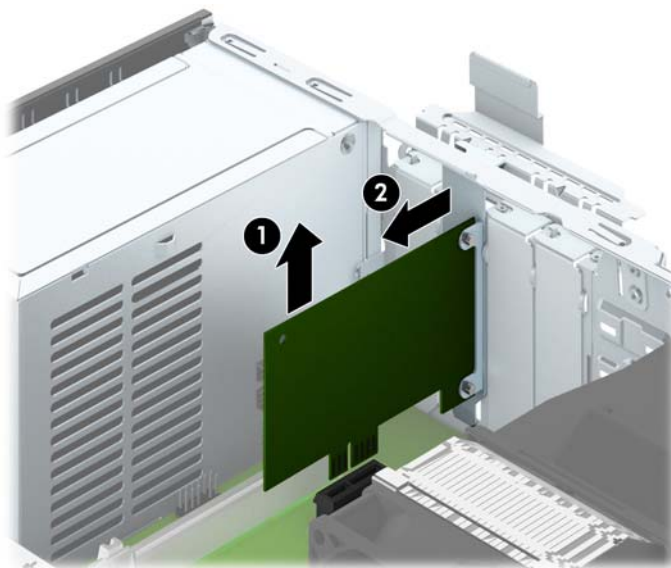
c. If you are removing a PCI Express x16 card, pull the retention arm on the back of the expansion socket away from the card and carefully rock the card back and forth until the connectors pull free from the socket. Pull the expansion card straight up from the socket then away from the inside of the chassis to release it from the chassis frame. Be sure not to scrape the card against the other components.

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.

⚠ **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.

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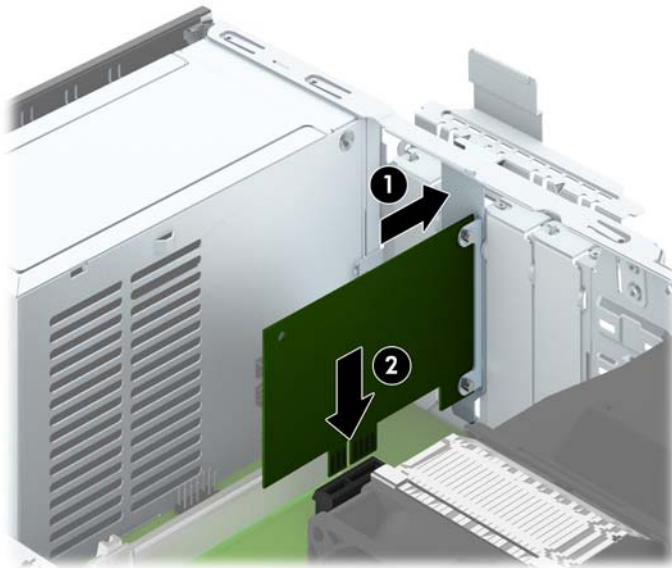
NOTE: When installing an expansion card, press firmly on the card so that the whole connector seats properly in the expansion card slot.

13. Rotate the slot cover retention latch back in place to secure the expansion card.
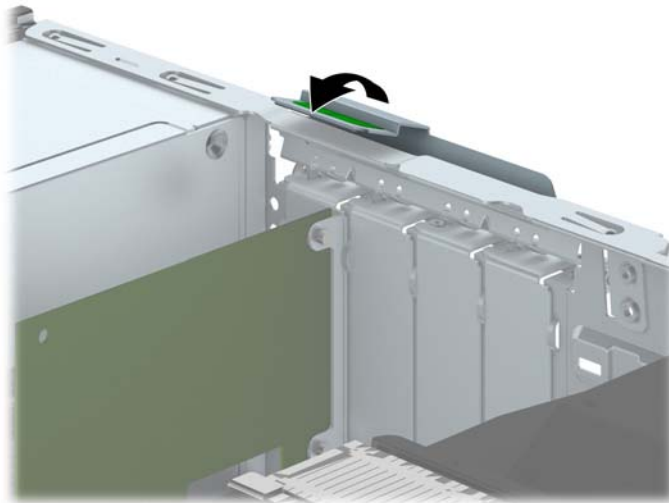
14. Connect external cables to the installed card, if needed. Connect internal cables to the system board, if needed.

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
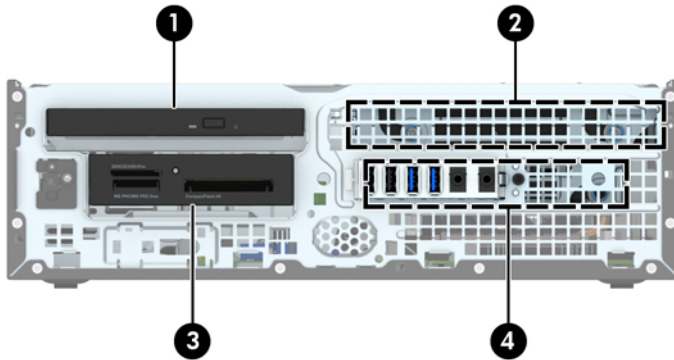
1	Slim optical drive bay
2	3.5-inch internal hard drive bay
3	3.5-inch drive bay for optional drives (media card reader shown)
4	2.5-inch internal hard drive bay

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.

- Connect secondary hard drives and optical drives to one of the light blue SATA connectors on the system board (labeled SATA1 and SATA2).

- Connect a media card reader USB 3.0 cable to the USB connector on the system board labeled MEDIA3.0.

- The power cable for the drives has two branches coming off the system board connector. The first branch is a dual-headed cable with the first connector (four-wire) routed to the 3.5-inch optional drive bay and the second connector (two-wire) routed to the slim optical drive bay. The second branch is a dual-headed cable with the first connector routed to the 3.5-inch hard drive bay and the second connector routed to the 2.5-inch hard drive bay.

- You must install guide screws to ensure the drive will line up correctly in the drive cage and lock in place. HP has provided four extra 6-32 standard guide screws installed on the top of the drive bay. The 6-32 standard guide screws are required for a media card reader or a secondary hard drive installed in the 3.5-inch optional drive bay. M3 isolation mounting guide screws for 2.5-inch hard drives are not provided. If you are replacing a drive, remove the guide screws from the old drive and install them in the new drive.

There are a total of five extra silver 6-32 standard screws. One is used for bezel security (1) (see Front bezel security on page 96 for more information). The other four are used as guide screws for a media card reader or a secondary hard drive in the 3.5-inch optional drive bay (2).

⚠ **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 132.

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."

Removing a 3.5-inch device

⚠ **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 access panel and front bezel.

7. Rotate the drive cage to its upright position.
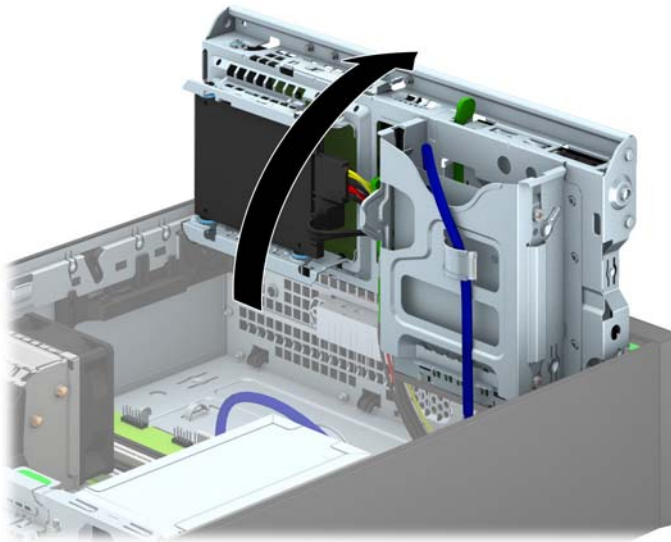
8. Disconnect the drive cables from the rear of the drive, or, if you are removing a media card reader, disconnect the USB cable from the system board as indicated in the following illustration.

9. Press inward on the release lever at the rear of the drive (1) and slide the drive out of the rear of the drive bay (2).

Installing a 3.5-inch device

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. 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 61 for more information.

8. Install 6-32 guide screws in the holes on each side of the drive.

   NOTE: HP has supplied four extra 6-32 guide screws on top of the drive cage. Refer to Installing and removing drives on page 73 for an illustration of the extra guide screws location.

   When replacing a drive, transfer the four 6-32 guide screws from the old drive to the new one.
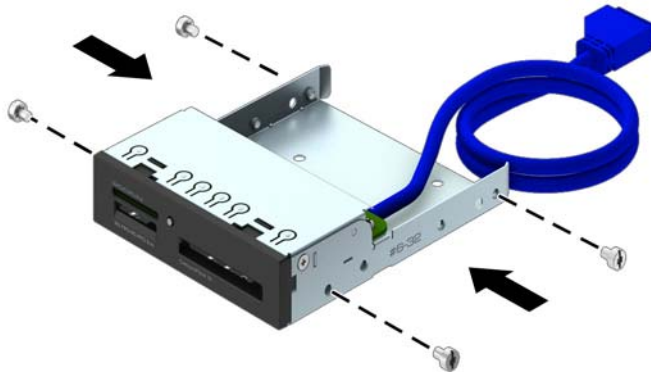
9. Rotate the drive cage to its upright position.
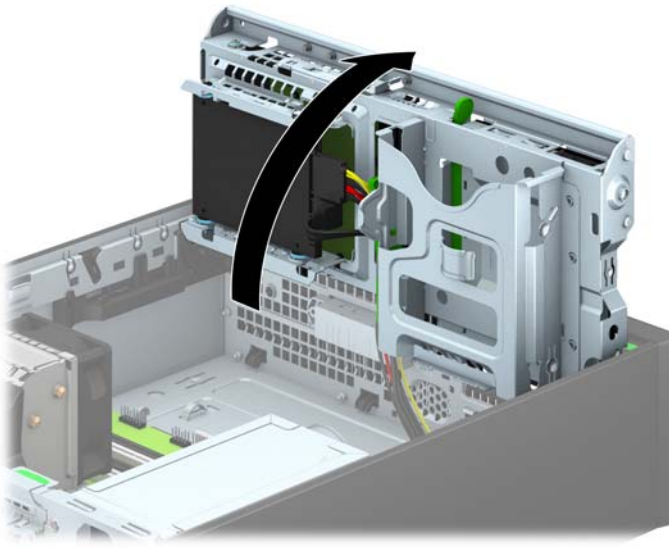
10. Slide the drive into the drive bay, making sure to align the guide screws with the guide slots, until the drive snaps into place.

