



Maintenance and Service Guide

HP EliteBook 850 G6 Notebook PC

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Product notice

This 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 or versions of Windows. Systems may require upgraded and/or separately purchased hardware, drivers, software or BIOS update to take full advantage of Windows functionality. Windows 10 is automatically updated, which is always enabled. ISP fees may apply and additional requirements may apply over time for updates. Go to <http://www.microsoft.com> for details.

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Important Notice about Customer Self-Repair Parts



IMPORTANT: Your computer includes Customer Self-Repair parts and parts that should be accessed only 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 applicable safety standards.

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1 Product description

Table 1-1 Product components and their descriptions

Category	Description
Product Name	HP EliteBook 850 G6 Notebook PC
Processors	<p>8th-generation Intel® Core™ quad-core processors</p> <p>Intel Core i7-8665U (1.9 GHz, turbo up to 4.8 GHz, 8 MB SmartCache, quad core, 15 W; Intel UHD Graphics 620)</p> <p>Intel Core i7-8565U (1.8 GHz, turbo up to 4.6 GHz, 8 MB SmartCache, quad core, 15 W; Intel UHD Graphics 620)</p> <p>Intel Core i5-8365U (1.6 GHz, turbo up to 4.1 GHz, 6 MB SmartCache, quad core, 15 W; Intel UHD Graphics 620)</p> <p>Intel Core i5-8265U (1.6 GHz, turbo up to 3.9 GHz, 6 MB SmartCache, quad core, 15 W; Intel UHD Graphics 620)</p>
Graphics	<p>Internal graphics</p> <p>Intel UHD Graphics 620</p> <p>External graphics</p> <p>AMD Radeon™ RX 550X, 2 GB of GPU memory</p> <p>Supports HD decode, DX12, HDMI 1.4b, HDCP 2.2 via DisplayPort™ up to 4K @ 60 Hz and via HDMI up to 4K @ 30 Hz</p> <p>Both unified memory architecture (UMA) and discrete configurations support three independent displays through docking stations as follows:</p> <ul style="list-style-type: none"> HP UltraSlim Docking Station - maximum resolution = 2.5K @ 60 Hz (DisplayPort 1) and 2.5K @ 60 Hz (DisplayPort 2) and FHD (VGA) HP Elite 90 W Thunderbolt™ 3 Dock - maximum resolution = 2.5K @ 60 Hz (DisplayPort 1) and 2.5K @ 60 Hz (DisplayPort 2) and FHD (VGA) or 4K @ 60 Hz (one DisplayPort) & 4K @ 60 Hz (USB Type-C output port using a Type C-to-DisplayPort adapter) HP Thunderbolt Dock 120 W G2 - maximum resolution = 2.5K @ 60 Hz (DisplayPort 1) and 2.5K @ 60 Hz (DisplayPort 2) and FHD (VGA) or 4K @ 60 Hz (one DisplayPort) & 4K @ 60 Hz (USB Type-C output port using a Type C-to-DisplayPort adapter)
Panel	<p>Supports privacy filter and narrow bezel</p> <p>39.6 cm (15.6 in.), UWVA, non-touch</p> <p>Full high-definition (FHD) (1920 × 1080), antiglare, 250 nits, 45% CG, eDP, slim, without camera</p> <p>FHD (1920 × 1080), antiglare, 250 nits, 45% CG, eDP, slim, with HD camera</p> <p>FHD (1920 × 1080), antiglare, 250 nits, 45% CG, eDP, slim, with HD + IR camera</p> <p>FHD (1920 × 1080), antiglare, 250 nits, 45% CG, eDP, slim, without camera, with WWAN</p> <p>FHD (1920 × 1080), antiglare, 250 nits, 45% CG, eDP, slim, with HD camera, with WWAN</p> <p>FHD (1920 × 1080), antiglare, 250 nits, 45% CG, eDP, slim, with HD + IR camera, with WWAN</p> <p>FHD (1920 × 1080), antiglare, 400 nits, 72% CG, eDP + PSR, slim, Ambient Light Sensor, with HD + IR camera</p> <p>FHD (1920 × 1080), antiglare, 400 nits, 72% CG, eDP + PSR, slim, Ambient Light Sensor, with HD + IR camera, with WWAN</p>

Table 1-1 Product components and their descriptions (continued)

Category	Description
	Ultra high definition (UHD) (3840 × 2160), antiglare, 400 nits, 72% CG, eDP + PSR, ultra slim, Ambient Light Sensor, with HD + IR camera, with WWAN
	39.6 cm (15.6 in.), UWVA, touch screen
	FHD (1920 × 1080), 250 nits, 45% CG, eDP, slim, with HD + IR camera, Touch-On Panel (TOP)
	FHD (1920 × 1080), 250 nits, 45% CG, eDP, slim, with HD + IR camera, with WWAN, TOP
Memory	Two memory module slots
	Memory is customer accessible/upgradeable
	DDR4-2400 dual channel support
	Supports up to 32 GB of system RAM in the following configurations:
	<ul style="list-style-type: none"> • 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)
	2 TB, PCIe, Gen 3 × 4, SS, NVMe, TLC
	1 TB, PCIe, Gen 3 × 4, SS, NVMe, TLC
	512 GB, PCIe, Gen 3 × 4, SS, NVMe, TLC, Opal 2
	512 GB, PCIe, Gen 3 × 4, SS, NVMe, TLC
	512 GB, SATA-3, SS, TLC, FIPS-140-2
	512 GB, PCIe, value
	512 GB QLC + 32 GB Optane™ Memory Module
	256 GB, PCIe, Gen 3 × 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) (13 mm × 38 mm × 4 mm)
	Webcam HD RGB 720p
	Webcam HD + IR RGB 720p
	Camera privacy cover

Table 1-1 Product components and their descriptions (continued)

Category	Description
	Supports WDR (Wide Dynamic Range)
	Support for models without camera
RJ-45 (network)	Intel Ethernet Connection I219-LM 10/100/1000 (vPro)
	Intel Ethernet Connection I219-V 10/100/1000 (non-vPro)
	S3/S4/S5 Wake-on-LAN
	The following support S3/S4/S5 wake on LAN/HBMA (via out of band): HP Elite USB-C Dock G4, HP USB-C Universal Dock, HP Thunderbolt Dock 120 W G2, and HP USB-C Mini Dock.
	The following support S0/S3/S4/S5 MAPT (via out of band): HP Elite USB-C Dock G4, HP USB-C Universal Dock, HP Thunderbolt Dock 120 W G2, and HP USB-C Mini Dock.
Wireless networking	WPAN Bluetooth®
	Bluetooth 5.0 and Bluetooth 4.2 wireless personal area network (PAN) supported by combo card
	Wireless local area network (WLAN)
	Integrated WLAN options with dual antennas (M.2 2230 socket MIPI/BRI):
	<ul style="list-style-type: none"> Intel Wireless-AC 9560 802.11ac 2 × 2 Wi-Fi + Bluetooth 5 (vPro) Intel Wireless-AC 9560 802.11ac 2 × 2 Wi-Fi + Bluetooth 5 (non-vPro)
	Integrated WLAN options with dual antennas (M.2 2230 socket PCIe/USB):
	<ul style="list-style-type: none"> Intel Wi-Fi 6 AX200 + Bluetooth 5 (802.11ax 2 × 2 vPro, supporting gigabit transfer speeds) Intel Wi-Fi 6 AX200 + Bluetooth 5 (802.11ax 2 × 2 non-vPro, supporting gigabit transfer speeds)
	Two WLAN antennas built into bottom of display assembly
	Support for models without WLAN
	Compatible with Wi-Fi CERTIFIED Miracast™-certified devices
	Supports HP Connection Optimizer
	Support S3/S4 wake on Wireless LAN
	Supports HP LAN-Wireless Protection (WLAN/LAN/WWAN switching)
	Support Staticv BIOS SAR
	Support Turbo Lite Wi-Fi
	Near-Field Communication (NFC)
	NXP NPC300 Near Field Communication Module (NXP NPC300 I2C 10 mm x 17 mm)
	NFC antenna
	Support for models without NFC
	Wireless wide area network (WWAN)
	WWAN cards are compatible with a programmable removable eSIM
	Two WWAN antennas (worldwide 5 band, configured at top of display panel)
	Supports the following WWAN formats:

Table 1-1 Product components and their descriptions (continued)

Category	Description
	Integrated WWAN options with dual antennas (M.2 30 × 42 socket USB2):
	<ul style="list-style-type: none"> • Intel XMM™ 7262 LTE-Advanced (CAT 6)
	Integrated WWAN options with dual antennas (M.2 30 × 42 socket PCIe):
	<ul style="list-style-type: none"> • Intel XMM 7360 LTE-Advanced (CAT 9) • Intel XMM 7560 LTE-Advanced Pro (CAT 16)
	WWAN modules are compatible with a programmable removable eSIM
	Support for models without WWAN
	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 (network) connector
	Docking connector
	Audio-out (headphone)/audio-in (microphone) combo jack
	AC port
Keyboard/ pointing devices	Keyboard
	HP Collaboration Keyboard
	<ul style="list-style-type: none"> • Dual point, non-backlit, spill resistant with drain • Dual point, backlit, spill resistant with drain, with HP Dura Keys, supports ALS • Dual point, backlit, spill resistant with drain, with HP Dura Keys, supports ALS Privacy
	Touchpad
	Support for Microsoft® precision touchpad default gestures
	Firmware PTP (Point to Point) with Filter Driver
	Support for No Hybrid Mode
Power requirements	Battery
	HP Long Life Lithium Polymer Soft Pack Battery, 3 cell, 56 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

Table 1-1 Product components and their descriptions (continued)

Category	Description
	45 W Smart right angle, 4.5 mm
	45 W Smart right angle, 4.5 mm - Argentina
	45 W Smart right angle, 4.5 mm, 2 prong (Japan only)
	45 W Straight USB Type C
	Power cord
	2-wire plug (C7), 1.0 m
	3-wire plug (C5), 1.8 m
	3-wire plug (C5), 1.0 m
	Duckhead power cord (C5) 1.0 m
	Duckhead power cord (C5) 1.8 m
	Duckhead power cord (C5)
Security	Security lock
	Trusted Platform Module (TPM) 2.0 (Infineon, soldered down)
	Touch fingerprint sensor (landed, touch with 8 × 8 sensor)
	Support for models without a fingerprint reader
	Smart card reader (active)
	Support for models without a smart card reader
	Preboot authentication (password, smart card)
	Hardware enforced Firmware Protection: HP Hardware Root of Trust + Sure Start Gen5
Operating system	Preinstalled
	Windows® 10 Home 64
	Windows 10 Home 64 Advanced
	Windows 10 Home 64 Advanced 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 Home 64 Plus Single Language APAC EM PPP
	Windows 10 Home 64 Plus Single Language India Market PPP
	Windows 10 Home 64 Plus Single Language Indonesia Market PPP
	Windows 10 Home 64 Single Language
	Windows 10 Home 64 Single Language APAC EM PPP
	Windows 10 Home 64 Single Language India Market PPP

Table 1-1 Product components and their descriptions (continued)

Category	Description
	Windows 10 Home 64 Single Language Indonesia Market PPP
	Windows 10 Professional 64
	Windows 10 Professional 64 Chinese Market
	Windows 10 Professional 64 StF MSNA Standard
	Windows 10 Professional 64 StF MSNA Plus
	FreeDOS 3.0
	Restore Media
	Windows 10 Driver DVD
	Windows 10 Driver USB
	Windows 10 Professional 64-bit OS DVD
	Windows 10 Professional 64-bit OS USB
	Certified
	Microsoft WHQL
	Web-only support
	Windows 10 Enterprise 64
	Windows 10 Professional 64 CBB 1803
Serviceability	End user replaceable parts
	AC adapter
	Solid-state drive
	Memory module
	WLAN module
	WWAN module
	Keyboard

2 Components

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

Right

 **NOTE:** Refer to the illustration that most closely matches your computer.

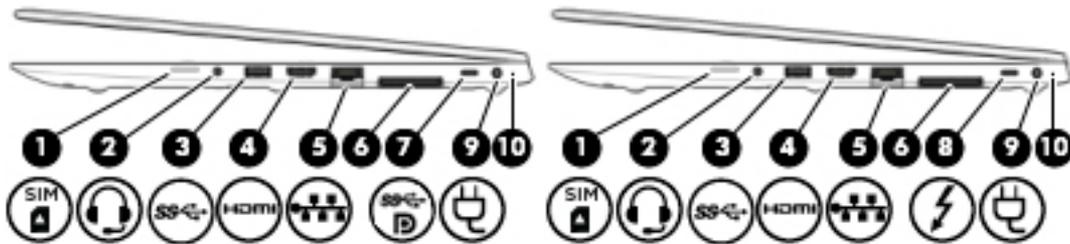


Table 2-1 Right-side components and their descriptions

Component	Description
(1) 	<p>SIM card slot (select products only)</p> <p>Supports a wireless subscriber identity module (SIM) card.</p>
(2) 	<p>Audio-out (headphone)/Audio-in (microphone) combo jack</p> <p>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.</p> <p>WARNING! To reduce the risk of personal injury, adjust the volume before putting on headphones, earbuds, or a headset. For additional safety information, see the <i>Regulatory, Safety, and Environmental Notices</i>.</p> <p>To access this guide:</p> <ul style="list-style-type: none"> ▲ Type <code>HP Documentation</code> in the taskbar search box, and then select HP Documentation. <p>NOTE: When a device is connected to the jack, the computer speakers are disabled.</p>
(3) 	<p>USB SuperSpeed port</p> <p>Connects a USB device, such as a cell phone, camera, activity tracker, or smartwatch, and provides high-speed data transfer.</p>
(4) 	<p>HDMI port</p> <p>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.</p>
(5) 	<p>RJ-45 (network) jack/status lights</p> <p>Connects a network cable.</p> <ul style="list-style-type: none"> ● Green (left): The network is connected.

Table 2-1 Right-side components and their descriptions (continued)

Component	Description
(6)	Docking connector
(7)	
USB Type-C SuperSpeed port and DisplayPort connector	<ul style="list-style-type: none"> Amber (right): Activity is occurring on the network. <p>Connects an optional docking device.</p> <p>When the computer is on, 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.</p> <p>NOTE: Cables and/or adapters (purchased separately) may be required.</p> <p>– and –</p> <p>Connects a DisplayPort device that has a USB Type-C connector, providing display output.</p>
(8)	
USB Type-C power connector and Thunderbolt™ port with HP Sleep and Charge	<p>Connects an AC adapter that has a USB Type-C connector, supplying power to the computer and, if needed, charging the computer battery.</p> <p>– and –</p> <p>Even when the computer is off, 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.</p> <p>– and –</p> <p>Connects a display device that has a USB Type-C connector, providing DisplayPort output.</p> <p>NOTE: Your computer may also support a Thunderbolt docking station.</p> <p>NOTE: Cables and/or adapters (purchased separately) may be required.</p>
(9)	
Power connector	Connects an AC adapter.
(10)	Battery light
	<p>When AC power is connected:</p> <ul style="list-style-type: none"> 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. <p>When AC power is disconnected (battery not charging):</p> <ul style="list-style-type: none"> 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

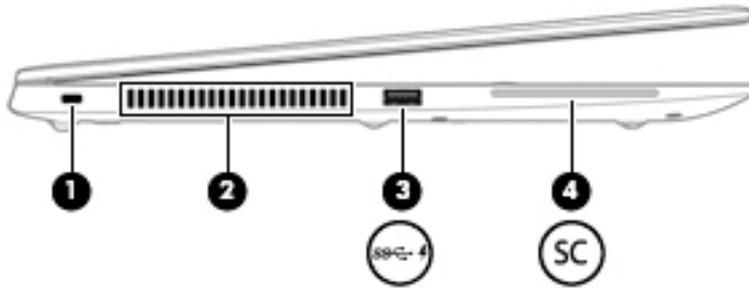


Table 2-2 Left-side components and their descriptions

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	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)  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)  Smart card reader	Supports optional smart cards.

Display

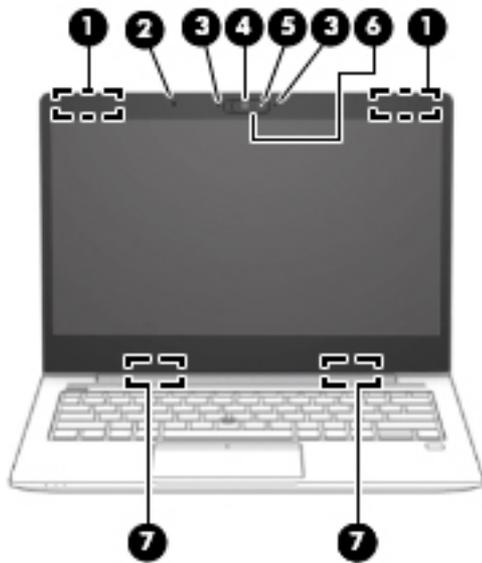


Table 2-3 Display components and their descriptions

Component	Description
(1) WWAN antennas* (select products only)	Send and receive wireless signals to communicate with wireless wide area networks (WWANs).
(2) Ambient light sensor (select products only)	Adjusts the brightness of the display, depending on the ambient light.
(3) Internal microphones	Record sound.
(4) Camera light(s) (select products only)	On: One or more cameras are in use.
(5) Camera(s) (select products only)	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.
(6) Camera privacy cover (select products only)	When closed, the camera privacy cover conceals the camera. <ul style="list-style-type: none">To reveal the camera, slide the cover to the left.To conceal the camera, slide the cover to the right.
(7) WLAN antennas* (select products only)	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.

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Keyboard area

Touchpad

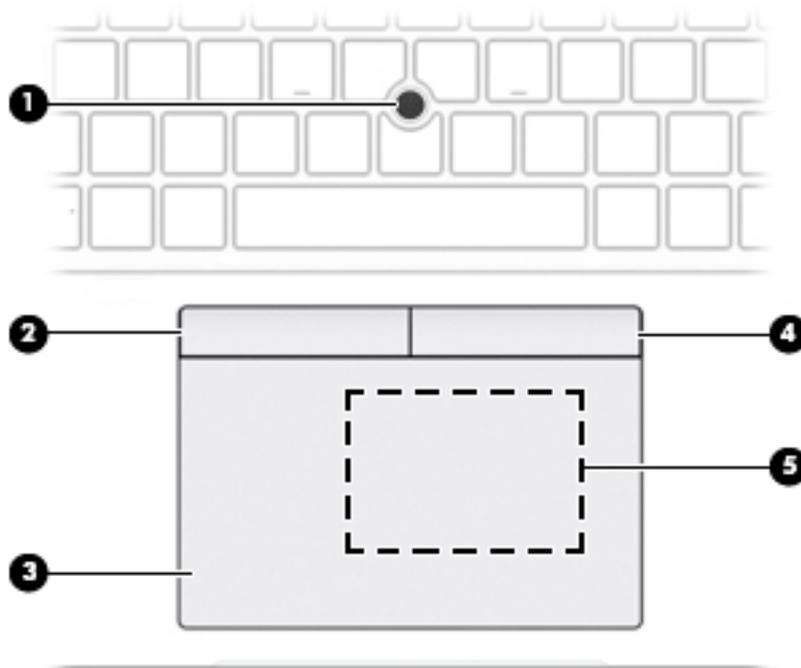


Table 2-4 Touchpad components and their descriptions

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* (select products only) Allows you to wirelessly share information when you tap it with an NFC-enabled device.

*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.

