HP EliteBook 840 G4 Notebook PC
HP EliteBook 848 G4 Notebook PC

Maintenance and Service Guide

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Product notice

This user guide describes features that are common to most models. Some features may not be available on your computer.

Not all features are available in all editions of Windows. This computer may require upgraded and/or separately purchased hardware, drivers and/or software to take full advantage of Windows functionality. Go to http://www.microsoft.com for details.

Your product does not support Windows 8 or Windows 7

In accordance with Microsoft's support policy, HP does not support the Windows 8 or Windows 7 operating system on this product or provide any Windows 8 or Windows 7 drivers on http://support.hp.com.

Software terms

By installing, copying, downloading, or otherwise using any software product preinstalled on this computer, you agree to be bound by the terms of the HP End User License Agreement (EULA). If you do not accept these license terms, your sole remedy is to return the entire unused product (hardware and software) within 14 days for a full refund subject to the refund policy of your seller.

For any further information or to request a full refund of the price of the computer, please contact your seller.

Important Notice about Customer Self-Repair Parts

⚠ **CAUTION:** Your computer includes Customer Self-Repair parts and parts that should only be accessed by an authorized service provider. See Chapter 5, "Removal and replacement procedures for Customer Self-Repair parts," for details. Accessing parts described in Chapter 6, "Removal and replacement procedures for Authorized Service Provider only parts," can damage the computer or void your warranty.

Safety warning notice

⚠ **WARNING!** To reduce the possibility of heat-related injuries or of overheating the device, do not place the device directly on your lap or obstruct the device air vents. Use the device only on a hard, flat surface. Do not allow another hard surface, such as an adjoining optional printer, or a soft surface, such as pillows or rugs or clothing, to block airflow. Also, do not allow the AC adapter to contact the skin or a soft surface, such as pillows or rugs or clothing, during operation. The device and the AC adapter comply with the user-accessible surface temperature limits defined by the International Standard for Safety of Information Technology Equipment (IEC 60950-1).

Table of contents

1 Product description

Category	Description
Product Name	HP EliteBook 840 G4 Notebook PC HP EliteBook 848 G4 Notebook PC
Processors	**7th-generation Intel® Core™ processors:** Intel Core i7-7600U Intel Core i7-7500U Intel Core i5-7300U Intel Core i5-7200U Intel Core i3-7100U
Chipset	Integrated with processor
Graphics	**Internal graphics:** Intel HD Graphics 620 Supports dual-display ports through the dock Supports 3 independent displays through the 2013 Ultraslim Docking Station
Panel	**35.6-cm (14.0-in), eDP:** Slim, high-definition (HD), AntiGlare (AG), SVA (1366 x 768), 220 nits display with and without webcam Slim, full high-definition (FHD), AntiGlare (AG), SVA (1920 x 1080), 300 nits display with and without webcam Ultra slim, eDP + PSR, quad high-definition (QHD), AntiGlare (AG), UWVA (2560 x 1440), 340 nits display with and without webcam Slim, full high-definition (FHD), SVA (1920 x 1080), 300 nits display with touch and webcam HP Sure View integrated privacy screen (FHD), SVA anti-glare (1920 x 1080) with and without camera. (Privacy screen must be configured at time of purchase. All Privacy screens including non-touch are hinge-up repair.) (Planned availability - first quarter 2017) *All display assemblies include two wireless local area network (WLAN) antenna cables and NFC antenna *WWAN models include two wireless wide area network (WWAN) antenna cables
Memory	Two memory module slots Memory is customer accessible/upgradeable DDR4-2400 dual channel support Supports up to 32 GB of system RAM in the following configurations: • 32768 MB (16384 MB×2) • 16384 MB (16384 MB×1 or 8192 MB×2) • 8192 MB (8192 MB×1 or 4096 MB×2) • 4096 MB (4096 MB×1)
Primary storage	**Hard drives:**

Category	Description
	Supports **6.35 cm** (2.5 in) hard drives in **7.0 mm** (.28 in) thicknesses Serial ATA • 1 TB, 5400 rpm • 500 GB, 7200 rpm, self-encrypting (FIPS-140-2) • 500 GB, 7200 rpm, self-encrypting (Opal 2) • 500 GB, 7200 rpm • 500 GB, hybrid, 8 GB cache
	M.2 solid-state drives (2280, NGFF): • 512 GB, PCIe, Gen3×4, SS/DS, NVMe, MLC • 512 GB, PCIe, Gen3×4, SS, NVMe, TLC, Opal 2 • 512 GB, PCIe, Gen3×4, NVMe, TLC • 512 GB, SATA-3, SS, TLC, FIPS-140-2 • 360 GB, PCIe, Gen3×4, SS, TLC • 256 GB, PCIe, Gen3×4, NVMe, TLC • 256 GB, SATA-3, Opal 2, TLC • 128 GB, SATA-3, SS, TLC
Audio and video	HP Bang & Olufsen Audio Dual-array microphone Premium stereo speakers (2) Webcam (720p) Supports “no camera” option
Ethernet	Intel Ethernet Connection I219-LM 10/100/1000 (for use with computer models with i7-7500U, i5-7200U or i3-7100U processors) Intel Ethernet Connection I219-V 10/100/1000 (for use with computer models with i7-7600U, i5-7300U processors) S3/S4/S5 Wake-on-LAN
Wireless networking	**WPAN Bluetooth:** Integrated wireless personal area network (PAN) supported by Bluetooth® 4.2 combo card
	WLAN: Integrated wireless local area network (WLAN) options by way of wireless module Supports the following WLAN formats: • Intel Dual band wireless-AC 8265 802.11AC 2x2 WiFi + BT 4.2 Combo Adaptor (vPro) • Intel Dual band wireless-AC 8265 802.11AC 2x2 WiFi + BT 4.2 Combo Adaptor (non-vPro) • Intel Dual band wireless-AC 3168 802.11AC 1x1 WiFi + BT 4.2 Combo Adapter (non-vPro) Two WLAN antennas built into display assembly Supports no WLAN option Compatible with Miracast-certified devices

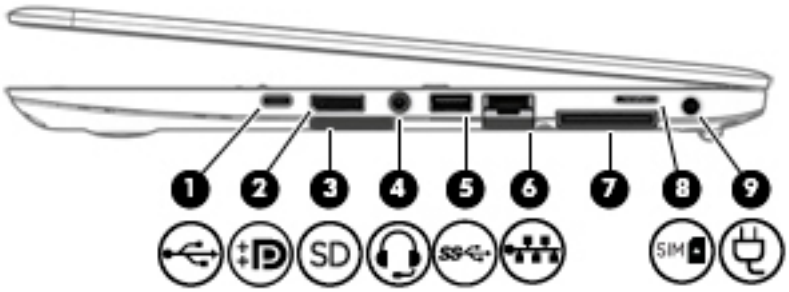
Category	Description
	Bluetooth Disabled IOPT
	Support S3/S4 wake on Wireless LAN (Intel only)
	Support for WiFi SAR in BIOS (Intel WLAN only)
	Support for HP Sure Connect
	NFC:
	Integrated NFC NXP NPC100 I2C NCI 10 mm x 25 mm module
	NFC antenna
	Supports no NFC option
	WWAN:
	Integrated wireless wide area network (WWAN) options by way of wireless module
	Two WWAN antennas (world wide 5 band, configured at top of panel on all units)
	Supports the following WWAN formats: • Foxconn HP It4120 LTE/EVDO/HSPA+ with GPS M.2 • Huawei HP It4132 - LTE/HSPA+ with GPS M.2 • Fibocom HP hs3210 WW HSPA+ without GPS
	Supports no WWAN option
External media cards	Memory card reader (SD, SDHC, SDXC)
Ports	VGA (Dsub 15 pin) supporting 1920 x 1200 external resolution @ 60Hz; hot plug/unplug and auto detect
	USB 3.1 Gen 1 charging port
	USB 3.1 Gen 1 port
	USB Type-C (basic)
	DisplayPort
	RJ-45
	Docking connector
	Audio-out (headphone)/audio-in (microphone) combo jack
	AC port
Docking	Ultraslim side Docking Station
	2013 Ultraslim Docking Station
Keyboard/pointing devices	**Keyboard:**
	Dual point, Dura keys, backlit, spill resistant with drain
	Dual point, Dura keys, backlit, spill resistant with drain – privacy
	Dual point, spill resistant with drain
	TouchPad:
	Gestures enabled by default: two-finger scrolling, two-finger pinch-zoom
	Taps enabled by default
	On/off button

Category	Description
	Glass
Power requirements	**Battery:**
	3 cell HP Long Life, 51 WHr, li-ion
	AC adapter:
	65 W HP Smart AC adapter (supports HP Fast Charging)
	45 W HP Smart AC adapter
	45 W, 2-prong AC adapter
	Power cord:
	2 wire plug, 1 m
	3 wire plug, 1.8 m
	3 wire plug, 1 m
Security	Security lock
	Fingerprint reader
	Supports “no fingerprint reader” option
	Supports Trusted Platform Module (TPM) 2.0 (1.2 downgradeable after purchase) (Infineon, soldered down)
	Integrated Smart Card reader (active)
	Preboot authentication (password, smart card)
Operating system	**Preinstalled:**
	Windows 10 Home 64
	Windows 10 Professional 64
	FreeDOS 2.0
	NeoKylin 64-bit
	Restore Media–DR/SR-DVD:
	Windows 10
	NeoKylin Linux
	Restore Media–OS-DVD:
	Windows 10 Professional 64
	USB Restore:
	Windows 10
	Windows 10 drivers
	Certified:
	Microsoft WHQL
	Web-only support:
	Windows 10 Enterprise
	Windows 10 Enterprise 64 LTSB 1507
Serviceability	**End user replaceable parts:**

Category	Description
	AC adapter
	Battery
	Hard drive
	Solid-state drive
	Memory module
	WLAN module
	WWAN module
	Keyboard

2 External component identification

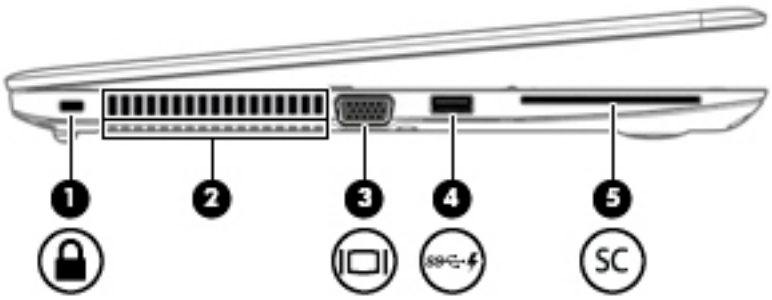
Right



Component			Description
(1)		USB Type-C basic	When the computer is on, connects and charges a USB device that has a Type-C connector, such as a cell phone, camera, activity tracker, or smartwatch, and provides data transfer.
(2)		Dual-Mode DisplayPort	Connects an optional digital display device, such as a high-performance monitor or projector.
(3)	SD	Memory card reader	Reads optional memory cards that enable you to store, manage, share, or access information. To insert a card: 1. Hold the card label-side up, with connectors facing the computer. 2. Insert the card into the memory card reader, and then press in on the card until it is firmly seated. To remove a card: ▲ Press in on the card, and then remove it from the memory card reader.
(4)		Audio-out (headphone)/Audio-in (microphone) combo jack	Connects optional powered stereo speakers, headphones, earbuds, a headset, or a television audio cable. Also connects an optional headset microphone. This jack does not support optional microphone-only devices. **WARNING!** To reduce the risk of personal injury, adjust the volume before putting on headphones, earbuds, or a headset. For additional safety information, refer to the *Regulatory, Safety, and Environmental Notices*. To access this guide: 1. Type `support` in the taskbar search box, and then select the **HP Support Assistant** app. – or – Click the question mark icon in the taskbar. 2. Select **My PC**, select the **Specifications** tab, and then select **User Guides**.

Component			Description
			NOTE: When a device is connected to the jack, the computer speakers are disabled.
(5)		USB 3.x port	Connects a USB device, such as a cell phone, camera, activity tracker, or smartwatch, and provides data transfer.
(6)		RJ-45 (network) jack/status lights	Connects a network cable. • Green (left): The network is connected. • Amber (right): Activity is occurring on the network.
(7)		Docking connector	Connects an optional docking device.
(8)	SIM	SIM card slot	Supports a wireless subscriber identity module (SIM) card.
(9)		Power connector	Connects an AC adapter.

Left



Component			Description
(1)		Security cable slot	Attaches an optional security cable to the computer. **NOTE:** The security cable is designed to act as a deterrent, but it may not prevent the computer from being mishandled or stolen.
(2)		Vents (2)	Enable airflow to cool internal components. **NOTE:** The computer fan starts up automatically to cool internal components and prevent overheating. It is normal for the internal fan to cycle on and off during routine operation.
(3)		External monitor port	Connects an external VGA monitor or projector.
(4)		USB 3.x charging port	When the computer is on, connects and charges a USB device, such as a cell phone, camera, activity tracker, or smartwatch, and provides high-speed data transfer.
(5)	SC	Smart card reader	Supports optional smart cards.

Display

Component		Description
(1)	WLAN antennas* (2)	Send and receive wireless signals to communicate with wireless local area networks (WLANs).
(2)	WWAN antennas* (2)	Send and receive wireless signals to communicate with wireless wide area networks (WWANs).
(3)	Internal microphones (2)	Record sound.
(4)	Webcam light (select products only)	On: The webcam is in use.
(5)	Webcam (select products only)	Records video and captures photographs. Some models allow you to video conference and chat online using streaming video. To use the webcam: ▲ Type `camera` in the taskbar search box, and then select **Camera**.

*The antennas are not visible from the outside of the computer. For optimal transmission, keep the areas immediately around the antennas free from obstructions.

For wireless regulatory notices, see the section of the *Regulatory, Safety, and Environmental Notices* that applies to your country or region.

To access this guide:

1. Type `support` in the taskbar search box, and then select the **HP Support Assistant** app.

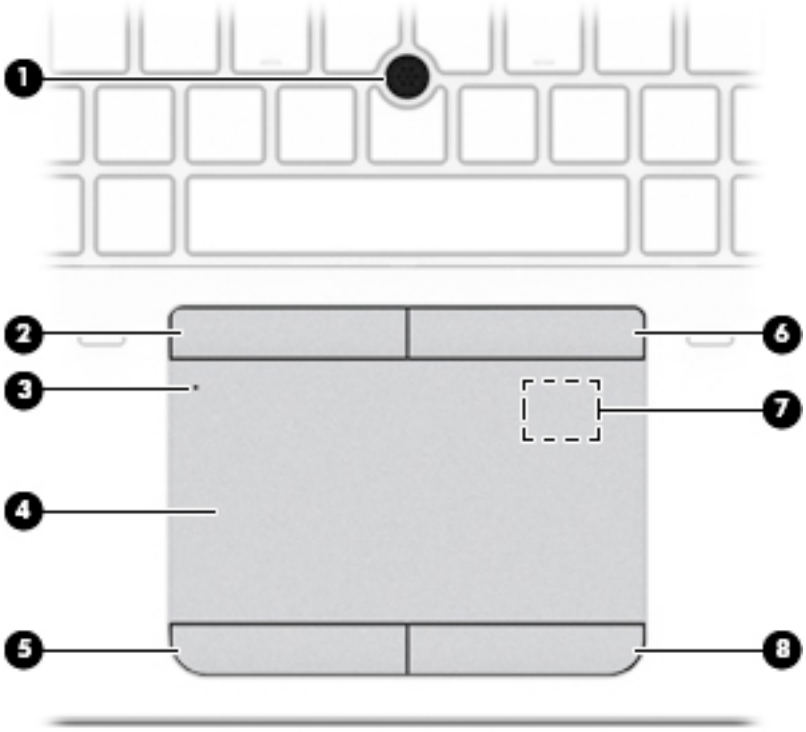
   – or –

   Click the question mark icon in the taskbar.

2. Select **My PC**, select the **Specifications** tab, and then select **User Guides**.

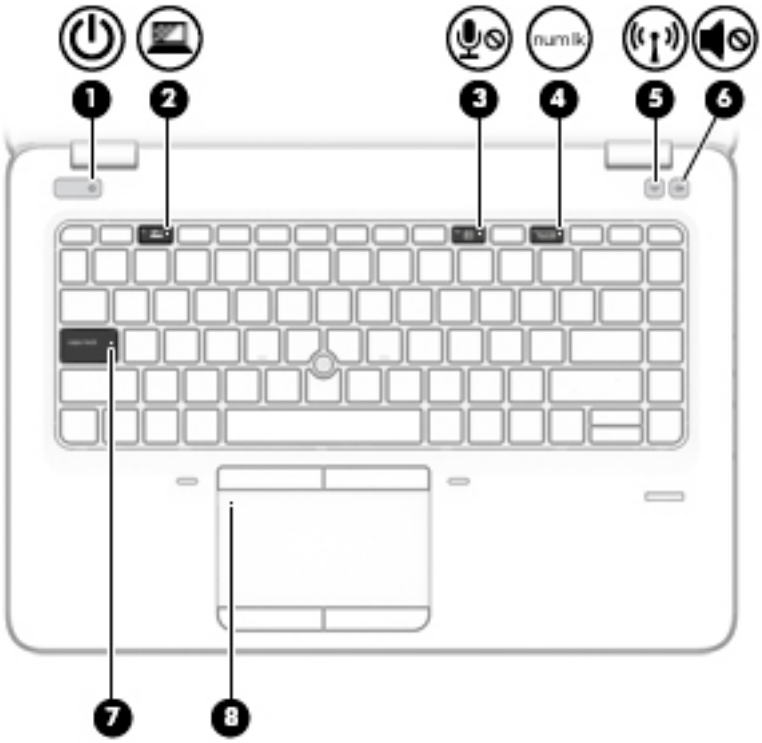
Top

TouchPad



Component		Description
(1)	Pointing stick	Moves the pointer on the screen.
(2)	Left pointing stick button	Functions like the left button on an external mouse.
(3)	TouchPad on/off button/TouchPad light	Turns the TouchPad on and off. • On: The TouchPad is off. • Off: The TouchPad is on.
(4)	TouchPad zone	Reads your finger gestures to move the pointer or activate items on the screen.
(5)	Left TouchPad button	Functions like the left button on an external mouse.
(6)	Right pointing stick button	Functions like the right button on an external mouse.
(7)	Near Field Communications (NFC) tapping area (select products only)	Allows you to touch an NFC-compatible device to this area to wirelessly connect and communicate with the computer and transfer data back and forth.
(8)	Right TouchPad button	Functions like the right button on an external mouse.

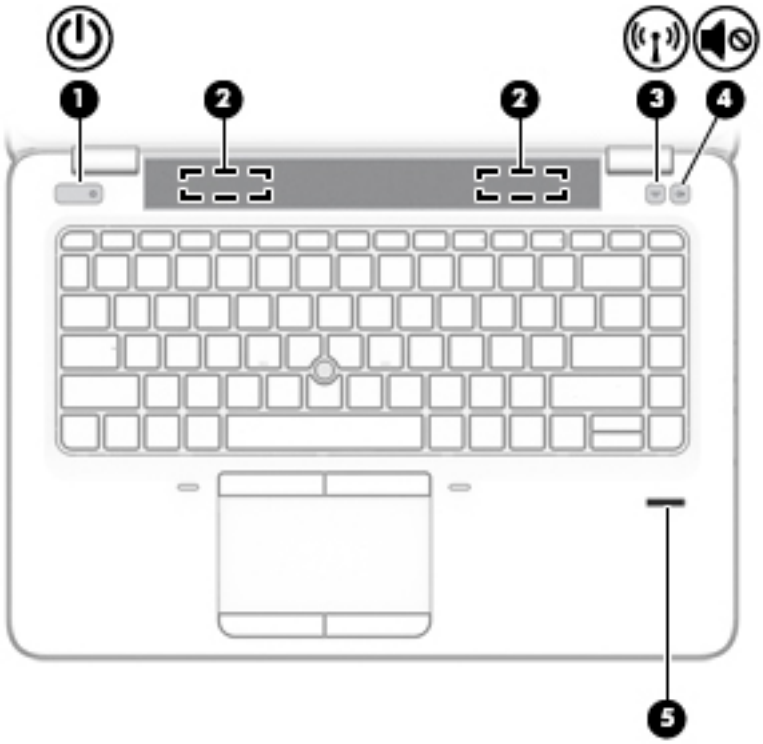
Lights



Component			Description
(1)		Power light	• On: The computer is on. • Blinking: The computer is in the Sleep state, a power-saving state. The computer shuts off power to the display and other unneeded components. • Off: The computer is off or in Hibernation. Hibernation is a power-saving state that uses the least amount of power.
(2)		Privacy light (select products only)	On: Privacy screen is on. Off: Privacy screen is off.
(3)		Microphone mute light	• Amber: microphone sound is off. • Off: microphone sound is on.
(4)	num lk	Num lk light	On: Num lock is on.
(5)		Wireless light	On: An integrated wireless device, such as a wireless local area network (WLAN) device and/or a Bluetooth® device, is on. **NOTE:** On some models, the wireless light is amber when all wireless devices are off.
(6)		Mute light	• Amber: Computer sound is off. • Off: Computer sound is on.

Component		Description
(7)	Caps lock light	On: Caps lock is on, which switches the key input to all capital letters.
(8)	TouchPad light	• On: The TouchPad is off. • Off: The TouchPad is on.

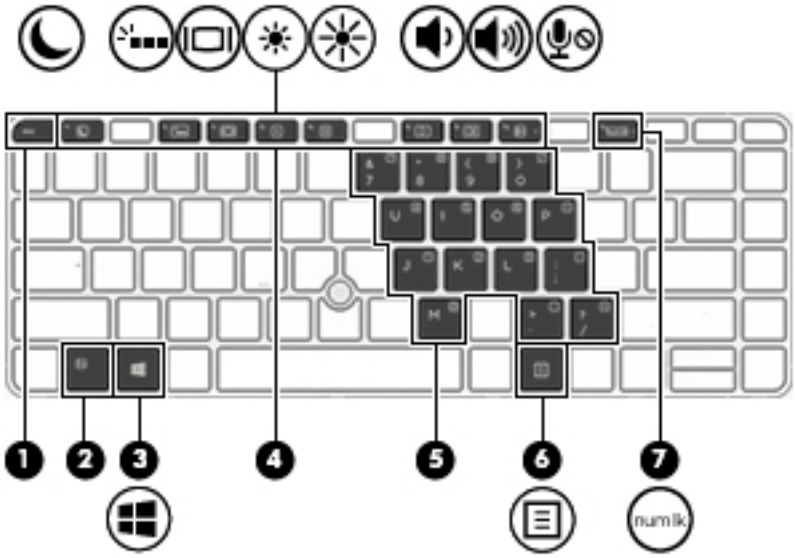
Buttons, speakers, and fingerprint reader



Component		Description
(1)	Power button	• When the computer is off, press the button to turn on the computer. • When the computer is on, press the button briefly to initiate Sleep. • When the computer is in the Sleep state, press the button briefly to exit Sleep. • When the computer is in Hibernation, press the button briefly to exit Hibernation. **CAUTION:** Pressing and holding down the power button results in the loss of unsaved information. If the computer has stopped responding and shutdown procedures are ineffective, press and hold the power button for at least 5 seconds to turn off the computer. To learn more about your power settings, see your power options.

Component			Description
			▲ Type `power options` in the taskbar search box, and then select **Power Options**. – or – Right-click the **Power meter** icon, and then select **Power Options**.
(2)		Speakers (2)	Produce sound.
(3)		Wireless button	Turns the wireless feature on or off but does not establish a wireless connection. A wireless network must be set up before a wireless connection is possible.
(4)		Volume mute button	Mutes and restores speaker sound.
(5)		Fingerprint reader (select products only)	Allows a fingerprint logon to Windows, instead of a password logon.

Keys

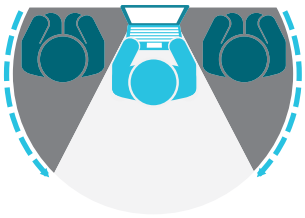


Component			Description
(1)		esc key	Displays system information when pressed in combination with the fn key.
(2)		fn key	Executes frequently used system functions when pressed in combination with a function key, the num lk key, the esc key, or other key. See Using the hot keys on page 14
(3)		Windows key	Opens the **Start** menu. **NOTE:** Pressing the Windows key again will close the **Start** menu.
(4)		Function keys	Executes frequently used system functions when pressed in combination with the fn key. See Using the hot keys on page 14
(5)		Embedded numeric keypad	A numeric keypad superimposed over the keyboard alphabet keys that enables you to add, subtract, and perform other numeric tasks. When num lk is on, the keypad can be used like an external numeric keypad. **NOTE:** If the keypad function is active when the computer is turned off, that function is reinstated when the computer is turned back on.
(6)		Windows application key	Displays options for a selected object.
(7)	num lk	num lk key	Turns the embedded numeric keypad on and off when pressed in combination with the fn key.