11. If installing a USB 3.0 media card reader, connect the USB cable from the media card reader to the USB 3.0 connector on the system board labeled MEDIA3.0.

NOTE: Refer to System board connections on page 64 for an illustration of the system board drive connectors.

12. 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.
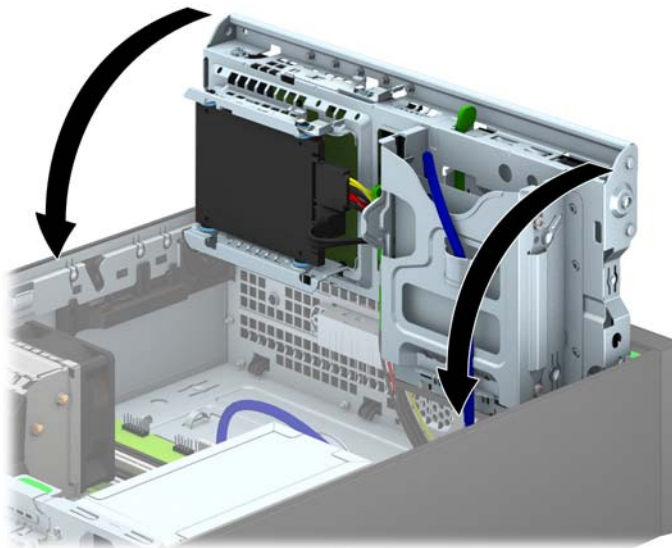
13. Replace the front bezel.

14. Replace the computer access panel.

15. If the computer was on a stand, replace the stand.

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

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

Removing a slim 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.

6. Remove the computer access panel.

7. Disconnect the power cable (1) and data cable (2) from the rear of the optical drive, push the green release latch on the right rear side of the drive toward the center of the drive (3), then slide the drive forward and out of the bay through the front bezel (4).

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

Installing a slim 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.

6. Remove the computer access panel.

7. Remove the front bezel if you are installing a drive in a bay covered by a bezel blank, then remove the bezel blank. See Removing bezel blanks on page 61 for more information.

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

   a. Peel the backing off the adhesive on the release latch.

   b. 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.

   c. Insert the pin at the front of the optical drive into the hole at the end of the release latch, and press firmly.

   d. Insert the second pin, and press the entire release latch firmly to fasten the latch securely to the optical drive.
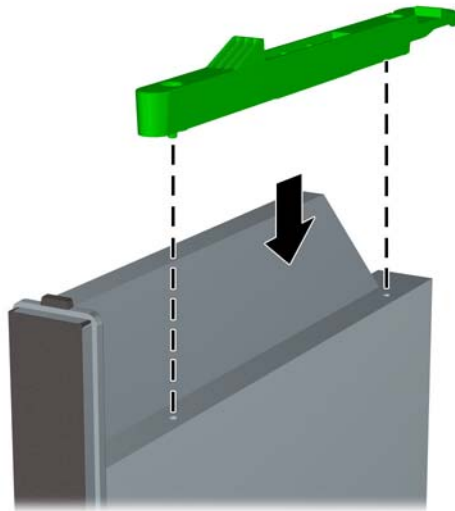
9. Slide the optical drive through the front bezel all the way into the bay so that it locks in place (1), then connect the power cable (2) and data cable (3) to the rear of the drive.
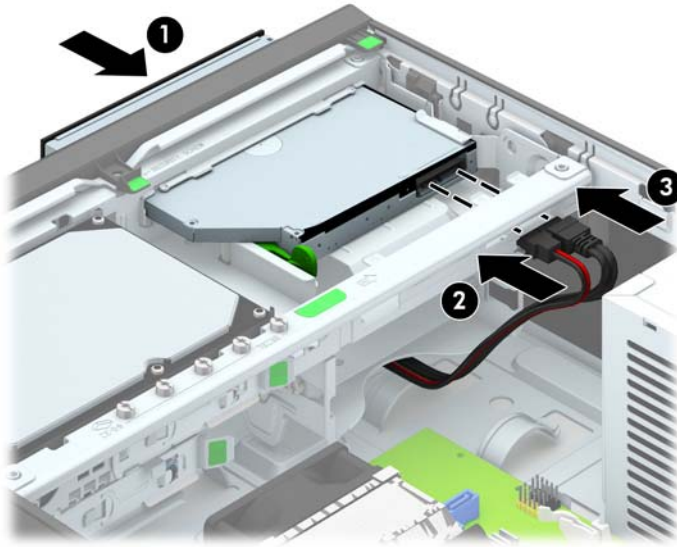
10. Connect the opposite end of the data cable to one of the light blue SATA connectors on the system board.

    NOTE: Refer to System board connections on page 64 for an illustration of the system board drive connectors.

11. Replace the front bezel if it was removed.

    NOTE: An optional bezel trim piece that surrounds the front of the optical drive is available from HP. Install the bezel trim piece in the front bezel before installing the front bezel.

12. Replace the computer access panel.

13. If the computer was on a stand, replace the stand.

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

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

Removing and replacing a 3.5-inch hard drive

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

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.

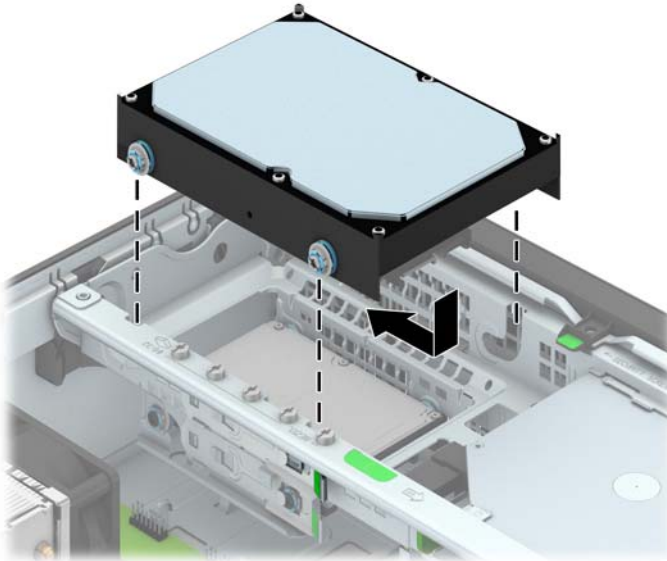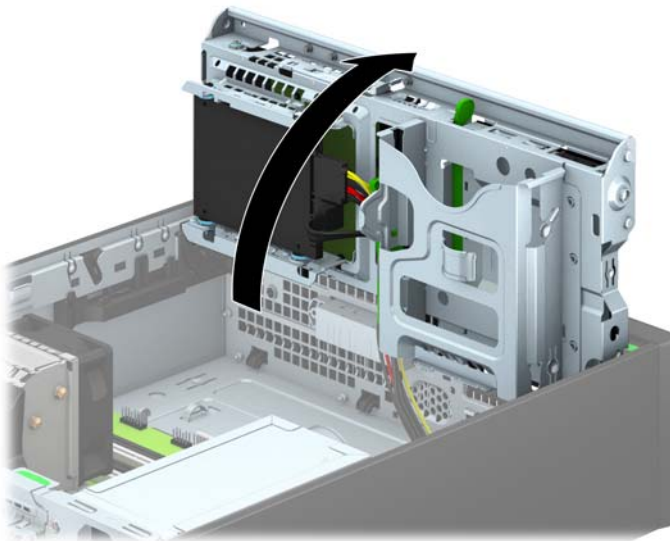**7.** Disconnect the power cable (1) and data cable (2) from the back of the hard drive.