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Lights

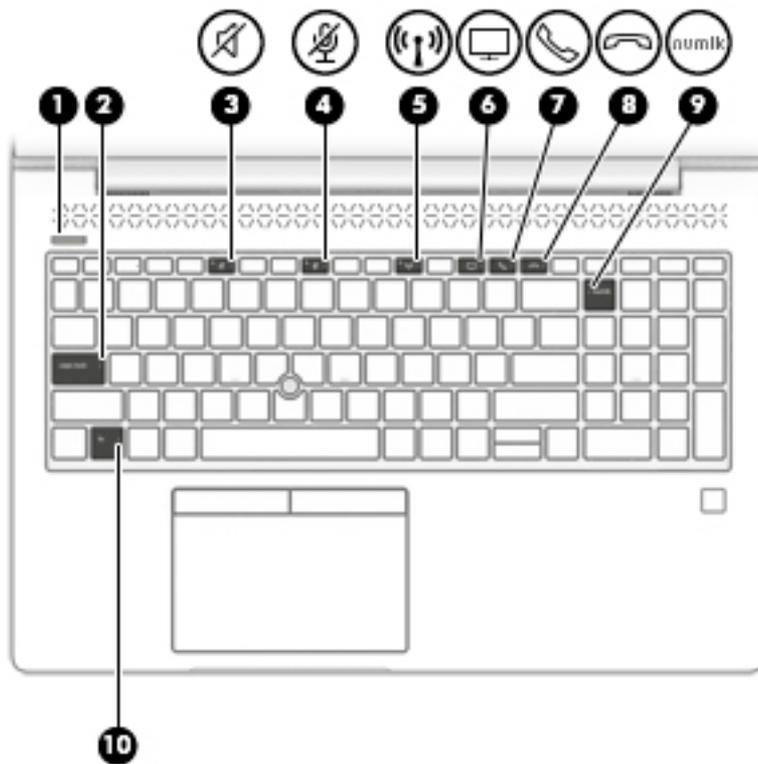


Table 2-5 Lights and their descriptions

Component	Description
(1) Power light	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> On: Computer sound is off. Off: Computer sound is on.
(4)  Microphone mute light	<ul style="list-style-type: none"> On: Microphone is off. Off: Microphone is on.
(5)  Wireless light	<p>On: An integrated wireless device, such as a wireless local area network (WLAN) device and/or a Bluetooth® device, is on.</p> <p>NOTE: On some models, the wireless light is amber when all wireless devices are off.</p>
(6)  Sharing or presenting light	On: Sharing is on.

Table 2-5 Lights and their descriptions (continued)

Component	Description
(7)  Call answer light	On: Call answer is on.
(8)  Call end light	On: Call end is on.
(9)  Num lk light	On: Num lock is on.
(10) Fn lock light	On: The fn key is locked. For more information, see Hot keys (select products only) on page 16 .

Buttons, speakers, and fingerprint reader

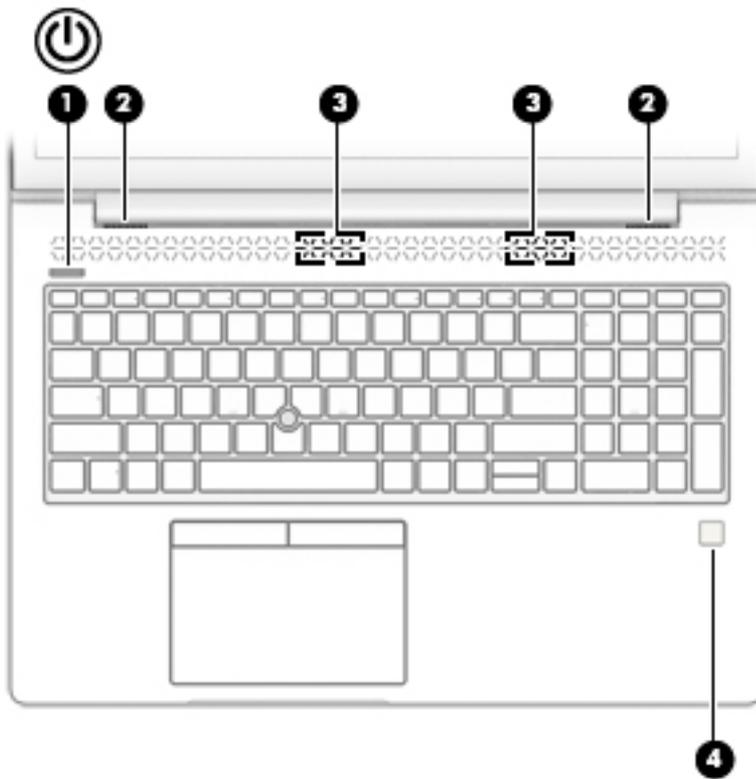


Table 2-6 Buttons, speakers, and fingerprint reader and their descriptions

Component	Description
(1)  Power button	<ul style="list-style-type: none">• 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 (select products only).

Table 2-6 Buttons, speakers, and fingerprint reader and their descriptions (continued)

Component	Description
	<ul style="list-style-type: none">• When the computer is in Hibernation, press the button briefly to exit Hibernation. <p>IMPORTANT: Pressing and holding down the power button results in the loss of unsaved information.</p> <p>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.</p> <p>To learn more about your power settings, see your power options.</p> <p>▲ Right-click the Power meter icon  and then select Power Options.</p>
(2)	Vents (2)
	Enable airflow to cool internal components. <p>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.</p>
(3)	Speakers (2)
	Produce sound.
(4)	Fingerprint reader (select products only)
	Allows a fingerprint logon to Windows, instead of a password logon. <p>▲ Swipe down across the fingerprint reader.</p> <p>IMPORTANT: To prevent fingerprint logon issues, make sure when you register your fingerprint that all sides of your finger are registered by the fingerprint reader.</p>

Special keys

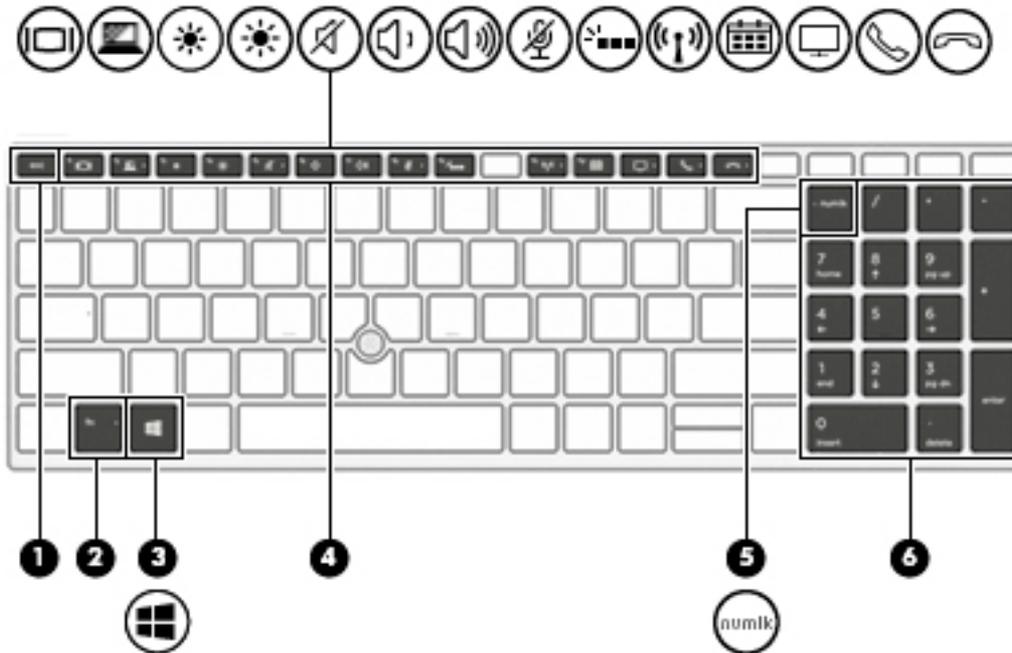


Table 2-7 Special keys and their descriptions

Component	Description
(1) <code>esc</code> key	Displays system information when pressed in combination with the <code>fn</code> key.
(2) <code>fn</code> key	Executes frequently used system functions when pressed in combination with another key. Such key combinations are called <i>hot keys</i> . See Hot keys (select products only) on page 16 .
(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.
(5) <code>num lk</code> key	Turns the embedded numeric keypad on and off. – or – Alternates between the navigational and numeric functions on the integrated numeric keypad.
(6) Integrated numeric keypad	A separate keypad to the right of the alphabet keyboard. When <code>num lk</code> is pressed, the integrated keypad can be used like an external numeric keypad. NOTE: If the keypad function is active when the computer is turned off, that function is reinstated when the computer is turned back on.

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.

Table 2-8 Hot keys and their descriptions

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

Bottom

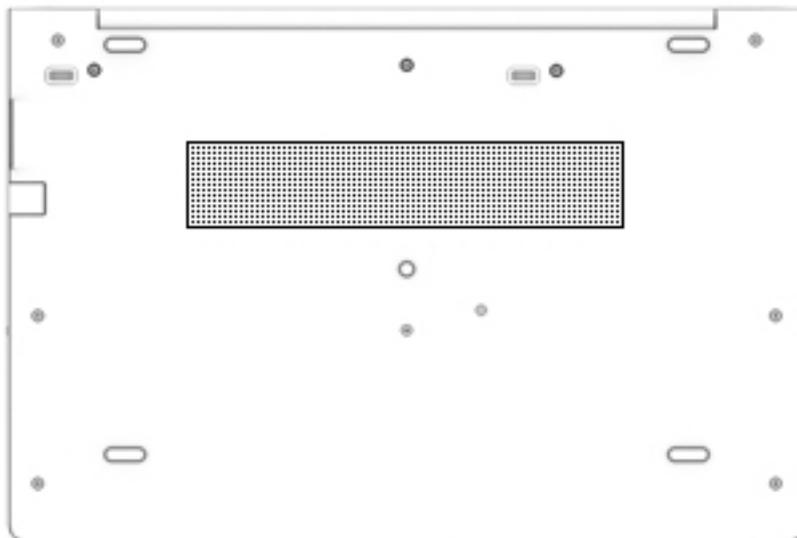


Table 2-9 Bottom components and their descriptions

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

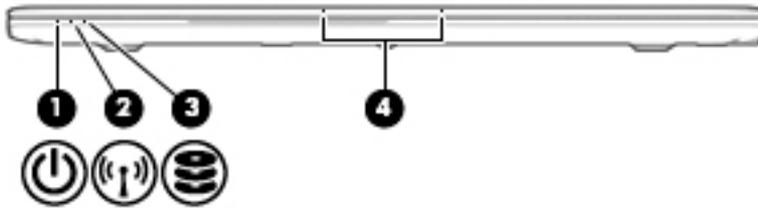


Table 2-10 Front components and their descriptions

Component	Description
(1) 	<p>Power light</p> <ul style="list-style-type: none"> 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) 	<p>Wireless light</p> <p>On: An integrated wireless device, such as a wireless local area network (WLAN) device and/or a Bluetooth® device, is on.</p> <p>NOTE: On some models, the wireless light is amber when all wireless devices are off.</p>
(3) 	<p>Drive light</p> <ul style="list-style-type: none"> Blinking white: The hard drive is being accessed. Amber: HP 3D DriveGuard has temporarily parked the hard drive.
(4)	<p>Internal microphones</p> <p>Record sound.</p>

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.

Your service label will resemble one of the examples shown below. Refer to the illustration that most closely matches the service label on your computer.

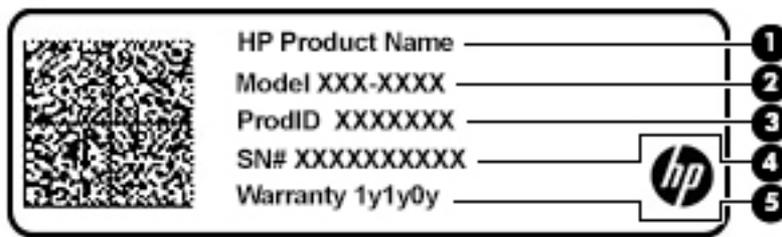


Table 2-11 Service label components

Component
(1) HP product name
(2) Model number
(3) Product ID
(4) Serial number
(5) Warranty period

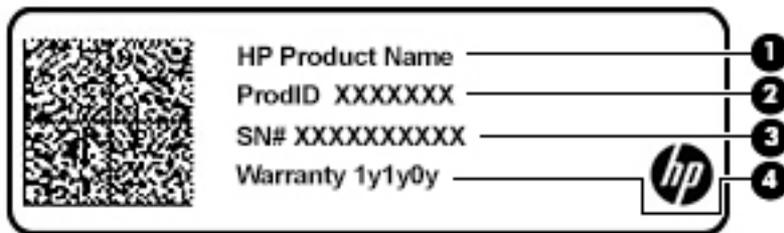


Table 2-12 Service label components

Component
(1) HP product name
(2) Product ID

Table 2-12 Service label components (continued)

Component	
(3)	Serial number
(4)	Warranty period

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

3 Illustrated parts catalog

Computer major components

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

 **NOTE:** Details about your computer, including model, serial number, product key, and length of warranty, are on the service tag at the bottom of your computer. See [Labels on page 18](#) for details.

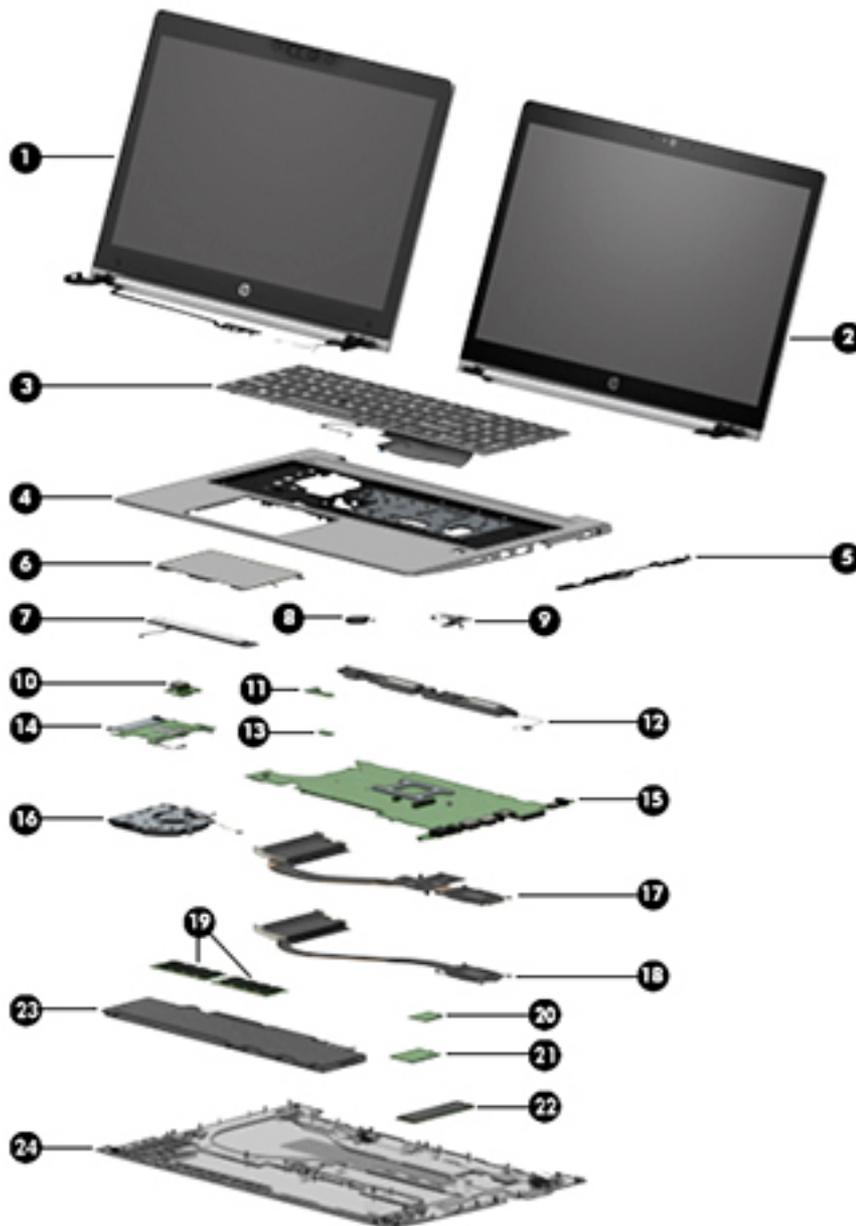


Table 3-1 Computer major components and their descriptions

Item	Component	Spare part number
(1)	Display assembly (non-touch) Display assemblies are available as spare parts at the subcomponent level only. See Display assembly subcomponents on page 23 .	not available as whole assembly
(2)	Display assembly (touch)	not available as whole assembly
(3)	Keyboard (for a list of keyboard country codes, see Keyboard on page 40). Without a backlight	L14367-xx1
	With a backlight	L14366-xx1
(4)	Top cover	L63370-001
(5)	RJ-45 board with bracket	L19420-001
(6)	Touchpad For use in models without an NFC module	L63368-001
	For use in models with an NFC module	L63369-001
(7)	Pointing stick module (includes buttons, board, and bracket)	L16643-001
(8)	RTC battery	L17255-001
(9)	Power button board (includes cable)	L65690-001
(10)	USB board	L65689-001
(11)	Fingerprint reader assembly (includes cable) NOTE: The fingerprint reader bracket is available as spare part number L63367-001.	L63365-001
(12)	Speakers (include cable)	L14368-001
(13)	NFC module (includes antenna and touchpad foam)	L14385-001
(14)	Smart card reader board (includes cable) NOTE: The smart card reader pass-thru board (for use in models without a smart card) is available as spare part number L62743-001.	L62733-001
(15)	System board (includes processor and replacement thermal material, see System board on page 61) 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 i7-8665U processor	L62755-xx1
	Intel i7-8565U processor	L62753-xx1
	Intel i5-8365U processor	L62754-xx1
	Intel i5-8265U processor	L62752-xx1
	For use in models with UMA graphics memory	
	Intel i7-8665U processor	L62760-001

Table 3-1 Computer major components and their descriptions (continued)

Item	Component	Spare part number
	Intel i7-8565U processor	L62758-001
	Intel i5-8365U processor	L62759-001
	Intel i5-8265U processor	L62757-001
(16)	Fan	L65691-001
(17)	Heat sink (for use in models with discrete graphics memory)	L65693-001
(18)	Heat sink (for use in models with UMA graphics memory)	L65692-001
(19)	Memory module (DDR-2400)	
	4 GB	862397-852
	8 GB	862398-852
	16 GB	865396-852
(20)	WLAN/Bluetooth combo card	
	Intel Wireless-AC 9560 802.11ac 2 × 2 Wi-Fi + Bluetooth 5 (non-vPro)	L22634-002
	Intel Wireless-AC 9560 802.11ac 2 × 2 Wi-Fi + Bluetooth 5 (vPro)	L28418-002
	Intel Wi-Fi 6 AX200 802.11ax 2 × 2 + Bluetooth 5 (non-vPro)	L35282-002
	Intel Wi-Fi 6 AX200 802.11ax 2 × 2 + Bluetooth 5 (vPro)	L35284-002
(21)	WWAN module	
	Intel XMM 7360 LTE-Advanced (CAT 9)	L15398-002
	Intel XMM 7560 LTE-Advanced Pro (CAT 16)	L27188-002
	Intel XMM 7262 LTE-Advanced (CAT 6)	L35286-002
(22)	Solid-state drive (SSD)	
	2 TB, PCIe, TLC	L62766-001
	1 TB, PCIe, TLC	L62763-001
	512 GB, PCIe, TLC	L62769-001
	512 GB, PCIe, self-encrypting drive (SED), Opal 2, TLC	L62768-001
	512 GB, SATA-3, FIPS-140-2, TLC	L62767-001
	512 GB, PCIe, value	L62762-001
	512 GB, PCIe + 32 GB Optane Memory	L63374-001
	256 GB, PCIe, NVMe, TLC	L62764-001
	256 GB, PCIe, NVMe, value	L62765-001
	256 GB, SATA-3, Opal 2, TLC	L63373-001
	128 GB, SATA-3, TLC	L63372-001
(23)	Battery (3 cell, 56 Whr, 4.85 Ahr)	933322-855
(24)	Bottom cover	L63359-001

