HP EliteBook 840 G5 Healthcare Edition Notebook PC
HP EliteBook 846 G5 Healthcare Edition Notebook PC

Maintenance and Service Guide

First Edition: May 2018

Document Part Number: L12741-001

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.

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 G5 Healthcare Edition Notebook PC
	HP EliteBook 846 G5 Healthcare Edition Notebook PC
Processors	**8th-generation Intel® Core™ quad-core processors:**
	Intel Core i7-8650U
	Intel Core i7-8550U
	Intel Core i5-8350U
	Intel Core i5-8250U
	7th-generation Intel Core dual-core processors:
	Intel Core i5-7300U
	Intel Core i5-7200U
Chipset	Integrated with processor
Graphics	Support HD decode, DX12, HDMI 1.4b, HDCP 2.2 via HDMI/DisplayPort up to 4K @60 Hz
	Both UMA and discrete configurations support three independent displays through docking stations as follows:
	• HP Docking Station - maximum resolution = 2.5K @60Hz (DisplayPort 1) and 2.5K @60Hz (DisplayPort 2)
	• HP Thunderbolt 3 Dock - maximum resolution = 4K @60Hz (DP1) and 4K @60Hz (DisplayPort 2)
	• HP Thunderbolt Dock 120W or 230W G2 - maximum resolution = 4K @60Hz (DisplayPort 1) and 4K @60Hz (DisplayPort 2) with Thunderbolt
	Internal graphics:
	Intel HD Graphics 620
	External graphics:
	AMD Radeon RX 540, 2 GB of GPU memory
Panel	Supports privacy filter and narrow bezel
	35.6-cm (14.0-in), full high-definition (FHD)(1920×1080) UWVA, 700 nits, 72% CG, eDP+PSR, uslim, privacy, touch enabled, high definition + infrared camera, WWAN
	Chemically-strengthened Gorilla Glass 3
Memory	Two memory module slots
	Memory is customer accessible/upgradeable
	DDR4-2400 dual channel support (8th generation processors)
	DDR4-2133 dual channel support (7th generation processors)
	Supports up to 32 GB of system RAM in the following configurations:

Category	Description
	• 32768 MB (16384 MB×2)
	• 24576 MB (16384 MB×1 + 8192 MB×1)
	• 20480 MB (16384 MB×1 + 4096 MB×1)
	• 16384 MB (16384 MB×1 or 8192 MB×2)
	• 12288 MB (8192 MB×1 + 4096 MB×1)
	• 8192 MB (8192 MB×1 or 4096 MB×2)
	• 4096 MB (4096 MB×1)
Primary storage	**M.2 solid-state drives (2280):**
	1 TB, PCIe, Gen3×4, SS, NVMe, TLC
	512 GB, PCIe, Gen3×4, SS, NVMe, TLC, Opal 2
	512 GB, PCIe, Gen3×4, SS, NVMe, TLC
	512 GB, SATA-3, SS, TLC, FIPS-140-2
	360 GB, PCIe, Gen3×4, NVMe, SS, TLC
	256 GB, PCIe, Gen3×4, NVMe, SS, TLC
	256 GB, PCIe, NVMe, SS, value
	256 GB, SATA-3, Opal 2, TLC
	128 GB, SATA-3, SS, TLC
Audio and video	HP Bang & Olufsen Audio
	Multi-array microphone (including World-Facing 3rd microphone)
	Stereo speakers (2)(13mm × 38mm × 4mm)
	Camera HD RGB 720p+IR
	Supports WDR (Wide Dynamic Range)
Ethernet	Intel Ethernet Connection I219-LM 10/100/1000 (vPro)
	Intel Ethernet Connection I219-V 10/100/1000 (non-vPro)
	The following support S3/S4/S5 Wake-on-LAN: embedded NIC
	The following support S3/S4/S5 wake on LAN/HBMA (via out of band): embedded NIC, HP Elite USB-C Dock, HP USB-C Universal Dock, HP Thunderbolt Dock 120W/230W G2, and HP USB-C Mini Dock.
	The following support S3 wake on LAN/HBMA (via Windows operating system): HP Thunderbolt 3 Dock, HP Elite USB-C Docking Station G2, HP USB-C Travel Dock, and HP USB Travel Dock.
Wireless networking	**WPAN Bluetooth:**
	Integrated wireless personal area network (PAN) supported by Bluetooth® 4.2 combo card
	Wireless local area network (WLAN): (select models)
	Integrated WLAN options with dual antennas (M.2 2230 socket PCIe/USB)
	Supports the following WLAN formats:
	• Intel Dual band wireless-AC 8265 802.11ac 2×2 WiFi + Bluetooth 4.2 Combo Adaptor (vPro)

Category	Description
	• Intel Dual band wireless-AC 8265 802.11ac 2×2 WiFi + Bluetooth 4.2 Combo Adaptor (non-vPro)
	• Realtek RTL8822BE 802.11ac 2×2 Wi-Fi + Bluetooth 4.2 Combo Adapter
	Two WLAN antennas built into bottom of display assembly
	Compatible with Miracast-certified devices
	Bluetooth Disabled IOPT
	Support S3/S4 wake on Wireless LAN
	Supports WLAN/LAN/WWAN switching
	Support for HP Sure Connect with Client Side Load Balancing (version 2.x)
	Near-Field Communication (NFC): (select models)
	NXP NPC300 Near Field Communication Module (NFC Mirage WNC XRAV-1 [NXP NPC300 I2C 10 mm x 17 mm])
	NFC antenna
	RFID (select models)
	Ritani RF IDeas HF/LF RFID Read SE Module (includes RFID antenna) **with or without** SE SAM (Security Access Module to support SE SEOS and iClass credentials for reading HID/iClass card type)
	HF band RFID (13.56MHz); LF band RFID (125kHz); 23 mm x 55 mm; RFID backprint in TouchPad; not available with NFC
	Wireless wide area network (WWAN): (select models)
	Integrated wireless wide area network (WWAN) options by way of wireless module
	Two WWAN antennas (world wide 5 band, configured at top of display panel)
	Supports the following WWAN formats:
	• LTE CAT4: Huawei HP lt4132, LTE/HSPA+ w/GPS M.2
	• LTE CAT9: Fibocom Intel XMM 7360 LTE-Advanced
	WWAN modules are compatible with a programmable removable eSIM
	Support for WWAN after market option (AMO)
Ports	USB Type-C (Thunderbolt)
	USB 3.1 Gen 1 port
	USB 3.1 Gen 1 charging port
	HDMI 1.4
	RJ-45/Ethernet
	Docking connector
	Audio-out (headphone)/audio-in (microphone) combo jack
	AC port
Docking	HP Thunderbolt Dock 120W G2
	HP 3005pr USB3.0 Port Replicator

Category	Description
	HP USB-C Travel Dock
	HP USB Travel Dock
	HP UltraSlim Docking Station
	HP USB-C Universal Dock
	HP USB-C Mini Dock
	HP Elite USB-C Dock G3
	HP Elite 90W Thunderbolt3 Dock
	HP USB-C universal Dock w/4.5mm Adapter
	HP Adjustable Dual Display Stand
	HP Display and Notebook Stand II
Keyboard/pointing devices	**Keyboard:**
	HP Collaboration Keyboard. Dual point, backlit, spill resistant with drain, with HP Dura Keys - privacy
	Point stick:
	Support for Microsoft Precision TouchPad Default Gestures
	Firmware PTP (Point to Point) with Filter Driver
	Support for 'No Hybrid Mode'
	TouchPad:
	RFIdeas icon back-printed on TouchPad glass (select models)
Power requirements	**Battery:**
	HP Long Life Lithium Polymer Soft Pack Battery, 3-cell, 50 WHr
	HP Fast Charge Technology
	AC adapter:
	65 W "Smart" right angle, 4.5 mm
	65 W "Smart" right angle, 4.5 mm - Argentina
	65 W "Smart" right angle, 4.5 mm - EM
	65 W Straight USB Type C
	45 W "Smart" right angle, 4.5 mm, 2-prong (Japan only)
	Power cord:
	Duckhead, 2 wire plug (C7), 1 m, conventional
	Duckhead, 3 wire plug (C5), 1.8 m, conventional
	Duckhead, 3 wire plug (C5), 1 m, conventional
	Duckhead, 3 wire plug (C5), 1.8 m, premium
	Duckhead, 3 wire plug (C5), 1 m, premium
Security	Security lock

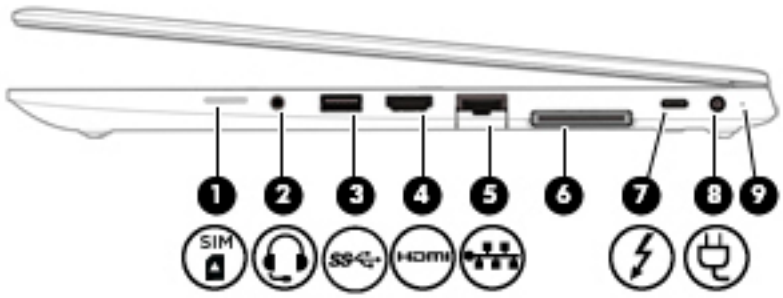
Category	Description
	Trusted Platform Module (TPM) 2.0 (Infineon, soldered down)
	Touch fingerprint sensor (landed, touch with 8x8 sensor)(select models)
	FIPS Fingerprint Sensor (Landed)
	Smart Card reader (active)(select models
	Preboot authentication (password, smart card)
	Hardware enforced Firmware Protection: HP Hardware Root of Trust + Sure Start Gen4
Operating system	**Operating system version:**
	Windows 10 RS3
	Preinstalled:
	Windows 10 Home 64
	Windows 10 Home 64 Single Language
	Windows 10 Home 64 Chinese Market CPPP
	Windows 10 Home 64 High End Chinese Market CPPP
	Windows 10 Home 64 Plus
	Windows 10 Home 64 Plus Single Language
	Windows 10 Professional 64
	Windows 10 Pro 64 StF MSNA Standard
	Windows 10 Pro 64 StF MSNA Plus
	FreeDOS 2.0
	Restore Media:
	Windows 10 DRDVD
	Windows 10 DRUSB
	Windows 10 Pro 64 OSDVD
	Windows 10 Pro 64 OSUSB
	Certified:
	Microsoft WHQL
	Web-only support:
	Windows 10 Enterprise 64
	Windows 10 Pro 64 CBB 1703
	Windows 10 Enterprise 64 LTSB 1607
Serviceability	**End user replaceable parts:**
	AC adapter
	Solid-state drive
	Memory module

Category	Description
	WLAN module
	WWAN module
	Keyboard

2 Components

Your computer features top-rated components. This chapter provides details about your components, where they're located, and how they work.

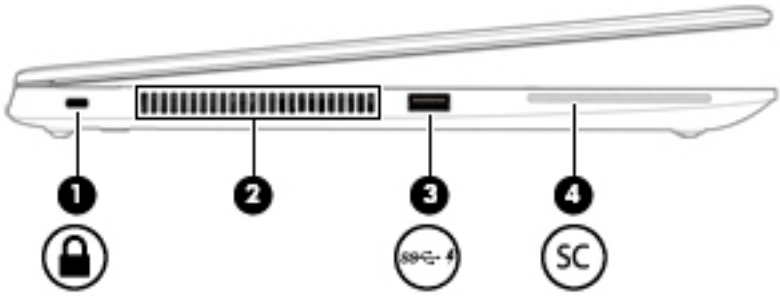
Right



Component			Description
(1)		SIM card slot	Supports a wireless subscriber identity module (SIM) card.
(2)		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 standalone microphones. **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: ▲ Select the **Start** button, select **HP Help and Support**, and then select **HP Documentation**. – or – ▲ Select the **Start** button, select **HP**, and then select **HP Documentation**. **NOTE:** When a device is connected to the jack, the computer speakers are disabled.
(3)		USB SuperSpeed port	Connects a USB device, such as a cell phone, camera, activity tracker, or smartwatch, and provides high-speed data transfer.
(4)		HDMI port	Connects an optional video or audio device, such as a high-definition television, any compatible digital or audio component, or a high-speed High Definition Multimedia Interface (HDMI) device.
(5)		RJ-45 (network) jack/status lights	Connects a network cable. • Green (left): The network is connected.

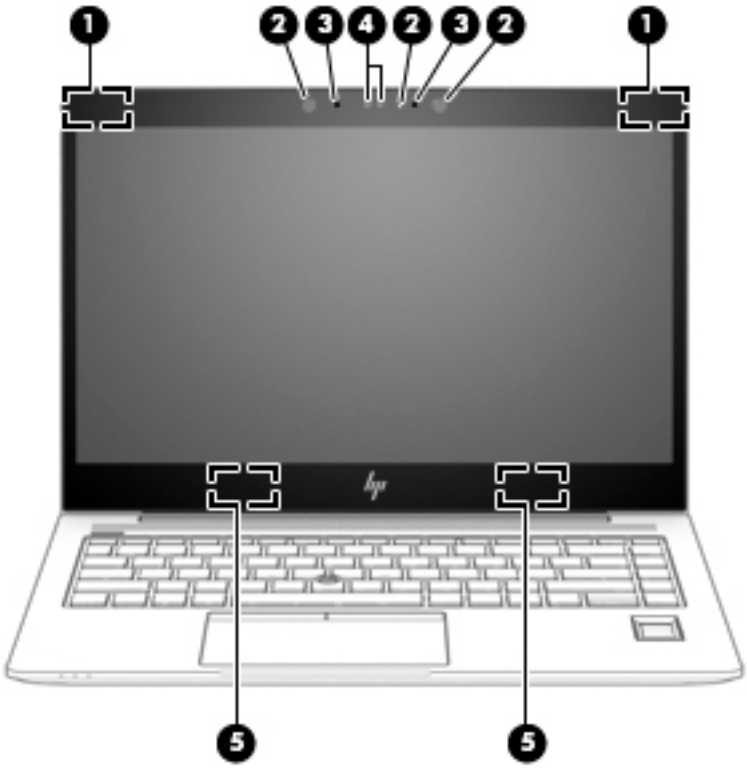
Component			Description
			• Amber (right): Activity is occurring on the network.
(6)		Docking connector	Connects an optional docking device.
(7)		USB Type-C power connector and Thunderbolt™ port with HP Sleep and Charge	Connects an AC adapter that has a USB Type-C connector, supplying power to the computer and, if needed, charging the computer battery. – and – Connects and charges most USB devices that have a Type-C connector, such as a cell phone, camera, activity tracker, or smartwatch, and provides high-speed data transfer. – and – Connects a display device that has a USB Type-C connector, providing DisplayPort output. **NOTE:** Your computer may also support a Thunderbolt docking station. **NOTE:** Cables and/or adapters (purchased separately) may be required.
(8)		Power connector	Connects an AC adapter.
(9)		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.

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)		Vent	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)		USB SuperSpeed port with HP Sleep and Charge	Connects a USB device, provides high-speed data transfer, and even when the computer is off, charges most products such as a cell phone, camera, activity tracker, or smartwatch.
(4)	SC	Smart card reader	Supports optional smart cards.

Display



Component		Description
(1)	WWAN antennas*	Send and receive wireless signals to communicate with wireless wide area networks (WWANs).
(2)	Camera light(s)	On: One or more cameras are in use.
(3)	Internal microphones	Record sound.
(4)	Camera(s)	Allow(s) you to video chat, record video, and record still images. Some cameras also allow a facial recognition logon to Windows, instead of a password logon. **NOTE:** Camera functions vary depending on the camera hardware and software installed on your product.
(5)	WLAN antennas*	Send and receive wireless signals to communicate with wireless local area networks (WLANs).

*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:

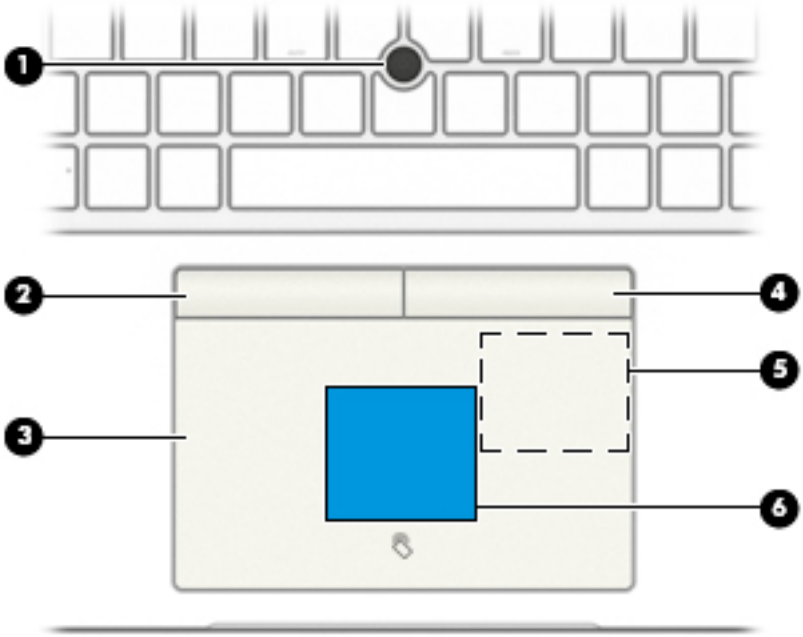
▲ Select the **Start** button, select **HP Help and Support**, and then select **HP Documentation**.

– or –

▲ Select the **Start** button, select **HP**, and then select **HP Documentation**.

Keyboard area

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 zone	Reads your finger gestures to move the pointer or activate items on the screen.
(4)	Right pointing stick button	Functions like the right button on an external mouse.
(5)	Near Field Communications (NFC) tapping area and antenna*	Allows you to wirelessly share information when you tap it with an NFC-enabled device.
(6)	Radio frequency identification (RFID) tapping area and antenna*	When your computer is configured with the proper single sign-on software, RFID allows you to sign in to your software application using an RFID card or tag.

*The antenna is not visible from the outside of the computer. For optimal transmission, keep the area immediately around the antenna free from obstructions.