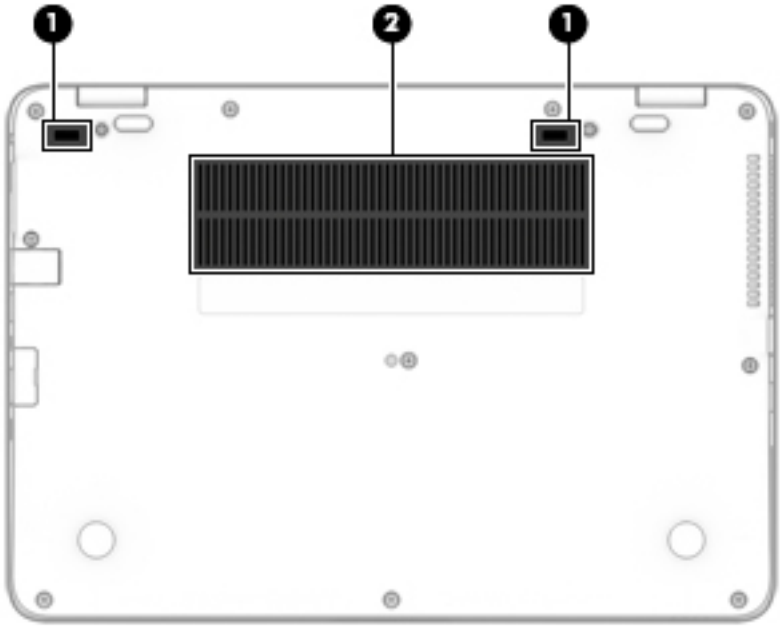
Using the hot keys

To use a hot key:

▲ Press the fn key, and then press one of the keys listed in the following table.

Press fn+function key	Description
	To help prevent side-angle viewing from onlookers, press fn+f2 to turn on your privacy screen. If needed, press fn+f5 or fn+f6 to adjust your privacy screen for well-lit or darker environments. Press fn+f2 again to turn off the privacy screen. **NOTE:** To quickly turn on the highest privacy setting, press fn+p. 
	Initiates Sleep, which saves your information in system memory. The display and other system components turn off and power is conserved. To exit Sleep, briefly press the power button. **CAUTION:** To reduce the risk of information loss, save your work before initiating Sleep.
	Turns the backlight keyboard off or on. **NOTE:** To conserve battery power, turn off this feature.
	Switches the screen image among display devices connected to the system. For example, if a monitor is connected to the computer, repeatedly pressing fn+f4 alternates the screen image from computer display to monitor display to simultaneous display on both the computer and the monitor. Most external monitors receive video information on the computer using the external VGA video standard. The fn+f4 hot key can also alternate images among other devices that are receiving video information on the computer.
	Decreases the screen brightness incrementally as long as you hold down the key.
	Increases the screen brightness incrementally as long as you hold down the key.
	Decreases speaker volume incrementally while you hold down the key.
	Increases speaker volume incrementally while you hold down the key.
	Mutes the microphone.
R	Pauses or breaks an operation. This replaces the break key.
C	Locks cell. This replaces the scroll lock key.
S	Sends a programming query. This replaces the sys rq key.

Bottom



Component		Description
(1)	Docking connectors (2)	Connect an optional docking device.
(2)	Vents (2)	Enable airflow to cool internal components. **NOTE:** The computer fan starts up automatically to cool internal components and prevent overheating. It is normal for the internal fan to cycle on and off during routine operation.

Front

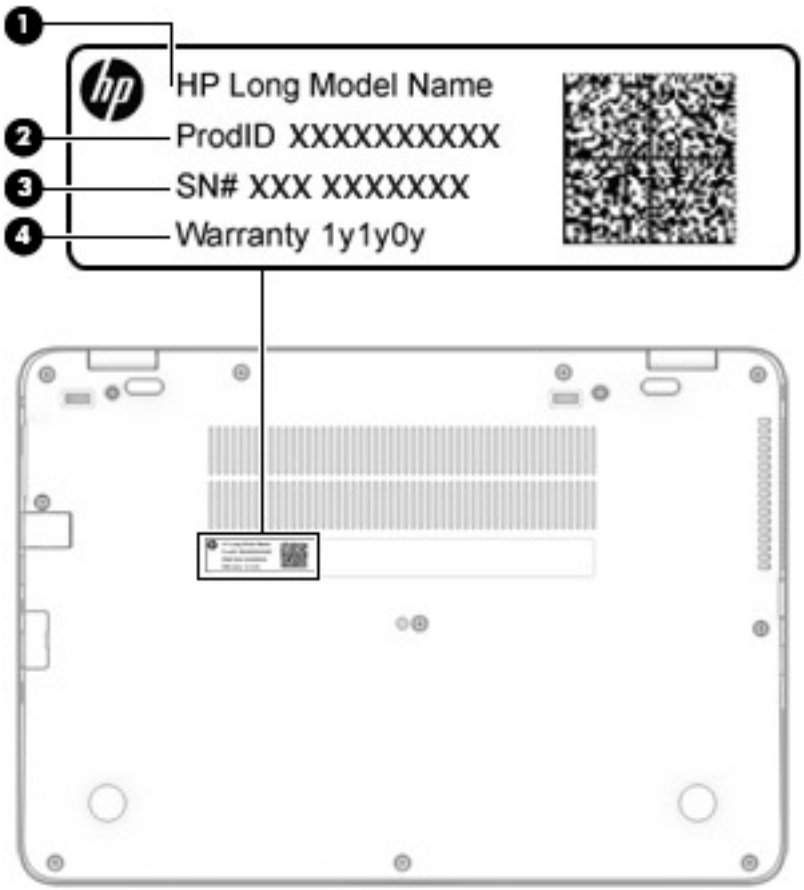
Component			Description
(1)		Wireless light	On: An integrated wireless device, such as a wireless local area network (WLAN) device and/or a Bluetooth® device, is on. **NOTE:** On some models, the wireless light is amber when all wireless devices are off.
(2)		Power light	• On: The computer is on. • Blinking: The computer is in the Sleep state, a power-saving state. The computer shuts off power to the display and other unneeded components. • Off: The computer is off or in Hibernation. Hibernation is a power-saving state that uses the least amount of power.
(3)		Battery light	When AC power is connected: • White: The battery charge is greater than 90 percent. • Amber: The battery charge is from 0 to 90 percent. • Off: The battery is not charging. When AC power is disconnected (battery not charging): • Blinking amber: The battery has reached a low battery level. When the battery has reached a critical battery level, the battery light begins blinking rapidly. • Off: The battery is not charging.
(4)		Drive light	• Blinking white: The hard drive is being accessed. • Amber: HP 3D DriveGuard has temporarily parked the hard drive.

Labels

The labels laser etched on the computer provide information you may need when you troubleshoot system problems or travel internationally with the computer.

IMPORTANT: Check the following locations for the labels described in this section: the bottom of the computer, inside the battery bay, under the service door, or on the back of the display.

- Service label—Provides important information to identify your computer. When contacting support, you will probably be asked for the serial number, and possibly for the product number or the model number. Locate these numbers before you contact support.



Component	
(1)	Model name (select products only)
(2)	Product number
(3)	Serial number
(4)	Warranty period

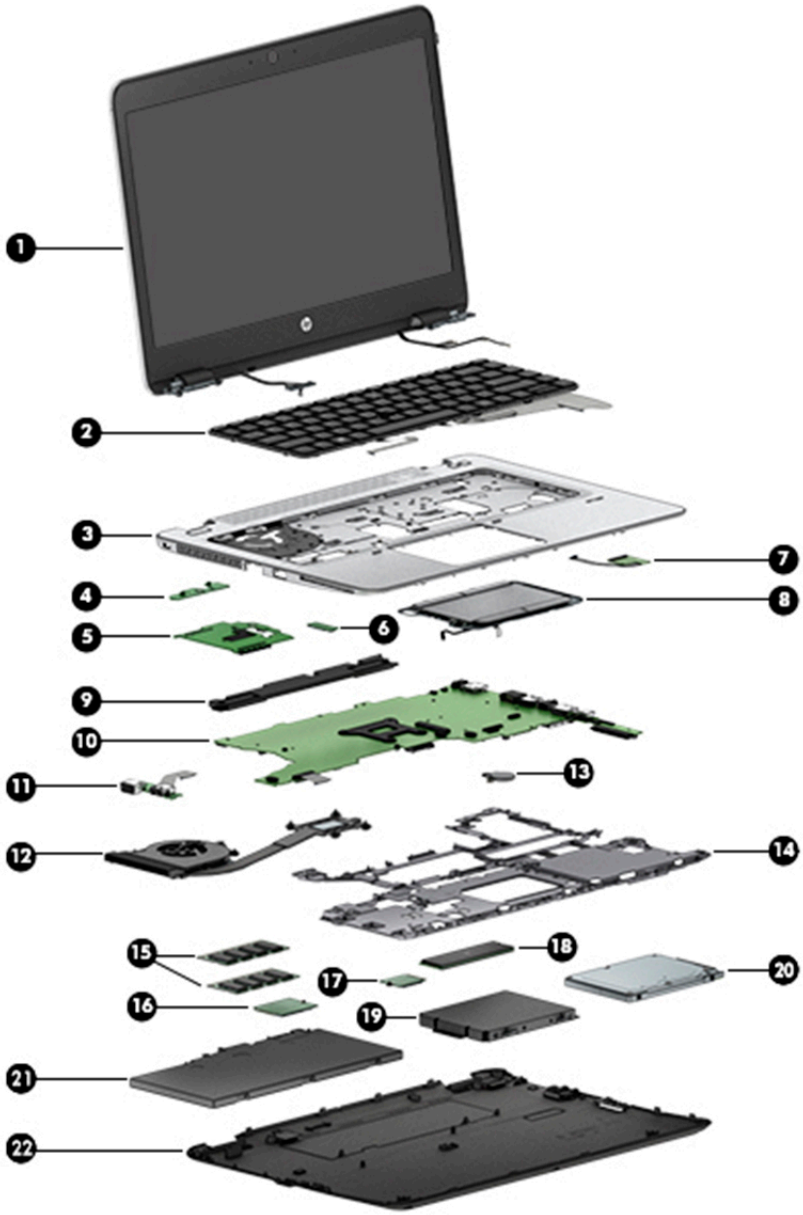
- Regulatory label(s)—Provide(s) regulatory information about the computer.
- Wireless certification label(s)—Provide(s) information about optional wireless devices and the approval markings for the countries or regions in which the devices have been approved for use.

3 Illustrated parts catalog

Computer major components

NOTE: HP continually improves and changes product parts. For complete and current information on supported parts for your computer, go to http://partsurfer.hp.com, select your country or region, and then follow the on-screen instructions.

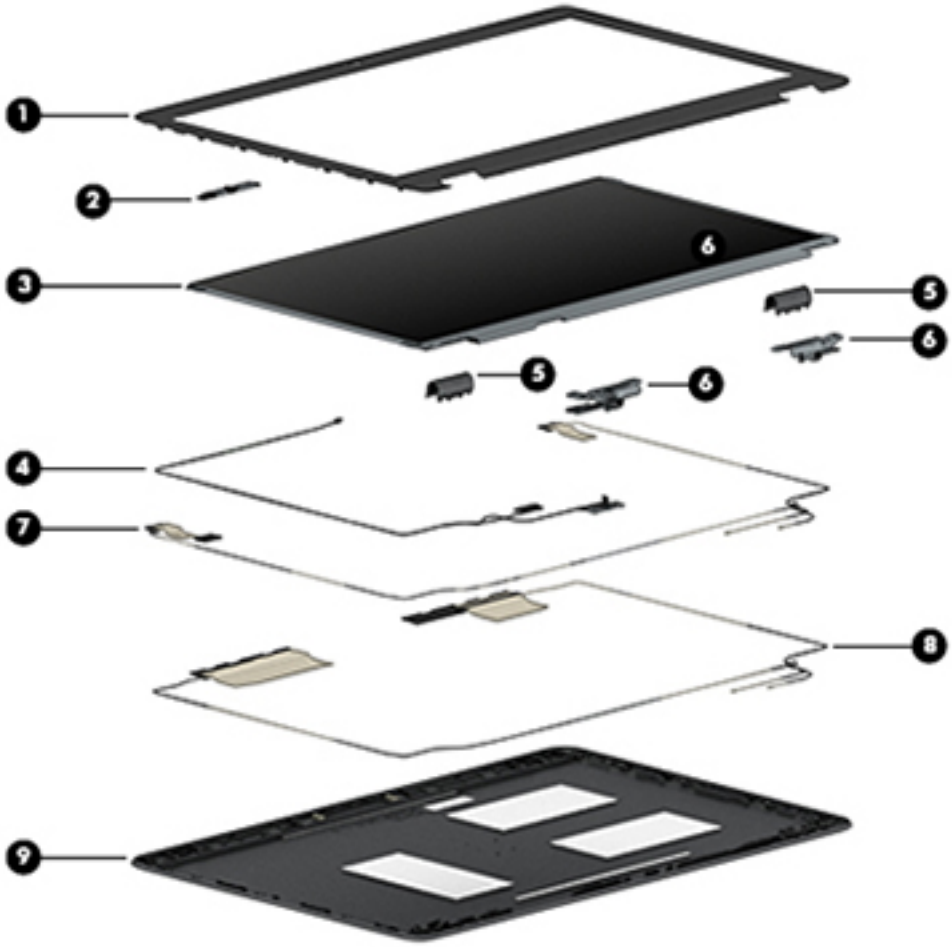
NOTE: Details about your computer, including model, serial number, product key, and length of warranty, are on the service tag at the bottom of your computer. See Labels on page 17 for details.



Item	Component	Spare part number
(1)	**Display assembly, touch** Touch screen display assemblies are spared only as whole unit hinge-ups. All privacy display assemblies including non-touch are spared as whole unit hinge-ups. Non-touch display assemblies are spared at the subcomponent level only. For more non-touch display assembly spare part information, see Display assembly subcomponents on page 21.	
	Touch	910584-001
	Privacy	922076-001
(2)	**Keyboard** (see Keyboard on page 47) For a list of keyboard country codes, see Keyboard on page 47.	
	Without a backlight	836307-xx1
	With a backlight	836308-xx1
	With a backlight, privacy	903008-xx1
	For use in Japan; without a backlight	923272-291
	For use in Japan; with a backlight	923273-291
(3)	**Top cover**	
	Standard top cover	821173-001
	Privacy	903979-001
(4)	**Power button board**	914382-001
(5)	**Smart card reader board** (includes cable)	914380-001
(6)	**NFC module** (includes NFC cable, antenna cable, Mylar insulator, and foam)	821666-001
(7)	**Fingerprint reader assembly** (includes cable)	849912-001
(8)	**TouchPad**	
	Without NFC antenna	821171-001
	Including NFC antenna	821172-001
(9)	**Speakers** (includes cable)	821170-001
(10)	**System board** (includes processor and replacement thermal material, see System board on page 62) All system boards use the following part numbers: xxxxxx-001: Non-Windows operating systems xxxxxx-601: Windows operating system	
	Intel i7-7600U processor	917507-xx1
	Intel i7-7500U processor	917504-xx1
	Intel i5-7300U processor	917501-xx1
	Intel i5-7200U processor	917503-xx1
	Intel i3-7100U processor	917499-xx1

Item	Component	Spare part number
(11)	**USB/audio board** (includes cable)	916922-001
(12)	**Heat sink/fan assembly**	821163-001
(13)	**RTC battery**	914384-001
(14)	**Internal base plate**	821164-001
(15)	**Memory module** (DDR-2400)	
	4-GB	862397-850
	8-GB	862398-850
	16-GB	865396-850
(16)	**WWAN module**	
	HP lt4120 LTE/EVDO/HSPA+ SnapdragonT X5 LTE Mobile Broadband Module	800870-001
	Huawei HP lt4132 - LTE/HSPA+ w/GPS M.2	845710-001
	Fibocom HP hs3210 WW HSPA+ w/o GPS	860726-001
(17)	**WLAN/Bluetooth combo card**	
	Intel Dual band wireless-AC 8265 802.11AC 2x2 WiFi + BT 4.2 Combo Adaptor (vPro)	851592-001
	Intel Dual band wireless-AC 8265 802.11AC 2x2 WiFi + BT 4.2 Combo Adaptor (non-vPro)	851594-001
	Intel Dual band wireless-AC 3168 802.11AC 1x1 WiFi + BT 4.2 Combo Adapter (non-vPro)	852511-001
(18)	**Solid-state drive (SSD)**	
	512 GB, PCIe, Gen3×4, SS/DS, NVMe, MLC	914935-001
	512 GB, PCIe, Gen3×4, SS, NVMe, TLC, Opal 2	914934-001
	512 GB, PCIe, NVMe, Gen3x4, MLC	914933-001
	512 GB, SATA-3, FIPS-140–2, TLC	917382-003
	360 GB, PCIe Gen3×4 SS TLC	919691-003
	256 GB, PCIe, Gen3x4, NVMe, TLC	914931-001
	256 GB, SATA-3, Opal 2, TLC	914930-001
	128 GB, SATA-3, SS, TLC	914929-001
(19)	**Hard drive hardware kit**	821665-001
(20)	**Hard drive**, 7 mm (does not include hard drive connector cable or hard drive rubber bracket):	
	1 TB, 5400 rpm	762990-001
	500 GB, 7200 rpm, FIPS	820572-001
	500 GB, 7200 rpm, Opal-2	820573-001
	500 GB, 7200 rpm	703267-001
	500 GB, 5400 rpm, hybrid, 8 GB cache	732000-001
(21)	**Battery** (3 cell, 51 WHr, 4.42 Ah)	854108-850
(22)	**Bottom cover** (includes RJ-45 door, feet, sponge)	821162-001

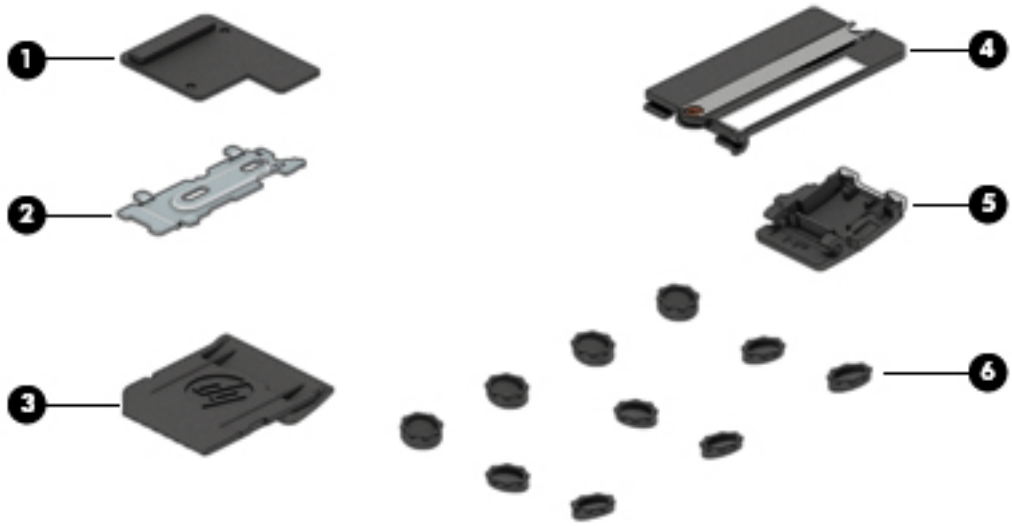
Display assembly subcomponents



Item	Component	Spare part number
(1)	**Bezel**	821160-001
(2)	**Webcam module** (includes microphone)	800575-020
	Microphone module (not shown)	920485-001
(3)	**Raw panel**	
	HD	806861-005
	FHD	806860-008
	QHD	806862-005
(4)	**Display/webcam cable** (HD/FHD and QHD)	914381-001 (Cable Kit)
(5)	**Hinge covers (left and right)** for use in models without privacy displays	821166-001 (Hinge Kit)
	Hinge covers (left and right) for use in models with privacy displays	903007-001
(6)	**Hinge Kit (includes left and right hinges)**	821166-001
(7)	**WLAN antenna** (spared with display enclosure)	

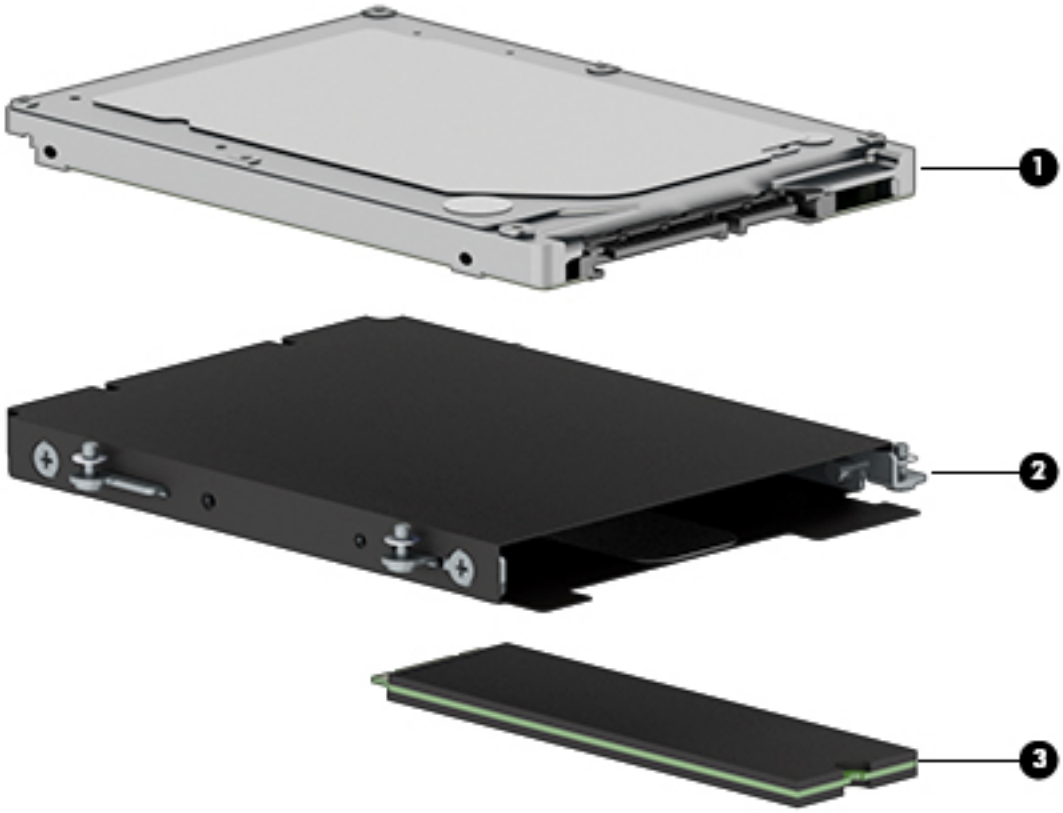
Item	Component	Spare part number
(8)	**WWAN antenna** (spared with display enclosure)	
(9)	**Display enclosure** (includes antennas)	821161-001

Plastics Kit



Item	Component	Spare part number
	Plastics kit	821175-001
(1)	Fingerprint reader blank	
(2)	Fingerprint reader bracket	
(3)	SD card blank	
(4)	Solid-state drive insert	
(5)	RJ-45 door	
(6)	Rubber feet	

Mass storage devices



Item	Component	Spare part number
(1)	**Hard drive**, 7 mm	
	1 TB, 5400 rpm	762990-001
	500 GB, 7200 rpm, FIPS	820572-001
	500 GB, 7200 rpm, Opal-2	820573-001
	500 GB, 7200 rpm	703267-001
	500 GB, 5400 rpm, hybrid, 8 GB cache	732000-001
(2)	**Hard drive hardware kit**	821665-001
(3)	**Solid-state drive**	
	512 GB, PCIe, Gen3×4, SS/DS, NVMe, MLC	914935-001
	512 GB, PCIe, Gen3×4, SS, NVMe, TLC, Opal 2	914934-001
	512 GB, PCIe, NVMe, Gen3x4, MLC	914933-001
	512 GB, SATA-3, FIPS-140–2, TLC	917382-003
	360 GB, PCIe Gen3×4 SS TLC	919691-003
	256 GB, PCIe, Gen3x4, NVMe, TLC	914931-001

Item	Component	Spare part number
	256 GB, SATA-3, Opal 2, TLC	914930-001
	128 GB, SATA-3, SS, TLC	914929-001

Cable Kit

Item	Description	Spare part number
	Cable Kit	914381-001
(1)	Display/webcam cable (HD/FHD and QHD)	
(2)	Card reader cable	

Miscellaneous parts

Component	Spare part number
AC adapter _non-PFC, 4.5 mm	
65 W HP Smart AC adapter, 3 prong	710412-001
65 W HP Smart AC adapter, 3 prong, EM	714635-850
65 W HP Smart AC Adapter for use in Argentina	710340-850
45 W HP Smart AC adapter, 3 prong	741727-001
45 W HP Smart AC adapter, 2 prong	742436-001
45 W HP Smart AC Adapter for use in Argentina	741553-852
HP DisplayPort to HDMI cable	749288-001
Power cord (3-pin, black, 1.83 m):	
Argentina	401300-001
Australia	213356-001
Brazil	438722-001
Denmark	213353-001
Europe (Austria, Belgium, Finland, France, Germany, the Netherlands, Norway and Sweden)	213350-001

Component	Spare part number
India	404827-001
Israel	398063-001
Italy	213352-001
Japan	349756-001
North America	213349-001
People's Republic of China	286497-001
South Africa	361240-001
South Korea	267836-001
Switzerland	213354-001
Taiwan	393313-001
Thailand	285096-001
United Kingdom and Singapore	213351-001
Power cord (3-pin, black, 1.0 m):	
Argentina	401300-007
Australia	213356-008
Brazil	438722-004
Denmark	213353-008
Europe (Austria, Belgium, Finland, France, Germany, the Netherlands, Norway and Sweden)	213350-009
India	404827-003
Israel	398063-003
Italy	213352-008
Japan	349756-002
North America	213349-009
People's Republic of China	286497-008
South Africa	361240-002
South Korea	267836-008
Switzerland	213354-008
Taiwan	393313-003
Thailand	285096-006
United Kingdom and Singapore	213351-008
Power cord (2-pin, black, 1.0 m)	
Japan	190548-003
Screw kit	840070-001

Component	Spare part number
Pointing stick covers (20 count)	828884-001
RJ-45 door (20 count)	917396-001

4 Removal and replacement procedures preliminary requirements

Tools required

You will need the following tools to complete the removal and replacement procedures:

- Phillips P0 screwdriver

Service considerations

The following sections include some of the considerations that you must keep in mind during disassembly and assembly procedures.