Display assembly subcomponents

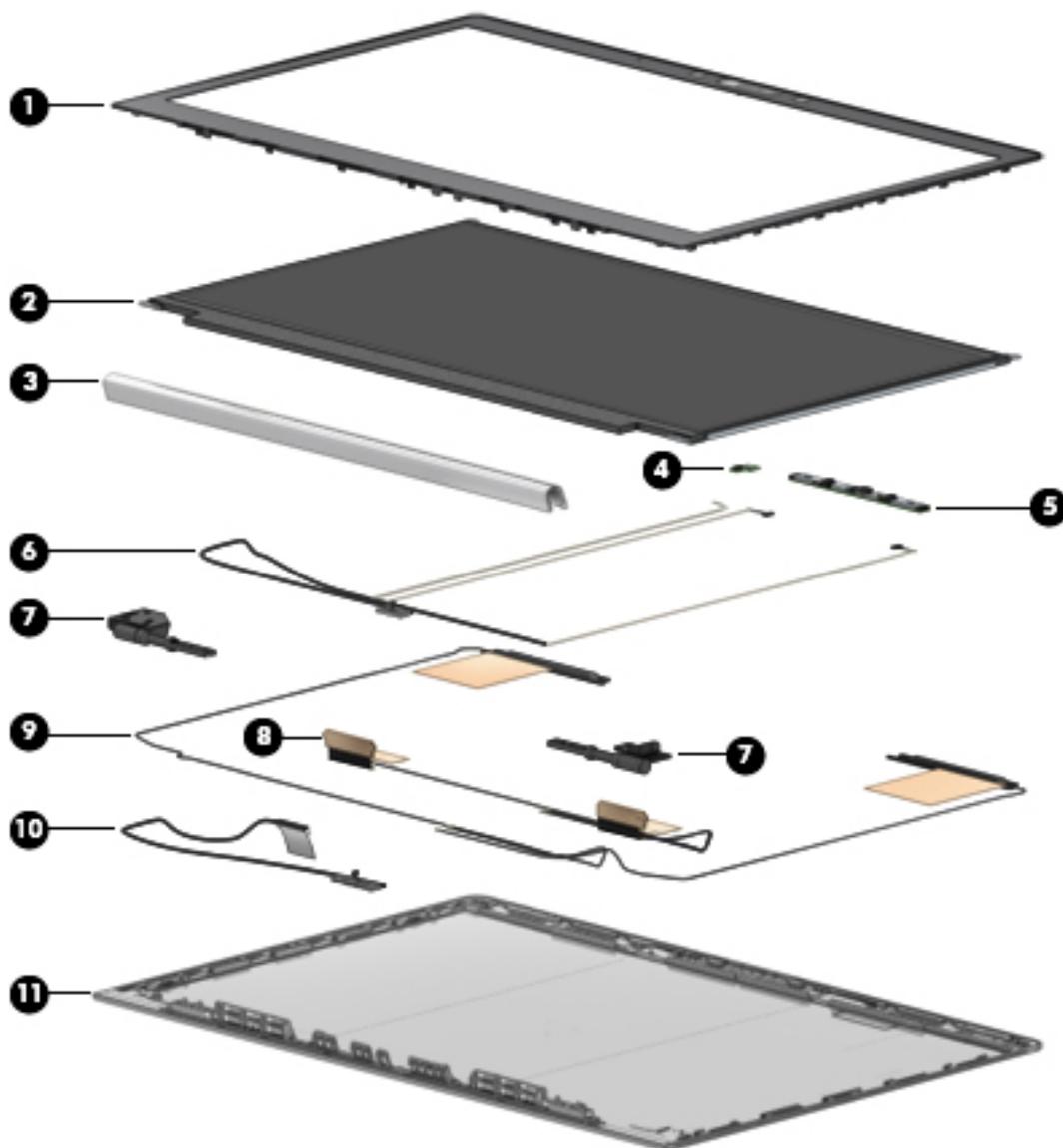


Table 3-2 Display components and their descriptions

Item	Component	Spare part number
(1)	Bezel	
	For use in models with microphone modules	L63360-001
	For use in models with an HD camera (includes camera privacy cover)	L63361-001
	For use in models with an IR camera (includes camera privacy cover)	L63362-001
	For use in models with an IR camera and an ambient light sensor (includes camera privacy cover)	L63363-001
(2)	Raw display panel (includes panel, touch module (as applicable), display cable, and interior panel bezel)	
	FHD, 250 nits	L62781-001

Table 3-2 Display components and their descriptions (continued)

Item	Component	Spare part number
	FHD, 400 nits	L16641-001
	FHD, 250 nits, Touch-on Panel (TOP)	L62783-001
	UHD	L62784-001
(3)	Hinge cover	
	For use in models with touch displays	L14364-001 (Hinge Kit)
	For use in models with non-touch displays	L14365-001 (Hinge Kit)
(4)	Ambient light sensor board (includes double-sided tape)	L62745-001
(5)	Camera module	
	HD camera	L62742-001
	IR camera	L64702-001
	Microphone module (not shown; includes double-sided tape)	L62744-001
(6)	Camera cable (HD and IR models)	L63364-001 (Cable Kit)
(7)	Hinges (left and right) (for use in models with touch displays)	L14364-001 (Hinge Kit)
	Hinges (left and right) (for use in models with non-touch displays)	L14365-001 (Hinge Kit)
(8)	WLAN antenna (available with display enclosure)	
(9)	WWAN antenna (available with display enclosure)	
(10)	Display cable	L63364-001 (Cable Kit)
(11)	Display enclosure (includes tape, gasket, and foam)	L63358-001

Plastics Kit

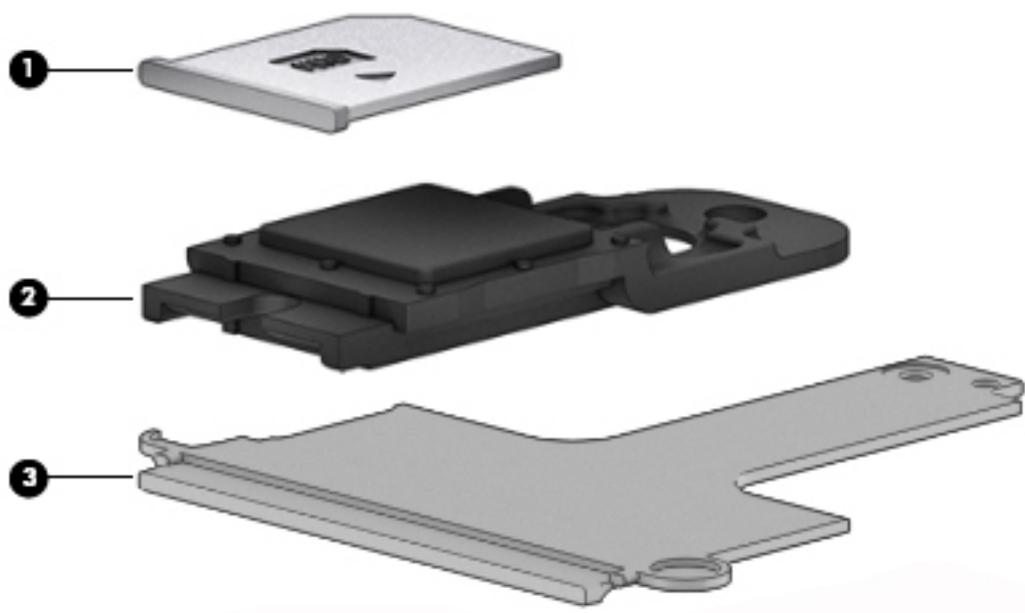


Table 3-3 Plastics components and their descriptions

Item	Component	Spare part number
	Plastics kit	L63366-001
(1)	SIM card reader insert	
(2)	Fingerprint reader insert	
(3)	Smart card reader insert	
	Camera privacy cover (not illustrated)	

Cable Kit

Table 3-4 Cable Kit components and their descriptions

Description	Spare part number
Cable Kit , includes:	L63364-001
Touchpad cable	
Touchpad button board cable	
USB board cable	
Card reader cable	
Power button board cable	
Fingerprint reader cable	
NFC cable	
Pointing stick cable	
FHD display panel cable	
UHD display panel cable	
Webcam cable	
IR webcam cable	
IR, ambient light sensor, webcam cable	

Miscellaneous parts

Table 3-5 Miscellaneous parts and their descriptions

Component	Spare part number
Screw Kit	L18441-001
Bracket Kit (includes fingerprint reader bracket)	L63367-001
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 USB Type-C, nPFC, 1.8 m	L32392-001
45 W HP Smart AC adapter, 2 prong	742436-001
45 W USB Type-C, nPFC, wall mount, 1.8 m	L32390-001
45 W HP Smart AC adapter, nPFC, 4.5 mm	741727-001
Power cord (3 pin, C5, black, 1.0 m, for use in:	
Denmark	L19360-001
Europe	L19361-001

4 Removal and replacement procedures preliminary requirements

Tools required

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

- Non-conductive, non-marking pry tool
- Magnetic Phillips P1 screwdriver
- Torx T8 screwdriver

Service considerations

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

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

Plastic parts

 **IMPORTANT:** Using excessive force during disassembly and reassembly can damage plastic parts.

Cables and connectors

 **IMPORTANT:** 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



IMPORTANT: 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 an optical drive, be sure that a disc is not in the drive and be sure that the optical drive tray is closed.

Handle drives on surfaces covered with at least 2.54 cm (1 inch) of shock-proof foam.

Avoid dropping drives from any height onto any surface.

After removing a hard drive or an optical drive, place it in a static-proof bag.

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.”

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, screw drivers, 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.

Electrostatic discharge information

A sudden discharge of static electricity from your finger or other conductor can destroy static-sensitive devices or microcircuitry. Often the spark is neither felt nor heard, but damage occurs. An electronic device exposed to electrostatic discharge (ESD) might not appear to be affected at all and can work perfectly throughout a normal cycle. The device might function normally for a while, but it has been degraded in the internal layers, reducing its life expectancy.

Networks built into many integrated circuits provide some protection, but in many cases, the discharge contains enough power to alter device parameters or melt silicon junctions.



IMPORTANT: To prevent damage to the device 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.

Generating static electricity

Note the following:

- Different activities generate different amounts of static electricity.
- Static electricity increases as humidity decreases.

Table 4-1 Static electricity occurrence based on activity and humidity

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

Multiple electric components can be packaged together in plastic tubes, trays, or Styrofoam.



NOTE: As little as 700 V can degrade a product.

Preventing electrostatic damage to equipment

Many electronic components are sensitive to ESD. Circuitry design and structure determine the degree of sensitivity. The following packaging and grounding precautions are necessary to prevent static electricity damage to electronic components.

- To avoid hand contact, transport products in static-safe containers such as tubes, bags, or boxes.
- Protect all electrostatic parts and assemblies with conductive or approved containers or packaging.
- Keep electrostatic-sensitive parts in their containers until they arrive at static-free stations.
- Place items on a grounded surface before removing them from their container.
- Always be properly grounded when touching a sensitive component or assembly.

- Avoid contact with pins, leads, or circuitry.
- Place reusable electrostatic-sensitive parts from assemblies in protective packaging or conductive foam.

Personal grounding methods and equipment

Use the following equipment to prevent static electricity damage to electronic components:

- **Wrist straps** are flexible straps with a maximum of $1\text{ M}\Omega \pm 10\%$ resistance in the ground cords. To provide proper ground, a strap must be worn snug against bare skin. The ground cord must be connected and fit snugly into the banana plug connector on the grounding mat or workstation.
- **Heel straps/Toe straps/Boot straps** can be used at standing workstations and are compatible with most types of shoes or boots. On conductive floors or dissipative floor mats, use them on both feet with a maximum of $1\text{ M}\Omega \pm 10\%$ resistance between the operator and ground.

Table 4-2 Static shielding protection levels

Static shielding protection levels	
Method	Voltage
Antistatic plastic	1,500
Carbon-loaded plastic	7,500
Metallized laminate	15,000

Grounding the work area

To prevent static damage at the work area, use the following precautions:

- Cover the work surface with approved static-dissipative material. Provide a wrist strap connected to the work surface and properly grounded tools and equipment.
- Use static-dissipative mats, foot straps, or air ionizers to give added protection.
- Handle electrostatic sensitive components, parts, and assemblies by the case or PCB laminate. Handle them only at static-free work areas.
- Turn off power and input signals before inserting and removing connectors or test equipment.
- Use fixtures made of static-safe materials when fixtures must directly contact dissipative surfaces.
- Keep work area free of nonconductive materials such as ordinary plastic assembly aids and Styrofoam.
- Use field service tools, such as cutters, screwdrivers, and vacuums, that are conductive.

Recommended materials and equipment

HP recommends the following materials and equipment to prevent static electricity:

- Antistatic tape
- Antistatic smocks, aprons, or sleeve protectors
- Conductive bins and other assembly or soldering aids
- Conductive foam
- Conductive tabletop workstations with ground cord of $1\text{ M}\Omega \pm 10\%$ resistance
- Static-dissipative table or floor mats with hard tie to ground

- Field service kits
- Static awareness labels
- Wrist straps and footwear straps providing 1 M Ω \pm 10% resistance
- Material handling packages
- Conductive plastic bags
- Conductive plastic tubes
- Conductive tote boxes
- Opaque shielding bags
- Transparent metallized shielding bags
- Transparent shielding tubes

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.

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 18](#) 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 16 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.

Preparation for disassembly

See [Removal and replacement procedures preliminary requirements on page 27](#) for initial safety procedures.

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.

Bottom cover

Table 5-1 Bottom cover description and part number

Description	Spare part number
Bottom cover	L63359-001

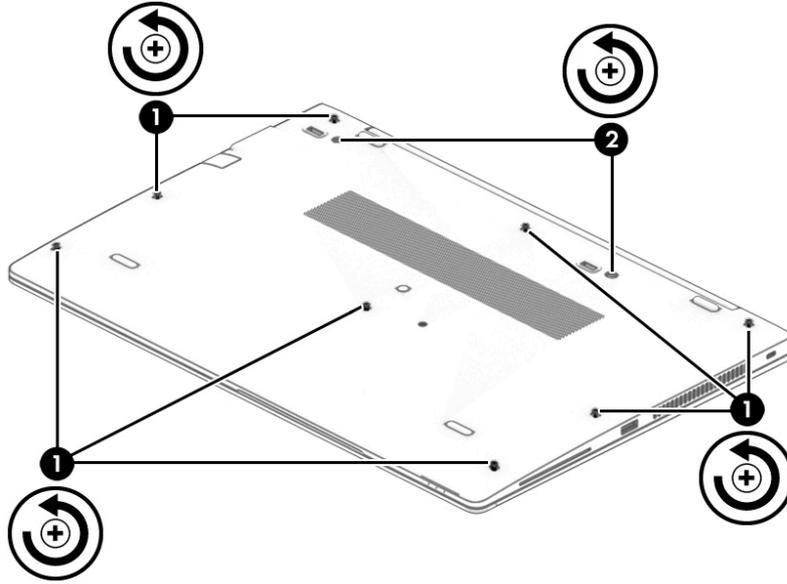
Before removing the bottom cover, follow these steps:

- ▲ Prepare the computer for disassembly ([Preparation for disassembly on page 32](#)).

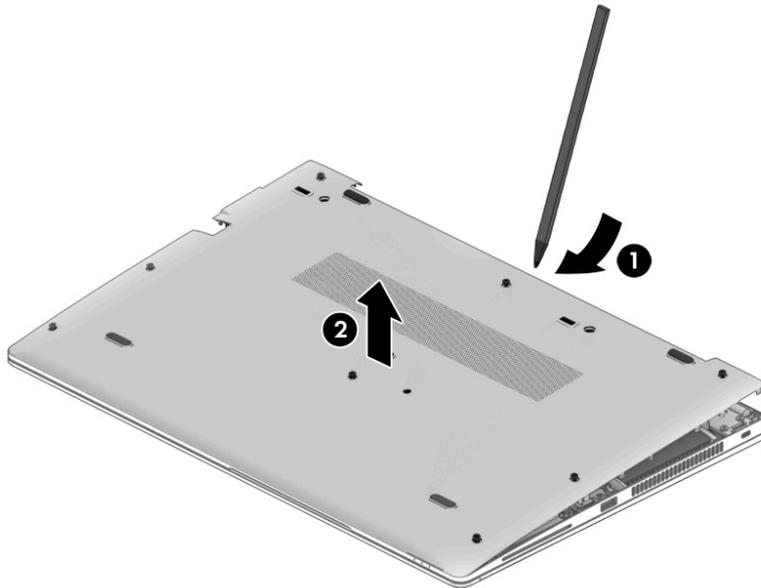
Remove the bottom cover:

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

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



3. Starting under the middle of the display, loosen **(1)** and lift the bottom cover off the computer **(2)**.



Reverse the removal procedures to install the bottom cover.

Solid-state drive (SSD)

Table 5-2 Solid-state drive descriptions and part numbers

Description	Spare part number
2 TB, PCIe, TLC	L62766-001
1 TB, PCIe, TLC	L62763-001
512 GB, PCIe, TLC	L62769-001
512 GB, PCIe, Self-encrypting drive (SED), Opal 2, TLC	L62768-001
512 GB, SATA-3, FIPS-140-2, TLC	L62767-001
512 GB, PCIe, value	L62762-001
512 GB, PCIe + 32 GB Optane Memory	L63374-001
256 GB, PCIe, NVMe, TLC	L62764-001
256 GB, PCIe, NVMe, value	L62765-001
256 GB, SATA-3, Opal 2, TLC	L63373-001
128 GB, SATA-3, TLC	L63372-001

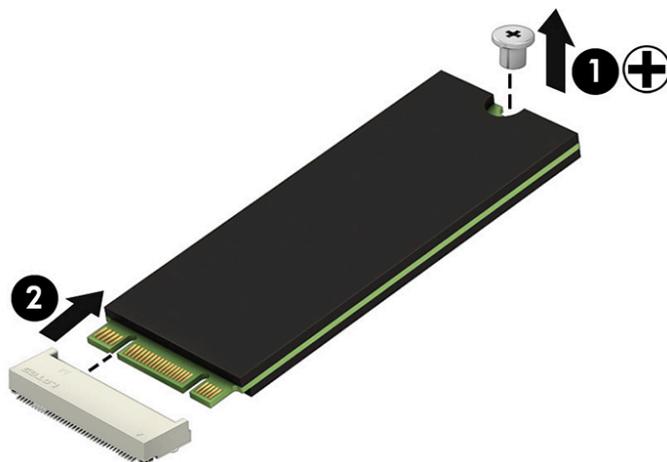
Before removing the solid-state drive, follow these steps:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 32](#)).
2. Remove the bottom cover (see [Bottom cover on page 32](#)).
3. Disconnect the battery cable from the system board (see [Battery on page 44](#)).