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

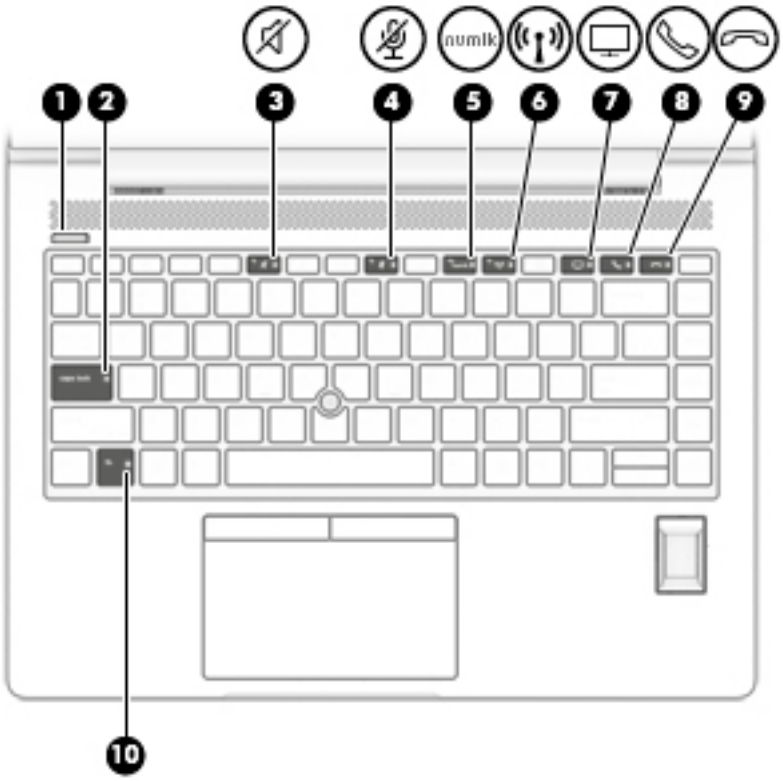
To access this guide:

▲ Select the **Start** button, select **HP Help and Support**, and then select **HP Documentation**.

– or –

▲ Select the **Start** button, select **HP**, and then select **HP Documentation**.

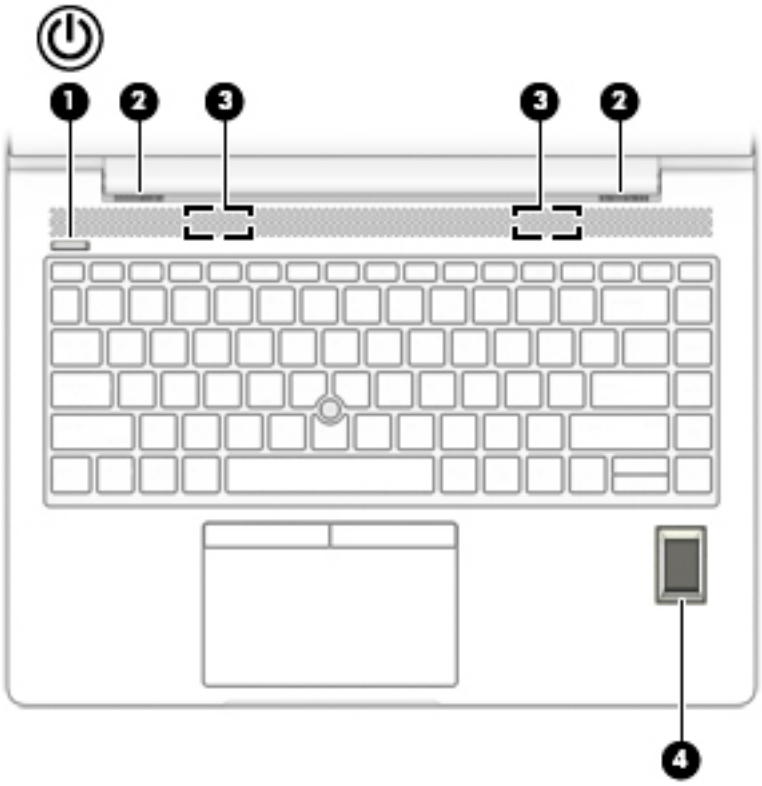
Lights



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)		Caps lock light	On: Caps lock is on, which switches the key input to all capital letters.
(3)		Mute light	• On: Computer sound is off. • Off: Computer sound is on.
(4)		Microphone mute light	• On: Microphone is off. • Off: Microphone is on.
(5)	num lk	Num lk light	On: Num lock is on.
(6)		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.

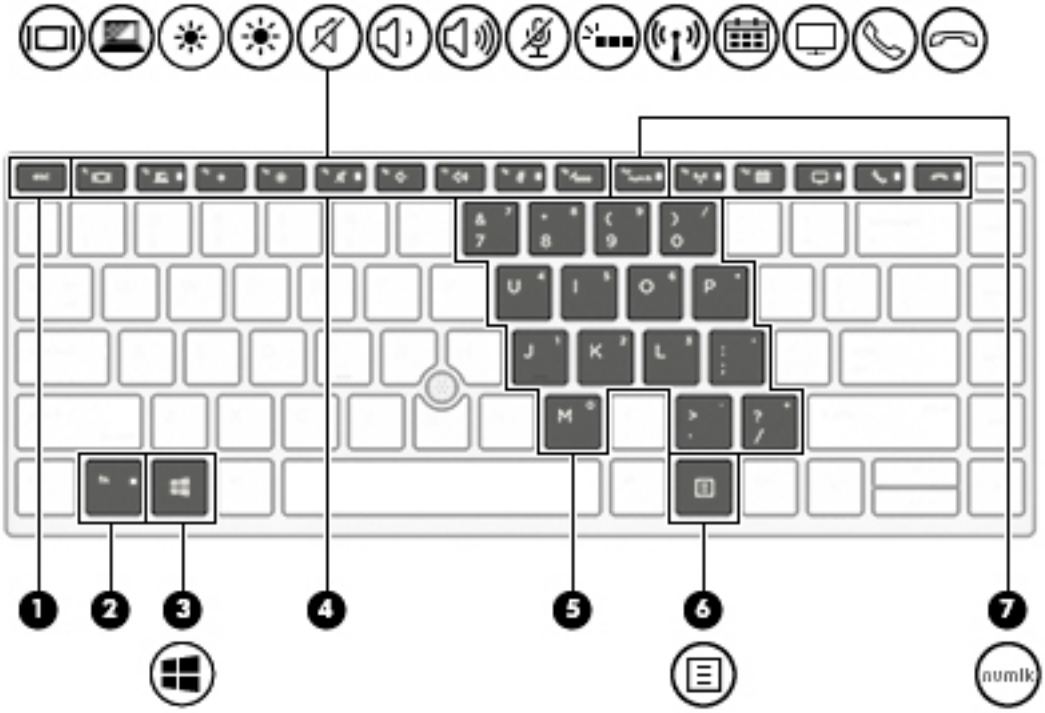
Component		Description
(7)	Sharing or presenting light	On: Sharing is on.
(8)	Call answer light	On: Call answer is on.
(9)	Call end light	On: Call end is on.
(10)	Fn lock light	On: The fn key is locked. For more information, see Hot keys (select products only) on page 17.

Button, vents, 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. ▲ Right-click the **Power meter** icon and then select **Power Options**.
(2)	Vents (2)	Enables 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)	Speakers (2)	Produce sound.
(4)	Fingerprint reader (select products only)	Allows a fingerprint logon to Windows, instead of a password logon.

Special 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 another key. Such key combinations are called *hot keys*. See Hot keys (select products only) on page 17.
(3)		Windows key	Opens the **Start** menu. **NOTE:** Pressing the Windows key again will close the **Start** menu.
(4)		Action keys	Execute frequently used system functions. See Action keys on page 16.
(5)		Embedded numeric keypad	A numeric keypad superimposed over the keyboard alphabet keys. When fn+num lk is pressed, the keypad can be used like an external numeric keypad. Each key on the keypad performs the function indicated by the icon in the upper-right corner of the key. **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 key	Turns the embedded numeric keypad on and off when pressed in combination with the fn key.

Action keys

An action key performs the function indicated by the icon on the key. To determine which keys are on your product, see Special keys on page 15.

▲ To use an action key, press and hold the key.

Icon	Description
	Helps prevent side-angle viewing from onlookers. If needed, decrease or increase brightness for well-lit or darker environments. Press the key again to turn off the privacy screen. **NOTE:** To quickly turn on the highest privacy setting, press fn+p. 
	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.
	Turns the keyboard backlight off or on. **NOTE:** To conserve battery power, turn off this feature.
	Plays the previous track of an audio CD or the previous section of a DVD or a Blu-ray Disc (BD).
	Starts, pauses, or resumes playback of an audio CD, a DVD, or a BD.
	Plays the next track of an audio CD or the next section of a DVD or a BD.
	Stops audio or video playback of a CD, a DVD, or a BD.
	Decreases speaker volume incrementally while you hold down the key.
	Increases speaker volume incrementally while you hold down the key.
	Mutes the microphone.
	Mutes or restores speaker sound.
	Turns the wireless feature on or off. **NOTE:** A wireless network must be set up before a wireless connection is possible.
	Turns the TouchPad and TouchPad light on and off.

Icon	Description
	Switches the screen image among display devices connected to the system. For example, if a monitor is connected to the computer, repeatedly pressing the key alternates the screen image from computer display to monitor display to simultaneous display on both the computer and monitor.
	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.
	Provides quick access to your Skype for Business calendar. **NOTE:** This feature requires Skype® for Business or Lync® 2013 running on Microsoft Exchange or Office 365® servers.
	Turns the screen sharing function on or off. **NOTE:** This feature requires Skype for Business or Lync 2013 running on Microsoft Exchange or Office 365 servers.
	• Answers a call. • Starts a call during a 1-on-1 chat. • Places a call on hold. **NOTE:** This feature requires Skype for Business or Lync 2013 running on Microsoft Exchange or Office 365 servers.
	• Ends a call. • Declines incoming calls. • Ends screen sharing. **NOTE:** This feature requires Skype for Business or Lync 2013 running on Microsoft Exchange or Office 365 servers.

NOTE: The action key feature is enabled at the factory. You can disable this feature by pressing and holding the fn key and the left shift key. The fn lock light will turn on. After you have disabled the action key feature, you can still perform each function by pressing the fn key in combination with the appropriate action key.

Hot keys (select products only)

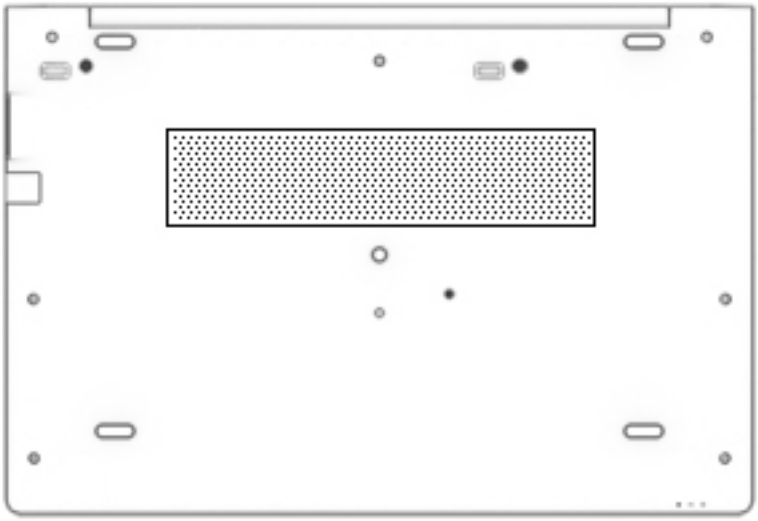
A hot key is the combination of the fn key and another key.

To use a hot key:

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

Key	Description
C	Turns on scroll lock.
E	Turns on the insert function.
R	Breaks the operation.
S	Sends a programing query.
W	Pauses the operation.

Bottom



Component	Description
Vent	Enables 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

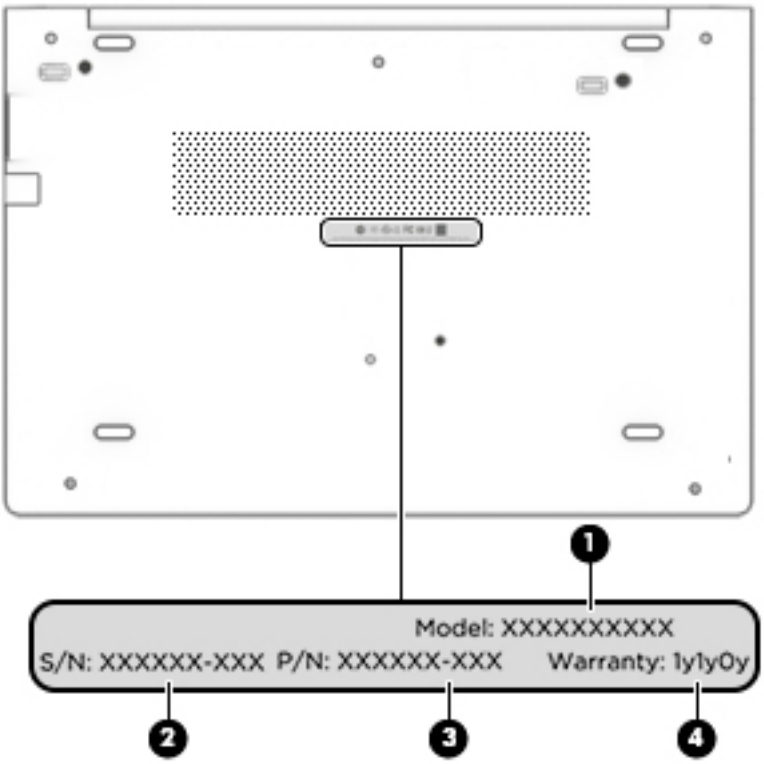
Component			Description
(1)		Power light	• On: The computer is on. • Blinking: The computer is in the Sleep state, a power-saving state. The computer shuts off power to the display and other unneeded components. • Off: The computer is off or in Hibernation. Hibernation is a power-saving state that uses the least amount of power.
(2)		Wireless light	• On: An integrated wireless device, such as a wireless local area network (WLAN) device and/or a Bluetooth® device, is on. • Off: All integrated wireless devices are off. **NOTE:** On some products, the wireless light is amber when all wireless devices are off.
(3)		Drive light	• Blinking white: The hard drive is being accessed. • Amber: HP 3D DriveGuard has temporarily parked the hard drive.

Labels

The labels affixed to the computer provide information you may need when you troubleshoot system problems or travel internationally with the computer. Labels may be in paper form or imprinted on the product.

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, on the back of the display, or on the bottom of a tablet kickstand.

- Service label—Provides important information to identify your computer. When contacting support, you may be asked for the serial number, the product number, or the model number. Locate this information before you contact support.



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

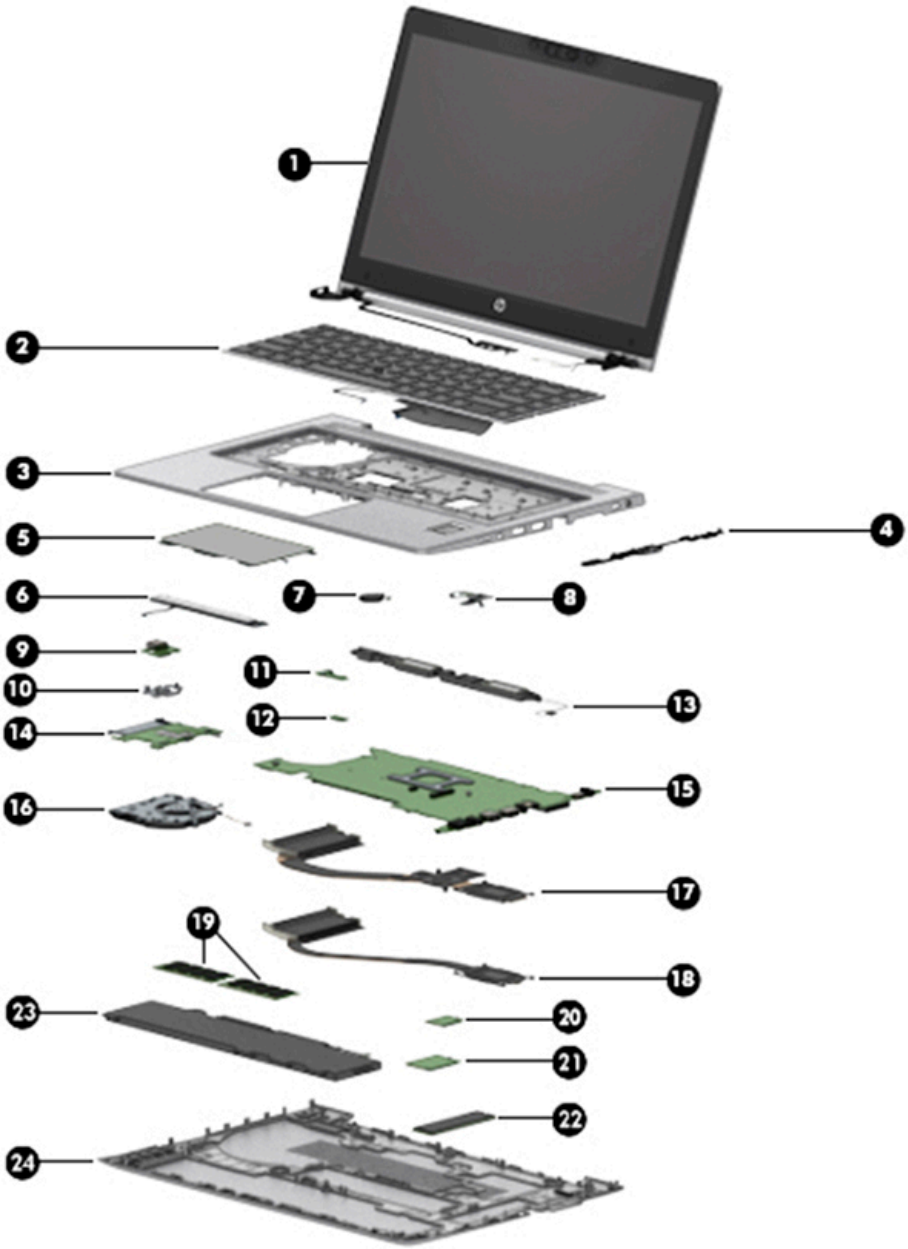
- Regulatory label(s)—Provide(s) regulatory information about the computer.
- Wireless certification label(s)—Provide(s) information about optional wireless devices and the approval markings for the countries or regions in which the devices have been approved for use.

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.

