Maintenance and Service Guide

HP ProBook 640 G5 Notebook PC

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.

To access the latest user guides, go to http://www.hp.com/support, and follow the instructions to find your product. Then select **User Guides**.

Important Notice about Customer Self-Repair Parts

IMPORTANT: Your computer includes Customer Self-Repair parts and parts that should be accessed by only 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 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 640 ProBook G5 Notebook PC
Processor	**8th-generation Intel® Core™ processors**
	Intel Core i7-8665U (1.9 GHz, turbo up to 4.8 GHz, 8 MB SmartCache, quad core, 15 W; Intel UHD Graphics 620)
	Intel Core i7-8565U (1.8 GHz, turbo up to 4.6 GHz, 8 MB SmartCache, quad core, 15 W; Intel UHD Graphics 620)
	Intel Core i5-8365U (1.6 GHz, turbo up to 4.1 GHz, 6 MB SmartCache, quad core, 15 W; Intel UHD Graphics 620)
	Intel Core i5-8265U (1.6 GHz, turbo up to 3.9 GHz, 6 MB SmartCache, quad core, 15 W; Intel UHD Graphics 620)
	Intel Core i3-8145U (2.1 GHz, turbo up to 3.9 GHz, 4 MB SmartCache, dual core, 15 W; Intel UHD Graphics 620)
Graphics	**Internal graphics**
	Intel UHD Graphics 620
	External graphics
	AMD® Radeon™ 540X with 2 GB of discrete graphics memory
	Supports HD decode, DX12, HDMI 1.4, DisplayPort™ 1.2, HDCP 2.2 via DisplayPort up to 4k @ 60 Hz and via HDMI up to 4K @ 30 Hz
	Up to three independent displays supported with HP Ultraslim Docking Station and HP Thunderbolt Dock 120 W G2
Panel	**35.6 cm (14.0 in), antiglare, slim, non-touch**
	High definition (HD) (1366 × 768), SVA, 45% CG, 220 nits, eDP, without camera
	HD (1366 × 768), SVA, 45% CG, 220 nits, eDP, with camera
	HD (1366 × 768), SVA, 45% CG, 220 nits, eDP, without camera, with WWAN
	HD (1366 × 768), SVA, 45% CG, 220 nits, eDP, with camera, with WWAN
	Full high-definition (FHD) (1920 × 1080), UWVA, 45% CG, 250 nits, eDP, without camera
	FHD (1920 × 1080), UWVA, 45% CG, 250 nits, eDP, with camera
	FHD (1920 × 1080), UWVA, 45% CG, 250 nits, eDP, with WWAN, without camera
	FHD (1920 × 1080), UWVA, 45% CG, 250 nits, eDP, with WWAN, with camera
	FHD (1920 × 1080), UWVA, 72% CG, 700 nits, eDP + PSR, with WWAN, with camera, with privacy screen
	35.6 cm (14.0 in), slim, touch screen
	FHD (1920 × 1080), UWVA, 45% CG, 250 nits, eDP, with WWAN, with camera

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

Category	Description
Memory	Two memory module slots
	Memory is customer accessible/upgradeable
	DDR4-2400, dual-channel support
	Supports up to 32 GB of system RAM in the following configurations:
	• 32768 MB (16384 MB × 2)
	• 16384 MB (16384 MB × 1) or (8192 MB × 2)
	• 12288 MB (8192 MB × 1 + 4096 MB × 1)
	• 8192 MB (8192 MB × 1 or 4096 MB × 2)
	• 4096 MB (4096 MB × 1)
	Brazil DDR4-2400 memory module requirements
	• 16384 MB (8192 MB × 2)
	• 8192 MB (8192 MB × 1 or 4096 MB × 2)
	• 4096 MB (4096 MB × 1)
Cache	Intel Optane™ 16-GB memory cache (only available on models with 2.5-inch hard drives)
Primary storage	**Hard drives, SATA, 6.35 cm (2.5 in.), 7.0 mm (0.28 in.)**
	• 2 TB, 5400 rpm
	• 1 TB, 7200 rpm
	• 500 GB, 7200 rpm, FIPS 140-2
	• 500 GB, 7200 rpm
Primary M.2 storage	**M.2 solid-state drives (NGFF, 2280)**
	2 TB, PCIe, Gen3 × 4, SS, NVMe, TLC
	1 TB, PCIe, Gen3 × 4, SS, NVMe, TLC
	512 GB, PCIe, Gen3 × 4, SS, NVMe, TLC
	512 GB, PCIe, Gen3 × 4, SS, NVMe, TLC, Opal 2
	512 GB, PCIe, NVMe, value
	512 GB QLC + 32 GB Optane memory module
	512 GB, SATA-3, SS, TLC, FIPS-140–2
	256 GB, PCIe, Gen3 × 4, SS, NVMe, TLC
	256 GB, SATA-3, TLC, FIPS
	256 GB, SATA-3, TLC, Opal 2
	256 GB, PCIe, SS, NVMe, value
	128 GB, SATA-3, SS, TLC
	Brazil M.2 (2280) solid-state drive requirements

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

Category	Description
	256 GB, SATA-3, TLC
	128 GB, SATA-3, TLC
Audio and video	Audio controls
	Dual-array microphone
	Stereo speakers (2)
	Camera HD RGB 720p
	Camera privacy cover
	Camera supports WDR (Wide Dynamic Range)
	Support for models without camera
RJ-45 (network) jack	Intel Ethernet Connection I219-LM 10/100/1000 Ethernet (vPro)
	Intel Ethernet Connection I219-V 10/100/1000 Ethernet (non-vPro)
	The following support S3/S4/S5 wake on LAN (via out of band): embedded NIC, HP USB-C Universal Dock, HP USB-C Dock
	The following support S0/S3/S4/S5 HBMA (via out of band): HP USB-C Universal Dock, HP USB-C Dock, HP Thunderbolt Dock 120 W G2, and HP USB-C Mini Dock
Wireless networking	**Bluetooth®**
	Integrated wireless personal area network (PAN) supported by Bluetooth 5.0 combo card
	Wireless Local Area Network (WLAN)
	Integrated WLAN options with dual antennas (M.2 2230 socket MIPI/BRI):
	• 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):
	• 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)
	Brazil RCTO WLAN
	• 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)
	Two WLAN antennas built into bottom of display assembly
	Support for models without WLAN
	Compatible with Wi-Fi CERTIFIED Miracast™ devices
	Supports HP Connection Optimizer
	Support S3/S4 wake on Wireless LAN
	Supports HP LAN-Wireless Protection (WLAN/LAN/WWAN switching)
	Support Turbo Lite Wi-Fi

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

Category	Description
	Near-Field Communication (NFC)
	NFC Mirage WNC XRAV-1 (NXP NPC300 I2C, 10 mm × 17 mm)
	NFC antenna
	Supports models without NFC
	Wireless Wide Area Network (WWAN)
	SIM Module (3FF/micro SIM)
	Supports the following WWAN formats via connector:
	• **Integrated WWAN options with dual antennas (M.2 30 × 42 socket USB2)** Intel XMM™ 7262 LTE-Advanced (Cat6)
	• **Integrated WWAN options with dual antennas (M.2 30 × 42 socket PCIe)** Intel XMM 7360 LTE-Advanced (Cat9)
	WWAN Antennas (2) (worldwide 5 band, configured at top of panel on all units)
	Supports models without WWAN
	Supports WWAN after market option
	WWAN cards are compatible with a programmable removable eSIM
External media cards	Micro SD Media Reader slot supports SD™, SDHC™, and SDXC™.
Ports	VGA (Dsub 15 pin) supporting 1920 × 1200 external resolution @ 60 Hz and hot plug/unplug and auto detect
	USB Type-C (PD + DP, Gen 1)
	USB 3.0 Gen 1 charging port
	HDMI 1.4
	RJ-45 (network)
	Docking connector
	Audio-out (headphone)/audio-in (microphone) combo jack
	Power connector, 4.5 mm
Sensors	Accelerometer
	Hall sensor
Keyboard/pointing devices	**HP Advanced Keyboard**
	Spill resistant with drain
	Dura Keys, dual point, backlit, spill resistant with drain, privacy
	Dura Keys, backlit, spill resistant with drain, dual point
	Dura Keys, backlit, spill-resistant with drain
	Touchpad
	Microsoft® precision touchpad default gestures support

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

Category	Description
	Firmware PTP with filter driver
	No hybrid mode support
	Settings enabled by default: 2-finger scrolling, 2-finger zoom (pinch), OSD (enabled/disabled), 3-finger tap (Cortana), 3-finger flip (app switch), 4-finger tap (Action Center)
	Gestures disabled by default: 3-finger flick, 2-finger rotate, momentum motion, 1-finger vertical scroll
	Taps enabled by default
	On/off control by driver
Power requirements	**Battery**
	HP long life lithium prismatic/polymer battery, 3 cell, 48 Wh, 4.21 Ah
	HP Fast Charge Technology, 90% in 90 minutes
	AC adapter
	65 W Smart right angle, 4.5 mm
	65 W Smart right angle, 4.5 mm – EM
	65 W Straight USB Type C
	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, conventional
	3 wire plug (C5), 1.8 m, conventional
	3 wire plug (C5), 1.0 m, conventional
	Duckhead power cord (C5) 1.0 m
	Duckhead power cord (C5) 1.8 m
	Duckhead power cord (C5)
Security	Security lock
	Fingerprint reader
	Supports Trusted Platform Module (TPM) 2.0 (Infineon, soldered down)
	Integrated Smart Card reader (active)
	Preboot authentication (password, smart card)
	Supports models without a Smart Card reader
	Hardware enforced firmware protection: HP Hardware Root of Trust + Sure Start Gen4; ANSSI Certified Hardware Root of Trust: Yes
Operating system	**Preinstalled**

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

Category	Description
	Windows® 10 Home 64
	Windows 10 Home 64 Single Language
	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
	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 APAC EM
	Windows 10 Home 64 Single Language India Market PPP
	Windows 10 Home 64 Single Language Indonesia Market PPP
	Windows 10 Home 64 StF MSNA for Higher Education Strategic
	Windows 10 Pro 64 StF MSNA Strategic
	Windows 10 Professional 64
	Windows 10 Professional 64 Chinese Market
	Windows 10 Professional 64 StF MSNA Plus
	Windows 10 Professional 64 StF MSNA Standard
	FreeDOS 3.0
	Restore Media
	Windows 10 Driver DVD
	Windows 10 Driver USB
	Windows 10 Professional 64 OS DVD
	Windows 10 Professional 64 OS USB
	Certified
	Microsoft WHQL
	Web-only support
	Windows 10 Enterprise 64
	Win 10 Pro 64 CBB 1803
Serviceability	**End user replaceable parts**
	AC adapter

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

Category	Description
	Battery
	Hard drive
	Solid-state drive
	Memory module

2   Components

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

Right

Table 2-1 Right-side components and their descriptions

Component		Description
(1)	Drive light	● Blinking white: The hard drive is being accessed. ● Amber: HP 3D DriveGuard has temporarily parked the hard drive.
(2)	USB Type-C SuperSpeed port and DisplayPort connector	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. **NOTE:** Cables and/or adapters (purchased separately) may be required. – and – Connects a DisplayPort device that has a USB Type-C connector, providing display output.
(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)	USB SuperSpeed port	Connects a USB device, such as a cell phone, camera, activity tracker, or smartwatch, and provides high-speed data transfer.
(5)	HDMI port	Connects an optional video or audio device, such as a high-definition television, any compatible digital or audio component, or a high-speed High Definition Multimedia Interface (HDMI) device.
(6)	RJ-45 (network) jack/status lights	Connects a network cable. ● Green (left): The network is connected. ● Amber (right): Activity is occurring on the network.

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

Component		Description
(7)	VGA port (select products only)	Connects an external VGA monitor or projector. Select products may include an optional serial port.
(8)	Docking connector	Connects an optional docking device.
(9)	MicroSD memory card reader	Reads optional memory cards that store, manage, share, or access information.
		To insert a card:
		1. Hold the card label-side up, with the connectors facing the computer.
		2. Insert the card into the memory card reader, and then press in on the card until it is firmly seated.
		To remove a card:
		▲ Press in on the card, and then remove it from the memory card reader.
(10)	Battery light	When AC power is connected:
		● White: The battery charge is greater than 90 percent.
		● Amber: The battery charge is from 0 to 90 percent.
		● Off: The battery is not charging.
		When AC power is disconnected (battery not charging):
		● Blinking amber: The battery has reached a low battery level. When the battery has reached a critical battery level, the battery light begins blinking rapidly.
		● Off: The battery is not charging.
(11)	Power connector	Connects an AC adapter.

Left
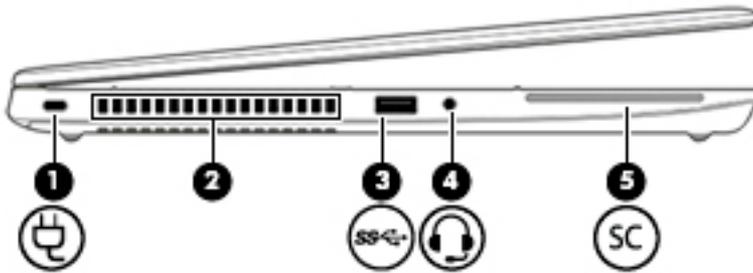
Table 2-2 Left-side components and their descriptions

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)	SS⌁	USB SuperSpeed port	Connects a USB device, such as a cell phone, camera, activity tracker, or smartwatch, and provides high-speed data transfer.
(4)	🎧	Audio-out (headphone)/Audio-in (microphone) combo jack	Connects optional powered stereo speakers, headphones, earbuds, a headset, or a television audio cable. Also connects an optional headset microphone. This jack does not support optional standalone microphones.
			WARNING! To reduce the risk of personal injury, adjust the volume before putting on headphones, earbuds, or a headset. For additional safety information, see the *Regulatory, Safety, and Environmental Notices*.
			To access this guide:
			▲ Type `HP Documentation` in the taskbar search box, and then select **HP Documentation**.
			NOTE: When a device is connected to the jack, the computer speakers are disabled.
(5)	SC	Smart card reader (select products only)	Supports optional smart cards.

Display

Table 2-3 Display components and their descriptions

	Component	Description
(1)	WLAN antennas*	Send and receive wireless signals to communicate with wireless local area networks (WLANs).
(2)	WWAN antennas* (select products only)	Send and receive wireless signals to communicate with wireless wide area networks (WWANs).
(3)	Internal microphones (2)	Record sound.
(4)	Camera	Allows you to video chat, record video, and record still images. Some cameras also allow a facial recognition logon to Windows, instead of a password logon. **NOTE:** Camera functions vary depending on the camera hardware and software installed on your product.
(5)	Camera privacy cover (select products only)	When closed, the camera privacy cover conceals the camera. To reveal the camera for use, slide the cover to the left. To conceal the camera, slide the cover to the right.
(6)	Camera light	On: The camera is in use.

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

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

To access this guide:

▲ Type HP Documentation in the taskbar search box, and then select **HP Documentation**.

Keyboard area

Pointing devices
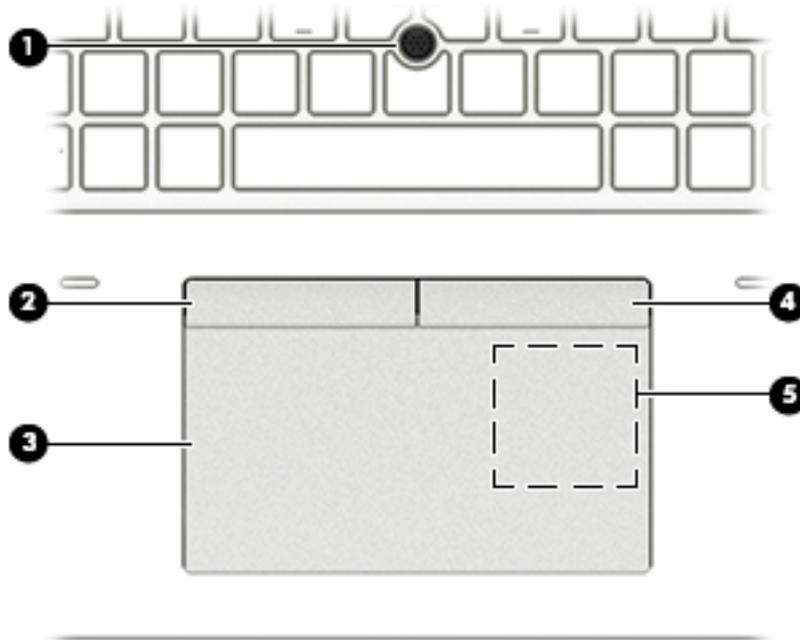
Table 2-4 Pointing device components and their descriptions

Component		Description
(1)	Pointing stick (select products only)	Moves the pointer on the screen.
(2)	Left pointing stick button (select products only)	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 (select products only)	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.

To access this guide:

▲ Type `HP Documentation` in the taskbar search box, and then select **HP Documentation**.

Lights
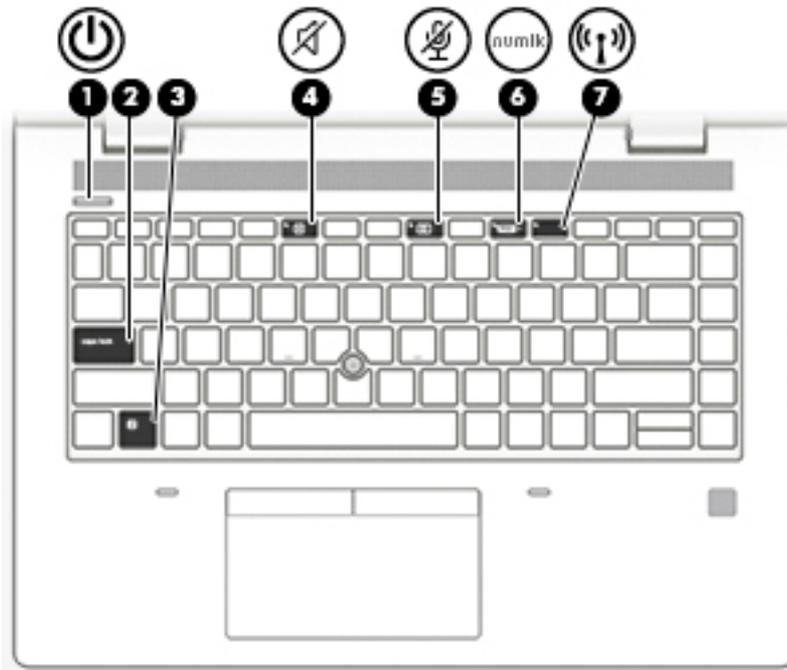
Table 2-5 Lights and their descriptions

Component		Description
(1) ⏻	Power light	● On: The computer is on.
		● Blinking: The computer is in the Sleep state, a power-saving state. The computer shuts off power to the display and other unneeded components.
		● Off: The computer is off or in Hibernation. Hibernation is a power-saving state that uses the least amount of power.
(2)	Caps lock light	On: Caps lock is on, which switches the key input to all capital letters.
(3)	Fn lock light	On: The fn key is locked.
(4)	Mute light	● On: Computer sound is off.
		● Off: Computer sound is on.
(5)	Microphone mute light	● On: Microphone is off.
		● Off: Microphone is on.
(6) num lk	Num lk light	On: Num lock is on.
(7) ((¹))	Wireless light	On: An integrated wireless device, such as a wireless local area network (WLAN) device and/or a Bluetooth® device, is on.
		NOTE: On some models, the wireless light is amber when all wireless devices are off.