8. Pull the release lever next to the rear of the hard drive outward (1). While pulling the release lever out, slide the drive back until it stops, then lift the drive up and out of the bay (2).
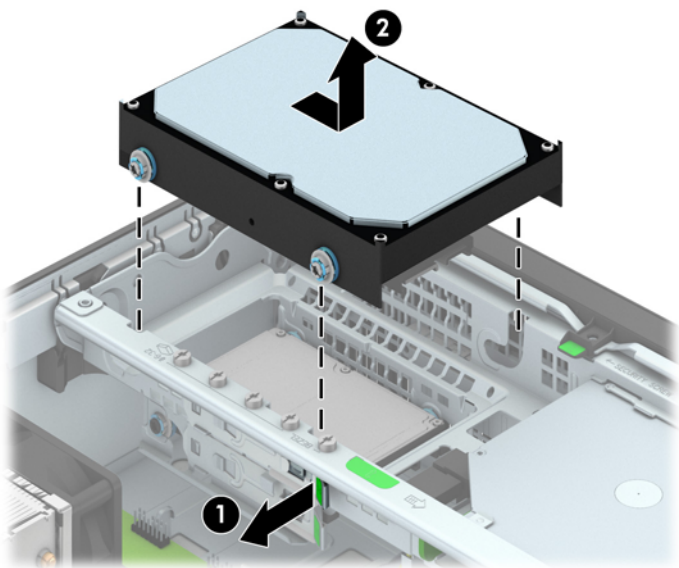
9. To install a hard drive, you must transfer the silver and blue isolation mounting guide screws from the old hard drive to the new hard drive.
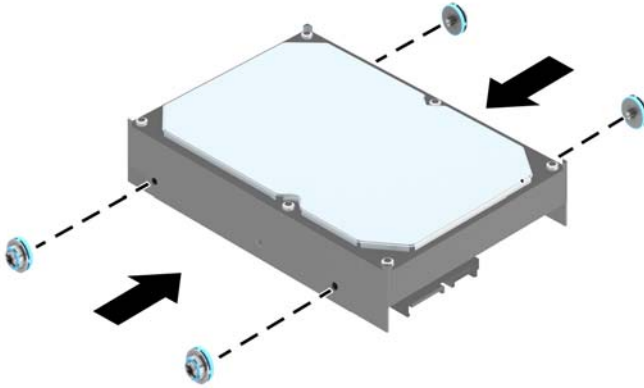
10. Align the guide screws with the slots on the chassis drive cage, press the hard drive down into the bay, then slide it forward until it stops and locks in place.

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

NOTE: The data cable for the primary hard drive must be connected to the dark blue connector labeled SATA0 on the system board to avoid any hard drive performance problems.
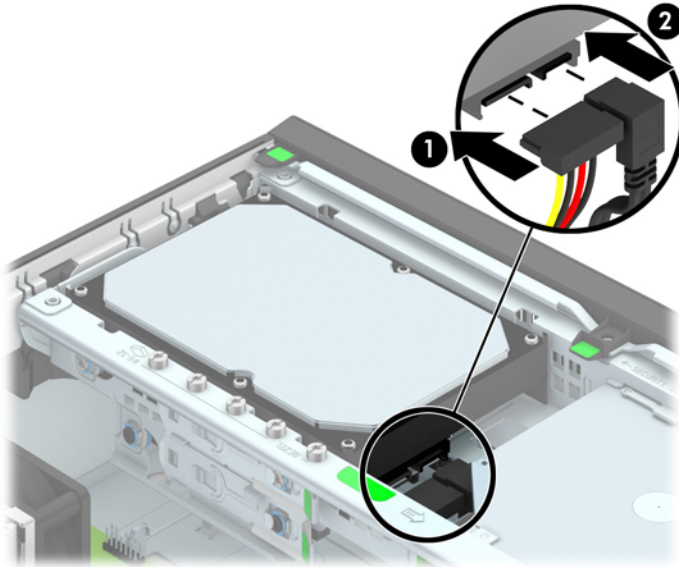
12. Replace the access panel.

13. If the computer was on a stand, replace the stand.

14. Reconnect the power cord and turn on the computer.

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

Removing a 2.5-inch 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 to its upright position.

8. Disconnect the power cable (1) and data cable (2) from the back of the hard drive.
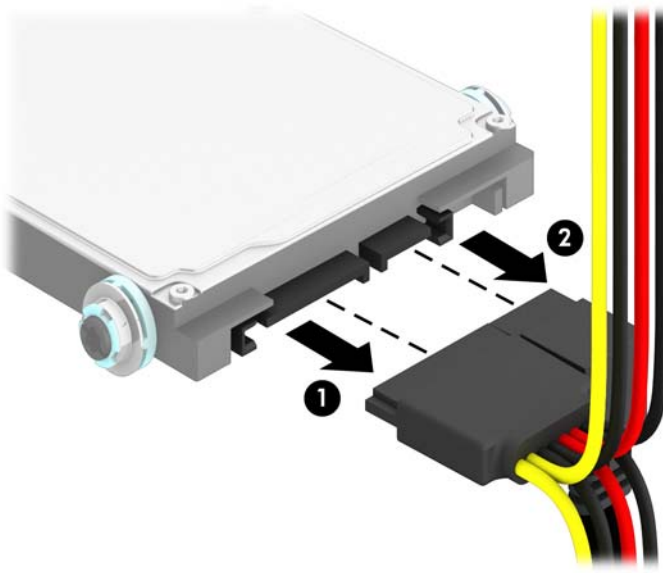
9. Pull outward on the release lever at the rear of the drive (1) then slide the drive back until it stops and pull it down and out of the drive bay (2).

Installing a 2.5-inch 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. Install four black and blue M3 isolation mounting guide screws (two on each side of the drive).

   📝 **NOTE:** M3 metric isolation mounting guide screws can be purchased from HP.

   When replacing a drive, transfer the four M3 isolation mounting guide screws from the old drive to the new one.
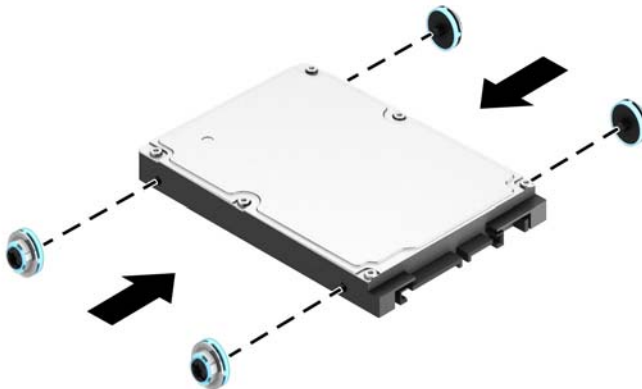
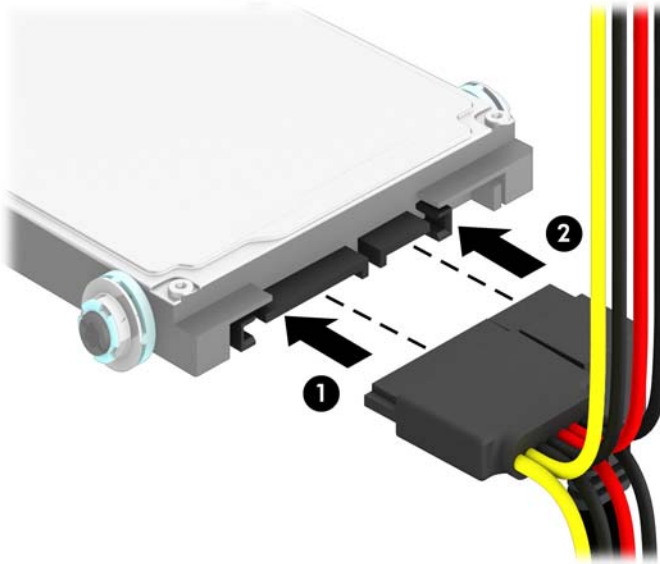**8.** Rotate the drive cage to its upright position.
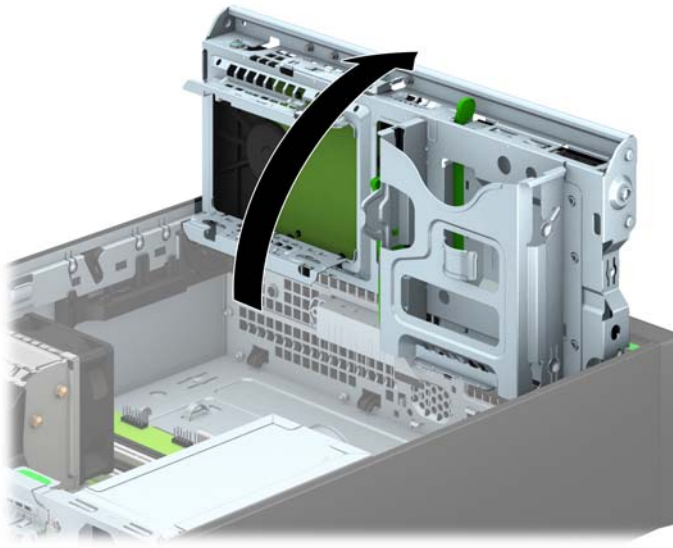
9. Align the guide screws on the drive with the J-slots on the sides of the drive bay. Press the drive up into the drive bay then slide it forward until it locks in place.
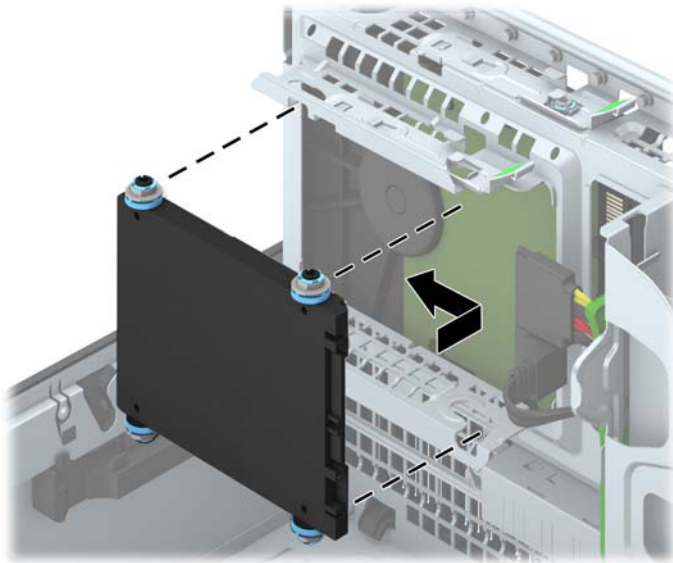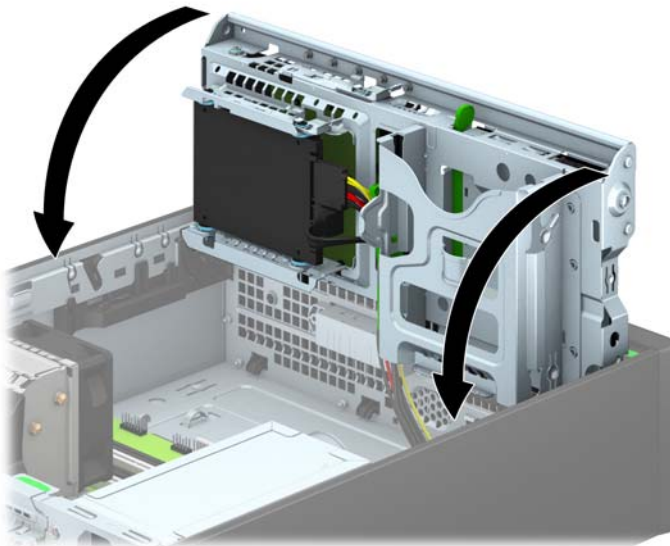
10. Connect the power cable (1) and data cable (2) to the back of the hard drive.