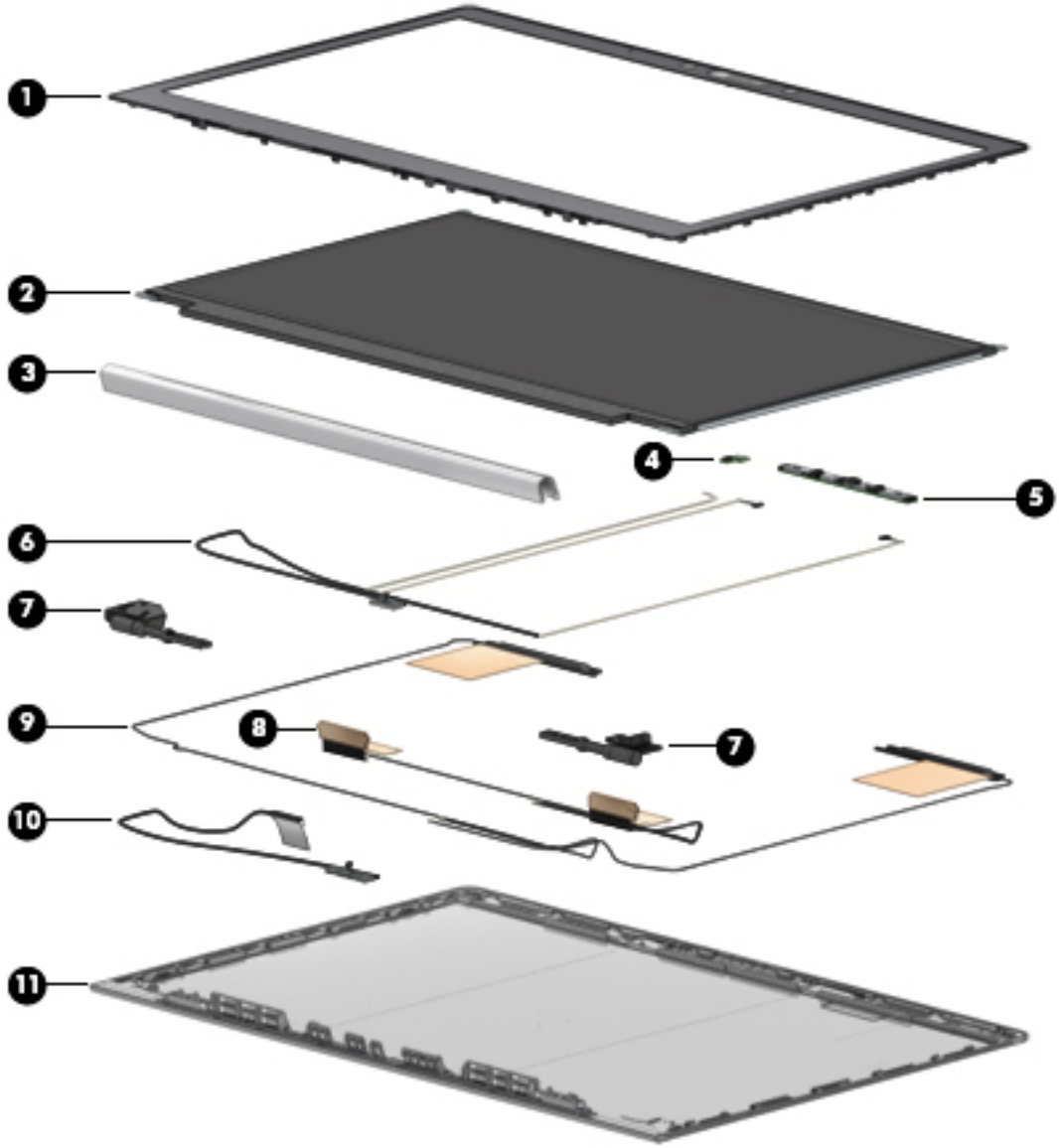
NOTE: Details about your computer, including model, serial number, product key, and length of warranty, are on the service tag at the bottom of your computer. See Labels on page 20 for details.



Item	Component	Spare part number
(1)	**Display assembly**, touch screen Display assemblies are spared at the subcomponent level only. For more display assembly spare part information, see Display assembly subcomponents on page 24.	
(2)	**Keyboard** (privacy) For a list of keyboard country codes, see Keyboard on page 41.	L29189-xx1
(3)	**Top cover**	
	Non-FIPS	L28398-001
	FIPS	L28399-001
(4)	**RJ-45 board with bracket**	not spared
(5)	**TouchPad**	
	For use in models with RFID	L29199-001
	For use in models with an NFC module	L29201-001
(6)	**TouchPad button board**	not spared
(7)	**RTC battery**	L17255-001
(8)	**Power button board**	L14374-001
(9)	**USB board**	L14380-001
(10)	**USB board bracket**	L14380-001
(11)	**Fingerprint reader assembly** (includes cable)	
	Touch sensor	L13681-001
	FIPS sensor	L28401-001
(12)	**NFC module** (includes antenna and TouchPad foam)	not spared
(13)	**Speakers** (includes cable)	L13684-001
(14)	**Smart card reader board**	L18312-001
(15)	**System board** (includes processor and replacement thermal material, see System board on page 63) All system boards use the following part numbers: xxxxxx-001: Non-Windows operating systems xxxxxx-601: Windows operating system	
	For use in models with discrete graphics memory	
	Intel i7-8650U processor	L15521-xx1
	Intel i7-8550U processor	L15519-xx1
	Intel i5-8350U processor	L15517-xx1
	Intel i5-8250U processor	L15515-xx1
	Intel i5-7200U processor	L15513-xx1
	For use in models with UMA graphics memory	
	Intel i7-8650U processor	L15522-001

Item	Component	Spare part number
	Intel i7-8550U processor	L15520-001
	Intel i5-8350U processor	L15518-001
	Intel i5-8250U processor	L15516-001
	Intel i5-7300U processor	L15523-001
	Intel i5-7200U processor	L15514-001
(16)	**Fan**	L22306-001
	Heat sink	
(17)	For use in models with discrete graphics memory	L14373-001
(18)	For use in models with UMA graphics memory	L14372-001
(19)	**Memory module** (DDR-2400)	
	4-GB	862397-850
	8-GB	862398-850
	16-GB	865396-850
(20)	**WLAN/Bluetooth combo card**	
	Realtek RTL8822BE 802.11ac 2x2 Wi-Fi + Bluetooth 4.2 Combo Adapter	915623-001
	Intel Dual band wireless-AC 8265 802.11AC 2x2 WiFi + Bluetooth 4.2 Combo Adaptor (vPro)	851592-001
	Intel Dual band wireless-AC 8265 802.11AC 2x2 WiFi + Bluetooth 4.2 Combo Adaptor (non-vPro)	851594-001
(21)	**WWAN module**	
	LTE CAT4: Huawei HP lt4132, LTE/HSPA+ w/GPS	845710-003
	LTE CAT9: Fibocom Intel XMM 7360 LTE-Advanced	L15397-800
(22)	**Solid-state drive (SSD)**	
	1 TB, PCIe, NVMe, TLC	L29198-001
	512 GB, PCIe, SS, NVMe, TLC	L29196-001
	512 GB, PCIe, Self-encrypting drive (SED), Opal 2, TLC	L29197-001
	512 GB, SATA-3, FIPS-140–2, TLC	L29195-001
	360 GB, PCIe, NVMe,TLC	L29194-001
	256 GB, PCIe, SS, NVMe, TLC	L29192-001
	256 GB, PCIe, NVMe, value	L29193-001
	256 GB, SATA-3, Opal 2, TLC	L29191-001
	128 GB, SATA-3, TLC	L29190-001
(23)	**Battery** (3 cell, 50 WHr, 4.33 Ah)	933321-855
(24)	**Bottom cover**	L14371-001

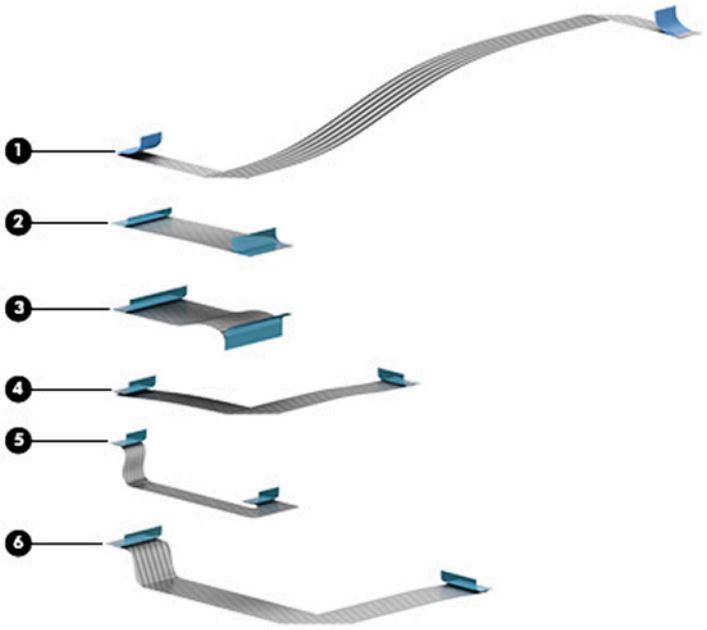
Display assembly subcomponents



Item	Component	Spare part number
(1)	**Bezel**	L28402-001
(2)	**Display panel** (included in the Touch Panel Kit)	L30424-001
(3)	**Hinge cover**	L29200-001 (Hinge Kit)
(4)	**Ambient light sensor board** (includes double-sided tape)	L15511-001
(5)	**Camera module**	L15509-001
	Microphone module (includes double-sided tape; not illustrated)	L15512-001
(6)	**Camera cable** (HD and IR models; included in Cable Kit)	L14370-001
(7)	**Hinges (left and right)** (for use in models with touch displays; included in Hinge Kit)	L29200-001

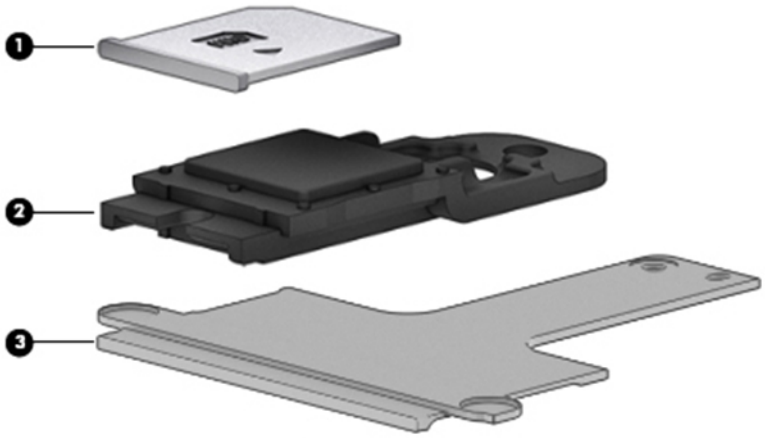
Item	Component	Spare part number
(8)	**WLAN antenna** (spared with display enclosure)	
(9)	**WWAN antenna** (spared with display enclosure)	
(10)	**Display cable** (included in the Touch Panel Kit)	L30424-001
(11)	**Display enclosure** (includes tape, gasket, and foam for display)	L28403-001
	Touch control board (included in the Touch Panel Kit; not illustrated)	L30424-001

Cable Kit



Item	Description	Spare part number
	Cable Kit	L14370-001
(1)	Keyboard cable	
(2)	USB board cable	
(3)	Card reader cable	
(4)	TouchPad cable	
(5)	Fingerprint reader cable	
(6)	NFC cable	

Plastics Kit



Item	Component	Spare part number
	Plastics kit	L15503-001
(1)	SIM card reader insert	
(2)	Fingerprint reader insert	
(3)	Smart card reader insert	
	Smart card reader (for use in models without a smart card reader; not illustrated)	
	HD camera shutter (not illustrated)	
	IR camera shutter (not illustrated)	

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, EM	913691-850
65 W, wall mount, 3 pin, USB-C	860209-850
45 W HP Smart AC adapter, 2 prong	742436-001
Screw Kit	L14352-001
Pointing stick covers, quantity of 20	L15396-001

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
- Torx T8 screwdriver
- Plastic, non-marking pry tool

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 20 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 12 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	L14371-001

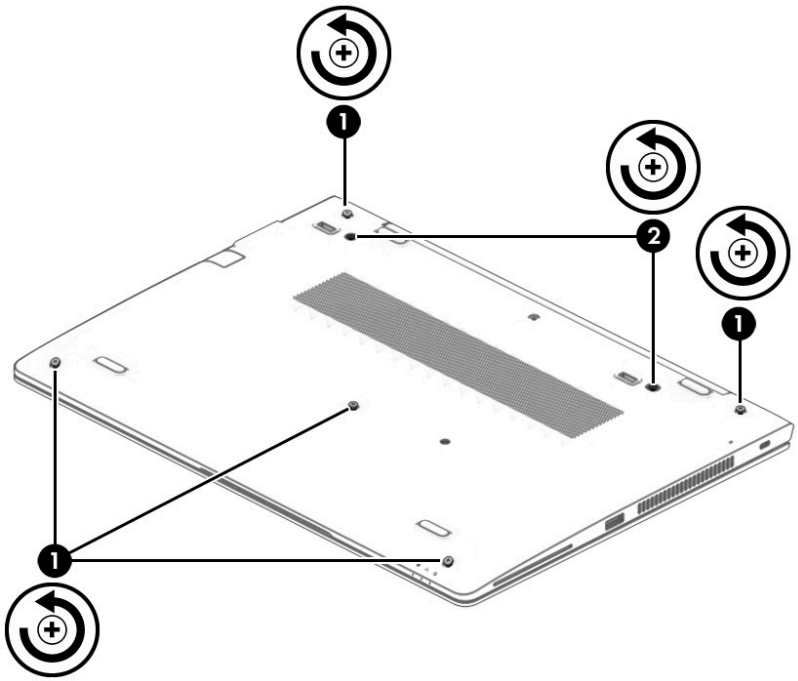
Before removing the bottom cover, follow these steps:

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.

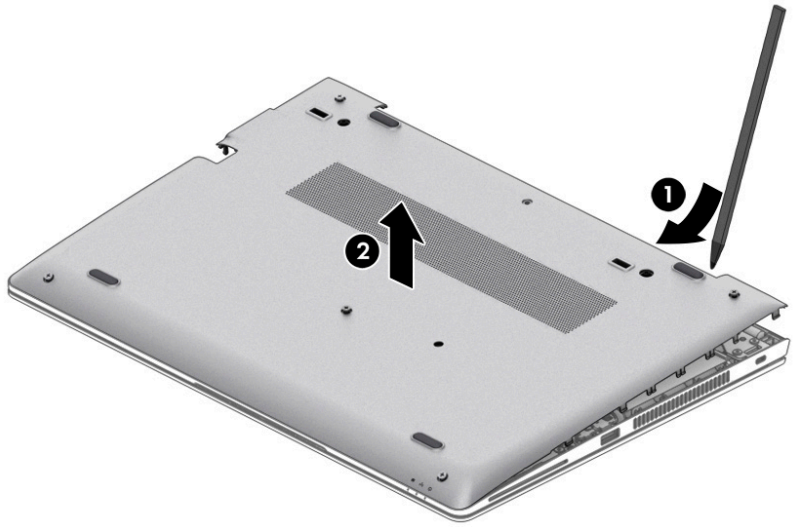
Remove the bottom cover:

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

2. Loosen the five captive screws **(1)** and the two inset captive screws **(2)** that secure the bottom cover.



3. Starting under the display in the upper left corner, pry **(1)** and lift the bottom cover off the computer **(2)**.



Reverse the removal procedures to install the bottom cover.

Solid-state drive (SSD)

Description	Spare part number
1 TB, PCIe, NVMe, TLC	L29198-001
512 GB, PCIe, SS, NVMe, TLC	L29196-001
512 GB, PCIe, Gen3×4, Self-encrypting drive (SED), Opal 2, TLC	L29197-001
512 GB, SATA-3, FIPS-140–2, TLC	L29195-001
360 GB, PCIe, NVMe,TLC	L29194-001
256 GB, PCIe, SS, NVMe, TLC	L29192-001
256 GB, PCIe, NVMe, value	L29193-001
256 GB, SATA-3, Opal 2, TLC	L29191-001
128 GB, SATA-3, TLC	L29190-001

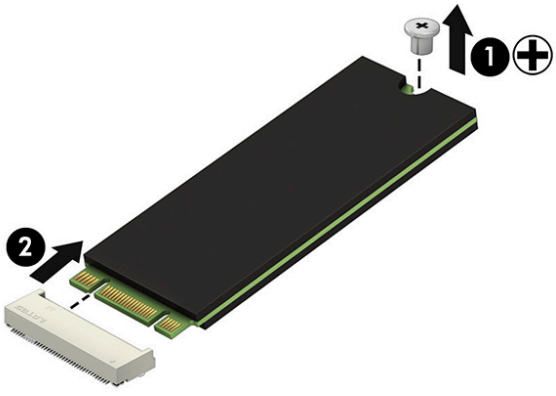
Before removing the solid-state drive, follow these steps:

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 cable from the system board (see Battery on page 45).

Remove the solid-state drive:

1. Remove the Phillips M2.0×2.0 screw **(1)** that secures the drive to the system board.
2. Remove the drive by pulling it away from the connector **(2)**.

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. Disconnect the battery cable from the system board (see Battery on page 45).

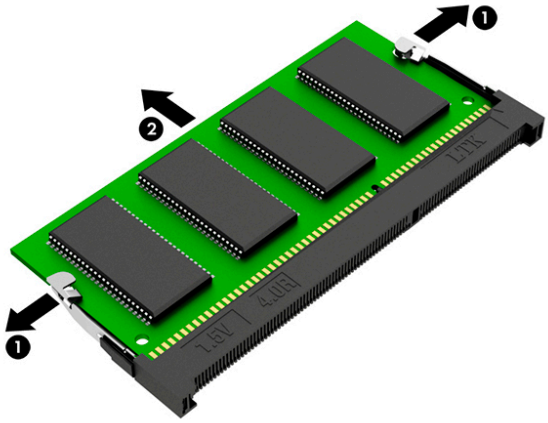
Remove the memory module:

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
Realtek RTL8822BE 802.11ac 2x2 Wi-Fi + Bluetooth 4.2 Combo Adapter	915623-001
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

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. Disconnect the battery cable from the system board (see Battery on page 45).

Remove the WLAN module:

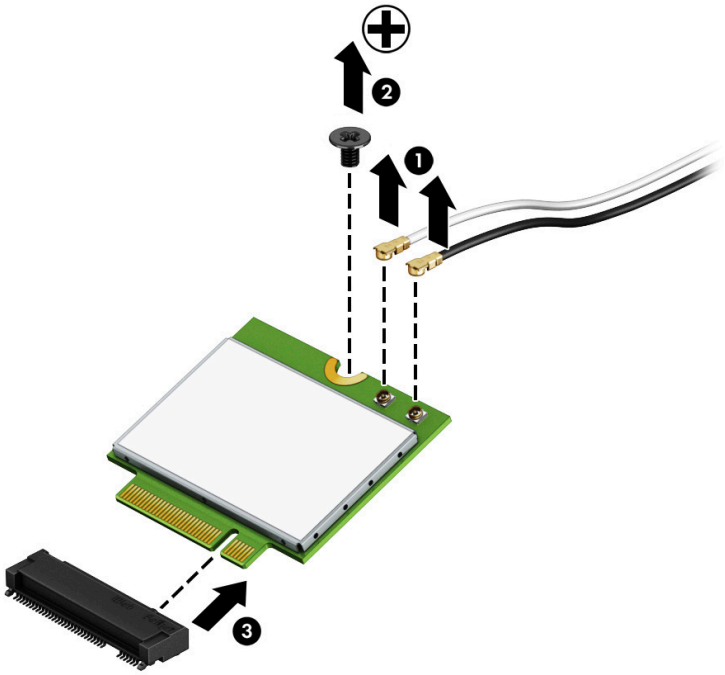
1. Disconnect the WLAN antenna cables **(1)** from the terminals on the WLAN module.