NOTE: As you remove each subassembly from the computer, place the subassembly (and all accompanying screws) away from the work area to prevent damage.

Plastic parts

CAUTION: Using excessive force during disassembly and reassembly can damage plastic parts. Use care when handling the plastic

Cables and connectors

⚠ **CAUTION:** When servicing the computer, be sure that cables are placed in their proper locations during the reassembly process. Improper cable placement can damage the computer.

Cables must be handled with extreme care to avoid damage. Apply only the tension required to unseat or seat the cables during removal and insertion. Handle cables by the connector whenever possible. In all cases, avoid bending, twisting, or tearing cables. Be sure that cables are routed in such a way that they cannot be caught or snagged by parts being removed or replaced. Handle flex cables with extreme care; these cables tear easily.

Drive handling

⚠ **CAUTION:** Drives are fragile components that must be handled with care. To prevent damage to the computer, damage to a drive, or loss of information, observe these precautions:

Before removing or inserting a hard drive, shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.

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

Before removing a diskette drive or optical drive, be sure that a diskette or disc is not in the drive and be sure that the optical drive tray is closed.

Handle drives on surfaces covered with at least one inch of shock-proof foam.

Avoid dropping drives from any height onto any surface.

Avoid exposing an internal hard drive to products that have magnetic fields, such as monitors or speakers.

Avoid exposing an internal hard drive to products that have magnetic fields, such as monitors or speakers.

Avoid exposing a drive to temperature extremes or liquids.

If a drive must be mailed, place the drive in a bubble pack mailer or other suitable form of protective packaging and label the package “FRAGILE.”

Grounding guidelines

Electrostatic discharge damage

Electronic components are sensitive to electrostatic discharge (ESD). Circuitry design and structure determine the degree of sensitivity. Networks built into many integrated circuits provide some protection, but in many cases, ESD contains enough power to alter device parameters or melt silicon junctions.

A discharge of static electricity from a finger or other conductor can destroy static-sensitive devices or microcircuitry. Even if the spark is neither felt nor heard, damage may have occurred.

An electronic device exposed to ESD may not be affected at all and can work perfectly throughout a normal cycle. Or the device may function normally for a while, then degrade in the internal layers, reducing its life expectancy.

⚠ **CAUTION:** To prevent damage to the computer when you are removing or installing internal components, observe these precautions:

Keep components in their electrostatic-safe containers until you are ready to install them.

Before touching an electronic component, discharge static electricity by using the guidelines described in this section.

Avoid touching pins, leads, and circuitry. Handle electronic components as little as possible.

If you remove a component, place it in an electrostatic-safe container.

The following table shows how humidity affects the electrostatic voltage levels generated by different activities.

⚠ **CAUTION:** A product can be degraded by as little as 700 V.

Typical electrostatic voltage levels

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

Packaging and transporting guidelines

Follow these grounding guidelines when packaging and transporting equipment:

- To avoid hand contact, transport products in static-safe tubes, bags, or boxes.
- Protect ESD-sensitive parts and assemblies with conductive or approved containers or packaging.
- Keep ESD-sensitive parts in their containers until the parts arrive at static-free workstations.
- Place items on a grounded surface before removing items from their containers.
- Always be properly grounded when touching a component or assembly.
- Store reusable ESD-sensitive parts from assemblies in protective packaging or nonconductive foam.
- Use transporters and conveyors made of antistatic belts and roller bushings. Be sure that mechanized equipment used for moving materials is wired to ground and that proper materials are selected to avoid static charging. When grounding is not possible, use an ionizer to dissipate electric charges.

Workstation guidelines

Follow these grounding workstation guidelines:

- Cover the workstation with approved static-shielding material.
- Use a wrist strap connected to a properly grounded work surface and use properly grounded tools and equipment.
- Use conductive field service tools, such as cutters, screwdrivers, and vacuums.
- When fixtures must directly contact dissipative surfaces, use fixtures made only of static safe materials.
- Keep the work area free of nonconductive materials, such as ordinary plastic assembly aids and Styrofoam.
- Handle ESD-sensitive components, parts, and assemblies by the case or PCM laminate. Handle these items only at static-free workstations.
- Avoid contact with pins, leads, or circuitry.
- Turn off power and input signals before inserting or removing connectors or test equipment.

Equipment guidelines

Grounding equipment must include either a wrist strap or a foot strap at a grounded workstation.

- When seated, wear a wrist strap connected to a grounded system. Wrist straps are flexible straps with a minimum of one megohm ±10% resistance in the ground cords. To provide proper ground, wear a strap snugly against the skin at all times. On grounded mats with banana-plug connectors, use alligator clips to connect a wrist strap.
- When standing, use foot straps and a grounded floor mat. Foot straps (heel, toe, or boot straps) can be used at standing workstations and are compatible with most types of shoes or boots. On conductive floors or dissipative floor mats, use foot straps on both feet with a minimum of one megohm resistance between the operator and ground. To be effective, the conductive must be worn in contact with the skin.

The following grounding equipment is recommended to prevent electrostatic damage:

- Antistatic tape
- Antistatic smocks, aprons, and sleeve protectors
- Conductive bins and other assembly or soldering aids
- Nonconductive foam
- Conductive tabletop workstations with ground cords of one megohm resistance
- Static-dissipative tables or floor mats with hard ties to the ground
- Field service kits
- Static awareness labels
- Material-handling packages
- Nonconductive plastic bags, tubes, or boxes
- Metal tote boxes
- Electrostatic voltage levels and protective materials

The following table lists the shielding protection provided by antistatic bags and floor mats.

Material	Use	Voltage protection level
Antistatic plastics	Bags	1,500 V
Carbon-loaded plastic	Floor mats	7,500 V
Metallized laminate	Floor mats	5,000 V

5 Removal and replacement procedures for Customer Self-Repair parts

This chapter provides removal and replacement procedures for Customer Self-Repair parts.

NOTE: The Customer Self-Repair program is not available in all locations. Installing a part not supported by the Customer Self-Repair program may void your warranty. Check your warranty to determine if Customer Self-Repair is supported in your location.

Component replacement procedures

NOTE: Details about your computer, including model, serial number, product key, and length of warranty, are on the service tag at the bottom of your computer. See Labels on page 17 for details.

NOTE: HP continually improves and changes product parts. For complete and current information on supported parts for your computer, go to http://partsurfer.hp.com, select your country or region, and then follow the on-screen instructions.

There are as many as 26 screws that must be removed, replaced, and/or loosened when servicing Customer Self-Repair parts. Make special note of each screw size and location during removal and replacement.

Bottom cover

Description	Spare part number
Bottom cover (includes RJ-45 door, feet, sponge)	821162-001

Before removing the bottom cover, follow these steps:

1. Turn off the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect the power from the computer by unplugging the power cord from the computer.
3. Disconnect all external devices from the computer.

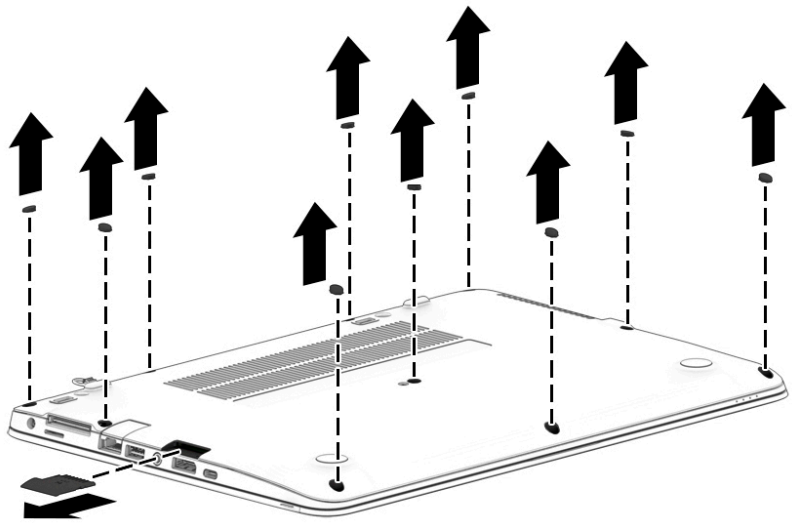
Remove the bottom cover:

1. Turn the computer upside down on a flat surface.

2. Remove the 10 rubber screw covers and the SD card reader blank from the bottom cover.

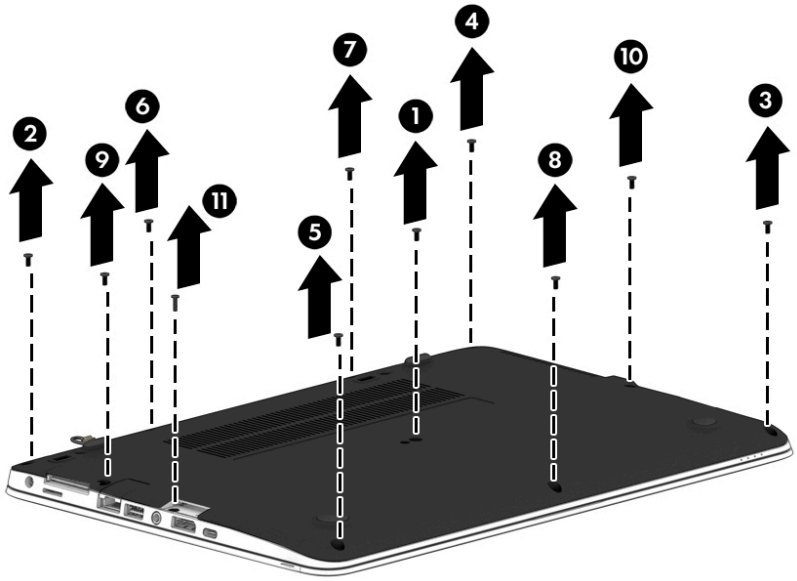
NOTE: The RJ-45 door and the SD card reader insert is available in the Plastics Kit using spare part number 821175-001.

NOTE: Multiple RJ-45 doors are available using spare part number 917396-001. The kit contains 20 doors.

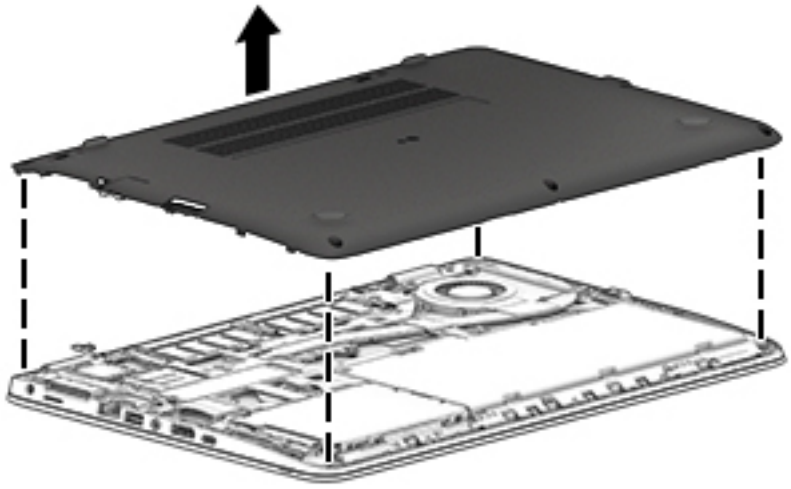


3. Remove the 10 Phillips M2.5x5.0 screws **(1) - (10)** and the Phillips M2.0x7.0 screw **(11)** in the order shown in the following image.

NOTE: The longer (Phillips M2.0x7.0) screw is located under the SD card reader.



4. Lift the bottom cover off the computer.

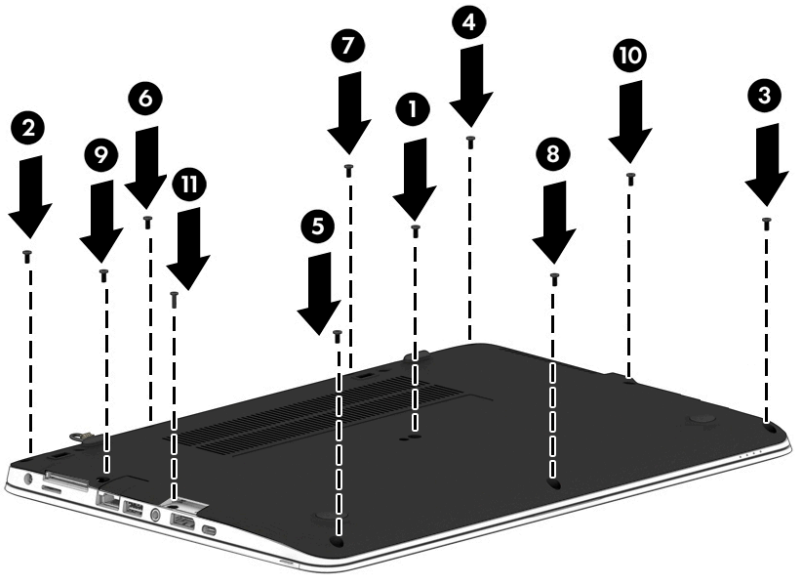


Reverse the removal procedures to install the bottom cover.

Replacing the bottom cover

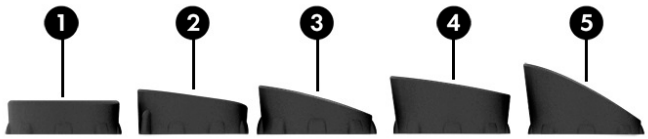
When replacing the bottom cover screws, be sure to install the screws in the order indicated in the following image.

IMPORTANT: Failure to install the screws in the correct order can result in uneven bottom cover installation.

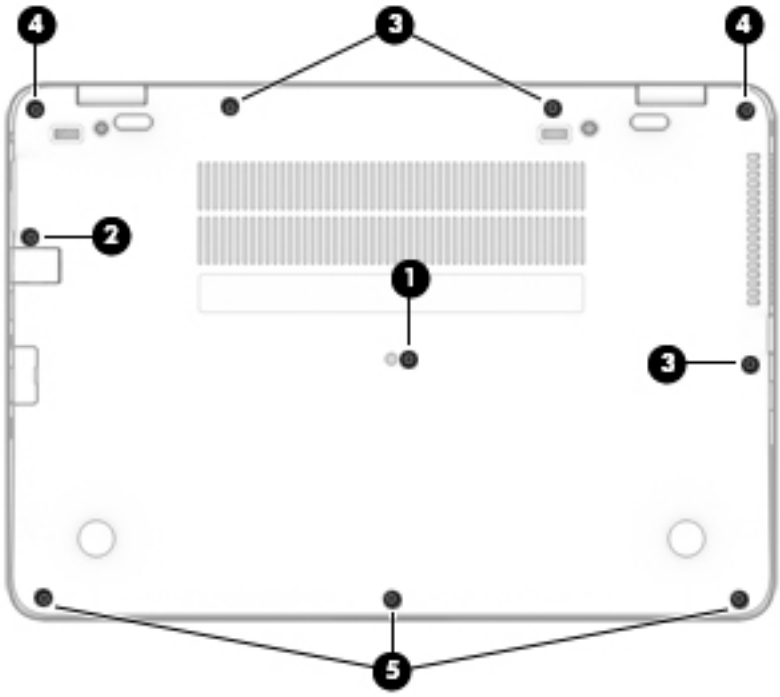


NOTE: There are five different sizes of rubber screw covers. Be sure that you reinstall them over the correct screws, as shown in the following images.

The rubber-screw cover sizes are shown in the following image.



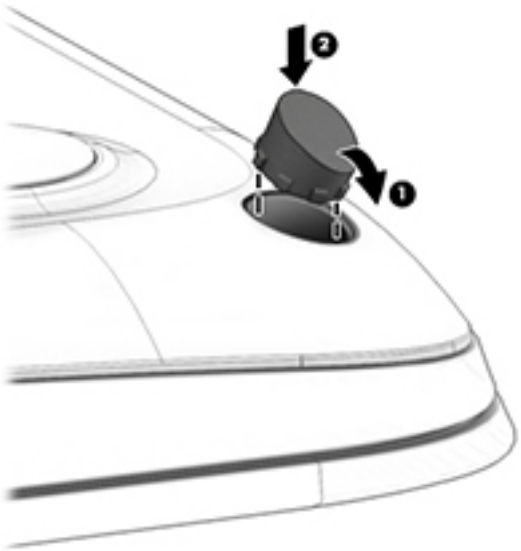
The rubber-screw cover locations are shown in the following image.



NOTE: If installing new rubber screw covers, carefully inspect for adhesive tape liner inside the cap and remove if present.

To properly insert the rubber covers, be sure to orient the covers in the correct direction:

1. Place the lower edge into the recess **(1)**, followed by the higher edge **(2)**.



2. Use a small plastic rod or the soft part of your finger (not a fingernail) to ensure compaction into the recess.
3. Visually inspect all rubber caps to be sure that they installed in the correct locations. Run a finger over the tops of the rubber caps to ensure they are properly seated.

Battery

Description	Spare part number
Battery, 3-cell, 51 WHr, 4.42 Ah	854108-850

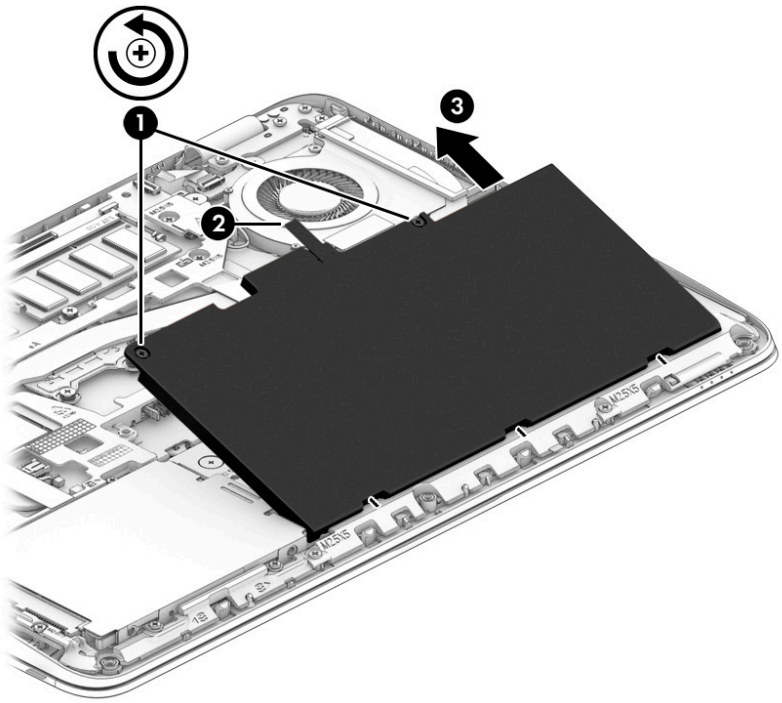
Before removing the battery, follow these steps:

1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet, and then unplugging the AC adapter from the computer.
4. Remove the bottom cover (see Bottom cover on page 32).

To remove the battery:

⚠ **CAUTION:** Removing a battery that is the sole power source for the computer can cause loss of information. To prevent loss of information, save your work and shut down the computer through Windows before removing the battery.

▲ Loosen the two captive screws **(1)** and use the pull tab **(2)** to remove the battery from the computer **(3)**.



Reverse the removal procedures to install the battery.

Hard drive

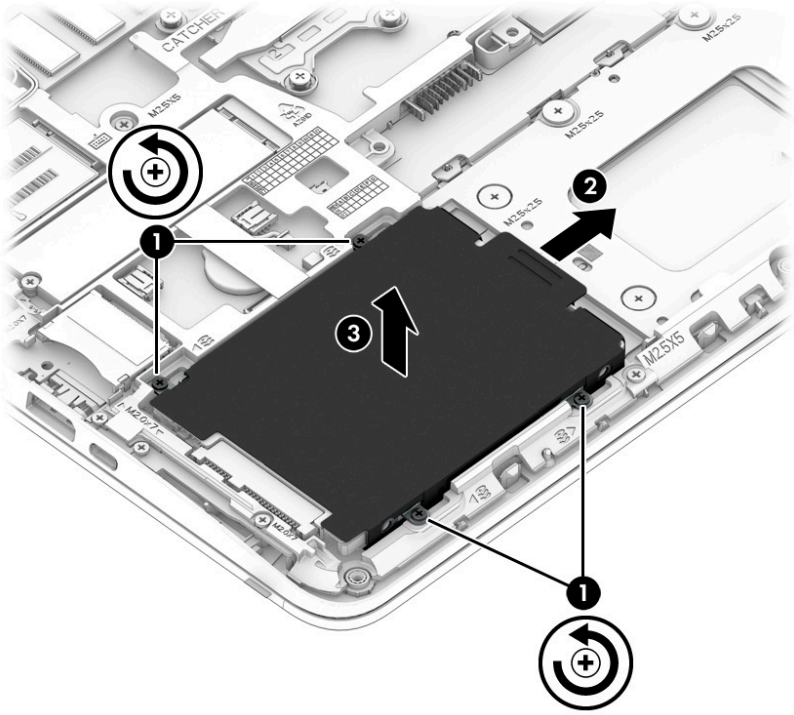
Description	Spare part number
1 TB, 5400 rpm, 7 mm	762990-001
500 GB, 7200 rpm, 7 mm, FIPS	820572-001
500 GB, 7200 rpm, 7 mm, Opal-2	820573-001
500 GB, 7200 rpm, 7 mm	703267-001
500 GB, 5400 rpm, 7 mm, hybrid, 8 GB cache	732000-001

Before removing the hard drive, follow these steps:

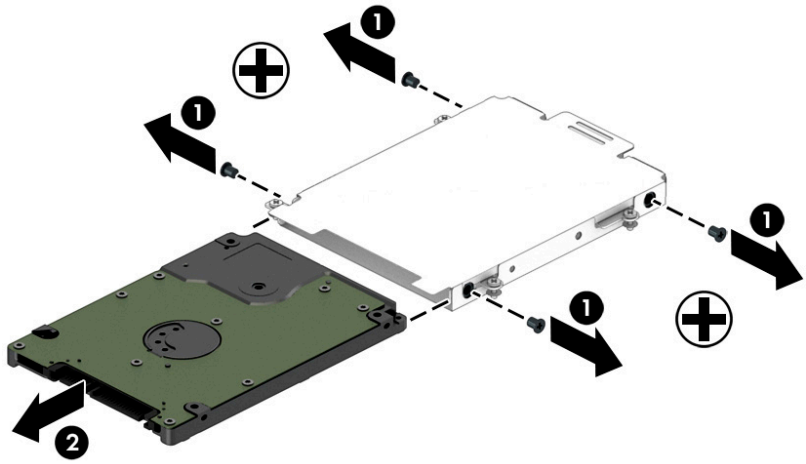
1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet, and then unplugging the AC adapter from the computer.
4. Remove the bottom cover (see Bottom cover on page 32).
5. Remove the battery (see Battery on page 36).

To remove a hard drive:

1. Loosen the 4 captive screws **(1)** that secure the hard drive to the chassis.
2. Slide the hard drive **(2)** away from the connector to disengage it.
3. Lift to remove the hard drive from the bay **(3)**.



4. To remove the hard drive cover from the hard drive, remove the 4 Phillips M3.0×3.0 screws **(1)** that secure the cover to the drive, and then lift the cover up and off the hard drive **(2)**.



Reverse this procedure to install a hard drive.