   NOTE: If the 2.5-inch hard drive is the primary drive, connect the data cable to the dark blue SATA connector labeled SATA0 on the system board. If it is a secondary drive, connect the data cable to one of the light blue SATA connectors on the system board.

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

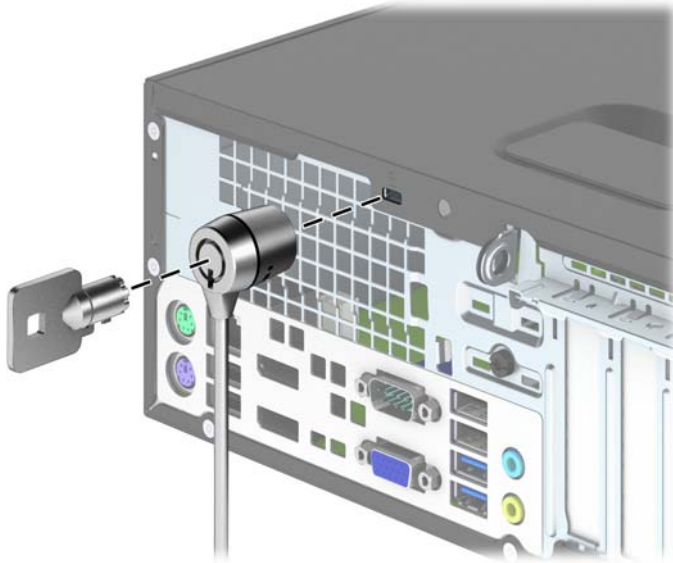   **CAUTION:** Be careful not to pinch any cables or wires when rotating the drive cage down.

12. Replace the computer access panel.

13. If the computer was on a stand, replace the stand.

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

15. 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.
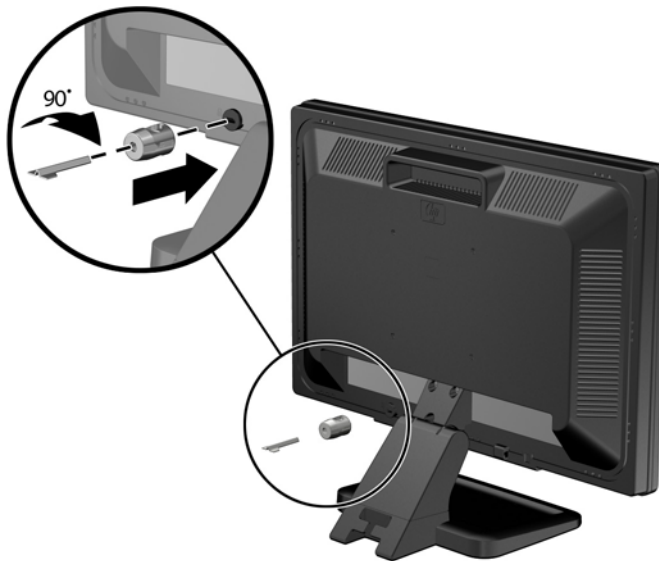
Cable lock

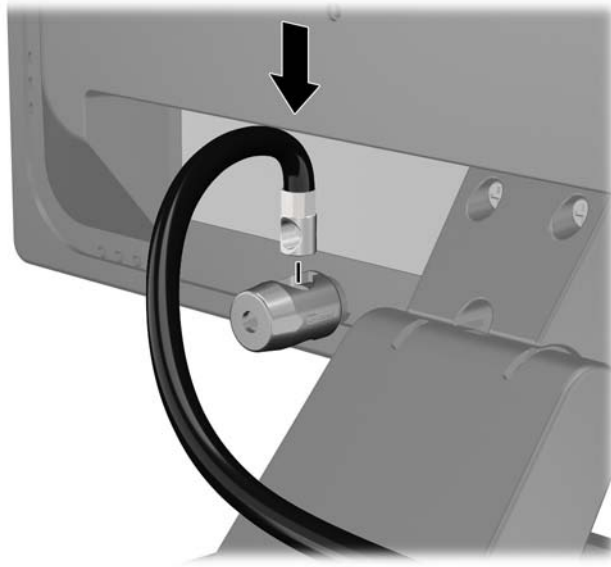## Padlock

HP business PC security lock

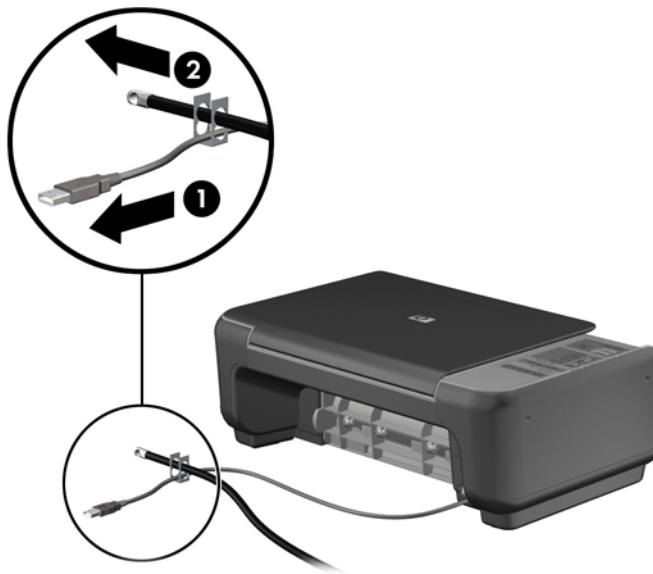1. Fasten the security cable by looping it around a stationary object.

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.

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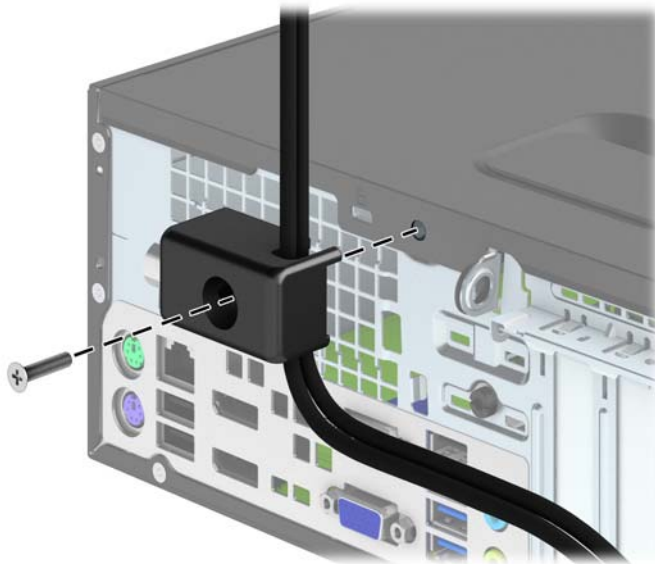

4. Use the bracket provided in the kit to secure other peripheral devices by laying the device cable across the center of the bracket (1) and inserting the security cable through one of the two holes in the bracket (2). Use the hole in the bracket that best secures the peripheral device cable.
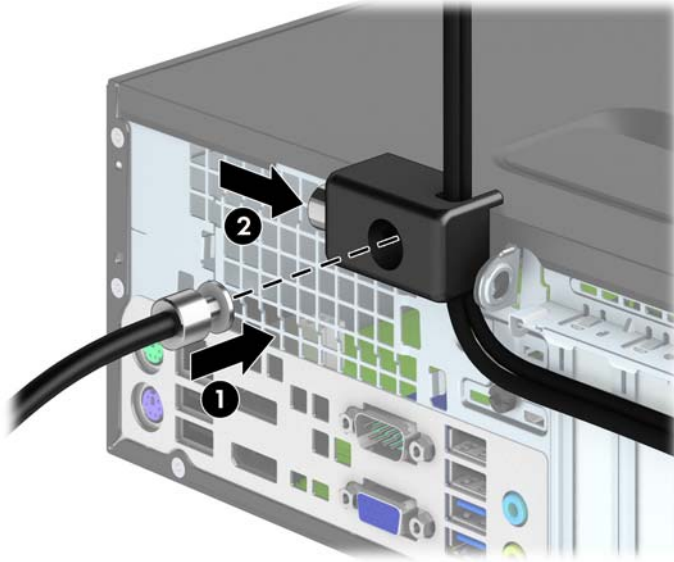
5. Thread the keyboard and mouse cables through the computer chassis lock.
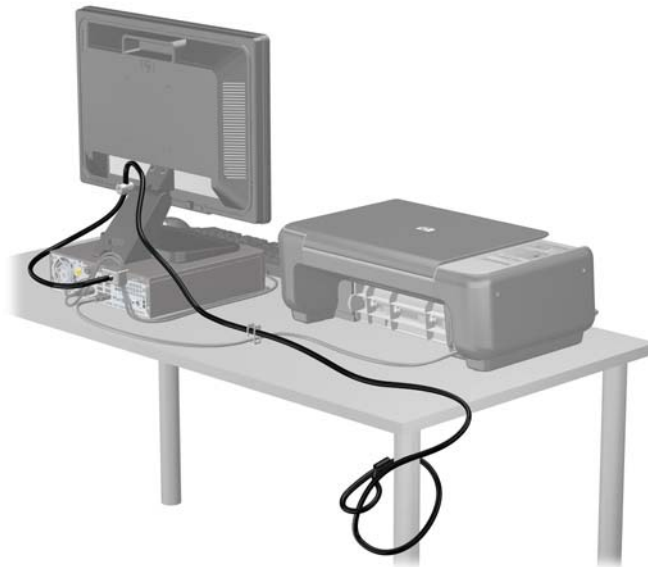

6. Screw the lock to the chassis in the thumbscrew hole using the screw provided.

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.