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.

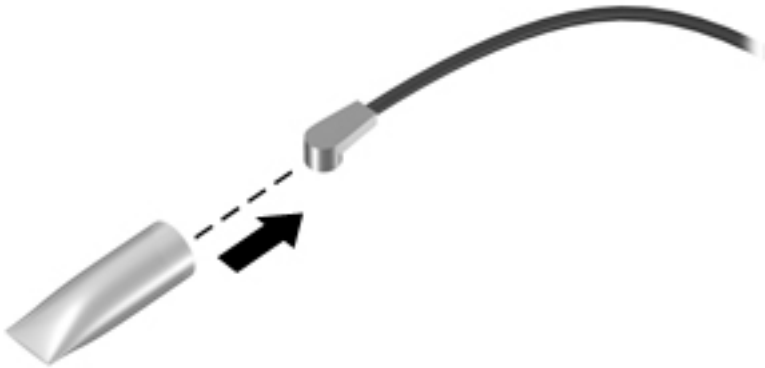
2. Remove the Phillips M2.0×2.0 screw **(2)** that secures the WLAN module to the computer. (The edge of the module opposite the slot rises away from the computer.)

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
LTE CAT4: Huawei HP lt4132, LTE/HSPA+ w/GPS	845710-003
LTE CAT9: Fibocom Intel XMM 7360 LTE-Advanced	L15397-800

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. Disconnect the battery cable from the system board (see Battery on page 45).

Remove the WWAN module:

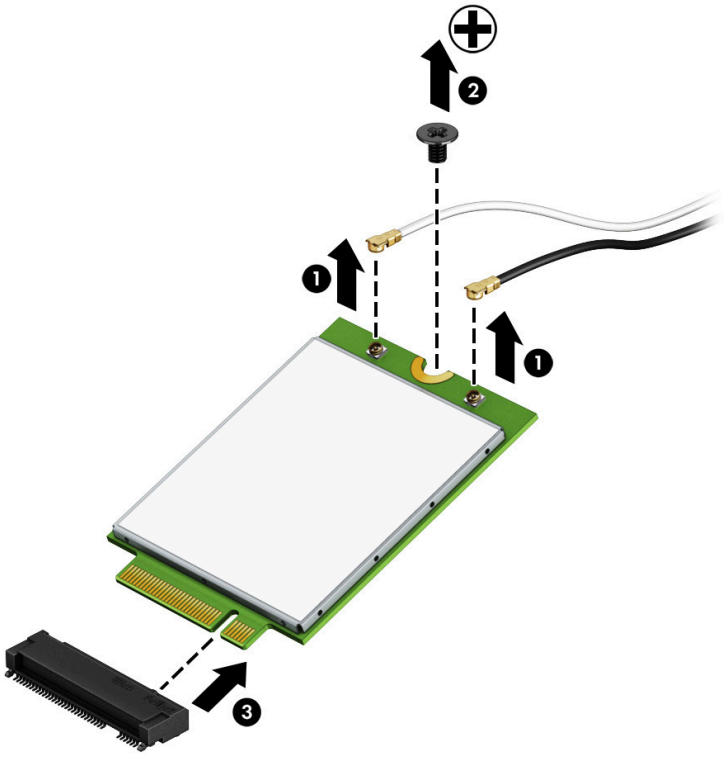
1. Position the computer upside-down.
2. Disconnect the WWAN antenna cables **(1)** from the terminals on the WWAN module.

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.

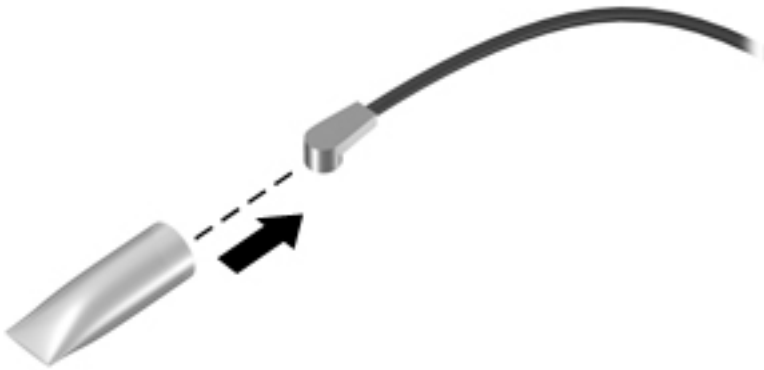
3. Remove the Phillips M2.0×2.0 screw **(2)** that secures the WWAN module to the computer. (The edge of the module opposite the slot rises away from the computer.)

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.

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, privacy	L29189-xx1
Pointing stick covers, quantity of 20	L15396-001

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. Disconnect the battery cable from the system board (see Battery on page 45).

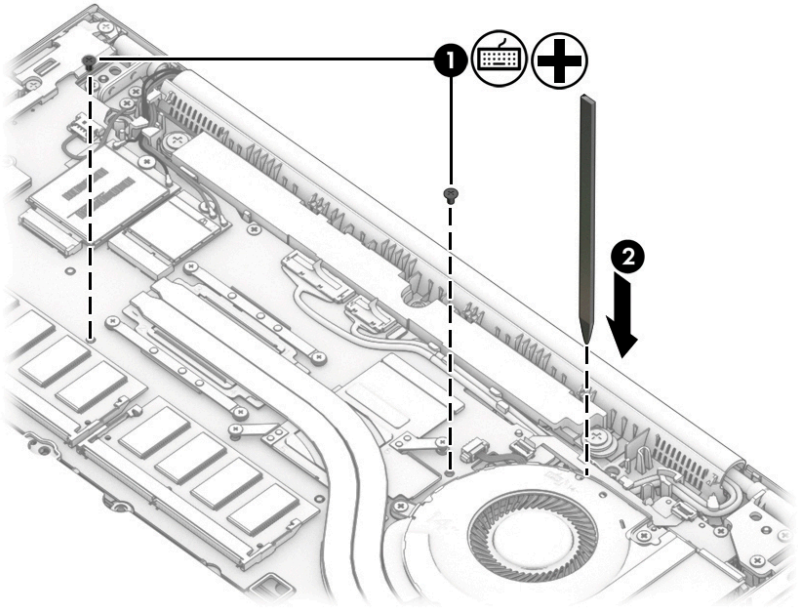
Remove the keyboard:

1. Remove the two Phillips M2.0×3.0 screws that secure the keyboard to the computer **(1)**.

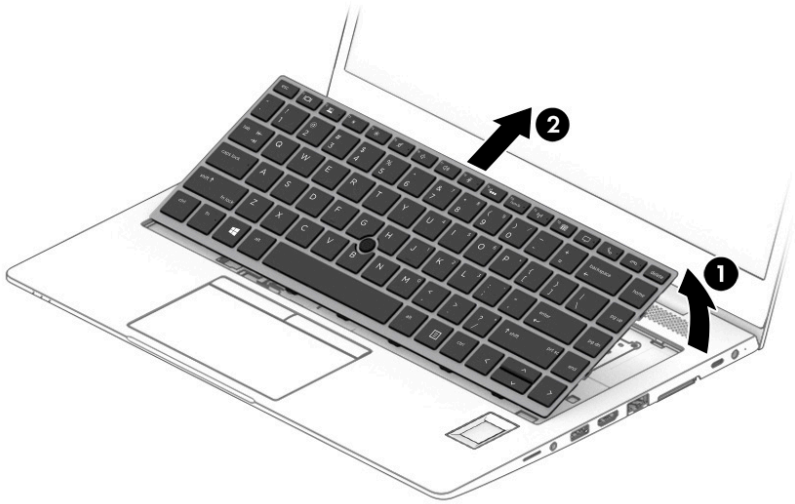
NOTE: The screws are labeled with a keyboard symbol.

2. Insert a screwdriver or similar thin tool into the release hole near the fan, 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.

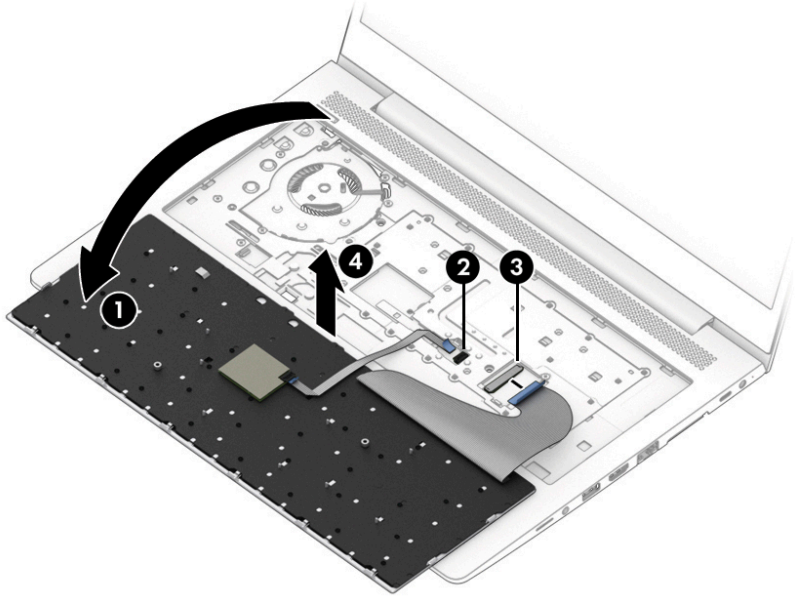


3. Position the computer upright with the front toward you, and then open the computer as far as possible.
4. Lift to disengage the top of the keyboard **(1)**, and then rotate the keyboard over onto the palm rest **(2)**.



5. With the keyboard resting on the palm rest **(1)**, disconnect the main keyboard cable from the system board ZIF connector **(2)**.
6. Disconnect the pointing stick cable from the system board ZIF connector **(3)**.
7. Disconnect the keyboard backlight cable from the system board ZIF connector **(4)** (select models only).

8. Remove the keyboard **(5)**.



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 20 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 81 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.

Battery

Description	Spare part number
Battery, 3 cell, 50 WHr, 4.33 Ah	933321-855

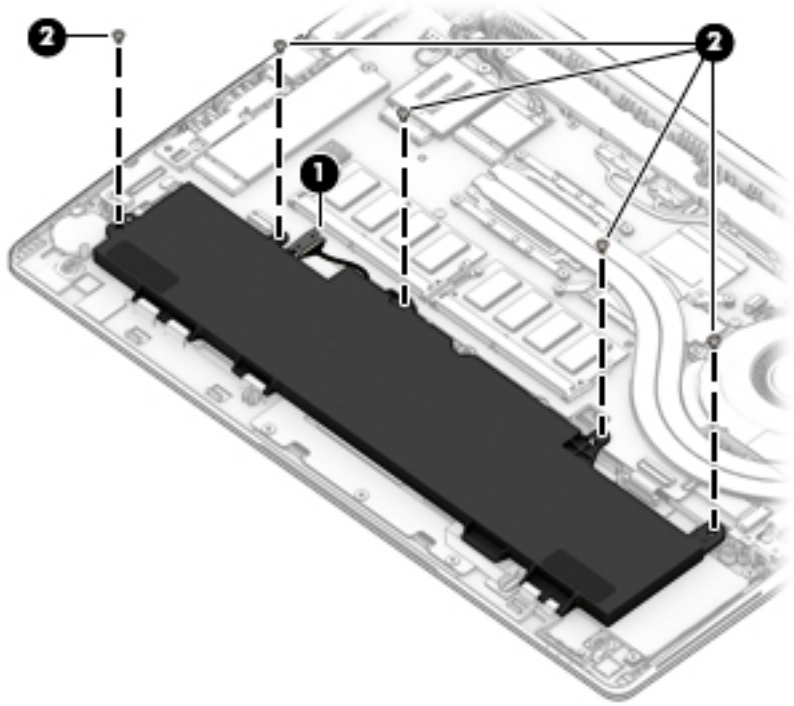
Before removing the battery, follow these steps:

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:

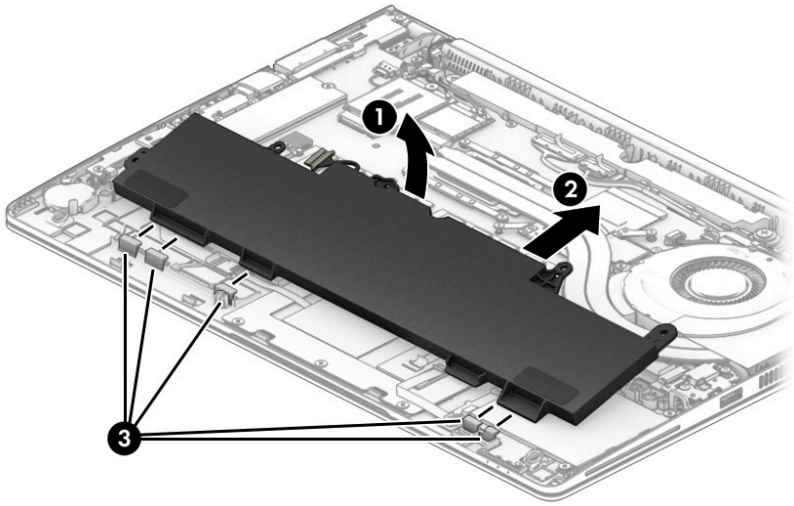
⚠ **CAUTION:** Removing a battery that is the sole power source for the computer can cause loss of information. To prevent loss of information, save your work and shut down the computer through Windows before removing the battery.

1. Disconnect the battery cable from the system board **(1)**.
2. Remove the five Torx T8 2.0×4.0 screws **(2)**.



3. Rotate the top of the battery upward **(1)**, and then lift the battery out of the computer **(2)**.

IMPORTANT: When installing the battery, insert the tabs on the bottom of battery into the clips built into the computer **(3)**, and then rotate the battery into place



Reverse the removal procedures to install the battery.

Heat sink assembly

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

Description	Spare part number
Heat sink for use in models with discrete graphics memory	L14373-001
Heat sink for use in models with UMA graphics memory	L14372-001

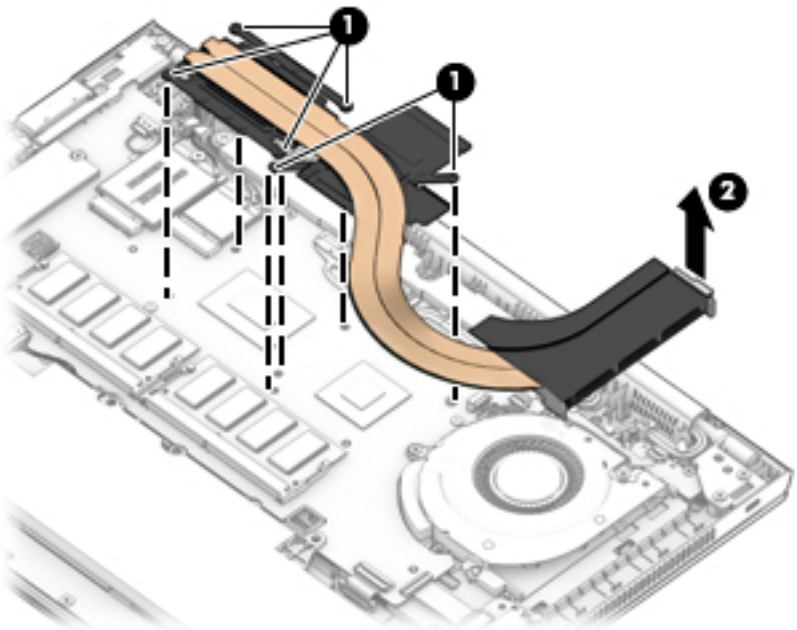
Before removing the heat sink assembly, follow these steps:

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. Disconnect the battery cable from the system board (see Battery on page 45).

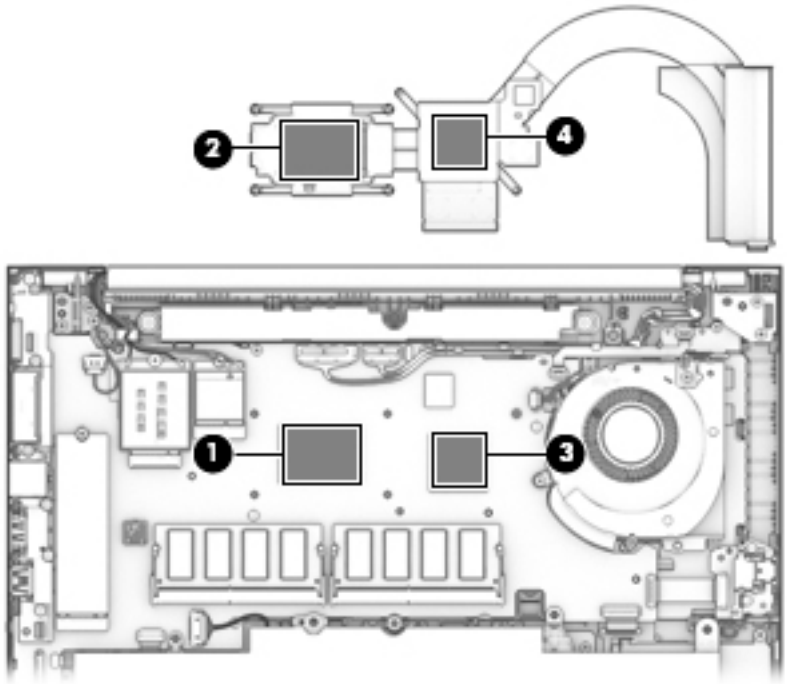
Remove the heat sink assembly:

1. **Discrete graphics models:** Loosen the six captive screws on the heat sink following the sequence stamped on the heat sink **(1)**, and then remove the heat sink from the system board **(2)**.