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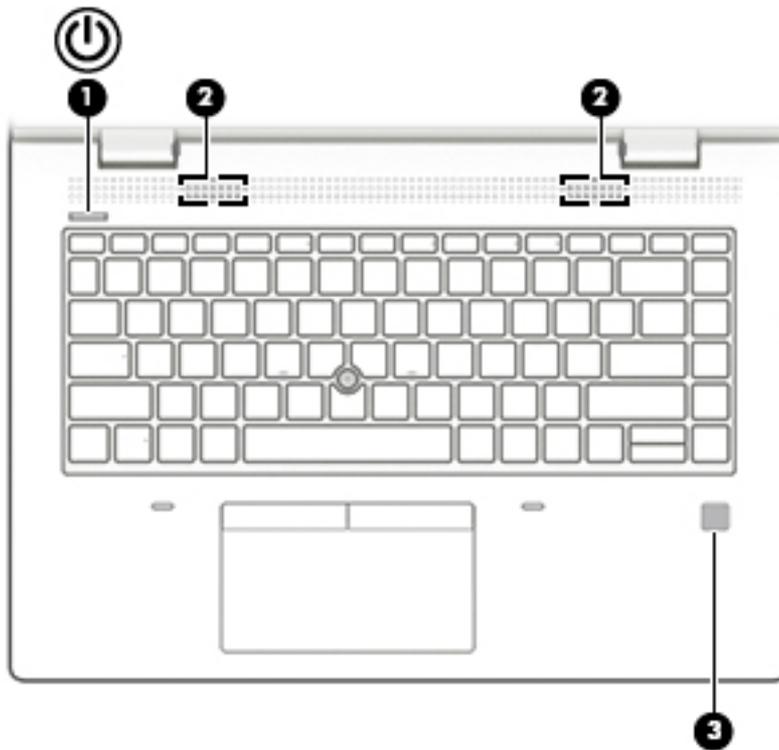
Table 2-6 Button, speakers, and fingerprint reader and their descriptions

Component		Description
(1)	Power button	• When the computer is off, press the button to turn on the computer.
		• When the computer is on, press the button briefly to initiate Sleep.
		• When the computer is in the Sleep state, press the button briefly to exit Sleep (select products only).
		• When the computer is in Hibernation, press the button briefly to exit Hibernation.
		IMPORTANT: Pressing and holding down the power button results in the loss of unsaved information.
		If the computer has stopped responding and shutdown procedures are ineffective, press and hold the power button for at least 5 seconds to turn off the computer.
		To learn more about your power settings, see your power options.
		▲ Right-click the **Power meter** icon ▭ and then select **Power Options**.
(2)	Speakers (2)	Produce sound.
(3)	Fingerprint reader (select products only)	Allows a fingerprint logon to Windows, instead of a password logon.
		▲ Touch your finger to the fingerprint reader.
		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.

Special keys
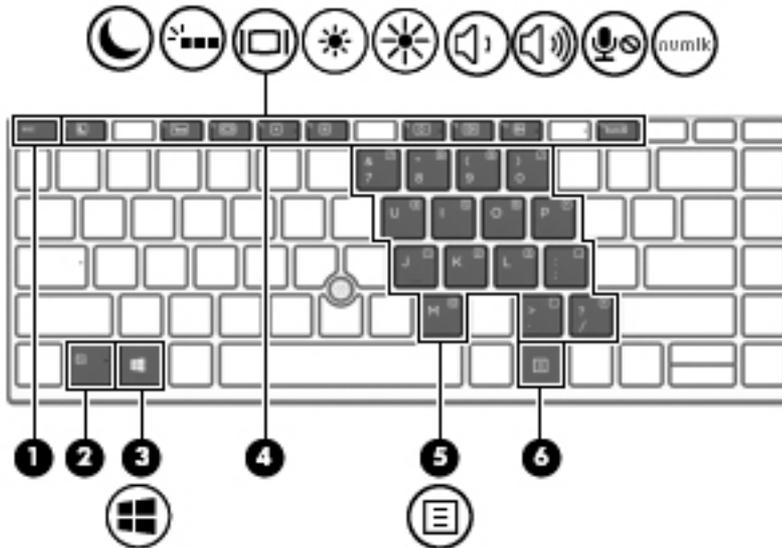
Table 2-7 Special keys and their descriptions

Component		Description
(1)	esc key	Displays system information when pressed in combination with the fn key.
(2)	fn key	Executes frequently used system functions when pressed in combination with another key. Such key combinations are called *hot keys*.
		See Hot keys (select products only) on page 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)	▤ Windows application key	Displays options for a selected object.
(6)	Embedded numeric keypad	A numeric keypad superimposed over the keyboard alphabet keys. When fn+num lk is pressed, the keypad can be used like an external numeric keypad. Each key on the keypad performs the function indicated by the icon in the upper-right corner of the key.
		NOTE: If the keypad function is active when the computer is turned off, that function is reinstated when the computer is turned back on.

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 programing query.
W	Pauses the operation.

Bottom
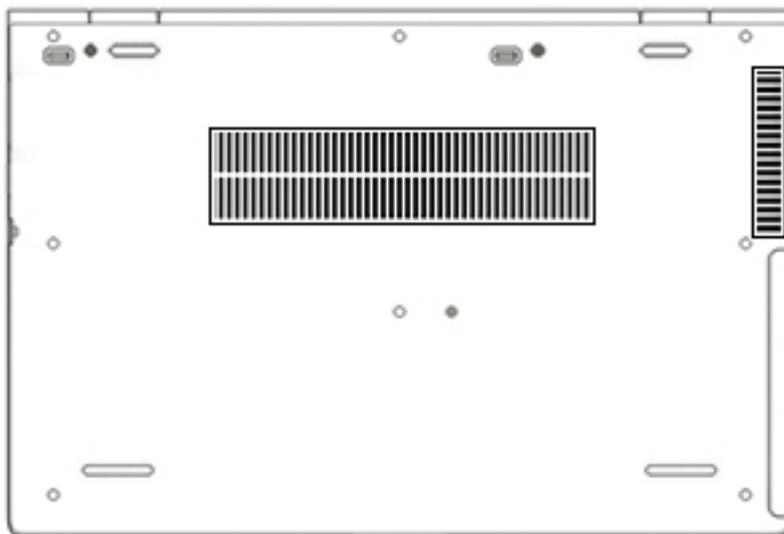
Table 2-9 Bottom components and their descriptions

Component	Description
Vents	Enable airflow to cool internal components.
	NOTE: The computer fan starts up automatically to cool internal components and prevent overheating. It is normal for the internal fan to cycle on and off during routine operation.

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.
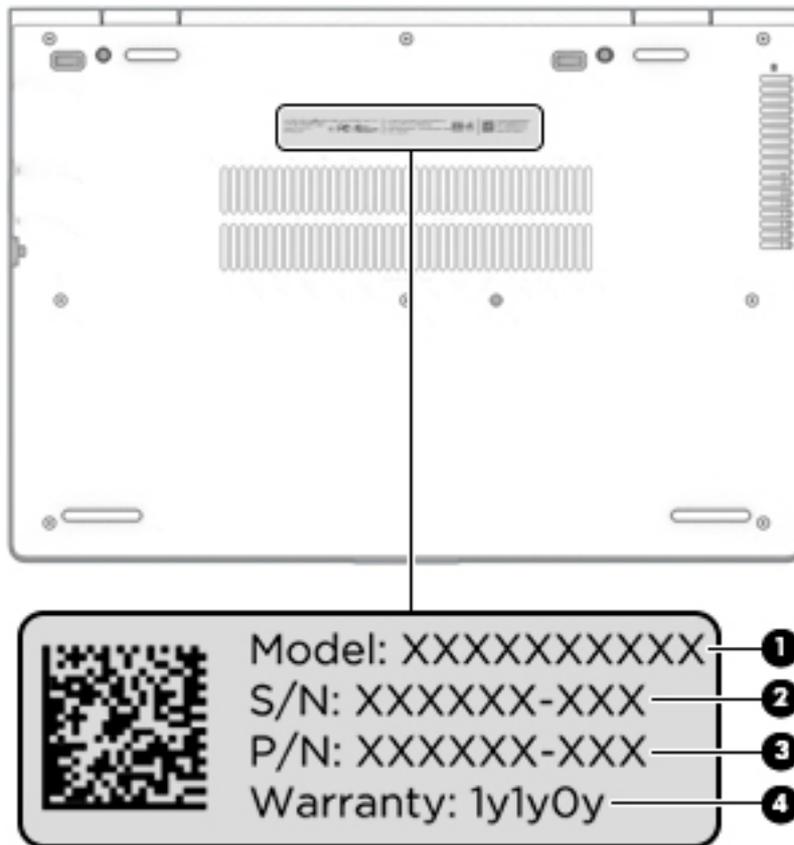
Table 2-10 Service label components

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

● Regulatory label(s)—Provide(s) regulatory information about the computer.

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

3   Illustrated parts catalog

Computer major components

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

📝 **NOTE:** Details about your computer, including model, serial number, product key, and length of warranty, are on the service tag at the bottom of your computer. See for details.
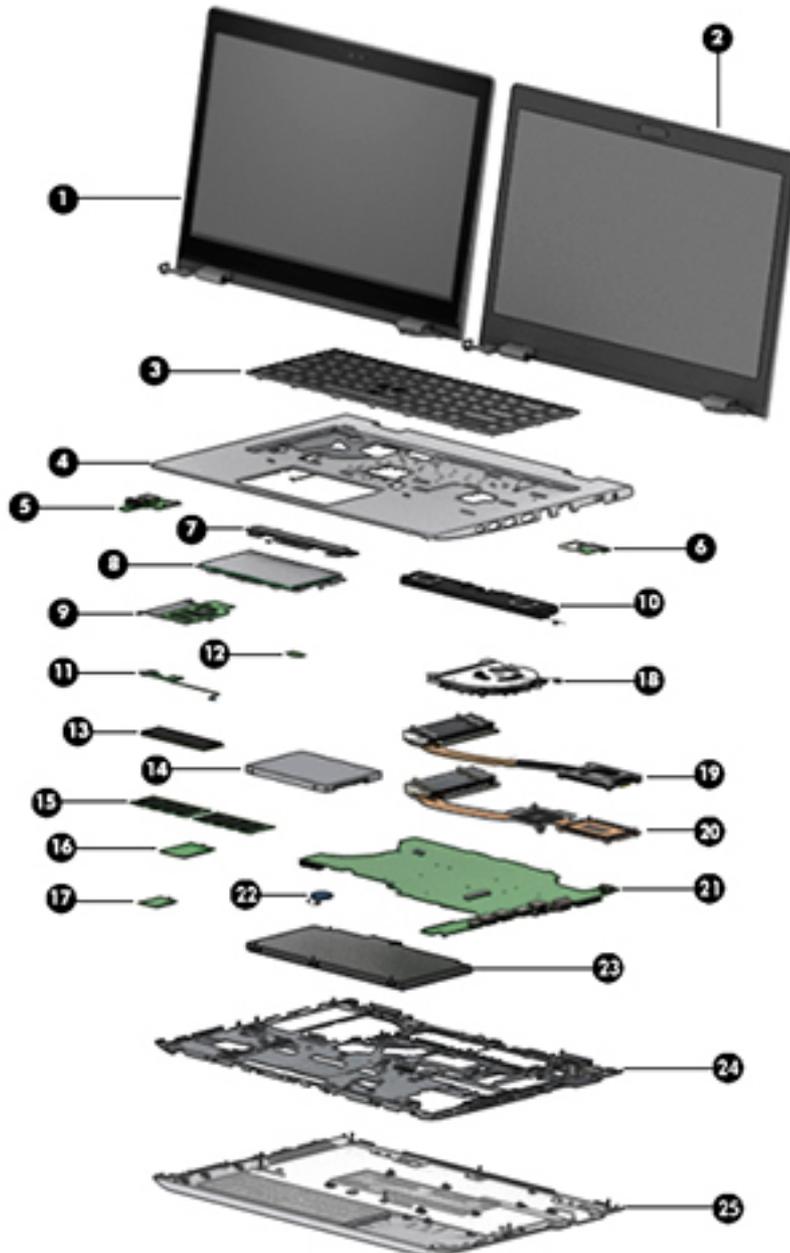
Table 3-1 Computer major components and their descriptions

Item	Component	Spare part number
(1)	**Display** (touch)	
	NOTE: Display assemblies are available as spare parts at the subcomponent level only. For spare part information, see <u>Display assembly subcomponents on page 22</u>.	
(2)	**Display** (non-touch)	
(3)	**Keyboard** (For a detailed list of country codes, see <u>Keyboard on page 44</u>.)	
	Backlit with pointing stick	L09548-xx1
	Backlit with pointing stick, models with a privacy display	L09549-xx1
	Backlit	L09546-xx1
	No backlight	L09547-xx1
(4)	**Top cover** (includes insulator tape)	
	For use in models with a pointing stick	L64871-001
	For use in models without a pointing stick	L64870-001
(5)	**USB board**	L58697-001
(6)	**Power button board** (includes cable and insulator tape)	L09552-001
(7)	**Touchpad button board**	L09541-001
(8)	**Touchpad**	
	For use in models with a pointing stick	L65632-001
	For use in models with a pointing stick	L65633-001
(9)	**Smart card reader board**	L58695-001
(10)	**Speaker** (includes cable)	L09558-001
(11)	**Fingerprint reader board** (includes cable and gasket)	L58693-001
(12)	**NFC module**	L09554-001
(13)	**Solid-state drive**	
	NOTE: For spare part information, see <u>Mass storage devices on page 24</u>.	
(14)	**Hard drive**	
	NOTE: For spare part information, see <u>Mass storage devices on page 24</u>.	
(15)	**Memory modules** (2400 MHz DDR4)	
	16 GB	937438-850
	8 GB	937236-850
	4 GB	L10598-850
(16)	**WWAN module**	
	Intel XMM 7360 LTE-Advanced	L15398-001
	Intel XMM 7262 LTE-Advanced	L35286-001
(17)	**WLAN module**	

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

Item	Component	Spare part number
	Intel Wireless-AC 9560 802.11ac 2 × 2 Wi-Fi + Bluetooth 5 (non-vPro)	L22634-001
	Intel Wireless-AC 9560 802.11ac 2 × 2 Wi-Fi + Bluetooth 5 (non-vPro) (for use in Brazil)	L22634-201
	Intel Wireless-AC 9560 802.11ac 2 × 2 Wi-Fi + Bluetooth 5 (vPro)	L28418-001
	Intel Wireless-AC 9560 802.11ac 2 × 2 Wi-Fi + Bluetooth 5 (vPro) (for use in Brazil)	L28418-201
	Intel Wi-Fi 6 AX200 802.11ax 2 × 2 + Bluetooth 5 (non-vPro)	L35282-001
	Intel Wi-Fi 6 AX200 802.11ax 2 × 2 + Bluetooth 5 (vPro)	L35284-001
(18)	**Fan**	L58690-001
	Heat sink	
(19)	For use in models with integrated UMA graphics	L58692-001
(20)	For use in models with discrete graphics	L58691-001
(21)	**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	
	For use in models with discrete graphics memory:	
	• Intel Core i7-8665U processor	L58704-xx1
	• Intel Core i7-8565U processor	L58703-xx1
	For use in models with UMA graphics memory:	
	• Intel Core i7-8665U processor, models with WWAN modules	L58710-xx1
	• Intel Core i7-8565U processor, models with WWAN modules	L58709-xx1
	• Intel Core i5-8365U processor, models with WWAN modules	L58708-xx1
	• Intel Core i5-8265U processor, models with WWAN modules	L58706-xx1
	• Intel Core i5-8265U processor	L58707-xx1
	• Intel Core i3-8145U processor, models with WWAN modules	L68324-xx1
	• Intel Core i3-8145U processor	L58705-xx1
(22)	**RTC battery** (includes cable)	L23943-001
(23)	**Battery** (3 cell, 48 Wh, 4.21 Ah)	931719-850
(24)	**Internal frame**	L66542-001
(25)	**Bottom cover**	L58686-001

Cable Kit
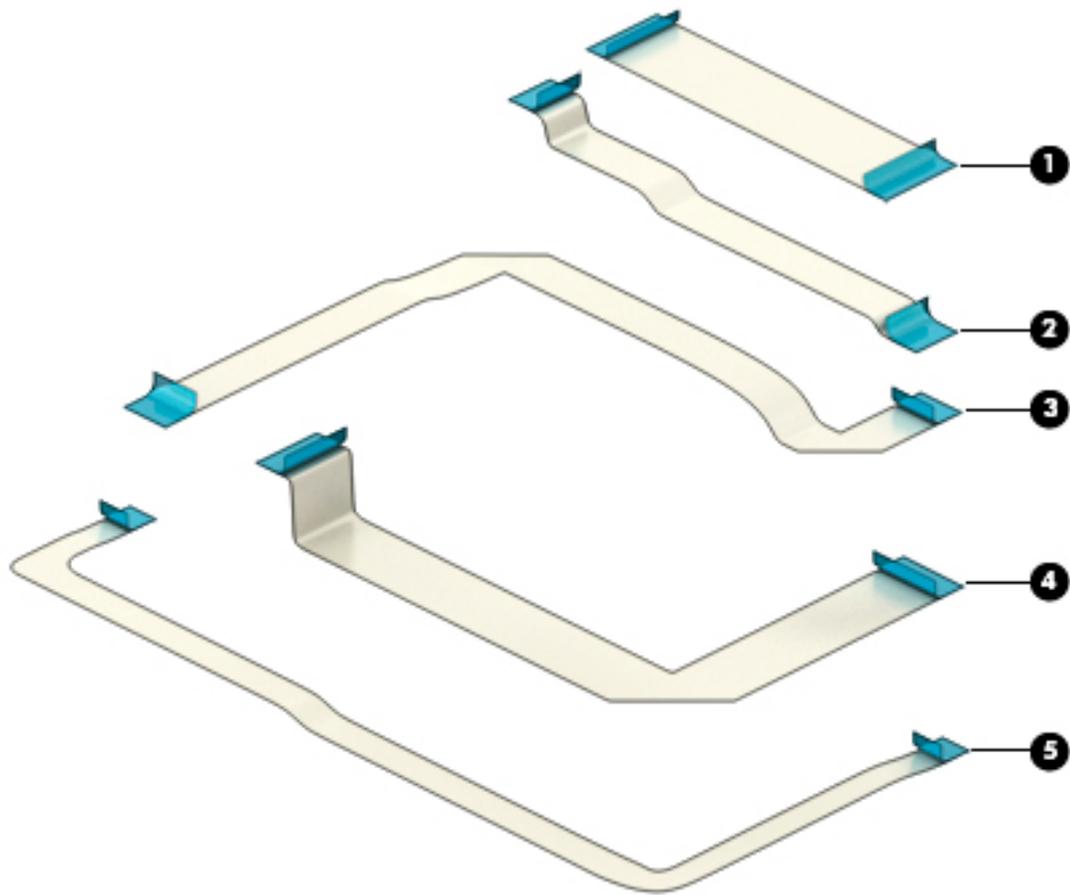
Table 3-2 Cable Kit components and their descriptions

Item	Component	Spare part number
	Cable Kit, includes the following parts:	L09534-001
(1)	Pointing stick cable	
(2)	NFC module cable	
(3)	Smart card board cable	
(4)	Touchpad button board cable	
(5)	USB board cable	