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**.

Table 5-3 Memory module descriptions and part numbers

Description	Spare part number
4 GB (DDR-2400)	862397-852
8 GB (DDR-2400)	862398-852
16 GB (DDR-2400)	865396-852

 **IMPORTANT:** Before adding new memory, make sure you update the computer to the latest BIOS, available at www.hp.com.

Before removing the memory module, follow these steps:

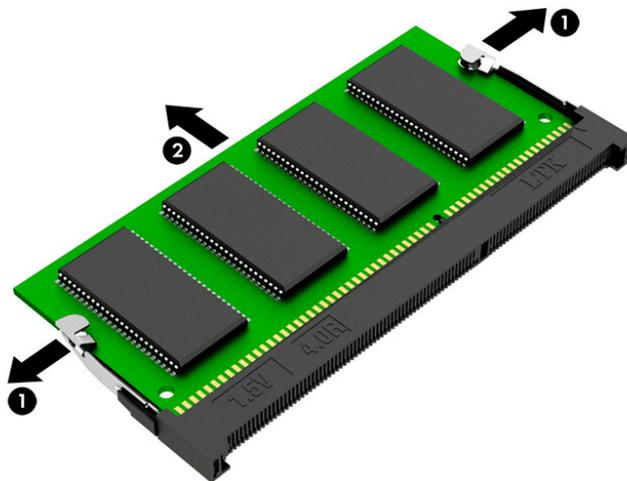
1. Prepare the computer for disassembly ([Preparation for disassembly on page 32](#)).
2. Remove the bottom cover (see [Bottom cover on page 32](#)).
3. Disconnect the battery cable from the system board (see [Battery on page 44](#)).

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.

Table 5-4 WLAN module descriptions and part numbers

Description	Spare part number
Intel Wireless-AC 9560 802.11ac 2 × 2 Wi-Fi + Bluetooth 5 (non-vPro)	L22634-002
Intel Wireless-AC 9560 802.11ac 2 × 2 Wi-Fi + Bluetooth 5 (vPro)	L28418-002
Intel Wi-Fi 6 AX200 802.11ax 2 × 2 + Bluetooth 5 (non-vPro)	L35282-002
Intel Wi-Fi 6 AX200 802.11ax 2 × 2 + Bluetooth 5 (vPro)	L35284-002

Before removing the WLAN module, follow these steps:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 32](#)).
2. Remove the bottom cover (see [Bottom cover on page 32](#)).
3. Disconnect the battery cable from the system board (see [Battery on page 44](#)).

Remove the WLAN module:

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

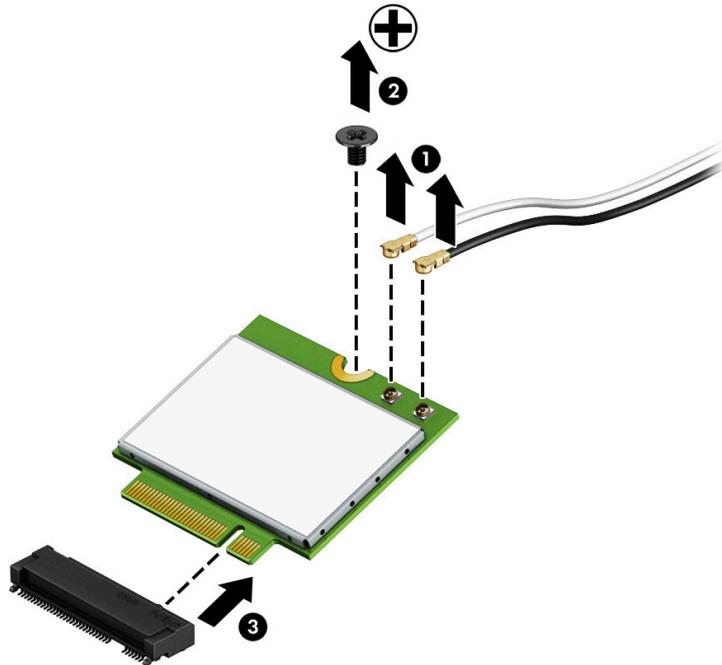


NOTE: The WLAN antenna cable labeled **1** connects to the WLAN module **Main** terminal labeled **1**. The WLAN antenna cable labeled **2** connects to the WLAN module **Aux** terminal labeled **2**. If the computer is equipped with an 802.11a/b/g/n WLAN module, the yellow WLAN antenna cable connects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

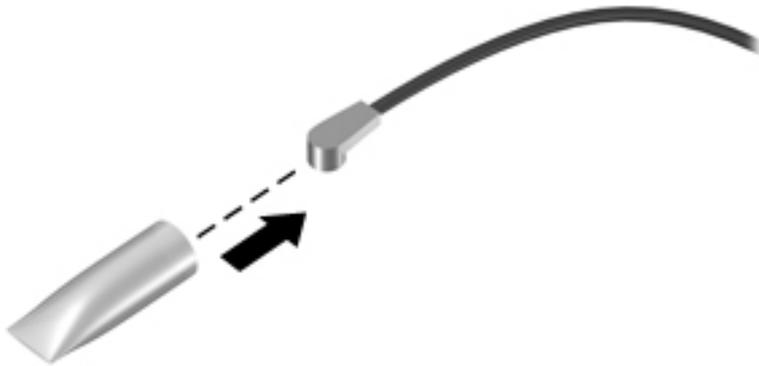
2. Remove the Phillips M2.0 × 2.0 screw (**2**) that secures the WLAN module to the computer. (The edge of the module opposite the slot rises away from the computer.)

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.

Table 5-5 WWAN module descriptions and part numbers

Description	Spare part number
Intel XMM 7360 LTE-Advanced (CAT 9)	L15398-002
Intel XMM 7560 LTE-Advanced Pro (CAT 16)	L27188-002
Intel XMM 7262 LTE-Advanced (CAT 6)	L35286-002

Before removing the WWAN module, follow these steps:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 32](#)).
2. Remove the bottom cover (see [Bottom cover on page 32](#)).
3. Disconnect the battery cable from the system board (see [Battery on page 44](#)).

Remove the WWAN module:

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

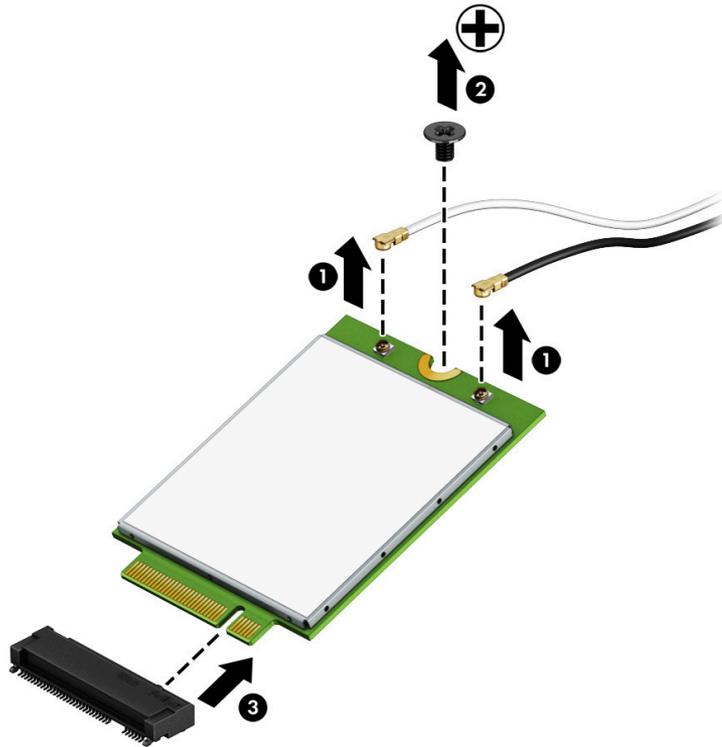


NOTE: The red WWAN antenna cable is connected to the WWAN module **Main** terminal. The blue WWAN antenna cable is connected to the WWAN module **Aux** terminal.

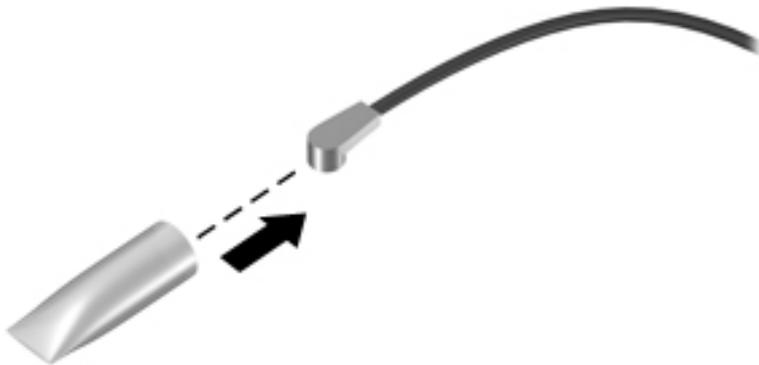
3. Remove the Phillips M2.0 × 2.0 screw **(2)** that secures the WWAN module to the computer. (The edge of the module opposite the slot rises away from the computer.)

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.

Table 5-6 Keyboard descriptions and part numbers

Description	Spare part number
Keyboard, no backlight	L14367-xx1
Keyboard, backlit	L14366-xx1

Table 5-7 Keyboard country codes

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	Ukraine	-BD1
Hungary	-211	Russia	-251	United Kingdom	-031
Iceland	-DD1	Saudi Arabia	-171	United States	-001

Before removing the keyboard, follow these steps:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 32](#)).
2. Remove the bottom cover (see [Bottom cover on page 32](#)).
3. Disconnect the battery cable from the system board (see [Battery on page 44](#)).

Remove the keyboard:

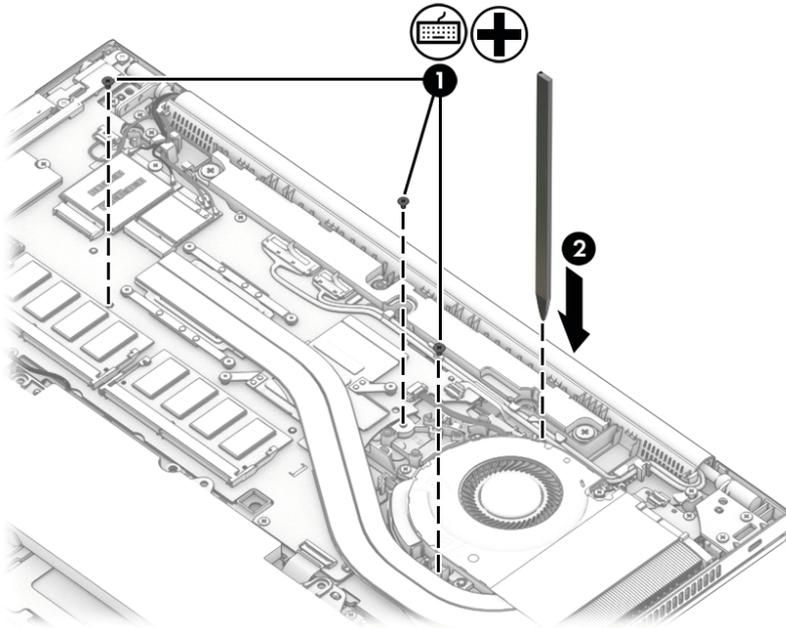
1. Remove the three Phillips M2.0 × 3.0 screws that secure the keyboard to the computer **(1)**.



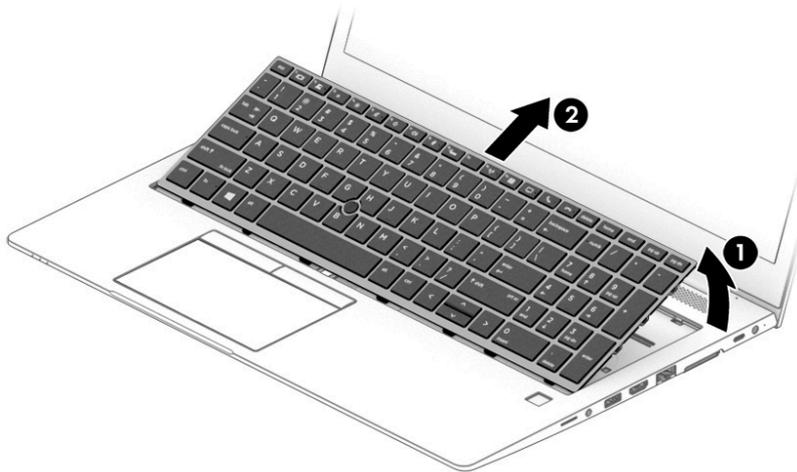
NOTE: The screws are labeled with a keyboard symbol.

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 releases 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.

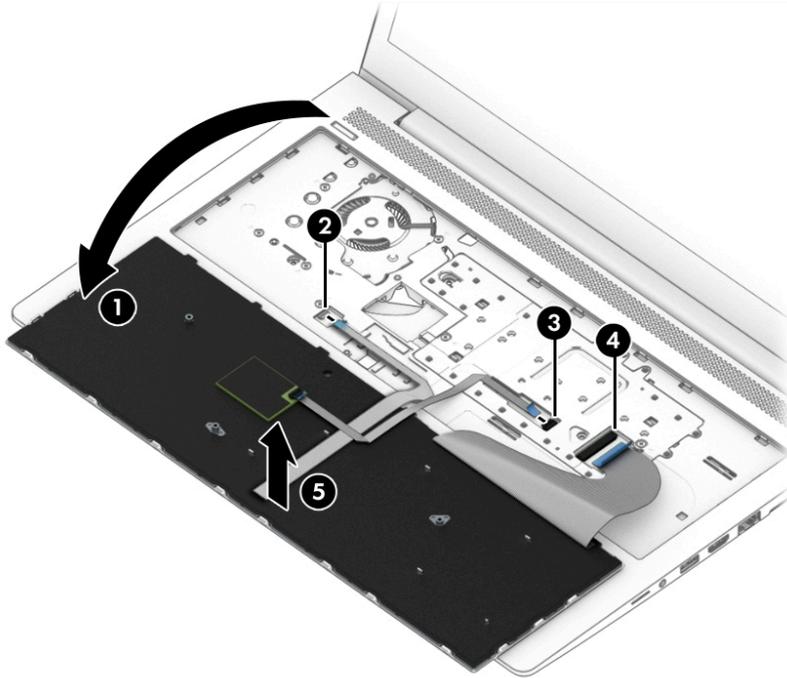


3. Position the computer upright with the front toward you, and then open the computer as far as possible.
4. Lift the top of the keyboard **(1)**, and then pull the keyboard up to remove the tabs from the computer **(2)**.



5. Rotate the keyboard over onto the palm rest **(1)**.
6. Disconnect the keyboard backlight cable from the system board ZIF connector **(2)** (select models only).
7. Disconnect the pointing stick cable from the system board ZIF connector **(3)**.
8. Disconnect the main keyboard cable from the system board ZIF connector **(4)**.

9. Remove the keyboard (5).



Reverse this procedure to install the keyboard.

6 Removal and replacement procedures for authorized service provider parts

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

 **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 18](#) for details.

Component replacement procedures

 **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 63 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

Table 6-1 Battery description and part number

Description	Spare part number
Battery, 3 cell, 56 Whr, 4.85 Ahr	933322-855

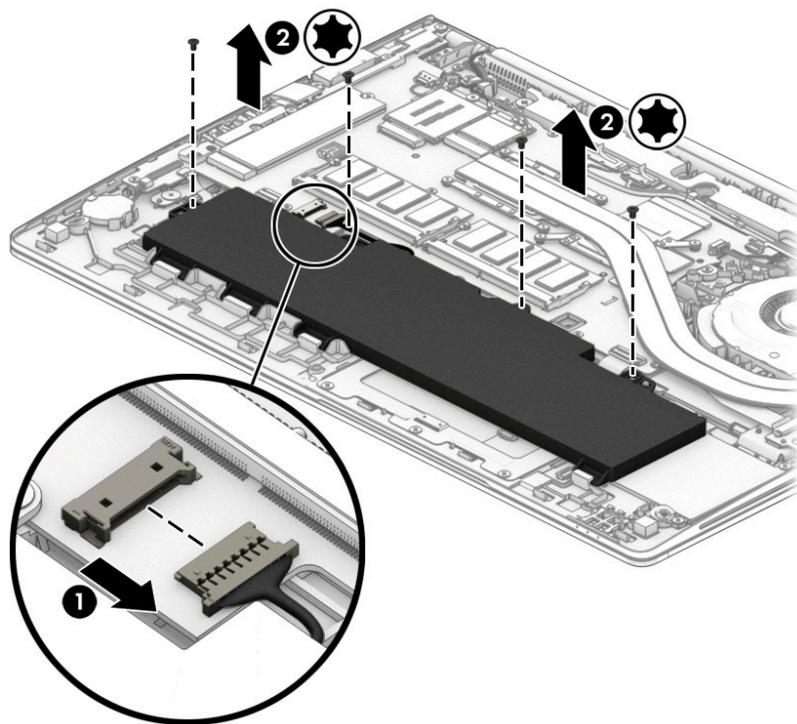
Before removing the battery, follow these steps:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 32](#)).
2. Remove the bottom cover (see [Bottom cover on page 32](#)).

To remove the battery:

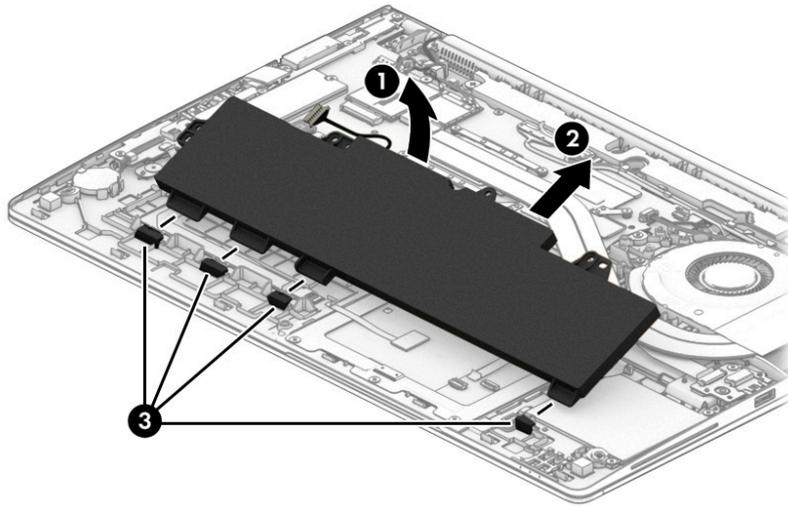
 **IMPORTANT:** Removing a battery that is the sole power source for the computer can cause loss of information. To prevent loss of information, save your work and shut down the computer through Windows before removing the battery.

1. Disconnect the battery cable from the system board (1).
2. Remove the four 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.