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

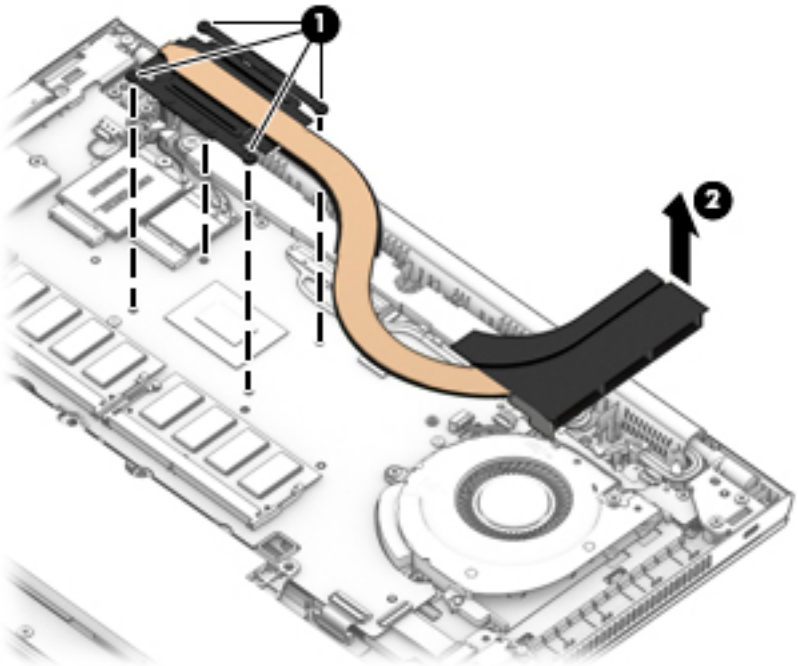


2. Thoroughly clean the thermal material from the surfaces of the system board components **(1)(3)** and the heat sink **(2)(4)** each time the heat sink is removed. Replacement thermal material is included with the heat sink and system board spare part kits.

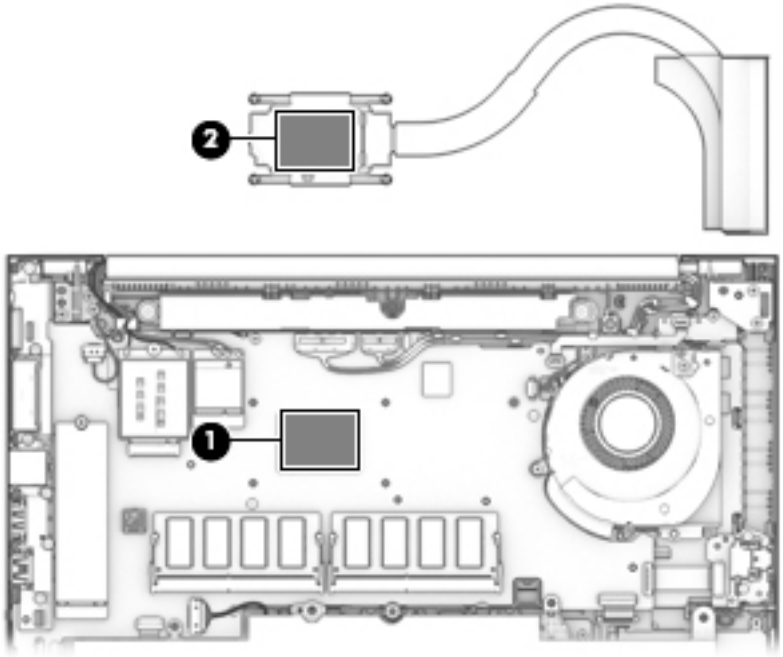


3. **UMA graphics models:** Loosen the four captive screws on the heat sink following the sequence stamped on the heat sink **(1)**, and then remove the heat sink from the system board **(2)**.

⚠ **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.



4. Thoroughly clean the thermal material from the surfaces of the system board component **(1)** and the heat sink **(2)** each time the heat sink is removed. Replacement thermal material is included with the heat sink and system board spare part kits.



Reverse this procedure to install the heat sink.

RTC battery

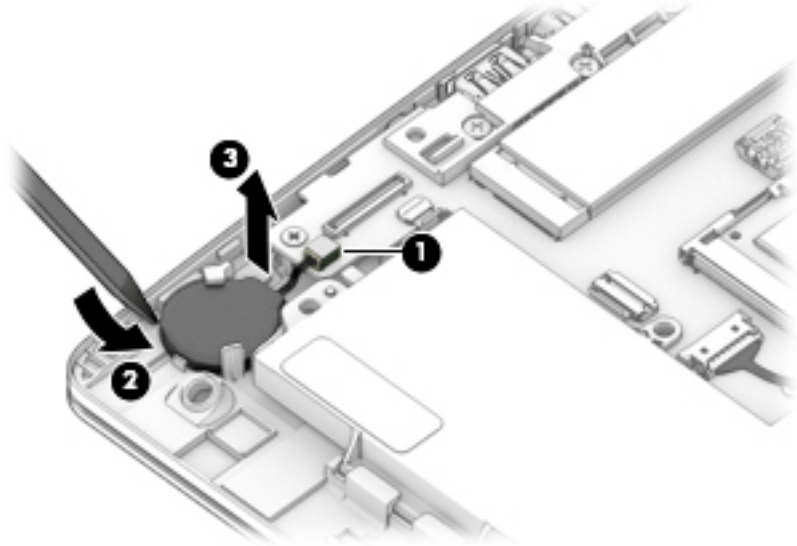
Description	Spare part number
RTC battery	L17255-001

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. Disconnect the battery cable from the system board (see Battery on page 45).

Remove the RTC battery:

1. Disconnect the RTC battery cable from the system board **(1)**.
2. Using a flat tool, pry the battery from the holder **(2)**, and then remove the battery from the computer **(3)**.



Reverse this procedure to install the RTC battery.

USB board

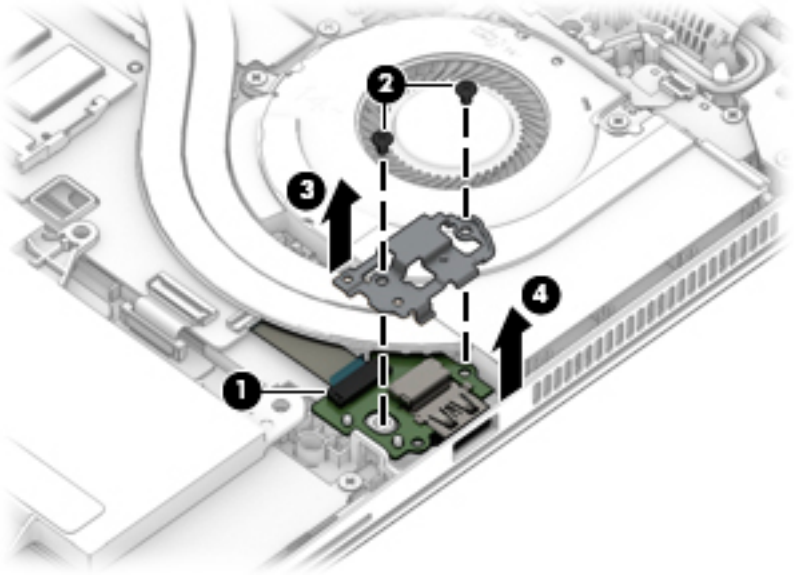
Description	Spare part number
USB board (includes bracket)	L14380-001

Before removing the USB 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. Disconnect the battery cable from the system board (see Battery on page 45).

Remove the USB board:

1. Disconnect the cable from the USB board **(1)**.
2. Remove the two Phillips M2.0×3.0 screws **(2)** that secure the board to the computer.
3. Lift the bracket from atop the board **(3)**.
4. Remove the board from the computer **(4)**.



Reverse this procedure to install the USB board.

RJ-45 board with bracket

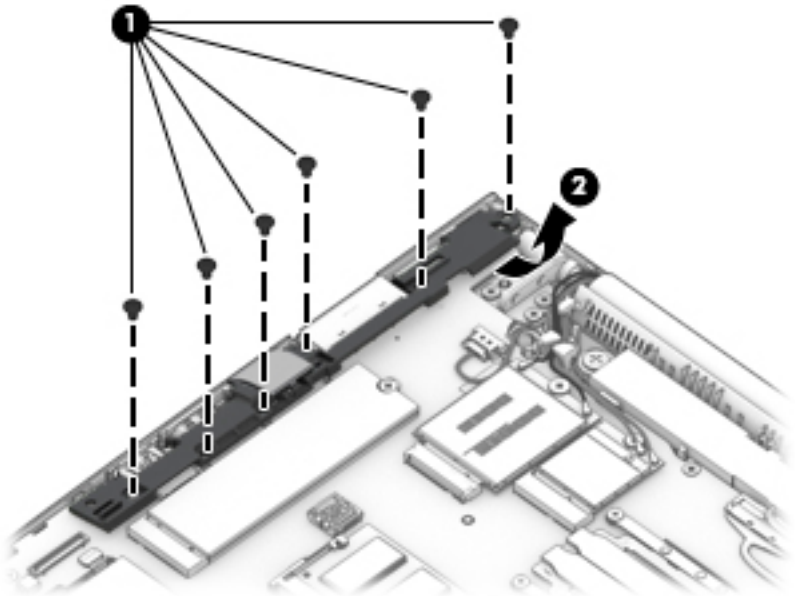
Description	Spare part number
RJ-45 board with bracket	not spared

Before removing the RJ-45 board and bracket, 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. Disconnect the battery cable from the system board (see Battery on page 45).

Remove the RJ-45 board and bracket:

1. Remove the six Phillips M2.5×5.0 screws **(1)** that secure the assembly to the computer.
2. Rotate the assembly out of the computer **(2)**.



Reverse this procedure to install the RJ-45 assembly.

Power button board

Description	Spare part number
Power button board assembly	L14374-001

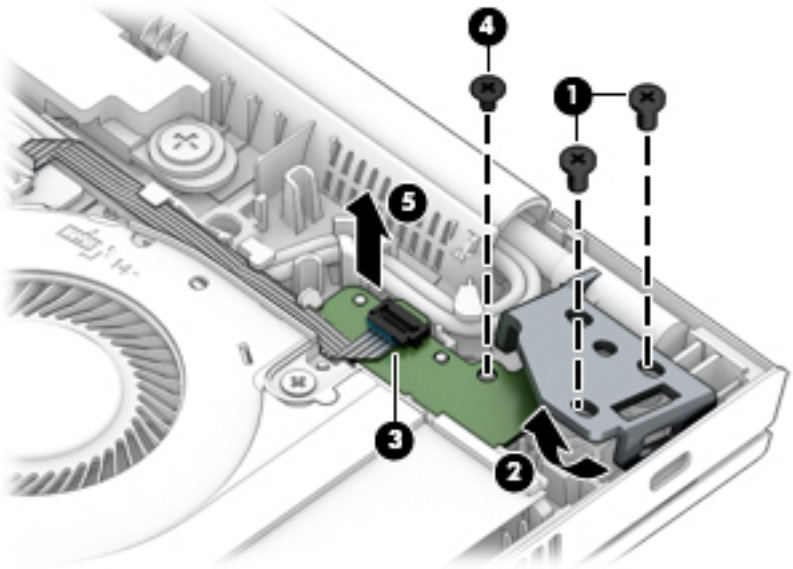
Before removing the power button board, follow these steps:

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. Disconnect the battery cable from the system board (see Battery on page 45).

Remove the power button board:

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.

1. Remove the two Phillips M2.5×5.0 screws **(1)** that secure the right display hinge, and then rotate the hinge upward from atop the power button board **(2)**.
2. Disconnect the cable from the power button board **(3)**.
3. Remove the Phillips M2.0×3.0 screw **(4)** that secures the power button board to the computer.
4. Remove the power button board from the computer **(5)**.



Reverse this procedure to install the power button board.

Speaker assembly

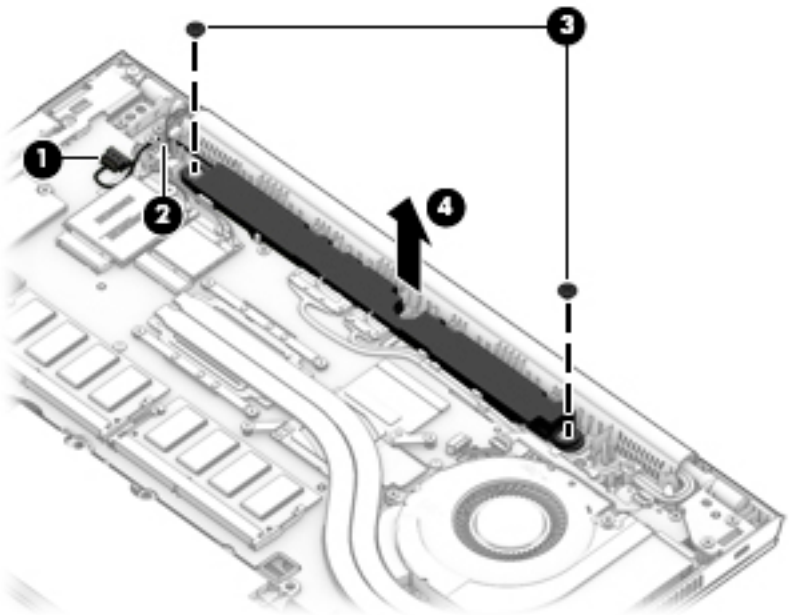
Description	Spare part number
Speaker assembly (includes cable)	L13684-001

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. Disconnect the battery cable from the system board (see Battery on page 45).

Remove the speaker assembly:

1. Disconnect the speaker cable from the system board **(1)**, and then remove the cable from the clip **(2)**.
2. Remove the two Phillips M2.0×2.5 screws **(3)** that secure the speaker to the computer.
3. Remove the speaker from the computer **(4)**.



Reverse this procedure to install the speaker.

Fingerprint reader assembly

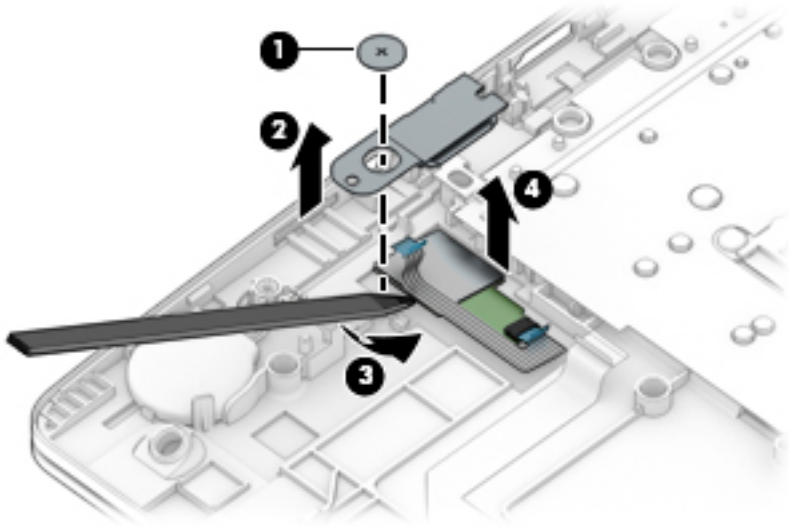
Description	Spare part number
Fingerprint reader assembly, touch (includes cable)	L13681-001
Fingerprint reader assembly, FIPS (includes cable)	L28401-001

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 45).

Remove the fingerprint reader assembly:

1. Remove the Phillips M2.0×3.0 screw **(1)** that secures the fingerprint reader bracket to the computer.
2. Lift the bracket from atop the fingerprint reader assembly **(2)**.
3. Use a tool to pry the fingerprint reader board free from the computer **(3)**, and then remove the assembly from the computer **(4)**.



Reverse this procedure to install the fingerprint reader assembly.

TouchPad

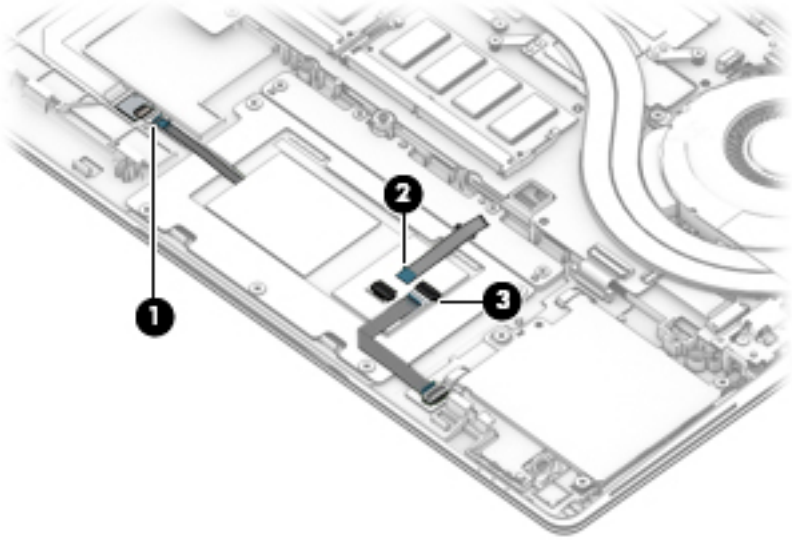
Description	Spare part number
TouchPad for use in models with RFID	L29199-001
TouchPad for use in models with an NFC module	L29201-001

Before removing the TouchPad, 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 45).

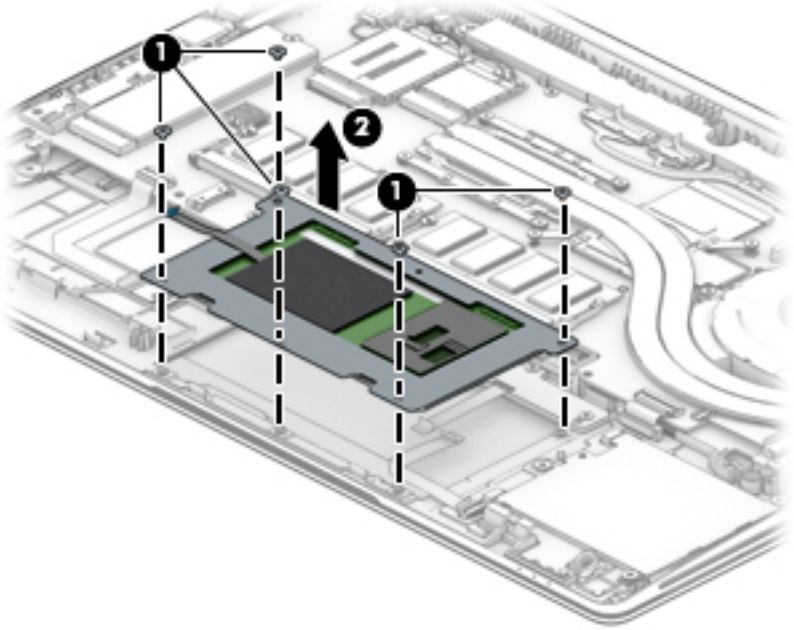
Remove the TouchPad:

1. Disconnect the NFC module cable from the ZIF connector on the NFC module **(1)**.
2. Disconnect the TouchPad button board cable from the ZIF connector on the TouchPad **(2)**.
3. Disconnect the card reader cable from the ZIF connector on the TouchPad **(3)**.



4. Remove the five Phillips M2.0x2.5 screws **(1)** that secure the TouchPad to the computer.

5. Remove the TouchPad from the computer **(2)**.



Reverse this procedure to install the TouchPad.