Display assembly subcomponents
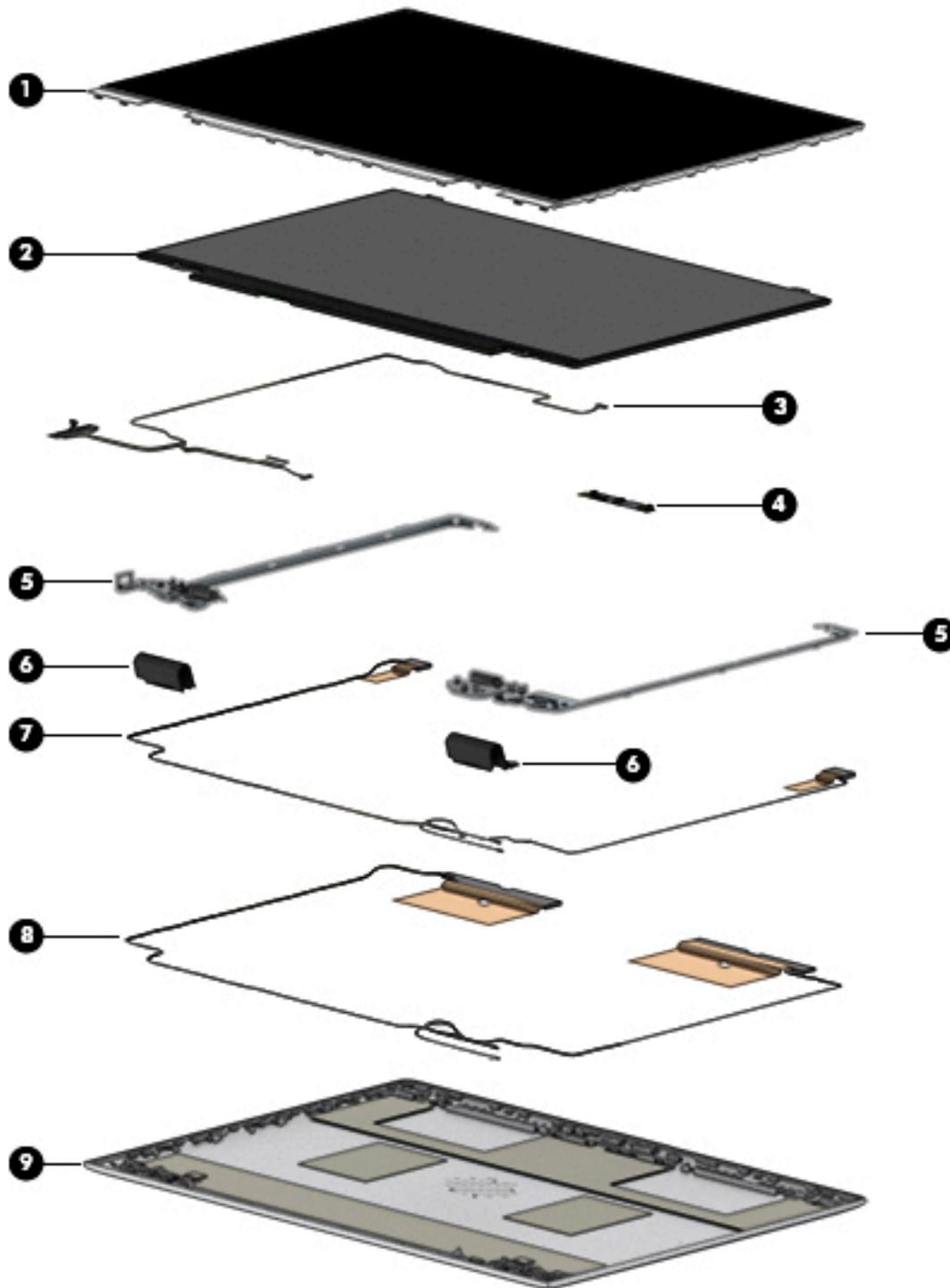
Table 3-3 Display assembly components and their descriptions

Item	Component	Spare part number
(1)	**Display bezel**	
	For use with non-touch displays with a camera module	L09530-001

Item	Component	Spare part number
	For use with non-touch displays with a microphone module	L09531-001
	Camera privacy cover (not illustrated)	L09542-001
(2)	**Display panel**	
	Non-touch, FHD	L58699-001
	Non-touch, FHD, privacy	L64869-001
	Non-touch, HD	L13835-001
	Touch	L58700-001
(3)	**Display cable**	
	For use in non-touch models with WLAN	L58688-001
	For use in non-touch models with WLAN + WWAN	L58687-001
	For use in non-touch, privacy models	L64867-001
	For use in touch models	L64868-001
(4)	**Camera module** (includes sponge)	L58702-001
	Microphone module (not illustrated)	L58696-001
(5)	**Hinge Kit** (includes left and right hinges)	
	For use in non-touch models	L09544-001
	For use in touch models	L64865-001
(6)	**Hinge covers** (right and left)	L09545-001
(7)	**WLAN antenna cable** (included in Antenna Kit)	L09523-001
(8)	**WWAN antenna cable** (included in Antenna Kit)	L09523-001
	NFC antenna (not illustrated)	L09524-001
(9)	**Back cover**	
	For use in models with a non-touch, HD display	L58685-001
	For use in models with a non-touch, FHD display	L69928-001
	For use in touch models	L64866-001

Plastics
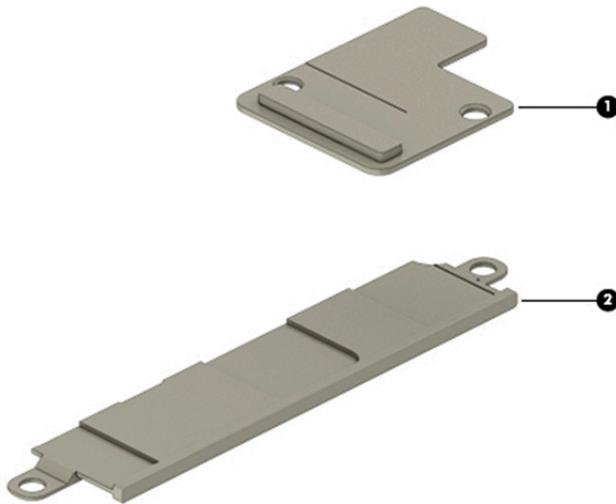
Table 3-4 Plastics Kit components and their descriptions

Item	Component	Spare part number
	Plastics Kit, includes the following parts:	
(1)	Smart card reader insert	L09555-001
(2)	Fingerprint reader insert (for use in models without a fingerprint reader)	L58698-001

Mass storage devices
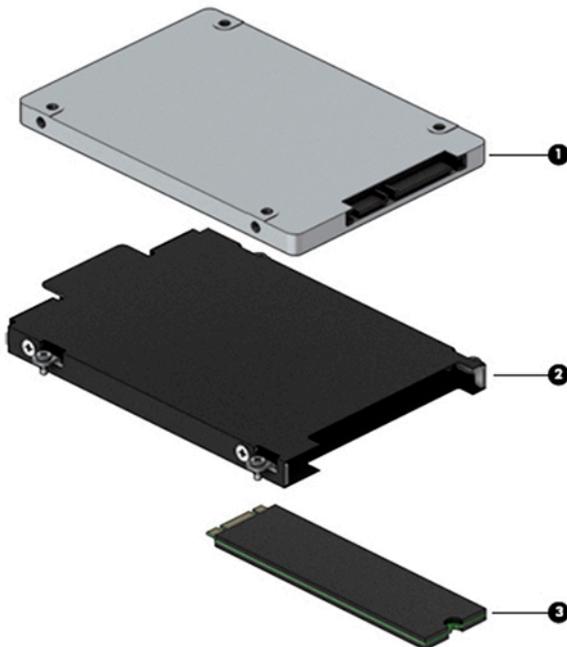
Table 3-5 Mass storage devices and their descriptions

Item	Component	Spare part number
(1)	**Hard drive**	
	1 TB, 7200 rpm	L06427-850
	500 GB, 7200 rpm	703267-001
	500 GB, 7200 rpm, FIPS 140-2	820572-001
	500 GB, 7200 rpm, self-encrypting drive (SED)	820573-001
(2)	**Hard drive cover** (included in Bracket Kit)	L58694-001
(3)	**Solid-state drive** (M.2)	
	1 TB, PCIe, NVMe, TLC	L12805-001
	512 GB, SATA-3, TLC, FIPS 140-2	L12810-001
	512 GB, PCIe, NVMe, TLC	L12811-001
	512 GB, PCIe, NVMe, value	L58065-001
	256 GB, PCIe, NVMe, TLC	L12807-001
	256 GB, PCIe, NVMe, value	L12808-001
	256 GB, SATA-3, self-encrypting drive (SED), Opal 2	L12803-001
	256 GB, SATA-3, TLC, FIPS 140-2	L40894-001
	256 GB, SATA-3, TLC	L32551-001
	128 GB, SATA-3, TLC	L12804-001
	16 GB Optane memory module	L32552-001

Miscellaneous parts

Table 3-6 Miscellaneous parts and their descriptions

Component	Spare part number
AC adapter:	
65 W AC adapter, nPFC, S-3P, 4.5 mm	710412-001
65 W AC adapter, nPFC, SMART, RC, 4.5 mm, EM	913691-850
65 W USB Type-C AC adapter, 1.8 m	L32392-001
45 W AC adapter, nPFC, SMART, RC, 4.5 mm, non-slim	741727-001
45 W AC adapter, nPFC, SMART, RC, 4.5 mm, 2P	742436-001
45 W USB Type-C AC adapter, 1.8 m	L32390-001
Power cord, C5, conventional, 1.0 m:	
For use in Argentina	L19357-001
For use in Australia	L19358-001

Table 3-6 Miscellaneous parts and their descriptions (continued)

Component	Spare part number
For use in Brazil	L19359-001
For use in Denmark	L19360-001
For use in Europe	L19361-001
For use in India	L19363-001
For use in Israel	L19362-001
For use in Italy	L19364-001
For use in Japan	L19365-001
For use in North America	L19367-001
For use in the People's Republic of China	L19368-001
For use in South Africa	L19369-001
For use in South Korea	L19366-001
For use in Switzerland	L19370-001
For use in Thailand	L19371-001
For use in Taiwan	L19372-001
For use in the United Kingdom	L19373-001
Power cord, C5, conventional, 1.8 m:	
For use in Argentina	L19357-002
For use in Australia	L19358-002
For use in Brazil	L19359-002
For use in Denmark	L19360-002
For use in Europe	L19361-002
For use in India	L19363-002
For use in Israel	L19362-002
For use in Italy	L19364-002
For use in Japan	L19365-002
For use in North America	L19367-002
For use in the People's Republic of China	L19368-002
For use in South Africa	L19369-002
For use in South Korea	L19366-002
For use in Switzerland	L19370-002
For use in Thailand	L19371-002
For use in Taiwan	L19372-002
For use in the United Kingdom	L19373-002

Table 3-6 Miscellaneous parts and their descriptions (continued)

Component	Spare part number
Power cord, C7, conventional, 1.0 m:	
For use in Japan	L19375-001
Power cord (C5N5, duckhead, 1.0 m), for use in:	
Australia	L50818-004
North America	L50818-002
The People's Republic of China	L50818-005
South Korea	L50818-001
United Kingdom and Singapore	L50818-003
Power cord (C5N5, duckhead, 1.8 m), for use in:	
India	L50824-001
Power cord (3 pin, C5, black, 1.8 m, duckhead), for use in:	
Brazil	L48055-001
Europe	L45265-001
Israel	L45266-001
North America	L45269-001
Taiwan	L45274-001
Power cord (C5, duckhead), for use in:	
North America	L50816-002
Plastics:	
Smart card reader insert	L09555-001
Fingerprint reader insert (for use in models without a fingerprint reader)	L58698-001
Bracket Kit (includes fingerprint reader bracket, hard drive bracket, smart card bracket)	L58694-001
Pointing stick covers (20 pieces)	L15396-001
Screw Kit	L58701-001

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

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 polystyrene foam.

- 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

	Relative humidity		
Event	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 (dual in-line packages) 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 polystyrene foam	3,500 V	5,000 V	14,500 V
Removing bubble pack from PCB (printed circuit board)	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 polystyrene foam.			

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 MΩ ±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 MΩ ±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 polystyrene foam.

- 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 MΩ ±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 MΩ ±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 17 for details.

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

There are as many as 24 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 28 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.

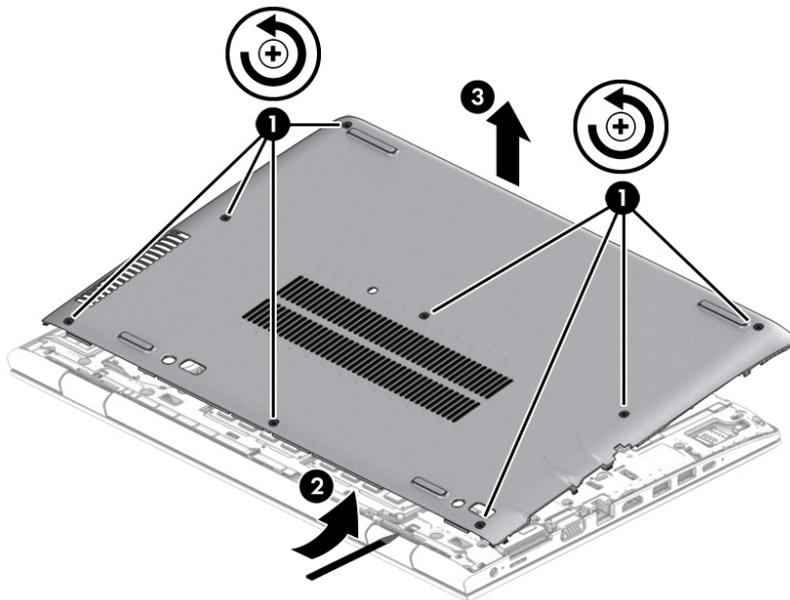3. Disconnect all external devices from the computer.

Bottom cover

Table 5-1 Bottom cover description and part number

Description	Spare part number
Bottom cover	L58686-001

▲ Prepare the computer for disassembly (Preparation for disassembly on page 33).

Remove the bottom cover:

1. Loosen the eight Phillips screws **(1)** that secure the cover to the computer.

2. Using a plastic tool and starting at the rear of the computer, release the cover **(2)**, and then remove it from the computer **(3)**.

Reverse this procedure to install the bottom cover.

Battery

Description	Spare part number
Battery (3 cell, 48 Wh, 4.21 Ah)	931719-850

Before removing the battery, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 33).

2. Remove the bottom cover (see Bottom cover on page 34).

Remove the battery:

1. Loosen the six captive screws **(1)** that secure the battery to the computer.

2. Lift the top of the battery, and then remove it from the computer **(2)**.
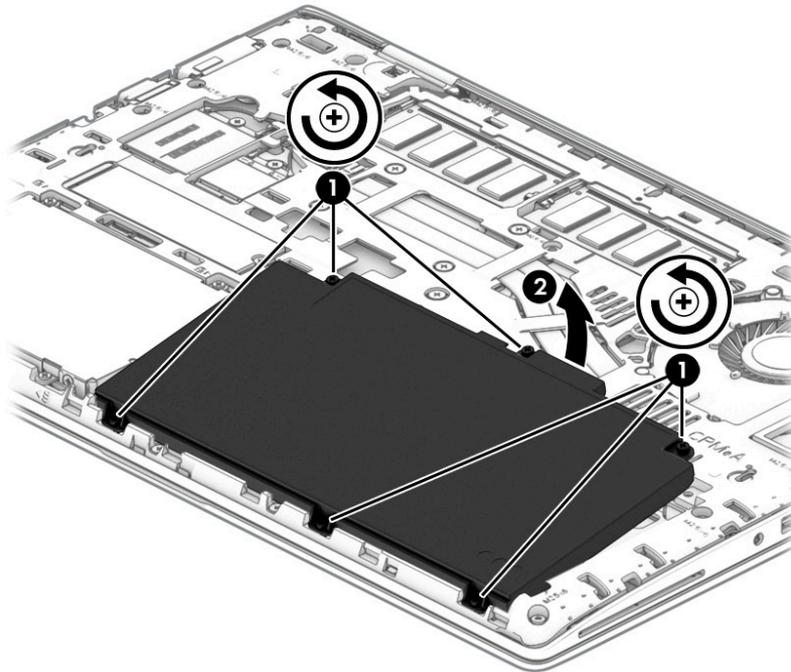
Reverse this procedure to install the battery.

Memory

Table 5-3 Memory module descriptions and part numbers

Description	Spare part number
Memory module, 16 GB	937438-850
Memory module, 8 GB	937236-850
Memory module, 4 GB	L10598-850

Before removing the memory module, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 33).

2. Remove the bottom cover (see Bottom cover on page 34).

3. Remove the battery (see Battery on page 35).

Remove the memory modules:

1. Spread the two retention clips outward **(1)** until the memory module tilts up at a 45° angle.

2. Grasp the edge of the memory module **(2)**, and then gently pull the module out of the slot. Use the same procedure to remove both memory modules.

📓 **IMPORTANT:** To prevent damage to the memory module, hold the memory module by the edges only. Do not touch the components on the memory module.

To protect a memory module after removal, place it in an electrostatic–safe container.
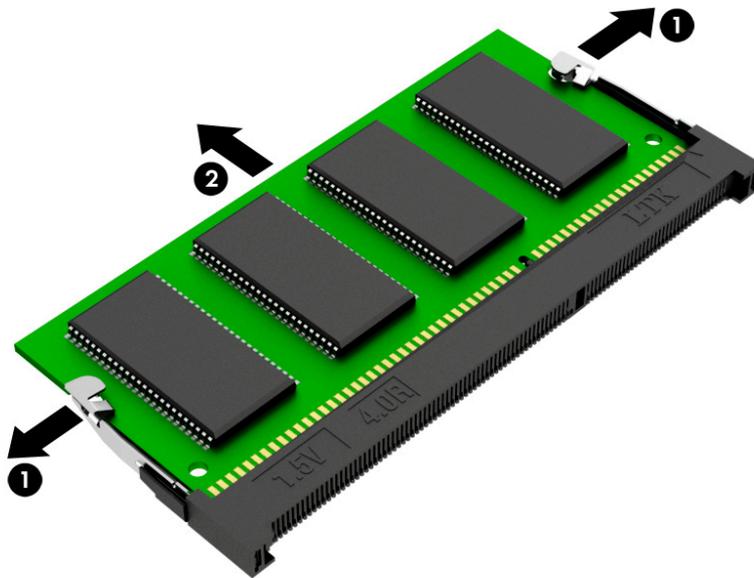
Install the memory modules:

📓 **IMPORTANT:** To prevent damage to the memory module, hold the memory module by the edges only. Do not touch the components on the memory module. Do not bend the memory module.