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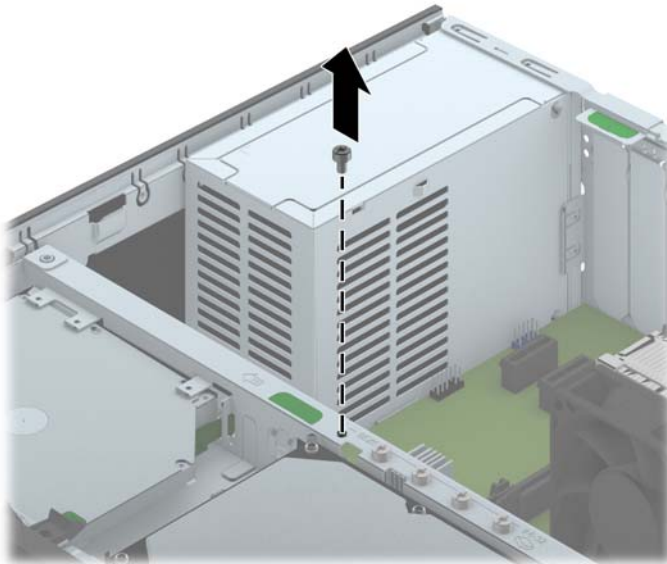
Front bezel security

The front bezel can be locked in place by installing a security screw provided by HP. To install the security screw:
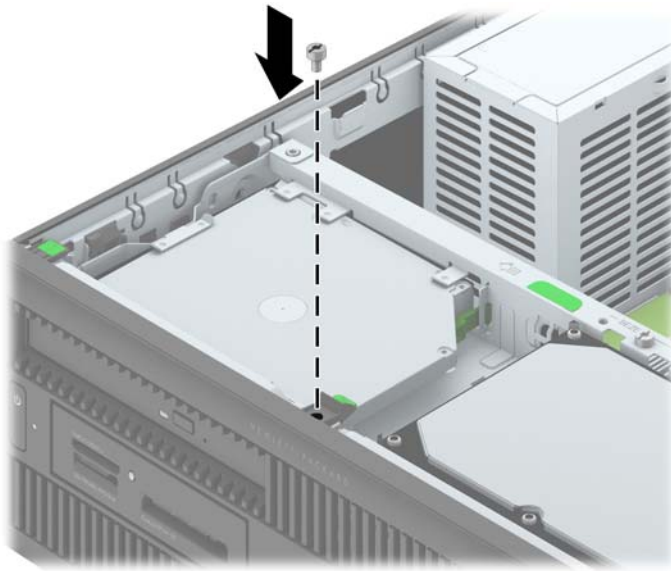
1. Remove/disengage any security devices that prohibit opening the computer.

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 computer access panel.

7. Remove one of the five silver 6-32 standard screws located on top of the drive cage.

8. Install the security screw through the middle front bezel release tab to secure the front bezel in place.

9. Replace the access panel.

10. If the computer was on a stand, replace the stand.

11. Reconnect the power cord and turn on the computer.

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

4 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 132 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.

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. Plug the female end of the power cord into the power supply brick (1).

2. Connect the other end of the power cord to an electrical outlet (2).

3. Connect the round end of the power supply cord to the power supply connector on the rear of the computer (3).

4. Insert the power cord retainer clip into a slot on the air vent to prevent the cord from becoming disconnected from the computer (4).

5. Bundle any excess power cord with the supplied strap (5).
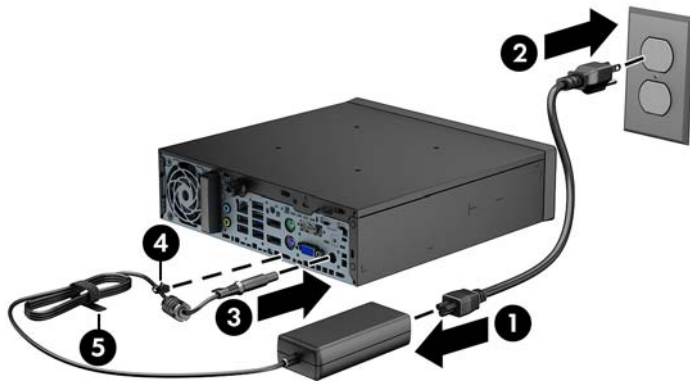
⚠ **CAUTION:** Failure to secure the power cable with the retainer clip may result in the power cord becoming disconnected and loss of data.

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).

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).
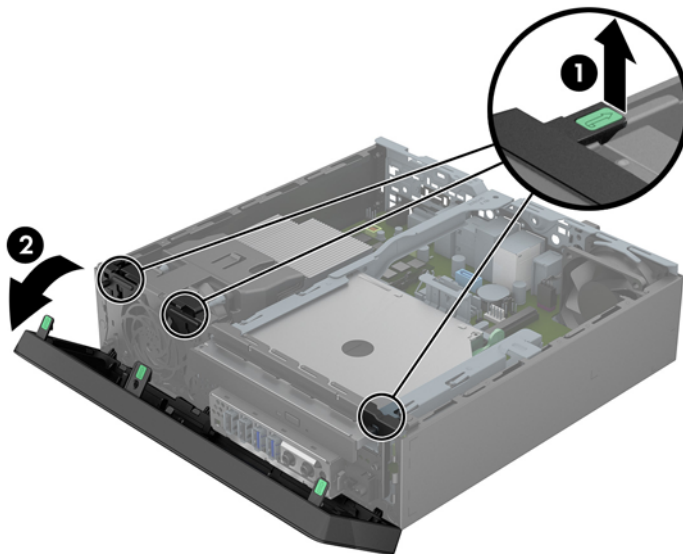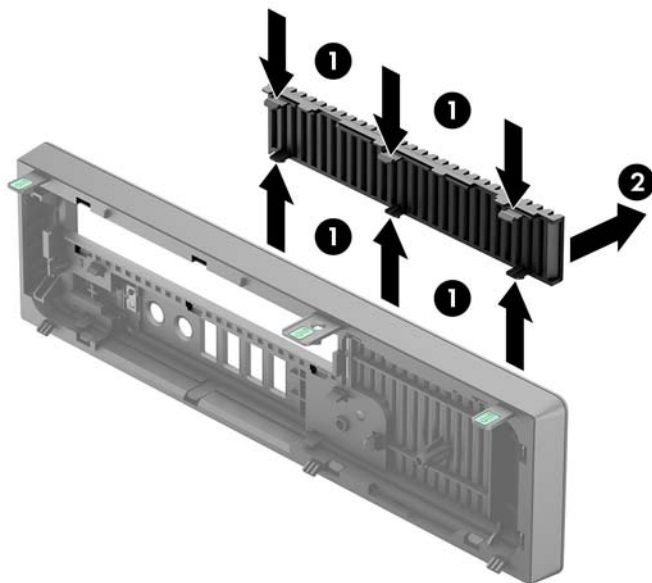
Removing the front bezel

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).

Removing a bezel blank

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

1. Remove the access panel and front bezel.

2. To remove the bezel blank, press inward on the six retaining tabs (1) and pull the blank off the front bezel (2).

> **NOTE:** After removing the slim optical drive bezel blank and installing a slim optical drive, you can install an optional bezel trim piece (available from HP) that surrounds the front of the slim optical drive.

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.
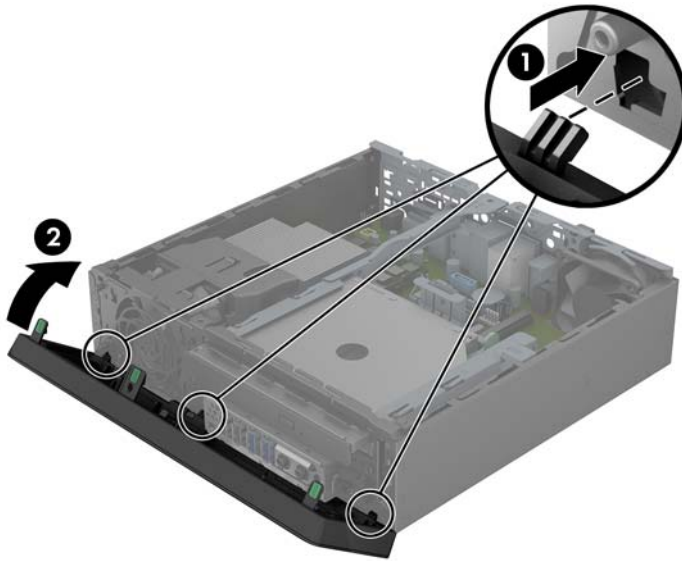
Changing from desktop to tower configuration

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.

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.