TouchPad button board

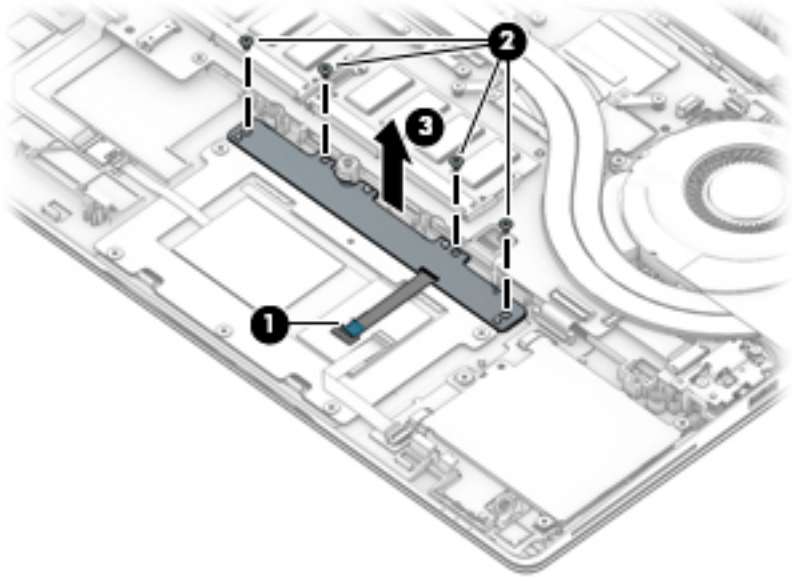
Description	Spare part number
TouchPad button board	not spared

Before removing the TouchPad 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 45).

Remove the TouchPad button board:

1. Disconnect the TouchPad button board cable from the ZIF connector on the TouchPad **(1)**.
2. Remove the four Phillips M2.0x3.0 screws **(2)** that secure the board to the computer, and then remove the TouchPad button board from the computer **(3)**.



Reverse this procedure to install the TouchPad button board.

NFC module

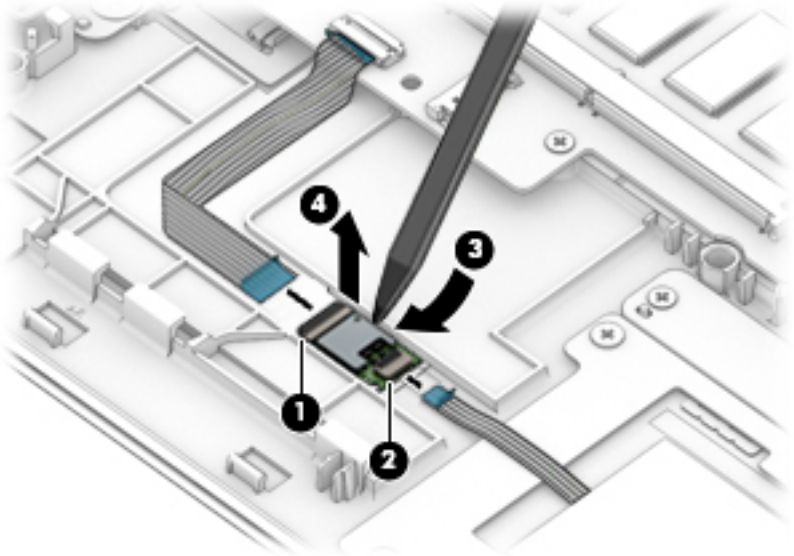
Description	Spare part number
NFC module (includes antenna and TouchPad foam)	not spared

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 45).

Remove the NFC module:

1. Disconnect the system board cable **(1)** and the NFC antenna **(2)** from the ZIF connectors on the NFC module.
2. Use a tool to release the NFC module from the adhesive securing it to the computer **(3)**, and then remove the module from the computer **(4)**.



Reverse the removal procedures to install the NFC module.

Smart card reader

Description	Spare part number
Smart card reader	L18312-001
Smart card reader cable (available in Cable Kit)	L14370-001 (Cable Kit)

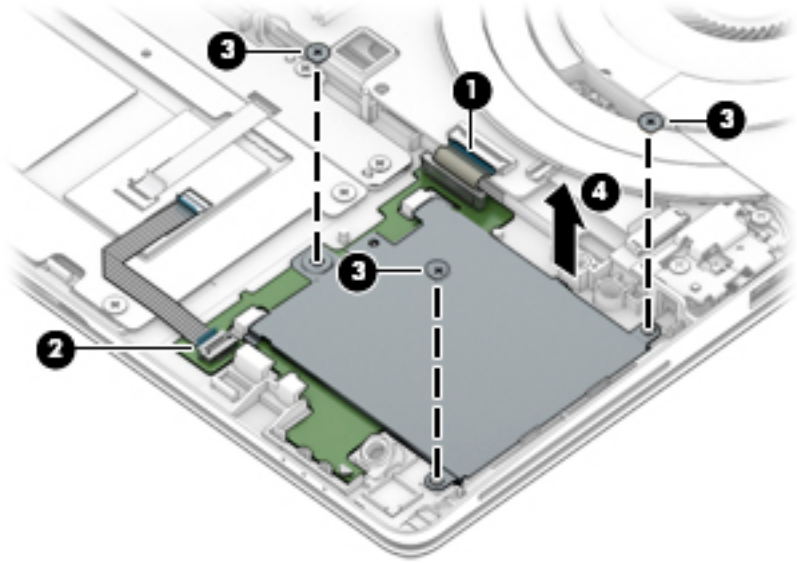
Before removing the card reader, follow these steps:

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 45).

Remove the smart card reader:

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

1. Disconnect the system board cable from the connector on the smart card reader board **(1)**.
2. Disconnect the TouchPad cable from the ZIF connector on the smart card reader board **(2)**.
3. Remove the three Phillips M2.0x2.5 screws **(3)** that secure the smart card reader to the computer.
4. Remove the smart card reader from the computer **(4)**.



Reverse this procedure to install the smart card reader.

Fan

Description	Spare part number
Fan	L22306-001

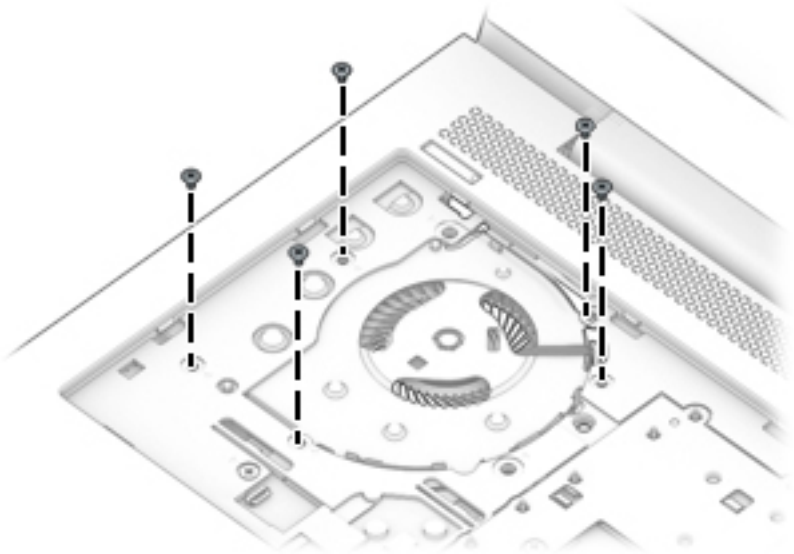
Before removing the fan, follow these steps:

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 45).
6. Remove the keyboard (see Keyboard on page 41).

Remove the fan:

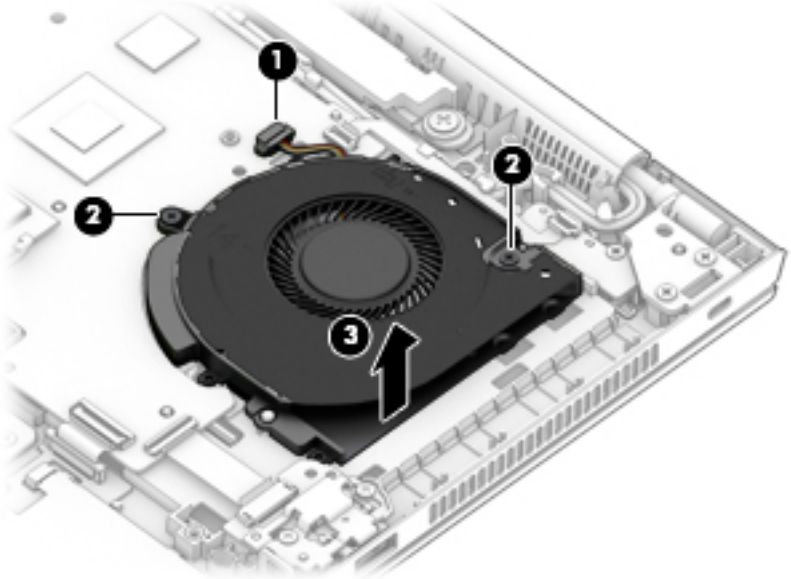
NOTE: To remove the fan you must remove screws from both the top (under the keyboard) and bottom of the computer.

1. Position the computer upright and open as far as possible.
2. Remove the five Phillips M2.0×3.0 screws that secure the fan to the computer.



3. Close the computer and position it upside down.
4. Disconnect the fan cable from the system board **(1)**.
5. Loosen the two captive Phillips screws **(2)** that secure the fan to the computer.

6. Remove the fan from the computer **(3)**.



Reverse this procedure to install the fan.

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 for use in models with discrete graphics memory (includes integrated processor)	
Intel i7-8650U processor	L15521-xx1
Intel i7-8550U processor	L15519-xx1
Intel i5-8350U processor	L15517-xx1
Intel i5-8250U processor	L15515-xx1
Intel i5-7200U processor	L15513-xx1
System board for use in models with UMA graphics memory	
Intel i7-8650U processor	L15522-001
Intel i7-8550U processor	L15520-001
Intel i5-8350U processor	L15518-001
Intel i5-8250U processor	L15516-001
Intel i5-7300U processor	L15523-001
Intel i5-7200U processor	L15514-001

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 45).
6. Remove the keyboard (see Keyboard on page 41).
7. Remove the RJ-45 board and bracket (see RJ-45 board with bracket on page 52).
8. Remove the fan (see Fan on page 61).

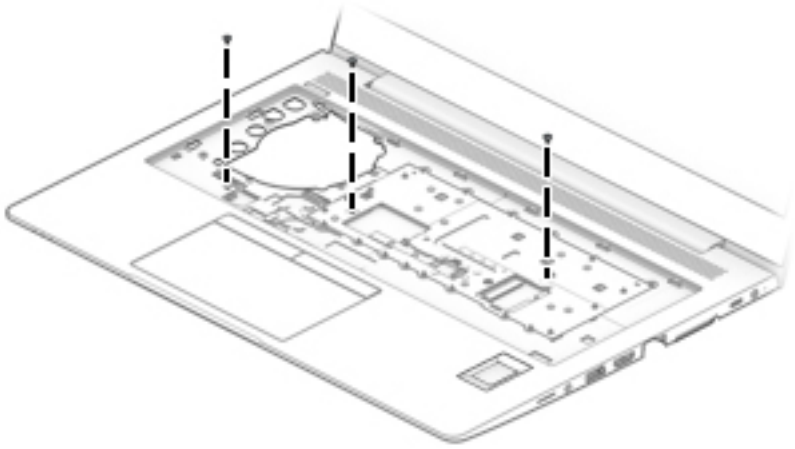
When replacing the system board, be sure to remove the following components (as applicable) from the defective system board and install on the replacement system board:

- Solid-state drive (see Solid-state drive (SSD) on page 34)
- Memory modules (see Memory modules on page 35)

- WLAN/Bluetooth module (see WLAN/Bluetooth combo card on page 37)
- WWAN module (see WWAN module on page 39)
- Heat sink (see Heat sink assembly on page 47)

Remove the system board:

1. Position the computer upright and open as far as possible.
2. Remove the three Phillips M2.5×3.0 screws that secure the system board to the computer.



3. Close the computer and position it upside down.

4. Disconnect the following cables from the system board:

   (1) RTC battery cable

   (2) Fingerprint reader cable

   (3) NFC module cable

   (4) Speaker cable

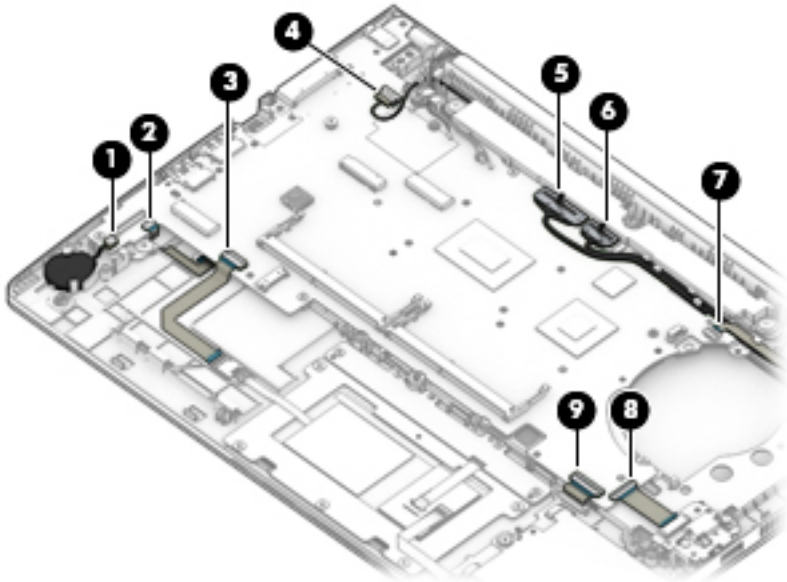
   (5) Display cable

   (6) Camera cable

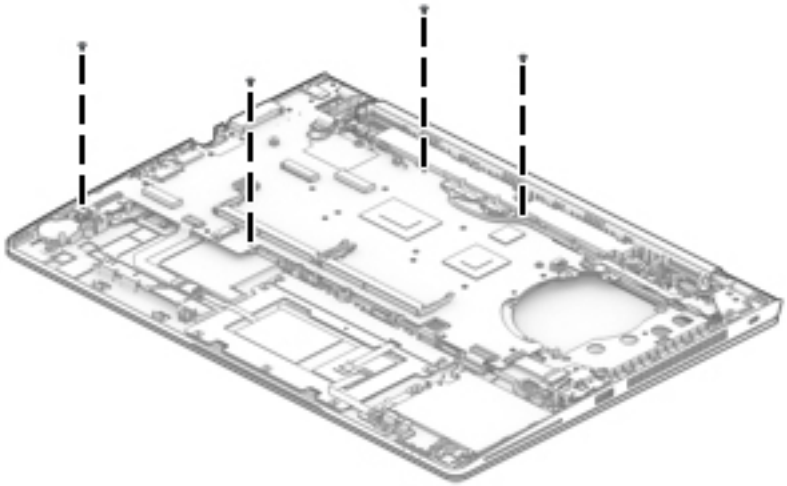
   (7) Power button board cable

   (8) USB cable

   (9) Smart card reader cable

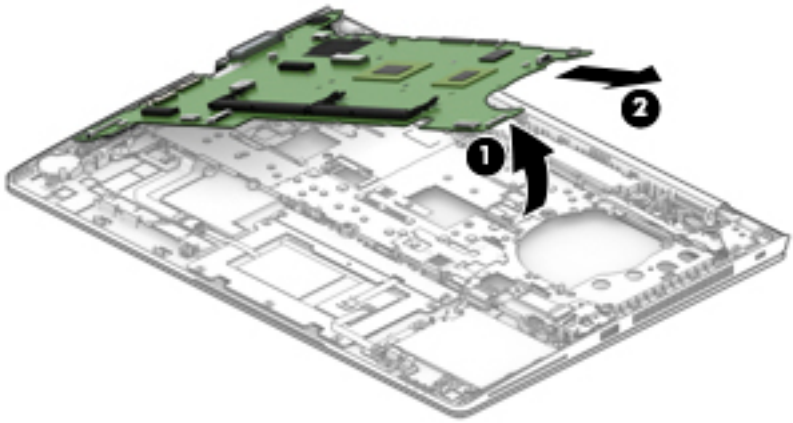


5. Remove the four Phillips M2.5×3.0 screws that secure the system board to the computer.



6. Lift the right side of the system board up at an angle **(1)**.

7. Pull the system board up and toward the right to disengage the connectors from the left side of the computer, and then remove the system board **(2)**.



Reverse this procedure to install the system board.

Display assembly

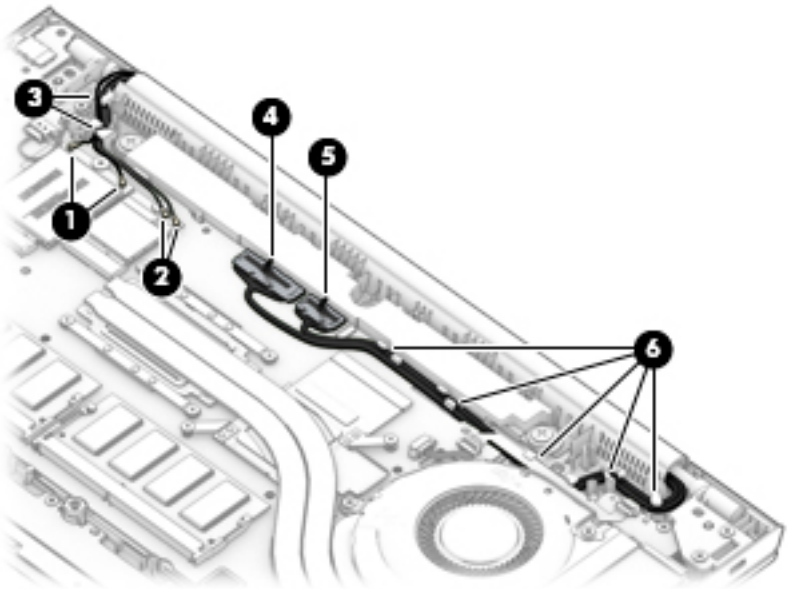
NOTE: Display assemblies are spared at the subcomponent level only. Display assembly spare part information is also available at Display assembly subcomponents on page 24.

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. Disconnect the battery cable from the system board (see Battery on page 45).

Remove the display assembly:

1. Disconnect the antenna cables from the WWAN module **(1)** and the WLAN module **(2)**.
2. Remove the antenna cables from the clips built into the computer **(3)**.
3. Disconnect the display cable **(4)** and the camera cable **(5)** from the system board.
4. Remove the cables from the clips built into the computer **(6)**.