1. Align the notched edge of the memory module with the tab in the memory module slot **(1)**.

2. Press the module into the slot until seated **(2)**.

3. Gently press down on the module edges until the side retention clips snap into place **(3)**.
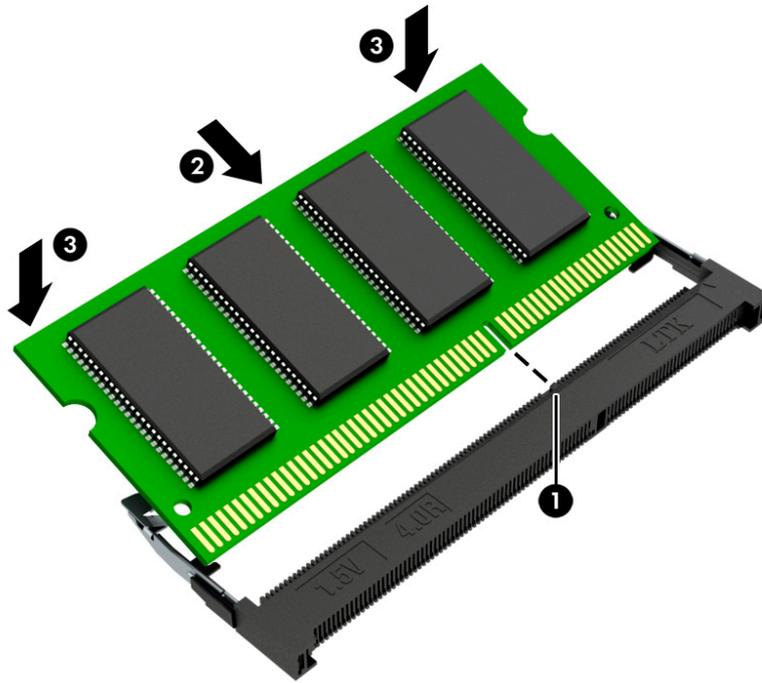
Hard drive

Table 5-4 Hard drive descriptions and part numbers
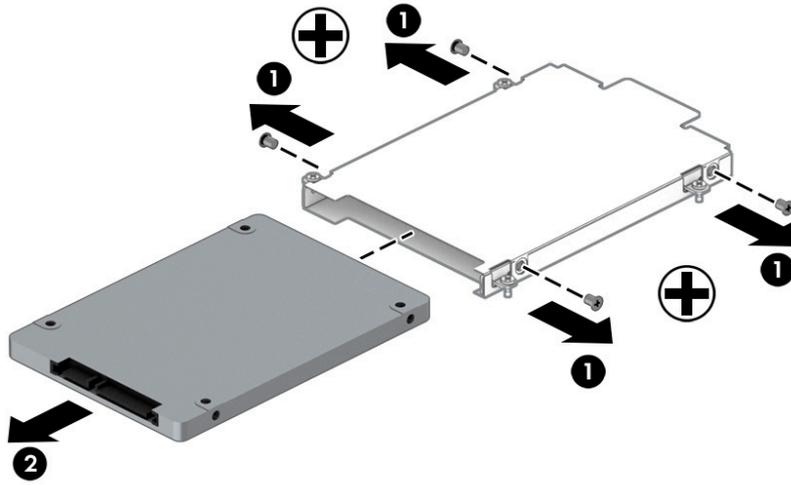
Description	Spare part number
Hard drive, 1 TB, 7200 rpm	L06427-850
Hard drive, 500 GB, 7200 rpm	703267-001
Hard drive, 500 GB, 7200 rpm, FIPS 140-2	820572-001
Hard drive cover (included in Bracket Kit)	L58694-001

Before removing the hard drive, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 33).

2. Remove the bottom cover (see Bottom cover on page 34).

3. Remove the battery (see Battery on page 35).

Remove the hard drive:

1. Loosen the four captive Phillips screws **(1)** that secure the drive assembly to the computer.

2. Pull the plastic tab to disconnect the hard drive from the connector and remove the drive from the computer **(2)**.
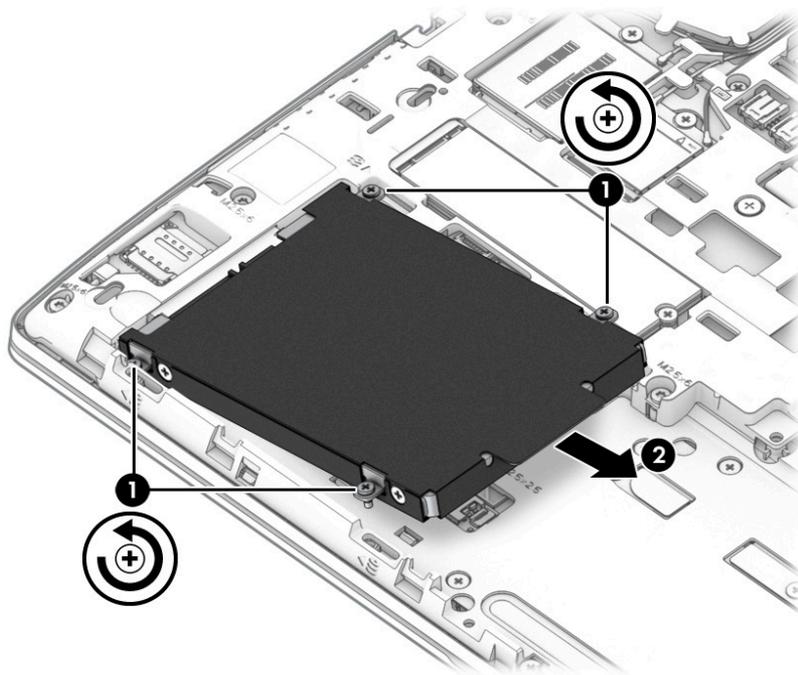
3. If it is necessary to disassemble the hard drive, remove the four Phillips M3.0 × 3.0 screws **(1)**, and then slide the drive out of the drive cover **(2)**.

Reverse this procedure to reassemble and install the hard drive.

Solid-state drive

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

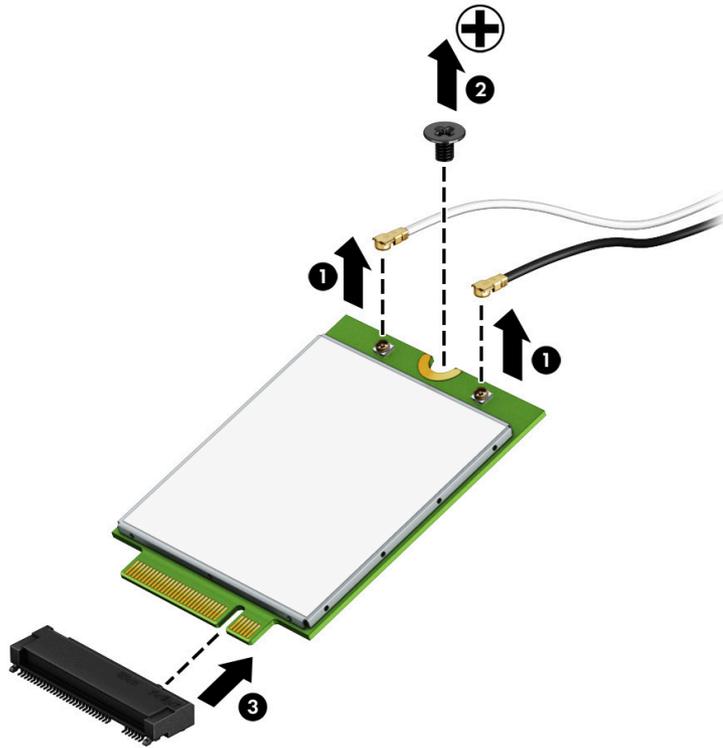| Description	Spare part number
1 TB, PCIe, NVMe, TLC	L12805-001
512 GB, SATA-3, TLC, FIPS 140-2	L12810-001
512 GB, PCIe, NVMe, TLC	L12811-001
512 GB, PCIe, NVMe, value	L58065-001
256 GB, PCIe, NVMe, TLC	L12807-001
256 GB, PCIe, NVMe, value	L12808-001
256 GB, SATA-3, self-encrypting drive (SED), Opal 2	L12803-001
256 GB, SATA-3, TLC, FIPS 140-2	L40894-001
256 GB, SATA-3, TLC	L32551-001
128 GB, SATA-3, TLC	L12804-001
16 GB Optane memory module	L32552-001

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

1. Prepare the computer for disassembly (Preparation for disassembly on page 33).

2. Remove the bottom cover (see Bottom cover on page 34).

3. Remove the battery (see Battery on page 35).

Remove the solid-state drive:

▲ Remove the Phillips M2.0 × 3.0 screw **(1)**, and then pull the solid-state drive module from the socket **(2)**.
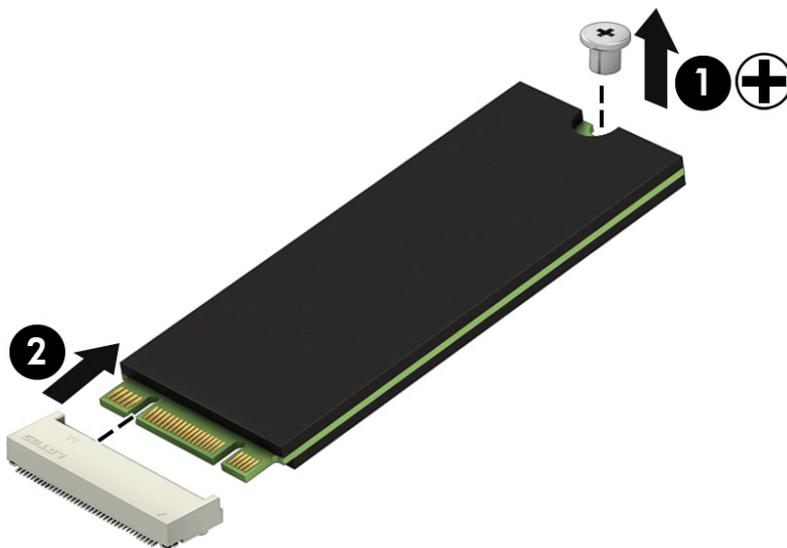
Reverse this procedure to install the solid-state drive.

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 17 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 64 screws that must be removed, replaced, and/or loosened when servicing the parts described in this chapter. Make special note of each screw size and location during removal and replacement.

WWAN module

Table 6-1 WWAN module description and part number

Description	Spare part number
Intel XMM 7360 LTE-Advanced	L15398-001
Intel XMM 7262 LTE-Advanced	L35286-001

Before removing the WWAN module, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 33).

2. Remove the bottom cover (see Bottom cover on page 34).

3. Remove the battery (see Battery on page 35).

Remove the WWAN module:

1. Disconnect the two antenna cables from the module **(1)**.

2. Remove the Phillips M2.0 × 3.0 screw **(2)**, and then pull the module out of the socket **(3)**.

Reverse this procedure to install the WWAN module.

WLAN module

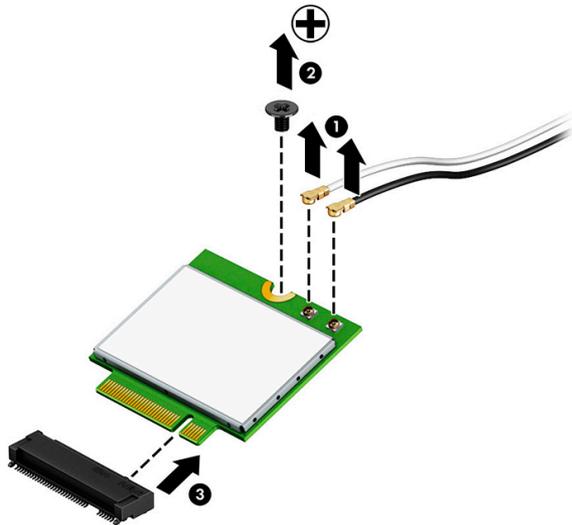**Table 6-2 WLAN module descriptions and part numbers**

Description	Spare part number
Intel Wireless-AC 9560 802.11ac 2 × 2 Wi-Fi + Bluetooth 5 (non-vPro)	L22634-001
Intel Wireless-AC 9560 802.11ac 2 × 2 Wi-Fi + Bluetooth 5 (non-vPro) (for use in Brazil)	L22634-201
Intel Wireless-AC 9560 802.11ac 2 × 2 Wi-Fi + Bluetooth 5 (vPro)	L28418-001
Intel Wireless-AC 9560 802.11ac 2 × 2 Wi-Fi + Bluetooth 5 (vPro) (for use in Brazil)	L28418-201
Intel Wi-Fi 6 AX200 802.11ax 2 × 2 + Bluetooth 5 (non-vPro)	L35282-001
Intel Wi-Fi 6 AX200 802.11ax 2 × 2 + Bluetooth 5 (vPro)	L35284-001

Before removing the WLAN, follow these steps:

1. Prepare the computer for disassembly ().

2. Remove the bottom cover (see).

3. Remove the battery (see).

Remove the WLAN module:

1. Disconnect the two antenna cables from the module **(1)**.

2. Remove the Phillips M2.0 × 3.0 screw **(2)**, and then pull the module out of the socket **(3)**.

Reverse this procedure to install the WLAN module.

Keyboard

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

Table 6-3 Keyboard descriptions and part numbers

Description	Spare part number
Keyboard, backlit with pointing stick	L09548-xx1
Keyboard, backlit with pointing stick, models with a privacy display	L09549-xx1
Keyboard, backlit	L09546-xx1
Keyboard, no backlight	L09547-xx1
Pointing stick cable (included in Cable Kit)	L09534-001

Table 6-4 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	Israel	-BB1	Slovenia	-BA1
Brazil	-201	Italy	-061	South Korea	-AD1
Bulgaria	-261	Japan	-291	Spain	-071
Canada	-DB1	Latin America	-161	Sweden and Finland	-B71
Czech Republic and Slovakia	-FL1	The Netherlands	-B31	Switzerland	-BG1
Denmark	-081	Nordic	-DH1	Taiwan	-AB1
France	-051	Northern Africa	-FP1	Thailand	-281
Germany	-041	Norway	-091	Turkey	-141
Greece	-151	Portugal	-131	Turkey F	-541
Hungary	-211	Romania	-271	Ukraine	-BD1
Iceland	-DD1	Russia	-251	United Kingdom	-031
India	-D61	Saudi Arabia	-171	United States	-001

Before removing the keyboard, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 33).

2. Remove the bottom cover (see Bottom cover on page 34).

3. Remove the battery (see Battery on page 35).

Remove the keyboard:

1. Loosen the two captive Phillips screws that secure the keyboard to the computer.
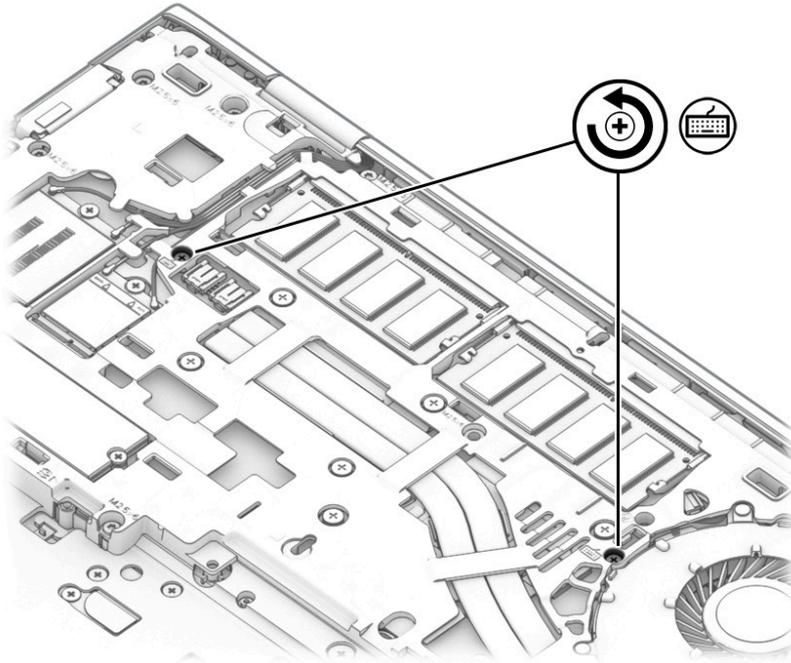
2. Position the computer on its side and open it so that you can access the bottom.

3. Insert a blunt tool into the keyboard release opening near the fan, and then press gently on the back of the keyboard until it releases from the computer.

   📝 IMPORTANT: Press gently to avoid damaging the keyboard.
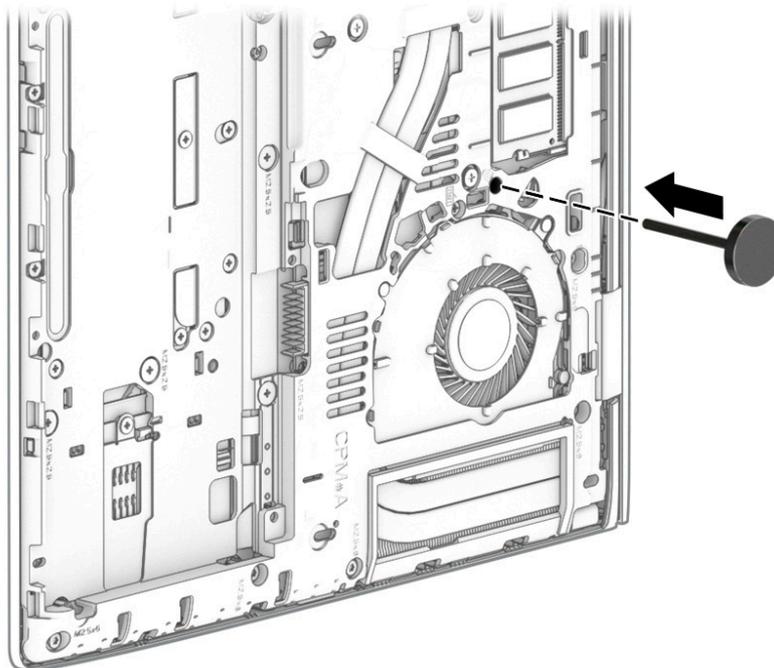
4. Position the computer upright and open the display as far as possible.

5. Press the keyboard downward slightly so that you can release the top **(1)**, and then lift and rotate the keyboard up and over onto the palm rest **(2)**.
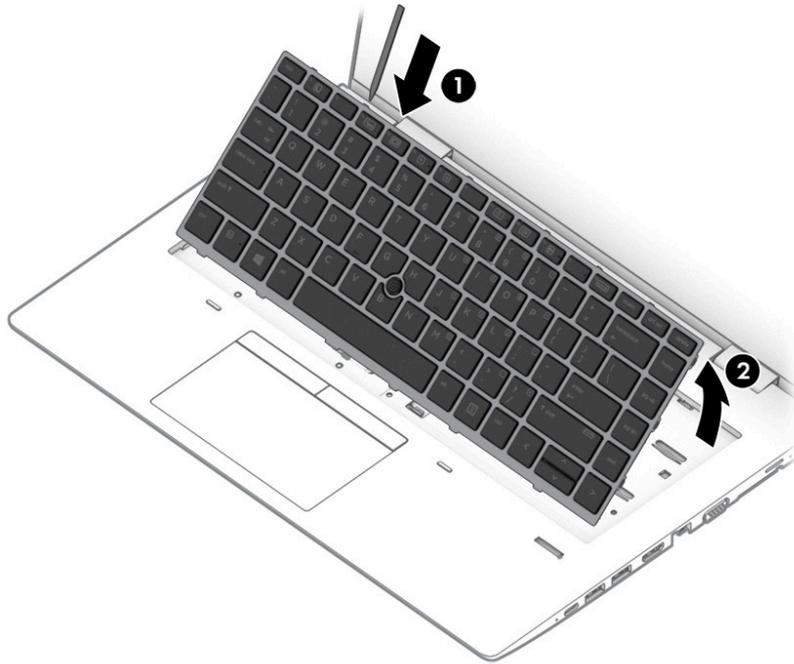
6. Release and disconnect the following connectors and cables located underneath the installed keyboard:

- Release the keyboard cable connector **(1)** and then remove the cable **(2)**.

- Release the pointing stick cable connector **(3)**, and then remove the cable **(4)**.

- For products with a backlit keyboard, release the backlight cable connector **(5)** and then remove the cable **(6)**.