Table 6-2 Heat sink descriptions and part numbers

Description	Spare part number
Heat sink for use in models with discrete graphics memory	L65693-001
Heat sink for use in models with UMA graphics memory	L65692-001

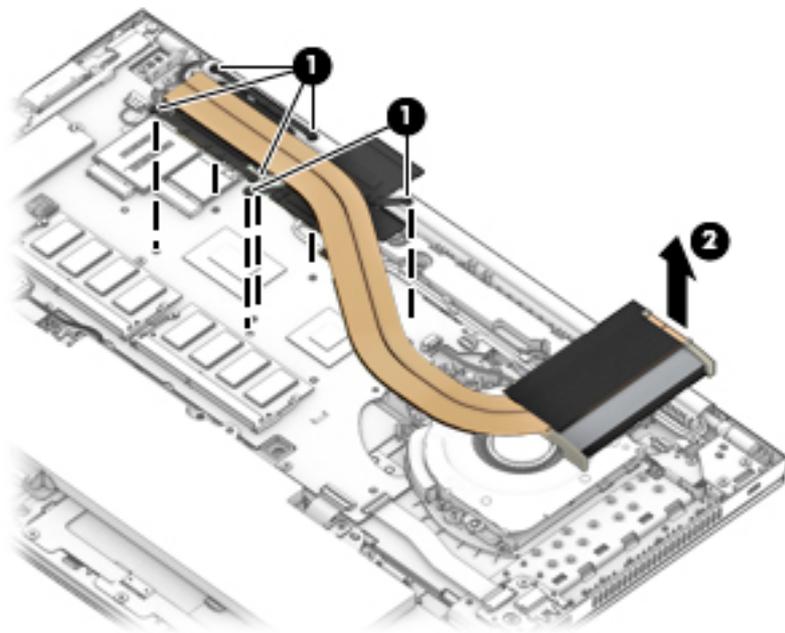
Before removing the heat sink assembly, follow these steps:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 32](#)).
2. Remove the bottom cover (see [Bottom cover on page 32](#)).
3. Disconnect the battery cable from the system board (see [Battery on page 44](#)).

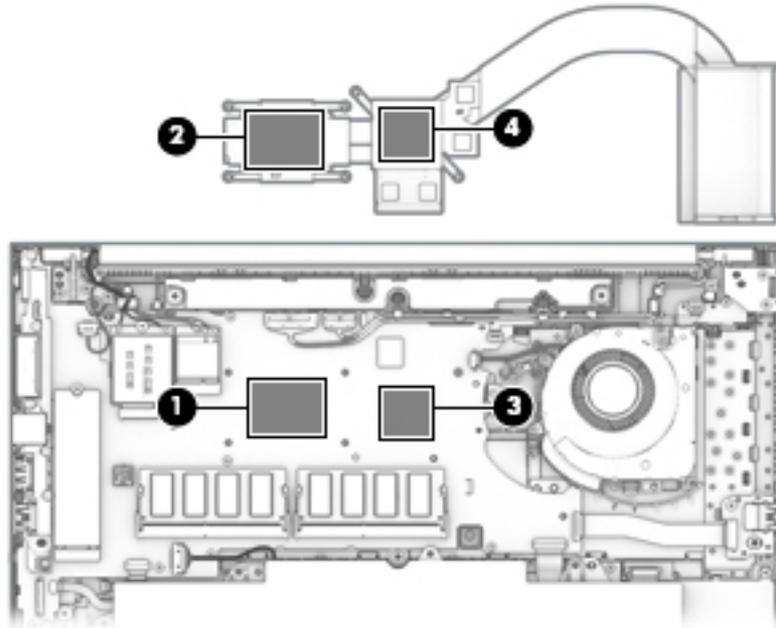
Remove the heat sink assembly:

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)**.

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

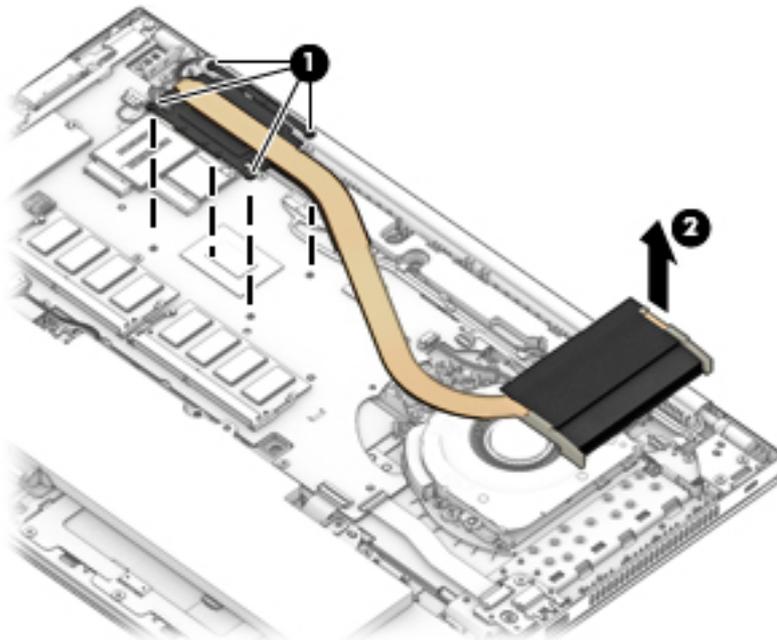


2. Thoroughly clean the thermal material from the surfaces of the system board components **(1)(3)** and the heat sink **(2)(4)** each time the heat sink is removed. Replacement thermal material is included with the heat sink and system board spare part kits.

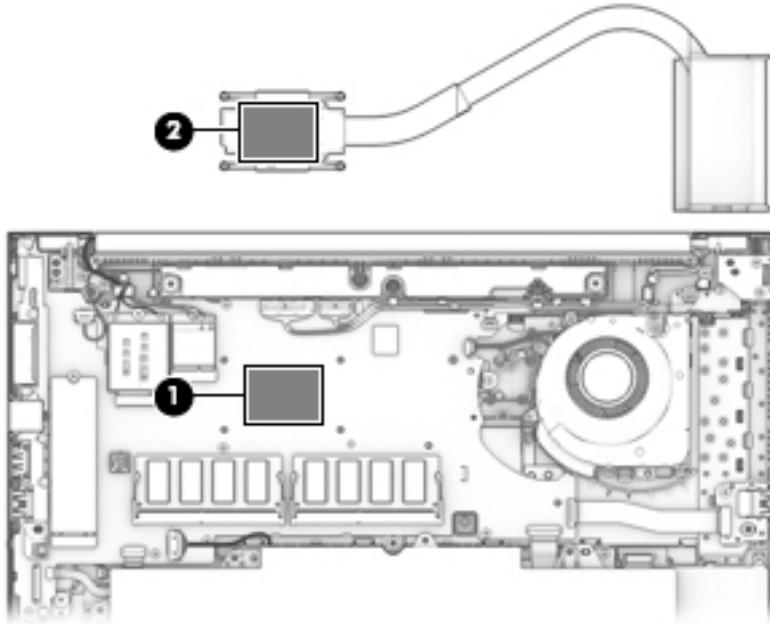


3. **UMA graphics models:** Loosen the four captive screws on the heat sink following the sequence stamped on the heat sink **(1)**, and then remove the heat sink from the system board **(2)**.

 **IMPORTANT:** 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

Table 6-3 RTC battery description and part number

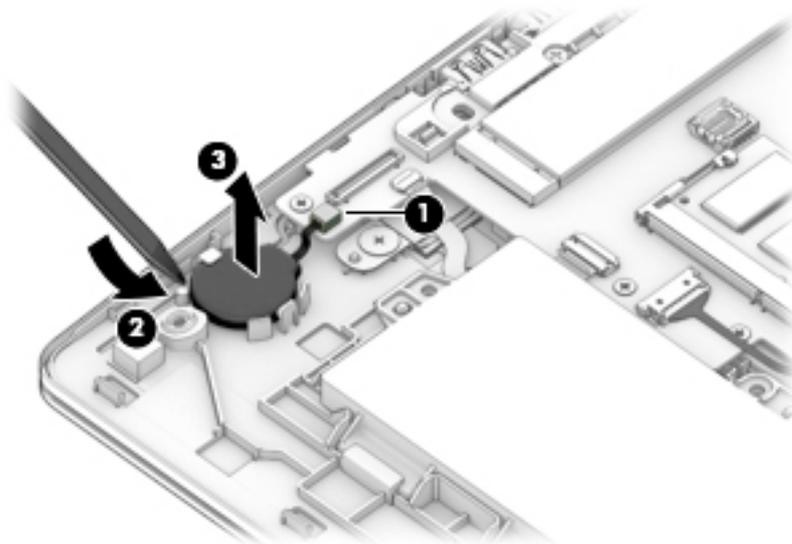
Description	Spare part number
RTC battery	L17255-001

Before removing the RTC battery, follow these steps:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 32](#)).
2. Remove the bottom cover (see [Bottom cover on page 32](#)).
3. Disconnect the battery cable from the system board (see [Battery on page 44](#)).

Remove the RTC battery:

1. Disconnect the RTC battery cable from the system board **(1)**.
2. Using a flat tool, release 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

Table 6-4 USB board description and part number

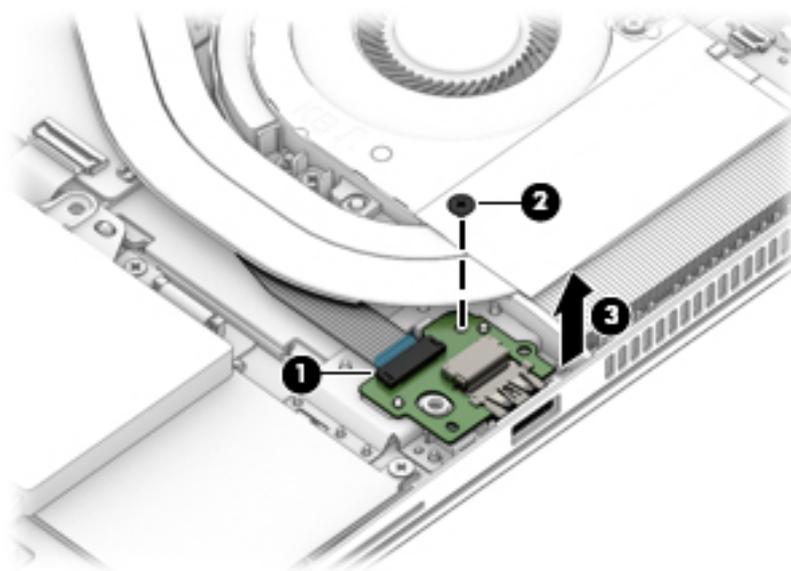
Description	Spare part number
USB board	L65689-001

Before removing the USB board, follow these steps:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 32](#)).
2. Remove the bottom cover (see [Bottom cover on page 32](#)).
3. Disconnect the battery cable from the system board (see [Battery on page 44](#)).

Remove the USB board:

1. Disconnect the cable from the ZIF connector on the USB board **(1)**.
2. Remove the Phillips M2.0 × 3.0 screw **(2)** that secures the board to the computer.
3. Remove the board from the computer **(3)**.



Reverse this procedure to install the USB board.

RJ-45 board with bracket

Table 6-5 RJ-45 board with bracket description and part number

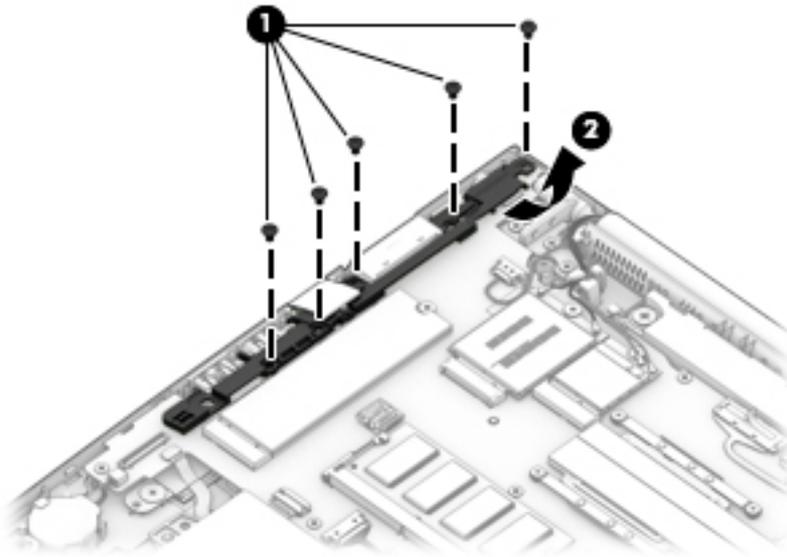
Description	Spare part number
RJ-45 board with bracket	L19420-001

Before removing the RJ-45 board and bracket, follow these steps:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 32](#)).
2. Remove the bottom cover (see [Bottom cover on page 32](#)).
3. Disconnect the battery cable from the system board (see [Battery on page 44](#)).

Remove the RJ-45 board and bracket:

1. Remove the five Phillips M2.5 × 4.0 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

Table 6-6 Power button board description and part number

Description	Spare part number
Power button board assembly (includes cable)	L65690-001

Before removing the power button board, follow these steps:

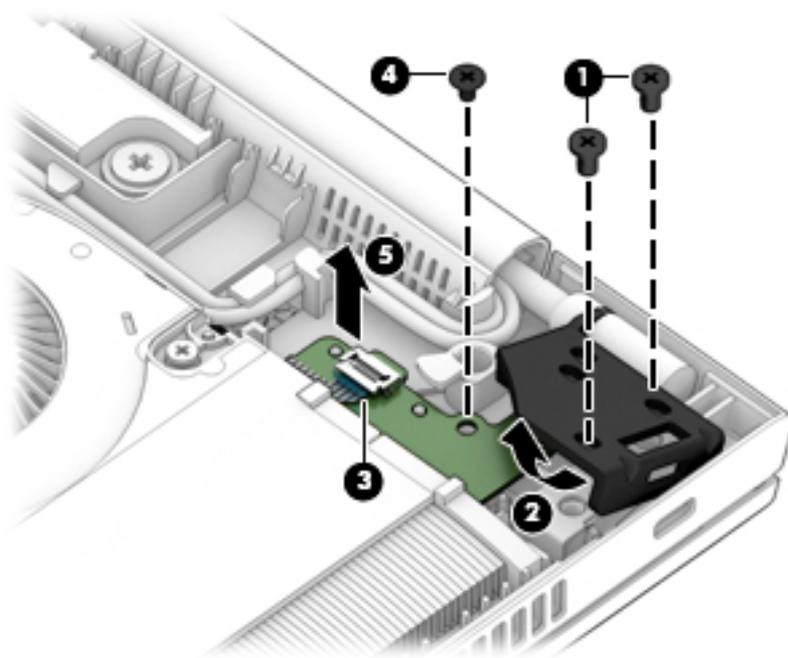
1. Prepare the computer for disassembly ([Preparation for disassembly on page 32](#)).
2. Remove the bottom cover (see [Bottom cover on page 32](#)).
3. Disconnect the battery cable from the system board (see [Battery on page 44](#)).

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 × 4.0 screws **(1)** that secure the right display hinge, and then rotate the hinge upward from 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

Table 6-7 Speaker assembly description and part number

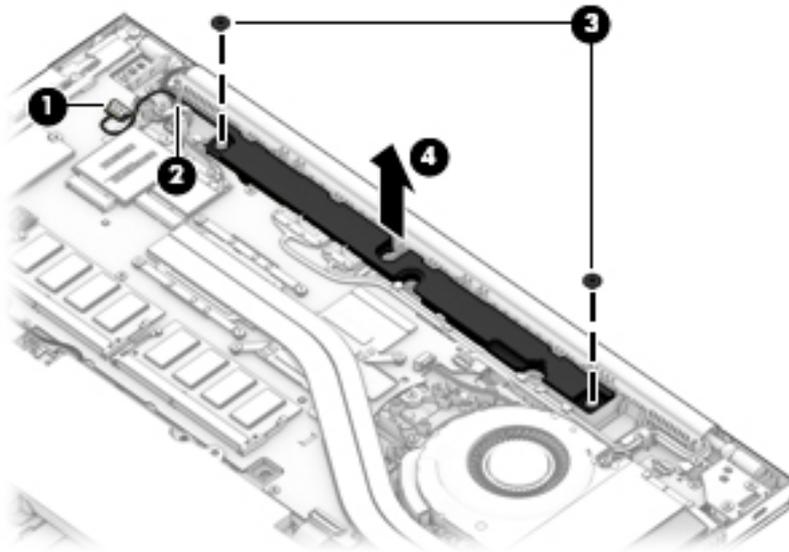
Description	Spare part number
Speaker assembly (includes cable)	L14368-001

Before removing the speaker assembly, follow these steps:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 32](#)).
2. Remove the bottom cover (see [Bottom cover on page 32](#)).
3. Disconnect the battery cable from the system board (see [Battery on page 44](#)).

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 × 2.0 screws **(3)** that secure the speaker to the computer.
3. Remove the speaker from the computer **(4)**.



Reverse this procedure to install the speaker.

Touchpad

Table 6-8 Touchpad descriptions and part numbers

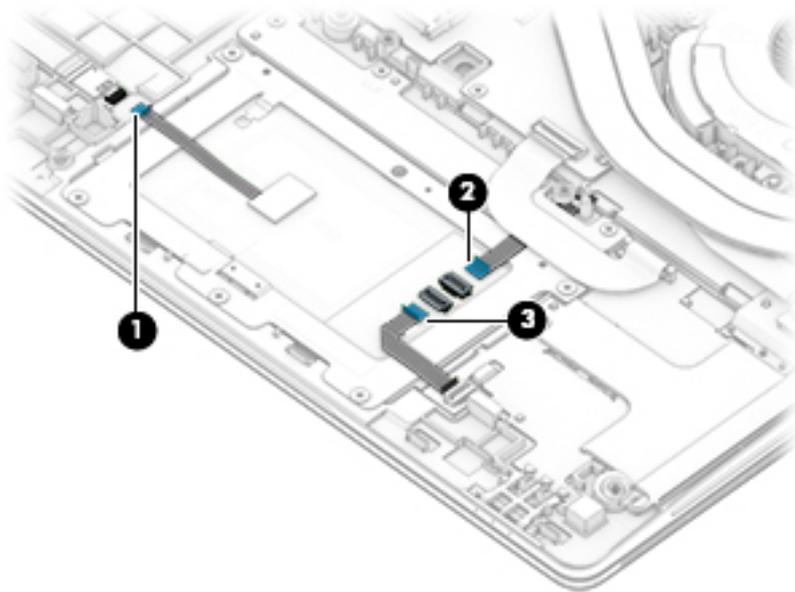
Description	Spare part number
Touchpad for use in models without an NFC module	L63368-001
Touchpad for use in models with an NFC module	L63369-001

Before removing the touchpad, follow these steps:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 32](#)).
2. Remove the bottom cover (see [Bottom cover on page 32](#)).
3. Remove the battery (see [Battery on page 44](#)).

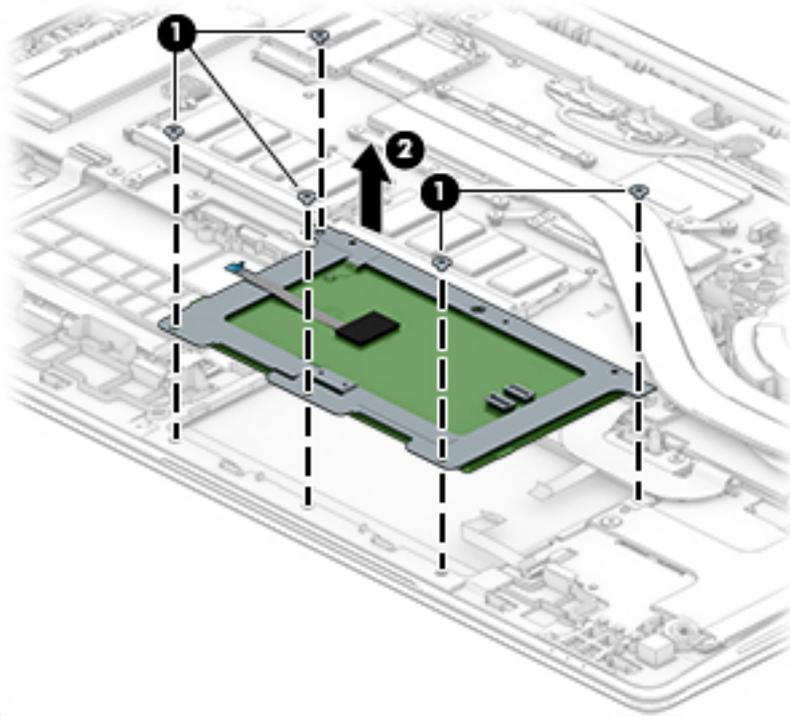
Remove the touchpad:

1. Disconnect the NFC module cable from the ZIF connector on the NFC module **(1)**.
2. Disconnect the pointing stick module 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 M2.0 × 2.0 screws **(1)** that secure the touchpad to the computer.