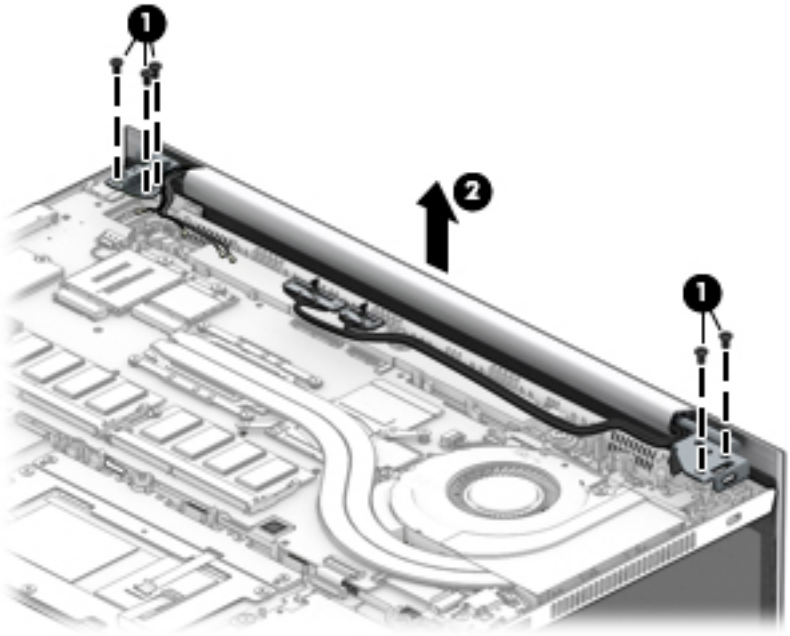


5. With the computer upside down, open the display, and then place the computer on a table with the display positioned off the edge of the table.
6. Remove the five Phillips M2.5×5.0 screws **(1)** from the display hinges.

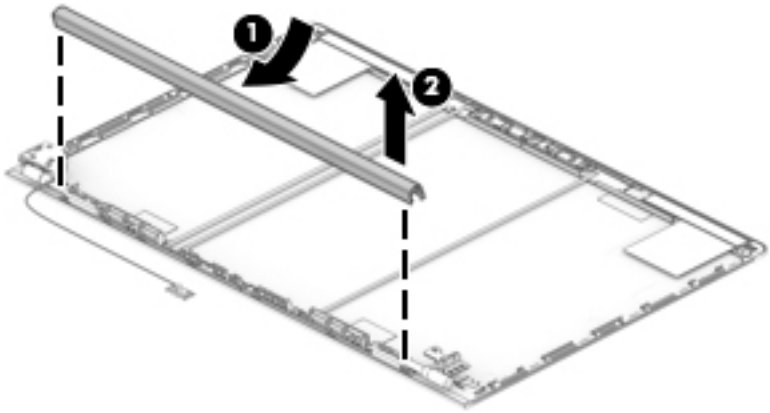
7. Lift the display assembly straight up and remove it **(2)**.

⚠ **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.

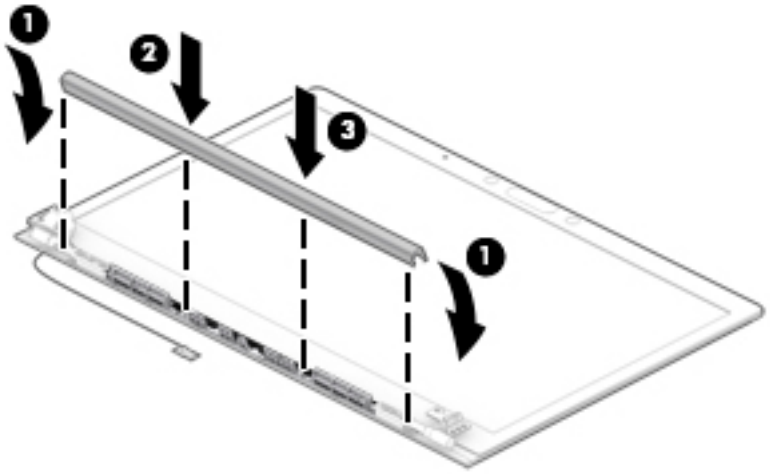


8. To remove the display hinge cover, rotate top of hinge cover away from display enclosure to disengage the tabs **(1)**, and then pull the cover off the enclosure **(2)**.



The display hinge cover is available in the Hinge Kit using spare part number L29200-001.

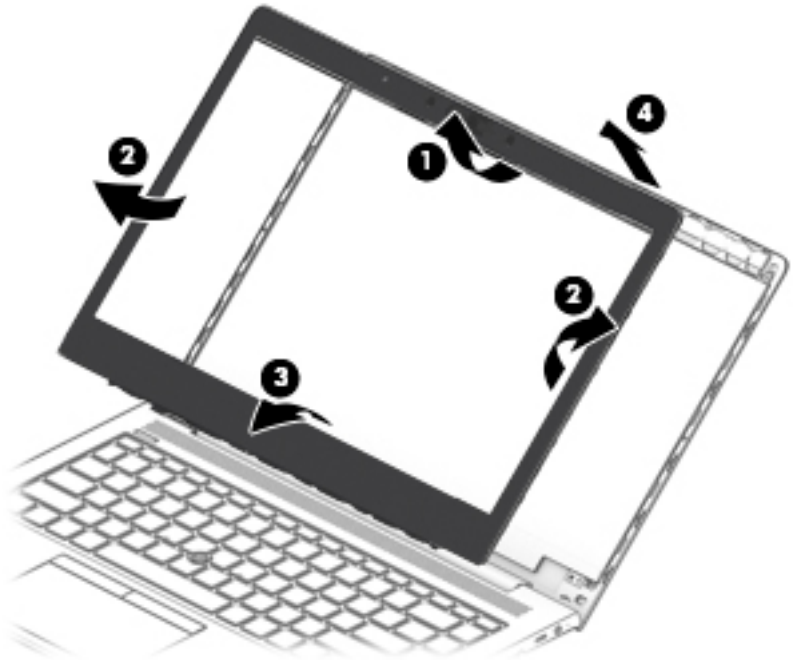
When installing the hinge cover, make sure all cables are routed correctly under the hinge cover and the hooks on the end of the cover are aligned correctly with the snaps on the bottom of the display **(1)**. Press the left **(2)**, and then right **(3)** middle sections of the hinge cover until it snaps into place.



9. 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.

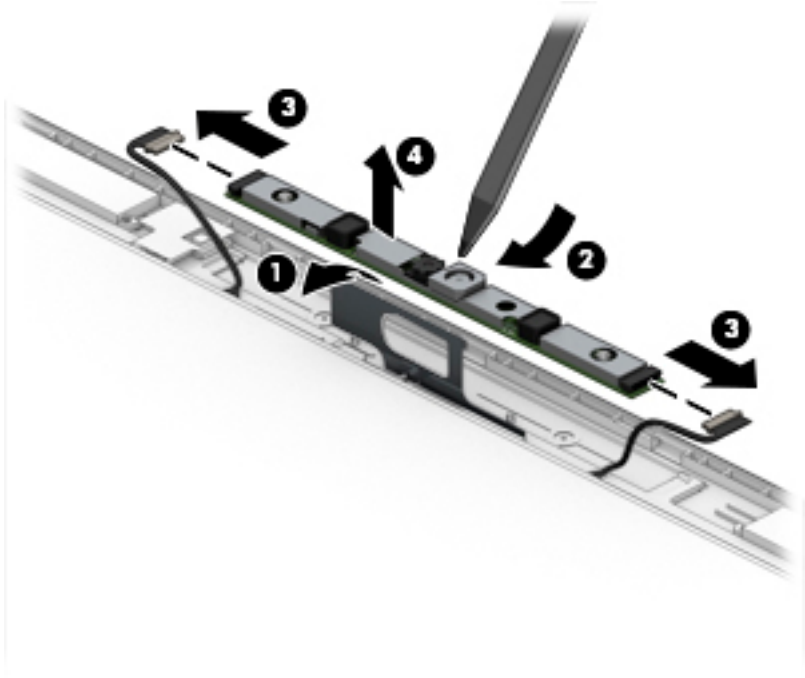
10. Remove the display bezel **(4)**.

    The display bezel is available using spare part number L28402-001.



11. If it is necessary to replace the camera module:

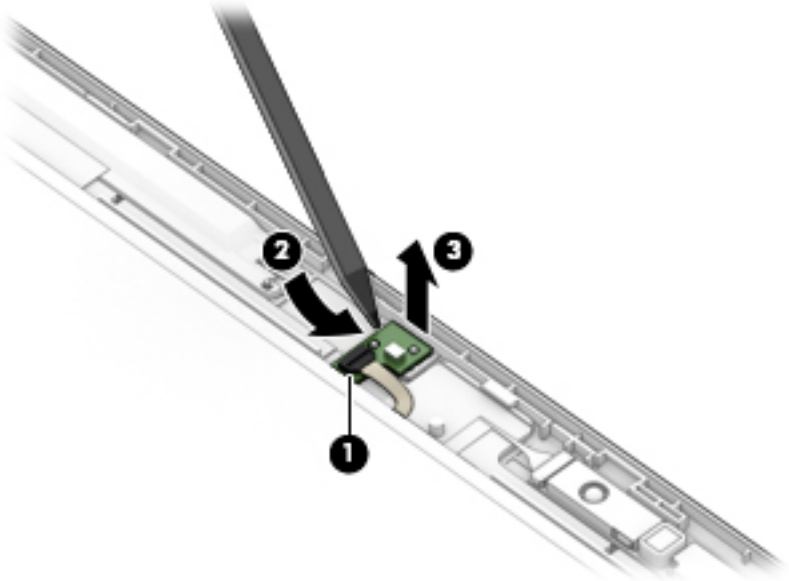
    ▲ Remove the tape from atop the module **(1)**, lift upward to disengage the module from the adhesive on the display enclosure **(2)**, disconnect the cables from the left and right sides of the module **(3)**, and then remove the camera module from the display **(4)**.



The IR camera module is available using spare part number L15509-001. The microphone module is available using spare part number L15512-001.

12. If it is necessary to remove the ambient light sensor board, disconnect the cable from the board **(1)**, lift upward to disengage the board from the adhesive on the display enclosure **(2)**, and then remove the board from the display **(3)**.

    The ambient light sensor board is available using spare part number L15511-001.



13. If it is necessary to remove the display panel from the enclosure, use a flat, non-marking tool to lift up the top left corner of the panel **(1)**. Lift the top **(2)**, left and right sides **(3)**, and then remove the panel from the enclosure **(4)**.

    The touch control board, cable, and display panel are available in the Touch Panel Kit using spare part number L30424-001.

14. If it is necessary to remove the touch board:.

a. Rotate the touch control board upside down **(1)**.

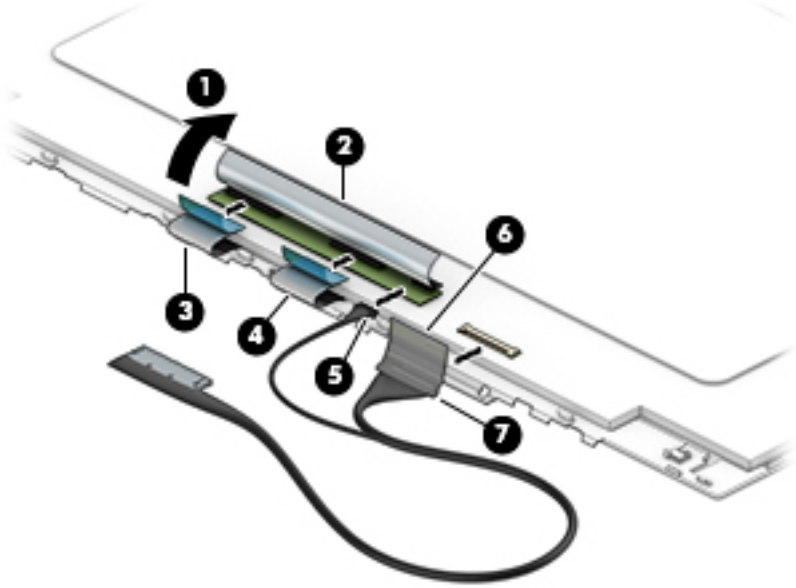
b. Lift the Mylar from on top of the connectors on the touch control board **(2)**.

c. Disconnect the two ribbon cables **(3)(4)** from the board.

d. Disconnect the touch cable **(5)**.

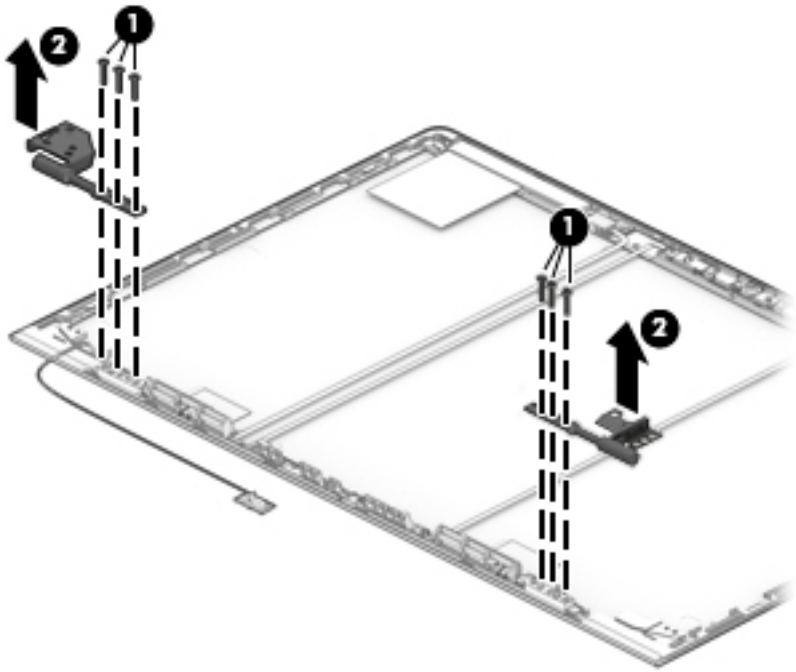
e. Lift the Mylar on the display panel cable **(6)**, and then disconnect the cable from the panel **(7)**.

The touch control board, cable, and display panel are available in the Touch Panel Kit using spare part number L30424-001.



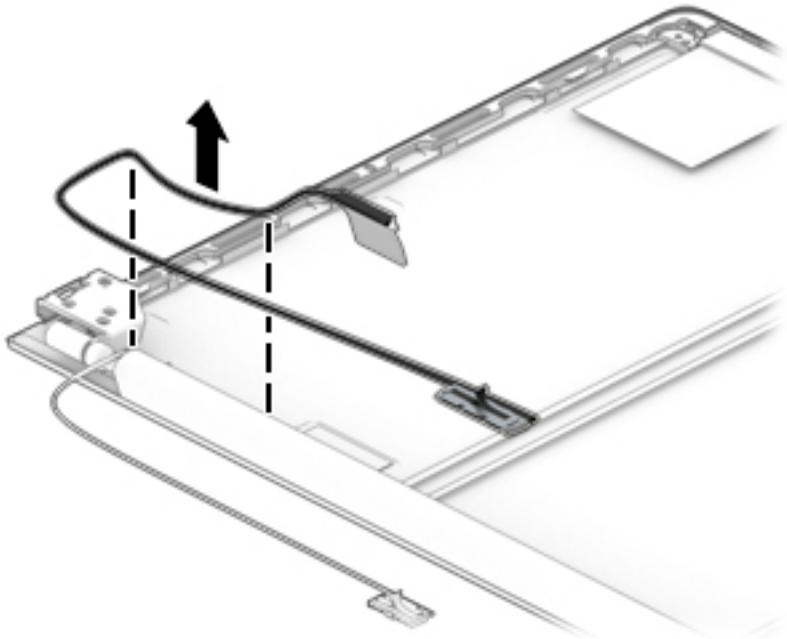
15. If it is necessary to replace the display hinges, remove the three Phillips M2.5x11.0 screws that secure each hinge **(1)**, and then remove the hinges from the display enclosure **(2)**.

    Display hinges are available in the Hinge Kit using spare part number L29200-001.



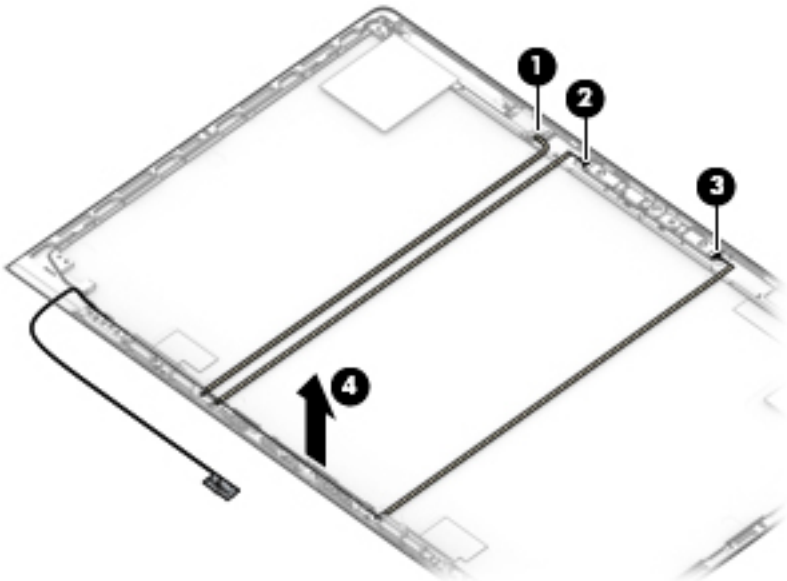
16. If it is necessary to replace the display cable, lift the cable from the routing path in the display enclosure.

    The display cable is available in the Cable Kit, using spare part number L14370-001.



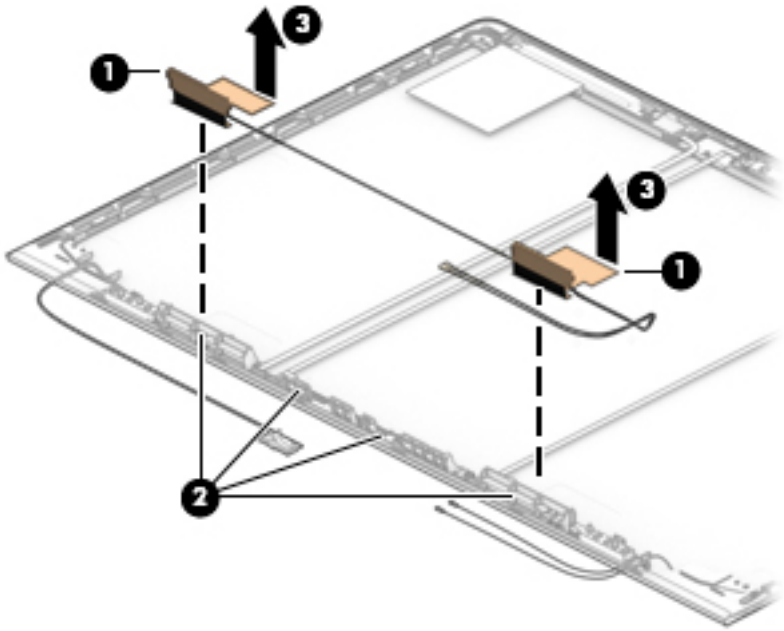
17. If it is necessary to replace the camera/ambient light sensor cable, disconnect the cable from the ambient light sensor board **(1)**, from the left **(2)** and right **(3)** sides of the IR camera, and then remove the cable from the display enclosure **(4)**.