7. Remove the keyboard from the computer **(7)**.
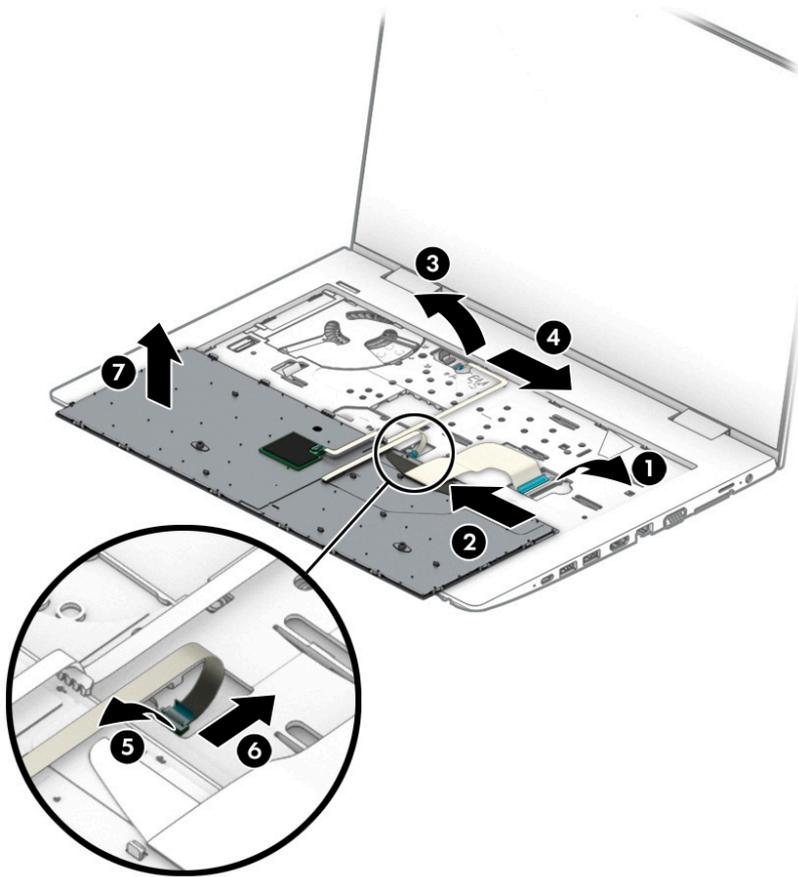
Reverse this procedure to install the keyboard.

Internal frame

Table 6-5 Internal frame description and part number

Description	Spare part number
Internal frame	L66542-001

Before removing the internal frame, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 33).

2. Remove the following components:

   a. Bottom cover (see Bottom cover on page 34)

   b. Battery (see Battery on page 35)

   c. Hard drive (see Hard drive on page 38)

   d. Keyboard (see Keyboard on page 44)

Remove the internal frame:

1. Remove the antenna cables from clips in the frame **(1)**, and then remove the cables from the frame **(2)**.
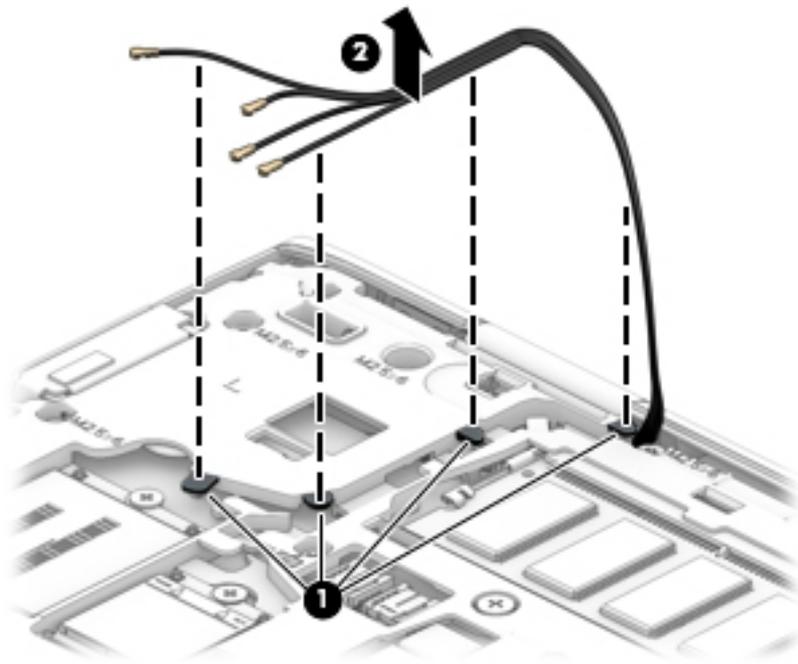
2. Remove the 14 Torx T8M 2.5 × 6.0 screws that secure the frame to the computer.
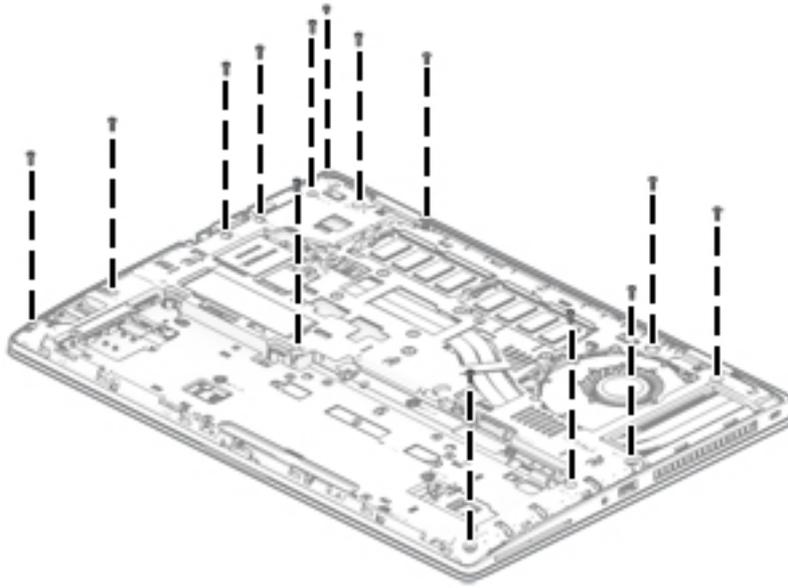
3. Remove the following screws that secure the frame to the computer:

(1): Two Phillips M2.0 × 2.5 screws

(2): Five Phillips M2.5 × 2.5 screws
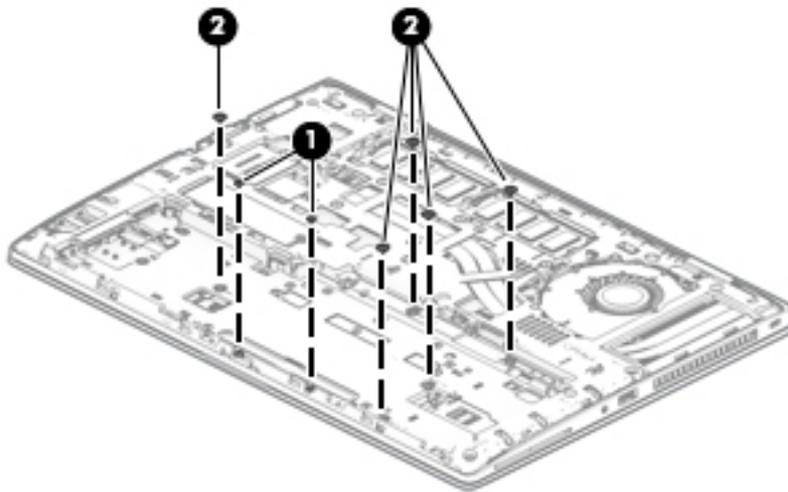
4. Use a tool to release the top of the frame **(1)**, and then lift the bottom of the frame to release it **(2)**.

5. Remove the frame from the computer **(3)**.
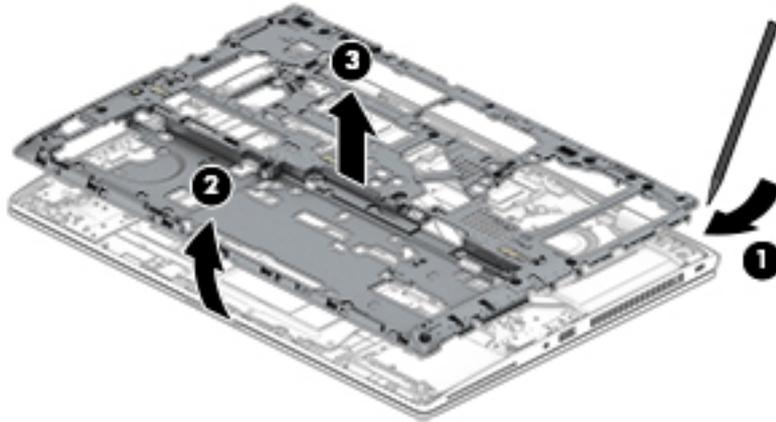
Reverse this procedure to install the internal frame.

Fan

| Description	Spare part number
Fan	L58690-001

Before removing the fan, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 33).

2. Remove the following components:

   a. Bottom cover (see Bottom cover on page 34)

   b. Battery (see Battery on page 35)

   c. Hard drive (see Hard drive on page 38)

   d. Solid-state drive (see Solid-state drive on page 40)

   e. WWAN module (see WWAN module on page 41)

   f. Keyboard (see Keyboard on page 44)

   g. Internal frame (see Internal frame on page 48)

Remove the fan:

1. Disconnect the fan cable from the system board **(1)**.

2. Loosen the three captive Phillips screws that secure the fan to the computer **(2)**.

3. Remove the fan from the computer **(3)**.
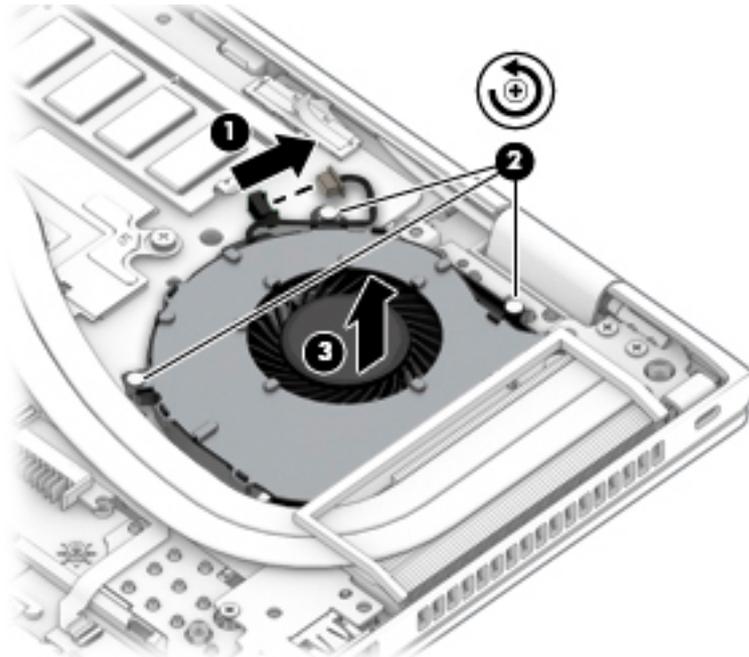
Reverse this procedure to install the fan.

Heat sink assembly

Table 6-7 Heat sink descriptions and part numbers

Description	Spare part number
Heat sink assembly for use in models with discrete graphics	L58691-001
Heat sink assembly for use in models with integrated UMA graphics	L58692-001

Before removing the heat sink, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 33).

2. Remove the following components:

   a. Bottom cover (see Bottom cover on page 34)

   b. Battery (see Battery on page 35)

   c. Hard drive (see Hard drive on page 38)

   d. Solid-state drive (see Solid-state drive on page 40)

   e. WWAN module (see WWAN module on page 41)

   f. Keyboard (see Keyboard on page 44)

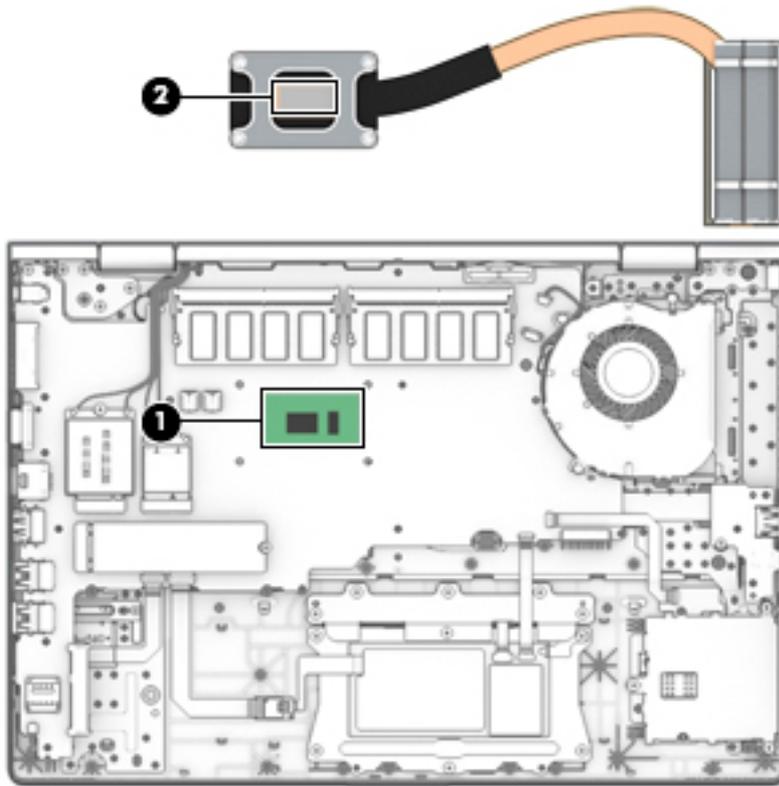   g. Internal frame (see Internal frame on page 48)

To remove the heat sink assembly for products with integrated UMA graphics:

1. In the order indicated on the heat sink assembly, loosen the four captive Phillips screws that secure the assembly to the computer **(1)**.

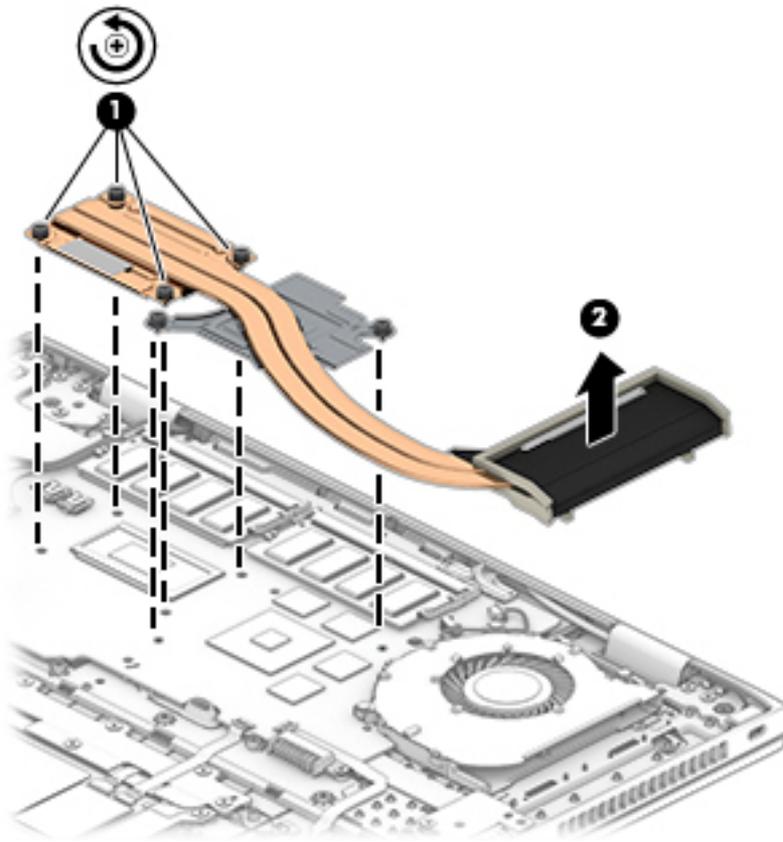**2.** Lift the heat sink assembly from the computer **(2)**.
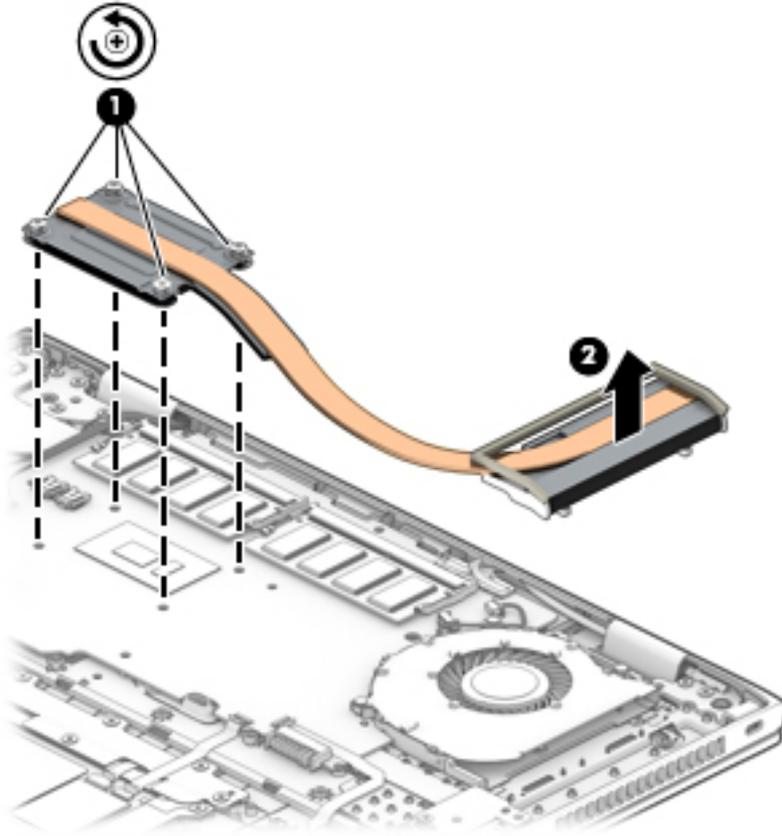
3.	Thoroughly clean the thermal material from the surfaces of the system board components **(1)** and the heat sink **(2)** each time you remove the heat sink. Replacement thermal material is included with the heat sink and system board spare part kits.

To remove the heat sink assembly for products with discrete graphics:

1.	In the order indicated on the heat sink assembly, loosen the six captive Phillips screws that secure the assembly to the computer **(1)**.

2. Lift the heat sink assembly from the computer **(2)**.

3. Thoroughly clean the thermal material from the surfaces of the system board components **(1)(3)** and the heat sink **(2)(4)** each time you remove the heat sink. Replacement thermal material is included with the heat sink and system board spare part kits.
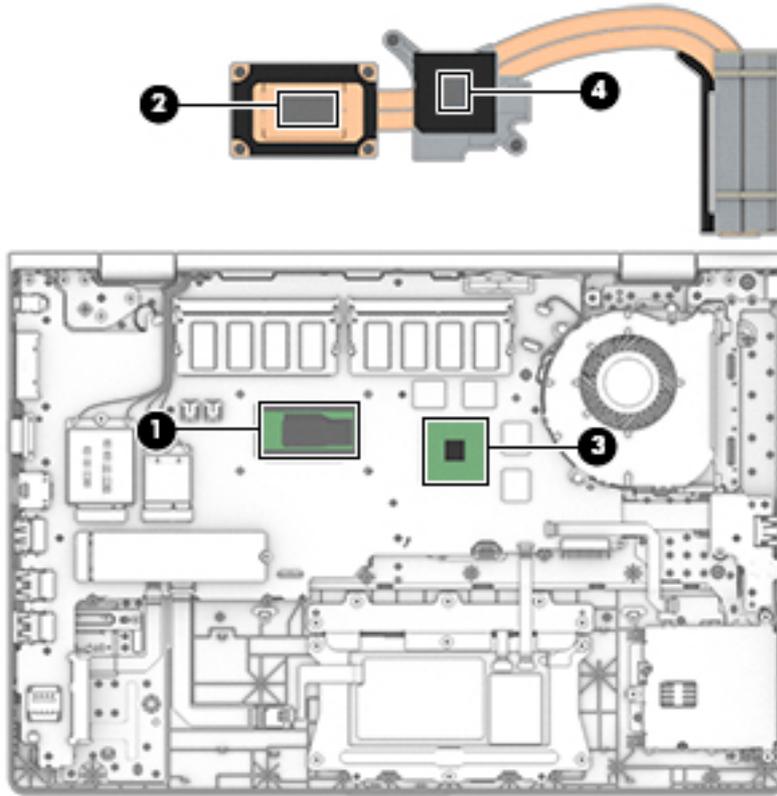
Reverse this procedure to install the heat sink assembly.