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

NOTE: An optional Quick Release mounting bracket is available from HP for mounting the computer to a wall, desk, or swing arm. When the mounting bracket is used, do not install the computer with the I/O ports oriented towards the ground.

System board connections

Refer to the following illustration and table to identify the system board connectors.
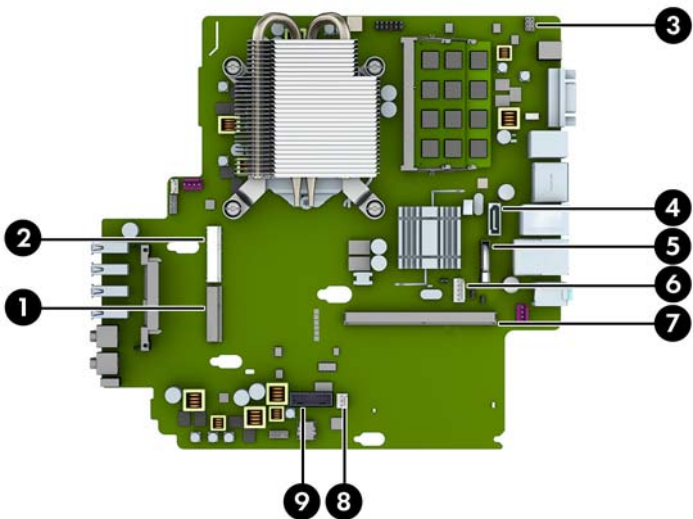
No.	System Board Connector	System Board Label	Color	Component
1	Mini PCI Express x1	X1PCIEXP1	black	Expansion Card (for example, WLAN card)
2	Mini-SATA	mSATA	white	Ultra-Small SSD
3	Hood Lock	HLOCK	black	Hood Lock
4	SATA 3.0	SATA1	light blue	Optical Drive
5	Battery	BAT	black	Battery
6	Power	SATA PWR1	white	Optical Drive
7	Mobile PCI Express Module	MXM	black	Graphics Card
8	Hood Sensor	HSENSE	white	Hood Sensor
9	USB 3.0	MEDIA 3.0	black	SD Media Card Reader

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 16-GB of memory.

DDR3-SDRAM SODIMMs

For proper system operation, the SODIMMs must be:

- industry-standard 204-pin

- unbuffered non-ECC PC3-12800 DDR3-1600 MHz-compliant

- 1.35 volt or 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

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

Populating SODIMM sockets

There are two SODIMM sockets on the system board, with one socket per channel. The sockets are labeled DIMM1 and DIMM3. The DIMM1 socket operates in memory channel B. The DIMM3 socket operates in memory channel A.
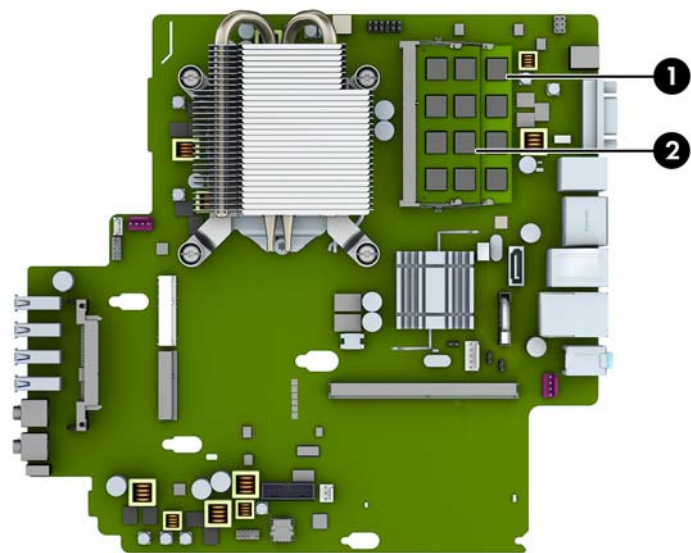
Item	Description	System Board Label	Socket Color
1	SODIMM1 socket, Channel B	DIMM1	Black
2	SODIMM3 socket, Channel A	DIMM3	Black

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

⚠ **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 132.

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 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).

NOTE: If a solenoid hood lock is installed in the computer, it may be necessary to remove the lock before removing or installing a SODIMM.
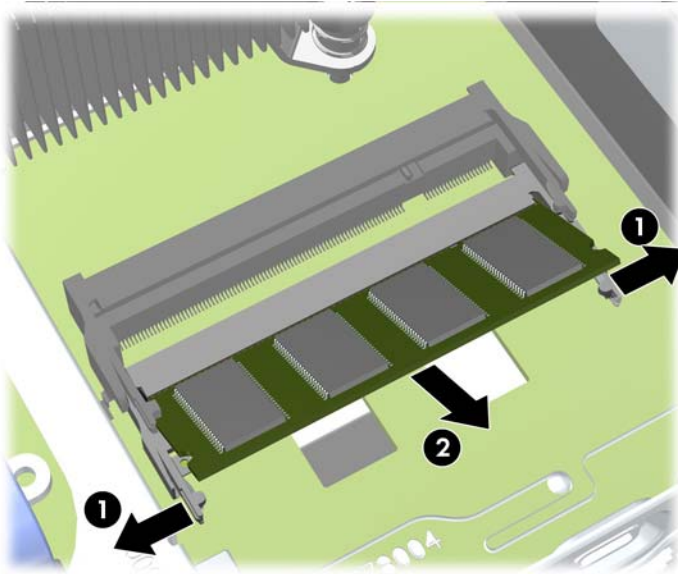
9. Slide the new SODIMM into the socket at approximately a 30° angle (1) then press the SODIMM down (2) so that the latches lock it in place.
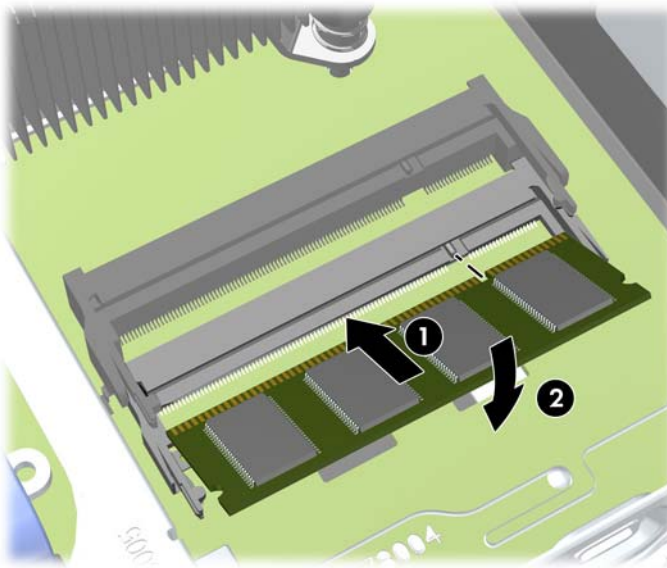
NOTE: A memory module can be installed in only one way. Match the notch on the module with the tab on the memory socket.

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 slim 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.

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.
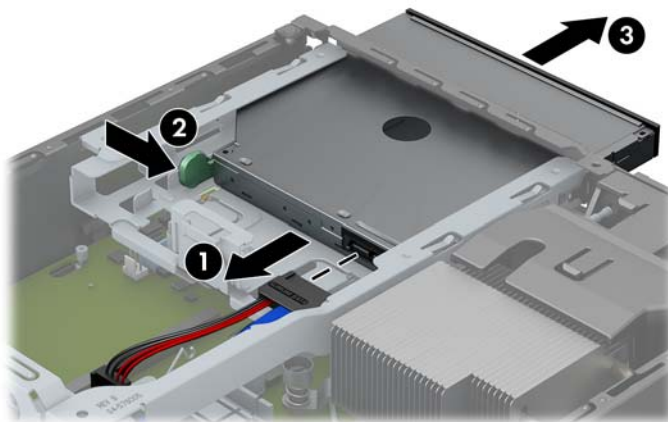
Preparing the new optical drive

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.
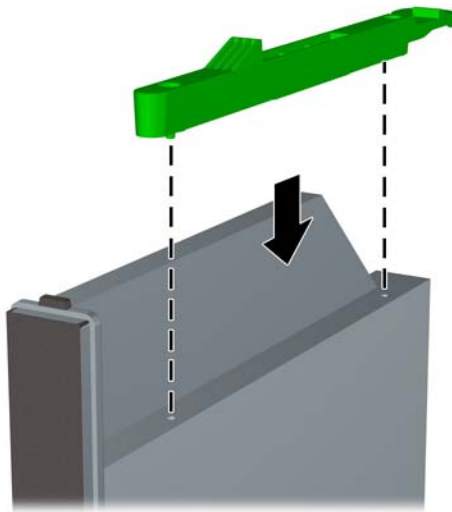
Installing the new optical drive

> **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, the front bezel, and the bezel blank covering the opening of the bay before proceeding. Follow the procedures in Removing the computer access panel on page 100 and Removing a bezel blank on page 103.

1. Follow the instructions for removing the optical drive if one was installed. Refer to Removing the optical drive on page 111.

2. Attach the release latch to the new optical drive. Refer to Preparing the new optical drive on page 112.

3. 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).
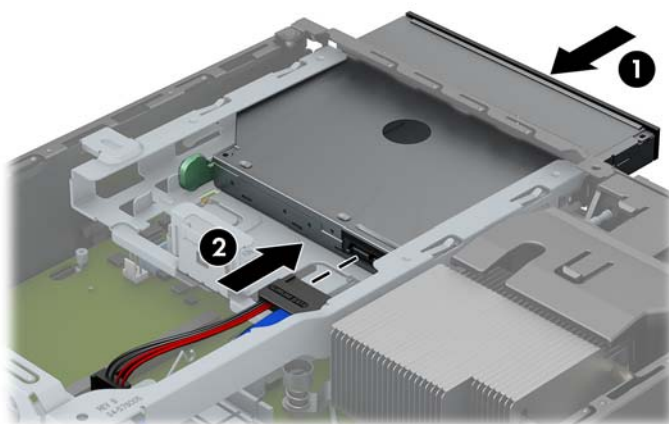
4. Replace the computer access panel.