Solid-state drive (SSD)

Description	Spare part number
512 GB, PCIe, Gen3×4, SS/DS, NVMe, MLC	914935-001
512 GB, PCIe, Gen3×4, SS, NVMe, TLC, Opal 2	914934-001
512 GB, PCIe, NVMe, Gen3x4, MLC	914933-001
512 GB, SATA-3, FIPS-140–2, TLC	917382-003
360 GB, PCIe Gen3×4 SS TLC	919691-003
256 GB, PCIe, Gen3x4, NVMe, TLC	914931-001
256 GB, SATA-3, Opal 2, TLC	914930-001
128 GB, SATA-3, SS, TLC	914929-001

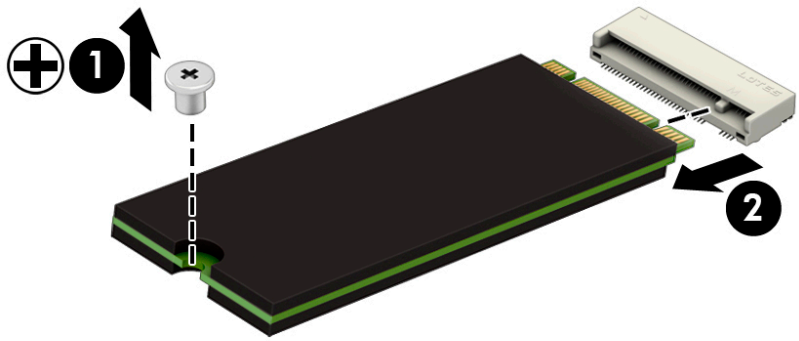
Before removing the solid-state drive, follow these steps:

1. Turn off the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect the power from the computer by unplugging the power cord from the computer.
3. Disconnect all external devices from the computer.
4. Remove the bottom cover (see Bottom cover on page 32).
5. Disconnect the battery (see Battery on page 36).

Remove the solid-state drive:

1. Remove the Phillips M2.0×3.0 screw **(1)** that secures the drive to the system board.
2. Remove the drive **(2)** by pulling it away from the connector.

NOTE: M.2 solid-state drives are designed with notches to prevent incorrect insertion.



Reverse this procedure to install the solid–state drive.

Memory modules

NOTE: Primary and expansion memory is installed in a side-by-side configuration in the bottom of the computer.

If only one memory module is installed, it must be installed in the socket labeled '1'.

Description	Spare part number
4-GB (DDR-2400)	862397-850
8-GB (DDR-2400)	862398-850
16-GB (DDR-2400)	865396-850

Update BIOS before adding memory modules

Before adding new memory, make sure you update the computer to the latest BIOS.

CAUTION: Failure to update the computer to the latest BIOS prior to installing new memory may result in various system problems.

To update BIOS:

1. Navigate to www.hp.com.
2. Click **Support & Drivers >** click **Drivers & Software**.
3. In the **Enter a product name/number** box, type the computer model information, and then click **Search**.
4. Click the link for the computer model.
5. Select the operating system, and then click **Next**.
6. Under **Step 2: Select a Download**, click the **BIOS** link.
7. Click the link for the most recent BIOS.
8. Click the **Download** button, and then follow the on-screen instructions.

Before removing the memory module, follow these steps:

1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet, and then unplugging the AC adapter from the computer.
4. Remove the bottom cover (see Bottom cover on page 32).
5. Remove the battery (see Battery on page 36).

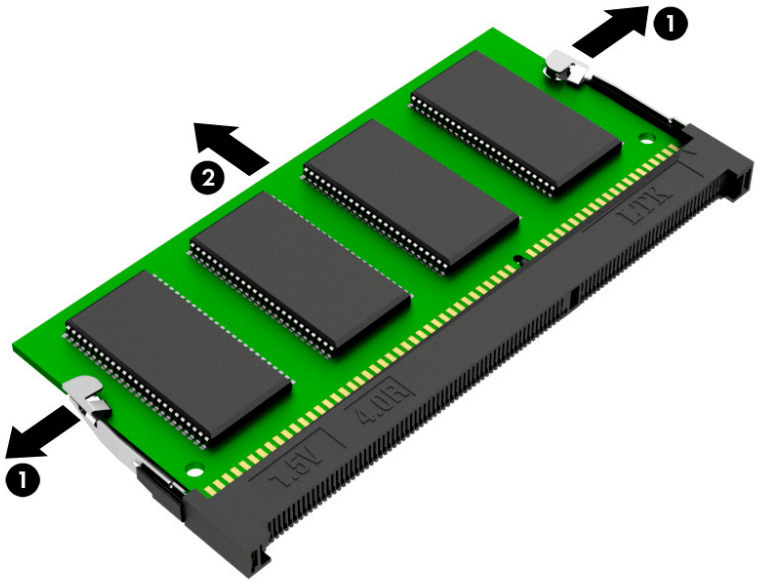
Remove the memory module:

1. Spread the retaining tabs **(1)** on each side of the memory module slot to release the memory module. (The edge of the module opposite the slot rises away from the computer.)

2. Remove the memory module **(2)** by pulling the module away from the slot at an angle.

NOTE: Memory modules are designed with a notch to prevent incorrect insertion into the memory module slot.

NOTE: The computer uses two memory sockets. The socket labeled ‘2’ houses the expansion memory module and the socket labeled ‘1’ houses the primary memory module. The removal procedure is the same for both memory sockets.



Reverse this procedure to install a memory module.

WLAN/Bluetooth combo card

The computer uses a card that provides both WLAN and Bluetooth functionality.

The WLAN module and WWAN module are not interchangeable.

Description	Spare part number
Intel Dual Band Wireless-AC 3165 802.11ac 1x1 WiFi + BT 4.0 combo adapter	851592-001
Intel Dual Band Wireless-AC 8260NGW 802.11a/g/g/n+ac 2x2 WiFi + BT 4.2 combo adapter	851594-001
Intel Dual Band Wireless-AC 8260NGW 802.11a/b/g/n+ac non-vPro 2x2 WiFi + BT 4.2 combo adapter	852511-001

Before removing the WLAN module, follow these steps:

1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet, and then unplugging the AC adapter from the computer.
4. Remove the bottom cover (see Bottom cover on page 32).
5. Remove the battery (see Battery on page 36).

Remove the WLAN module:

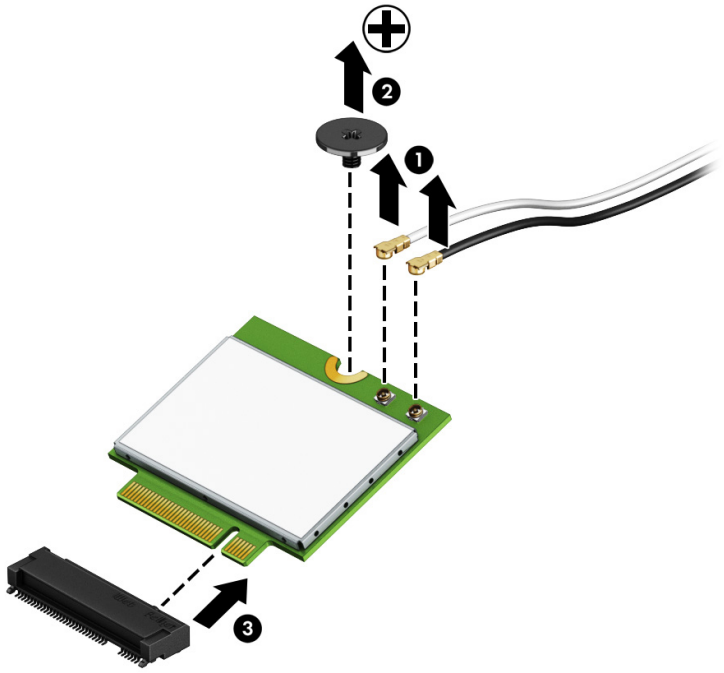
1. Disconnect the WLAN antenna cables **(1)** from the terminals on the WLAN module.

NOTE: The WLAN antenna cable labeled ‘1’ connects to the WLAN module “Main” terminal labeled ‘1’. The WLAN antenna cable labeled ‘2’ connects to the WLAN module ‘Aux’ terminal labeled ‘2’. If the computer is equipped with an 802.11a/b/g/n WLAN module, the yellow WLAN antenna cable connects to the middle terminal on the WLAN module.

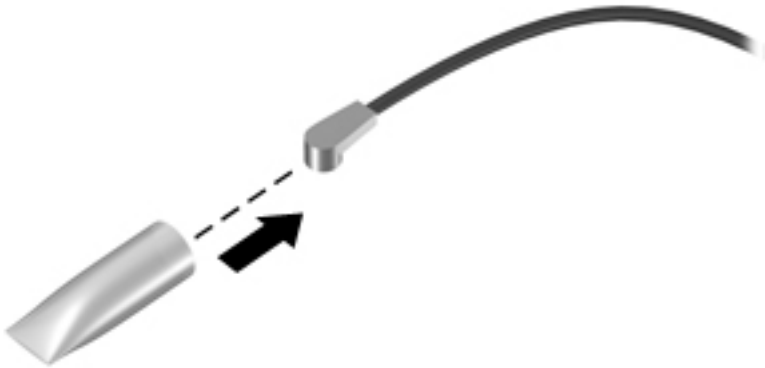
2. Remove the one Phillips M2.5×3.0 screw **(2)** that secures the WLAN module to the computer. (The edge of the module opposite the slot rises away from the computer.)

3. Remove the WLAN module by pulling the module away from the slot at an angle **(3)**.

NOTE: WLAN modules are designed with a notch to prevent incorrect insertion.



NOTE: If the WLAN antennas are not connected to the terminals on the WLAN module, the protective sleeves must be installed on the antenna connectors, as shown in the following illustration.



Reverse this procedure to install the WLAN module.

WWAN module

The WLAN module and WWAN module are not interchangeable.

The WWAN module is available on select models only.

Description	Spare part number
HP lt4120 LTE/EVDO/HSPA+ SnapdragonT X5 LTE Mobile Broadband Module	800870-001
Huawei HP lt4132 - LTE/HSPA+ with GPS	845710-001
Fibocom HP hs3210 WW HSPA+ without GPS	860726-001

Before removing the WWAN module, follow these steps:

1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet, and then unplugging the AC adapter from the computer.
4. Remove the bottom cover (see Bottom cover on page 32).
5. Remove the battery (see Battery on page 36).

Remove the WWAN module:

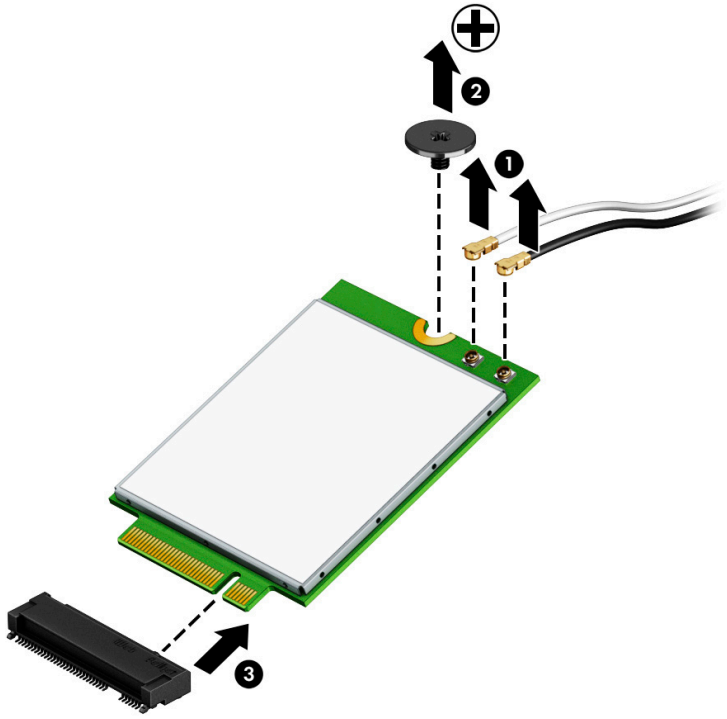
1. Position the computer upside-down.
2. Disconnect the WWAN antenna cables **(1)** from the terminals on the WWAN module.

NOTE: The red WWAN antenna cable is connected to the WWAN module 'Main' terminal. The blue WWAN antenna cable is connected to the WWAN module 'Aux' terminal.

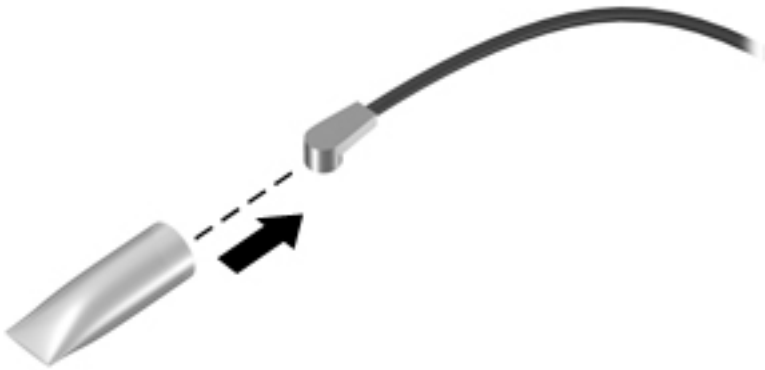
3. Remove the one Phillips M2.5×3.0 screws **(2)** that secure the WWAN module to the computer. (The edge of the module opposite the slot rises away from the computer.)

4. Remove the WWAN module **(3)** by pulling the module away from the slot at an angle.

NOTE: WWAN modules are designed with a notch to prevent incorrect insertion.



NOTE: If the WWAN antennas are not connected to the terminals on the WWAN module, the protective sleeves must be installed on the antenna connectors, as shown in the following illustration.



Reverse this procedure to install the WWAN module.

RTC battery

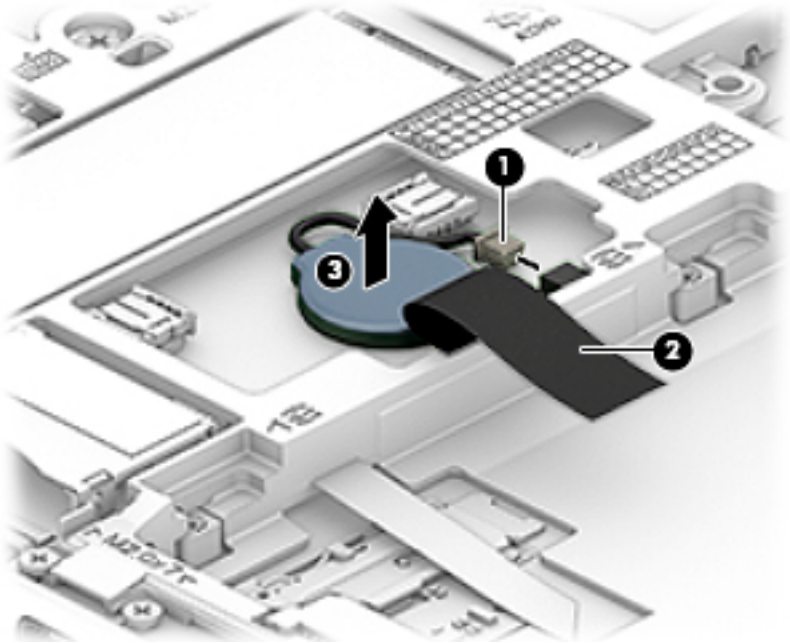
Description	Spare part number
RTC battery	914384-001

Before removing the RTC battery, follow these steps:

1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet, and then unplugging the AC adapter from the computer.
4. Remove the bottom cover (see Bottom cover on page 32).
5. Remove the battery (see Battery on page 36).

Remove the RTC battery:

1. Disconnect the battery cable from the system board **(1)**.
2. Lift the Mylar from atop the battery **(2)**.
3. Using a flat tool, pry the battery out of the computer **(3)**.



Reverse this procedure to install the RTC battery.

Keyboard

In this section, the first table provides the main spare part number for the keyboards. The second table provides the country codes.

Description	Spare part number
Keyboard, no backlight	836307-xx1
Keyboard, backlit	836308-xx1
Keyboard, backlit, privacy	903008-xx1
Keyboard for use in Japan; without a backlight	923272-291
Keyboard for use in Japan; with a backlight	923273-291
Pointing stick covers (20 count)	828884-001

For use in country or region	Spare part number	For use in country or region	Spare part number	For use in country or region	Spare part number
Belgium	-A41	India	-D61	Slovenia	-BA1
Brazil	-201	Israel	-BB1	South Korea	-AD1
Bulgaria	-261	Italy	-061	Spain	-071
Canada	-DB1	Japan	-291	Sweden and Finland	-B71
Czech Republic and Slovakia	-FL1	Latin America	-161	Switzerland	-BG1
Denmark	-081	The Netherlands	-B31	Taiwan	-AB1
Denmark, Finland, and Norway	-DH1	Northern Africa	-FP1	Thailand	-281
France	-051	Norway	-091	Turkey	-141
Germany	-041	Portugal	-131	Turkey F	-541
Greece	-151	Romania	-271	United Kingdom	-031
Hungary	-211	Russia	-251	United States	-001
Iceland	-DD1	Saudi Arabia	-171		

Before removing the keyboard, follow these steps:

1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet, and then unplugging the AC adapter from the computer.
4. Remove the bottom cover (see Bottom cover on page 32).
5. Remove the battery (see Battery on page 36).

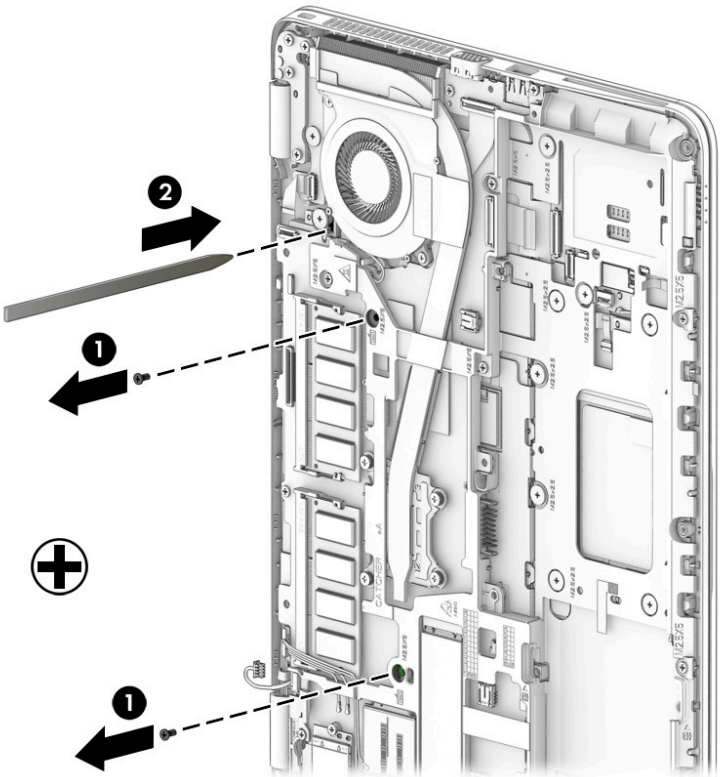
Remove the keyboard:

1. Position the computer upside down.
2. Remove the 2 Phillips M2.5×5.0 screws that secure the keyboard to the computer **(1)**.

NOTE: The screws are labeled with a keyboard symbol.

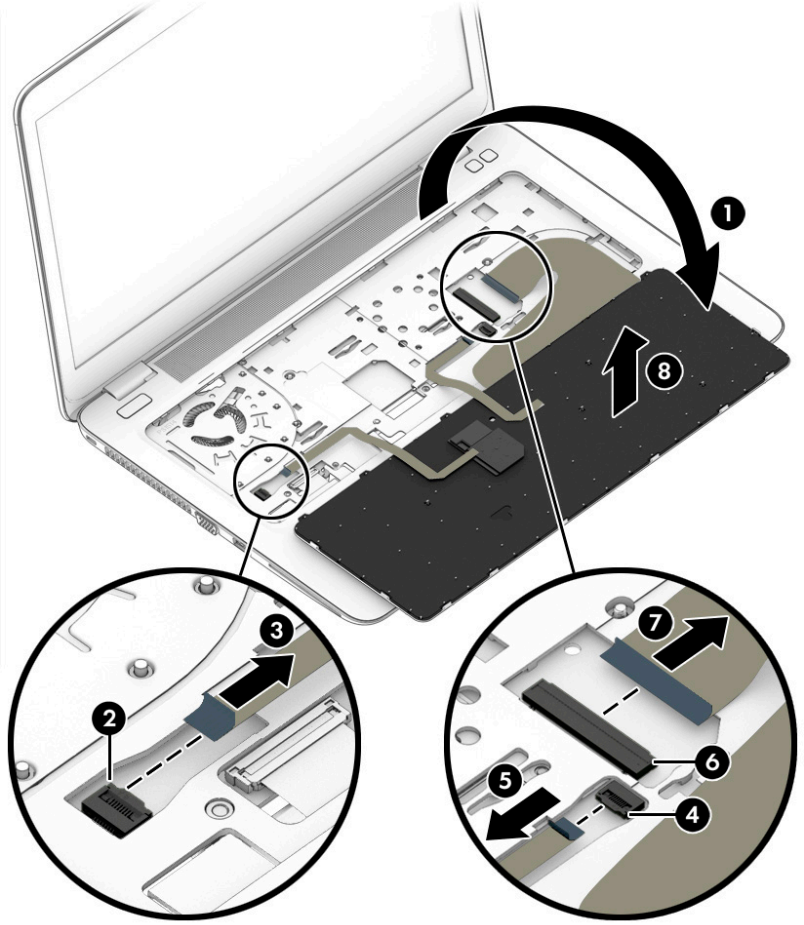
3. Position the computer on its side and partially open.
4. Insert a screwdriver or similar thin tool into the hole beside the heat sink/fan assembly, and then press on the back of the keyboard until it disengages from the computer **(2)**.

NOTE: Cables connect the bottom of the keyboard to the system board. Make sure not to prematurely pull the keyboard cables out of the system board connectors.



5. Position the computer upright with the front toward you, and then open the computer as far as possible.
6. Slide the keyboard slightly downward, and then lift and rotate the keyboard over onto the palm rest **(1)**.
7. Lift the ZIF connector **(2)** for the pointing stick cable connector, then and remove the cable from the connector **(3)**.
8. Lift the ZIF connector **(4)** for the keyboard backlight cable connector, and then remove the cable from the connector **(5)**.
9. Lift the ZIF connector **(6)** for the keyboard cable connector, and then remove the cable from the connector **(7)**.

10. Remove the keyboard **(8)**.



Reverse this procedure to install the keyboard.

6 Removal and replacement procedures for Authorized Service Provider parts

This chapter provides removal and replacement procedures for Authorized Service Provider only parts.

CAUTION: Components described in this chapter should only be accessed by an authorized service provider. Accessing these parts can damage the computer or void the warranty.

CAUTION: This computer does not have user-replaceable parts. Only HP authorized service providers should perform the removal and replacement procedures described here. Accessing the internal part could damage the computer or void the warranty.

Component replacement procedures

NOTE: Details about your computer, including model, serial number, product key, and length of warranty, are on the service tag at the bottom of your computer. See Labels on page 17 for details.

NOTE: HP continually improves and changes product parts. For complete and current information on supported parts for your computer, go to http://partsurfer.hp.com, select your country or region, and then follow the on-screen instructions.

There are as many as 45 screws that must be removed, replaced, and/or loosened when servicing Authorized Service Provider only parts. Make special note of each screw size and location during removal and replacement.