Touchpad button board

Description	Spare part number
Touchpad button board	L09541-001
Touchpad button board cable (included in Cable Kit)	L09534-001

Before removing the touchpad button board, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 33).

2. Remove the following components:

   a. Bottom cover (see Bottom cover on page 34)

   b. Battery (see Battery on page 35)

   c. Hard drive (see Hard drive on page 38)

   d. Solid-state drive (see Solid-state drive on page 40)

   e. WWAN module (see WWAN module on page 41)

   f. Keyboard (see Keyboard on page 44)

   g. Internal frame (see Internal frame on page 48)

Remove the touchpad button board:

1. Disconnect the system board cable from the ZIF connector on the touchpad **(1)**.

2. Disconnect the touchpad button board cable from the ZIF connector on the touchpad **(2)**.

3. Remove the five Phillips M2.0 × 2.0 screws **(3)**, and then remove the touchpad button board from the computer **(4)**.
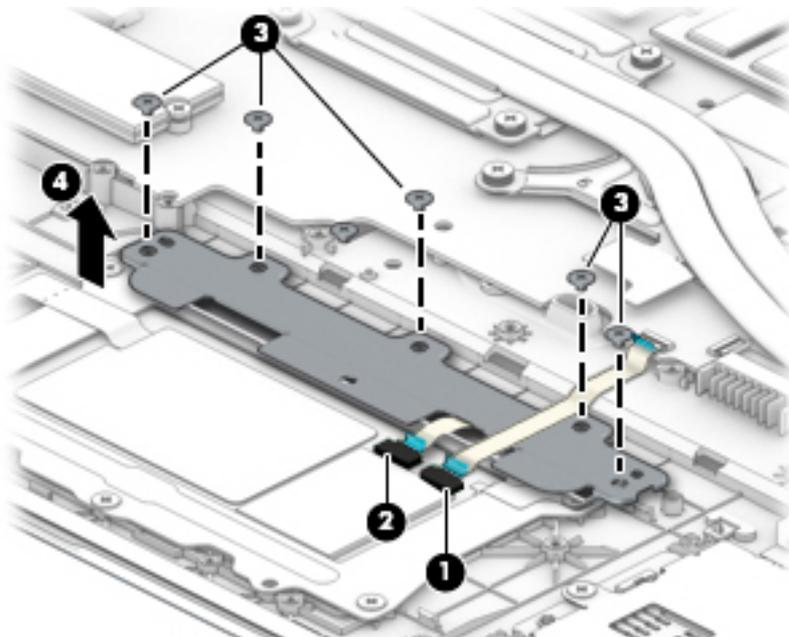
Reverse this procedure to install the touchpad button board.

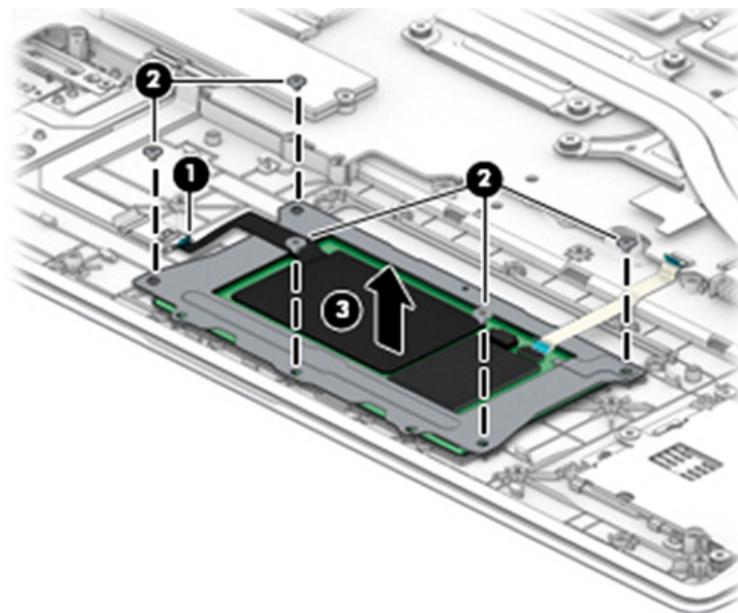# Touchpad

Table 6-9 Touchpad descriptions and part numbers

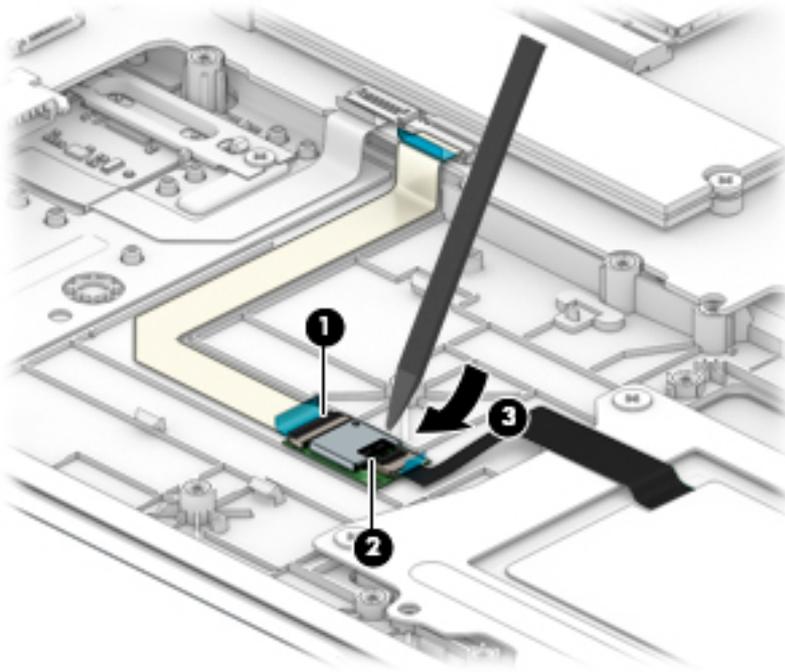| Description	Spare part number
Touchpad module for use in models with a pointing stick	L65632-001
Touchpad module for use in models with a pointing stick	L65633-001

Before removing the touchpad, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 33).

2. Remove the following components:

   a. Bottom cover (see Bottom cover on page 34)

   b. Battery (see Battery on page 35)

   c. Hard drive (see Hard drive on page 38)

   d. Solid-state drive (see Solid-state drive on page 40)

   e. WWAN module (see WWAN module on page 41)

   f. Keyboard (see Keyboard on page 44)

   g. Internal frame (see Internal frame on page 48)

   h. Touchpad button board (see Touchpad button board on page 57)

To remove the touchpad:

1. Disconnect the NFC antenna cable from the NFC module reverse ZIF connector **(1)**

2. Remove the five Phillips M2.0 × 2.0 screws **(2)**, and then remove the touchpad **(3)**.

Reverse this procedure to install the touchpad.

Near Field Communication (NFC) module

Table 6-10 NFC module descriptions and part numbers

Description	Spare part number
NFC module	L09554-001
NFC antenna	L09524-001
NFC cable (included in Cable Kit)	L09534-001

Before removing the NFC module, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 33).

2. Remove the following components:

    a. Bottom cover (see Bottom cover on page 34)

    b. Battery (see Battery on page 35)

    c. Hard drive (see Hard drive on page 38)

    d. Solid-state drive (see Solid-state drive on page 40)

    e. WWAN module (see WWAN module on page 41)

    f. Keyboard (see Keyboard on page 44)

    g. Internal frame (see Internal frame on page 48)

Remove the NFC module:

1. Disconnect the system board cable from the NFC module ZIF connector **(1)**.

2. Disconnect the NFC antenna cable (that connects to the touchpad) from the NFC module reverse ZIF connector **(2)**.

3. Use a tool to release the NFC module from the computer **(3)**.

Reverse this procedure to replace the NFC module.
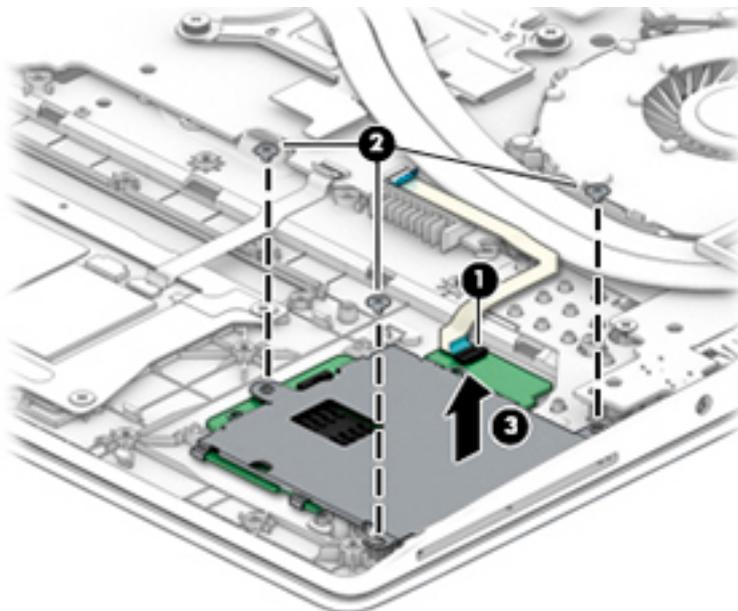
Smart card reader

Description	Spare part number
Smart card reader board	L58695-001
Smart card reader bracket (included in Bracket Kit)	L58694-001
Smart card reader cable (included in Cable Kit)	L09534-001

Before removing the smart card reader, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 33).

2. Remove the following components:

   a. Bottom cover (see Bottom cover on page 34)

   b. Battery (see Battery on page 35)

   c. Hard drive (see Hard drive on page 38)

   d. Solid-state drive (see Solid-state drive on page 40)

   e. WWAN module (see WWAN module on page 41)

   f. Keyboard (see Keyboard on page 44)

   g. Internal frame (see Internal frame on page 48)

Remove the smart card reader:

1. Disconnect the system board cable from the smart card reader board ZIF connector **(1)**.

2. Remove the three Phillips M2.0 × 2.5 screws **(2)**, and then remove the smart card reader board from the computer **(3)**.

Reverse this procedure to install the smart card reader.

USB board
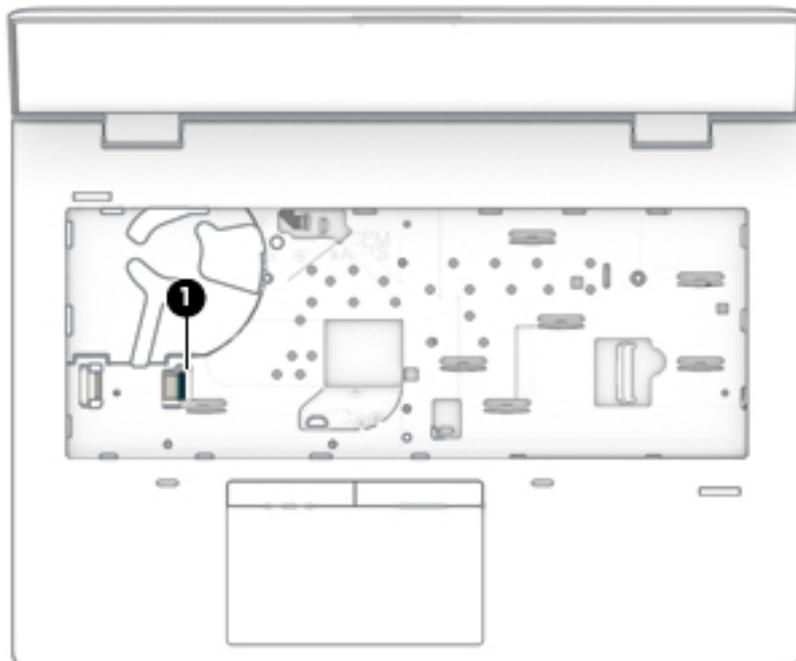
Table 6-12 USB board descriptions and part numbers

Description	Spare part number
USB board	L58697-001
USB board cable (included in Cable Kit)	L09534-001

Before removing the USB board, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 33).

2. Remove the following components:

   a. Bottom cover (see Bottom cover on page 34)

   b. Battery (see Battery on page 35)

   c. Hard drive (see Hard drive on page 38)

   d. Solid-state drive (see Solid-state drive on page 40)

   e. WWAN module (see WWAN module on page 41)

   f. Keyboard (see Keyboard on page 44)

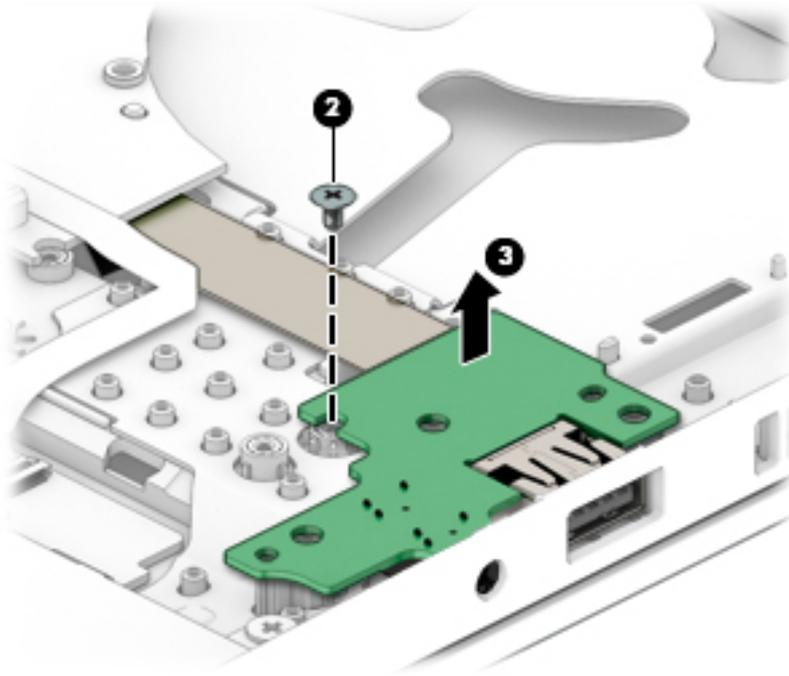   g. Internal frame (see Internal frame on page 48)

Remove the USB board:

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

2. Disconnect the USB board cable from the system board **(1)**.

3. Position the computer upside down.

4. Remove the Phillips M2.0 × 3.0 screw **(2)**, and then remove the board from the computer **(3)**.

Reverse this procedure to replace the USB board.

Power button board

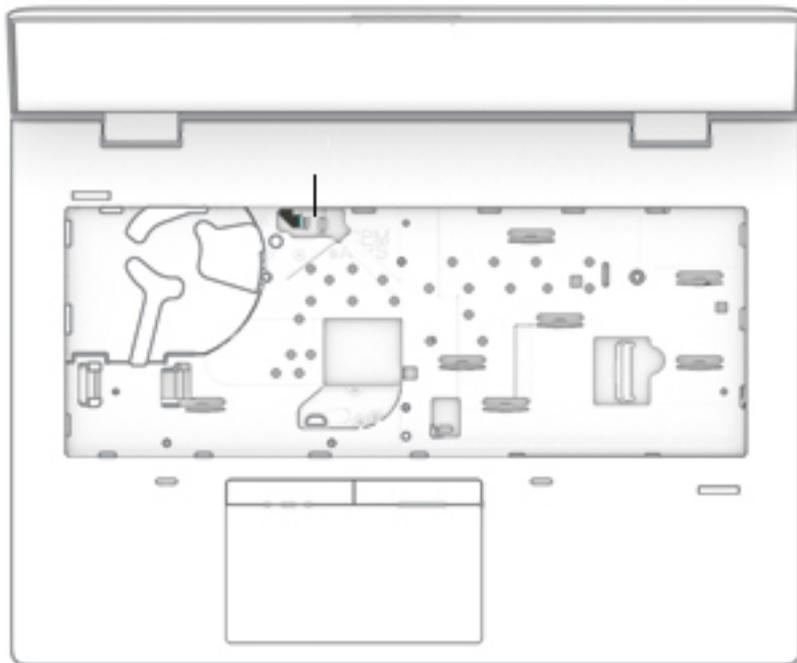**Table 6-13 Power button board descriptions and part numbers**

Description	Spare part number
Power button board (includes cable and insulator tape)	L09552-001

Before removing the power button board, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 33).

2. Remove the following components:

    a. Bottom cover (see Bottom cover on page 34)

    b. Battery (see Battery on page 35)

    c. Hard drive (see Hard drive on page 38)

    d. Solid-state drive (see Solid-state drive on page 40)

    e. WWAN module (see WWAN module on page 41)

    f. Keyboard (see Keyboard on page 44)

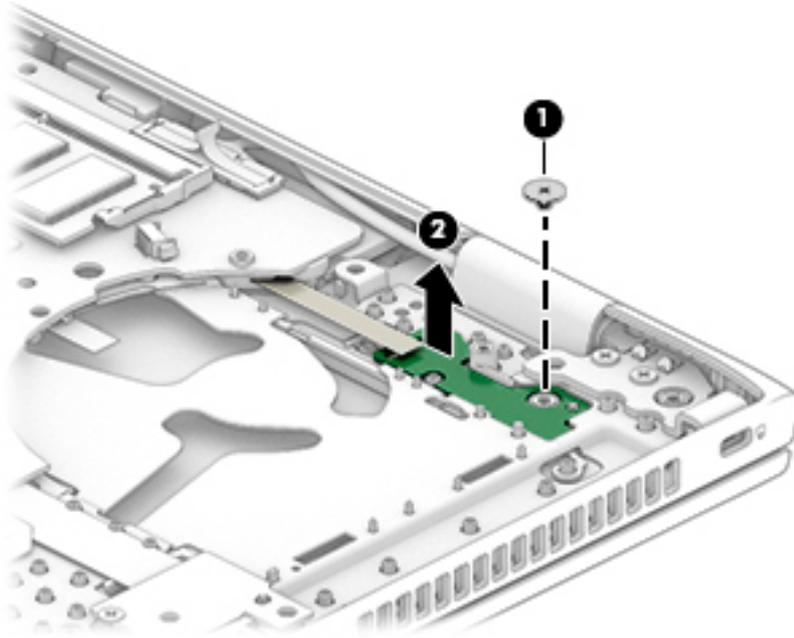   g. Internal frame (see Internal frame on page 48)

Remove the power button board:

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

2. Disconnect the power button board cable from the system board.

3. Position the computer upside down.

4. Remove the Phillips M2.0 × 3.0 screw **(1)** that secures the board to the computer.

5. Remove the board and cable from the computer **(2)**.

Reverse this procedure to install the power button board.