5. If the computer was on a stand, replace the stand.

6. Reconnect the power cord and turn on the computer.

7. 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 111 for instructions.

8. Press in the release latch on the left side of the hard drive carrier (1) then rotate the carrier handle up (2).
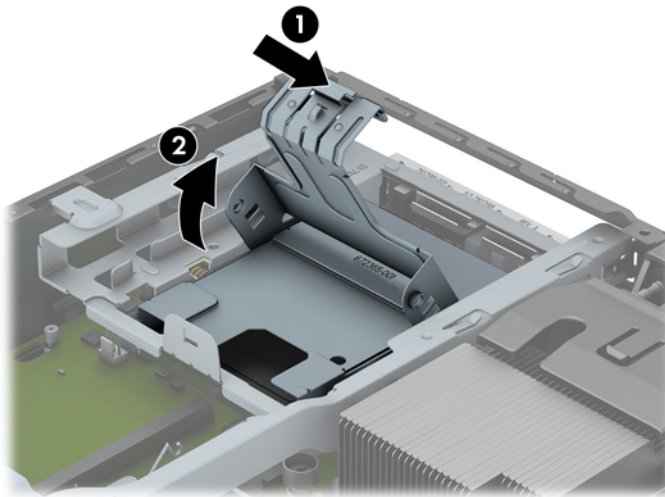
9. Lift the hard drive carrier straight up and out of the chassis.
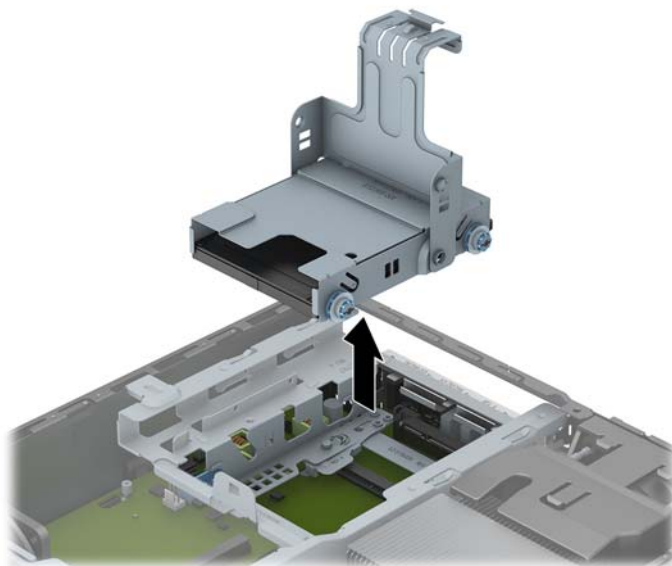
10. Remove the four guide screws from the sides of the hard drive carrier.
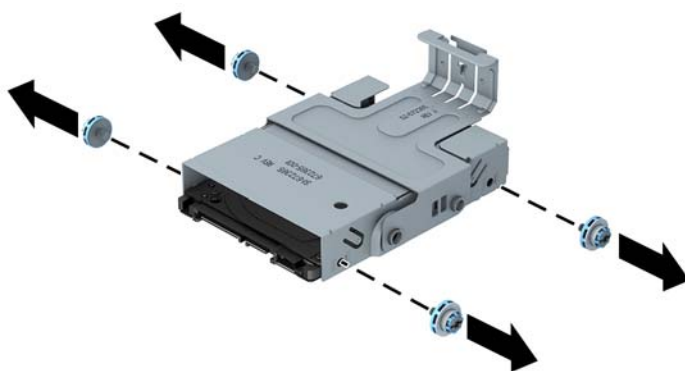
11. Lift the hard drive up to the top of the carrier (1) and slide the drive out of the carrier (2).

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.
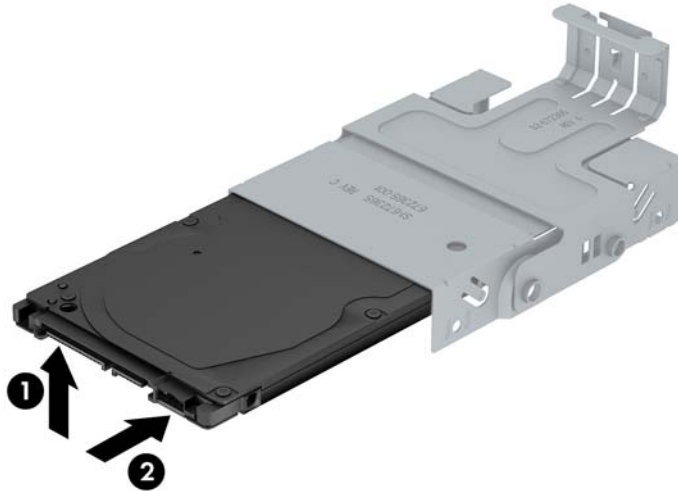
13. Set the hard drive down into the bottom of the carrier (1), then replace the four guide screws on the sides of the carrier to secure the drive in the carrier (2).
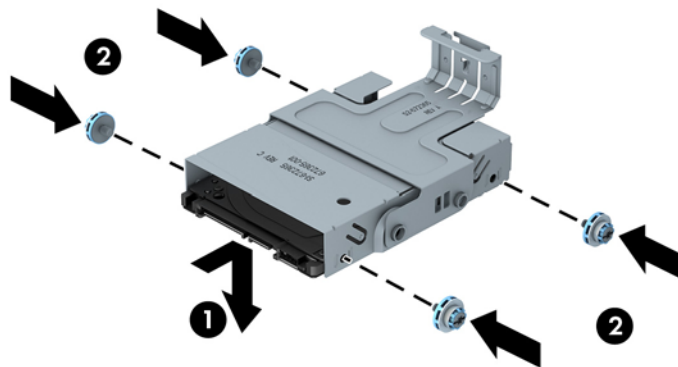
14. To place the hard drive carrier back in the chassis, align the guide screws with the slots on the drive bay, drop the carrier straight down into the drive bay (1), and press the handle on the carrier all the way down (2) so that the drive is properly seated and locked in place.
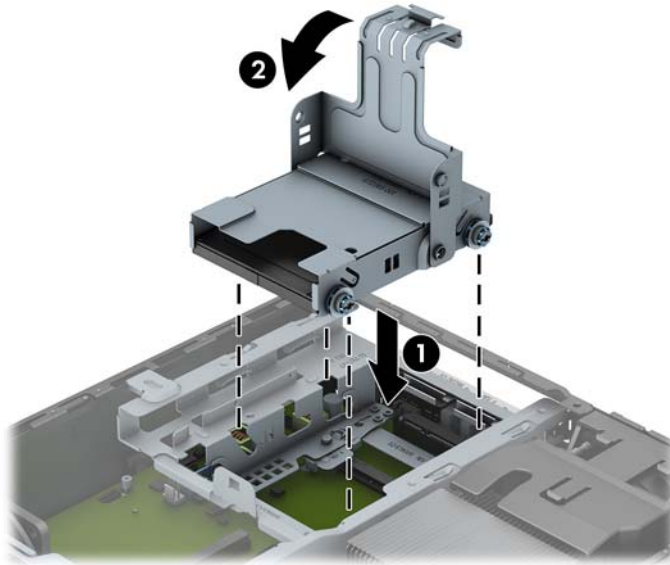
15. Replace the optical drive and reconnect the cable on the back of the optical drive.

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).
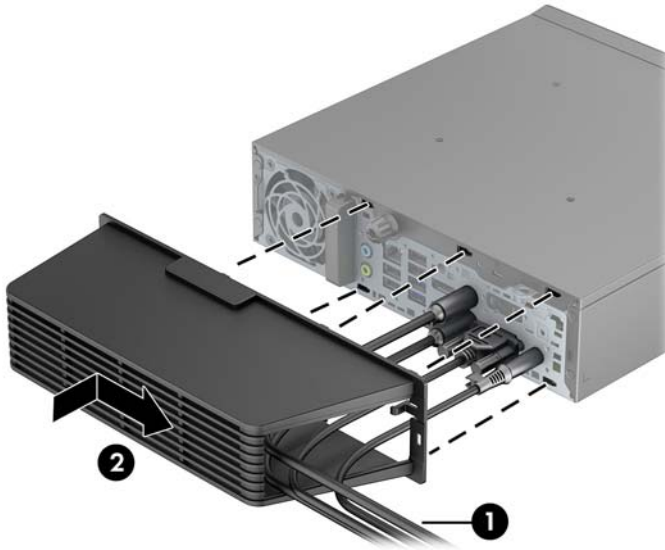
NOTE: For security purposes, you can install an optional cable lock to the chassis that locks the port cover and secures the computer. See Installing a security lock on page 119.