Internal base plate

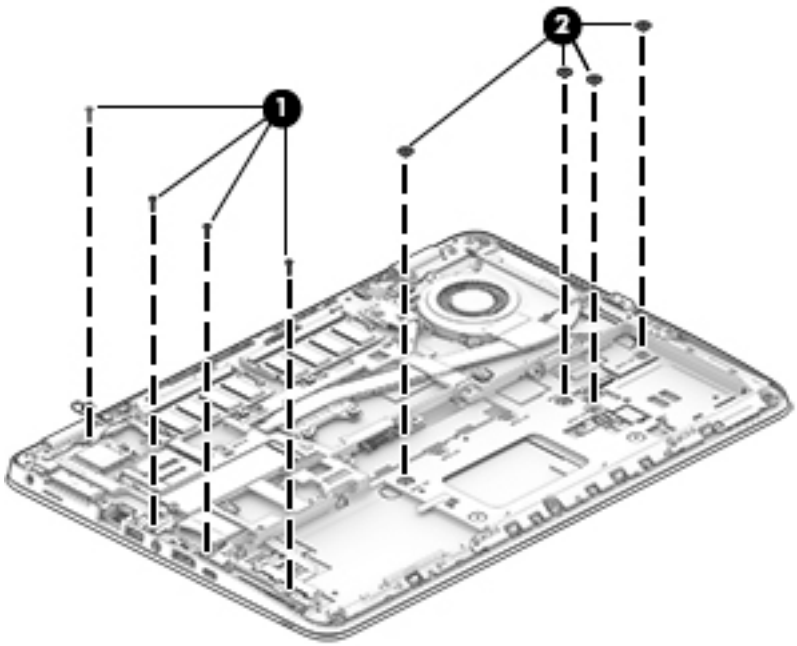
Description	Spare part number
Internal base plate	821164-001

Before removing the internal base plate, follow these steps:

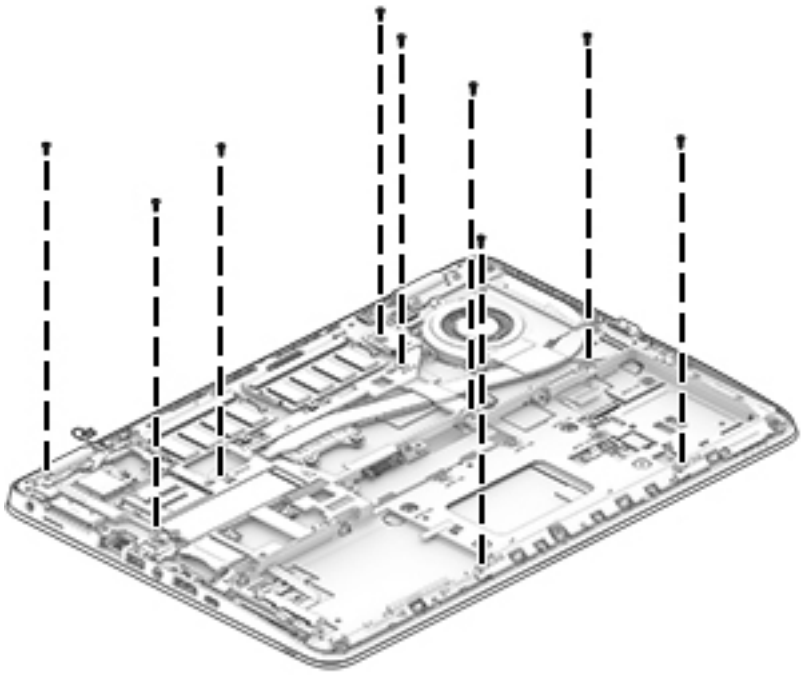
1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet, and then unplugging the AC adapter from the computer.
4. Remove the bottom cover (see Bottom cover on page 32).
5. Remove the battery (see Battery on page 36).
6. Remove the keyboard (see Keyboard on page 47).
7. If equipped, disconnect the antenna cables from the WLAN module (see WLAN/Bluetooth combo card on page 42).
8. If equipped, disconnect the antenna cables from the WWAN module (see WWAN module on page 44).

Remove the internal base plate:

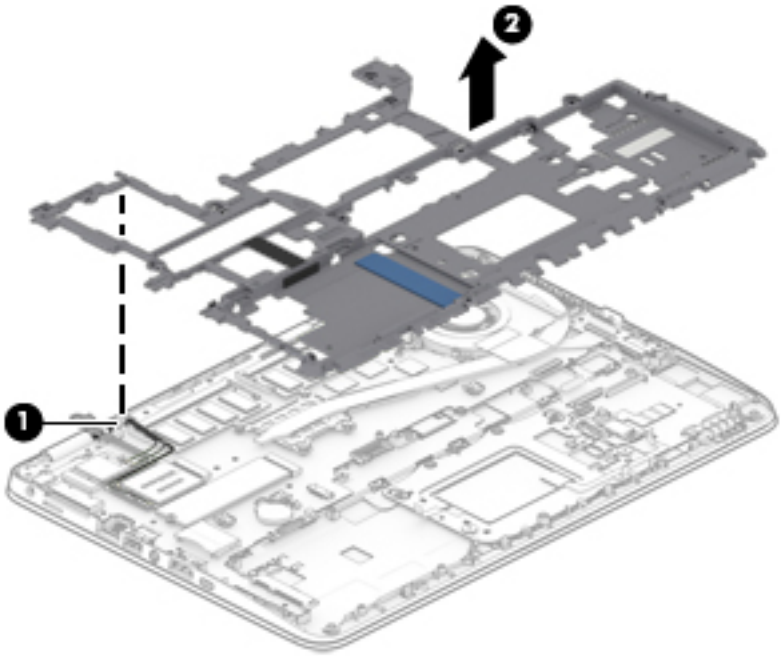
1. Remove the 4 Phillips M2.0x7.0 screws **(1)** and the 4 broadhead Phillips M2.5x2.5 screws **(2)** that secure the internal base plate to the computer.



2. Remove the 9 Phillips M2.5x5.0 screws that secure the internal base plate to the computer.



3. Lift the tape and remove the antenna cables from the base plate **(1)**, and then remove the base plate from the computer **(2)**.



Reverse this procedure to install the internal base plate.

Heat sink/fan assembly

NOTE: The heat sink/fan assembly spare part kit includes replacement thermal material.

Description	Spare part number
Heat sink/thermal module	821163-001

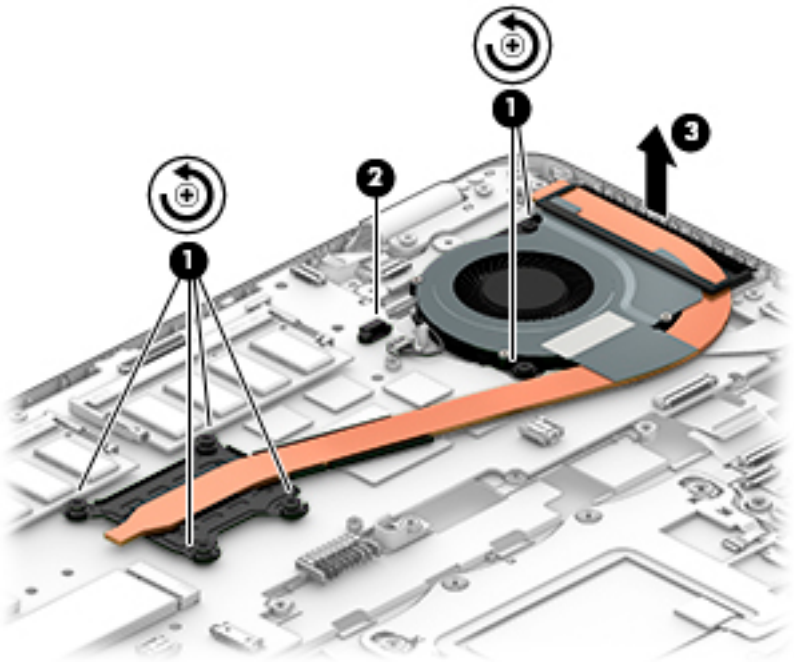
Before removing the heat sink/fan assembly, follow these steps:

1. Turn off the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect the power from the computer by unplugging the power cord from the computer.
3. Disconnect all external devices from the computer.
4. Remove the bottom cover (see Bottom cover on page 32).
5. Remove the battery (see Battery on page 36).
6. Remove the keyboard (see Keyboard on page 47).
7. Remove the internal base plate (see Internal base plate on page 50).

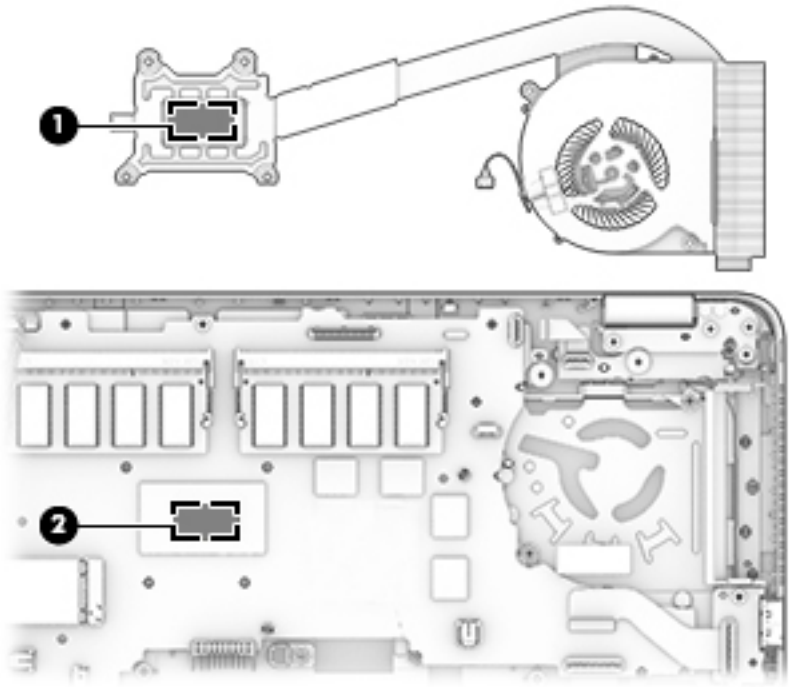
Remove the heat sink/fan assembly:

▲ Loosen the six captive screws on the fan and heat sink following the sequence stamped on the fan and heat sink **(1)**, disconnect the fan cable from the system board **(2)**, and then remove the heat sink/fan assembly from the system board **(3)**.

CAUTION: Take extreme care when removing the heat sink and fan assembly. The heatpipe is very fragile and can be easily damaged and bent during removal.



NOTE: The thermal material must be thoroughly cleaned from the surfaces of the heat sink and the system board components each time the heat sink is removed. Replacement thermal material is included with the heat sink, processor, and system board spare part kits.



Reverse this procedure to install the heat sink/fan assembly.

Fingerprint reader assembly

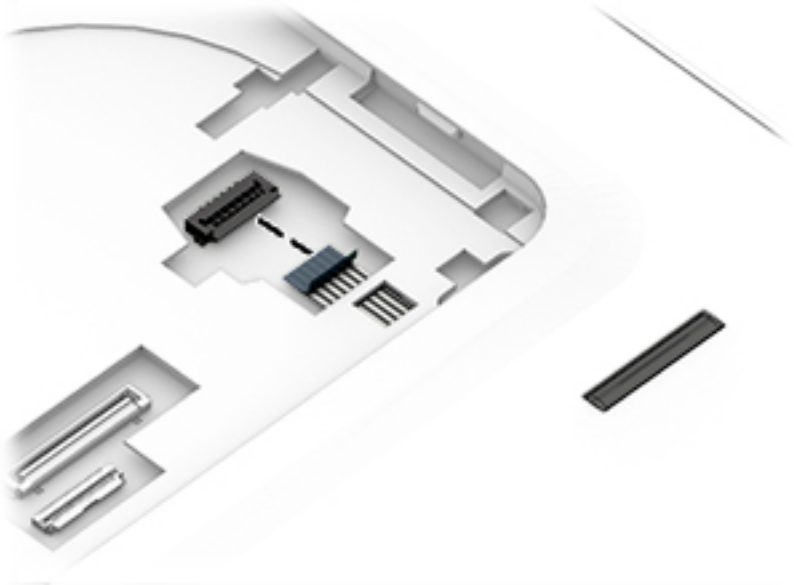
Description	Spare part number
Fingerprint reader assembly (includes cable)	849912-001

Before removing the fingerprint reader assembly, follow these steps:

1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet, and then unplugging the AC adapter from the computer.
4. Remove the bottom cover (see Bottom cover on page 32).
5. Remove the battery (see Battery on page 36).
6. Remove the keyboard (see Keyboard on page 47).
7. Remove the internal base plate (Internal base plate on page 50).

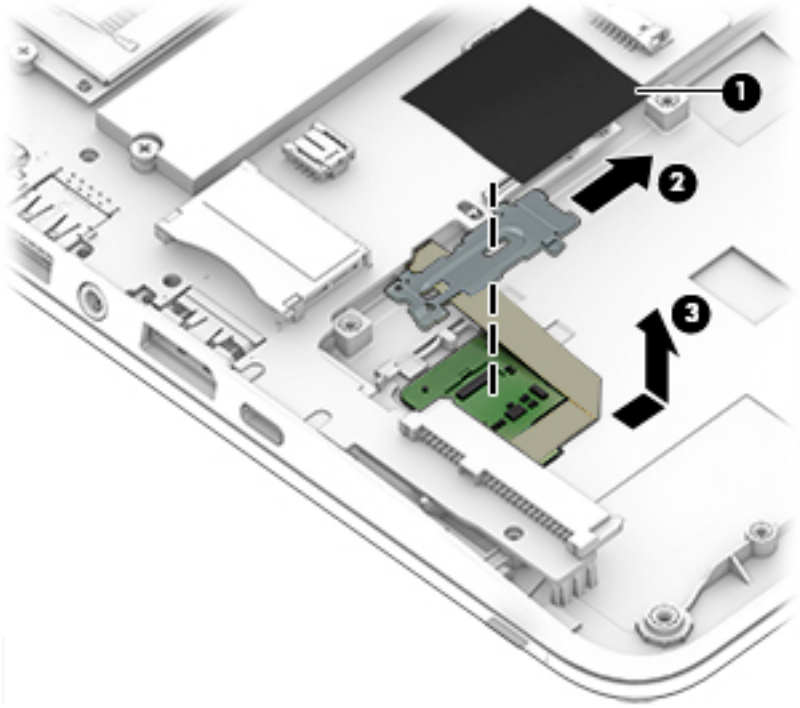
Remove the fingerprint reader assembly:

1. Position the computer upright and open all the way.
2. Disconnect the fingerprint reader board cable from the system board.



3. Position the computer upside down.
4. Remove the Mylar cover from atop the fingerprint reader assembly **(1)**.
5. Slide the bracket toward the right, and then lift it from the computer **(2)**.

6. Remove the fingerprint reader board and cable assembly from the computer **(3)**.



Reverse this procedure to install the fingerprint reader assembly.

Touchpad board

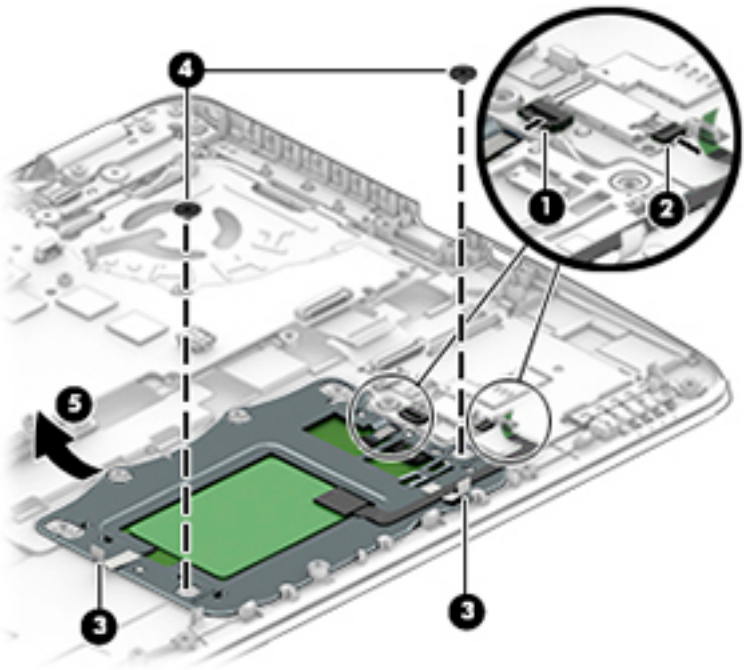
Description	Spare part number
Touchpad board without NFC antenna	821171-001
Touchpad board with NFC antenna	821172-001

Before removing the touchpad board, follow these steps:

1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet, and then unplugging the AC adapter from the computer.
4. Remove the bottom cover (see Bottom cover on page 32).
5. Remove the battery (see Battery on page 36).
6. Remove the keyboard (see Keyboard on page 47).
7. Remove the internal base plate (see Internal base plate on page 50

Remove the touchpad board:

1. Disconnect the cable from the touchpad to the smart card reader board **(1)**, and then disconnect the NFC antenna from the NFC module **(2)**.
2. Lift the tape **(3)**, and then remove the 2 Phillips M2.5x2.5 screws **(4)** that secure the touchpad button board to the computer.
3. Lift the top of the touchpad board up, and then pull it forward to remove it from the computer **(5)**.



Reverse this procedure to install the touchpad board.

NFC module

Description	Spare part number
NFC (Near Field Communication) module (includes NFC cable, antenna cable, Mylar insulator, and foam)	821666-001

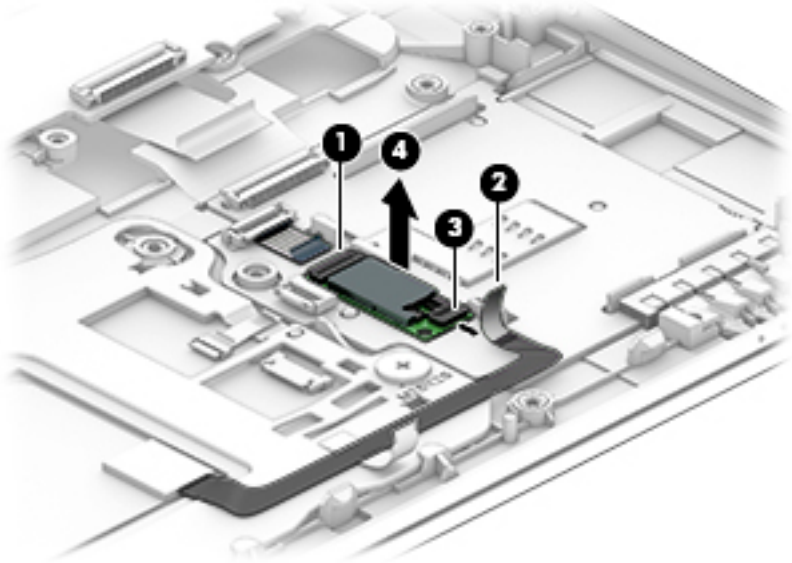
Before removing the NFC module, follow these steps:

1. Turn off the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect the power from the computer by unplugging the power cord from the computer.
3. Disconnect all external devices from the computer.
4. Remove the bottom cover (see Bottom cover on page 32).
5. Remove the battery (see Battery on page 36).
6. Remove the keyboard (see Keyboard on page 47).
7. Remove the internal base plate (see Internal base plate on page 50

Remove the NFC module:

1. Disconnect the system board cable **(1)** and the NFC antenna **(2)** from the NFC module.
2. Pry the NFC module from the smart card reader **(3)**, and the lift it from the computer **(4)**.

NOTE: The NFC antenna is also spared with the touchpad.



Reverse the removal procedures to install the NFC module.

Smart card reader board

Description	Spare part number
Smart card reader board	914380-001
Smart card reader cable (available in Cable Kit)	914381-001 (Cable Kit)

Before removing the card reader board, follow these steps:

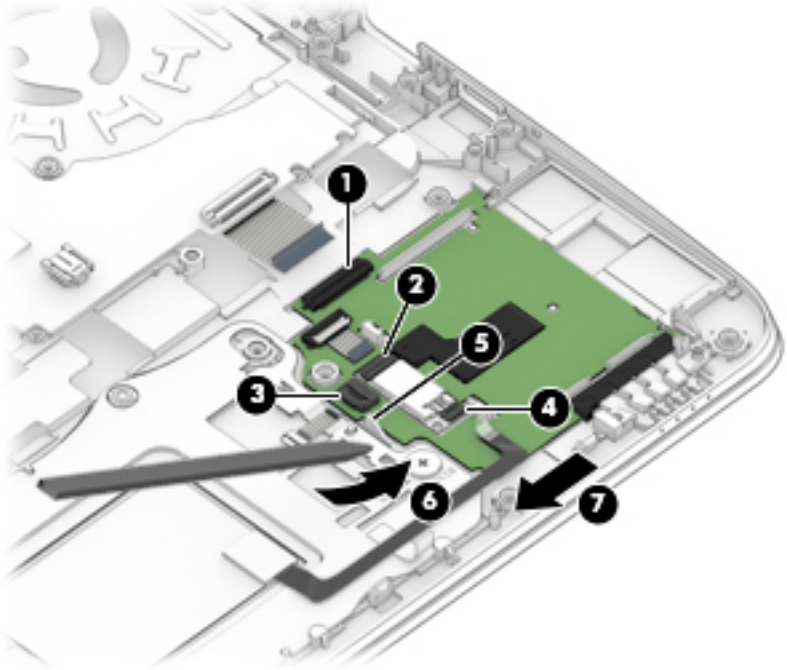
1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet, and then unplugging the AC adapter from the computer.
4. Remove the bottom cover (see Bottom cover on page 32).
5. Remove the battery (see Battery on page 36).
6. Remove the keyboard (see Keyboard on page 47).
7. Remove the internal base plate (see Internal base plate on page 50

Remove the smart card reader board:

NOTE: Before you remove the smart card reader, make sure nothing (memory card or plastic insert) in inserted in the reader.

1. Disconnect the main system board cable from the card reader board **(1)**.
2. Disconnect the cable from the top of the NFC board **(2)**.
3. Disconnect the touchpad cable from the side of the card reader board **(3)**.
4. Disconnect the cable from the bottom of the NFC board **(4)**.

5. Pull the plastic tab on the side of the card reader board to disengage the board **(5)**, use a thin tool to pry up the side of board (near touchpad) **(6)**, and then pull the board away from the side of the computer to remove it from the clips built into the computer **(7)**.



Reverse this procedure to install the card reader board.

USB/audio board

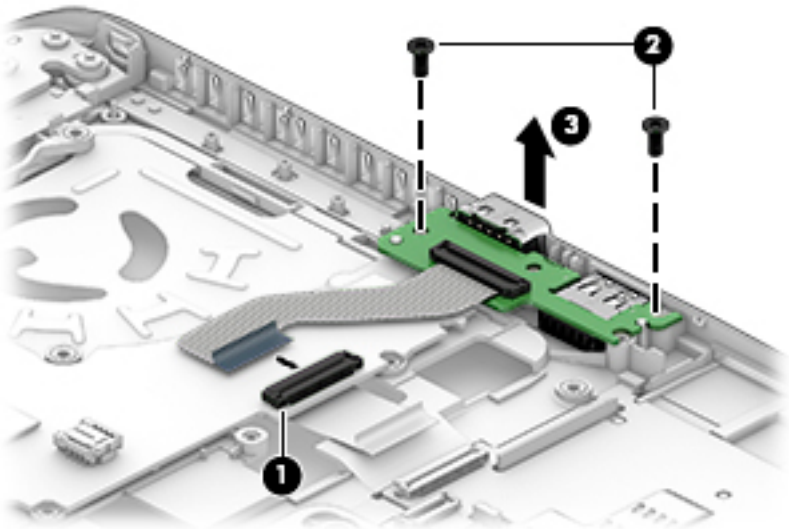
Description	Spare part number
USB/audio board	916922-001

Before removing the USB/audio board, follow these steps:

1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet, and then unplugging the AC adapter from the computer.
4. Remove the bottom cover (see Bottom cover on page 32).
5. Remove the battery (see Battery on page 36).
6. Remove the keyboard (see Keyboard on page 47).
7. Remove the internal base plate (see Internal base plate on page 50

Remove the USB/audio board:

1. Disconnect the cable from the system board **(1)**.
2. Remove the 2 Phillips M2.5×5.0 screws **(2)** that secure the USB/audio board to the computer.
3. Lift up rear side of the board, and then pull it away from the side of computer to remove it **(3)**.



Reverse this procedure to install the USB/audio board.

System board

NOTE: All system board spare part kits include replacement thermal material.

All system boards use the following part numbers:

xxxxxx-001: Non-Windows operating systems

xxxxxx-601: Windows operating system

Description	Spare part number
System board with Intel i7-7600U processor	917507-xx1
System board with Intel i7-7500U processor	917504-xx1
System board with Intel i5-7300U processor	917501-xx1
System board with Intel i5-7200U processor	917503-xx1
System board with Intel i3-7100U processor	917499-xx1

Before removing the system board, follow these steps:

1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet, and then unplugging the AC adapter from the computer.
4. Remove the bottom cover (see Bottom cover on page 32).
5. Remove the battery (see Battery on page 36).
6. Remove the keyboard (see Keyboard on page 47).
7. Remove the internal base plate (see Internal base plate on page 50

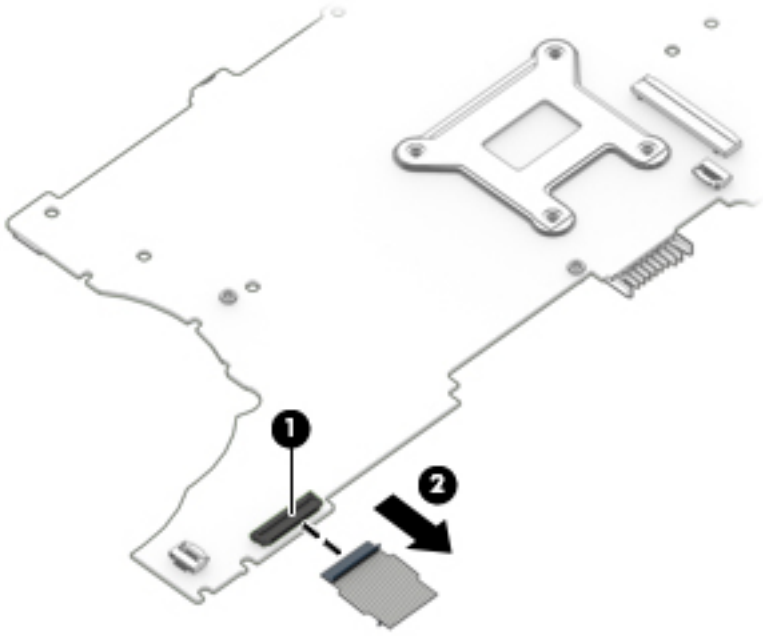
When replacing the system board, be sure to remove the following components (as needed) from the defective system board and install on the replacement system board:

- Solid-state drive (see Solid-state drive (SSD) on page 39)
- Memory modules (see Memory modules on page 40)
- WLAN/Bluetooth module (see WLAN/Bluetooth combo card on page 42)
- WWAN module (see WWAN module on page 44)
- Heat sink/fan assembly (see Heat sink/fan assembly on page 53)

Remove the system board:

1. Position the computer upright and open as far as possible.

2. Disconnect the card reader cable from the system board by lifting the ZIF connector **(1)** and removing the cable from the connector **(2)**.