System board

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

All system boards use the following part numbers:

xxxxxx-001: Non-Windows operating systems

xxxxxx-601: Windows operating system

Table 6-14 System board descriptions and part numbers

Description	Spare part number
System board for use in models with discrete graphics memory:	
● Intel Core i7-8665U processor	L58704-xx1
● Intel Core i7-8565U processor	L58703-xx1
System board for use in models with UMA graphics memory:	
● Intel Core i7-8665U processor, models with WWAN modules	L58710-xx1
● Intel Core i7-8565U processor, models with WWAN modules	L58709-xx1
● Intel Core i5-8365U processor, models with WWAN modules	L58708-xx1
● Intel Core i5-8265U processor, models with WWAN modules	L58706-xx1
● Intel Core i5-8265U processor	L58707-xx1
● Intel Core i3-8145U processor, models with WWAN modules	L68324-xx1
● Intel Core i3-8145U processor	L58705-xx1

Before removing the system board, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 33).

2. Remove the following components:

   a. Bottom cover (see Bottom cover on page 34)

   b. Battery (see Battery on page 35)

   c. Hard drive (see Hard drive on page 38)

   d. Solid-state drive (see Solid-state drive on page 40)

   e. WWAN module (see WLAN module on page 43)

   f. WLAN module (see WWAN module on page 41)

   g. Memory modules (see Memory on page 36)

   h. Keyboard (see Keyboard on page 44)

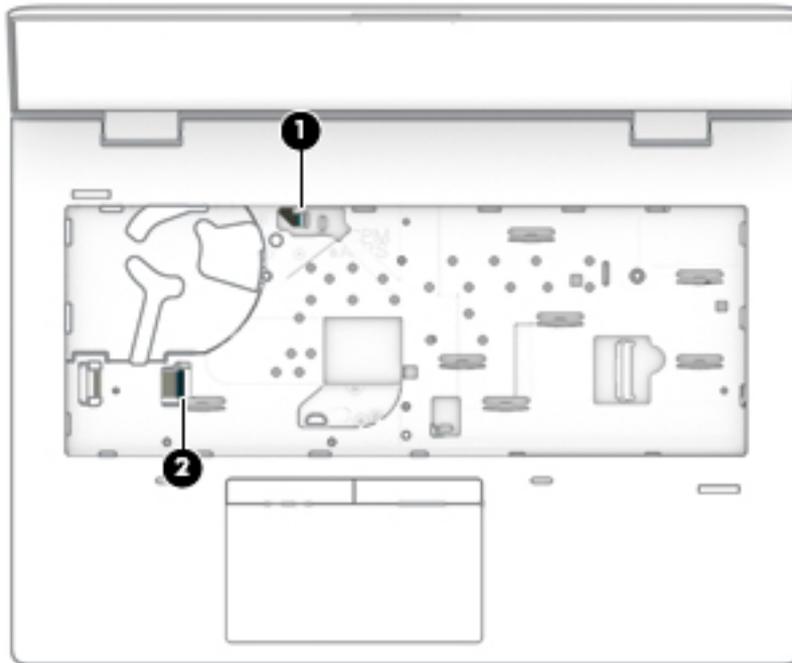   i. Internal frame (see Internal frame on page 48)

Remove the system board:

1. Position the computer upright and open.

2. Disconnect the following cables from the system board:
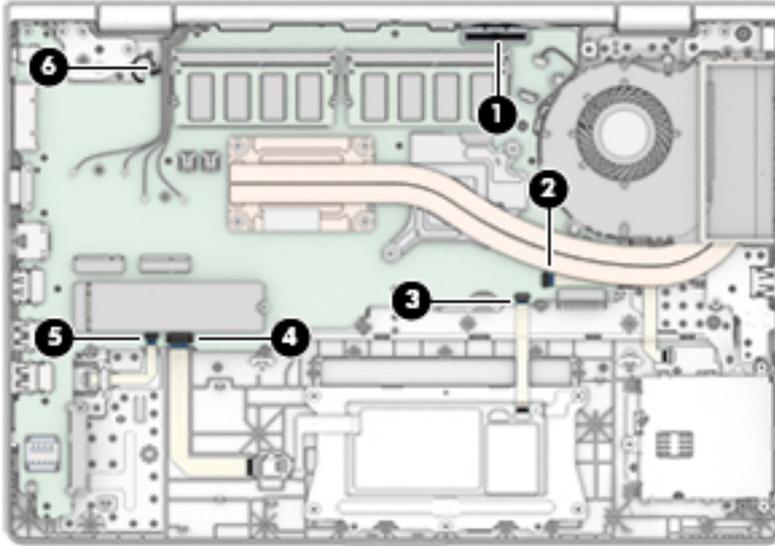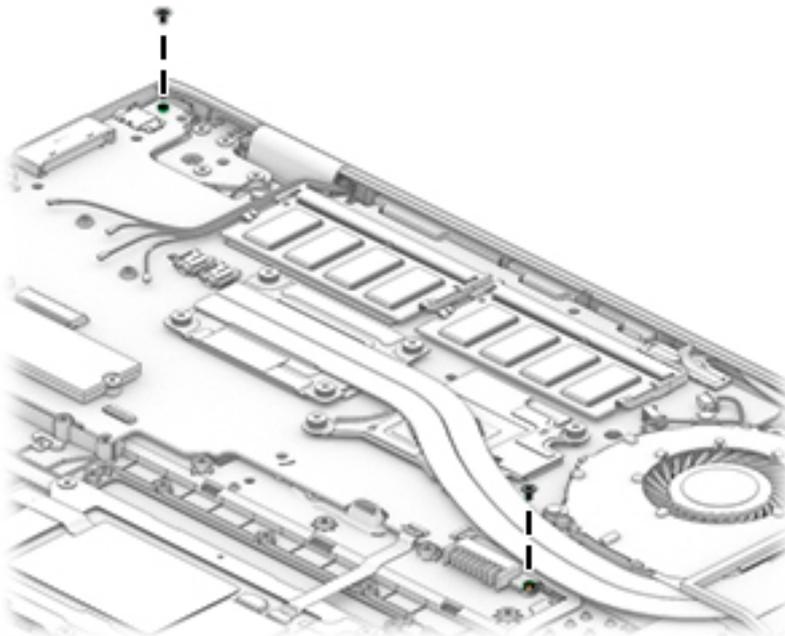
(1) Power button board cable

(2) USB cable

3. Position the computer upside down.

4. Disconnect the following cables from the system board:

    (1) Display cable

    (2) Smart card reader cable

    (3) Touchpad cable

    (4) NFC module cable

    (5) Fingerprint reader board cable

    (6) Speaker cable

5. Remove the two Phillips M2.0 × 3.0 screws that secure the system board to the computer.

6. Lift the right side of the system board **(1)**, and then pull it to the right to remove it from the computer **(2)**.
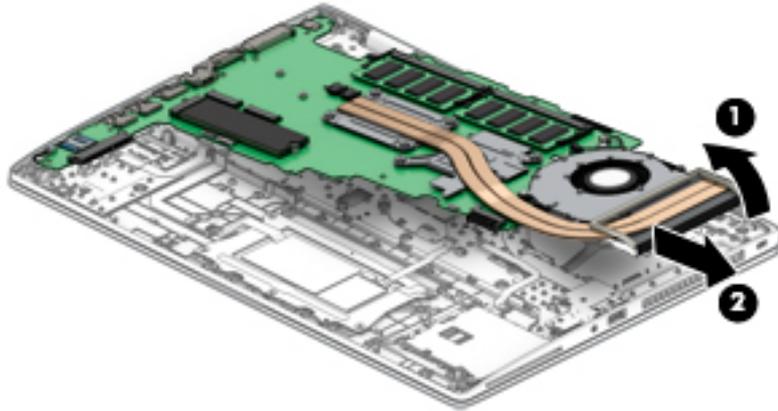
Reverse this procedure to install the system board.

RTC battery
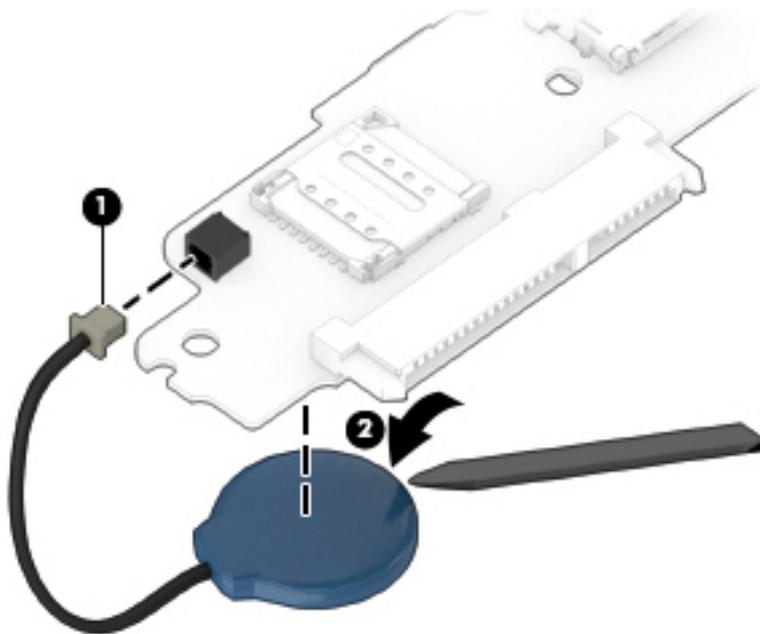
Table 6-15 RTC battery description and part number

Description	Spare part number
RTC battery	L23943-001

Before removing the RTC battery, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 33).

2. Remove the following components:

    a. Bottom cover (see Bottom cover on page 34)

    b. Battery (see Battery on page 35)

    c. Hard drive (see Hard drive on page 38)

    d. Solid-state drive (see Solid-state drive on page 40)

    e. WWAN module (see WWAN module on page 41)

    f. Keyboard (see Keyboard on page 44)

    g. Internal frame (see Internal frame on page 48)

    h. System board (see System board on page 66)

To remove the RTC battery:

▲ Disconnect the RTC battery cable from the system board **(1)**, and then pry the RTC battery from the system board **(2)**.

Reverse this procedure to install the RTC battery.

Speaker

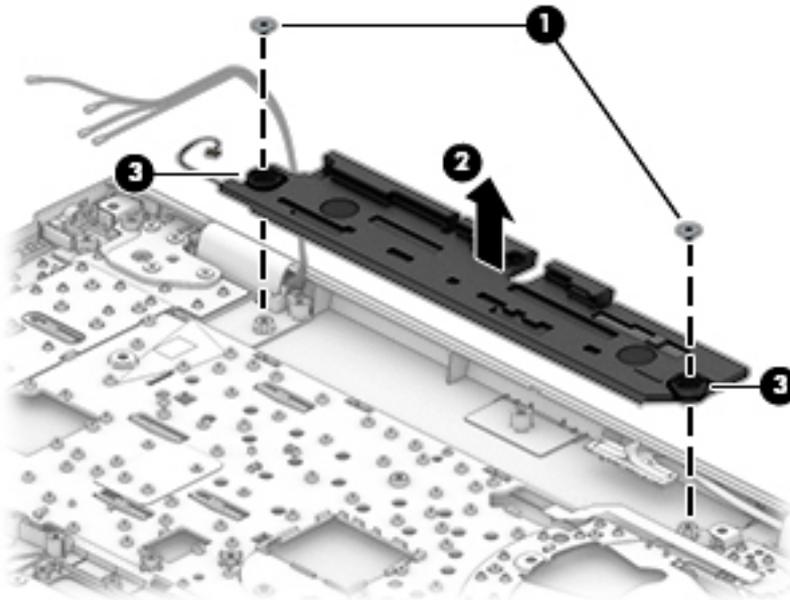**Table 6-16 Speaker description and part number**

Description	Spare part number
Speaker Kit	L09558-001

Before removing the speaker, follow these steps:

1.   Prepare the computer for disassembly (Preparation for disassembly on page 33).

2.   Remove the following components:

 a.   Bottom cover (see Bottom cover on page 34)

 b.   Battery (see Battery on page 35)

 c.   Hard drive (see Hard drive on page 38)

 d.   Solid-state drive (see Solid-state drive on page 40)

 e.   WWAN module (see WWAN module on page 41)

 f.   Keyboard (see Keyboard on page 44)

 g.   Internal frame (see Internal frame on page 48)

 h.   System board (see System board on page 66)

Remove the speaker:

1.   Remove the two Phillips M2.5 × 3.0 screws **(1)** that secure the speaker to the computer.

2.   Lift the speaker assembly up enough to access and remove the antenna cables connected to it **(2)**, and then remove the speaker from the computer **(3)**.

Reverse this procedure to install the speaker.

Fingerprint reader assembly

Table 6-17 Fingerprint reader assembly descriptions and part numbers

| Description	Spare part number
Fingerprint reader assembly (includes cable and gasket)	L58693-001
Fingerprint reader bracket (included in Bracket Kit)	L58694-001

Before removing the fingerprint reader assembly, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 33).

2. Remove the following components:

   a. Bottom cover (see Bottom cover on page 34)

   b. Battery (see Battery on page 35)

   c. Hard drive (see Hard drive on page 38)

   d. Solid-state drive (see Solid-state drive on page 40)

   e. WWAN module (see WWAN module on page 41)

   f. Keyboard (see Keyboard on page 44)

   g. Internal frame (see Internal frame on page 48)

   h. System board (see System board on page 66)

Remove the fingerprint reader assembly:

1. Remove the Phillips M2.0 × 2.0 screw **(1)** from the fingerprint reader bracket.

2. Slide to release the bracket, and then lift the bracket off the fingerprint reader board **(2)**.

3. Use a tool to release the fingerprint reader board from the computer **(3)**.
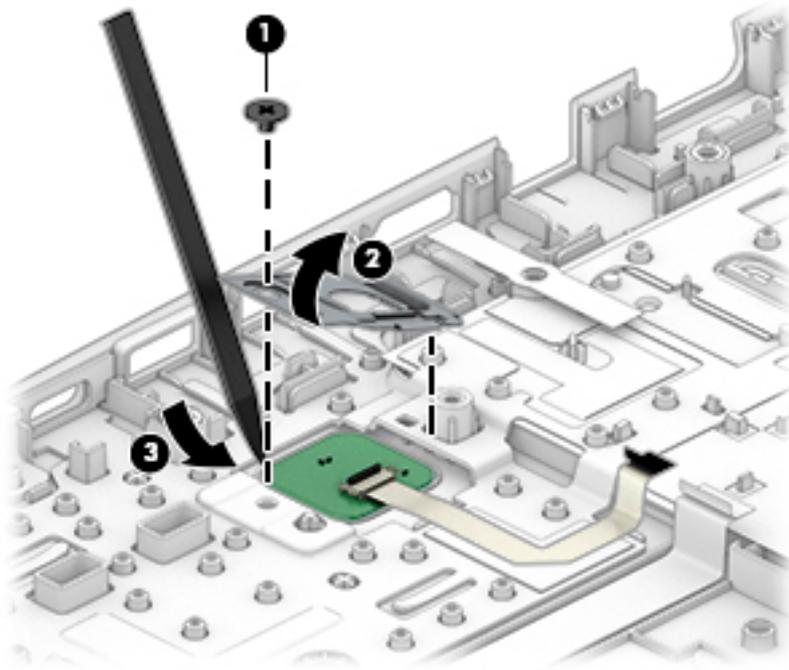
Reverse this procedure to install the fingerprint reader assembly.
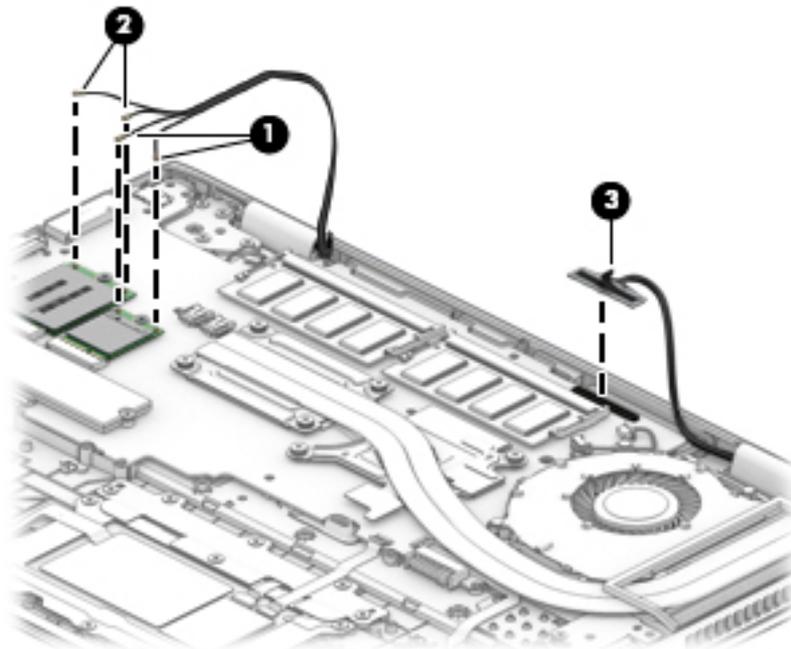
Display assembly

Display assemblies are available as spare parts at the subcomponent level only.

Before removing the display panel, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 33).

2. Remove the following components:

    a. Bottom cover (see Bottom cover on page 34)

    b. Battery (see Battery on page 35)

    c. Hard drive (see Hard drive on page 38)

    d. Solid-state drive (see Solid-state drive on page 40)

    e. WWAN module (see WWAN module on page 41)

    f. Keyboard (see Keyboard on page 44)

   g. Internal frame (see Internal frame on page 48)

Remove the display assembly:

1. Disconnect the antenna cables from the WLAN module **(1)** and the WWAN module **(2)** (select models only).

2. Disconnect the display cable from the system board **(3)**.

3. Rotate the display to open the hinges as far as possible (about 145º) **(1)**.

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

5. Pull the display away from the computer **(3)**.
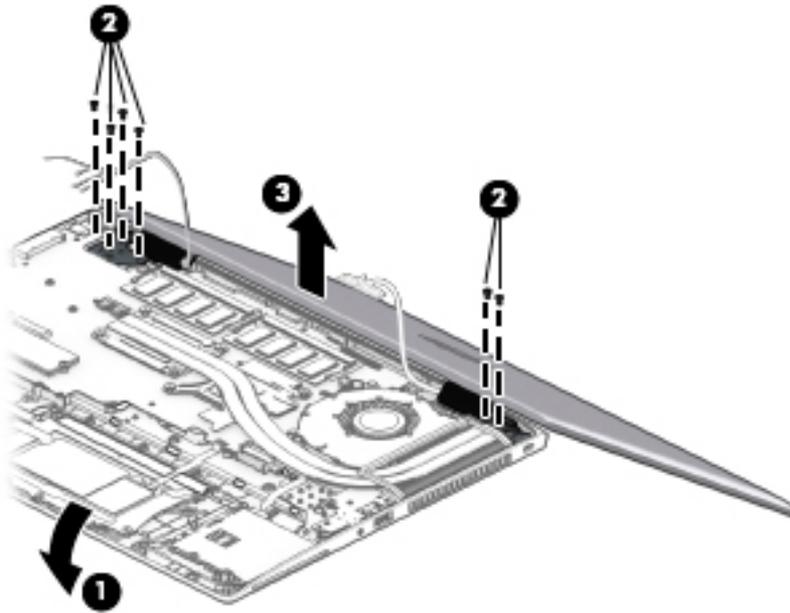
Remove the display assembly components:

1. If it is necessary to replace the display bezel:

   a. Use a non-marking tool to separate the display from the display cover **(1)**.

   b. Rotate the display over and place it next to the display cover **(2)**.