    The camera cable is available in the Cable Kit using spare part number L14370-001.



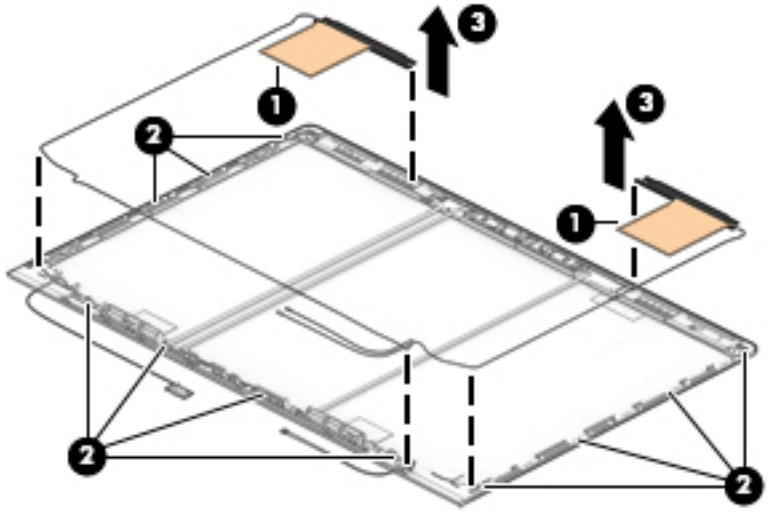
18. If it is necessary to replace the WLAN antenna cables, peel the antennas from the top of the display enclosure **(1)**, remove the antenna cables from the routing path on the bottom of the display enclosure **(2)**, and then remove the antenna cables **(3)**.

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



19. If it is necessary to replace the WWAN antenna cables, peel the antennas from the top of the display enclosure **(1)**, remove the antenna cables from the bottom and 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 L28403-001.

Reverse this procedure to reassemble and install the display assembly.

Top cover

Description	Spare part number
Top cover, non-FIPS	L28398-001
Top cover, FIPS	L28399-001

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

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

Using a USB keyboard or USB mouse to start Computer Setup (BIOS)

You can start Computer Setup by using a keyboard or mouse connected to a USB port, but you must first disable FastBoot.

1. Turn on or restart the computer, and when the HP logo appears, press f9 to enter the Boot Device Options menu.
2. Clear the check box for **Fast Boot**.
3. 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.

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 79.
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 79.
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 81.

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 displayed on the screen after the download is complete. If no instructions are displayed, 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, press enter, and then follow the on-screen instructions.

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 79.
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

Using HP PC Hardware Diagnostics Windows

HP PC Hardware Diagnostics Windows is a Windows-based utility that allows you to run diagnostic tests to determine whether the computer hardware is functioning properly. The tool runs within the Windows operating system in order to diagnose hardware failures.

If HP PC Hardware Diagnostics Windows is not installed on your computer, first you must download and install it. To download HP PC Hardware Diagnostics Windows, see Downloading HP PC Hardware Diagnostics Windows on page 83.

After HP PC Hardware Diagnostics Windows is installed, follow these steps to access it from HP Help and Support or HP Support Assistant.

1. To access HP PC Hardware Diagnostics Windows from HP Help and Support:

   a. Select the **Start** button, and then select **HP Help and Support**.

   b. Right-click **HP PC Hardware Diagnostics Windows**, select **More**, and then select **Run as administrator**.

   – or –

   To access HP PC Hardware Diagnostics Windows from HP Support Assistant:

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

      – or –

      Select the question mark icon in the taskbar.

   b. Select **Troubleshooting and fixes**.

   c. Select **Diagnostics**, and then select **HP PC Hardware Diagnostics Windows**.

2. When the 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 at any time, select **Cancel**.

3. When HP PC Hardware Diagnostics Windows detects a failure that requires hardware replacement, a 24-digit Failure ID code is generated. For assistance in correcting the problem, contact support, and then provide the Failure ID code.

Downloading HP PC Hardware Diagnostics Windows

- The HP PC Hardware Diagnostics Windows download instructions are provided in English only.
- You must use a Windows computer to download this tool because only .exe files are provided.

Downloading the latest HP PC Hardware Diagnostics Windows version

To download HP PC Hardware Diagnostics Windows, follow these steps:

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 **Download**, and then select the installation location:

   To run the tool on your computer, download it to the computer desktop.

   – or –

   To run the tool from a USB flash drive, download it to a USB flash drive.
3. Select **Run**.

Downloading HP Hardware Diagnostics Windows by product name or number (select products only)

NOTE: For some products, it may be necessary to download the software to a USB flash drive by using the product name or number.

To download HP PC Hardware Diagnostics Windows by product name or number (select products only), follow these steps:

1. Go to http://www.hp.com/support.
2. Select **Get software and drivers**, and then enter the product name or number.
3. In the **HP PC Hardware Diagnostics** section, select **Download**, and then select the installation location:

   To run the tool on your computer, download it to the computer desktop.

   – or –

   To run the tool from a USB flash drive, download it to a USB flash drive.
4. Select **Run**.

Installing HP PC Hardware Diagnostics Windows

To install HP PC Hardware Diagnostics Windows, follow these steps:

- Navigate to the folder on your computer or the flash drive where the .exe file was downloaded, double-click the .exe file, and then follow the on-screen instructions.

Using HP PC Hardware Diagnostics UEFI

HP PC Hardware Diagnostics UEFI (Unified Extensible Firmware Interface) 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.

If your PC will not boot into Windows, you can use HP PC Hardware Diagnostics UEFI to diagnose hardware issues.

When HP PC Hardware Diagnostics UEFI detects a failure that requires hardware replacement, a 24-digit Failure ID code is generated. For assistance in correcting the problem, contact support, and provide the Failure ID code.

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

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

Starting HP PC Hardware Diagnostics UEFI

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 flash drive

   NOTE: To download the HP PC Hardware Diagnostics UEFI tool to a USB flash drive, see Downloading the latest HP PC Hardware Diagnostics UEFI version on page 85.

   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.

Downloading HP PC Hardware Diagnostics UEFI to a USB flash drive

Downloading HP PC Hardware Diagnostics UEFI to a USB flash drive can be useful in the following situations:

- HP PC Hardware Diagnostics UEFI is not included in the preinstall image.
- HP PC Hardware Diagnostics UEFI is not included in the HP Tool partition.
- The hard drive is damaged.

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 provided.

Downloading the latest HP PC Hardware Diagnostics UEFI version

To download the latest HP PC Hardware Diagnostics UEFI version to a USB flash drive:

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 UEFI** section, select **Download UEFI Diagnostics**, and then select **Run**.

Downloading HP PC Hardware Diagnostics UEFI by product name or number (select products only)

NOTE: For some products, it may be necessary to download the software to a USB flash drive by using the product name or number.

To download HP PC Hardware Diagnostics UEFI by product name or number (select products only) to a USB flash drive:

1. Go to http://www.hp.com/support.
2. Enter the product name or number, select your computer, and then select your operating system.
3. In the **Diagnostics** section, follow the on-screen instructions to select and download the specific UEFI Diagnostics version for your computer.

Using Remote HP PC Hardware Diagnostics UEFI settings (select products only)

Remote HP PC Hardware Diagnostics UEFI is a firmware (BIOS) feature that downloads HP PC Hardware Diagnostics UEFI to your computer. It can then execute the diagnostics on your computer, and it may upload results to a preconfigured server. For more information on Remote HP PC Hardware Diagnostics UEFI, go to http://www.hp.com/go/techcenter/pcdiags, and then select **Find out more**.

Downloading Remote HP PC Hardware Diagnostics UEFI

NOTE: HP Remote PC Hardware Diagnostics UEFI is also available as a Softpaq that can be downloaded to a server.

Downloading the latest Remote HP PC Hardware Diagnostics UEFI version

To download the latest Remote HP PC Hardware Diagnostics UEFI version, follow these steps:

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 UEFI** section, select **Download Remote Diagnostics**, and then select **Run**.

Downloading Remote HP PC Hardware Diagnostics UEFI by product name or number

NOTE: For some products, it may be necessary to download the software by using the product name or number.

To download HP Remote PC Hardware Diagnostics UEFI by product name or number, follow these steps:

1. Go to http://www.hp.com/support.
2. Select **Get software and drivers**, enter the product name or number, select your computer, and then select your operating system.
3. In the **Diagnostics** section, follow the on-screen instructions to select and download the **Remote UEFI** version for the product.

Customizing Remote HP PC Hardware Diagnostics UEFI settings

Using the Remote HP PC Hardware Diagnostics setting in Computer Setup (BIOS), you can perform the following customizations:

- Set a schedule for running diagnostics unattended. You can also start diagnostics immediately in interactive mode by selecting **Execute Remote HP PC Hardware Diagnostics**.
- Set the location for downloading the diagnostic tools. This feature provides access to the tools from the HP website or from a server that has been preconfigured for use. Your computer does not require the traditional local storage (such as a disk drive or USB flash drive) to run remote diagnostics.
- Set a location for storing the test results. You can also set the user name and password settings used for uploads.
- Display status information about the diagnostics run previously.

To customize Remote HP PC Hardware Diagnostics UEFI settings, follow these steps:

1. Turn on or restart the computer, and when the HP logo appears, press f10 to enter Computer Setup.
2. Select **Advanced**, and then select **Settings**.

3. Make your customization selections.
4. Select **Main**, and then **Save Changes and Exit** to save your settings.

Your changes take effect when the computer restarts.

10 Backing up, restoring, and recovering

This chapter provides information about the following processes, which are standard procedure for most products:

- **Backing up your personal information**—You can use Windows tools to back up your personal information (see Using Windows tools on page 88).
- **Creating a restore point**—You can use Windows tools to create a restore point (see Using Windows tools on page 88).
- **Creating recovery media** (select products only)—You can use HP Recovery Manager or HP Cloud Recovery Download Tool (select products only) to create recovery media (see Creating HP Recovery media (select products only) on page 88).
- **Restoring and recovery**—Windows offers several options for restoring from backup, refreshing the computer, and resetting the computer to its original state (see Using Windows tools on page 88).
- **Removing the Recovery Partition**—To remove the Recovery partition to reclaim hard drive space (select products only), select the **Remove Recovery Partition** option of HP Recovery Manager. For more information, see Removing the HP Recovery partition (select products only) on page 92.

Using Windows tools

IMPORTANT: Windows is the only option that allows you to back up your personal information. Schedule regular backups to avoid information loss.

You can use Windows tools to back up personal information and create system restore points and recovery media, allowing you to restore from backup, refresh the computer, and reset the computer to its original state.

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

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

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

NOTE: You must be connected to the Internet to access the Get Help app.

Creating HP Recovery media (select products only)

After you have successfully set up the computer, use HP Recovery Manager to create a backup of the HP Recovery partition on the computer. This backup is called HP Recovery media. In cases where the hard drive is corrupted or has been replaced, the HP Recovery media can be used to reinstall the original operating system.

To check for the presence of the Recovery partition in addition to the Windows partition, right-click the **Start** button, select **File Explorer**, and then select **This PC**.

NOTE: If your computer does not list the Recovery partition in addition to the Windows partition, contact support to obtain recovery discs. Go to http://www.hp.com/support, select your country or region, and then follow the on-screen instructions.

On select products, you can use the HP Cloud Recovery Download Tool to create HP Recovery media on a bootable USB flash drive. For more information, see Using the HP Cloud Recovery Download Tool to create recovery media on page 90.

Using HP Recovery Manager to create recovery media

NOTE: If you cannot create recovery media yourself, contact support to obtain recovery discs. Go to http://www.hp.com/support, select your country or region, and then follow the on-screen instructions.

Before you begin

Before you begin, note the following:

- 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 media storage capacity.
- To create recovery media, use one of the following options:

NOTE: If the computer does not have a recovery partition, HP Recovery Manager displays the Windows Create a Recovery Drive feature. Follow the on-screen instructions to create a recovery image on a blank USB flash drive or hard drive.

  - If your computer has an optical drive with DVD writer capability, be sure to 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, which are not compatible with HP Recovery Manager software.
  - If your computer does not include an integrated optical drive with DVD writer capability, you can use an external optical drive (purchased separately) to create recovery discs, as described above. If an external optical drive is used, you must connect it directly to a USB port on the computer. It cannot be connected to a USB port on an external device, such as a USB hub.
  - To create a recovery flash drive, use a high-quality blank USB flash drive.
- 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 this process.
- If necessary, you can exit the program before you have finished creating all of the recovery media. HP Recovery Manager will finish the current DVD or flash drive. The next time you start HP Recovery Manager, you will be prompted to continue.

Creating the recovery media

To create HP Recovery media using HP Recovery Manager:

IMPORTANT: For a tablet with a detachable keyboard, connect the tablet to the keyboard base 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 need to recover the system, see Recovering using HP Recovery Manager on page 90.

Using the HP Cloud Recovery Download Tool to create recovery media

To create HP Recovery media using the HP Cloud Recovery Download Tool:

1. Go to http://www.hp.com/support.
2. Select **Software and Drivers**, and then follow the on-screen instructions.

Restoring and recovery

Restoring and recovery can be performed using one or more of the following options: Windows tools, HP Recovery Manager, or the HP Recovery partition.

IMPORTANT: Not all methods are available on all products.

Restoring, resetting, and refreshing using Windows tools

Windows offers several options for restoring, resetting, and refreshing the computer. For details, see Using Windows tools on page 88.

Restoring using HP Recovery Manager and the HP Recovery partition

You can use HP Recovery Manager and the HP Recovery partition (select products only) to restore the computer to the original factory state:

- **Resolving problems with preinstalled applications or drivers**—To correct a problem with a preinstalled application or driver:
  1. Type `recovery` in the taskbar search box, and then select **HP Recovery Manager**.
  2. Select **Reinstall drivers and/or applications**, and then follow the on-screen instructions.
- **Using System Recovery**—To recover the Windows partition to original factory content, select 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 90. If you have not already created recovery media, see Creating HP Recovery media (select products only) on page 88.
- **Using Factory Reset** (select products only)—Restores the computer to its original factory state by deleting all information from the hard drive and recreating the partitions and then reinstalling the operating system and the software that was installed at the factory (select products only). To use the **Factory Reset** option, you must use HP Recovery media. If you have not already created recovery media, see Creating HP Recovery media (select products only) on page 88.

NOTE: If you have replaced the hard drive in the computer, you can use the Factory Reset option to install the operating system and the software that was installed at the factory.

Recovering using HP Recovery Manager

You can use HP Recovery Manager software 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 HP Recovery media, see Creating HP Recovery media (select products only) on page 88.

IMPORTANT: HP Recovery Manager does not automatically provide backups of your personal data. Before beginning recovery, back up any personal data that you want to retain. See Using Windows tools on page 88.

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

NOTE: When you start the recovery process, only the options available for your computer are displayed.

Before you begin, note the following:

- 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.
- If the computer hard drive fails, HP Recovery media must be used. This media is created using HP Recovery Manager. See Creating HP Recovery media (select products only) on page 88.
- If your computer does not allow the creation of HP Recovery media or if the HP Recovery media does not work, contact support to obtain recovery media. Go to http://www.hp.com/support, select your country or region, and then follow the on-screen instructions.

Recovering using the HP Recovery partition (select products only)

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

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

To start HP Recovery Manager from the HP Recovery partition:

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

1. Type `recovery` in the taskbar search box, select **HP Recovery Manager**, and then select **Windows 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, quickly hold down the volume up button, and then select **f11**.
2. Select **Troubleshoot** from the boot options menu.
3. Select **Recovery Manager**, and then follow the on-screen instructions.

NOTE: If your computer does not automatically restart in HP Recovery Manager, change the computer boot order, and then follow the on-screen instructions. See Changing the computer boot order on page 92.

Recovering using HP Recovery media

If your computer does not have an HP Recovery partition or if the hard drive is not working properly, you can use HP Recovery media to recover the original operating system and software programs that were installed at the factory.

▲ Insert the HP Recovery media, and then restart the computer.

NOTE: If your computer does not automatically restart in HP Recovery Manager, change the computer boot order, and then follow the on-screen instructions. See Changing the computer boot order on page 92.

Changing the computer boot order

If your computer does not restart in HP Recovery Manager, you can change the computer boot order. This 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, depending on the location of your HP Recovery media.

To change the boot order:

IMPORTANT: For a tablet with a detachable keyboard, connect the tablet to the keyboard base 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, quickly hold down the volume up button, and then select **f9**.

   – or –

   Turn on or restart the tablet, quickly hold down the volume down button, and then select **f9**.
3. Select the optical drive or USB flash drive from which you want to boot, and then 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 (select products only) 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. Before removing the Recovery partition, create HP Recovery media. See Creating HP Recovery media (select products only) on page 88.

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	234.0 mm	9.22 in
Width	326.0 mm	12.84 in
Height	18.05 mm	0.72 in
Weight	1.63 kg	3.59 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	1920×1080	
Surface treatment	Chemically-strengthened Gorilla Glass 3	
Brightness	700 nits	
Viewing angle	UWVA	
Backlight	LED	
Aspect ratio	16:9	
Display panel interface	eDP+PSR	

M.2 SATA 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.

M.2 PCIe solid-state drive specifications

	256-GB*	512-GB*	1-TB*
Dimensions			
Height	1 mm	1 mm	1 mm
Length	50.8 mm	50.8 mm	50.8 mm
Width	28.9 mm	28.9 mm	28.9 mm
Weight	< 10 g	< 10 g	< 10 g
Interface type	ATA-7	ATA-7	ATA-7
Transfer rate			
Sequential Read	Up to 2150 MB/s	Up to 2150 MB/s	Up to 2150 MB/s
Random Read	Up to 300,000 IOPs	Up to 300,000 IOPs	Up to 300,000 IOPs
Sequential Write	Up to 1260 MB/s	Up to 1550 MB/s	Up to 1550 MB/s
Random Write	Up to 100,000 IOPs	Up to 100,000 IOPs	Up to 100,000 IOPs
Ready time, Maximum (to not busy)	1.0 s	1.0 s	1.0 s
Access times			
Logical	0.1	0.1	0.1
Total logical sectors	500,118,192	1,000,215,216	1,500,336,388
Operating temperature			
Operating	0° to 70°C (32°F to 158°F)	0° to 70°C (32°F to 158°F)	0° to 70°C (32°F to 158°F)
Non-operating	-40° to 80°C (-40°F to 176°F)	-40° to 85°C (-40°F to 185°F)	-40° to 85°C (-40°F to 185°F)

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

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 99.

   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 98, 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 104.	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.

Index

U

V

W