3. Close the computer and position it upside down.

4. Disconnect the following cables from the system board:

   (1) Speaker cable

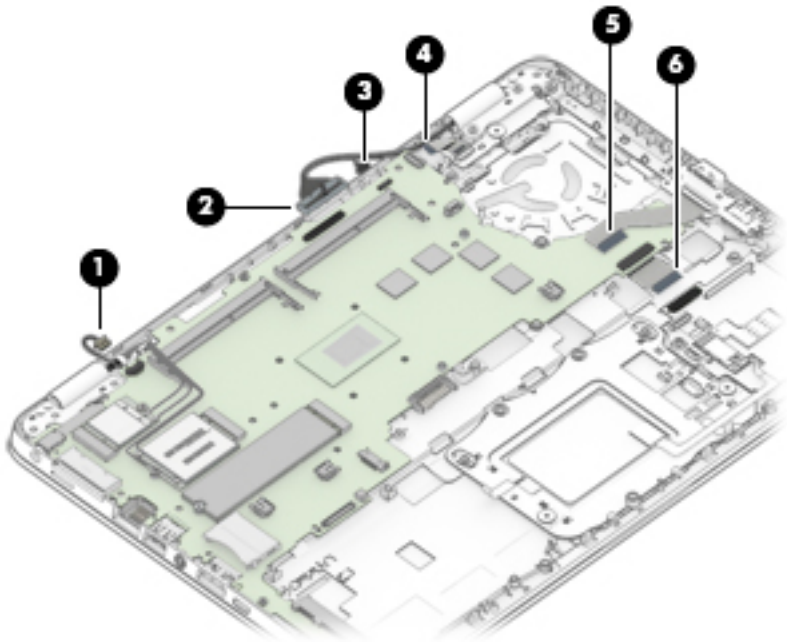
   (2) Display cable

   (3) Touch cable

   (4) Power button board cable

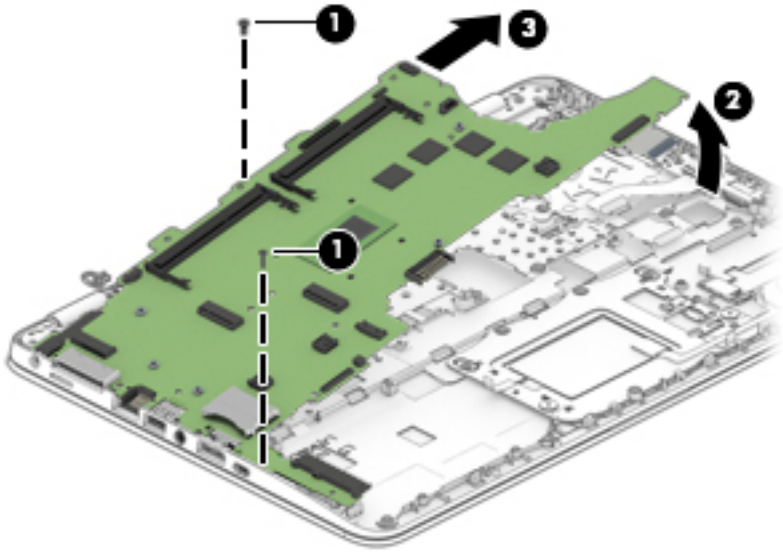
   (5) USB/audio board cable

   (6) Card reader cable



5. Remove the 2 Phillips M2.5×5.0 screws **(1)** that secure the system board to the computer.
6. Lift the right side of the system board up at an angle **(2)**.

7. Pull the system board up and toward the right to disengage the connectors from the left side of the computer and remove the system board **(3)**.



Reverse this procedure to install the system board.

Speaker assembly

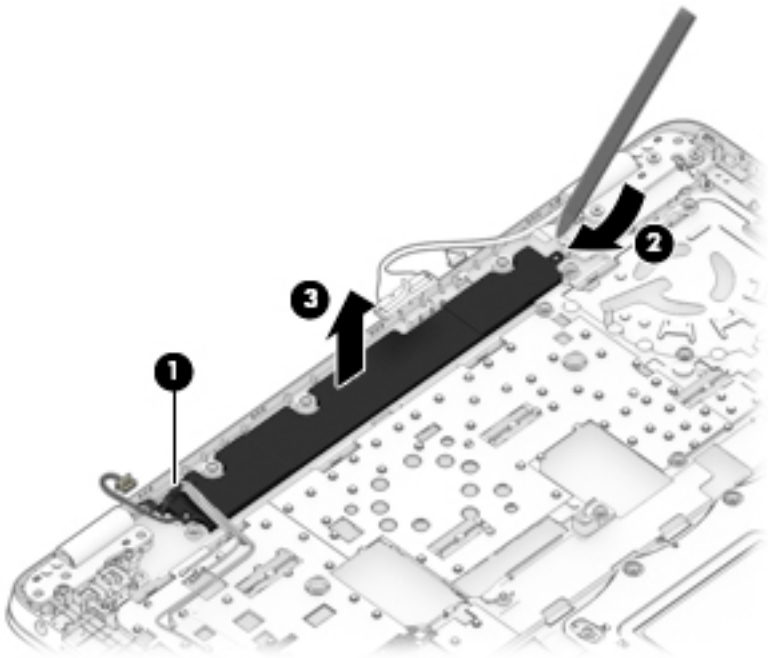
Description	Spare part number
Speaker assembly (includes cable)	821170-001

Before removing the speaker assembly, follow these steps:

1. Turn off the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect the power from the computer by unplugging the power cord from the computer.
3. Disconnect all external devices from the computer.
4. Remove the bottom cover (see Bottom cover on page 32).
5. Remove the battery (see Battery on page 36).
6. Remove the keyboard (see Keyboard on page 47).
7. Remove the internal base plate (see Internal base plate on page 50)
8. Remove the system board (see System board on page 62).

Remove the speaker assembly:

1. Remove the antennas from the clip in the speaker assembly **(1)**.
2. Use a thin tool to pry the middle of the speaker assembly up to disengage the adhesive that secures it to the computer **(2)**, and then remove the speaker assembly **(3)** from the computer.



Reverse this procedure to install the speakers.

Display assembly

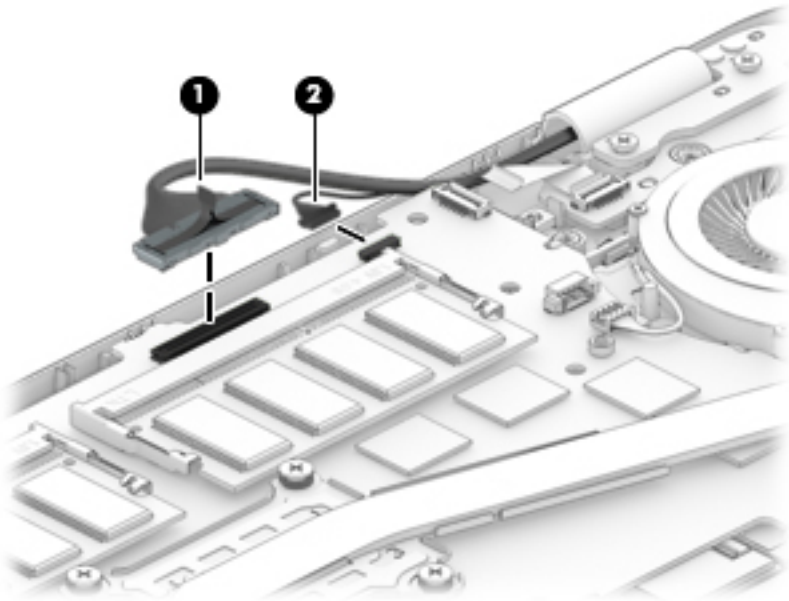
Description	Spare part number
Display panel assembly, touch screen	910584-001
NOTE: Touch screen display assemblies are spared only as whole unit hinge-ups.	
NOTE: Non-touch display assemblies are spared at the subcomponent level only. For more non-touch display assembly spare part information, see Display assembly subcomponents on page 21.	
Display panel assembly, privacy	922076-001
NOTE: All privacy display assemblies including non-touch are spared as whole unit hinge-ups.	

Before removing the display assembly, follow these steps:

1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet, and then unplugging the AC adapter from the computer.
4. Remove the bottom cover (see Bottom cover on page 32).
5. Remove the battery (see Battery on page 36).
6. Remove the internal base plate (see Internal base plate on page 50)

Remove the display assembly:

1. Disconnect the display cable **(1)** and the touch cable **(2)** from the system board.

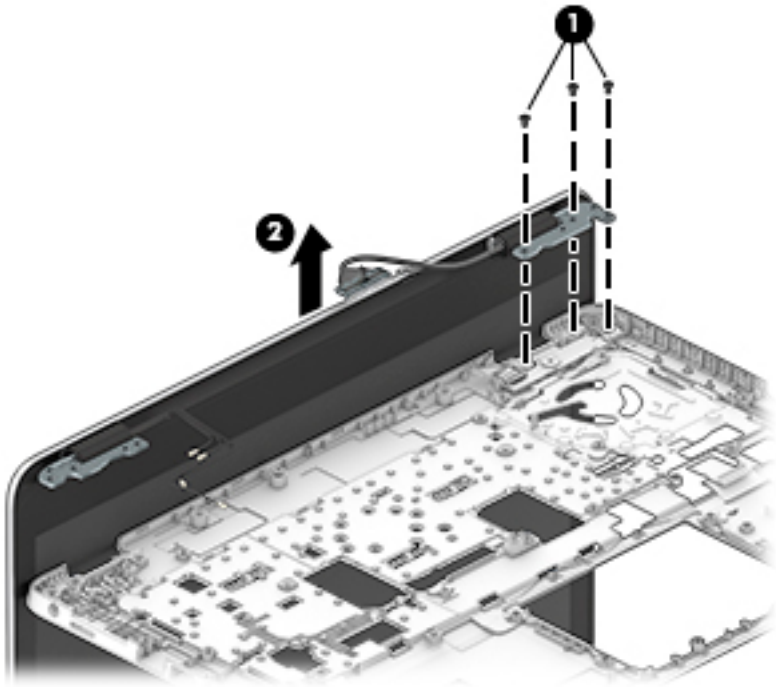


2. Remove the 3 Phillips M2.5×5.0 screws **(1)** from the display hinges.

3. Lift the display assembly straight up and remove it **(2)**.

CAUTION: When installing the display assembly, be sure that the wireless antenna cables are routed and arranged properly.

Failure to properly route the antennas can result in degradation of the computer's wireless performance.

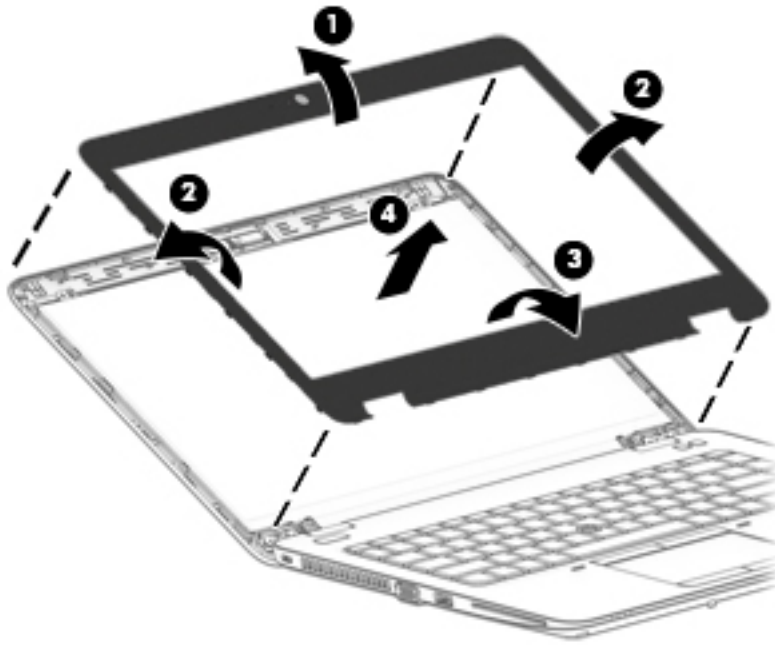


4. If you need to remove the display bezel, flex the top **(1)** of the bezel, the inside edges of the left and right sides **(2)**, and then the bottom **(3)** of the bezel until it disengages from the display enclosure..

NOTE: Make sure the hinges are not bent (see hinge position in following image) when you remove the bezel.

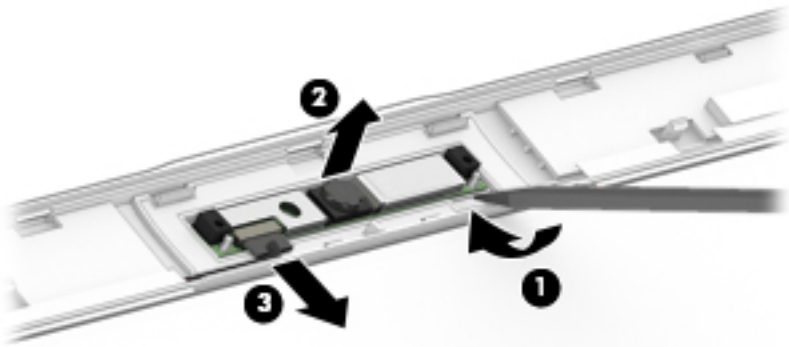
5. Remove the display bezel **(4)**.

   The display bezel is available using spare part number 821160-001.



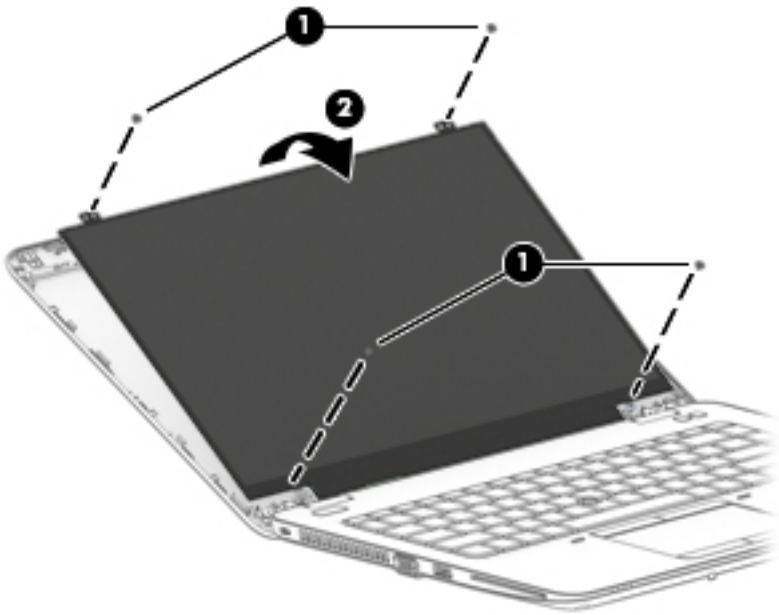
6. If it is necessary to replace the webcam or microphone module, use a thin tool to pry the module away from the double-sided tape on the display enclosure **(1)**, lift the module up enough to access the cable connector **(2)**, and then disconnect the cable from the module **(3)**.

   The webcam module is available using spare part number 800575-020. The microphone module is available using spare part number 920485-001.

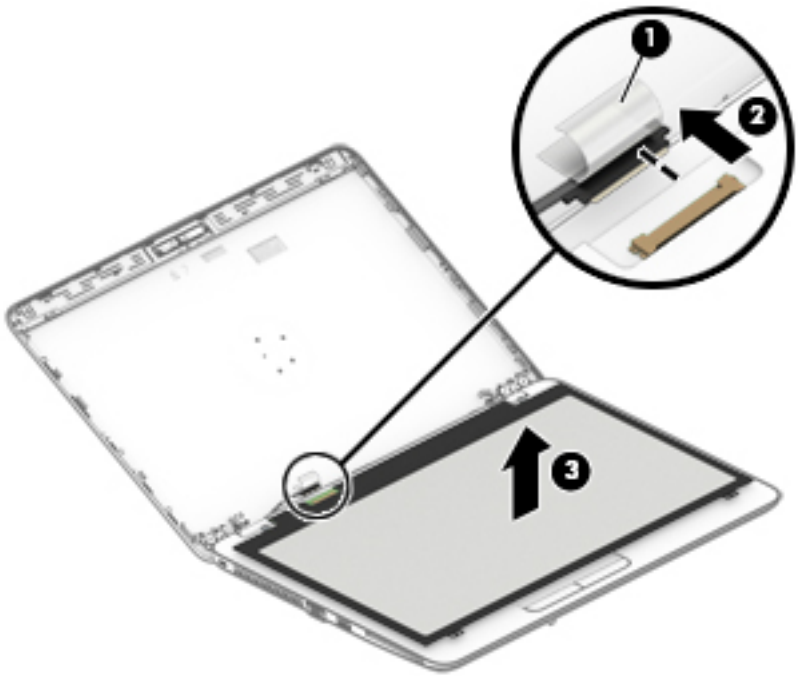


7. If it is necessary to remove the display panel from the enclosure, remove the 4 Phillips M2.0×2.0 screws that secure the panel to the display enclosure, and then rotate the display panel over onto the keyboard **(2)**.

   The raw display panel is available using spare part number 806861-005 for HD panels, 806860-008 for FHD panels, and 806862-005 for QHD panels.



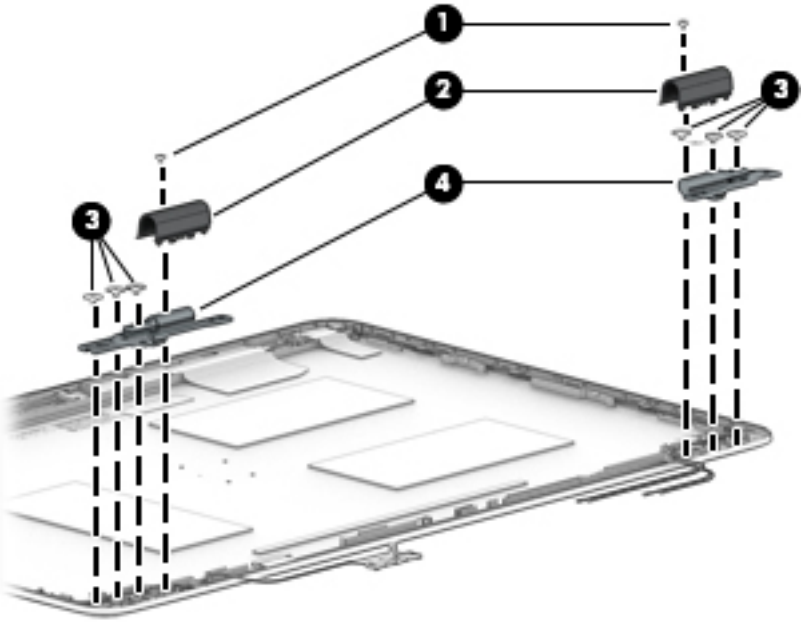
8. On the back of the display panel, lift the tape from atop the connector **(1)**, and then disconnect the display cable from the rear of the panel **(2)**.
9. Remove the display panel from the enclosure **(3)**.



10. If it is necessary to replace the display covers or hinges, remove the Phillips M2.0×3.0 screw **(1)** that secures the hinge covers to the display enclosure, and then remove the hinge covers **(2)**.

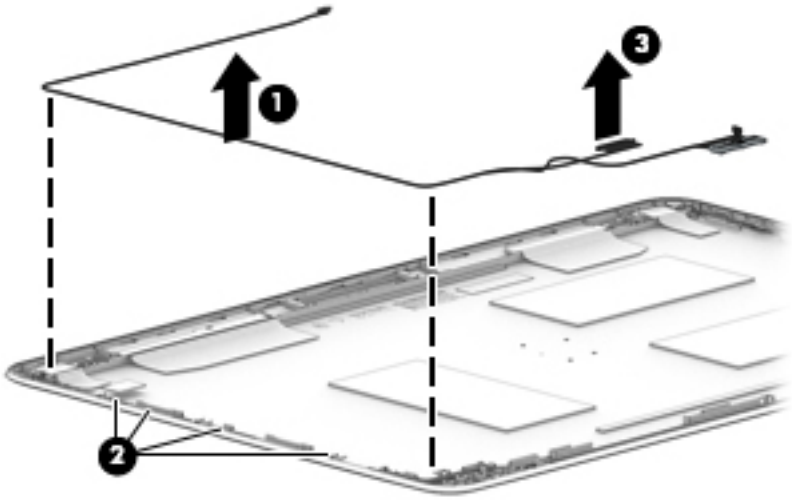
11. Remove the 6 Phillips M2.0x2.0 screws that secure the hinges to the display enclosure **(3)**, and then remove the display hinges from the display enclosure **(4)**.

    Display hinge covers (for non-privacy displays) and hinges are available in the Hinge Kit using spare part number 821166-001. Display hinge covers (for privacy displays) and hinges are available using spare part number 903007-001.



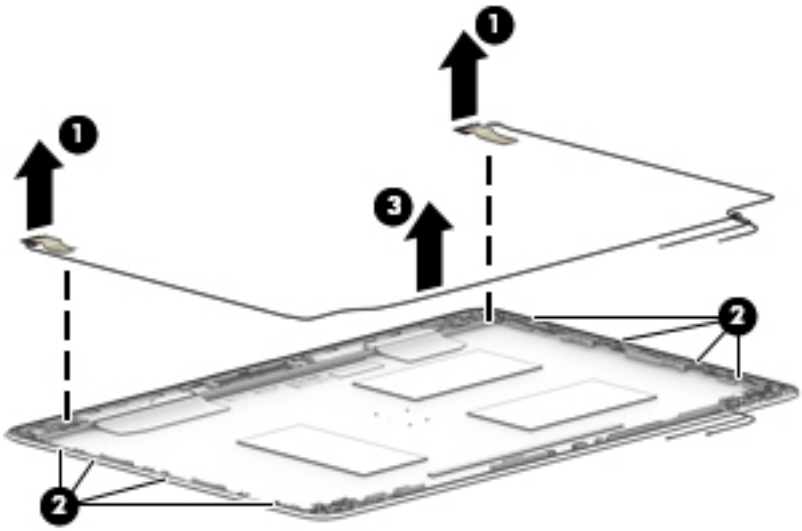
12. If it is necessary to replace the display/webcam cable, lift the display/webcam cable assembly **(1)** from the routing path on the side of the display enclosure **(2)**, and then remove the cable **(3)**.

    The display cable is available in the Cable Kit using spare part number 914381-001.



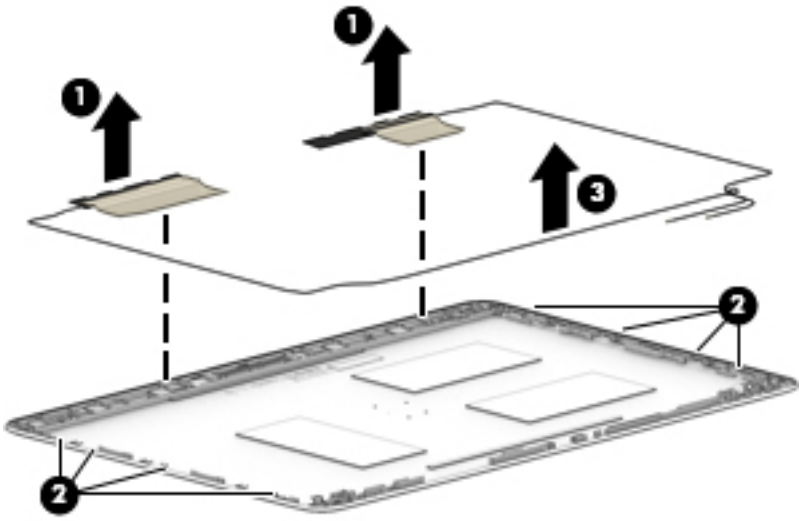
13. If it is necessary to replace the WLAN antenna cables, peel the transceivers from the top of the display enclosure **(1)**, remove the antenna cables from the routing path on the sides of the display enclosure **(2)**, and then remove the antenna cables **(3)**.