5. Remove the touchpad from the computer (2).



Reverse this procedure to install the touchpad.

Pointing stick module

Table 6-9 Pointing stick module description and part number

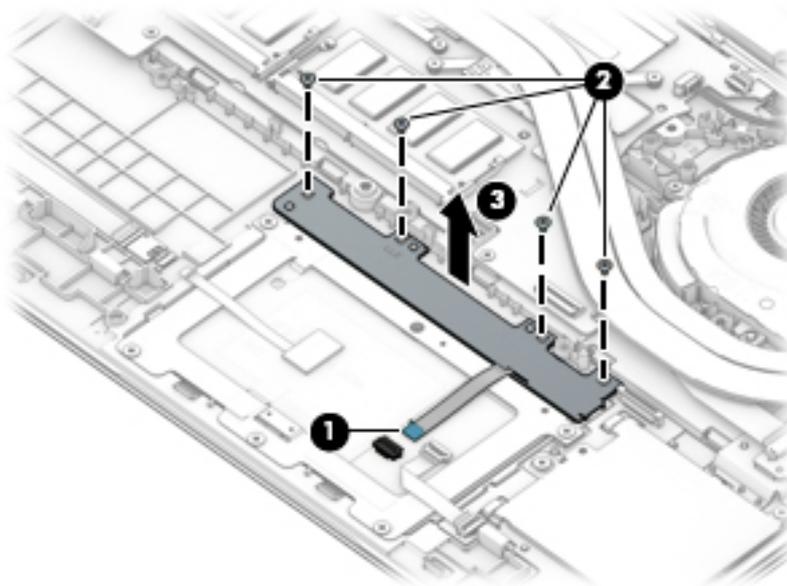
Description	Spare part number
Pointing stick module (includes buttons, board, and bracket)	L16643-001

Before removing the pointing stick module, follow these steps:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 32](#)).
2. Remove the bottom cover (see [Bottom cover on page 32](#)).
3. Remove the battery (see [Battery on page 44](#)).

Remove the pointing stick module:

1. Disconnect the pointing stick module cable from the ZIF connector on the touchpad **(1)**.
2. Remove the four Phillips M2.0 × 2.0 screws **(2)** that secure the module to the computer, and then remove the module from the computer **(3)**.



Reverse this procedure to install the pointing stick module.

NFC module

Table 6-10 NFC module description and part number

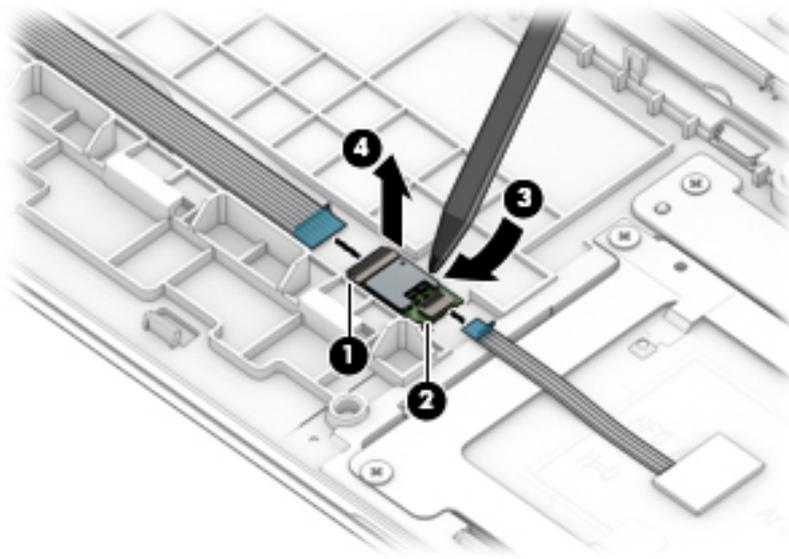
Description	Spare part number
NFC module (includes antenna and touchpad foam)	L14385-001

Before removing the NFC module, follow these steps:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 32](#)).
2. Remove the bottom cover (see [Bottom cover on page 32](#)).
3. Remove the battery (see [Battery on page 44](#)).

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

Table 6-11 Smart card reader and cable descriptions and part numbers

Description	Spare part number
Smart card reader	L62733-001
Smart card reader pass-thru board (for use in models without a smart card)	L62743-001
NOTE: This board provides cable pass through capability for models without a smart card.	
Smart card reader cable (available in Cable Kit)	L63364-001 (Cable Kit)

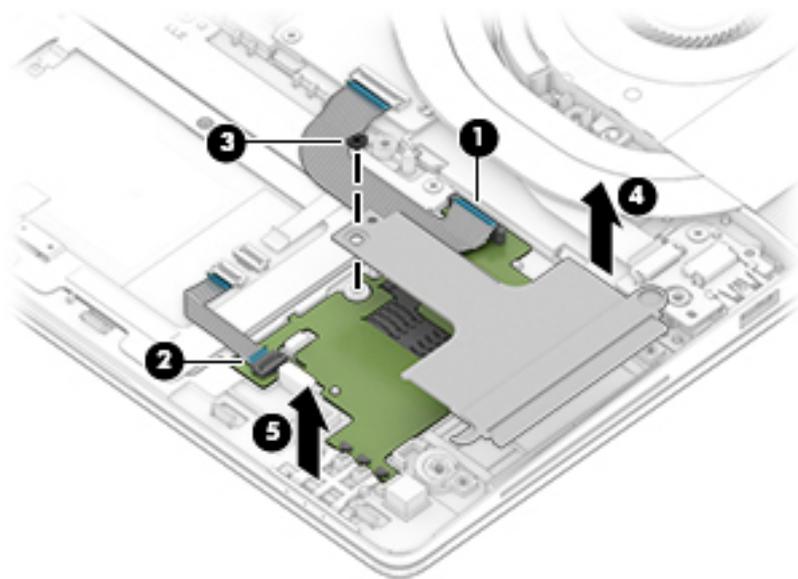
Before removing the card reader, follow these steps:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 32](#)).
2. Remove the bottom cover (see [Bottom cover on page 32](#)).
3. Remove the battery (see [Battery on page 44](#)).

Remove the smart card reader:

 **NOTE:** Before you remove the smart card reader, make sure nothing (memory card or plastic insert) is 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 M2.0 × 2.5 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

Table 6-12 Fan description and part number

Description	Spare part number
Fan	L65691-001

Before removing the fan, follow these steps:

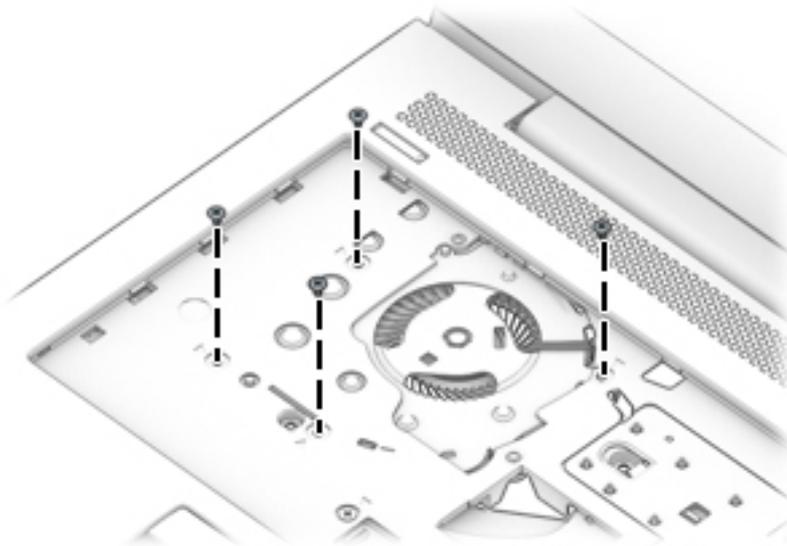
1. Prepare the computer for disassembly ([Preparation for disassembly on page 32](#)).
2. Remove the bottom cover (see [Bottom cover on page 32](#)).
3. Remove the battery (see [Battery on page 44](#)).
4. Remove the keyboard (see [Keyboard on page 40](#)).

Remove the fan:



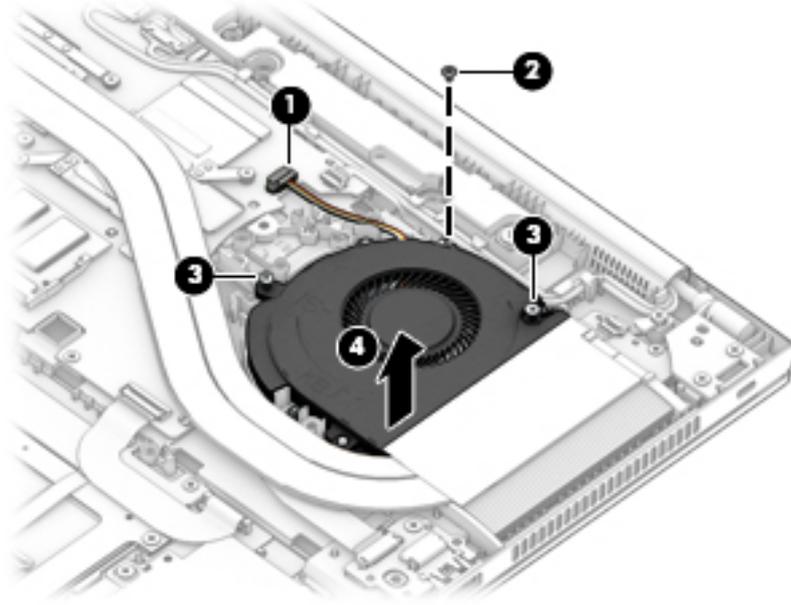
NOTE: To remove the fan you must remove screws from both the top (under the keyboard) and bottom of the computer.

1. Position the computer upright and open as far as possible.
2. Remove the four 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. Remove the Phillips M2.0 × 3.0 screw **(2)** that secures the fan to the computer.
6. Loosen the two captive Phillips screws **(3)** that secure the fan to the computer.

7. Remove the fan from the computer (4).



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

Table 6-13 System board descriptions and part numbers

Description	Spare part number
System board for use in models with discrete graphics memory (includes integrated processor)	
Intel i7-8665U processor	L62755-xx1
Intel i7-8565U processor	L62753-xx1
Intel i5-8365U processor	L62754-xx1
Intel i5-8265U processor	L62752-xx1
System board for use in models with UMA graphics memory (includes integrated processor)	
Intel i7-8665U processor	L62760-001
Intel i7-8565U processor	L62758-001
Intel i5-8365U processor	L62759-001
Intel i5-8265U processor	L62757-001

Before removing the system board, follow these steps:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 32](#)).
2. Remove the bottom cover (see [Bottom cover on page 32](#)).
3. Remove the battery (see [Battery on page 44](#)).
4. Remove the keyboard (see [Keyboard on page 40](#)).
5. Remove the RJ-45 board and bracket (see [RJ-45 board with bracket on page 51](#)).
6. Remove the fan (see [Fan on page 59](#)).

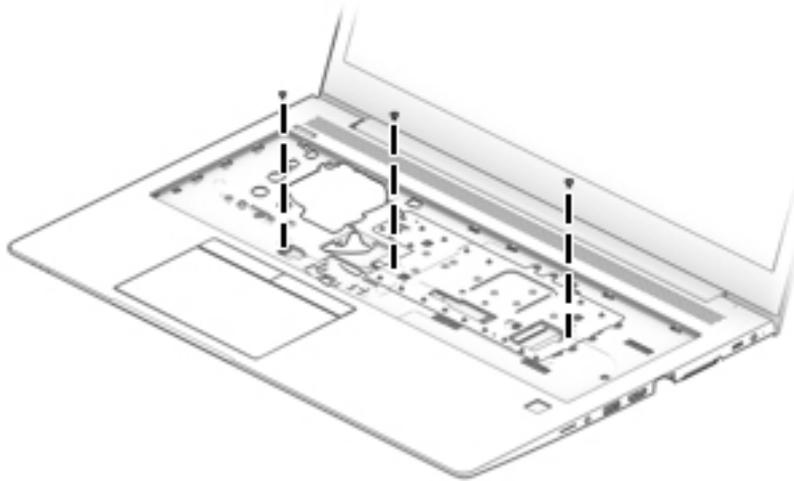
When replacing the system board, be sure to remove the following components (as applicable) from the defective system board and install on the replacement system board:

- 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 36](#))
- WWAN module (see [WWAN module on page 38](#))
- Heat sink (see [Heat sink assembly on page 46](#))

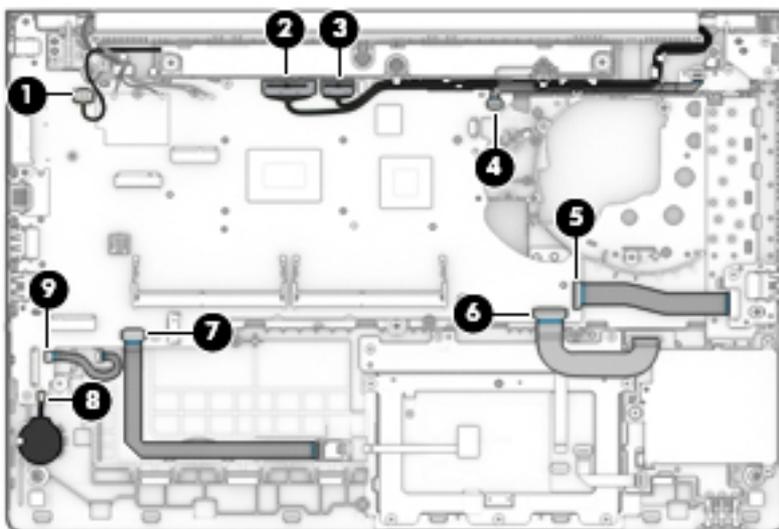
Remove the system board:

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

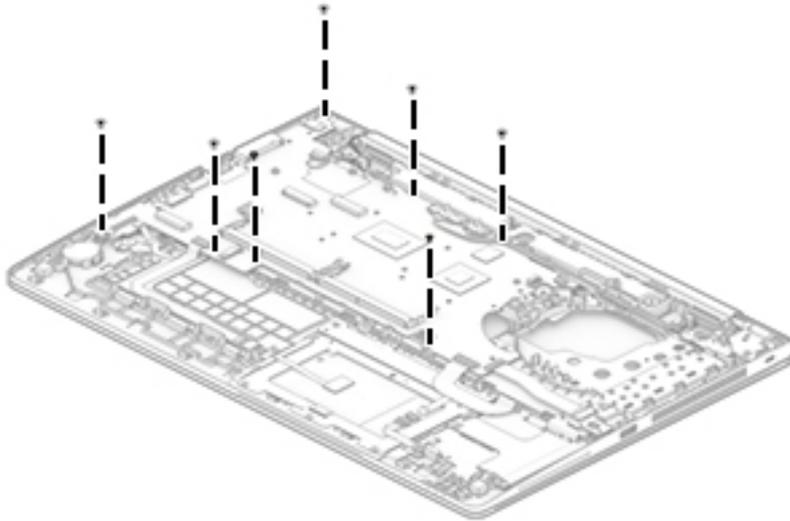
2. Remove the three Phillips M2.5 × 3.0 screws that secure the system board to the computer.



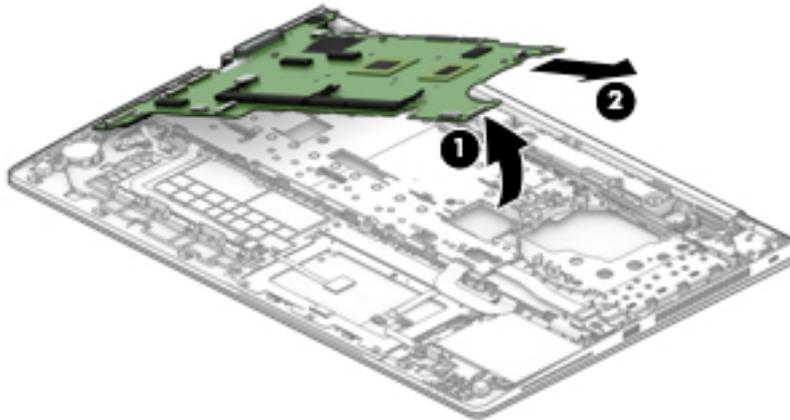
3. Close the computer and position it upside down.
4. Disconnect the following cables from the system board:
 - (1) Speaker cable
 - (2) Display cable
 - (3) Camera cable
 - (4) Power button board cable
 - (5) USB cable
 - (6) Smart card reader cable
 - (7) NFC module cable (select products only)
 - (8) RTC battery cable
 - (9) Fingerprint reader cable



5. Remove the seven 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 release the connectors from the left side of the computer, and then remove the system board (2).



Reverse this procedure to install the system board.

Fingerprint reader assembly

Table 6-14 Fingerprint reader and bracket descriptions and part numbers

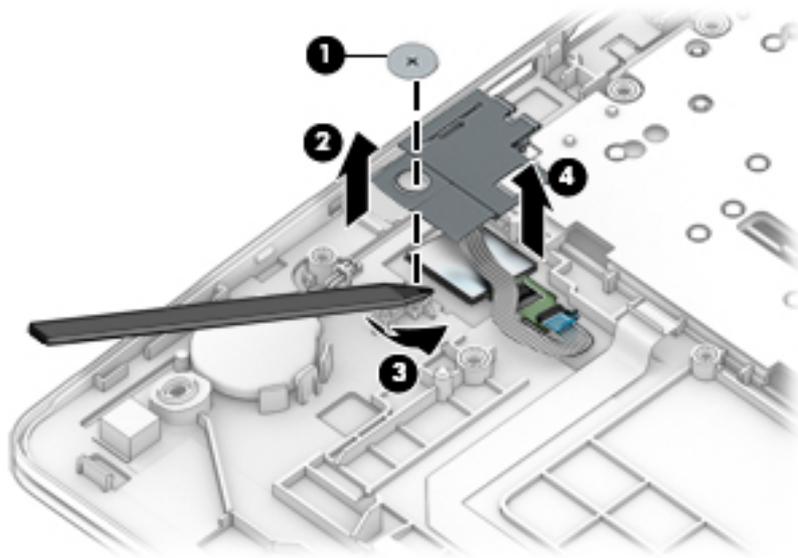
Description	Spare part number
Fingerprint reader assembly (includes cable)	L63365-001
Fingerprint reader bracket	L63367-001

Before removing the fingerprint reader assembly, follow these steps:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 32](#)).
2. Remove the bottom cover (see [Bottom cover on page 32](#)).
3. Remove the battery (see [Battery on page 44](#)).
4. Remove the keyboard (see [Keyboard on page 40](#)).
5. Remove the RJ-45 board and bracket (see [RJ-45 board with bracket on page 51](#)).
6. Remove the fan (see [Fan on page 59](#)).
7. Remove the system board (see [System board on page 61](#)).