   Display bezels are available using the following spare part numbers:

   – Non-touch displays with camera module: L09530-001

   – Non-touch displays with microphone module: L09531-001
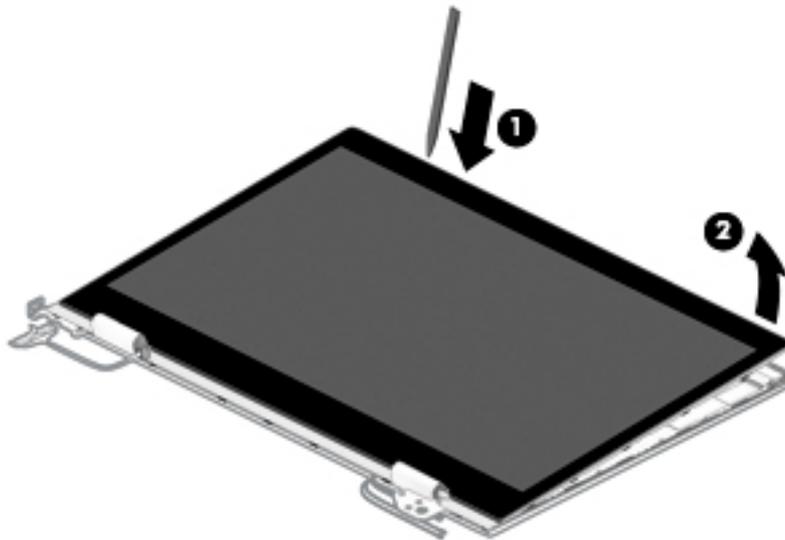
2. If it is necessary to replace the camera or microphone module:

   a. Use a tool to detach the camera **(1)** from the display cover.

b. Disconnect the cable **(2)** from the camera.

The camera module is available as spare part number L58702-001.

The microphone module is available as spare part number L58696-001.

3. If it is necessary to replace the display panel:

a. Lift the tape on the main connector **(1)**.

b. Squeeze both sides of main connector on the panel, and then pull the cable from the connector **(2)**.

c. (Touch models only) Lift the tape on the touch board connector **(3)**, and then pull the cable from the connector **(4)**.
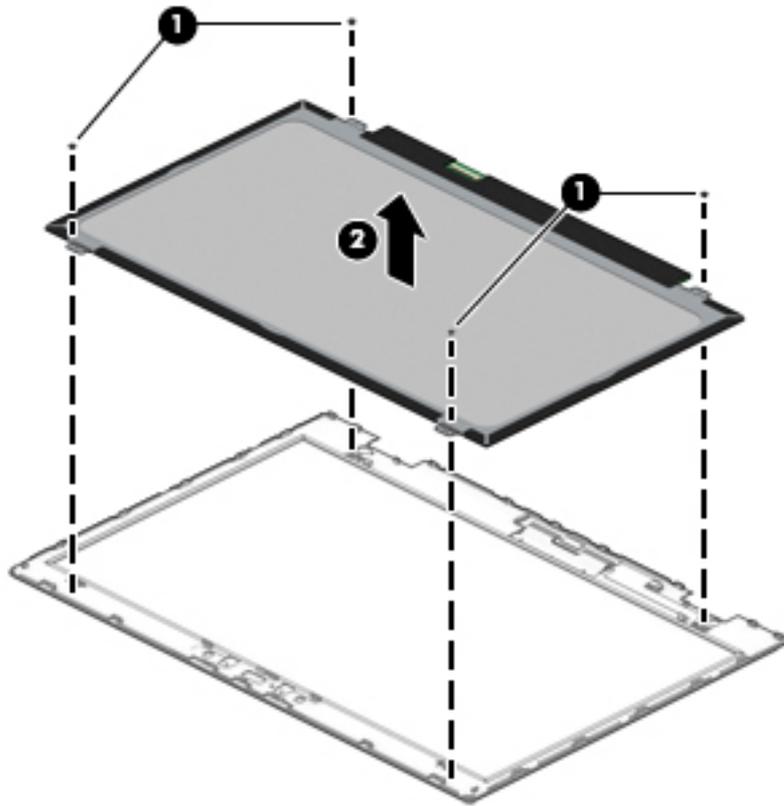
Raw display panels are available using the following spare part numbers:

– Non-touch, FHD: L58699-001

– Non-touch, FHD, privacy: L64869-001

– Non-touch, HD: L13835-001

– Touch, FHD: L58700-001
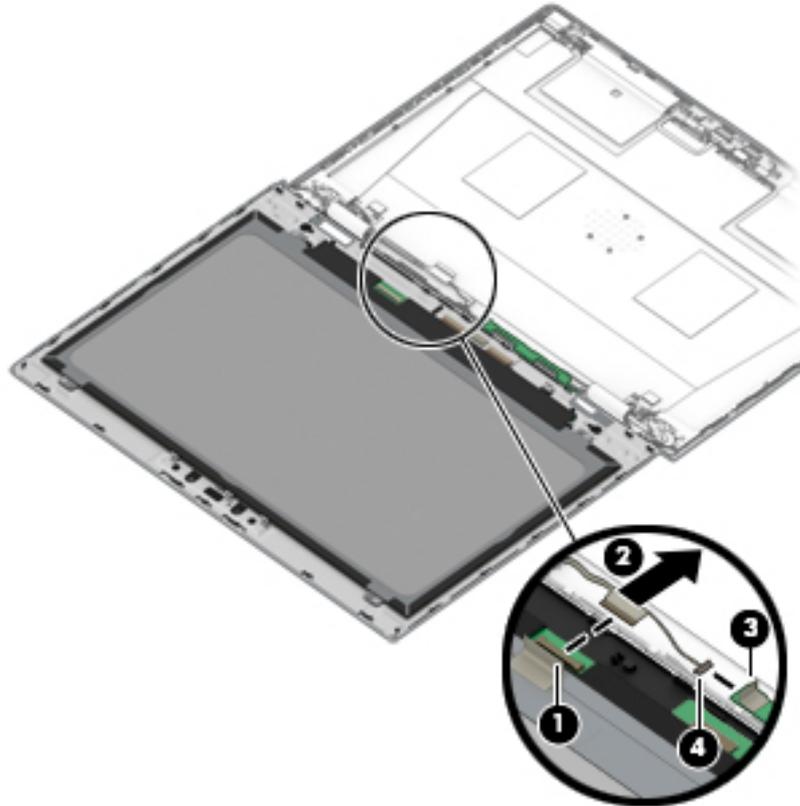
d. Remove the four Phillips M2.0 × 1.6 screws **(1)** that secure the display panel to the display cover.

e. Lift the panel from the display cover **(2)**.

4. If it is necessary remove the hinge covers, remove the Phillips M2.0 × 3.0 screw from each hinge cover **(1)**.

5. Use a thin tool to pry up at the seam under each hinge cover, between the hinge cover and bottom of the display cover **(2)**.

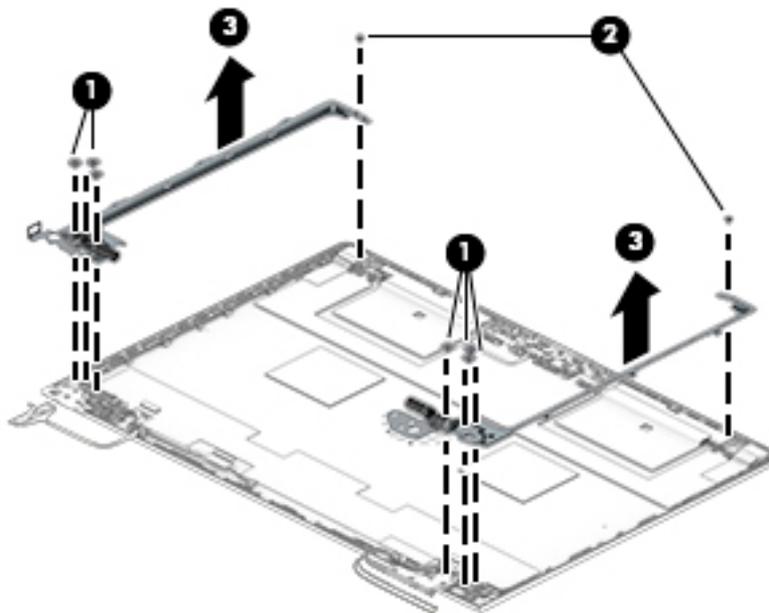**6.** Remove the hinge covers from the display cover **(3)**.

Display hinge covers are available as spare part number L09545-001.
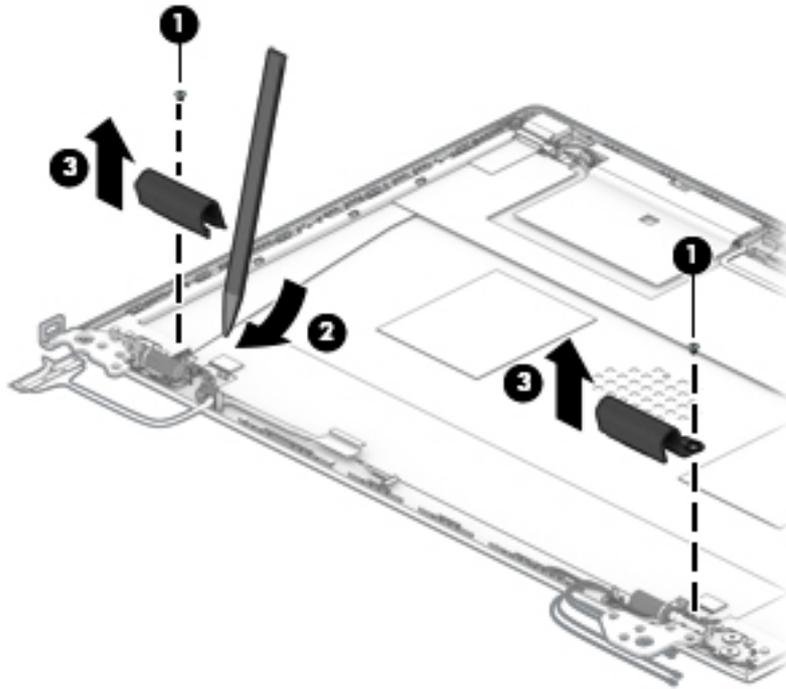
7. If it is necessary to replace the hinge brackets, remove the three Phillips M2.5 × 3.0 screws from the bottom of each hinge **(1)** and the Phillips M2.0 × 3.0 screw from the top of each hinge **(2)**.
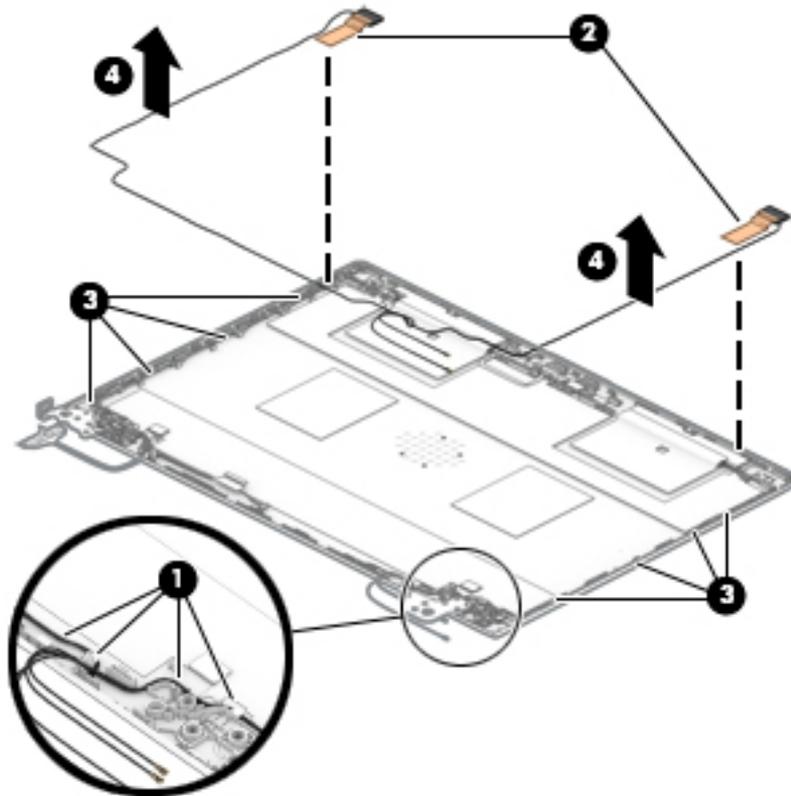
8. Remove the hinges from the display cover **(3)**.

Display hinges are available as spare part number L09544-001 for non-touch models or L64865-001 for touch models.

9. If it is necessary to replace the WLAN antenna cables, note the proper cable routing through the right hinge **(1)**.

10. Peel the antennas from the top of the display cover **(2)**, and then remove the WLAN antenna cables from the channels along the sides of the display cover **(3)**.

11. Remove the antenna cables from the display cover **(4)**.

    WLAN antennas are available in the Antenna Kit as spare part number L09523-001.

12. If it is necessary to replace the WWAN antenna cables, note the proper cable routing through the right hinge **(1)**.

13. Peel the antennas from the top of the display cover **(2)**, and then remove the WWAN antenna cables from the channels along the sides of the display cover **(3)**.

14. Remove the antenna cables from the display cover **(4)**.

WWAN antennas are available in the Antenna Kit as spare part number L09523-001.
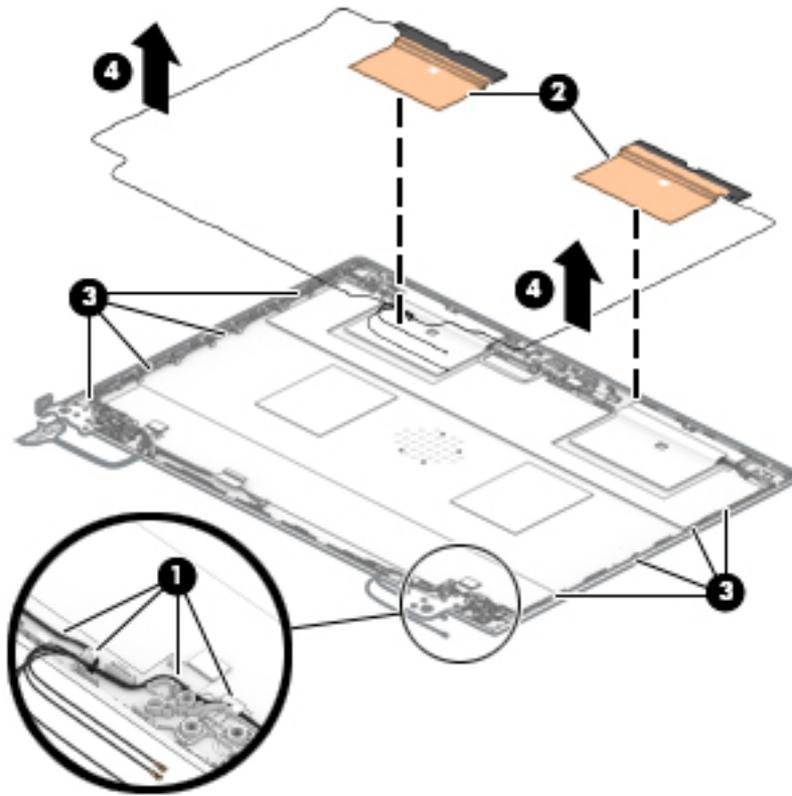
The display rear cover is available as spare part number L58685-001 for non-touch, HD models, L69928-001 for non-touch, FHD models, or L64866-001 for touch models.

The display cable is available as spare part number L58688-001 for non-touch models with WLAN, L58687-001 for non-touch models with WLAN + WWAN, L64867-001 for non-touch privacy models, or L64868-001 for touch models.

Reverse these procedures to reassemble and install the display assembly components.

7 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 .

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 .

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

⚠ **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 .

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.

8   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 86.

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 88.

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 88.

 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.

9 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 91).

- **Creating a restore point**—You can use Windows tools to create a restore point (see Using Windows tools on page 91).

- **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 91).

- **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 91).

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 91.

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 91.

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.

10   Specifications

Computer specifications

	Metric	U.S.
Dimensions		
Length	240.0 mm	9.5 in.
Width	340.0 mm	13.4 in.
Height (non-touch)	20.95 mm	0.83 in.
Height (touch)	21.95 mm	0.87 in.
Weight		
Non-touch display	1.73 kg	3.8 lbs
Touch display	1.95 kg	4.3 lbs
Input power		
Operating voltage	19.0 V dc @ 4.74 A – 90 W or 18.5 V dc @ 3.5 A – 65 W or 45 W	
Operating current	4.74 A or 3.5 A	
Temperature		
Operating (not writing to optical disc)	0°C to 35°C	32°F to 95°F
Operating (writing to optical disc)	5°C to 35°C	41°F to 95°F
Nonoperating	-20°C to 60°C	-4°F to 140°F
Relative humidity		
Operating	10% to 90%	
Nonoperating	5% to 95%	
Maximum altitude (unpressurized)		
Operating (14.7 to 10.1 psia)	-15 m to 3,048 m	- 50 ft to 10,000 ft
Nonoperating (14.7 to 4.4 psia)	-15 m to 12,192 m	-50 ft to 40,000 ft
Shock		
Operating	125 g, 2 ms, half-sine	
Nonoperating	200 g, 2 ms, half-sine	
Random vibration		
Operating	0.75 g zero-to-peak, 10 Hz to 500 Hz, 0.25 oct/min sweep rate	
Nonoperating	1.50 g zero-to-peak, 10 Hz to 500 Hz, 0.5 oct/min sweep rate	

NOTE: Applicable product safety standards specify thermal limits for plastic surfaces. The computer operates well within this range of temperatures.

35.6 cm (14.0 in) display specifications

	Metric	U.S.
Active diagonal size	35.6 cm	14.0 in
Resolution	FHD: 1920 × 1080	
	HD: 1366 × 768	
Surface treatment	Antiglare (except touch screen)	
Brightness	HD: 220 nits	
	FD: 250 nits or 700 nits (privacy)	
Viewing angle	HD: SVA	
	FHD: UWVA	
Backlight	LED	
Aspect ratio	16:9	
Display panel interface	eDP	

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

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

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

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

Hard drive specifications

	1 TB*	500 GB*
Dimensions		
Height	7.0 mm	7.0 mm
Length	100.4 mm	100.6 mm
Width	69.9 mm	70.1 mm
Weight	107.0 g	92.0 g
Interface type	SATA	SATA
Transfer rate		
Synchronous (maximum)	300 MB/sec	300 MB/sec
Security	ATA security	ATA security
Seek times (typical read, including setting)		
Single track	2.0 ms	3 ms
Average (read/write)	12 ms	13 ms
Maximum	22 ms	24 ms
Logical blocks	1,953,525,168	1,048,576,000
Disk rotational speed	5400 rpm	5400 rpm
Operating temperature		

*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.

11 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 11-1 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 HO5VV-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.

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 mm² or 1.25 mm² 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 mm² 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 mm² 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 mm² 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 mm² or 1.00 mm2 conductor size, with plug BS 1363/A with BSI or ASTA marks.

12 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 12-1 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 106.	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.

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

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

Questions and answers

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

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

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

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

    b. Select **Main**, and then select **Apply Factory Defaults and Exit**.

    c. Follow the on-screen instructions.

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

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

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

    Like the legacy BIOS, the UEFI BIOS provides an interface to display the system information and configuration settings and to change the configuration of your computer before an OS is loaded. BIOS provides a secure run-time environment that supports a Graphic User Interface (GUI). In this environment, you can use either a pointing device (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.

13 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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