NOTE: The WLAN antennas are spared with the display enclosure.



14. If it is necessary to replace the WWAN antenna cables, peel the transceivers from the top of the display enclosure **(1)**, remove the antenna cables from the on the sides of the display enclosure **(2)**, and then remove the antenna cables **(3)**.

NOTE: The WWAN antennas are spared with the display enclosure.



The display enclosure is available using spare part number 821161-001.

Reverse this procedure to reassemble and install the display assembly.

Power button board

Description	Spare part number
Power button board assembly	914382-001

Before removing the power button board, follow these steps:

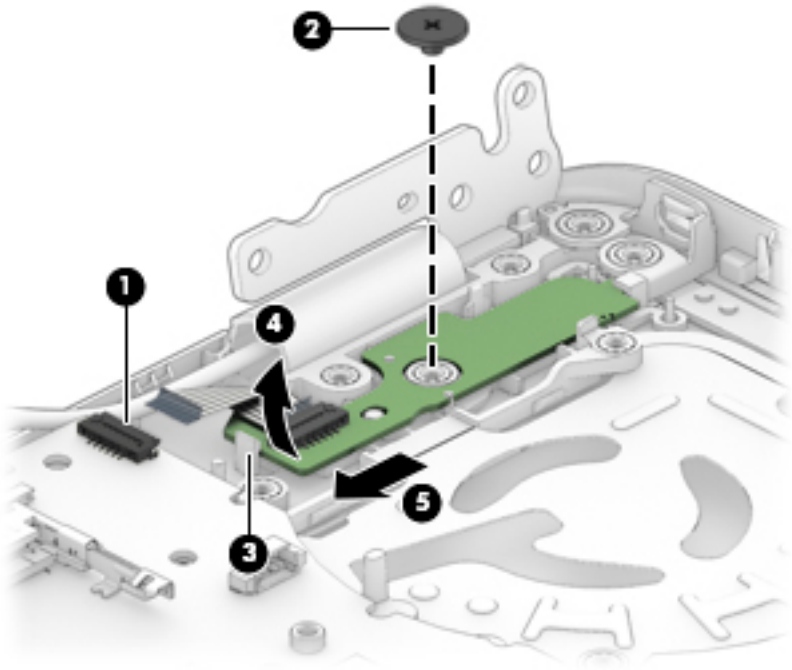
1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet, and then unplugging the AC adapter from the computer.
4. Remove the bottom cover (see Bottom cover on page 32).
5. Remove the battery (see Battery on page 36).
6. Remove the internal base plate (see Internal base plate on page 50).
7. Rotate the right display hinge upward (see Display assembly on page 67).

NOTE: The power button board sits under the right display hinge. You do not have to remove the display to remove the board, but you do have to rotate the right display hinge upward to gain access.

Remove the power button board:

1. Disconnect the cable from the system board **(1)**.
2. Remove the Phillips broadhead M2.0×2.0 screw **(2)** that secures the power button board to the computer.
3. Push the retention clip so it disengages the board **(3)**.

4. Rotate the connector side of board upward **(4)**, and then remove it from the computer **(5)**.



Reverse this procedure to install the power button board.

Top cover

Description	Spare part number
Top cover, standard	821173-001
Top cover, privacy	903979-001

The top cover remains after removing all other spared parts from the computer.

7 Interpreting system validation diagnostic front panel LEDs and audible codes

During the system validation phase that occurs at system startup, the BIOS validates the functionality of the following subsystems and conditions:

- AC adapter
- System board power
- Processor failure
- BIOS corruption
- Memory failure
- Graphics failure
- System board failure
- BIOS authentication failure

If an error is detected, specific patterns of long and short blinks, accompanied by long and short beeps (where applicable) are used to identify the error. These patterns will make up a two part code:

- Major – the category of the error
- Minor – the specific error within the category

NOTE: Single beep/blink codes are not used.

Number of long beeps/blinks	Error category
1	Not used
2	BIOS
3	Hardware
4	Thermal
5	System board

Patterns of blink/beep codes are determined by using the following parameters:

- 1 second pause occurs after the last major blink.
- 2 second pause occurs after the last minor blink.
- Beep error code sequences occur for the first 5 iterations of the pattern and then stop.
- Blink error code sequences continue until the computer is unplugged or the power button is pressed.

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

The red LED blinks to represent the major error category (long blinks). The white LED blinks to represent the minor error category (short blinks). For example, '3.5' indicates 3 long red blinks and 5 short white blinks to communicate the processor is not detected.

Component tested	Major/ minor code	Error condition	Notebook Caps Lock/Num Lock LED	Desktop	Action
BIOS	2.2	The main area (DXE) of BIOS has become corrupted and there is no recovery binary image available	CAP/NUM Blink = 2	2.2 - Power LED (red.white)	Follow the Crisis Recovery instructions at http://support.hp.com/us-en/document/c02693833/.
	2.3	The embedded controller policy requires the user to enter a key sequence (SureStart 2.0)	CAP/NUM Blink = 8	2.3 - Power LED (red.white)	If analysis of the event that caused Sure Start recovery is desired, replace the board and send the bad board back. Otherwise, press this key combination to restore BIOS and boot: Up Arrow+ Down Arrow+ Esc.
	2.4	The embedded controller is recovering the boot block or DXE. Since it takes 10 sec. or so to load the DXE image and get video in the DXE case, this blink code is necessary. (SureStart)	Battery LED White and Amber blinking	2.4 - Power LED (red.white)	Wait for DXE recovery to complete.
Hardware	3.2	The embedded controller has timed out waiting for BIOS to return from memory initialization	CAP/NUM Blink = 3	3.2 - Power LED (red.white)	System board replacement.
	3.3	The embedded controller has timed out waiting for BIOS to return from graphics initialization (4/13- Graphics adaptor not found)	CAP/NUM Blink = 4	3.3 - Power LED (red.white)	If the system has an MXM module, try a different MXM module. Otherwise, the board most likely needs to be replaced.
	3.4	The system board displays a power failure (crowbar) *	CAP/NUM Blink = 5	3.4 - Power LED (red.white)	System board replacement.
System board	5.2	The embedded controller cannot find valid firmware	CAP/NUM Blink = 7 (2 BB failure) Battery LED Blinking = 1 Hz (3 B failure)	5.2 - Power LED (red.white)	System board replacement.
	5.3	The embedded controller has timed out waiting for the BIOS	CAP/NUM Blink = 1	Not implemented	System board replacement.

8 Computer Setup (BIOS), TPM, and HP Sure Start

Using Computer Setup

Computer Setup, or Basic Input/Output System (BIOS), controls communication between all the input and output devices on the system (such as disk drives, display, keyboard, mouse, and printer). Computer Setup includes settings for the types of devices installed, the startup sequence of the computer, and the amount of system and extended memory.

NOTE: Use extreme care when making changes in Computer Setup. Errors can prevent the computer from operating properly.

Starting Computer Setup

NOTE: An external keyboard or mouse connected to a USB port can be used with Computer Setup only if USB legacy support is enabled.

▲ Turn on or restart the computer, and when the HP logo appears, press f10 to enter Computer Setup.

Navigating and selecting in Computer Setup

- To select a menu or a menu item, use the tab key and the keyboard arrow keys and then press enter, or use a pointing device to select the item.
- To scroll up and down, select the up arrow or the down arrow in the upper-right corner of the screen, or use the up arrow key or the down arrow key on the keyboard.
- To close open dialog boxes and return to the main Computer Setup screen, press esc, and then follow the on-screen instructions.

To exit Computer Setup menus, choose one of the following methods:

- To exit Computer Setup menus without saving your changes:

  Select the **Exit** icon in the lower-right corner of the screen, and then follow the on-screen instructions.

  – or –

  Select **Main**, select **Ignore Changes and Exit**, and then press enter.

- To save your changes and exit Computer Setup menus:

  Select the **Save** icon in the lower-right corner of the screen, and then follow the on-screen instructions.

  – or –

  Select **Main**, select **Save Changes and Exit**, and then press enter.

Your changes go into effect when the computer restarts.

Restoring factory settings in Computer Setup

NOTE: Restoring defaults will not change the hard drive mode.

To return all settings in Computer Setup to the values that were set at the factory, follow these steps:

1. Start Computer Setup. See Starting Computer Setup on page 78.
2. Select **Main**, and then select **Apply Factory Defaults and Exit**.

   NOTE: On select products, the selections may display **Restore Defaults** instead of **Apply Factory Defaults and Exit**.

3. Follow the on-screen instructions.
4. To save your changes and exit, select the **Save** icon in the lower-right corner of the screen, and then follow the on-screen instructions.

   – or –

   Select **Main**, select **Save Changes and Exit**, and then press enter.

Your changes go into effect when the computer restarts.

NOTE: Your password settings and security settings are not changed when you restore the factory settings.

Updating the BIOS

Updated versions of the BIOS may be available on the HP website.

Most BIOS updates on the HP website are packaged in compressed files called *SoftPaqs*.

Some download packages contain a file named Readme.txt, which contains information regarding installing and troubleshooting the file.

Determining the BIOS version

To decide whether you need to update Computer Setup (BIOS), first determine the BIOS version on your computer.

BIOS version information (also known as *ROM date* and *System BIOS*) can be accessed by pressing fn+esc (if you are already in Windows) or by using Computer Setup.

1. Start Computer Setup. See Starting Computer Setup on page 78.
2. Select **Main**, and then select **System Information**.
3. To exit Computer Setup without saving your changes, select the **Exit** icon in the lower-right corner of the screen, and then follow the on-screen instructions.

   – or –

   Select **Main**, select **Ignore Changes and Exit**, and then press enter.

To check for later BIOS versions, see Downloading a BIOS update on page 80.

Downloading a BIOS update

CAUTION: To reduce the risk of damage to the computer or an unsuccessful installation, download and install a BIOS update only when the computer is connected to reliable external power using the AC adapter. Do not download or install a BIOS update while the computer is running on battery power, docked in an optional docking device, or connected to an optional power source. During the download and installation, follow these instructions:

Do not disconnect power on the computer by unplugging the power cord from the AC outlet.

Do not shut down the computer or initiate Sleep.

Do not insert, remove, connect, or disconnect any device, cable, or cord.

1. Type `support` in the taskbar search box, and then select the HP Support Assistant app.

   – or –

   Select the question mark icon in the taskbar.

2. Select **Updates**, and then select **Check for updates and messages**.
3. Follow the on-screen instructions.
4. At the download area, follow these steps:

   a. Identify the most recent BIOS update and compare it to the BIOS version currently installed on your computer. Make a note of the date, name, or other identifier. You may need this information to locate the update later, after it has been downloaded to your hard drive.

   b. Follow the on-screen instructions to download your selection to the hard drive.

      Make a note of the path to the location on your hard drive where the BIOS update is downloaded. You will need to access this path when you are ready to install the update.

NOTE: If you connect your computer to a network, consult the network administrator before installing any software updates, especially system BIOS updates.

BIOS installation procedures vary. Follow any instructions that are revealed on the screen after the download is complete. If no instructions are revealed, follow these steps:

1. Type `file` in the taskbar search box, and then select **File Explorer**.
2. Select your hard drive designation. The hard drive designation is typically Local Disk (C:).
3. Using the hard drive path you recorded earlier, open the folder that contains the update.
4. Double-click the file that has an .exe extension (for example, *filename*.exe).

   The BIOS installation begins.

5. Complete the installation by following the on-screen instructions.

NOTE: After a message on the screen reports a successful installation, you can delete the downloaded file from your hard drive.

Changing the boot order using the f9 prompt

To dynamically choose a boot device for the current startup sequence, follow these steps:

1. Access the Boot Device Options menu:

- Turn on or restart the computer, and when the HP logo appears, press f9 to enter the Boot Device Options menu.

2. Select a boot device, then press enter.

TPM BIOS settings (select products only)

IMPORTANT: Before enabling Trusted Platform Module (TPM) functionality on this system, you must ensure that your intended use of TPM complies with relevant local laws, regulations and policies, and approvals or licenses must be obtained if applicable. For any compliance issues arising from your operation/usage of TPM which violates the above mentioned requirement, you shall bear all the liabilities wholly and solely. HP will not be responsible for any related liabilities.

TPM provides additional security for your computer. You can modify the TPM settings in Computer Setup (BIOS).

NOTE: If you change the TPM setting to Hidden, TPM is not visible in the operating system.

To access TPM settings in Computer Setup:

1. Start Computer Setup. See Starting Computer Setup on page 78.
2. Select **Security**, select **TPM Embedded Security**, and then follow the on-screen instructions.

Using HP Sure Start (select products only)

Select computer models are configured with HP Sure Start, a technology that monitors the computer's BIOS for attacks or corruption. If the BIOS becomes corrupted or is attacked, HP Sure Start automatically restores the BIOS to its previously safe state, without user intervention.

HP Sure Start is configured and already enabled so that most users can use the HP Sure Start default configuration. The default configuration can be customized by advanced users.

To access the latest documentation on HP Sure Start, go to http://www.hp.com/support. Select **Find your product**, and then follow the on-screen instructions.

9 Using HP PC Hardware Diagnostics (UEFI)

HP PC Hardware Diagnostics is a Unified Extensible Firmware Interface (UEFI) that allows you to run diagnostic tests to determine whether the computer hardware is functioning properly. The tool runs outside the operating system so that it can isolate hardware failures from issues that are caused by the operating system or other software components.

When HP PC Hardware Diagnostics (UEFI) detects a failure that requires hardware replacement, a 24-digit Failure ID code is generated. This ID code can then be provided to support to help determine how to correct the problem.

NOTE: To start diagnostics on a convertible computer, your computer must be in notebook mode and you must use the keyboard attached.

To start HP PC Hardware Diagnostics (UEFI), follow these steps:

1. Turn on or restart the computer, and quickly press esc.
2. Press f2.

   The BIOS searches three places for the diagnostic tools, in the following order:

   a. Connected USB drive

      NOTE: To download the HP PC Hardware Diagnostics (UEFI) tool to a USB drive, see Downloading HP PC Hardware Diagnostics (UEFI) to a USB device on page 82.

   b. Hard drive

   c. BIOS
3. When the diagnostic tool opens, select the type of diagnostic test you want to run, and then follow the on-screen instructions.

NOTE: If you need to stop a diagnostic test, press esc.

Downloading HP PC Hardware Diagnostics (UEFI) to a USB device

NOTE: The HP PC Hardware Diagnostics (UEFI) download instructions are provided in English only, and you must use a Windows computer to download and create the HP UEFI support environment because only .exe files are offered.

There are two options to download HP PC Hardware Diagnostics to a USB device.

Download the latest UEFI version

1. Go to http://www.hp.com/go/techcenter/pcdiags. The HP PC Diagnostics home page is displayed.
2. In the HP PC Hardware Diagnostics section, select the **Download** link, and then select **Run**.

Download any version of UEFI for a specific product

1. Go to http://www.hp.com/support.
2. Select **Get software and drivers**.

3. Enter the product name or number.

   – or –

   Select **Identify now** to let HP automatically detect your product.

4. Select your computer, and then select your operating system.

5. In the **Diagnostic** section, follow the on-screen instructions to select and download the UEFI version you want.

Additional BIOS crisis recovery tool

HP provides a BIOS crisis recovery tool through the HP PC Hardware Diagnostics 3-in-1 USB key. This tool can be used by HP authorized service providers to recover systems that have failed due to a corrupted BIOS. For more information about using the 3-in-1 USB key for BIOS crisis recovery, go to http://www.hp.com/go/techcenter/pcdiags. Additional information is included in the web-based training offered by HP University. See the modules that cover HP PC Hardware Diagnostics (UEFI).

10 Backup and recovery

This chapter provides information about the following processes. The information in the chapter is standard procedure for most products.

- Creating recovery media and backups
- Restoring and recovering your system

For additional information, refer to the HP support assistant app.

▲ Type `support` in the taskbar search box, and then select the **HP Support Assistant** app.

– or –

Click the question mark icon in the taskbar.

IMPORTANT: If you will be performing recovery procedures on a tablet, the tablet battery must be at least 70% charged before you start the recovery process.

IMPORTANT: For a tablet with a detachable keyboard, connect the keyboard to the keyboard dock before beginning any recovery process.

Creating recovery media and backups

The following methods of creating recovery media and backups are available on select products only. Choose the available method according to your computer model.

- Use HP Recovery Manager to create HP Recovery media after you successfully set up the computer. This step creates a backup of the HP Recovery partition on the computer. The backup can be used to reinstall the original operating system in cases where the hard drive is corrupted or has been replaced. For information on creating recovery media, see Creating HP Recovery media (select products only) on page 84. For information on the recovery options that are available using the recovery media, see Using Windows tools on page 85.
- Use Windows tools to create system restore points and create backups of personal information.

  For more information, see Recovering using HP Recovery Manager on page 86.

NOTE: If storage is 32 GB or less, Microsoft System Restore is disabled by default.

Creating HP Recovery media (select products only)

If possible, check for the presence of the Recovery partition and the Windows partition. From the **Start** menu, select **File Explorer**, and then select **This PC**.

- If your computer does not list the Windows partition and the Recovery partition, you can obtain recovery media for your system from support. See the *Worldwide Telephone Numbers* booklet included with the computer. You can also find contact information on the HP website. Go to http://www.hp.com/support, select your country or region, and follow the on-screen instructions.

You can use Windows tools to create system restore points and create backups of personal information, see Using Windows tools on page 85.

- If your computer does list the Recovery partition and the Windows partition, you can use HP Recovery Manager to create recovery media after you successfully set up the computer. HP Recovery media can be used to perform system recovery if the hard drive becomes corrupted. System recovery reinstalls the original operating system and software programs that were installed at the factory and then configures the settings for the programs. HP Recovery media can also be used to customize the system or restore the factory image if you replace the hard drive.
  - Only one set of recovery media can be created. Handle these recovery tools carefully, and keep them in a safe place.
  - HP Recovery Manager examines the computer and determines the required storage capacity for the media that will be required.
  - To create recovery discs, your computer must have an optical drive with DVD writer capability, and you must use only high-quality blank DVD-R, DVD+R, DVD-R DL, or DVD+R DL discs. Do not use rewritable discs such as CD±RW, DVD±RW, double-layer DVD±RW, or BD-RE (rewritable Blu-ray) discs; they are not compatible with HP Recovery Manager software. Or, instead, you can use a high-quality blank USB flash drive.
  - If your computer does not include an integrated optical drive with DVD writer capability, but you would like to create DVD recovery media, you can use an external optical drive (purchased separately) to create recovery discs. If you use an external optical drive, it must be connected directly to a USB port on the computer; the drive cannot be connected to a USB port on an external device, such as a USB hub. If you cannot create DVD media yourself, you can obtain recovery discs for your computer from HP. See the *Worldwide Telephone Numbers* booklet included with the computer. You can also find contact information on the HP website. Go to http://www.hp.com/support, select your country or region, and follow the on-screen instructions.
  - Be sure that the computer is connected to AC power before you begin creating the recovery media.
  - The creation process can take an hour or more. Do not interrupt the creation process.
  - If necessary, you can exit the program before you have finished creating all of the recovery DVDs. HP Recovery Manager will finish burning the current DVD. The next time you start HP Recovery Manager, you will be prompted to continue.

To create HP Recovery media:

IMPORTANT: For a tablet with a detachable keyboard, connect the keyboard to the keyboard dock before beginning these steps.

1. Type `recovery` in the taskbar search box, and then select **HP Recovery Manager**.
2. Select **Create recovery media**, and then follow the on-screen instructions.

If you ever need to recover the system, see Recovering using HP Recovery Manager on page 86.

Using Windows tools

You can create recovery media, system restore points, and backups of personal information using Windows tools.

NOTE: If storage is 32 GB or less, Microsoft System Restore is disabled by default.

For more information and steps, see the Get started app.

- Select the **Start** button, and then select the **Get started** app.

Restore and recovery

There are several options for recovering your system. Choose the method that best matches your situation and level of expertise:

IMPORTANT: Not all methods are available on all products.

- Windows offers several options for restoring from backup, refreshing the computer, and resetting the computer to its original state. For more information see the Get started app.

  ▲ Select the **Start** button, and then select the **Get started** app.

- If you need to correct a problem with a preinstalled application or driver, use the Reinstall drivers and/or applications option (select products only) of HP Recovery Manager to reinstall the individual application or driver.

  ▲ Type `recovery` in the taskbar search box, select **HP Recovery Manager**, select **Reinstall drivers and/or applications**, and then follow the on-screen instructions.

- If you want to recover the Windows partition to original factory content, you can choose the System Recovery option from the HP Recovery partition (select products only) or use the HP Recovery media. For more information, see Recovering using HP Recovery Manager on page 86. If you have not already created recovery media, see Creating HP Recovery media (select products only) on page 84.

- On select products, if you want to recover the computer's original factory partition and content, or if you have replaced the hard drive, you can use the Factory Reset option of HP Recovery media. For more information, see Recovering using HP Recovery Manager on page 86.

- On select products, if you want to remove the recovery partition to reclaim hard drive space, HP Recovery Manager offers the Remove Recovery Partition option.

  For more information, see Removing the HP Recovery partition (select products only) on page 89.

Recovering using HP Recovery Manager

HP Recovery Manager software allows you to recover the computer to its original factory state by using the HP Recovery media that you either created or that you obtained from HP, or by using the HP Recovery partition (select products only). If you have not already created recovery media, see Creating HP Recovery media (select products only) on page 84.

What you need to know before you get started

- HP Recovery Manager recovers only software that was installed at the factory. For software not provided with this computer, you must either download the software from the manufacturer's website or reinstall the software from the media provided by the manufacturer.

  IMPORTANT: Recovery through HP Recovery Manager should be used as a final attempt to correct computer issues.

- HP Recovery media must be used if the computer hard drive fails. If you have not already created recovery media, see Creating HP Recovery media (select products only) on page 84.

- To use the Factory Reset option (select products only), you must use HP Recovery media. If you have not already created recovery media, see Creating HP Recovery media (select products only) on page 84.

- If your computer does not allow the creation of HP Recovery media or if the HP Recovery media does not work, you can obtain recovery media for your system from support. See the *Worldwide Telephone Numbers* booklet included with the computer. You can also find contact information from the HP

website. Go to http://www.hp.com/support, select your country or region, and follow the on-screen instructions.

IMPORTANT: HP Recovery Manager does not automatically provide backups of your personal data. Before beginning recovery, back up any personal data you want to retain.

Using HP Recovery media, you can choose from one of the following recovery options:

NOTE: Only the options available for your computer display when you start the recovery process.

- System Recovery—Reinstalls the original operating system, and then configures the settings for the programs that were installed at the factory.
- Factory Reset—Restores the computer to its original factory state by deleting all information from the hard drive and re-creating the partitions. Then it reinstalls the operating system and the software that was installed at the factory.

The HP Recovery partition (select products only) allows System Recovery only.

Using the HP Recovery partition (select products only)

The HP Recovery partition allows you to perform a system recovery without the need for recovery discs or a recovery USB flash drive. This type of recovery can be used only if the hard drive is still working.

To start HP Recovery Manager from the HP Recovery partition:

IMPORTANT: For a tablet with a detachable keyboard, connect the keyboard to the keyboard dock before beginning these steps (select products only).

1. Type `recovery` in the taskbar search box, select **Recovery Manager**, and then select **HP Recovery Environment**.

   - or-

   For computers or tablets with keyboards attached, press f11 while the computer boots, or press and hold f11 as you press the power button.

   For tablets without keyboards:

   Turn on or restart the tablet, and then quickly hold down the volume up button; then select **f11**.

   - or -

   Turn on or restart the tablet, and then quickly hold down the volume down button; then select **f11**.

   - or -

   Turn on or restart the tablet, and then quickly hold down the Windows button; then select **f11**.
2. Select **Troubleshoot** from the boot options menu.
3. Select **Recovery Manager**, and then follow the on-screen instructions.

Using HP Recovery media to recover

You can use HP Recovery media to recover the original system. This method can be used if your system does not have an HP Recovery partition or if the hard drive is not working properly.

1. If possible, back up all personal files.
2. Insert the HP Recovery media, and then restart the computer.

   NOTE: If the computer does not automatically restart in HP Recovery Manager, change the computer boot order. See Changing the computer boot order on page 88.

3. Follow the on-screen instructions.

Changing the computer boot order

If your computer does not restart in HP Recovery Manager, you can change the computer boot order, which is the order of devices listed in BIOS where the computer looks for startup information. You can change the selection to an optical drive or a USB flash drive.

To change the boot order:

IMPORTANT: For a tablet with a detachable keyboard, connect the keyboard to the keyboard dock before beginning these steps.

1. Insert the HP Recovery media.
2. Access the system **Startup** menu.

   For computers or tablets with keyboards attached:

   ▲ Turn on or restart the computer or tablet, quickly press esc, and then press f9 for boot options.