Remove the fingerprint reader assembly:

1. Remove the Phillips M2.0 × 2.0 screw **(1)** that secures the fingerprint reader bracket to the computer.
2. Lift the bracket from the fingerprint reader assembly **(2)**.
3. Use a tool to loosen the fingerprint reader board **(3)**, and then remove the assembly from the computer **(4)**.



Reverse this procedure to install the fingerprint reader assembly.

Display assembly

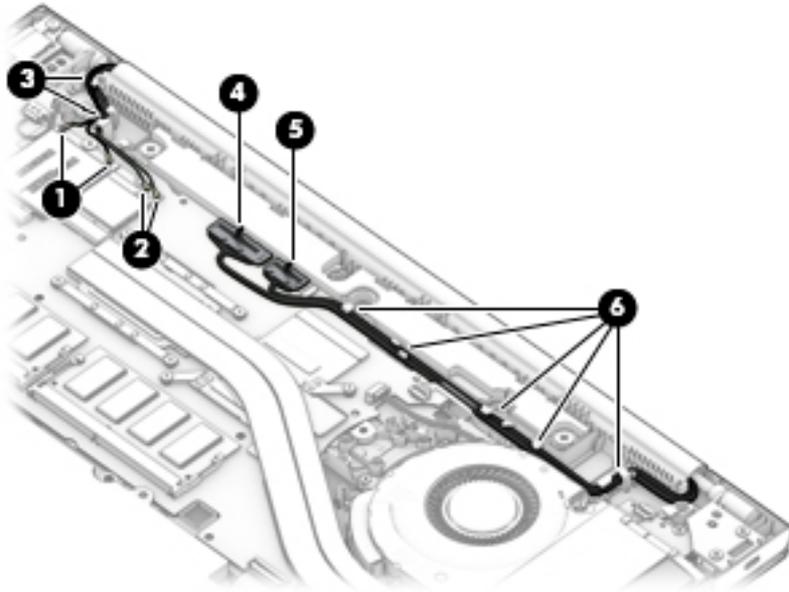
 **NOTE:** Displays are not available as whole assemblies – only subcomponent spare parts are available. Additional display assembly spare part information is available at [Display assembly subcomponents on page 23](#).

Before removing the display assembly, follow these steps:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 32](#)).
2. Remove the bottom cover (see [Bottom cover on page 32](#)).
3. Disconnect the battery cable from the system board (see [Battery on page 44](#)).

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)**.

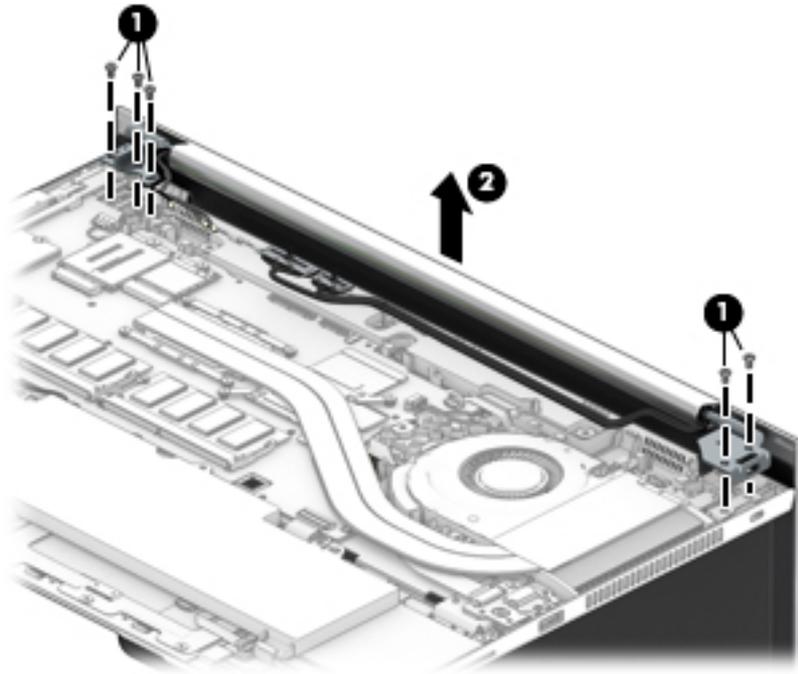


5. With the computer upside down, open the display, and then place the computer on a table with the display positioned off the edge of the table.
6. Remove the five Phillips M2.5 × 4.0 screws **(1)** from the display hinges.

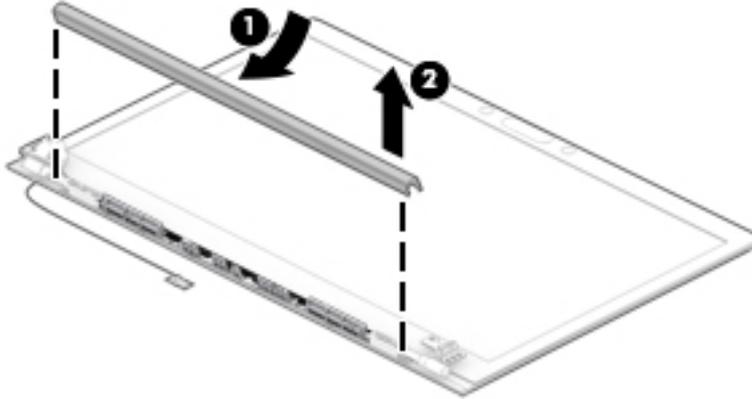
7. Lift the display assembly straight up and remove it (2).

 **IMPORTANT:** 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.

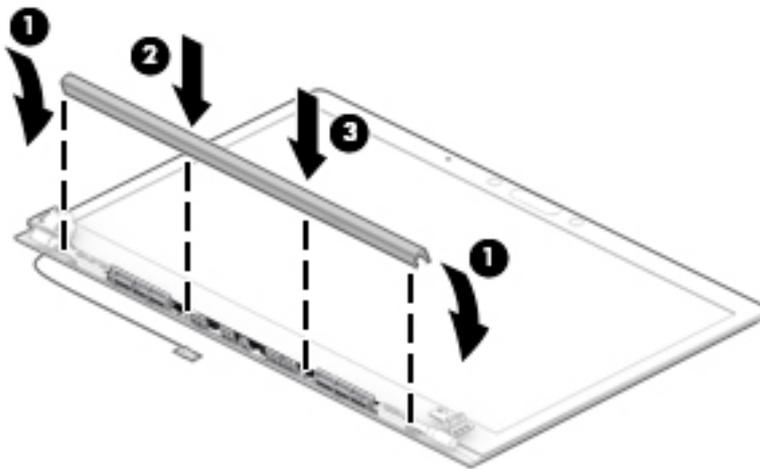


8. To remove the display hinge cover, rotate top of hinge cover away from display enclosure to release the tabs **(1)**, and then pull the cover off the enclosure **(2)**.



The display hinge cover for non-touch displays is available in the Hinge Kit as spare part number L14364-001. The display hinge cover for touch displays is available as spare part number L14365-001.

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 releases from the display enclosure.

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

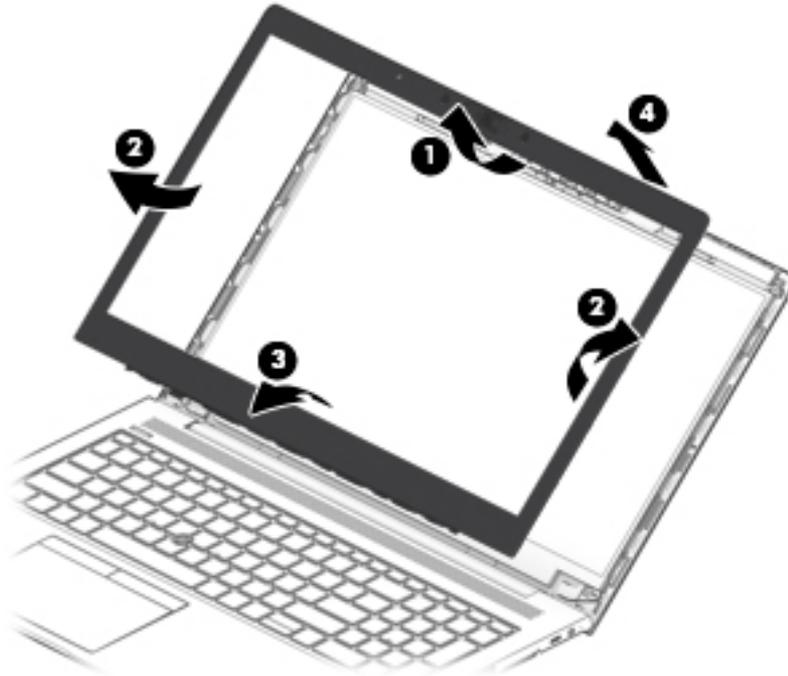
The display bezel is available using the following spare part numbers:

Models with a microphone module: L63360-001

Models with an HD camera: L63361-001

Models with an IR camera: L63362-001

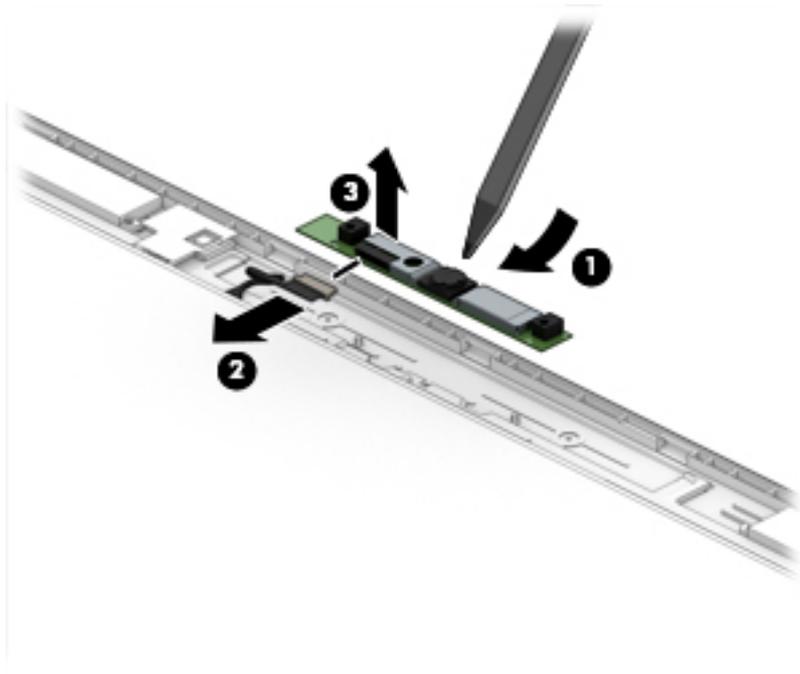
Models with an IR camera and an ambient light sensor: L63363-001



11. Two different camera modules are available. Refer to the following procedure appropriate for your computer if it is necessary to replace the camera module:

a. HD camera or microphone module

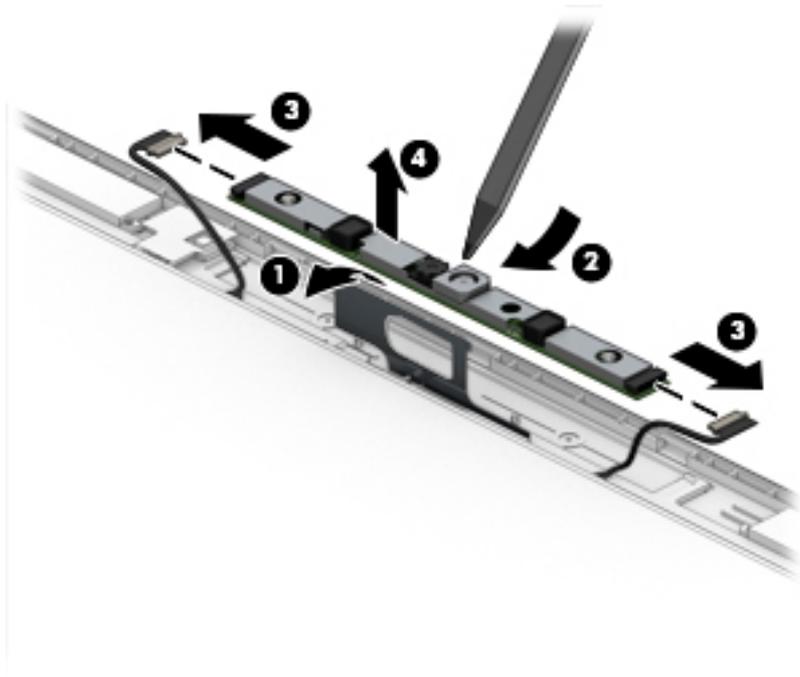
Lift upward to release the module from the adhesive on the display enclosure **(1)**, disconnect the cable from the module **(2)**, and then remove the module from the display **(3)**.



The HD camera module is available as spare part number L62742-001. The microphone module is available as spare part number L62744-001.

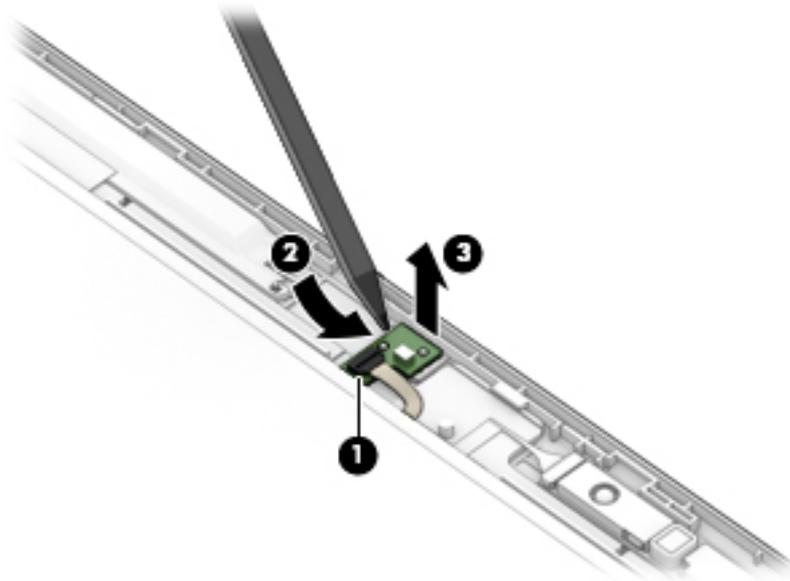
b. IR camera

Remove the tape from the module (1), lift upward to release 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 as spare part number L64702-001.

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



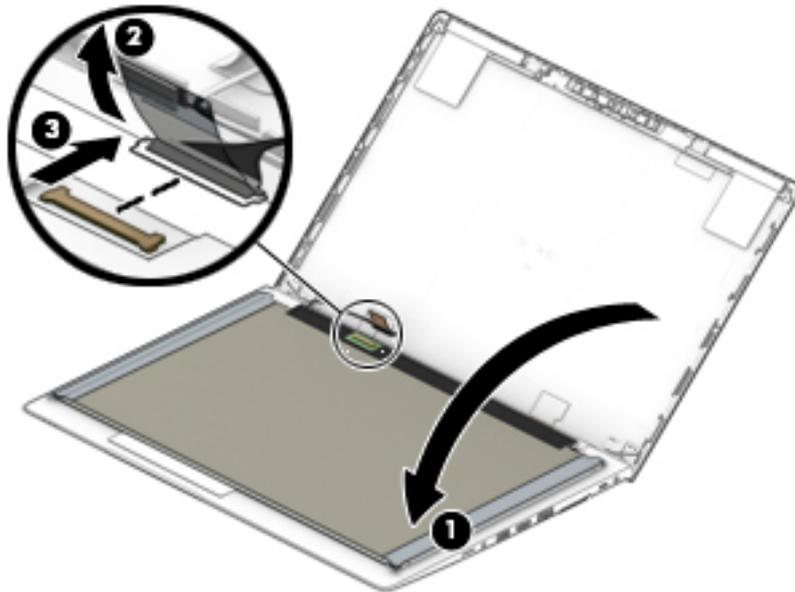
The ambient light sensor board is available as spare part number L62745-001.

13. If it is necessary to remove the display panel from the enclosure, remove the four Phillips M2.0 × 2.0 screws that secure the panel to the display enclosure.



14. Rotate the display panel over onto the keyboard **(1)**.

15. On the back of the display panel, lift the tape from the connector **(2)**, and then disconnect the display cable from the rear of the panel **(3)**.



The raw display panel is available using the following spare part numbers:

 **NOTE:** Display panel kits include panel, touch module (as applicable), display cable, and interior panel bezel.

UHD panel: L62784-001

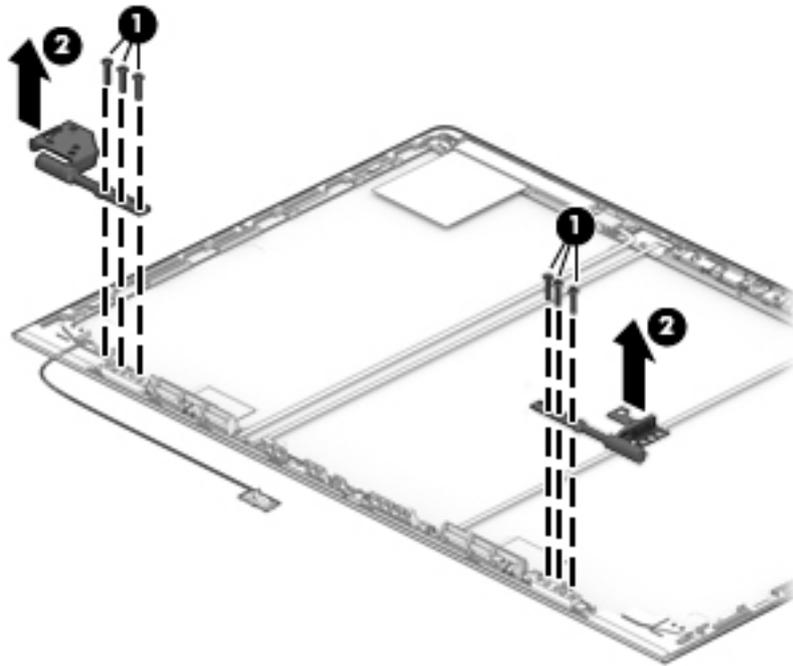
FHD panel, non-touch, non-privacy, 250 nits: L62781-001

FHD panel, non-touch, non-privacy, 400 nits: L16641-001

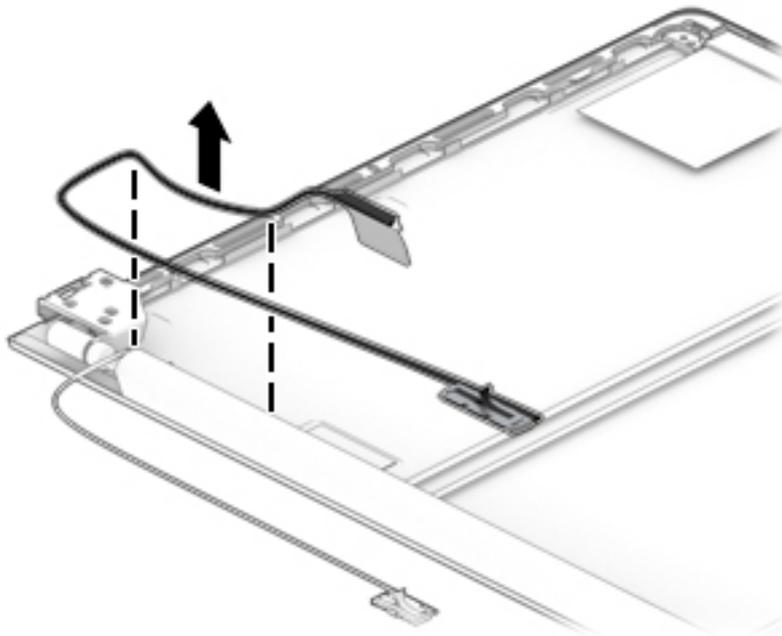
FHD panel, 250 nits, Touch-on Panel (TOP): L62783-001

16. If it is necessary to replace the display hinges, remove the three Phillips M2.5 × 11.0 screws that secure each hinge (1), and then remove the hinges from the display enclosure (2).