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).
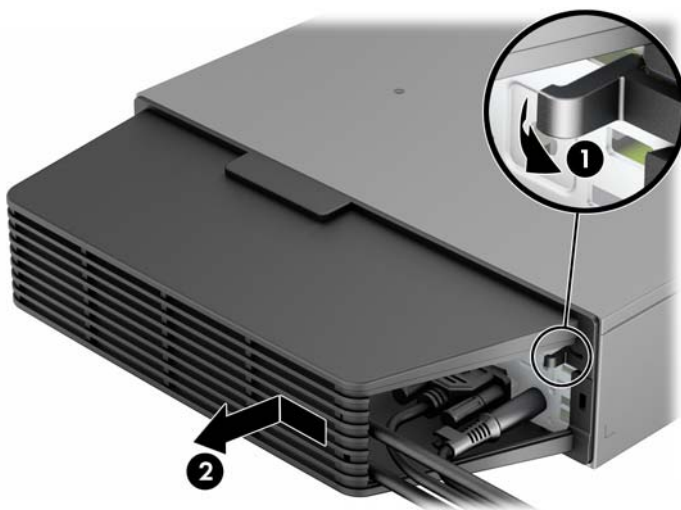
Installing a security lock

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.

Padlock

HP business PC security lock

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

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

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

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

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.

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

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."
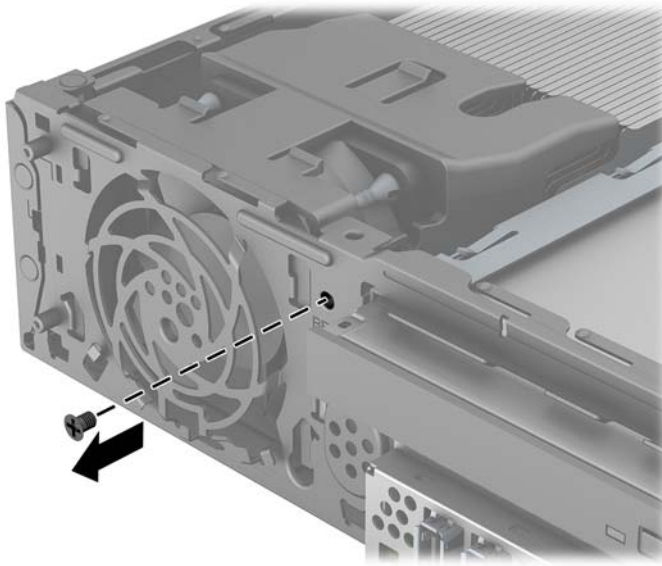
8. Replace the front bezel.

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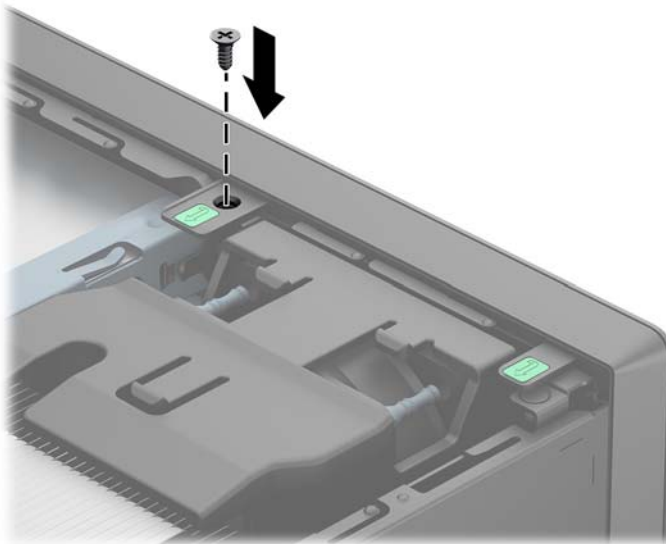
10. Replace the access panel.

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 (140ºF).

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.

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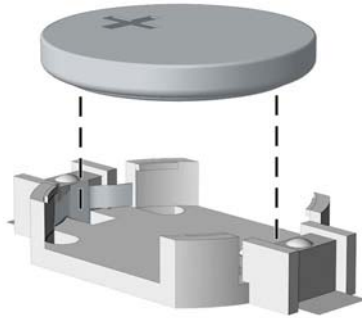
   b. Slide the replacement battery into position, positive side up. The battery holder automatically secures the battery in the proper position.

   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).
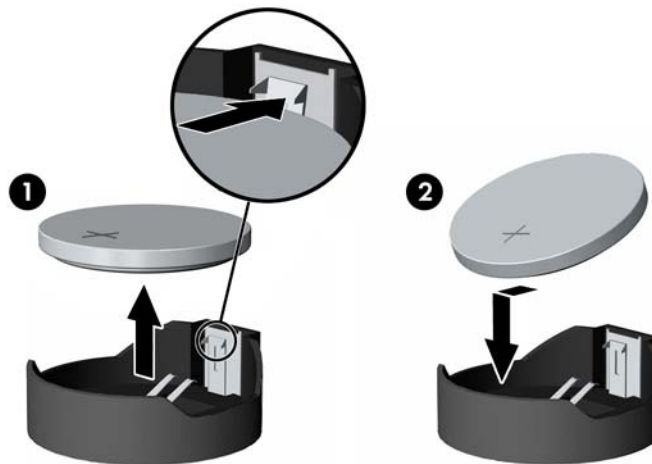
   Type 3

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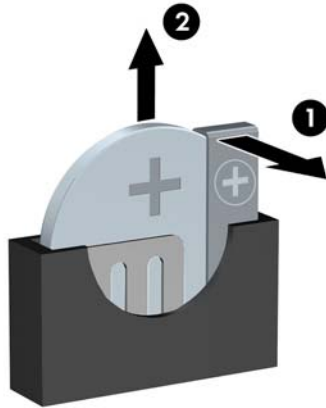
NOTE: After the battery has been replaced, use the following steps to complete this procedure.

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 Unlocking the Smart Cover Lock

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.

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.

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 tamper-proof screw(s) that secure the Smart Cover Lock to the chassis.

    ●   Removing the Smart Cover Lock Screws from the Tower
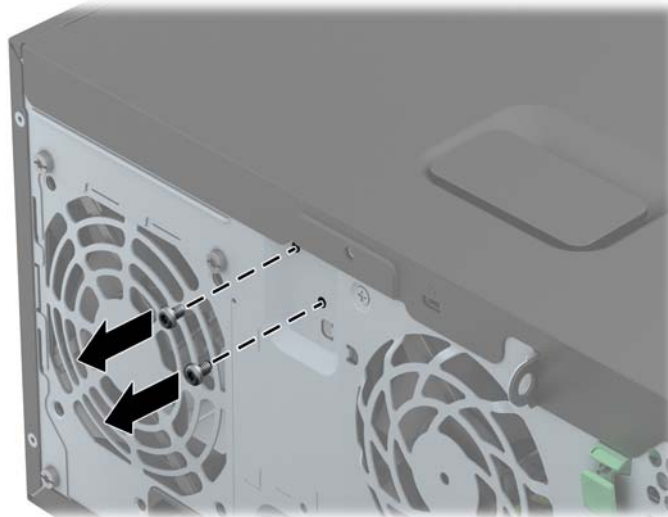
● Removing the Smart Cover Lock Screw from the Small Form Factor
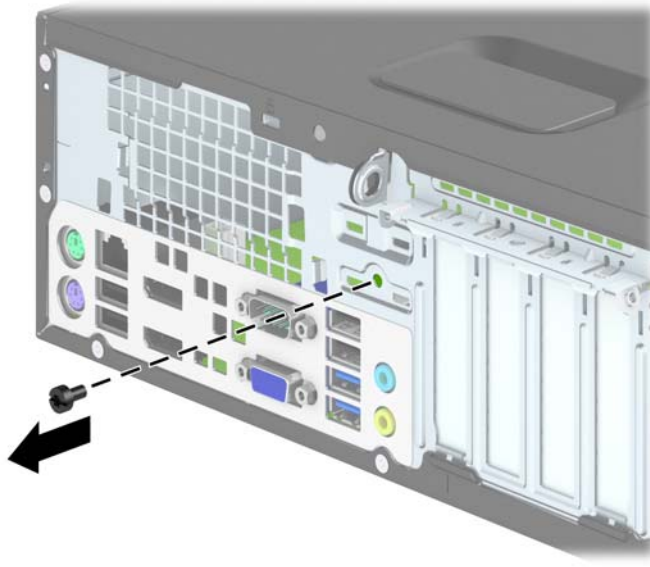
● Removing the Smart Cover Lock Screw from the Ultra-slim Desktop
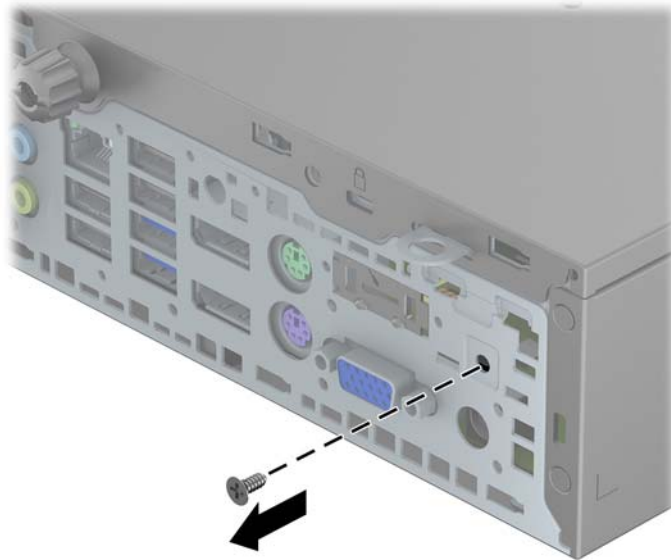
6. You can now remove the access panel.

To reattach the Smart Cover Lock, secure the lock in place with the tamper-proof screws.

C 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.

NOTE: For more information on static electricity, contact an HP authorized dealer, reseller, or service provider.

D 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.

   NOTE: The hard drive locks automatically when the system power is turned off.

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.

   NOTE: Ensure that all boards are seated properly and secured in the board slots before shipping the computer.

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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