   For tablets without keyboards:

   ▲ Turn on or restart the tablet, and then quickly hold down the volume up button; then select **f9**.

   - or -

   Turn on or restart the tablet, and then quickly hold down the volume down button; then select **f9**.

   - or -

   Turn on or restart the tablet, and then quickly hold down the Windows button; then select **f9**.
3. Select the optical drive or USB flash drive from which you want to boot.
4. Follow the on-screen instructions.

Removing the HP Recovery partition (select products only)

HP Recovery Manager software allows you to remove the HP Recovery partition to free up hard drive space.

IMPORTANT: After you remove the HP Recovery partition, you will not be able to perform System Recovery or create HP recovery media from the HP Recovery partition. So before you remove the Recovery partition, create HP Recovery media; see Creating HP Recovery media (select products only) on page 84.

NOTE: The Remove Recovery Partition option is only available on products that support this function.

Follow these steps to remove the HP Recovery partition:

1. Type `recovery` in the taskbar search box, and then select **HP Recovery Manager**.
2. Select **Remove Recovery Partition**, and then follow the on-screen instructions.

11 Specifications

Computer specifications

	Metric	U.S.
Dimensions		
Length	237.0 mm	9.3 in
Width	338.0 mm	13.3 in
Height (front to rear)	18.9 - 20.2 mm	0.74 - 0.80 in
Weight		
3-cell battery (51WHr), no FPR, 1 SODIMM, WLAN, M.2 SSD, no camera, no WWAN, QHD panel	1.58 kg	3.48 lbs
3-cell battery (51WHr), no FPR, 1 SODIMM, WLAN, M.2 SSD, no camera, no WWAN, FHD touch panel	1.74 kg	3.83 lbs
Input power		
Operating voltage	19.0 V dc @ 4.74 A – 90 W or 18.5 V dc @ 3.5 A - 65 W or 45 W	
Operating current	4.74 A or 3.5 A	
Temperature		
Operating (not writing to optical disc)	0°C to 35°C	32°F to 95°F
Operating (writing to optical disc)	5°C to 35°C	41°F to 95°F
Nonoperating	-20°C to 60°C	-4°F to 140°F
Relative humidity		
Operating	10% to 90%	
Nonoperating	5% to 95%	
Maximum altitude (unpressurized)		
Operating (14.7 to 10.1 psia)	-15 m to 3,048 m	50 ft to 10,000 ft
Nonoperating (14.7 to 4.4 psia)	-15 m to 12,192 m	-50 ft to 40,000 ft
Shock		
Operating	125 g, 2 ms, half-sine	
Nonoperating	200 g, 2 ms, half-sine	
Random vibration		
Operating	0.75 g zero-to-peak, 10 Hz to 500 Hz, 0.25 oct/min sweep rate	
Nonoperating	1.50 g zero-to-peak, 10 Hz to 500 Hz, 0.5 oct/min sweep rate	
NOTE: Applicable product safety standards specify thermal limits for plastic surfaces. The computer operates well within this range of temperatures.		

35.6-cm (14.0-in) display specifications

	Metric	U.S.
Active diagonal size	35.6-cm	14.0-in
Resolution	HD: 1366x768 FHD: 1920x1080 QHD: 2560x1440	
Surface treatment	Anti-glare (except touch screen)	
Brightness	HD: 220 nits FHD: 300 nits QHD: 340 nits	
Viewing angle	SVA	
Backlight	LED	
Aspect ratio	16:9	
Display panel interface	eDP 1.2	

Solid-state drive specifications

	128-GB*	256-GB*	512-GB*
Height	1.35 mm	1.35 mm	1.35 mm
Weight	< 10 g	< 10 g	< 10 g
Form factor	M.2 2280-D2-B-M	M.2 2280-D2-B-M	M.2 2280-D2-B-M
Transfer rate	up to 540 MB/sec	up to 540 MB/sec	up to 540 MB/sec
Interface type	SATA-3	SATA-3	SATA-3
Ready time, maximum (to not busy)	1.0 ms	< 1.0 ms	< 1.0 ms
Access times, logical	0.1 ms	0.1 ms	0.1 ms
Total logical sectors	234,441,648	468,883,296	937,766,592
Operating temperature		0°C to 70°C (32°F to 158°F)	

*1 GB = 1 billion bytes when referring to hard drive storage capacity. Actual accessible capacity is less. Actual drive specifications may differ slightly.

NOTE: Certain restrictions and exclusions apply. Contact technical support for details.

Hard drive specifications

	1-TB*	500-GB*	500-GB* hybrid
Dimensions			
Height	9.5 mm	7.0 mm	7.0 mm
Width	70 mm	70 mm	70 mm
Weight	115 g	101 g or 95 g	95 g
Interface type	SATA	SATA	SATA
Transfer rate	100 MB/sec	100 MB/sec	100 MB/sec
Security	ATA security	ATA security	ATA security
Seek times (typical read, including setting)			
Single track	1.4 ms	3 ms	2 ms
Average	10 ms	13 ms	12 ms
Maximum	12 ms	24 ms	22 ms
Logical blocks	1,938,921,461	1,048,576,000	976,773,168
Disc rotational speed	5400 rpm	7200 rpm or 5400 rpm	5400 rpm
Operating temperature			
*1 GB = 1 billion bytes when referring to hard drive storage capacity. Actual accessible capacity is less. Actual drive specifications may differ slightly.			
NOTE: Certain restrictions and exclusions apply. Contact technical support for details.			

12 Power cord set requirements

The wide-range input feature of the computer permits it to operate from any line voltage from 100 to 120 volts AC, or from 220 to 240 volts AC.

The 3-conductor power cord set included with the computer meets the requirements for use in the country or region where the equipment is purchased.

Power cord sets for use in other countries and regions must meet the requirements of the country or region where the computer is used.

Requirements for all countries

The following requirements are applicable to all countries and regions:

- The length of the power cord set must be at least **1.0 m** (3.3 ft) and no more than **2.0 m** (6.5 ft).
- All power cord sets must be approved by an acceptable accredited agency responsible for evaluation in the country or region where the power cord set will be used.
- The power cord sets must have a minimum current capacity of 10 amps and a nominal voltage rating of 125 or 250 V AC, as required by the power system of each country or region.
- The appliance coupler must meet the mechanical configuration of an EN 60 320/IEC 320 Standard Sheet C13 connector for mating with the appliance inlet on the back of the computer.

Requirements for specific countries and regions

Country/region	Accredited agency	Applicable note number
Australia	EANSW	1
Austria	OVE	1
Belgium	CEBC	1
Canada	CSA	2
Denmark	DEMKO	1
Finland	FIMKO	1
France	UTE	1
Germany	VDE	1
Italy	IMQ	1
Japan	METI	3
The Netherlands	KEMA	1
Norway	NEMKO	1
The People's Republic of China	COC	5
South Korea	EK	4

Country/region	Accredited agency	Applicable note number
Sweden	SEMKO	1
Switzerland	SEV	1
Taiwan	BSMI	4
The United Kingdom	BSI	1
The United States	UL	2

1. The flexible cord must be Type HO5VV-F, 3-conductor, 1.0-mm² conductor size. Power cord set fittings (appliance coupler and wall plug) must bear the certification mark of the agency responsible for evaluation in the country or region where it will be used.
2. The flexible cord must be Type SPT-3 or equivalent, No. 18 AWG, 3-conductor. The wall plug must be a two-pole grounding type with a NEMA 5-15P (15 A, 125 V) or NEMA 6-15P (15 A, 250 V) configuration.
3. The appliance coupler, flexible cord, and wall plug must bear a “T” mark and registration number in accordance with the Japanese Dentori Law. The flexible cord must be Type VCT or VCTF, 3-conductor, 1.00-mm² conductor size. The wall plug must be a two-pole grounding type with a Japanese Industrial Standard C8303 (7 A, 125 V) configuration.
4. The flexible cord must be Type RVV, 3-conductor, 0.75-mm² conductor size. Power cord set fittings (appliance coupler and wall plug) must bear the certification mark of the agency responsible for evaluation in the country or region where it will be used.
5. The flexible cord must be Type VCTF, 3-conductor, 0.75-mm² conductor size. Power cord set fittings (appliance coupler and wall plug) must bear the certification mark of the agency responsible for evaluation in the country or region where it will be used.

13 Statement of memory volatility

The purpose of this chapter is to provide general information regarding nonvolatile memory in HP Business PCs. This chapter also provides general instructions for restoring nonvolatile memory that can contain personal data after the system has been powered off and the hard drive has been removed.

HP Business PC products that use Intel®-based or AMD®-based system boards contain volatile DDR memory. The amount of nonvolatile memory present in the system depends upon the system configuration. Intel-based and AMD-based system boards contain nonvolatile memory subcomponents as originally shipped from HP, assuming that no subsequent modifications have been made to the system and assuming that no applications, features, or functionality have been added to or installed on the system.

Following system shutdown and removal of all power sources from an HP Business PC system, personal data can remain on volatile system memory (DIMMs) for a finite period of time and will also remain in nonvolatile memory. Use the steps below to remove personal data from the PC, including the nonvolatile memory found in Intel-based and AMD-based system boards.

NOTE: If your tablet has a keyboard base, connect to the keyboard base before beginning steps in this chapter.

Current BIOS steps

1. Follow steps (a) through (l) below to restore the nonvolatile memory that can contain personal data. Restoring or reprogramming nonvolatile memory that does not store personal data is neither necessary nor recommended.

   a. Turn on or restart the computer, and then press esc while the “Press the ESC key for Startup Menu” message is displayed at the bottom of the screen.

   IMPORTANT: If the **Main** menu displays **Restore Defaults** instead of **Apply Factory Defaults and Exit**, go to Legacy BIOS Steps on page 96.

   NOTE: If the system has a BIOS administrator password, enter the password at the prompt.

   b. Select **Main**, select **Apply Factory Defaults and Exit**, and then select **Yes** to load defaults.

   The computer will reboot.

   c. During the reboot, press esc while the “Press the ESC key for Startup Menu” message is displayed at the bottom of the screen.

   NOTE: If the system has a BIOS administrator password, enter the password at the prompt.

   d. Select the **Security** menu, select **Restore Security Settings to Factory Defaults**, and then select **Yes** to restore security level defaults.

   The computer will reboot.

   e. During the reboot, press esc while the “Press the ESC key for Startup Menu” message is displayed at the bottom of the screen.

   NOTE: If the system has a BIOS administrator password, enter the password at the prompt.

   f. If an asset or ownership tag is set, select the **Security** menu and scroll down to the **Utilities** menu. Select **System IDs**, and then select **Asset Tracking Number**. Clear the tag, and then make the selection to return to the prior menu.

g. If a DriveLock password is set, select the **Security** menu, and scroll down to **Hard Drive Utilities** under the **Utilities** menu. Select **Hard Drive Utilities**, select **DriveLock**, then uncheck the checkbox for **DriveLock password on restart**. Select **OK** to proceed.

h. Select the **Main** menu, and then select **Reset BIOS Security to factory default**. Click **Yes** at the warning message.

   The computer will reboot.

i. During the reboot, press esc while the "Press the ESC key for Startup Menu" message is displayed at the bottom of the screen.

NOTE: If the system has a BIOS administrator password, enter the password at the prompt.

j. Select the **Main** menu, select **Apply Factory Defaults and Exit**, select **Yes** to save changes and exit, and then select **Shutdown**.

k. Reboot the system. If the system has a Trusted Platform Module (TPM) and/or fingerprint reader, one or two prompts will appear—one to clear the TPM and the other to Reset Fingerprint Sensor; press or tap F1 to accept or F2 to reject.

l. Remove all power and system batteries for at least 24 hours.

2. Complete one of the following:

   - Remove and retain the storage drive.

   – or –

   - Clear the drive contents by using a third party utility designed to erase data from an SSD.

   – or –

   - Clear the contents of the drive by using the following BIOS Setup Secure Erase command option steps:

IMPORTANT: If you clear data using Secure Erase, it cannot be recovered.

a. Turn on or restart the computer, and then press esc while the "Press the ESC key for Startup Menu" message is displayed at the bottom of the screen.

b. Select the **Security** menu and scroll down to the **Utilities** menu.

c. Select **Hard Drive Tools**.

d. Under **Utilities**, select **Secure Erase**, select the hard drive storing the data you want to clear, and then follow the on-screen instructions to continue.

Legacy BIOS Steps

Use the steps for older versions of BIOS.

NOTE: If you already completed the steps in Current BIOS steps on page 95, skip this section.

1. Follow steps (a) through (i) below to restore the nonvolatile memory that can contain personal data. Restoring or reprogramming nonvolatile memory that does not store personal data is neither necessary nor recommended.

NOTE: If you have not already done so, access the BIOS menu.

   - Turn on or restart the computer, and then press esc while the "Press the ESC key for Startup Menu" message is displayed at the bottom of the screen.

NOTE: If the system has a BIOS administrator password, enter the password at the prompt.

a. Select **Main**, select **Restore Defaults**, and then select **Yes** to load defaults.

b. Select the **Security** menu, select **Restore Security Level Defaults**, and then select **Yes** to restore security level defaults.

c. If an asset or ownership tag is set, select the **Security** menu and scroll down to the **Utilities** menu. Select **System IDs**, and then select **Asset Tracking Number**. Clear the tag, and then make the selection to return to the prior menu.

d. If a DriveLock password is set, select the **Security** menu, and scroll down to **Hard Drive Tools** under the **Utilities** menu. Select **Hard Drive Tools**, select **DriveLock**, then uncheck the checkbox for **DriveLock password on restart**. Select **OK** to proceed.

e. If an Automatic DriveLock password is set, select the **Security** menu, scroll down to **Hard Drive Tools** under the **Utilities** menu. Select **Hard Drive Tools**, scroll down to **Automatic DriveLock**, then select the desired hard drive and disable protection. At the automatic drive lock warning screen, select **Yes** to continue. Repeat this procedure if more than one hard drive has an Automatic DriveLock password.

f. Select the **Main** menu, and then select **Reset BIOS Security to factory default**. Click **Yes** at the warning message.

g. Select the **Main** menu, select **Save Changes and Exit**, select **Yes** to save changes and exit, and then select **Shutdown**.

h. Reboot the system. If the system has a Trusted Platform Module (TPM) and/or fingerprint reader, one or two prompts will appear—one to clear the TPM and the other to Reset Fingerprint Sensor; press or tap F1 to accept or F2 to reject.

i. Remove all power and system batteries for at least 24 hours.

2. Complete one of the following:

- Remove and retain the storage drive.

– or –

- Clear the drive contents by using a third party utility designed to erase data from an SSD.

– or –

- Clear the contents of the drive by using the following BIOS Setup Secure Erase command option steps:

IMPORTANT: If you clear data using Secure Erase, it cannot be recovered.

a. Turn on or restart the computer, and then press esc while the “Press the ESC key for Startup Menu” message is displayed at the bottom of the screen.

b. Select the **Security** menu and scroll down to the **Utilities** menu.

c. Select **Hard Drive Tools**.

d. Under **Utilities**, select **Secure Erase**, select the hard drive storing the data you want to clear, and then follow the on-screen instructions to continue.

– or –

- Clear the contents of the drive by using the following Disk Sanitizer command steps:

IMPORTANT: If you clear data using Disk Sanitizer, it cannot be recovered.

NOTE: The amount of time it takes for Disk Sanitizer to run can take several hours. Plug the computer into an AC outlet before starting.

a. Turn on or restart the computer, and then press esc while the “Press the ESC key for Startup Menu” message is displayed at the bottom of the screen.

b. Select the **Security** menu and scroll down to the **Utilities** menu.

c. Select **Hard Drive Tools**.

d. Under **Utilities**, select **Disk Sanitizer**, select the hard drive storing the data you want to clear, and then follow the on-screen instructions to continue.

Nonvolatile memory usage

Nonvolatile Memory Type	Amount (Size)	Does this memory store customer data?	Does this memory retain data when power is removed?	What is the purpose of this memory?	How is data input into this memory?	How is this memory write-protected?
HP Sure Start flash (select models only)	2 MBytes	No	Yes	Provides protected backup of critical System BIOS code, EC firmware, and critical PC configuration data for select platforms that support HP Sure Start. For more information, see Using HP Sure Start (select models only) on page 101.	Data cannot be written to this device via the host processor. The content is managed solely by the HP Sure Start Embedded Controller.	This memory is protected by the HP Sure Start Embedded Controller.
Real Time Clock (RTC) battery backed-up CMOS configuration memory	256 Bytes	No	Yes	Stores system date and time and noncritical data.	RTC battery backed-up CMOS is programmed using the Computer Setup (BIOS), or changing the Microsoft Windows date & time.	This memory is not write-protected.
Controller (NIC) EEPROM	64 KBytes (not customer accessible)	No	Yes	Stores NIC configuration and NIC firmware.	NIC EEPROM is programmed using a utility from the NIC vendor that can be run from DOS.	A utility is required to write data to this memory and is available from the NIC vendor. Writing data to this ROM in an inappropriate manner will render the NIC non-functional.
DIMM Serial Presence Detect (SPD) configuration data	256 Bytes per memory module, 128 Bytes programmable	No	Yes	Stores memory module information.	DIMM SPD is programmed by the memory vendor.	Data cannot be written to this memory when the module is installed in a PC. The specific write-protection method varies by memory vendor.

Nonvolatile Memory Type	Amount (Size)	Does this memory store customer data?	Does this memory retain data when power is removed?	What is the purpose of this memory?	How is data input into this memory?	How is this memory write-protected?
	(not customer accessible)					
System BIOS	4 MBytes to 5 MBytes	Yes	Yes	Stores system BIOS code and PC configuration data.	System BIOS code is programmed at the factory. Code is updated when the system BIOS is updated. Configuration data and settings are input using the Computer Setup (BIOS) or a custom utility.	**NOTE:** Writing data to this ROM in an inappropriate manner can render the PC non-functional. A utility is required for writing data to this memory and is available on the HP website; go to http://www.hp.com/support. Select **Find your product**, and then follow the on-screen instructions.
Intel Management Engine Firmware (present in only specific ZBook and EliteBook models. For more information, go to http://www.hp.com/support. Select **Find your product**, and then follow the on-screen instructions.)	1.5 MBytes or 5 MBytes	Yes	Yes	Stores Management Engine Code, Settings, Provisioning Data and iAMT third-party data store.	Management Engine Code is programmed at the factory. Code is updated via Intel secure firmware update utility. Unique Provisioning Data can be entered at the factory or by an administrator using the Management Engine (MEBx) setup utility. The third party data store contents can be populated by a remote management console or local applications that have been registered by an administrator to have access to the space.	The Intel chipset is configured to enforce hardware protection to block all direct read/write access to this area. An Intel utility is required for updating the firmware. Only firmware updates digitally signed by Intel can be applied using this utility.
Bluetooth flash	2 Mbit	No	Yes	Stores Bluetooth configuration and firmware.	Bluetooth flash is programmed at the factory. Tools for writing data to this memory are not publicly available but can be obtained from the silicon vendor.	A utility is required for writing data to this memory and is made available through newer versions of the driver whenever the flash requires an upgrade.
802.11 WLAN EEPROM	4 Kbit to 8 Kbit	No	Yes	Stores configuration and calibration data.	802.11 WLAN EEPROM is programmed at the factory. Tools for writing data to this memory are not made public.	A utility is required for writing data to this memory and is typically not made available to the public unless a firmware upgrade is necessary to address a unique issue.
Web camera	64 Kbit	No	Yes	Stores webcam configuration and firmware.	Webcam memory is programmed using a utility from the device manufacturer that can be run from Windows.	A utility is required for writing data to this memory and is typically not made available to the public unless a firmware

Nonvolatile Memory Type	Amount (Size)	Does this memory store customer data?	Does this memory retain data when power is removed?	What is the purpose of this memory?	How is data input into this memory?	How is this memory write-protected?
						upgrade is necessary to address a unique issue.
Fingerprint reader	512 KByte flash	Yes	Yes	Stores fingerprint templates.	Fingerprint reader memory is programmed by user enrollment in HP ProtectTools Security Manager.	Only a digitally signed application can make the call to write to the flash.

Questions and answers

1. **How can the BIOS settings be restored (returned to factory settings)?**

IMPORTANT: Restore defaults does not securely erase any data on your hard drive. See question and answer 6 for steps to securely erase data.

Restore defaults does not reset the Custom Secure Boot keys. See question and answer 7 for information about resetting the keys.

   a. Turn on or restart the computer, and then press esc while the “Press the ESC key for Startup Menu” message is displayed at the bottom of the screen.

   b. Select **Main**, and then select **Restore defaults**.

   c. Follow the on-screen instructions.

   d. Select **Main**, select **Save Changes and Exit**, and then follow the on-screen instructions.

2. **What is a UEFI BIOS, and how is it different from a legacy BIOS?**

   The Unified Extensible Firmware Interface (UEFI) BIOS is an industry-standard software interface between the platform firmware and an operating system (OS). It is a replacement for the older BIOS architecture, but supports much of the legacy BIOS functionality.

   Like the legacy BIOS, the UEFI BIOS provides an interface to display the system information and configuration settings and to change the configuration of your computer before an OS is loaded. BIOS provides a secure run-time environment that supports a Graphic User Interface (GUI). In this environment, you can use either a pointing device (Touchscreen, TouchPad, pointing stick, or USB mouse) or the keyboard to navigate and make menu and configuration selections. The UEFI BIOS also contains basic system diagnostics.

   The UEFI BIOS provides functionality beyond that of the legacy BIOS. In addition, the UEFI BIOS works to initialize the computer’s hardware before loading and executing the OS; the run-time environment allows the loading and execution of software programs from storage devices to provide more functionality, such as advanced hardware diagnostics (with the ability to display more detailed system information) and advanced firmware management and recovery software.

   HP has provided options in Computer Setup (BIOS) to allow you to run in legacy BIOS, if required by the operating system. Examples of this requirement would be if you upgrade or downgrade the OS.

3. **Where does the UEFI BIOS reside?**

   The UEFI BIOS resides on a flash memory chip. A utility is required to write to the chip.

4. **What kind of configuration data is stored on the DIMM Serial Presence Detect (SPD) memory module? How would this data be written?**

   The DIMM SPD memory contains information about the memory module, such as size, serial number, data width, speed/timing, voltage, and thermal information. This information is written by the module manufacturer and stored on an EEPROM. This EEPROM cannot be written to when the memory module is installed in a PC. Third-party tools do exist that can write to the EEPROM when the memory module is not installed in a PC. Various third-party tools are available to read SPD memory.

5. **What is meant by "Restore the nonvolatile memory found in Intel-based system boards"?**

   This message relates to clearing the Real Time Clock (RTC) CMOS memory that contains PC configuration data.

6. **How can the BIOS security be reset to factory defaults and data erased?**

   IMPORTANT: Resetting will result in the loss of information.

   These steps will not reset Custom Secure Boot Keys. See question and answer 7 for information about resetting the keys.

   a. Turn on or restart the computer, and then press esc while the "Press the ESC key for Startup Menu" message is displayed at the bottom of the screen.

   b. Select **Main**, and then select **Reset BIOS Security to Factory Default**.

   c. Follow the on-screen instructions.

   d. Select **Main**, select **Save Changes and Exit**, and then follow the on-screen instructions.

7. **How can the Custom Secure Boot Keys be reset?**

   Secure Boot is a feature to ensure that only authenticated code can start on a platform. If you enabled Secure Boot and created Custom Secure Boot Keys, simply disabling Secure Boot will not clear the keys. You must also select to clear the Custom Secure Boot Keys. Use the same Secure Boot access procedure you used to create the Custom Secure Boot Keys, but make the selection to clear or delete all Secure Boot Keys.

   a. Turn on or restart the computer, and then press esc while the "Press the ESC key for Startup Menu" message is displayed at the bottom of the screen.

   b. Select the **Security** menu, select **Secure Boot Configuration**, and then follow the on-screen instructions.

   c. At the **Secure Boot Configuration** window, select **Secure Boot**, select **Clear Secure Boot Keys**, and then follow the on-screen instructions to continue.

Using HP Sure Start (select models only)

Select computer models are configured with HP Sure Start, a technology that continuously monitors your computer's BIOS for attacks or corruption. If the BIOS becomes corrupted or is attacked, HP Sure Start restores the BIOS to its previously safe state, without user intervention. Those select computer models ship with HP Sure Start configured and enabled. HP Sure Start is configured and already enabled so that most users can use the HP Sure Start default configuration. The default configuration can be customized by advanced users.

To access the latest documentation on HP Sure Start, go to http://www.hp.com/support. Select **Find your product**, and then follow the on-screen instructions.

14 Recycling

When a non-rechargeable or rechargeable battery has reached the end of its useful life, do not dispose of the battery in general household waste. Follow the local laws and regulations in your area for battery disposal.

HP encourages customers to recycle used electronic hardware, HP original print cartridges, and rechargeable batteries. For more information about recycling programs, see the HP Web site at http://www.hp.com/recycle.

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