Display hinges for touch displays are available in the Hinge Kit as spare part number L14364-001.
Display hinges for non-touch displays are available as spare part number L14365-001.



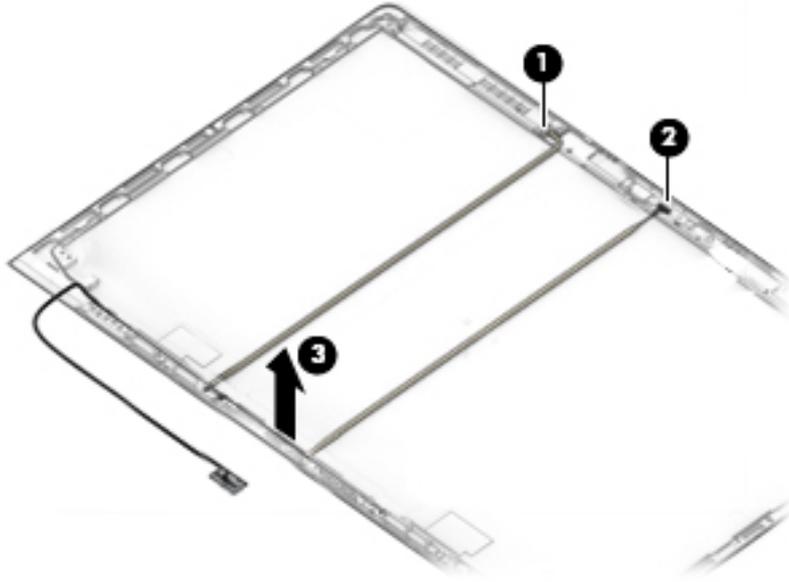
17. If it is necessary to replace the display cable, lift the cable from the routing path in the display enclosure.
The display cable is available in the Cable Kit as spare part number L63364-001.



18. If it is necessary to replace the camera/ambient light sensor cable:

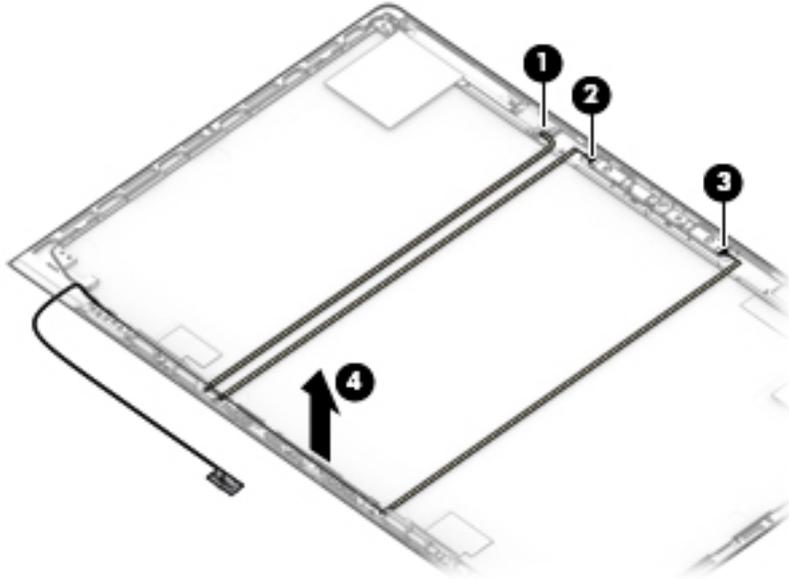
a. HD camera models

Disconnect the cable from the ambient light sensor board **(1)** and from the HD camera **(2)**, and then remove the cable from the display enclosure **(3)**.



b. IR camera models

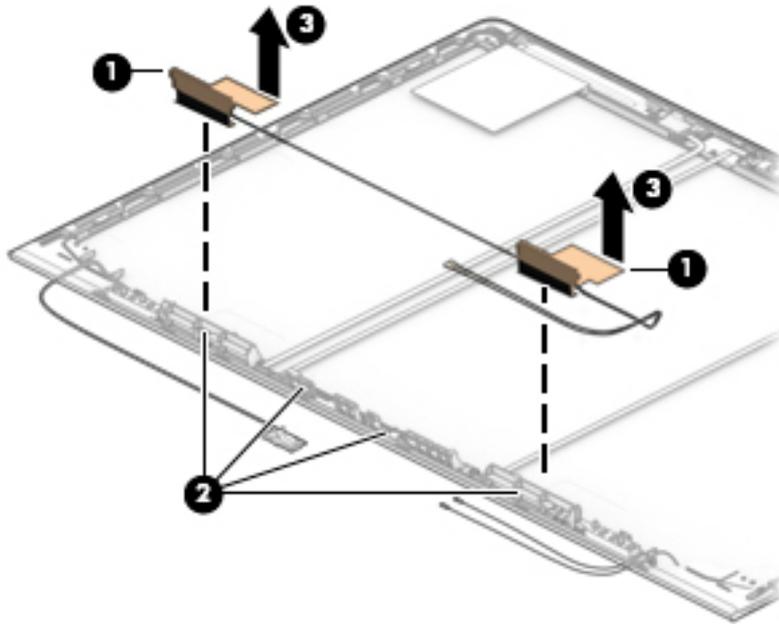
Disconnect the cable from the ambient light sensor board **(1)**, from the left **(2)** and right **(3)** sides of the IR camera, and then remove the cable from the display enclosure **(4)**.



The camera cable is available in the Cable Kit as spare part number L63364-001.

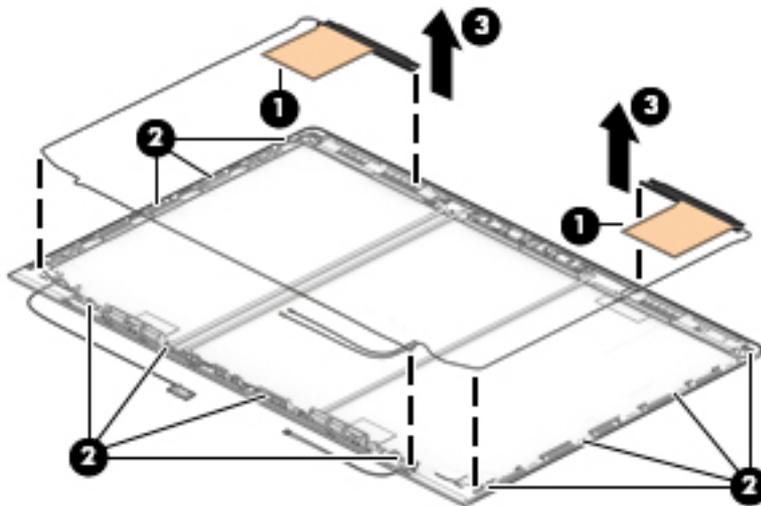
19. If it is necessary to replace the WLAN antenna cables, peel the antennas from the top of the display enclosure (1), remove the antenna cables from the routing path on the bottom of the display enclosure (2), and then remove the antenna cables (3).

 **NOTE:** The WLAN antennas are available with the display enclosure.



20. 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 available with the display enclosure.



The display enclosure is available as spare part number L63358-001.

Reverse this procedure to reassemble and install the display assembly.

Top cover

Table 6-15 Top cover description and part number

Description	Spare part number
Top cover	L63370-001

The top cover remains after removing all other spare 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 you want an analysis of the event that caused Sure Start recovery, 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.

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, choose one of the following methods:

- To exit Computer Setup menus without saving your changes, select **Main**, select **Ignore Changes and Exit**, and then select **Yes**.

 **NOTE:** If you are using arrow keys to highlight your choice, you must then press **enter**.

- To save your changes and exit Computer Setup menus, select **Main**, select **Save Changes and Exit**, and then select **Yes**.

 **NOTE:** If you are using arrow keys to highlight your choice, you must then press **enter**.

Your changes go into effect when the computer restarts.

Restoring factory settings in Computer Setup

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

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

1. Start Computer Setup. See [Starting Computer Setup on page 78](#).
2. Select **Main**, select **Apply Factory Defaults and Exit**, and then select **Yes**.

 **NOTE:** If you are using arrow keys to highlight your choice, you must then press **enter**.

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

Your changes go into effect when the computer restarts.

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

Updating the BIOS

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

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

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

Determining the BIOS version

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

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

1. Start Computer Setup. See [Starting Computer Setup on page 78](#).
2. Select **Main**, and then select **System Information**.
3. To exit Computer Setup menus without saving your changes, select **Main**, select **Ignore Changes and Exit**, and then select **Yes**.

 **NOTE:** If you are using arrow keys to highlight your choice, you must then press **enter**.

To check for later BIOS versions, see [Downloading a BIOS update on page 79](#).

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 78](#).
2. Select **Security**, select **TPM Embedded Security**, and then follow the on-screen instructions.

Using HP Sure Start (select products only)

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

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

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

9 Using HP PC Hardware Diagnostics

Using HP PC Hardware Diagnostics Windows (select products only)

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 82](#).

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. Select **HP PC Hardware Diagnostics Windows**.

– 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**.

When HP PC Hardware Diagnostics Windows detects a failure that requires hardware replacement, a 24-digit Failure ID code is generated. The screen displays one of the following options:

- A Failure ID link is displayed. Select the link and follow the on-screen instructions.
- A Quick Response (QR) code is displayed. With a mobile device, scan the code and then follow the on-screen instructions.
- Instructions for calling support are displayed. Follow those instructions.

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. Select **Download HP Diagnostics Windows**, and then select a location on your computer or a USB flash drive.

The tool is downloaded to the selected location.

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, follow these steps:

1. Go to <http://www.hp.com/support>.
2. Select **Get software and drivers**, select your type of product, and then enter the product name or number in the search box that is displayed.
3. In the **Diagnostics** section, select **Download**, and then follow the on-screen instructions to select the specific Windows diagnostics version to be downloaded to your computer or USB flash drive.

The tool is downloaded to the selected location.

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 USB 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

 **NOTE:** For Windows 10 S computers, you must use a Windows computer and a USB flash drive to download and create the HP UEFI support environment because only .exe files are provided. For more information, see [Downloading HP PC Hardware Diagnostics UEFI to a USB flash drive on page 84](#).

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 Windows detects a failure that requires hardware replacement, a 24-digit Failure ID code is generated. For assistance in solving the problem:

- ▲ Select **Get Support**, and then use a mobile device to scan the QR code that displays on the next screen. The HP Customer Support - Service Center page displays, with your Failure ID and product number automatically filled in. Follow the on-screen instructions.

– or –

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 84](#).

- b. Hard drive

- c. BIOS

3. When the diagnostic tool opens, select a language, 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. Select **Download HP Diagnostics UEFI**, 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 about 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. 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**, select your type of product, enter the product name or number in the search box that is displayed, 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 87](#)).
- **Creating a restore point**—You can use Windows tools to create a restore point (see [Using Windows tools on page 87](#)).
- **Creating recovery media** (select products only)—You can use the HP Cloud Recovery Download Tool (select products only) to create recovery media (see [Using the HP Cloud Recovery Download Tool to create recovery media \(select products only\) on page 87](#)).
- **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 87](#)).

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

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

Backing up information and creating recovery media

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.

 **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.

1. Select the **Start** button, and then select the **Get Help** app.
2. Enter the task you want to perform.

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

Using the HP Cloud Recovery Download Tool to create recovery media (select products only)

You can use the HP Cloud Recovery Download Tool to create HP Recovery media on a bootable USB flash drive.

To download the tool:

- ▲ Go to the Microsoft Store and search for HP Cloud Recovery.

For details, go to <http://www.hp.com/support>, search for HP Cloud Recovery, and then select "HP PCs – Using the Cloud Recovery Tool (Windows 10, 7)."



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.

Restoring and recovery

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 87](#).

Recovering using HP Recovery media

HP Recovery media is used to recover the original operating system and software programs that were installed at the factory. On select products, it can be created on a bootable USB flash drive using the HP Cloud Recovery Download Tool. For details, see [Using the HP Cloud Recovery Download Tool to create recovery media \(select products only\) on page 87](#).



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.

To recover your system:

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

Changing the computer boot order

If your computer does not restart using the HP Recovery media, 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.

11 Specifications

Computer specifications

Table 11-1 Computer specifications

	Metric	U.S.
Dimensions		
Depth	251.7 mm	9.91 in.
Width	370.8 mm	14.60 in.
Height (non-touch)	18.3 mm	0.72 in.
Height (touch)	18.6 mm	0.73 in.
Weight		
Models with UHD display	1.78 kg	3.94 lbs
Models with FHD display	1.89 kg	4.16 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	0°C to 35°C	32°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.

39.6 cm (15.6 in.) display specifications

Table 11-2 Display specifications

	Metric	U.S.
Active diagonal size	39.6 cm	15.6 in.
Resolution	FHD: 1920 × 1080 UHD: 3840 × 2160	
Surface treatment	Anti-glare (except touch screen)	
Brightness	FHD (45% CG): 250 nits FHD (72% CG): 400 nits UHD: 400 nits	
Viewing angle	UWVA	
Backlight	LED	
Aspect ratio	16:9	
Display panel interface	eDP (250 nit) eDP + PSR (400 nit)	

M.2 PCIe solid-state drive specifications

Table 11-3 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 sec	1.0 sec	1.0 sec
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.			

M.2 SATA solid-state drive specifications

Table 11-4 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.

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 V ac, or from 220 to 240 V 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 or regions must meet the requirements of the country and 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 A 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

Table 12-1 Power cord requirements for specific countries and regions

Country/region	Accredited agency	Applicable note number
Argentina	IRAM	1
Australia	SAA	1
Austria	OVE	1
Belgium	CEBEC	1
Brazil	ABNT	1
Canada	CSA	2
Chile	IMQ	1
Denmark	DEMKO	1
Finland	FIMKO	1
France	UTE	1
Germany	VDE	1
India	BIS	1
Israel	SII	1
Italy	IMQ	1
Japan	JIS	3
The Netherlands	KEMA	1
New Zealand	SANZ	1
Norway	NEMKO	1
The People's Republic of China	CCC	4
Saudi Arabia	SASO	7
Singapore	PSB	1
South Africa	SABS	1
South Korea	KTL	5
Sweden	SEMKO	1
Switzerland	SEV	1
Taiwan	BSMI	6
Thailand	TISI	1
The United Kingdom	ASTA	1
The United States	UL	2

1. The flexible cord must be Type H05VV-F, 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.

Table 12-1 Power cord requirements for specific countries and regions (continued)

Country/region	Accredited agency	Applicable note number
		2. The flexible cord must be Type SVT/SJT 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 ac) or NEMA 6-15P (15 A, 250 V ac) configuration. CSA or C-UL mark. UL file number must be on each element.
		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 VCTF, 3-conductor, 0.75 mm ² or 1.25 mm ² conductor size. The wall plug must be a two-pole grounding type with a Japanese Industrial Standard C8303 (7 A, 125 V ac) configuration.
		4. The flexible cord must be Type RVV, 3-conductor, 0.75 mm ² conductor size. Power cord set fittings (appliance coupler and wall plug) must bear the CCC certification mark.
		5. The flexible cord must be Type H05VV-F 3-conductor, 0.75 mm ² conductor size. KTL logo and individual approval number must be on each element. Corset approval number and logo must be printed on a flag label.
		6. The flexible cord must be Type HVCTF 3-conductor, 1.25 mm ² conductor size. Power cord set fittings (appliance coupler, cable, and wall plug) must bear the BSMI certification mark.
		7. For 127 V ac, the flexible cord must be Type SVT or SJT 3-conductor, 18 AWG, with plug NEMA 5-15P (15 A, 125 V ac), with UL and CSA or C-UL marks. For 240 V ac, the flexible cord must be Type H05VV-F 3-conductor, 0.75 mm ² or 1.0 mm ² conductor size, with plug BS 1363/A with BSI or ASTA marks.

13 Statement of memory volatility

The purpose of this chapter is to provide general information regarding nonvolatile memory in HP Business computers. 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 computer 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 computer 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 computer, 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.

 **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 Utilities**.
 - 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 using the following Disk Sanitizer commands 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 Utilities**.
- 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

Table 13-1 Troubleshooting steps for 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)	8 MB	No	Yes	Provides protected backup of critical System BIOS code, EC firmware, and critical computer configuration data for select platforms that support HP Sure Start. For more information, see Using HP Sure Start (select models only) on page 101 .	Data cannot be written to this device via the host processor. The content is managed solely by the HP Sure Start Embedded Controller.	This memory is protected by the HP Sure Start Embedded Controller.
Real Time Clock (RTC) battery backed-up CMOS configuration memory	256 bytes	No	Yes	Stores system date and time and noncritical data.	RTC battery backed-up CMOS is programmed using Computer Setup (BIOS), or by changing the Microsoft® Windows date & time.	This memory is not write-protected.
Controller (NIC) EEPROM	64 KB (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 must be used 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 (not customer accessible)	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 computer. The specific write-protection method varies by memory vendor.

Table 13-1 Troubleshooting steps for nonvolatile memory usage (continued)

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?
System BIOS	9 MB	Yes	Yes	Stores system BIOS code and computer 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 computer non-functional. A utility must be used 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 only in select Elite or Z models. For more information, go to http://www.hp.com/support . Select Find your product , and then follow the on-screen instructions.)	1.5 MB or 7 MB	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 must be used for updating the firmware. Only firmware updates digitally signed by Intel can be applied using this utility.
Bluetooth flash (select products only)	2 Mb	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 must be used 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 Kb to 8 Kb	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 must be used 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.
Webcam (select products only)	64 Kb	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 must be used for writing data to this memory and is typically not made available to the public unless a firmware

Table 13-1 Troubleshooting steps for nonvolatile memory usage (continued)

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?
Fingerprint reader (select products only)	512 KB flash	Yes	Yes	Stores fingerprint templates.	Fingerprint reader memory is programmed by user enrollment in HP ProtectTools Security Manager.	upgrade is necessary to address a unique issue. 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.

- 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.
- Select **Main**, and then select **Apply Factory Defaults and Exit**.
- Follow the on-screen instructions.
- 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 (touch screen, 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 must be used 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 computer. Third-party tools do exist that can write to the EEPROM when the memory module is not installed in a computer. 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 computer 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 Security to Factory Defaults**.
- c. Follow the on-screen instructions.
- d. Select **Main**, select **Save Changes and Exit**, and then follow the on-screen instructions.

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

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

- a. Turn on or restart the computer, and then press **esc** while the “Press the ESC key for Startup Menu” message is displayed at the bottom of the screen.
- b. Select the **Security** menu, select **Secure Boot Configuration**, and then follow the on-screen instructions.
- c. At the **Secure Boot Configuration** window, select **Secure Boot**, select **Clear Secure Boot Keys**, and then follow the on-screen instructions to continue.

Using HP Sure Start (select models only)

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

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

14 Recycling

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

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

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